

# iCeMS

# Safety and Health

# Guidelines

March 2015

Edited by Research Building Management Sub-committee

(Contact: Shared Equipment Support Office: [ts@icems.kyoto-u.ac.jp](mailto:ts@icems.kyoto-u.ac.jp))

**Institute for Integrated Cell-Material Sciences, Kyoto University**  
京都大学 物質－細胞統合システム拠点



## Emergency Contact List

(as of March 1, 2015)

|                                               | Name                                           | Phone Number (Full)                         | Call from Campus Phone | Reception Hours           | Remarks                                                                       |                                |
|-----------------------------------------------|------------------------------------------------|---------------------------------------------|------------------------|---------------------------|-------------------------------------------------------------------------------|--------------------------------|
| Fire                                          | <b>Fire Station</b>                            | <b>119</b>                                  | <b>0-119</b>           | 24 hours                  |                                                                               |                                |
|                                               | iCeMS General Affairs & Planning Section       | 075-753-9754                                | 9754                   | 8:30~17:15                |                                                                               |                                |
|                                               | Main Gate Security Station of Main Campus      | 075-753-2201                                | 2201                   | 17:15~8:30                | *Call iCeMS General Affairs & Planning Section first.                         |                                |
|                                               | SECOM                                          | 075-211-1745                                | 0-211-1745             | 18:00~9:00                | Customer code<br>Main Bldg: 777983<br>Research Bldg: 524424                   |                                |
| Disease<br>Injury                             | <b>Ambulance</b>                               | <b>119</b>                                  | <b>0-119</b>           | 24 hours                  |                                                                               |                                |
|                                               | Kyoto Minren Daini Chuo Hospital               | 075-701-6111                                | 0-701-6111             | 8:30~11:30<br>17:30~20:00 | Out-of-hours service is available with emergency cases                        |                                |
|                                               | Kyoto University Hospital                      | 075-751-3047                                | 19-3047                | 8:30~11:00                | Outpatient Reception                                                          |                                |
| Power Failure<br>Gas Leakage<br>Water Leakage | iCeMS Facilities & Environment Section         |                                             |                        |                           | ←Please write the phone number provided at beginning of year.                 |                                |
|                                               | Yoshida-South Facilities & Environment Section |                                             |                        |                           | ←Please write the phone number provided at beginning of year.                 |                                |
|                                               | OSAKA GAS                                      | 0120-8-19424                                | 0-0120-8-19424         | 24 hours                  | For gas leakage only<br>*Call iCeMS General Affairs & Planning Section first. |                                |
| Elevator                                      | Main Bldg                                      | FUJITEC                                     | 075-231-7144           | 0-231-7144                | 24 hours                                                                      | Customer code:<br>71-06217     |
|                                               | Research Bldg                                  | TOSHIBA                                     | 0120-76-2433           | 0-0120-76-2433            | 24 hours                                                                      | Customer code:<br>0-28217      |
|                                               | RB No.1 Project Lab                            | Mitsubishi Electric Building Techno-Service | 075-213-1194           | 0-213-1194                | 24 hours                                                                      | Customer code:<br>26-00511-015 |
|                                               | RB No.1 Annex                                  | Mitsubishi Electric Building Techno-Service | 075-213-1194           | 0-213-1194                | 24 hours                                                                      | Customer code:<br>26-00511-029 |
| Water Receiving Tank (Basement of Main Bldg)  | KAGECHIKA MENTE                                | 075-752-0591                                | 0-752-0591             | 24 hours                  |                                                                               |                                |
| Laboratory Wastewater Treatment Tank          | DAIKO Facility Maintenance & Development       | 075-803-0507                                | 0-803-0507             | 24 hours                  | (Contract Period: until March 31, 2017)                                       |                                |
| Theft<br>Suspicious Person                    | iCeMS General Affairs & Planning Section       | 075-753-9754                                | 9754                   | 8:30~17:15                |                                                                               |                                |
|                                               | Main Gate Security Station                     | 075-753-2201                                | 2201                   | 17:15~8:30                | *Call iCeMS General Affairs & Planning Section first.                         |                                |
|                                               | Police Station                                 | 110                                         | 0-110                  | 24 hours                  | *Call iCeMS General Affairs & Planning Section first.                         |                                |
|                                               | Higashi-Ichijo Police Box                      | 075-771-0169                                | 0-771-0169             | 24 hours                  | *Call iCeMS General Affairs & Planning Section first.                         |                                |

# iCeMS Safety and Health Guidelines

## Contents

|           |                                                                         |    |
|-----------|-------------------------------------------------------------------------|----|
| Chapter 1 | Objective of iCeMS Safety and Health Guidelines .....                   | 1  |
| Chapter 2 | Safety Education and Training and its Handling at iCeMS .....           | 1  |
| Chapter 3 | Emergency Contact List.....                                             | 2  |
| Chapter 4 | General Precautions .....                                               | 3  |
| 4-1       | Overall Precautions                                                     |    |
| 4-2       | Locking of Room Doors                                                   |    |
| 4-3       | Fire Prevention Supervisor                                              |    |
| 4-4       | Fires                                                                   |    |
| 4-5       | Accidents                                                               |    |
| 4-6       | Earthquakes                                                             |    |
| 4-7       | Theft                                                                   |    |
| 4-8       | VDT Works                                                               |    |
| 4-9       | Mental Health                                                           |    |
| 4-10      | Disposal Methods for Waste from iCeMS                                   |    |
| Chapter 5 | Technical Precautions Concerning Experimental Studies .....             | 10 |
| 5-1       | General Precautions on Education and Research Experiments               |    |
| 5-2       | Chemicals                                                               |    |
| 5-2-1     | General Precautions in Handling Chemicals                               |    |
| 5-2-2     | Outsourcing the Disposal of Waste Chemicals                             |    |
| 5-2-3     | Hazardous Materials (Including Flying Dust)                             |    |
| 5-2-4     | Poisonous and Deleterious Substances                                    |    |
| 5-2-5     | Dangerous Substances Having Ignitable, Combustible, or Explosive Nature |    |
| 5-3       | Exhaust Gas                                                             |    |
| 5-4       | Laboratory Waste Solutions                                              |    |
| 5-5       | High-Pressure Gases                                                     |    |
| 5-5-1     | Gas Supply Lines                                                        |    |
| 5-5-2     | High-Pressure Gas Cylinders                                             |    |
| 5-5-3     | Liquid Nitrogen and Liquid Helium                                       |    |

|           |                                                |    |
|-----------|------------------------------------------------|----|
| 5-5-4     | Liquid Oxygen                                  |    |
| 5-5-5     | Special Material Gases                         |    |
| 5-5-6     | Refrigeration Equipment                        |    |
| 5-6       | Explosives                                     |    |
| 5-7       | Radiation                                      |    |
| 5-8       | Laser Devices                                  |    |
| 5-9       | High Magnetic Field Generators                 |    |
| 5-10      | Electricity                                    |    |
| 5-11      | Machines                                       |    |
| 5-11-1    | Power Conversion / Transmission Devices        |    |
| 5-11-2    | Machine Tools, Etc.                            |    |
| 5-11-3    | Cranes and Sling Works                         |    |
| 5-11-4    | Forklift Trucks                                |    |
| Chapter 6 | Chemical Experiments .....                     | 25 |
|           | [General Precautions]                          |    |
| 6-1       | Heating                                        |    |
| 6-2       | Distillation                                   |    |
| 6-3       | Depressurization and Pressurization            |    |
| 6-4       | Glassware and Glassworks                       |    |
| 6-4-1     | Glassware                                      |    |
| 6-4-2     | Glassworks                                     |    |
| 6-5       | Fume Hood                                      |    |
| Chapter 7 | Explosions .....                               | 27 |
|           | [Prevention Measures]                          |    |
|           | [Damage Mitigation Measures]                   |    |
| 7-1       | Explosive Gas Mixture                          |    |
| 7-2       | Explosive-Decomposition Gas                    |    |
| 7-3       | Explosive Substances                           |    |
| Chapter 8 | Life Sciences .....                            | 29 |
|           | [Basic Precautions for Biological Experiments] |    |
| 8-1       | Recombinant DNA Experiments                    |    |

8-1-1 Laws and Regulations Concerning Security

8-1-2 Precautions for an Experiment Using Recombinant DNA

8-2 Animal Experiments

Necessity and Appropriate Implementation of Animal Experiments

8-2-1 Animal Protocol

<1> Animal Laboratories, Facilities for the Care and Keeping of the Experimental Animals

Animal Laboratory

Facilities for the Care and Keeping of the Experimental Animals

Experimental animals other than Mammalian, Avian and Reptilian Species

<2> Education and Training for Animal Experiments

<3> Animal Experimental Protocol

<4> Health Check

8-2-2 Precautions for Animal Experiments

8-3 Human-Derived Samples

Human Embryonic Stem (ES) cell

Human induced Pluripotent Stem (iPS) cell

Conditions for the Use of human ES cells

<1> Purpose of Experiment (Paragraph 1, Article 5)

<2> Cells to be Utilized

<3> Prohibited Acts

<4> Summary of the Procedures for the Utilization of human ES Cells

## **Appended Figures & Tables**

Figure 2 Flow for Registration and Control of Chemical Substances by KUCRS

Figure 3 Procedures for Users of Radioisotopes and X-ray Equipment

Table 4 Organic Solvents (Ordinance on Prevention of Organic Solvent Poisoning)

Table 5 Specified Chemical Substances (Ordinance on Prevention of Hazards due to Specified Chemical Substances)

Table 6 Asbestos (Ordinance on Prevention of Health Impairment due to Asbestos)

Table 7 Poisonous Substances (Those Specified in the Appended Table 1 of Poisonous and Deleterious Substances Control Law)

Table 8 Poisonous Substances (Those Specified by the Cabinet Order for the Designation of the Poisonous and Deleterious Substances (1))

Table 8 Poisonous Substances (Those Specified by the Cabinet Order for the Designation of the Poisonous and Deleterious Substances (2))

Table 8 Poisonous Substances (Those Specified by the Cabinet Order for the Designation of the Poisonous and Deleterious Substances (3))

Table 9 Deleterious Substances (Those Specified in the Appended Table 2 of Poisonous and Deleterious Substances Control Law (1))

Table 9 Deleterious Substances (Those Specified in the Appended Table 2 of Poisonous and Deleterious Substances Control Law (2))

Table 10 Hazardous Substances (Fire Services Act)

Table 11 Classification of Collection and Storage of Experimental Waste Solutions

Table 12 Special Material Gases

Reference 1 Penal Provisions

Reference 2 Flow Chart for Disposing of Unnecessary Chemicals

Reference 3 Precautions for Disposal of Unnecessary Chemicals

## **Forms**

Please download these forms from "CeMS Inside" (<http://cloud.icems.kyoto-u.ac.jp/cms/>).

Form 1-1 Confirmation of Safety and Health Education and Training

Form 2-1 Facilities Inspection Check List

Form 2-2 Fire-Extinguishing Equipment Check List

Form 3-1 Centrifuge: Periodical Voluntary Inspection

Form 3-2 Small-sized pressure vessel: Periodical Voluntary Inspection

Form 3-3 Draft chamber (Fume hood): Periodical Voluntary Inspection <Japanese version>

Form 3-4 Draft chamber (Fume hood): Periodical Voluntary Inspection <English version>

## Chapter 1 Objective of iCeMS Safety and Health Guidelines

These safety and health guidelines define the code of conduct to be observed by all faculty members and students working and studying at the iCeMS and also make clear the duties of administrative personnel in conforming to the code of conduct. In particular, these guidelines specify that all iCeMS works must be performed in compliance with the Labor Standards Law, the Industrial Safety and Health Law, and other applicable laws and ordinances to prevent accidents, fires, and other emergencies, thereby ensuring daily health of all people associated with the iCeMS.

Any violation of the provisions of the Industrial Safety and Health Law and other applicable laws and ordinances will be dealt with by disciplinary action (Reference 1).

## Chapter 2 Safety Education and Training and its Handling at iCeMS

- 1) All iCeMS members\* must receive safety education and training in accordance with these Safety and Health Guidelines.
- 2) Each supervisor (group leader) must undertake the safety education and training of his/her direct subordinates.
- 3) Students commencing experimental studies at the iCeMS must prove that they have already received safety education and training at the departments to which they belong. In addition, precautions on the use of the equipment installed in the iCeMS must be explained to them by their supervisor.
- 4) In the case of visiting researchers who will stay at the iCeMS for only a short duration, the academic advisor who receives them must give them safety education and training.
- 5) A person who has been newly assigned to the iCeMS must report that he/she has already attended a proper safety education and training course and must obtain an approval or the signature of the Institute's Director or the person responsible for safety education and training. (Form 1-1: "Confirmation of Safety and Health Education and Training")
- 6) Each person in charge of safety education and training (group leader) must submit the original of the Confirmation of Safety and Health Education and Training to the Institute's Director to obtain his/her approval.
- 7) After approving the Confirmation of Safety and Health Education and Training, the Institute's Director must issue a copy of it to the person who received the safety education and training. The person who received the safety education and training must retain the copy.
- 8) Office staff may receive an explanation of general precautions, while the persons who will be involved in experiments and other specialized research works must receive an explanation of all related items.

\* "iCeMS member" means (a) faculty, staffs and researchers enrolled in the iCeMS, (b) all persons who use facilities and experimental devices owned by the iCeMS (including students and persons outside the iCeMS).

## Chapter 3 Emergency Contact List

Table 1: Emergency contact list (as of March 1, 2015)

|                                              | Name                                           | Phone Number (Full)                         | Call from Campus Phone | Reception Hours           | Remarks                                                                       |                                |
|----------------------------------------------|------------------------------------------------|---------------------------------------------|------------------------|---------------------------|-------------------------------------------------------------------------------|--------------------------------|
| Fire                                         | <b>Fire Station</b>                            | <b>119</b>                                  | <b>0-119</b>           | 24 hours                  |                                                                               |                                |
|                                              | iCeMS General Affairs & Planning Section       | 075-753-9754                                | 9754                   | 8:30~17:15                |                                                                               |                                |
|                                              | Main Gate Security Station of Main Campus      | 075-753-2201                                | 2201                   | 17:15~8:30                | *Call iCeMS General Affairs & Planning Section first.                         |                                |
|                                              | SECOM                                          | 075-211-1745                                | 0-211-1745             | 18:00~9:00                | Customer code<br>Main Bldg: 777983<br>Research Bldg: 524424                   |                                |
| Disease<br>Injury                            | <b>Ambulance</b>                               | <b>119</b>                                  | <b>0-119</b>           | 24 hours                  |                                                                               |                                |
|                                              | Kyoto Minren Daini Chuo Hospital               | 075-701-6111                                | 0-701-6111             | 8:30~11:30<br>17:30~20:00 | Out-of-hours service is available with emergency cases                        |                                |
|                                              | Kyoto University Hospital                      | 075-751-3047                                | 19-3047                | 8:30~11:00                | Outpatient Reception                                                          |                                |
| Power Failure                                | iCeMS Facilities & Environment Section         |                                             |                        |                           | ←Please write the phone number provided at beginning of year.                 |                                |
| Gas Leakage                                  | Yoshida-South Facilities & Environment Section |                                             |                        |                           | ←Please write the phone number provided at beginning of year.                 |                                |
| Water Leakage                                | OSAKA GAS                                      | 0120-8-19424                                | 0-0120-8-19424         | 24 hours                  | For gas leakage only<br>*Call iCeMS General Affairs & Planning Section first. |                                |
| Elevator                                     | Main Bldg                                      | FUJITEC                                     | 075-231-7144           | 0-231-7144                | 24 hours                                                                      | Customer code:<br>71-06217     |
|                                              | Research Bldg                                  | TOSHIBA                                     | 0120-76-2433           | 0-0120-76-2433            | 24 hours                                                                      | Customer code:<br>0-28217      |
|                                              | RB No.1 Project Lab                            | Mitsubishi Electric Building Techno-Service | 075-213-1194           | 0-213-1194                | 24 hours                                                                      | Customer code:<br>26-00511-015 |
|                                              | RB No.1 Annex                                  | Mitsubishi Electric Building Techno-Service | 075-213-1194           | 0-213-1194                | 24 hours                                                                      | Customer code:<br>26-00511-029 |
| Water Receiving Tank (Basement of Main Bldg) | KAGECHIKA MENTE                                | 075-752-0591                                | 0-752-0591             | 24 hours                  |                                                                               |                                |
| Laboratory Wastewater Treatment Tank         | DAIKO Facility Maintenance & Development       | 075-803-0507                                | 0-803-0507             | 24 hours                  | (Contract Period: until March 31, 2017)                                       |                                |
| Theft                                        | iCeMS General Affairs & Planning Section       | 075-753-9754                                | 9754                   | 8:30~17:15                |                                                                               |                                |
|                                              | Main Gate Security Station                     | 075-753-2201                                | 2201                   | 17:15~8:30                | *Call iCeMS General Affairs & Planning Section first.                         |                                |
| Suspicious Person                            | Police Station                                 | 110                                         | 0-110                  | 24 hours                  | *Call iCeMS General Affairs & Planning Section first.                         |                                |
|                                              | Higashi-Ichijo Police Box                      | 075-771-0169                                | 0-771-0169             | 24 hours                  | *Call iCeMS General Affairs & Planning Section first.                         |                                |



## Chapter 4 General Precautions

### 4-1 Overall Precautions

- 1) Make yourself familiar with two evacuation routes.
- 2) Make yourself familiar with the locations of fire extinguishers. Do not move the fire extinguishers to different locations.
- 3) Do not leave objects near fire-proof doors, emergency exits, firefighting equipment, indoor hydrants, or in hallways.  
Do not leave obstacles in the access passage of firefighters (windows with an inverted triangle mark).
- 4) Each evacuation passage must be at least 80 cm in width. Do not leave obstacles (including toppled objects and fallen objects) in the passage.
- 5) Electrical wiring must conform to the electric capacity specified for each electric system. For a 20A capacity wall outlet with two sockets, the maximum electricity that can be simultaneously supplied through the two sockets must be 20A or 2,000W).
- 6) Do not use an electric wire or connect electric wires to supply electricity exceeding the rated capacity of the wire or wires. When using a power strip, confirm that its capacity is larger than the capacity of the appliance that will be connected to the strip.
- 7) Before leaving the office or laboratory at the end of the day, make an effort to reduce standby power consumption, putting the workplace in order, and checking for safety of the workplace.
- 8) No smoking is permitted outside of designated areas. Drinking and eating in laboratories are prohibited.
- 9) If the electric supply is cut off, water supply to the Main Building will stop.
- 10) If the electric supply is cut off, locked automatic doors will be unlocked. Pay particular attention to the security of the laboratory.  
\* In the Main / Research Buildings, the automatic doors at the gates will function when the emergency power supply system is started.

### 4-2 Locking of Room Doors

- 1) Keep the entrance door of the laboratory closed, as a rule. (When using liquid nitrogen, helium, or other freezing medium or when using a high-pressure gas, be sure to ventilate the laboratory and open the door.)
- 2) When all members go out of the laboratory, be sure to lock the door. Keep the keys securely. For the precautions for controlling chemical storage rooms, conform to the Chemical Substance Handling Rules.

### 4-3 Fire Prevention Supervisor

The fire prevention supervisor is responsible for protecting rooms (from fires, disasters, toppled objects, fallen objects, electrical wiring, etc.) in accordance with a fire prevention plan. **S/he should voluntarily inspect each room at least once a month.** Replacement of the fire prevention supervisor must be reported to the Facilities and Environment Section without delay.

When inspecting each room, the fire prevention supervisor must use the following checklists:

Form 2-1: Facilities Inspection Check List

Form 2-2: Fire-Extinguishing Equipment Check List

#### 4-4 Fires

##### Notification

- 1) If a fire alarm bell sounds, check the surrounding area and passageways for fire. If no abnormality is found in the floor, check the floor immediately below.
- 2) If you notice the outbreak of a fire, shout an alarm. Call persons. Activate a fire alarm. Report the fire according to the Emergency Contact Network and call the relevant fire station.

##### Fire extinguisher

- 1) To use a fire extinguisher;
  1. Pull out the yellow pin upward.
  2. Detach the hose. Do not spray the extinguisher at the flame but at the burning object itself.
  3. Grip the hand lever in front of you strongly.
- 2) Once operated, the usually-used type of "ABC dry chemical fire extinguisher" does not stop spraying until it uses up the fire extinguishant. When using this type of fire extinguisher, consider whether it is suitable for the fire site. It is unsuitable for extinguishing a fire near a personal computer, precision machine, or optical instrument.
- 3) A "wet chemical fire extinguisher" stops spraying the fire extinguishant when the operator returns the hand lever to the original position during use.

##### Evacuation

- 1) Before evacuating the building, stop the supply of electricity, city gas, and other chemicals.
- 2) Before leaving the room, close all doors without locking them. Do not use an elevator.
- 3) When evacuating, cover your mouth and nose with a handkerchief or other suitable piece of cloth and walk with your head down in order to avoid inhaling smoke.

#### 4-5 Accidents

- 1) As needed, give first-aid treatment to victims to save their lives. Call other persons to ask for their assistance.
- 2) In the event of an emergency, call an ambulance or police station. Direct the ambulance to the accident site.
- 3) In the case of an accident involving an explosion, immediately transfer explosive substances to a safe place to prevent the spread of the danger zone. If it is difficult to transfer the substances or there is a possibility of additional explosions, evacuate the site immediately.  
If an explosion occurs, its force may scatter debris and cause a secondary disaster. Also pay attention to the area around the object that has exploded.
- 4) If a highly hazardous chemical substance leaks, immediately evacuate the site. If possible, remove the cause of the leakage to prevent the spread of the leaked substance.
- 5) If somebody suffers an electric shock, do not approach closely to the victim until you confirm that the area around the scene has been electrically insulated. Put on rubber gloves and rubber boots and confirm your own safety before touching and trying to help the victim.
- 6) Do not turn off the air-exhaust system until its safety is confirmed.
- 7) Do not enter a room without due care where liquid nitrogen or helium is used, since the room is likely to be deficient in oxygen.
- 8) When the presence of an inflammable substance is suspected, do not turn any power switch on or off.
- 9) If you are involved in an accident (including a traffic accident), contact the General Affairs and Planning

Section or the Facilities and Environment Section. You are also required to fill an accident memorandum and submit it to the Agency for Health, Safety and Environment.

Website of the Agency for Health, Safety and Environment (only displayed in Japanese):

<http://www.esho.kyoto-u.ac.jp/jiko/>

#### 4-6 Earthquakes

- 1) Ensure your own safety. Protect yourself from falling objects and other structures. Make sure that the hard hat provided at each table is always ready for use.
- 2) Open the doors to secure emergency exits. Extinguish any fire that you are using. Turn off the power switches, close the gas valves, and stop the valves for other chemical substances. Prevent the outbreak of a fire. If a fire occurs, try to extinguish it at an early stage as much as possible.
- 3) Exit from the building via the stairs. Do not use an elevator.
- 4) Immediately after the quake's most dangerous shaking calms down, go to the following evacuation sites:  
Main building: square in front of the gate  
Research Building: square in front of the south gate
- 5) If the disaster is serious and large-scale evacuation is essential, assemble by walking to the square on the south side of the gymnasium in the West Campus (square between the co-op and gymnasium). Avoid walking near broken glass fragments and glass-fitted walls.
- 6) Report your situation to the Administrative Office of iCeMS by e-mail ([emergency@icems.kyoto-u.ac.jp](mailto:emergency@icems.kyoto-u.ac.jp)).
- 7) When needed, cooperate in rescue and emergency treatment.
- 8) Visit an insurance health clinic when medical treatment is necessary. When the responsible medical doctor judges that a patient should be transported to a large-scale medical facility, Kyoto University Hospital must receive the patient as a rule. (See the Emergency Contact Numbers List.)
- 9) If you have difficulty in returning home because of a serious disaster, follow the instructions of the Administrative Office of iCeMS.
- 10) Familiarize yourself with the evacuation map (Figure 1).
- 11) If you find that a building has been seriously damaged, keep away from the building and contact the Administrative Office of iCeMS.
- 12) To prevent an outbreak of fire associated with the recovery of electricity/gas supply, keep the breakers turned off and the main valve closed until the electrical system and gas system are confirmed to be safe. In addition, do not start an emergency power generator until you confirm that it will not cause a fire.

(The remainder of this page is intentionally left blank.)



Figure 1 Map of iCeMS emergency evacuation site for large-scale disasters and the vicinity of site

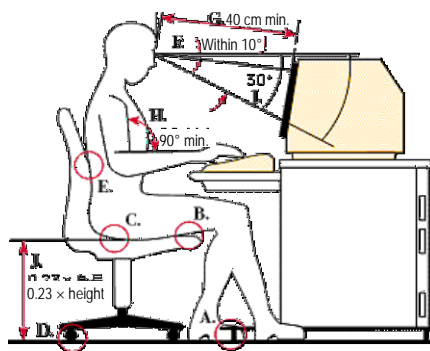
(The remainder of this page is intentionally left blank.)

#### 4-7 Theft

- 1) If you discover that there has been a theft, leave the scene as it is and contact the relevant parties according to the Emergency Contact Network.
- 2) If you encounter a thief, do not confront him/her but ensure your own safety.

#### 4-8 VDT Works

- 1) Do not continue VDT work for longer than one hour. Take a 10 to 15 minute break before starting the following work.
- 2) It is preferable to position the top of the display level with or slightly lower than your eye height.
- 3) Faculty staff who engages routinely in VDT works must have a regular VDT health checkup.



#### 4-9 Mental Health

A significant change in sleeping hours or weight is an important sign of health problems. Occasionally pay attention to your own physical and mental conditions to check for any change over a short period. You can consult an industrial physician on preventing health disturbance from working long hours or overworking. A harassment consulting system has been established.

Harassment consultation desk: [http://www.kyoto-u.ac.jp/ja/profile/human\\_rights/harassment/index.htm/](http://www.kyoto-u.ac.jp/ja/profile/human_rights/harassment/index.htm/)

An outside specialist's counseling service system has also been established. You can apply for this service through the Agency for Health, Safety and Environment's website (only displayed in Japanese).

Top page > Health maintenance > Mental health

<http://www.esho.kyoto-u.ac.jp/index.php?p=26>

#### 4-10 Disposal Methods for Waste from iCeMS

The Kyoto University Liquid/Solid Waste Management Rules specify different disposal methods for different kinds of waste. Read these rules carefully until you can dispose of waste properly. If there is anything unclear, check with the Facilities and Environment Section of iCeMS.

(The remainder of this page is intentionally left blank.)

## Classification of Waste Disposal Methods in iCeMS (Outline)

**Table 2 Classification of Liquid/Solid Waste according to Kyoto University Liquid and Solid Waste Management Rules**

(These rules are applied to waste other than radioactive waste.)

|                                                                     |                                             |                                                                                                               |
|---------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Liquid waste                                                        |                                             | Sewage water and other liquid waste ( <b>laboratory liquid waste</b> )                                        |
| Solid waste                                                         | <b>Sludge</b>                               | Sludge in catch basin, sludge produced by liquid waste treatment, etc.                                        |
|                                                                     | <b>Waste oil</b>                            | Organic solvents, machine oils, etc.                                                                          |
|                                                                     | <b>Waste acid</b>                           | Sulfuric acid, nitric acid, etc.                                                                              |
|                                                                     | <b>Waste alkali</b>                         | Caustic soda, caustic potash, etc.                                                                            |
|                                                                     | Waste plastic                               | Reagent containers, experimental/medical instruments, etc.                                                    |
|                                                                     | Waste rubber                                |                                                                                                               |
|                                                                     | Waste metal                                 | Reagent containers, experimental/medical instruments, etc.                                                    |
|                                                                     | Glass waste and ceramic waste               | Reagent containers, experimental/medical instruments, etc.                                                    |
|                                                                     | Other waste designated by the Chancellor    |                                                                                                               |
| Specially managed waste                                             | <b>PCB containing parts</b>                 | General waste (parts disassembled from air conditioners, TVs, and microwave ovens)                            |
|                                                                     | <b>General infectious waste</b>             | Bloodstained gauze and other general waste that contains or is considered likely to contain infectious agents |
|                                                                     | <b>Highly inflammable waste oil</b>         | Volatile oils, kerosene, and light oils                                                                       |
|                                                                     | <b>Strong acid and strong alkali</b>        | Waste acid with pH of 2 or less, and waste alkali with pH of 12.5 or more                                     |
|                                                                     | <b>Infectious industrial waste</b>          | Blood and industrial waste containing or expected to contain syringe needles and other infectious agents      |
|                                                                     | <b>Specified hazardous industrial waste</b> | Waste PCB and substances contaminated by PCB                                                                  |
|                                                                     |                                             | Waste asbestos                                                                                                |
|                                                                     |                                             | Waste containing heavy metals (data of the Environment Preservation Research Center)                          |
| Substances containing trichloroethylene or other hazardous chemical |                                             |                                                                                                               |
| Other waste designated by the Chancellor                            |                                             |                                                                                                               |

[Note:] Waste name in red: waste whose disposal requires administrative procedures by the Environment Preservation Research Center

Waste in blue: waste that must be collected at the infectious waste collection site (Research Building No. 1 B25)

Waste that must be disposed of by the same method as that for infectious waste: culture media used for experiment, dead laboratory animals, test tubes, laboratory dishes, syringe needles, surgical knives, broken ampules/vials, disposable medical apparatuses, gloves, blood bags, hygiene products, etc.

**Syringe needles, surgical knives, glass pieces, and other sharp-edged products must be handled as infectious waste, even though they are new or can be converted to "non-infectious waste" by sterilization.**

Dispose of waste routinely according to the methods shown in Table 3.

For the waste excluded from this table, contact the Facilities and Environment Section of iCeMS.

Table 3 Waste disposal method

| Category                                                                         | Classification                                                   |                                                                                                                                                                                                                                  | Method, collection site, etc.                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General waste                                                                    | Combustible garbage (including kitchen garbage)                  |                                                                                                                                                                                                                                  | Classify the waste, put the classified waste in a transparent bag, and carry the bag to the designated waste collection site.                                                                                                                                                                    |                                                                                                                                                                                                                                                                              |
|                                                                                  | Recyclable waste (empty beverage bottles, cans, and PET bottles) |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |
| Industrial waste                                                                 | Plastics (excepting laboratory waste)                            |                                                                                                                                                                                                                                  | Main Building: square in front of west gate                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                              |
|                                                                                  | Incombustibles (glass products and ceramic ware)                 |                                                                                                                                                                                                                                  | Research Building No.1: waste collection site on the south side of Building No. 1                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                              |
|                                                                                  | Others (small devices, cables, etc.)                             |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |
|                                                                                  | Laboratory waste                                                 | Noninfectious waste, combustibles, instruments, etc. (for which, no autoclave sterilization is required)                                                                                                                         |                                                                                                                                                                                                                                                                                                  | Put the waste in a transparent bag and carry it to an industrial waste collection site.                                                                                                                                                                                      |
|                                                                                  |                                                                  | Infectious waste, combustibles, instruments, etc. (for which, autoclave sterilization is required)                                                                                                                               |                                                                                                                                                                                                                                                                                                  | <b>Sterilize infectious waste with an autoclave</b> , put the waste in a transparent bag as a noninfectious waste, and carry it to an industrial waste collection site.                                                                                                      |
|                                                                                  |                                                                  | Used medicine bottles                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                  | Register the bottles in the KUCRS, pass them through up to third stage washing processes, and put the used washing solutions in each designated waste tank. Without peeling the labels off the bottles, carry them as incombustibles to an industrial waste collection site. |
| Batteries and fluorescent tubes                                                  |                                                                  | Store them in each laboratory until the designated collection date (once a year)                                                                                                                                                 |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |
| Infectious waste*                                                                | Laboratory waste                                                 | Animal body                                                                                                                                                                                                                      | Put it in a small transparent bag and write down your group name on the bag, put the bag in a black polyethylene bag stored in a freezer located in the basement of Building No. 1 (B25), and return the bag into the freezer (enter necessary information in the file placed near the freezer). |                                                                                                                                                                                                                                                                              |
|                                                                                  |                                                                  | Infectious waste (mice bedding, substances contaminated with blood or body fluid, and culture media)                                                                                                                             | Put the waste in a black polyethylene bag and carry it to the designated collection site in the basement of Building No. 1 (B25).                                                                                                                                                                |                                                                                                                                                                                                                                                                              |
|                                                                                  |                                                                  | Syringe needles, Pasteur pipettes, sharp blades, etc.<br>*Includes non-infectious sharp materials                                                                                                                                | Put in a sharp container and carry it to the designated collection site in the basement of Building No. 1 (B25). If the waste is infectious, sterilize it with an autoclave beforehand.                                                                                                          |                                                                                                                                                                                                                                                                              |
| Laboratory waste liquids (organic waste liquids and inorganic waste liquids)     |                                                                  | Store liquid waste liquid in each appropriate tank. Based on the information from the Waste Liquid Management Subcommittee, these waste liquids are treated at the Environment Preservation Research Center.                     |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |
| Waste chemicals, waste oils, waste acid, waste alkali, developers, and fixatives |                                                                  | In accordance with the procedures specified in the Chemical Substance Handling Rules, notify the Facilities and Environment Section (iCeMS) of the disposal of the waste. Submit an application form to the relevant department. |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |
| Waste paper (corrugated cardboard, PPC paper, magazines, etc.)                   | iCeMS Main Building                                              |                                                                                                                                                                                                                                  | Storage in basement (iCeMS General Affairs & Planning Section)                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                              |
|                                                                                  | iCeMS Research Building                                          |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |
|                                                                                  | Research Building No.1                                           |                                                                                                                                                                                                                                  | EPS on the first floor (reception counter of Administration Department in Research Building)<br>* Bundle waste paper with a string.                                                                                                                                                              |                                                                                                                                                                                                                                                                              |
|                                                                                  | Research Building No.1 Annex                                     |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |

The method for disposing of waste differs depending on the type of the waste. Avoid self-judgment and understand the proper disposal.

## Chapter 5 Technical Precautions Concerning Experimental Studies

This chapter describes the precautions concerning professional education and research including experiments.

### 5-1 General Precautions on Education and Research Experiments

- 1) Clerical staff must not undertake dangerous or hazardous works associated with education and research experiments.
- 2) As a rule, do not perform dangerous or hazardous works on holidays or late at night. If it is unavoidable to perform such work on a holiday or late at night, two or more persons must participate.
- 3) As a rule, part-time faculty staff, visiting researchers, and students must not perform any experiment or other hazardous work in the absence of fulltime faculty staff. If it is unavoidable to disregard the above basic rule, they must obtain approval from the responsible fulltime faculty staff.
- 4) When part-time faculty staff and visiting researchers need to carry out an experiment outside the designated place, they must obtain approval from the responsible fulltime faculty staff.
- 5) Always keep the laboratory in order.
- 6) Do not leave any unnecessary chemical or material on the laboratory table. More particularly, never leave any chemical or material on the laboratory floor.
- 7) Be sure to close tightly the chemical containers and put stoppers on the waste liquid containers.
- 8) Do not use a direct-flame room heater in a laboratory in which a volatile solvent is used.
- 9) Wear protective eyeglasses, as well as a protective coat and experiment shoes suitable for a particular experiment.
- 10) When you leave the laboratory with the apparatus remaining in operation automatically, take appropriate safety measures and put your emergency contact number on the laboratory door or other prominent place.
- 11) Determine the site for storing spray cans containing combustible gases, and control the temperature so that cans are not excessively heated.
- 12) **The fire prevention supervisor must inspect the usage of each laboratory at least once a month.** (This precaution is listed here again, though it was described first in Section 4-3.)
- 13) Inspect centrifuges and small-capacity pressure vessels voluntarily once a year, and retain the inspection record for three years. For the voluntary inspections, use the following forms:  
Form 3-1: Centrifuge Periodical Voluntary Inspection  
Form 3-2: Small-sized pressure vessel Periodical Voluntary Inspection

### 5-2 Chemicals

#### 5-2-1 General Precautions in Handling Chemicals

- 1) When handling a chemical substance, refer to the Safety Data Sheet (SDS)\* submitted by the supplier or posted on the supplier's website. The purpose is to preliminarily understand how to handle this substance, keeping its toxic properties (acute toxicity and chronic toxicity including carcinogenicity), combustibility, explosiveness, hazardousness, and other properties in mind.

\* Examples:

Data opened to the public by the Japan Advanced Information Center of Safety and Health:

<http://www.jaish.gr.jp/index.html> (only displayed in Japanese), the National Institute of Technology and Evaluation: <http://www.safe.nite.go.jp/english/db.html>, and reagent manufacturers



- 2) When using a chemical substance, conduct a preliminary investigation to determine whether the use of this substance is legally restricted. (The web page of the Japanese Open Government for Law and Regulation Data Delivery System is available for the investigation:  
<http://law.e-gov.go.jp/cgi-bin/idxsearch.cgi> \*only displayed in Japanese.)  
 If legal procedures are required, obtain approval from your advisor, superior, or the relevant department manager in advance.
- 3) After you acquire a chemical substance (chemical agent or high-pressure gas) for education or research study purposes, register the substance in the Kyoto University Chemicals Registration System (KUCRS). Manage the substance in accordance with the Chemical Substance Management Rules and the Implementation Guideline for Chemical Substance Management Rules.
- 4) For a highly dangerous substance because of its toxicity, combustibility, explosiveness, and hazardousness, consider carefully its essentiality and the possibility of using an alternative substance at the experiment planning stage in order to minimize the chance of using hazardous substances.
- 5) Dangerous chemicals are designated in the following laws and regulations. These chemicals must be used with particular care.
 

|                                                                                                             |                      |
|-------------------------------------------------------------------------------------------------------------|----------------------|
| (a) Organic solvents (Ordinance on Prevention of Organic Solvent Poisoning)                                 |                      |
| Class 1, Class 2, and Class 3                                                                               | ..... Table 4        |
| (b) Specified chemical substances (Ordinance on Prevention of Hazards due to Specified Chemical Substances) |                      |
| Category 1, Category 2, and Category 3                                                                      | ..... Table 5        |
| (c) Asbestos (Ordinance on Prevention of Health Impairment due to Asbestos)                                 | ..... Table 6        |
| (d) Poisonous substances (Poisonous and Deleterious Substances Control Law)                                 |                      |
| Poisonous substances, specified poisonous substances                                                        | ..... Tables 7 and 8 |
| (e) Deleterious substances (Poisonous and Deleterious Substances Control Law)                               | ..... Table 9        |
| (f) Hazardous materials (Fire Services Act)                                                                 | ..... Table 10       |
| Categories 1 through 6                                                                                      |                      |
- 6) When handling dangerous chemicals, be sure to comply with the above laws and ordinances and the dangerous chemicals handling procedures developed by the relevant department.
- 7) For a narcotic or psychotropic drug, the researcher who will use it (a license is required) must report the acquisition to the authority in charge at the Ministry of Health, Labour and Welfare. **The group leader must contact the Facilities and Environment Section (iCeMS) before purchasing a narcotic or psychotropic drug.** When handling the narcotics and psychotropic drug, be sure to comply with the Narcotics and Psychotropic Control Act and other ordinances.
- 8) Do not use dangerous chemicals for purposes other than education or research. Do not take dangerous chemicals out of the campus, as a rule. When it is indispensable to take a dangerous chemical out of the campus because of an unavoidable reason, obtain approval from your academic advisor, superior, or the relevant department manager.
- 9) Dangerous chemicals must be carried and used only by persons having sufficient knowledge of the chemicals. Clerical staff must not handle any dangerous chemicals, as a rule.
- 10) Do not use food and beverage containers to store chemicals. To store chemicals, choose fissure-free, uncorroded containers. Avoid using fissured or cracked containers.

- 11) Handle a dangerous chemical while taking care not to scatter, leak, or lose it. Use a durable container whose opening can be closed tightly with a lid or plug to prevent the content from spilling, leaking, or oozing out.
- 12) The person who handles and uses a dangerous chemical must check frequently the storage conditions and stored quantity of the chemical and must take appropriate measures to maintain his/her own health and safety.
- 13) Do not dispose of any dangerous chemicals together with general waste. For the disposal of chemicals, refer to Section 5-2-2.
- 14) Take appropriate safety measures to prevent fracture of chemical containers by falling, turning over, or collision in the event of an earthquake. Store the containers separately according to the kind of the chemicals so that they will not ignite or explode by mixing with each other even if the containers are broken and the chemicals leak out.
- 15) Take extra care when opening a glass ampule in which a liquid dangerous chemical has been encapsulated. If s/he has never done it before, receive proper guidance from an experienced academic advisor.

For chemical substance management procedures, see the "Flow for Registration and Control of Chemical Substances by KUCRS" shown in Figure 2.

#### 5-2-2 Outsourcing the Disposal of Waste Chemicals

This section describes the policy for disposing of waste chemicals and substances produced in laboratories and other facilities (laboratory waste) <sup>[Note 1]</sup>.

- 1) Waste chemicals and organic liquid waste discharged from the laboratory must be registered in the Kyoto University Chemicals Registration System (KUCRS) as waste chemicals <sup>[Note 2]</sup>. (Laboratory waste other than organic liquid waste may not be registered.)
- 2) Do not inconsiderately ask the contractor to dispose of waste chemicals, but seek proper disposal methods to minimize the environmental impacts of these chemicals.

[Note1]: The substances produced as a result of experiments and other research studies are:

- (a) Experimental instruments containing hazardous materials
- (b) Liquid and solid waste produced as a result of experiments in the laboratory and other facilities

[Note 2]: The waste chemicals to be disposed of by outsourcing are:

- (a) Old chemicals that cannot be used for experiments
- (b) Leftover chemicals preferable to be disposed of rather than being stored for a long period from the standpoint of disaster and other accident prevention.
- (c) Chemicals that will not be used in future

For the outsourcing procedures, see the Kyoto University Liquid and Solid Waste Management Rules, Reference 2 "Flow of Chart for Disposing of Unnecessary Chemicals," and Reference 3 "Precautions for Disposal of Unnecessary Chemicals".

The Facilities and Environment Section (iCeMS) must be responsible for the office procedures for outsourcing waste chemical disposal.

### 5-2-3 Hazardous Materials (Including Flying Dust)

Take meticulous care when handling hazardous materials (including flying dust) as described below. Note that organic solvents (Table 4) (Classes 1 and 2 in particular) and specified chemical substances (Table 5) (categories 1 and 2 and substances under special supervision) are strictly controlled by the Ordinance on Prevention of Organic Solvent Poisoning and the Ordinance on Prevention of Hazards due to Specified Chemical Substances.

- 1) When handling Class 1 or 2 organic solvent or Category 1 or 2 specified chemical substances, use an enclosed hood type local ventilation system (fume hood).
- 2) For an organic solvent, the fume hood must have a ventilation capacity of 0.4 m/s or more in wind velocity at the hood opening. For a specified chemical substance, the wind velocity at the hood opening must be 0.5 m/s or more.
- 3) **The fume hood must be voluntarily inspected once a year in accordance with the applicable ordinance and voluntary inspection guidelines.** The inspection records must be retained for three years.  
For the voluntary inspection, use the following forms:  
Form 3-3: Draft chamber (Fume hood): Periodical Voluntary Inspection  
Form 3-4: Draft chamber (Fume hood): Periodical Voluntary Inspection <English version>
- 4) When installing, modifying, or relocating a fume hood, the responsible department must prepare necessary documents and **submit them to the relevant Labor Standards Supervision Office** through the Agency for Health, Safety and Environment.
- 5) Make protective cloths, protective eyeglasses, respiratory protective devices (masks), and protective gloves always ready for use, and wear them as needed.
- 6) To prepare for accidental exposure to a chemical, install a water flushing device (an emergency shower, for example).
- 7) **Do not eat, drink, or smoke in the laboratory.** (Post a notice "No Eating or Smoking" at a prominent place.) Never reside in a laboratory in which Class 1 or 2 organic solvent or Category 1 or 2 specified chemical substance is used.
- 8) A laboratory in which Class 1 or 2 organic solvent or Category 1 or 2 specified chemical substance is used must be subject to working environment measurement once every six months. Evaluate the environment based on the criteria specified for each control class and take an appropriate measure based on the evaluation result. The environment measurement records for substances under special supervision and substances covered by the "Guidelines for Preventing Health Impairment by Carbon Tetrachloride" must be retained for 30 years, while the measurement records for the other substances must be retained for three years. <sup>[Note 1]</sup>
- 9) In a laboratory in which an organic solvent is used, the class of the solvent (red for Class 1 solvent, yellow for Class 2 solvent, or blue for Class 3 solvent) must be indicated at a prominent place. In addition, notices concerning the health hazards of organic solvents, handling precautions, first-aid treatment in the case of poisoning, and other necessary information must be posted at a prominent place in compliance with the method specified in the Notification No. 123 of the Ministry of Health, Labour, and Welfare. <sup>[Note 2]</sup>
- 10) When handling a substance under special supervision, record the work (worker's name, general description of the work, work period, pollution, etc.) once a month. This work record must be retained for 30 years.

- 11) In a laboratory in which a substance under special supervision is handled or used, a board showing the name of the substance, its effect on the human body, handling precautions, and the protectors to be worn must be posted at a prominent place in the laboratory.
- 12) Fulltime faculty staff, part-time staff, visiting researchers, and students must receive a special health examination before starting research works using hazardous substances. <sup>[Note 3]</sup>
- 13) The above rules (1) - (4) and (7) - (10) do not apply if the hourly (or daily) organic substance consumption does not exceed the maximum permissible limit <sup>[Note 4]</sup> prescribed in the applicable ordinance and if exemption from these rules has been accredited by the relevant labor standards supervision office.

[Note 1] The Ordinance on Prevention of Organic Solvent Poisoning and the Ordinance on Prevention of Hazards due to Specified Chemical Substances stipulate detailed health examination items and require the examination results to be retained from the standpoint of protecting workers' health.

[Note 2] Classes 1 and 2 organic solvents are more hazardous and have higher vapor pressure than Class 3 organic solvents. Class 3 organic solvents are petroleum solvents or plant-based solvents in which many hydrocarbons exist in a mixed state. With a boiling point of approximately 200°C or less, Class 3 organic solvents are controlled relatively loosely.

[Note 3] Specified chemical substances have been designated to prevent cancer, skin inflammation, nerve damage, and other health impairments. Category 1 specified chemical substances are particularly hazardous to health. To produce a substance in this category, permission in compliance with Article 56 of the Industrial Safety and Health Law is required. Category 2 chemical substances cause chronic disorders. Category 3 chemical substances cause acute poisoning if leaked in large quantities. In terms of health disturbance prevention over a long period, Category 3 chemical substances are controlled more loosely than the chemical substance of Categories 1 and 2.

[Note 4] The allowable consumption  $W$  (grams) of Classes 1 and 2 organic solvents is determined from  $W = (1/15)A$  and  $W = (2/5)A$ , respectively. Here,  $A$  is defined as the volume (cubic meter) of the space of the laboratory with its height above the floor limited to four meters. If  $A$  exceeds 150 cubic meters, fix  $A$  at 150 cubic meters. When an experiment is usually conducted in a laboratory with all the doors and windows kept closed, the allowable consumption per day is applied in cases where the request for exemption is approved.

(The remainder of this page is intentionally left blank.)

#### 5-2-4 Poisonous and Deleterious Substances

Substances stipulated in the Poisonous and Deleterious Substances Control Law (Tables 7 to 9) must be handled in compliance with the Kyoto University Chemical Substance Control Rules. Also handle these substances with the utmost cautions as described below.

Only a small quantity of poisonous substance or deleterious substance may be lethal. Since these substances could be used for criminal activities, the Poisonous and Deleterious Substances Control Law stipulates provisions focused on their storage and control.

- 1) Poisonous and deleterious substances must be separated from other chemicals and must be kept in a chemical cabinet or other proper storage box. The cabinet or storage box must be locked without fail. In particular, poisonous substances must be separated from deleterious substances and must be kept in a chemical cabinet or other proper storage box provided with a special-purpose key.
- 2) Post a "non-medical poisonous substance" or "non-medical deleterious substance" sticker on each poisonous substance or deleterious substance cabinet or storage box.
- 3) Persons who handle poisonous and deleterious substances must be registered in the Kyoto University Chemicals Registration System (KUCRS) as handlers of poisonous and deleterious substances.
- 4) Handlers of poisonous and deleterious substances, when they used a poisonous substance or deleterious substance, must record user names, the name of the substance, and the quantity used.
- 5) The person responsible for handling/storage of chemical substances must **check the storage and usage conditions of poisonous substances at least once a month**, even when the substances remain unused for a long period. In this check, the person must pay particular attention to locking of the cabinet/storage box, any sign of use by an unauthorized person, and change in the number of reagent bottles.
- 6) When students or staff members want to purchase a poisonous substance, their academic advisors and superiors (group leaders) must check the necessity of such a substance.
- 7) When handling a highly poisonous substance, be sure to wear protective clothing, protective eyeglasses, protective gloves, and other proper protectors.

#### 5-2-5 Dangerous Substances Having Ignitable, Combustible, or Explosive Nature

Ignitable, combustible, and explosive substances, especially the hazardous materials stipulated in the Fire Services Act (Table 10), must be handled with fastidious care as follows:

- 1) Hazardous materials whose quantity exceeding a permissible upper limit (designated in the Fire Services Act) must be kept in a legal hazardous material warehouse (indoor hazardous material repository, etc.). Note that the Fire Services Act stipulates the permissible upper limit of storable quantity.
- 2) When the quantity of a stored hazardous material reaches one-fifth of the permissible upper limit, the quantity must be reported to the relevant fire marshal. As a rule, a hazardous material must not be kept in a laboratory in excess of one-fifth of the permissible upper limit of the storable quantity.
- 3) To secure the safety of life in a place where a hazardous material is handled, fires, sparks, highly heated materials, static electricity, shocks, friction, and other ignition, combustion, and explosion sources must be strictly controlled. In addition, such a place must always be provided with fire-extinguishing equipment for use in the case of an emergency.
- 4) Keep it in mind that a vaporized solvent is generally heavier than air and spreads over the floor to reach a distant ignition source, causing it to ignite or explode.

- 5) When handling a chemical that may generate an explosive vapor/air mixture, ensure sufficient ventilation of the laboratory. Store this type of chemical in an explosion-proof refrigerator.
- 6) When storing a hazardous material, take reliable anti-theft measures. Also control the material properly that it will not increase in hazardousness due to deterioration or contamination with a foreign matter. Furthermore, as described in Item (13) of Section 5-2-1, do not keep hazardous substances together on the same shelf if their combination is prohibited for mixed loading shown in Table 10-2.
- 7) When handling highly hazardous chemicals, an explosive chemical in particular, ensure your own safety by using protective eyeglasses, protective equipment, protective plate and other suitable tools as needed.

### 5-3 Exhaust Gas

- 1) When using an organic solvent, specified chemical substances, or other legally designated hazardous substances in a fume hood, the exhaust gas must be released into the atmosphere after detoxifying by using an exhaust gas treatment system (scrubber, for example) or other legally designated method.
- 2) To detoxify the exhaust gas, combine water or alkali cleaning, activated carbon treatment, and other methods (oxidation, burning, etc.) as required in order to achieve absolutely safe discharge of exhaust gas.

### 5-4 Laboratory Waste Solutions

Process the laboratory waste solutions in accordance with the following methods. When outsourcing the processing of laboratory waste solutions, follow the rules described in Section 5-2-2.

- 1) When disposing of laboratory waste solutions, sort them in accordance with the method shown in Table 11.
- 2) Waste solutions containing chemicals must not be discharged into a sewerage system.
- 3) In accordance with the "Classification of collection and storage of experimental waste solutions" shown in Table 11, sort the laboratory waste solutions according to their properties and store each type of waste solution in each waste solution tank specified by the Environment Preservation Research Center. Do not use any waste solution tanks exceeding the service life (seven years). For the method and site for discharging a laboratory waste solution from a storage tank, as well as for other related matters, follow the instructions of the Environment Preservation Research Center.
- 4) When washing the beakers, reagent bottles, and other containers used for an experiment, pass them through up to third stage washing processes. Put the washing solutions in the designated waste solution tank.
- 5) When disposing a waste solution containing solid matter, filter it with a 100 mesh (150  $\mu\text{m}$ ) filter. Dispose of the solid matter in accordance with the waste chemical disposal procedures.
- 6) Keep the waste solution tank lid closed loosely at all times. (Solvents are easily evaporated and create a hazardous condition.)
- 7) To ensure safe transport of waste solution tanks, do not put the solution in the tanks to a level exceeding 80% of their capacity.
- 8) Do not store any waste solution tanks over a long period.
- 9) Fill out the waste solution container card and use application card with the composition, concentration, and other necessary information of the solution, and attach the cards to the waste solution tank.
- 10) Handling of laboratory waste solutions and transport of waste solution tanks must be conducted by

persons having a thorough knowledge of the waste solutions.

### 5-5 High-Pressure Gases

When using a high-pressure gas, conform to the High Pressure Gas Safety Law, the Kyoto University High Pressure Gas Production Facility Safety Precaution Rules, and other applicable rules. In the production, consumption, and storage facilities regulated by the High Pressure Gas Safety Law, in particular, comply with the technical standards and security control provisions prescribed in this law. All high-pressure gases, when purchased, must be registered in the Kyoto University Chemicals Registration System (KUCRS).

If a high-pressure gas leaks, it will create an extremely hazardous condition by spreading many components quickly and widely. Especially, if the high-pressure gas is combustive, explosive and toxic, special attention must be paid to leakage, corrosion of the plumbing, opening/closing of the valve, installation site of the gas cylinder and other items, because the high-pressure gas leakage can cause serious damages.

The High Pressure Safety Law classifies high-pressure gases into the following four types:

- (a) Inert gas: nine gases including helium and argon
- (b) Combustible gas: 39 gases including acetylene and hydrogen plus gases whose explosion limits meet a prescribed condition
- (c) Toxic gas: 33 gases including carbon mono oxide and hydrogen sulfide plus gases whose threshold limit values (equivalent to allowable concentrations) are 200 ppm or less
- (d) Special high-pressure gas: seven gases (arsine, disilane, diborane, hydrogen selenide, phosphine, monogermane, and monosilane)

The High Pressure Gas Safety Law designates a total of 39 gases as special material gases. These material gases consist of the seven legally designated special high-pressure gases and 32 gases having the same degree of hazardousness as the above 32 special high-pressure gases. These material gases are shown in Table 12.

Reporting is required depending on the use condition of special material gas cylinders. The responsible group leader must check with the Facilities and Environment Section (iCeMS).

#### 5-5-1 Gas Supply Lines

- 1) Pay attention to prevention of gas leakage from the supply line at all times.
- 2) Make an effort to use the least necessary quantity of gas.
- 3) Be sure to shut off the main tap on stopping using the gas.
- 4) Do not connect the gas line to a closed container that has been pressurized to a level higher than the supply pressure. Do not directly connect two gas supply lines.
- 5) Never pollute oxygen discharge ports with oil or other liquid.
- 6) When using a gas, ventilate the room adequately.

#### 5-5-2 High-Pressure Gas Cylinders

- 1) When reducing a gas pressure with a reducing valve of a high-pressure gas cylinder to 1 MPa or more (0.2 MPa or more for acetylene gas or liquefied gas) to conduct an experiment, legal proceedings are required in accordance with the procedures for high-pressure gas use specified by the relevant department bureau.

- 2) When handling a high-pressure cylinder, pay adequate attention to the toxicity, combustibility, combustion-supporting property, explosivity, and other hazardous nature of the high-pressure gas stored in the cylinder.
- 3) When storing a high-pressure gas of 300 m<sup>3</sup> or more within the range prescribed in the High Pressure Gas Safety Law, the storage site must be reported to the relevant authority as a storage facility.
- 4) The principal precautions in handling high-pressure gas cylinders are as follows:
  - (a) When carrying a high-pressure gas cylinder, be sure to use a specially designed gas cylinder barrow.
  - (b) Prevent each high-pressure gas cylinder from falling down by securing with a cylinder stand, chain, or other tool. When securing the cylinder with a string of chain, fix the cylinder at the top and bottom. Do not secure two or more cylinders with a single piece of chain.
  - (c) As a rule, do not lay a high-pressure gas cylinder on its side when using the gas in the cylinder.
  - (d) Use a reducing valve, pressure gauge, and other instruments that have been designed for the particular gas.
  - (e) Open or close gradually the high-pressure gas cylinder's main tap. When stopping the use of the gas, close the cylinder's main tap without fail. When opening the main tap, close the valve on the outlet side and confirm that the reducing valve is not on the pressurization side in advance.
  - (f) Do not inconsiderately release the gas into the atmosphere.
  - (g) Unless implementing a specific fire-prevention measure, do not use fire within two meters from a combustible gas cylinder or combustion-supporting gas cylinder. Further, do not leave any flammable or ignitable matter in the above area.
  - (h) Control the gas cylinder temperature to 40°C or less. Avoid exposing the cylinder to direct sunlight but sufficiently ventilate the cylinder storage area.
  - (i) Do not place a gas cylinder in a corrosive environment when using the gas in the cylinder.
  - (j) For an emptied gas cylinder, immediately take necessary return procedures. Do not dispose of an empty cylinder as waste, irrespective of its size.
  - (k) Return any idle gas cylinder to the supplier.
  - (l) Before storing gas cylinders, sort them into combustible gas, combustion-supporting gas, and inert gas cylinders.
  - (m) Indicate open or close with tags as the main tap is opened or closed.

(The remainder of this page is intentionally left blank.)



#### 5-5-3 Liquid Nitrogen and Liquid Helium

- 1) When receiving liquid nitrogen or liquid helium from the Center for Low Temperature and Materials Sciences, annually attending the training course for cryogen users provided by the center above is mandatory. When receiving these liquid substances, follow the instructions of the above center.
- 2) When handling liquid nitrogen or liquid helium, wear low-temperature gloves as needed in order to protect your fingers from frostbite and have the air flow at your back.
- 3) Do not directly contact liquid nitrogen or liquid helium or low-temperature metallic members with your bare hands.
- 4) When handling a liquid nitrogen or liquid helium container, handle it carefully so that it will not topple over.
- 5) When using an elevator, automobile, or other sealed vehicle to carry a liquid nitrogen or liquid helium container, pay extra attention to oxygen shortage.
- 6) Both liquid nitrogen and liquid helium evaporate rapidly at room temperature and expand to a gas 700 times its initial volume, thereby creating a risk of explosion. To prevent such a dangerous situation, do not hermetically seal the container.
- 7) Since nitrogen is a suffocating gas, it does not absorb thick vapor.
- 8) When using liquid nitrogen or liquid helium in a room, ventilate the room adequately.

#### 5-5-4 Liquid Oxygen

Referring to the cautions for handling liquid nitrogen and liquid helium, which were described in Section 5-5-3, prevent frostbite or explosion and ventilate the laboratory sufficiently. Also avoid bringing liquid oxygen into contact with oil or grease in consideration of the susceptibility to burn.

#### 5-5-5 Special Material Gases

- 1) Take legal procedures as needed when handling a special material gas. For details concerning this matter, contact the Facilities and Environment Section (iCeMS).
- 2) When handling a special material gas, conform to the method and procedures established by the relevant department.
- 3) **Academic advisors and superiors (group leaders) must provide their students and subordinates with necessary guidance about the hazardousness and precautions for use of special material gases.**
- 4) The consumption equipment, detoxifying apparatus, exhaust duct and other equipment for special material gas must have structures which meet the High Pressure Gas Safety Law's requirements for air tightness, durability, corrosion resistance and related matters.
- 5) When installing the consumption equipment for special material gas or large quantities of toxic gas, comply with the following standards:
  - (a) The building containing the consumption equipment for special material gas is installed must be durable enough to endure earthquakes and other disastrous events.
  - (b) The consumption facility for special material gas must be equipped with a surveillance system for anomalous situation. Uninterruptible power supply systems must be used in the surveillance, detoxifying and exhaust system.
  - (c) The gas exhausted from the consumption equipment for special material gas must be detoxified by detoxifying apparatus and the detoxifying function must be confirmed in the event of gas leakage.

- (d) Safe evacuation procedures must be provided for the building containing the consumption equipment for special material gas. The building must be designed to allow people to evacuate smoothly in the event of an emergency and equipped with an emergency broadcasting system or other appropriate warning systems that announce the evacuation.

#### 5-5-6 Refrigeration Equipment

- 1) When operating refrigeration equipment having a daily refrigeration capacity of three tons or more (20 tons for equipment that uses inactive fluorocarbon and five tons for equipment that uses other kind of fluorocarbon or ammonia), obtain permission from the relevant department and then take legal procedures.
- 2) For refrigeration equipment comprising a centrifugal compressor, consider the rated output of 1.2 kW of the motor to be equivalent to a daily refrigeration capacity of one ton. For absorption and other types of refrigeration equipment, calculate their refrigeration capacity in accordance with Article 5 of the Refrigeration Safety Regulations.
- 3) The person responsible for managing refrigeration equipment must educate and train the equipment users about the safe handling and operation of the refrigeration equipment they are going to use.

#### 5-6 Explosives

- 1) When handling explosives, comply with the Explosives Control Law and the explosives handling methods and procedures established by the Agency for Health, Safety and Environment.
- 2) Excepting those who have been authorized by the Agency for Health, Safety and Environment, any other personnel must not handle or use explosives.
- 3) Explosives must not be handled or used out of regular working hours (from 8:30 until 17:15), as a rule.
- 4) The place where explosives can be handled or used and the maximum usable quantity must comply with the standards established by the Agency for Health, Safety and Environment.
- 5) If it is indispensable to use explosives outside the predetermined place or in excess of the maximum usable quantity, contact the Facilities and Environment Section of iCeMS in advance.
- 6) Explosives must not be used for purposes other than those approved (permitted) for receipt of the explosives.

#### 5-7 Radiation

Radiation equipment must be operated in a properly controlled facility by persons who have been certified as operators of radiation equipment.

- 1) Persons who will use radioisotopes, radiation generators, synchrotron radiation facilities (SRO), X-ray equipment, etc. (hereinafter referred to as "radiation worker") must be registered as radioisotope workers or X-ray workers depending on the equipment category they will use.
- 2) Prior to being registered as a radiation worker, each candidate worker must receive the education and training (e.g. University's training course for safe handling of radiation and radioisotopes) indispensable to a radioisotope worker or X-ray worker. Workers who have received the necessary education and training and those who are confirmed to have the same or higher level of knowledge and skills **must have special medical checkups for radiation users**. Following the above procedures, they are finally registered as radiation workers on the responsibility of the department to which they belong (application

for registration as radiation worker).

- 3) In the case that the radiation equipment is unable because the applicant's department does not possess any radiation equipment, the department possessing the objective radiation equipment registers him/her as a radiation worker in response to a request by the applicant's department.
- 4) Each department bureau must lend a glass badge or other proper personal radiation exposure dosimeter to each registered radiation worker.
- 5) The registration of radiation workers expires at the end of each academic year. For the update of registration, they need to take the education and training (re-education and training) at each department before applying for continued registration.

For the registration procedures, see Figure 3 "Procedures for Users of Radioisotopes and X-ray Equipment". The Facilities and Environment Section (iCeMS) is responsible for the registration procedures.

## 5-8 Laser Devices

Laser devices are classified by accessible emission limit based on the degree of hazard to the human body. Classes 1 and 2 laser devices do not require particular precautions as long as the laser beams are not immoderately directed to the human body.

When using Class 3R devices, the direct observation is dangerous if the beams are used in telescopes and other magnifying optical devices. When using Classes 3B and 4 laser devices, conform to the following instructions:

- 1) All Kyoto University personnel involved in working with laser devices must ensure the safety of themselves and other staff working for the relevant department in accordance with the operation and instruction manual for laser devices established by the relevant department.
- 2) Academic advisor and superiors (group leaders) must provide his/her students and subordinates with an explanation of the hazards and other effects of laser to and on the human body.
- 3) Department directors must implement appropriate laser hazard prevention measures.
- 4) Department directors must implement the following accident prevention measures:
  - (a) Designate the area where people may be exposed to laser beams emitted from a laser device as a laser control area
  - (b) Post a proper warning sign at the entrance of the room where a laser device is located or on the protective enclosure for the room
  - (c) Turn on an indicator lamp when a laser device is in operation. Turning on a warning lamp as required when a Class 4 laser device is in operation
  - (d) Install a sign or warning lamp specified in Section 5-10 (8) when using a high-voltage power source
  - (e) Provide laser workers with education on the safe use of laser devices
- 5) Laser workers must take the following measures when operating a laser device in order to ensure their own safety.
  - (a) Pay particular attention to protecting your eyes.
    - (i) Set the laser beam path at a height different from the workers' eye levels.
    - (ii) Confirm that the reflection mirrors, prisms, and other components have been fixed securely and are free from any damage.
    - (iii) Do not place any unnecessary item on the optical bench. (Otherwise the item will reflect the

laser beams and cause an unexpected accident.)

- (iv) Wear protective eyeglasses that deal effectively with the wavelength of the laser beam.
- (v) Cover the laser beam path as much as possible to prevent unexpected reflection of the laser beam.
- (b) Take care not to expose your skin directly to the laser beam to prevent burns.
- (c) When checking the laser beam path, remotely operate the laser device using a fluorescent plate, heat-sensitive paper, or observation camera. Wear protective gloves as required.
- (d) Take care not to block the laser beam path with an ignitable substance or combustible item.
  - (i) Do not leave any combustible item (e.g. solvent, oil, or paper) near the laser beam path.
  - (ii) Use a flame-retardant sheet to cover the laser beam path.
  - (iii) Use a high heat-resistant material as a beam stopper.
- (e) Never open the high-voltage unit enclosure when the laser device is operating normally. When opening the enclosure for troubleshooting or other purpose, conform to the precautions described in Section 5-10 to protect yourself from electric shock.
- (f) When using fluorine or other poisonous gas for laser oscillation, conform to the precautions for the use of high-pressure gas described in Section 5-5.

### 5-9 High Magnetic Field Generators

Advancement in superconductive coil technology has made it easy to generate magnetic fields of 1T (tesla) or more. However, we cannot feel such high magnetic fields. Though the health effects of magnetic fields on the human body have not yet fully been revealed, the results of epidemiological studies, animal experiments, and other studies have suggested the potential health hazards of magnetic fields. This section describes only the general precautions to be taken when using high magnetic field generators. However, the person responsible for each high magnetic field generator must prepare an operation manual in consideration of safety.

- 1) On the door of the room in which a high magnetic field generator is used, put a hazard warning labels of the generation of high magnetic fields. Prohibit the entry of unauthorized persons into the room. Enclose the danger zone around the generator with a white line or other proper marks to draw relevant persons' attention to their own safety.
- 2) Note that when a magnetized item is brought close to a strong magnetic field generator, the item is attracted violently to the generator.
  - (a) When using bolts/nuts and tools, take care not to scatter them.
  - (b) Do not bring a metallic carrier or other unstable device close to a magnetic field generator.
  - (c) When using a movable ambulance stretcher in an emergency, never pull it closer to a magnetic field generator.
  - (d) If a metallic item is attracted to a magnetic field generator, do not try to forcibly detach the item from the generator. Detach the item after reducing the output power of the generator.
- 3) Keep in mind that even a weak magnetic field may affect the human body and other equipment.
  - (a) A cardiac pacemaker may malfunction in a magnetic flux of 500  $\mu$ T or more. Shield the magnetic field generator sufficiently to reduce the magnetic flux density less than 500  $\mu$ T at the shared space in front of the room (e.g. hallway). Do not allow any person with a pacemaker to enter the room.
  - (b) Watches, magnetic cards, floppy disks, and other data media may be unusable under a magnetic

flux over 1.0 mT. Do not bring these items into the room when working in the room.

- 4) Metal placed in a magnetic field may induce an electric current if the magnetic field is changed rapidly. Do not allow any person with a metal therapeutic device to enter in the room.
- 5) A low-temperature superconducting coil will be quenched (generation of electrical resistance) if subjected to such an external disturbance as attraction of the liquid nitrogen container. The Joule heat generated by the disturbance may evaporate liquid helium. Implement appropriate measures to prevent oxygen deficiency due to the leakage of liquid nitrogen or liquid helium.
- 6) There are many unknown aspects regarding the hazards of a magnetic field to the human body. Persons of decreased physical strength and women of childbearing potential should avoid working in magnetized workplaces.

### 5-10 Electricity

This section describes the general precautions for preventing electric shocks and other electrical hazards. Basic electric handling knowledge and the right operation rules must be understood, because connecting electric cables and repairing devices are often required by individuals in the laboratory to perform electric devices under the critical condition.

- 1) Do not touch electrical devices with wet hands.
- 2) Ground electrical devices perfectly. When using an electrical device and power source in a moist or humid place, install ground fault interrupters in addition to grounding.
- 3) Do not ground electrical devices to a water pipe or gas pipe in the building.
- 4) Do not directly place a power cord connector or power strip on the laboratory floor that may be flooded by leaked water.
- 5) Keep the electrical device free from dust, dirt, or oil to prevent current leakage. Measure regularly the insulation of the electrical device to detect any abnormality as early as possible.
- 6) Capacitors are often kept at high voltages even after the power supply to them is turned off. When it is necessary to touch a circuit, discharge the capacitors completely.
- 7) When using a high-voltage device, place it in a wide floor space and separate it sufficiently from the surrounding devices. Enclose the device with a cover, rope, or fence to prevent persons from touching the device even if they get close to it. (Providing sufficient space is also effective to prevent a secondary accident).
- 8) Attach a "High Voltage" sign to a high-voltage device. Install a warning lamp as needed to indicate that the device is in operation.

### 5-11 Machines

If your research object is directly about motors, machine tools or other machines, and if you use machine tools such as a slinging device or grinding machine and motorized equipment to conduct simple manufacturing and assembling work in order to proceed your studies, you must comply with the Industrial Safety and Health Law (Article 61, etc.), the Ordinance on Industrial Safety and Health (Articles 36, 634, etc.), and the administrative notification (Guidelines for Sling Work Safety, Labor Standards Bureau Notification No. 96. February 24, 2000). In addition, obtain necessary qualifications as required. This section describes only fundamental precautions concerning the principal equipment used in research processes in the field of machines.

#### **5-11-1 Power Conversion / Transmission Devices**

- 1) For a motor, a belt, a pulley and other rotating parts of machines, which can be liable to cause dangers to workers, the employer must provide an enclosure, a cover, a sleeve, an overbridge, etc. to prevent scattering of broken pieces or rolling-in accident.
- 2) Provide a power cut-off device such as switch or clutch for each machine, and the device must be unlikely to be unexpectedly activated due to contact or vibration (e.g. sunken push button).
- 3) When carrying out an experimental study using a high-speed rotary machine (e.g. a motor, automobile test bench, etc.), fuel, or high-temperature source, develop an instruction manual in advance. This manual must contain apparatus operation procedures and the cautions to be taken when performing an emergency stop of the apparatus in the event of its failure. During the experiment, conform to this instruction manual.

If the experimental apparatus contains any component that can harm the research staff during the experiment, install a safeguard or control the apparatus remotely from a separate room. Keep as safe a distance as possible from the apparatus at all times. (Do not stand on the front side of a rotating component.)

#### **5-11-2 Machine Tools, Etc.**

- 1) Persons operating a grinding machine, drilling machine, lathe, or other machine tool, must receive sufficient education and training in advance.
- 2) When using a machine installed in a workshop for common use, conform to the rules established by each department, such as attending a safety education and training course.
- 3) Cover toothed gears, belts, and other rotating parts in machine tools to protect the operators from accidental contact and resulting injury.
- 4) For a machine that produces chips or that may accidentally release workpieces, cover the machine with a dust shield or other proper structure. If such a protective structure is difficult to install because it interferes with the machining work, the operator must wear dust-proof glasses and other suitable protection.
- 5) Replacement of a grinding stone must be performed by a person who has received special education and training.

#### **5-11-3 Cranes and Sling Works**

- 1) Crane operation and sling works must be performed by qualified workers.
- 2) Before using a crane and slinging device, confirm that the over-winding protector, latches, and other protective tools work properly.
- 3) Wear properly a working suit with tight sleeves and cuffs, a safety helmet, and other necessary protectors.

(The remainder of this page is intentionally left blank.)

#### 5-11-4 Forklift Trucks

- 1) Forklift trucks must be operated by qualified drivers.
- 2) Before starting the engine, check the braking equipment, steering system, and other units for any abnormal functioning.
- 3) When transporting loads, comply with the maximum allowable load, maximum allowable travelling speed, and other legally specified limits. Also avoid driving the forklift in an unsafe manner, such as lifting up a load while running and making a sharp turn with the load kept suspended.

## Chapter 6 Chemical Experiments

For chemical experiment methods, refer to "Doing Chemical Experiments Safely, Part II" (Kagaku-Dojin Publishing Co., Inc.). General precautions in chemical experiments are described below. Also refer to the following video clip: [http://www.chem.zenkyo.h.kyoto-u.ac.jp/operation/index\\_e.html](http://www.chem.zenkyo.h.kyoto-u.ac.jp/operation/index_e.html).

### [General Precautions]

- Wear white lab coat, protective eyeglasses, rubber gloves, and other protectors appropriate for each experiment. However, do not enter the office with these protectors on.
- Wear arch-covered shoes.
- Tie your hair if it is long.
- Do not conduct an experiment alone. Also avoid conducting thoughtless experiments.
- Make detailed experiment plans.
- Keep always the laboratory in order.
- Do not leave any unnecessary chemicals and instruments on the laboratory table.
- When operating an experimental apparatus at night, obtain approval from the responsible person. Then post the user's name and emergency contact number at a prominent place.
- When leaving high temperature instrument, display a warning notice such as "CAUTION. HOT" near the instrument. Provide a proper warning notice under any other hazardous situations.

### 6-1 Heating

- 1) Before starting the experiment, confirm that the experimental apparatus has not been hermetically closed.
- 2) Except when absolutely necessary, do not directly heat the experimental object on a gas flame. Instead, use a water bath (up to 100°C), oil bath (up to 200°C), or heating mantle.
- 3) Heat the experimental object gradually. Rapid heating may cause the instrument to break or the reaction to go out of control.
- 4) When recrystallizing a material, put the coarsely crystallized material in the solvent when the solvent temperature is sufficiently low. If the material is put in the solvent after its temperature is raised to near boiling point, explosive boiling may occur.

### 6-2 Distillation

- 1) Put a boiling stone in the solvent before starting a heating operation.
- 2) When restarting the heating operation after suspending the distillation operation, reduce sufficiently the solvent temperature and then put a new boiling stone in the solvent.

- 3) Ethers often form explosive peroxides during storage. Before distilling ethers, check for the presence of peroxides using potassium iodide starch test paper. It is preferable to dispose of the ethers if they are discovered to contain a large quantity of peroxides. If only a small quantity of peroxides is contained, distill the ethers after refluxing these solvents by adding  $\text{LiAlH}_4$  or other proper desiccant.

### 6-3 Depressurization and Pressurization

- 1) When conducting a depressurization experiment, use pressure-proof glassware.
- 2) For a compression experiment, use a pressure-proof metallic tube or autoclave. When using the autoclave, receive guidance from a specialist.
- 3) During decompression or compression, never apply force or impact to the instruments and equipment.
- 4) When reducing/increasing pressure from/to normal pressure, perform the work at a slow speed.

### 6-4 Glassware and Glassworks

#### 6-4-1 Glassware

- 1) Prior to use, check the glassware for any defect. Do not use glassware if it exhibits cracks or other defects.
- 2) Do not use conical flasks or other planar glassware for a decompression/compression experiment.
- 3) Be careful not to get injury while glass tubes are connected to a rubber plug, tubes and other material, because glass tubes are easily distorted and broken.
- 4) After you use glassware, soak it immediately in water and wash it clean. Select a proper cleaning method according to the degree of staining.
- 5) Do not place measuring cylinders and other measuring glassware in a high-temperature drying machine.

#### 6-4-2 Glassworks

- 1) When processing glassworks, wear protective eyeglasses. Use a burner with sufficient care.
- 2) When reworking on used glassware, wash and dry it in advance. (A combustible substance or vapor may remain in it.)
- 3) Touching hot glassware with a bare hand will cause a burn. Before touching, hold your hand over the glassware to check if it is hot.
- 4) After finishing the glasswork, clean the work table and surrounding area. Wash your hands with running water. Using a vacuum cleaner or adhesive tape, remove fine glass pieces from your lab coat.

(The remainder of this page is intentionally left blank.)



### 6-5 Fume Hood

- 1) Do not unnecessarily open the hood sash. When you are not working at your hood, the sash should be completely closed.
- 2) When using the fume hood, the sash should be lowered to proper position. Keep your head outside the hood.
- 3) Discharge an acid gas after neutralizing with an alkali solution.
- 4) Discharge hazardous gas or foul-smelling material after reducing its concentration as much as possible.
- 5) The fume hood sash does not work as an explosion protection barrier. If there is a risk of explosion during use, take proper damage mitigation measures such as installing a protective barrier around the fume hood or wearing a protective mask. Also announce other users when there is a risk of explosion during the experiment.
- 6) Do not use the fume hood as a store space. Always keep the fume hood in good order.

## Chapter 7 Explosions

An explosion is a phenomenon in which combustion, decomposition, or other exothermal reaction progresses rapidly and causes violent thermal expansion of the surrounding gas. Expansion of the gas generates a detonating sound and may damage or destroy nearby structures. General precautions for preventing explosions are described below.

### [Prevention Measures]

The best prevention approach is not to use explosive substances. If it is unavoidable to use an explosive substance, investigate its properties in detail in advance and take effective measures to avoid the risk of explosion.

The general precautions are given below.

- Do not store more explosive substances than necessary. Store explosive substances under the most appropriate ambient conditions.
- Avoid using fire within a distance of five meters from an explosive substance.
- Take proper static electricity removal measures.
- For heating, use water and oil baths and monitor the temperature, pressure, gas concentration and more while substances are heated.
- For an apparatus with any risks of explosion, inspect the apparatus for any problems before use and operate it properly.

### [Damage Mitigation Measures]

**A group leader must always take effective measures for mitigating explosion damages.**

The following are general precautions:

- Store each explosive substance in a safe place even if an explosion occurs, or in a specially designed container.
- Wear protective eyeglasses, protective mask, and gloves, as well as a protective panel and other proper protective equipment.

- Do not leave any unnecessary objects around an explosive substance.
- Ensure that fire extinguishers and evacuating apparatuses are ready for use at any time, and inspect them regularly. Train all facility users so that they can correctly use these apparatuses.
- Draw up an emergency escape plan and make all facility users familiar with the plan.

### 7-1 Explosive Gas Mixture

When mixed with air, combustible gases and vaporized flammable liquids often catch fire and explode. The explosion ranges\*1 of typical gases and liquids are shown in the following table. The risk of explosion increases as the mixture limit is lower and the range is wider.

\*1: The concentration and pressure ranges of a mixture of air and a combustible gas that may cause the mixture to explode. These gases will not explode if the mixture with air is outside the explosion range.

Table 14 Explosion ranges of gases and combustible liquids (standard pressure, 20°C)

| Combustible gas |          | Combustible liquid |           | Special material gas |         |
|-----------------|----------|--------------------|-----------|----------------------|---------|
| Acetylene       | 2.5-100% | Ethyl ether        | 2.1-13.0% | Monosilane           | 1.3-98% |
| Hydrogen        | 2.5-93%  | Gasoline           | 1.4-7.6%  | Disilane             | 0.8-88% |
| Ethylene        | 3.0-34%  | Acetone            | 2.1-13.0% | Arshin               | 4.5-78% |
| Propane         | 2.1-9.5% | Methanol           | 6.0-36.5% | Phosphine            | 1.3-98% |

Two most effective ways for preventing the explosion of these gases are ① not bringing the origin of a fire close to these gases and ② ventilating sufficiently the rooms where these gases are placed.

[Special material gases (see Table 12)]

Monosilane and diborane require particular attention, since they are special material gases that may ignite spontaneously if mixed with air. Handling of special material gases is permitted only to persons who are qualified as a "Person Responsible for Handling Specified High-Pressure Gas." Special material gas containers must have the engraved registration number of Kyoto University "M228" and others are not available.

### 7-2 Explosive-Decomposition Gas

Acetylene, diacetylene, monovinylacetylene, and ethylene oxide decompose spontaneously and explode if stimulated by adequate ignition energy. When storing these gases, do not pressurize or apply a shock load to them and keep them at a low temperature. Handling of these gases requires the expert guidance.

### 7-3 Explosive Substances

Explosive substances are roughly classified into the following three types:

- Unstable substances that will explode if heated or impacted  
(Compounds containing mainly O-O, O-Cl, N-O, N-N, N=N, O-C-N, or C≡C bond)
- Substances that tend to form an explosive compound (e.g. ether)
- Substances that are stable by themselves but will become explosive if mixed with different materials (e.g. black gunpowder)

When handling any type of explosive substances, investigate their properties and reaction mechanisms in detail to prevent their explosion.

Handle explosives in compliance with the provisions of the Explosives Control Law and the rules established by the relevant department. (No explosives are used in iCeMS at present).

## Chapter 8 Life Sciences

The risk of human infection from microorganisms and viruses used in common biological experiments is unlikely, however, the possibility of damage cannot be ruled out if microorganisms and viruses are leaked. Not only the safety of experimenters but also the effects on the university and neighboring residents must be considered carefully. Experimenters gain right knowledge of biological experimentation and consciously carry out studies in compliance with relevant laws and regulations in order to prevent risks and conduct experiments in a safe manner. **The group leader must give group members proper training and mentoring.**

### [Basic Precautions for Biological Experiments]

- Do not eat, drink, or smoke in the laboratory.
- Keep laboratory benches well organized and disinfected.
- Infections most likely tend to occur from fingers during biological experiments. Do not handle with bare hands any liquid or instrument that may be contaminated with microorganisms. Do not touch other experimental instruments with gloves used for handling microorganisms. Keep your nails short and wash your hands and fingers with soap after experiments.
- Comply with the specified procedures for treating liquids and containers including microorganisms with the utmost care. (See also 4-10 and 8-1-2)
- Handle microorganisms only in the designated sites and do not carry instruments around with microorganisms attached.
- Store injection needles and razors in specific containers. Never contaminate general wastes.

### 8-1 Recombinant DNA Experiments

The following procedures are required to conduct recombinant DNA experiments in the iCeMS, and the Facilities and Environment Section of iCeMS takes care of these administrative procedures.

- 1) Before beginning a recombinant DNA experiment, the experimental protocols must be submitted to the Safety Committee for Recombinant DNA Experiments of Kyoto University and approved by the President in accordance with the Safety Management Code of Recombinant DNA Experiments of Kyoto University.
- 2) All persons who conduct experiments must receive the proper training and mentoring in accordance with the Safety Management Code of Recombinant DNA Experiments of Kyoto University and they must perform experiments carefully to prevent accidents by using appropriate equipment according to the experiment level.
- 3) **When an experiment is completed or discontinued, the experiment leader must submit the experiment report to the President.**
- 4) All persons who conduct experiments must comply with the precautions specified in the Safety Management Code of Recombinant DNA Experiments of Kyoto University when storing and transporting samples and waste products containing genetically modified organisms.

Recombinant DNA experiments include the following:

- [1] An experiment to produce recombinant molecules of proliferative DNA (vector) and different DNA of living cells *in vitro*, import them into the living cells, and proliferate different DNA.

[2] An experiment using viruses, viroids, cultured cells and recombinant animals and plants that were obtained as a result of the above experiment [1].

The following risks are to be considered.

[1] The effect of recombinant DNA on the environment is critical in the case of experiments recombining DNAs from different species. If a vector used in an experiment can pass through different species, the inserted DNAs may spread in the environment.

[2] Recombinant proteins may have risks. For example, recombinant toxic proteins.

### 8-1-1 Laws and Regulations Concerning Security

Before starting an experiment, the experiment leader must submit the application for approval of recombinant DNA experiment. Complete the procedures according to the advice of the Facilities and Environment Section.

(For the form, refer to <http://www.kyoto-u.ac.jp/ja/research/ethic/dna/yosiki.htm/>)

To establish the experimental level, evaluate the class of (1) host organisms and (2) nucleic acid-derived organisms (nucleotide donor) in the compliance with the classifications specified in Article 3 of the "Ministerial Ordinance Providing Containment Measures to Be Taken in Type 2 Use of Living Modified Organisms for Research and Development" by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

Recombinant experiments are classified into microbial, large-scale culture, animal and plant experiments. Determine the type of experiment to be applied (microbial, large-scale culture, animal, or plant experiment) and the class of containment measures to be taken (P1, P2, P3, LS1, LS2, P1A, P2A, P3A, P1P, P2P and P3P) in accordance with the class of hosts and nucleotide donors to be used, and take containment measures (violation is subject to penalty).

(See <http://www.lifescience.mext.go.jp/bioethics/anzen.html#kumikae>)

Precautions specified in this regulation are summarized below.

#### **Containment Measures [Biosafety Level (P1, P2)]**

P1 level: Experiments are allowed to be performed in usual biological laboratories, provided that the following procedures are complied with.

- Use a container that does not allow genetically modified organisms from leaking.
- Inactivate genetically modified organisms (e.g. autoclaving).
- Keep the laboratory door closed.
- Designate a hand-washing sink to prevent infection from genetically modified organisms.
- Restrict the access of unauthorized persons.

P2 level: In addition to the P1-level measure, take the following measures.

- Install a safety cabinet to prevent aerosol dispersion.
- Install an autoclave in laboratories.

- "Warning. Biosafety Level 2" should be displayed.

### 8-1-2 Precautions for an Experiment Using Recombinant DNA

Understand the risks of the experiment to be performed, and make efforts to prevent from dispersal of recombinant products from laboratories.

Always ensure disinfection and sterilization of laboratory benches, floors and instruments.

In case microorganisms come into contact the skin, always keep 70% ethanol and invert soap in a laboratory.

- Separate any containers (e.g. culture flask) containing microorganisms from others.
- Autoclave microorganisms at 121°C for at least for 15 minutes in principle. Always dispose of wastes after autoclaving. Sterilize tubes, tips and agar plates in a durable bag for autoclaving and dispose them as incombustible products. Autoclave tapes should be used to confirm autoclaving.
- Reagents, media and instruments including disposable flasks used in experiments shall be **discarded after autoclaving**. Reusable glassware can be reused after autoclaving. If experimental instruments are contaminated, remove contamination with alcohol, etc. as much as possible. For sterilization of instruments that cannot be sterilized by heating or steaming, use disinfectants. Check components of disinfectants before use and select the most appropriate one because the use conditions, effects and target will differ depending on the type of disinfectants.
- Do not take genetically modified microorganisms, animals or plants outside of laboratories.

#### Disinfection, sterilization and antisepsis

These terms are generally used almost synonymously, however, medical definitions are given here.

Disinfection: to decrease the number of microorganisms.

Sterilization: to kill all microorganisms including viruses.

Antisepsis: to kill or inactivate pathogens.

### 8-2 Animal Experiments

#### Necessity and Appropriate Implementation of Animal Experiments

- 1) Animal experiments provide information that is very important for improving the welfare of humankind. Legal evidence that animal experiments are performed for study and education of students must comply with the "Act on Welfare and Management of Animals (Act No. 105 of October 1, 1973).
- 2) Do not sacrifice animals unnecessarily during animal experiments. In accordance with the Three R's (Replacement, Reduction and Refinement), other approaches must be considered in terms of Replacement (by non-animal methods), Reduction (in numbers of animals used) and Refinement (of experiments to cause minimum pain). Keep in mind that animal experiments are performed in return for precious lives of animals, and achieve the best results using the fewest animals.
- 3) Required notifications for experiments using imported animals, plants and microorganisms are specified below.
  - (a) Animals, plants and microorganisms that are imported and correspond to the "Act on Domestic

- Animal Infectious Diseases Control" and the "Plant Protection Act" must be permitted by the Minister of Agriculture, Forestry and Fisheries (MAFF).
- (b) Microorganisms that are covered by the "Plant Protection Act" must be annually inspected by the Plant Protection Station and a report must be submitted.
  - (c) If importing monkeys for research, holding facilities must be designated by the Minister of Health, Labour and Welfare (MHLW) and the Minister of MAFF, based on the "Ministerial Ordinance of Import-prohibited Area on Paragraph 1, Article 54 of the Act on Prevention of Infectious Diseases and Medical Care for Patients Suffering Infectious Disease."
  - (d) If keeping alien organisms designated as invasive alien species, holding facilities must be designated by the Minister of MHLW and the Minister of MAFF, based on the "Invasive Alien Species Act".
  - (e) When caring for or keeping the specified animals (including imported animals), the facility for the care and keeping of the specified animals must receive the permission of the prefectural governor or the mayor having jurisdiction over the location of the facility for each kind of specified animals, based on the "Act on Welfare and Management of Animals".

#### **8-2-1 Animal Protocol**

Animal experiments must be performed in accordance with the "Regulations on Animal Experimentation at Kyoto University," which are defined from the scientific viewpoint to ensure animal welfare, environmental conservation, and security of the faculty members and students who conduct animal experiments.

<http://www.kyoto-u.ac.jp/static/ja/research/ethic/arcku/2013/documents/03.pdf>

\* The forms are available for download from "The Kyoto University Animal Experimentation Committee"  
<http://www.kyoto-u.ac.jp/ja/research/ethic/arcku> (In Japanese).

#### **<1> Animal Laboratories, Facilities for the Care and Keeping of the Experimental Animals**

When caring for or keeping experimental animals of mammalian, avian and reptilian species, the following procedures regulated by the Animal Experimentation Committee of Kyoto University are required for the facilities for care and keeping of the experimental animals and the animal laboratories.

##### **Animal Laboratories**

- (a) Set up a laboratory for handling experimental animals with measures to prevent the escape of animals (e.g. rat guard and trap), and control of odor and wastes. Use an isolated laboratory for animal experiments in accordance with the classification of experiments specified by the Cartagena Protocol on Biosafety. Submit the "Application form for the approval of laboratory installation (Form 5)" to set up a laboratory. The Facilities and Environment Section of iCeMS takes care of these administrative procedures.
- (b) The term "laboratory" shall mean an animal laboratory where experimental operations are carried out on experimental animals, which are brought from the facilities for the care and keeping of the experimental animals or purchased from an experimental animal supplier, including cases where experimental animals are temporarily kept for experimental activities for no longer than 48 hours.

##### **Facilities for the Care and Keeping of the Experimental Animals**

When keeping experimental animals for more than 48 hours, the designated facilities for the care and

keeping of the experimental animals must be used. Registration is required to use iCeMS animal facilities. A person who conducts an experiment must be trained by the animal holding manager and use facilities in accordance with the facility rules.

#### **Experimental animals other than Mammalian, Avian and Reptilian Species**

The above rules do not apply to the use of model animals including drosophila and C. elegans, however it is necessary to take measures to prevent escape and dispersal and to prepare equipment with careful consideration.

#### **<2> Education and Training for Animal Experiments**

Before engaging in an animal experiment, laboratory members must receive necessary education and training. They must participate in the education and training programs provided by each department. If they cannot participate in the education and training programs, they should rent the DVD from the Facilities and Environment Section of iCeMS.

Persons who have received education and training are registered as a person engaged in animal experiments.

#### **<3> Animal Experimental Protocol**

(a) An animal experiment leader shall submit the "Animal experimental protocol (Form 1)". The submitted protocol shall be reviewed by the animal research committee of the relevant department and approved by the department director. The experiment can be started after approval is given.

(b) If any major changes of experiment plans and animal species during the animal use project, submit the "Application form for change/addition of animal experimental protocol (Form2)" to obtain the approval of the department director.

(c) At the completion of an animal experiment, submit the "Report of animal experiment results (Form 3)." The Facilities and Environment Section of iCeMS takes care of the above administrative procedures.

#### **<4> Health Check**

All persons who will conduct experiments must confirm the necessity of blood test beforehand, because they have risk of hemorrhagic fever with renal syndrome (HFRS) virus infection. If required, they must take a blood test before conducting the first experiment and each time they receive a regular health checkup.

(The remainder of this page is intentionally left blank.)

### 8-2-2 Precautions for Animal Experiments

- Familiarize yourself with the possibility of injury and disease including bites, animal allergy and zoonosis caused by experimental animals.
- Make efforts to learn the techniques necessary for animal experiments in advance under the instruction of a skilled person (e.g. faculty).
- Wear the specified lab coat and shoes with a cap, a mask and gloves when entering facilities handling experimental animals. Eating and drinking in the facilities and storage of food are prohibited.
- Conduct animal experiments only in the site designated as an animal laboratory and report the manager of laboratory animal facility of any injury during experiments.
- Pay attention to control and ventilation when using of anesthetic agents, fixing reagents and solvents.
- Avoid contact with experimental animals when in bad health. Mice and rats may be infected by human cold.
- Record the in and out of experimental animals into the facilities for the care and keeping of the experimental animals and keep the facilities locked to prevent access by unauthorized persons.
- Keep experimental animals in the appropriate environment by feeding food, water cleaning and exchange of bedding based on biological characteristics and habits. Be cautious to prevent the escape of experimental animals during bedding exchange.
- In case of a laboratory animal escape, take actions to prevent running into other rooms and report to the manager of laboratory animal facility. Follow the instructions to handle lab animal escape. Report the animal facility when strange or dead animal is found in the facilities for the care and keeping of the experimental animals.
- Seal a used laboratory animal into a leak-proof bag to prevent liquid leakage like blood, and store it in a freezer of the designated site until the processing day.
- For processing of infectious wastes, refer to Section 4-10 of Disposal Methods for Waste from iCeMS.

### 8-3 Human-Derived Samples

Studies using established Embryonic Stem (ES) cells currently have no contribution to ontogeny unless nuclear transplantation or connection with embryos, thus ethical issues involved in the birth of human life have not been raised. However, the serious considerations are required in view of the origin of ES cells. In other words, the abuse of ES cells may increase the loss of human embryos and this may evanesce careful considerations to establish ES cells. ES cells can be differentiated into all types of cells, therefore, studies using ES cells may cause ethical problems.

To conduct a human genome study, it is required to submit the study protocol to the institutional ethics committee of genome study and gain the approval of the committee. The study progress and results must be reported to the committee and reviewed as required.

#### Human Embryonic Stem (ES) cell

In Vitro Fertilization (IVF) technology has been established as a fertility treatment, and multiple fertilized eggs are prepared for IVF and some are cryopreserved as extra. There extra fertilized eggs (spare embryos) are used for the establishment (production) of human ES cells after obtaining informed consent from married couples (excluding common-law couples) who provide sperm and eggs.



A human fertilized egg forms a blastocyst 4 to 5 days after fertilization. The inner cell mass of the blastocyst has pluripotency (ability to differentiate into all types of tissues and organs) and is used for the establishment of human ES cells for research.

### **Human induced Pluripotent Stem (iPS) cell**

These cells are defined as the pluripotent stem cells that are produced by introducing 4 types of genes, Oct3/4, Sox2, c-Myc and Klf4 into somatic cells. Human iPS cells are produced without fertilized eggs or clone embryos differently from ES cells, therefore, major ethical problems are avoided.

### **[Conditions for the Use of human ES cells]**

For the use of established human ES cells in a cell culture study, the following procedure is required: [1] participation in an ethical seminar concerning human ES cells, [2] presentation of culture data using iPS cells, etc., and [3] registration as the research worker with the "Protocol for use of human ES cells" specified by the MEXT in compliance with the "Guidelines on the Derivation and Distribution of Human Embryonic Stem Cells" of the "Human ES cell research" of the MEXT prior to research.

Reference: "Guidelines for implementation of the protocol for the use of human ES cells"

[http://www.lifescience.mext.go.jp/files/pdf/n743\\_00.pdf](http://www.lifescience.mext.go.jp/files/pdf/n743_00.pdf)

The Research Planning Section acts for the hESC Ethics Committee (Support Office) of iCeMS. The following are important points of the "Guidelines on the Utilization of Human Embryonic Stem Cells".

#### **<1> Purpose of Experiment (Paragraph 1, Article 5)**

The purpose of utilization is for basic research contributing to any of the following:

- Clarification of the function of human development, differentiation and regeneration
- Development of a new diagnosis method, preventive method or treatment method or development of such products as medicines

#### **<2> Cells to be Utilized**

- (a) The human ES cells to be utilized should be limited from the cells that have satisfied the requirements prescribed in the Guidelines on the Derivation and Distribution of Human Embryonic Stem Cells (Paragraph 3, Article 5). In cases where they are to be utilized for the production of germ cells, informed consent for the production of germ cells must be obtained.
- (b) The human ES cells that have been derived in a foreign country are allowed to be used when the Minister of MEXT recognizes that the cells have been derived based on standards that are equivalent to the Guidelines on the Derivation and Distribution of Human Embryonic Stem Cells (Paragraph 4, Article 5). (In cases where they are to be utilized for the production of germ cells, those cells must be recognized as having been derived based on standards that are equivalent to the Guidelines, and for which the production of germ cells from human ES cells is not prohibited in the relevant country's national laws and regulations or guidelines equivalent thereto and in the conditions pertaining to the provision of human ES cells.)
- (c) A project utilizing human ES cells must keep an incubator only for hES cells. A project utilizing hES cells should be performed in a lab space with necessary equipment including clean bench and locked cabinet (Article 8).

### <3> Prohibited Acts

- (a) Create an individual through the transplantation of embryos produced by utilizing human ES cells into a human or animal uterus or through any other method (Article 6).
- (b) Introduce human ES cells into a human embryo or fetus (Article 6).
- (c) In cases where germ cells are to be produced from human ES cells, produce a human embryo using the said germ cells (Article 6).
- (d) Distribute or transfer human ES cells (Article 7). (Processed hES cells can be distributed and transferred if the utilizing institute is reviewed by the ethics committee based on the Guidelines on the Derivation and Distribution of Human Embryonic Stem Cells in addition to the submission the related forms to the government).

### <4> Summary of the Procedures for the Utilization of human ES Cells

- (a) Before starting an experiment, the utilization director of human ES cells must make a utilization plan and seek the approval of the director of iCeMS for the implementation of the utilization plan.
- (b) After getting the approval of the implementation of the utilization plan, human ES cells can be received from the institution that established or distributed human ES cells.
- (c) When intending to amend the utilization plan, the utilization director must prepare a written amendment to the utilization plan and receive approval of the director of iCeMS.
- (d) When completing the utilization of human ES Cells, the utilization director must submit a completion report of the utilization of human ES cells to the director of iCeMS.
- (e) The hESC Ethics Committee of iCeMS shall examine the appropriateness of the utilization plan and the change of the plan. The Research Planning Section of iCeMS takes care of the administrative procedures.

(The remainder of this page is intentionally left blank.)

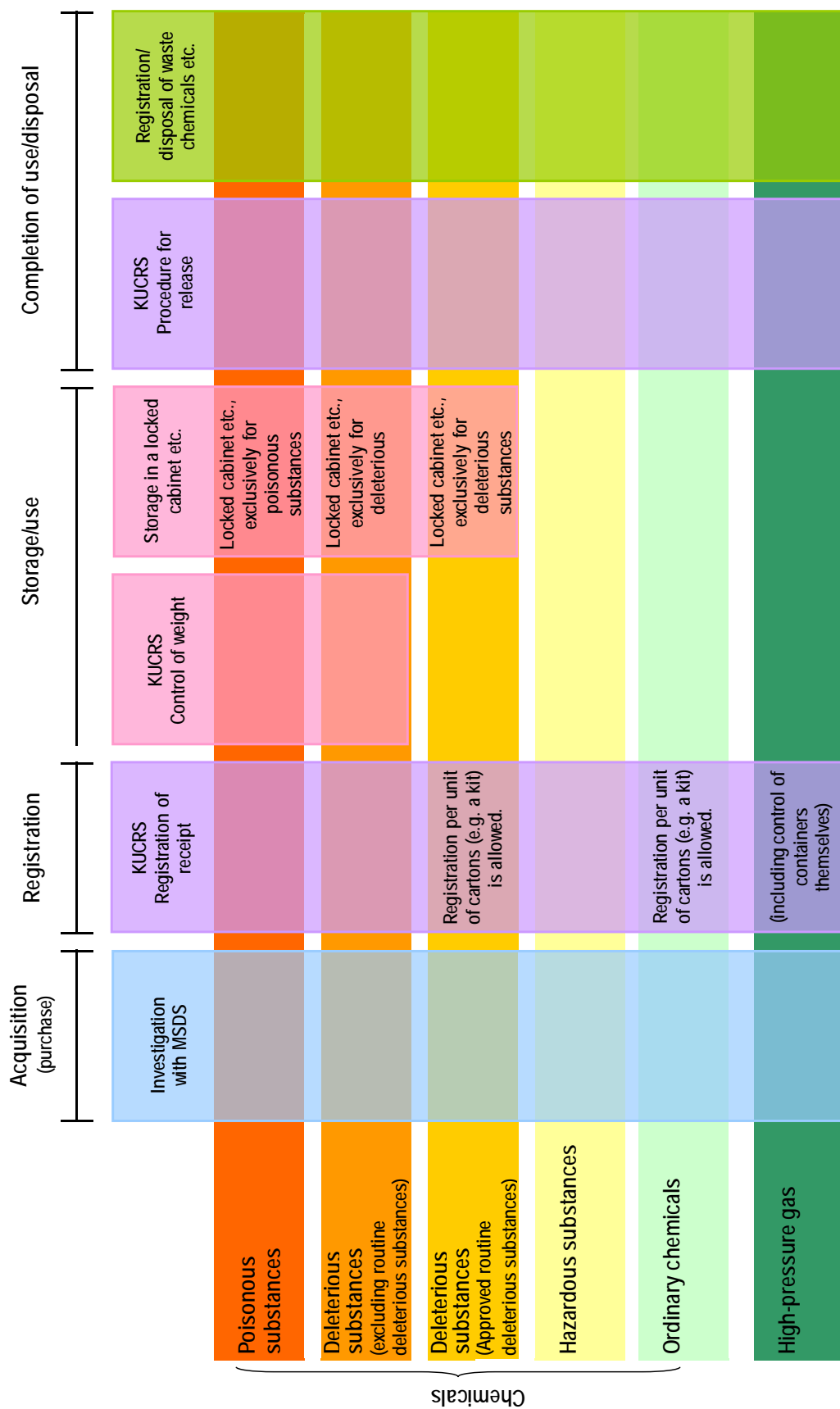
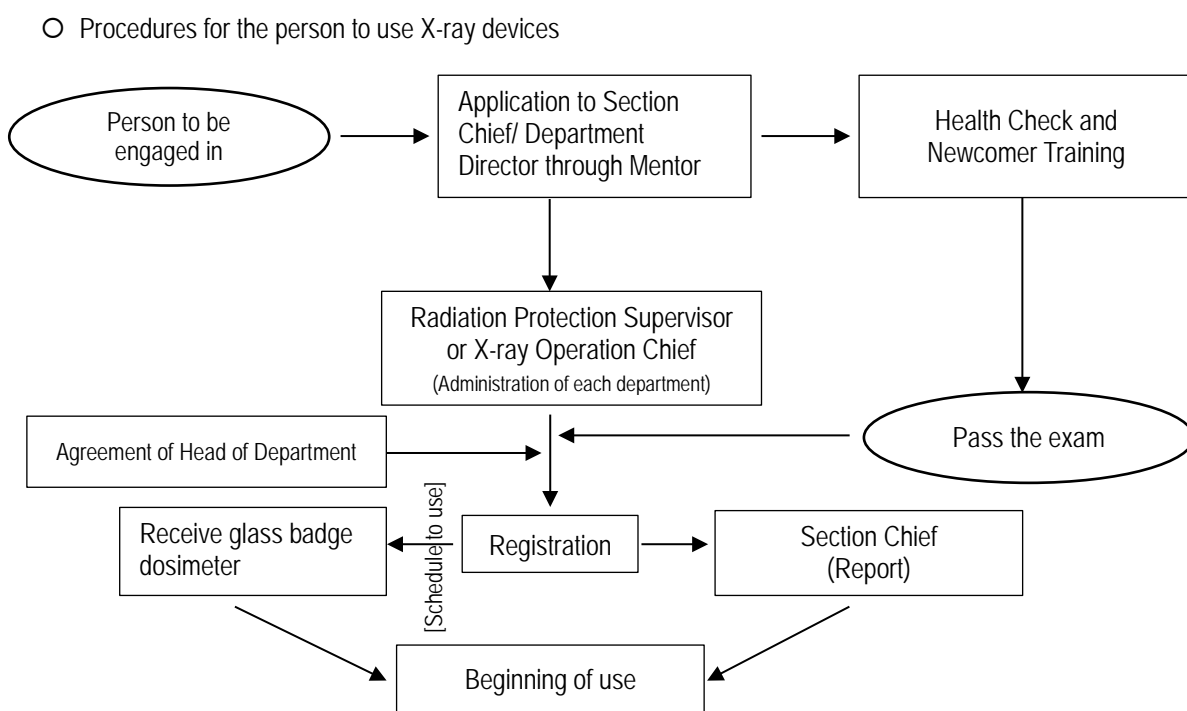
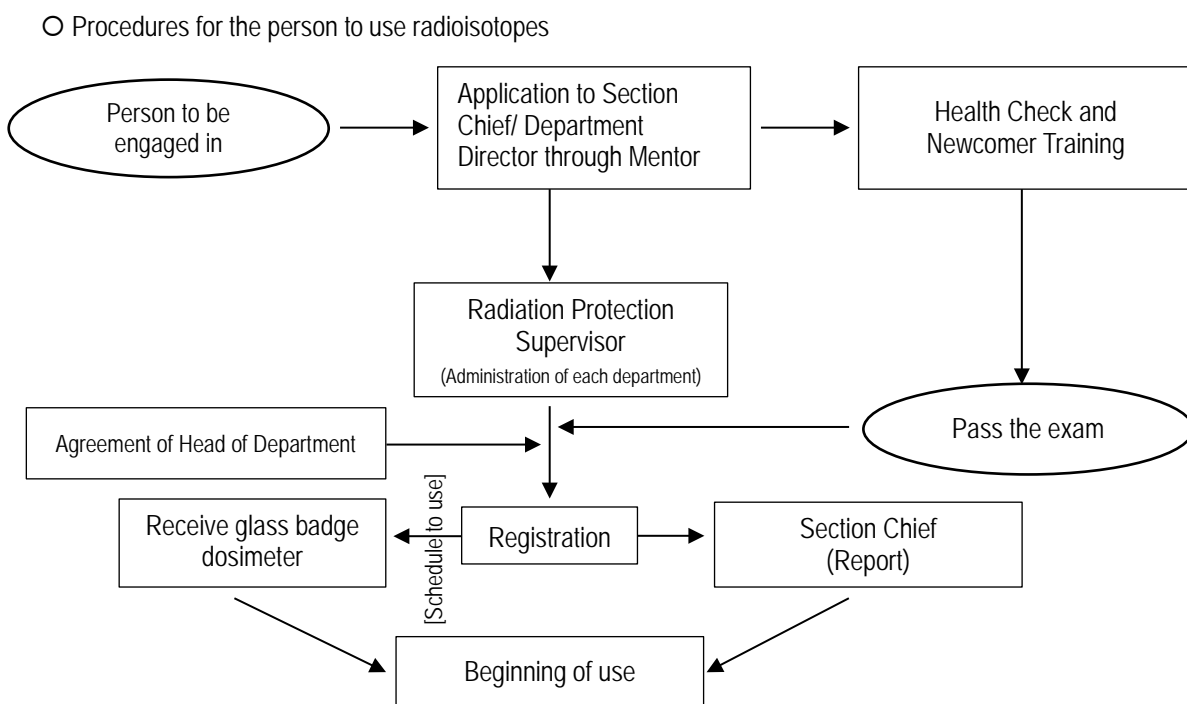


Figure 2. Flow for Registration and Control of Chemical Substances by KUCRS

Figure 3 Procedures for Users of Radioisotopes and X-ray Equipment



Regulation for Prevention of Radiation Damage at Kyoto University  
 "Regulations for Prevention of Radiation Damage" issued by each department  
 (Contact: Radioisotope Research Center of Kyoto University)

## Table 4 Organic Solvents (Ordinance on Prevention of Organic Solvent Poisoning)

(Note) Applicable in the case of a mixture containing any of the following substances beyond 5%.

### Class 1

- 1 Chloroform
- 2 Carbon tetrachloride
- 3 1,2-dichloroethane (ethylene dichloride)
- 4 1,2-dichloroethylene (acetylene dichloride)
- 5 1,1,1,2-tetrachloroethane (acetylene tetrachloride)
- 6 Trichloroethylene
- 7 Carbon disulfide

### Class 2

- 8 Acetone
- 9 Isobutyl alcohol
- 10 Isopropyl alcohol
- 11 Isopentyl alcohol (isoamyl alcohol)
- 12 Ethyl ether
- 13 Ethylene glycol monoethyl ether (cellosolve)
- 14 Ethylene glycol monoethyl ether acetate (cellosolve acetate)
- 15 Ethylene glycol mono-*n*-butyl ether (butyl cellosolve)
- 16 Ethylene glycol monomethyl ether (methyl cellosolve)
- 17 *O*-dichlorobenzene
- 18 Xylene
- 19 Cresol
- 20 Chlorobenzene
- 21 Isobutyl acetate
- 22 Isopropyl acetate
- 23 Isopentyl acetate (isoamyl acetate)
- 24 Ethyl acetate
- 25 *N*-butyl acetate
- 26 *N*-propyl acetate
- 27 *N*-pentyl acetate (*n*-amyl acetate)
- 28 Methyl acetate
- 29 Cyclohexanol
- 30 Cyclohexanone
- 31 1,4-Dioxane
- 32 Dichloromethane (methylene dichloride)
- 33 *N,N*-Dimethylformamide
- 34 Styrene
- 35 Tetrachloroethane (perchloroethylene)
- 36 Tetrahydrofuran
- 37 1,1,1-Trichloroethane (methyl chloroform)
- 38 Toluene
- 39 *N*-Hexane
- 40 1-Butanol
- 41 2-Butanol
- 42 Methanol
- 43 Methyl isobutyl ketone
- 44 Methyl ethyl ketone
- 45 Methyl cyclohexanol
- 46 Methyl cyclohexanone
- 47 Methyl-*n*-butyl ketone

### Class 3 (Work environment measurement is not required)

- 48 Gasoline
- 49 Coal tar naphtha (including solvent naphtha)
- 50 Petroleum ether
- 51 Petroleum naphtha
- 52 Petroleum benzene
- 53 Turpentine
- 54 Mineral spirit  
(including mineral thinner, petroleum spirit, white spirit, and mineral turpentine)

**Table 5 Specified Chemical Substances  
(Ordinance on Prevention of Hazards due to Specified Chemical Substances)**

(As of May 30, 2014)

(Note 1) Special controlled substances (requiring labeling) are underlined.

(Note 2) Categorize as specified chemical substances when the containing amount is greater than the indicated.

**Category 1**

|   |                                         |                                |
|---|-----------------------------------------|--------------------------------|
| 1 | <u>Dichlorobenzidine and its salts</u>  | 1 wt%                          |
| 2 | <u>Alfa-naphthylamine and its salts</u> | 1 wt%                          |
| 3 | Polychlorinated biphenyl (PCB)          | 1 wt%                          |
| 4 | <u>o-toluidine and its salts</u>        | 1 wt%                          |
| 5 | <u>Dianisidine and its salts</u>        | 1 wt%                          |
| 6 | <u>Beryllium and its compounds</u>      | 1 wt% (3 wt% of Be for alloys) |
| 7 | <u>Benzotrithloride</u>                 | 0.5 wt%                        |

**Category 2**

|      |                                                                                                 |       |      |                                                                                 |       |
|------|-------------------------------------------------------------------------------------------------|-------|------|---------------------------------------------------------------------------------|-------|
| 1    | Acrylamide                                                                                      | 1 wt% | 20   | Methyl bromide                                                                  | 1 wt% |
| 2    | Acrylonitrile                                                                                   | 1 wt% | 21   | <u>Dichromic acid and its salts</u>                                             | 1 wt% |
| 3    | Alkyl mercury compounds<br>(limited to those with an alkyl group such as methyl or ethyl group) | 1 wt% | 22   | Mercury and its inorganic compounds(excluding mercury sulfide)                  | 1 wt% |
| 3-2  | <u>Indium compounds</u>                                                                         | 1 wt% | 23   | Tolylene diisocyanate                                                           | 1 wt% |
| 3-3  | <u>Ethylbenzene</u>                                                                             | 1 wt% | 23-2 | <u>Nickel compounds</u><br>(limited to powders except for those given in 24)    | 1 wt% |
| 4    | <u>Ethyleneimine</u>                                                                            | 1 wt% | 24   | <u>Nickel carbonyl</u>                                                          | 1 wt% |
| 5    | <u>Ethylene oxide</u>                                                                           | 1 wt% | 25   | Nitroglycol                                                                     | 1 wt% |
| 6    | <u>Vinyl chloride</u>                                                                           | 1 wt% | 26   | <u>p-Dimethylaminoazobenzene</u>                                                | 1 wt% |
| 7    | Chlorine                                                                                        | 1 wt% | 27   | p-Nitrochlorobenzene                                                            | 5 wt% |
| 8    | <u>Auramine</u>                                                                                 | 1 wt% | 27-2 | <u>Arsenic and its compounds</u><br>(excluding arsine and gallium arsenide)     | 1 wt% |
| 9    | o-Phthalodinitrile                                                                              | 1 wt% | 28   | Hydrogen fluoride                                                               | 5 wt% |
| 10   | Cadmium and its compounds                                                                       | 1 wt% | 29   | <u>Beta-propiolactone</u>                                                       | 1 wt% |
| 11   | <u>Chromic acid and its salts</u>                                                               | 1 wt% | 30   | <u>Benzene</u>                                                                  | 1 wt% |
| 12   | <u>Chloromethyl methyl ether</u>                                                                | 1 wt% | 31   | Pentachlorophenol (PCP)<br>and its sodium salts                                 | 1 wt% |
| 13   | Vanadium pentoxide                                                                              | 1 wt% | 31-2 | <u>Formaldehyde</u>                                                             | 1 wt% |
| 13-2 | <u>Cobalt and its inorganic compounds</u>                                                       | 1 wt% | 32   | <u>Magenta</u>                                                                  | 1 wt% |
| 14   | <u>Coal tar</u>                                                                                 | 5 wt% | 33   | Manganese and its compounds<br>(excluding basic manganese oxide)                | 1 wt% |
| 15   | <u>Propylene oxide</u>                                                                          | 1 wt% | 34   | Methyl iodide                                                                   | 1 wt% |
| 16   | Potassium cyanide                                                                               | 5 wt% | 35   | Hydrogen sulfide                                                                | 1 wt% |
| 17   | Hydrogen cyanide                                                                                | 1 wt% | 36   | Dimethyl sulfate                                                                | 1 wt% |
| 18   | Sodium cyanide                                                                                  | 5 wt% | 37   | Preparation containing ethylbenzene or 1,2-Dichloropropane and organic solvents | 5 wt% |
| 19   | <u>3,3'-Dichloro-4,4'-diaminodiphenylmethane</u>                                                | 1 wt% |      |                                                                                 |       |
| 19-2 | <u>1,2-Dichloropropane</u>                                                                      | 1 wt% |      |                                                                                 |       |
| 19-3 | <u>1,1-Dimethylhydrazine</u>                                                                    | 1 wt% |      |                                                                                 |       |

**Category 3**

|   |                   |       |
|---|-------------------|-------|
| 1 | Ammonia           | 1 wt% |
| 2 | Carbon monoxide   | 1 wt% |
| 3 | Hydrogen chloride | 1 wt% |
| 4 | Nitric acid       | 1 wt% |
| 5 | Sulfur dioxide    | 1 wt% |
| 6 | Phenol            | 5 wt% |
| 7 | Phosgene          | 1 wt% |
| 8 | Sulfuric acid     | 1 wt% |

**Table 6 Asbestos (Ordinance on Prevention of Health Impairment due to Asbestos)**

(Note) Applicable when the amount exceeds that indicated.

|                                                   |         |
|---------------------------------------------------|---------|
| Asbestos and other substances containing asbestos | 0.1 wt% |
|---------------------------------------------------|---------|



Table 8 Poisonous Substances (Those Specified by the Cabinet Order for the Designation of the Poisonous and Deleterious Substances (1))

(As of May 30, 2014)

|      | 毒物                                                                                                           | 別名、物質(例)                                                                                                                                                                                 | Chemical Name                                                                                                                                                     | Synonym                                                                                                                                                                                                                                                                                                        | CAS                                                                                                                                                                            |
|------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | アジ化ナトリウム<br>(但し、0.1%以下を含有する物を除く)                                                                             |                                                                                                                                                                                          | Sodium azide<br>[over 0.1% concentration]                                                                                                                         |                                                                                                                                                                                                                                                                                                                | 26628-22-8                                                                                                                                                                     |
| 1-2  | 亜硝酸イソプロピル                                                                                                    |                                                                                                                                                                                          | Isopropyl nitrite                                                                                                                                                 | 2-propyl nitrite                                                                                                                                                                                                                                                                                               | 541-42-4                                                                                                                                                                       |
| 1-3  | 亜硝酸ブチル                                                                                                       | 亜硝酸n-ブチル                                                                                                                                                                                 | Butyl nitrite                                                                                                                                                     | Nitrous acid butyl ester                                                                                                                                                                                                                                                                                       | 544-16-1                                                                                                                                                                       |
| 1-4  | アバメクチン<br>(但し、1.8%以下は劇物)                                                                                     |                                                                                                                                                                                          | Avermectin<br>[designated as deleterious substance at 1.8% or less]                                                                                               |                                                                                                                                                                                                                                                                                                                | 71751-41-2<br>アバメクチンE1a:<br>65195-55-3<br>アバメクチンE1b:<br>65195-56-4                                                                                                             |
| 1-5  | 3-アミノ-1-プロペン                                                                                                 | アリルアミン                                                                                                                                                                                   | 3-amino-1-propen                                                                                                                                                  | Allylamine                                                                                                                                                                                                                                                                                                     | 107-11-9                                                                                                                                                                       |
| 1-6  | アリルアルコール                                                                                                     |                                                                                                                                                                                          | Allyl alcohol                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                | 107-18-6                                                                                                                                                                       |
| 1-7  | アルカノールアンモニウム-2,4-ジニトロ-6-(1-メチルプロピル)-フェノラート<br>(但し、トリエタノールアンモニウム-2,4-ジニトロ-6-(1-メチルプロピル)-フェノラート及びこれを含有する製剤を除く) | ジノセブ(DNBP)のアルカノールアミン塩                                                                                                                                                                    | Alkanolammonium 2,4-dinitro-6-(1-methylpropyl)-phenolate<br>[excluding solvents containing Triethanolammonium-2,4-dinitro-6-(1-methylpropyl)phenolate and itself] | Dinoseb alkanolamine salts                                                                                                                                                                                                                                                                                     | 8048-12-2                                                                                                                                                                      |
| 1-8  | O-エチル-O-(2-イソプロポキシカルボニルフェニル)-N-イソプロピルチオホスホリアミド<br>(但し、5%以下は劇物)                                               | イソフェンホス                                                                                                                                                                                  | O-Ethyl-O-(2-isopropoxycarbonylphenyl)-N-isopropylthiophosphoramidate<br>[designated as deleterious substance at 5% or less]                                      | Isofenphos                                                                                                                                                                                                                                                                                                     | 25311-71-1                                                                                                                                                                     |
| 1-9  | O-エチル-S,S-ジプロピルホスホロジチオエート<br>(但し、5%以下は劇物)                                                                    | エトプロホス                                                                                                                                                                                   | O-Ethyl S,S-dipropyl phosphorodithioate<br>[designated as deleterious substance at 5% or less]                                                                    | Ethoprophos                                                                                                                                                                                                                                                                                                    | 13194-48-4                                                                                                                                                                     |
| 2    | エチルパラニトロフェニルチオノベンゼンホスホネイト<br>(但し、1.5%以下は劇物)                                                                  | EPN                                                                                                                                                                                      | Ethylparanitrophenylthio benzene phosphonate<br>[designated as deleterious substance at 1.5% or less]                                                             | EPN                                                                                                                                                                                                                                                                                                            | 2104-64-5                                                                                                                                                                      |
| 2-2  | N-エチル-メチル-(2-クロロ-4-メチルメルカプトフェニル)-チオホスホリアミド                                                                   | アミドチオエート                                                                                                                                                                                 | N-Ethyl-methyl-(2-chloro-4-methylmercaptophenyl)-thiophosphoramidate                                                                                              | Amidodithioate                                                                                                                                                                                                                                                                                                 | 54381-26-9                                                                                                                                                                     |
| 2-3  | 塩化ベンゼンスルホニル                                                                                                  | ベンゼンスルホニルクロリド                                                                                                                                                                            | Benzensulfonyl chloride                                                                                                                                           |                                                                                                                                                                                                                                                                                                                | 98-09-9                                                                                                                                                                        |
| 2-4  | 塩化ホスホリル                                                                                                      | オキシ塩化リン                                                                                                                                                                                  | Phosphorus oxychloride                                                                                                                                            | Phosphoryl chloride                                                                                                                                                                                                                                                                                            | 10025-87-3                                                                                                                                                                     |
| 3    | 黄燐                                                                                                           | 黄リン、白リン                                                                                                                                                                                  | Yellow phosphorus                                                                                                                                                 | White phosphorus                                                                                                                                                                                                                                                                                               | 12185-10-3                                                                                                                                                                     |
| 4    | オクタクロルテトラヒドロメタノフタラン                                                                                          | テロドリリン                                                                                                                                                                                   | Octachlorotetrahydro methanophthalan                                                                                                                              | Isobenzan                                                                                                                                                                                                                                                                                                      | 297-78-9                                                                                                                                                                       |
| 5    | オクタメチルピロホスホリアミド [特定毒物]                                                                                       | シュラーダン                                                                                                                                                                                   | Octamethyl pyrophosphoramidate<br>[Specified poisonous substances]                                                                                                | Schradan                                                                                                                                                                                                                                                                                                       | 152-16-9                                                                                                                                                                       |
| 5-2  | オルトケイ酸テトラメチル                                                                                                 |                                                                                                                                                                                          | Tetramethyl orthosilicate                                                                                                                                         |                                                                                                                                                                                                                                                                                                                | 681-84-5                                                                                                                                                                       |
| 6    | クラール                                                                                                         |                                                                                                                                                                                          | Curare                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                | 8063-06-7                                                                                                                                                                      |
| 6-2  | クロトンアルデヒド及びこれを含有する製剤                                                                                         |                                                                                                                                                                                          | Crotonaldehyde                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                | 4170-30-3                                                                                                                                                                      |
| 6-3  | クロロアセトアルデヒド                                                                                                  |                                                                                                                                                                                          | Chloroacetaldehyde                                                                                                                                                | 2-Chloroacetaldehyde                                                                                                                                                                                                                                                                                           | 107-20-0                                                                                                                                                                       |
| 6-4  | クロロ酢酸メチル及びこれを含有する製剤                                                                                          |                                                                                                                                                                                          | Methyl Chloroacetate                                                                                                                                              |                                                                                                                                                                                                                                                                                                                | 96-34-4                                                                                                                                                                        |
| 6-5  | 3-クロロ-1,2-プロパンジオール                                                                                           |                                                                                                                                                                                          | 3-Chloropropane-1,2-diol                                                                                                                                          |                                                                                                                                                                                                                                                                                                                | 96-24-2<br>SI:60827-45-4<br>E:67024-45-6                                                                                                                                       |
| 6-6  | 五塩化燐                                                                                                         | 五塩化リン                                                                                                                                                                                    | Phosphorus pentachloride                                                                                                                                          |                                                                                                                                                                                                                                                                                                                | 10026-13-9                                                                                                                                                                     |
| 6-7  | 三塩化燐素                                                                                                        | 塩化ホウ素                                                                                                                                                                                    | Boron trichloride                                                                                                                                                 | Boron chloride                                                                                                                                                                                                                                                                                                 | 10294-34-5                                                                                                                                                                     |
| 6-8  | 三塩化燐                                                                                                         | 三塩化リン                                                                                                                                                                                    | Phosphorus trichloride                                                                                                                                            |                                                                                                                                                                                                                                                                                                                | 7719-12-2                                                                                                                                                                      |
| 6-9  | 三臭化燐素                                                                                                        | フッ化ホウ素                                                                                                                                                                                   | Boron trifluoride                                                                                                                                                 | Boron fluoride                                                                                                                                                                                                                                                                                                 | 7637-07-2                                                                                                                                                                      |
| 6-10 | 三臭化燐                                                                                                         | 三フッ化リン                                                                                                                                                                                   | Phosphorus trifluoride                                                                                                                                            |                                                                                                                                                                                                                                                                                                                | 7783-56-3                                                                                                                                                                      |
| 6-11 | ジアセトキシプロペン                                                                                                   |                                                                                                                                                                                          | Diacetoxypropene                                                                                                                                                  | 1,1-Diacetoxy-2-propene                                                                                                                                                                                                                                                                                        | 869-29-4                                                                                                                                                                       |
| 7    | 四アルキル鉛 [特定毒物]                                                                                                | 四アルキル鉛                                                                                                                                                                                   | Tetraalkyl lead                                                                                                                                                   | Tetraalkyl lead                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                |
|      |                                                                                                              | テトラメチル鉛、四メチル鉛                                                                                                                                                                            | Tetramethyl lead                                                                                                                                                  | Tetramethyl lead                                                                                                                                                                                                                                                                                               | 75-74-1                                                                                                                                                                        |
|      |                                                                                                              | テトラエチル鉛、四エチル鉛                                                                                                                                                                            | Tetraethyl lead                                                                                                                                                   | Tetraethyl lead                                                                                                                                                                                                                                                                                                | 78-00-2                                                                                                                                                                        |
| 8    | 無機シアン化合物<br>(但し、次に掲げるものを除く)<br>イ 砒毒<br>ロ フェロシアン塩<br>ハ フェロシアン塩                                                | シアン化銅酸ナトリウム<br>シアン化白金バリウム<br>シアン化カドミウム<br>青酸カリ、シアン化カリウム<br>シアン化カルシウム<br>シアン化コバルトカリウム<br>シアン化銅酸カリウム<br>シアン化亜鉛(II)<br>シアン化鉛<br>シアン化銀<br>シアン化第一金カリウム<br>シアン化第二水銀<br>シアン化第一銅<br>シアン化ニッケルカリウム | Inorganic cyanide<br>excluding chemicals below:<br>a. Ferric hexacyanoferrate<br>b. Ferricyanide<br>c. Ferrocyanide                                               | Sodium cuprocyanide<br>Platinum-barium cyanide<br>Cadmium cyanide<br>Potassium cyanide<br>Calcium cyanide<br>Potassium cobalt cyanide<br>Potassium cuprocyanide<br>Zinc cyanide<br>Lead cyanide<br>Silver cyanide<br>Gold-potassium cyanide<br>Mercuric cyanide<br>Cuprous cyanide<br>Potassium nickel cyanide | 14264-31-4<br>562-81-2<br>542-83-6<br>151-50-8<br>592-01-8<br>13963-58-1<br>13682-73-0<br>557-21-1<br>592-06-2<br>506-64-9<br>13967-50-5<br>592-04-1<br>544-92-3<br>14220-17-8 |
| 9    | ジエチル-S-(エチルチオエチル)-ジチオホスフェイト<br>(但し、5%以下は劇物)                                                                  | ジスルホトン                                                                                                                                                                                   | Diethyl-S-(ethylthioethyl)-dithiophosphate<br>[designated as deleterious substance at 5% or less]                                                                 | Disulfoton                                                                                                                                                                                                                                                                                                     | 298-04-4                                                                                                                                                                       |
| 9-2  | ジエチル-S-(2-クロロ-1-フタルイミドエチル)-ジチオホスフェイト                                                                         | ジアリホール                                                                                                                                                                                   | Diethyl-S-(2-chloro-1-phthalimidoethyl)-dithiophosphate                                                                                                           | Dialfos                                                                                                                                                                                                                                                                                                        | 10311-84-9                                                                                                                                                                     |
| 9-3  | ジエチル-(1,3-ジチオシクロペンチリデン)-チオホスホリアミド<br>(但し、5%以下は劇物)                                                            | 2-(ジエトオキシホスフィノチオイル)ミノ-1,3-ジチオレン                                                                                                                                                          | Diethyl-(1,3-dithiocyclopentylidene)-thiophosphoramidate<br>[designated as deleterious substance at 5% or less]                                                   | Phosfolan                                                                                                                                                                                                                                                                                                      | 333-29-9                                                                                                                                                                       |
| 9-4  | ジエチルパラジメチルアミノスルホニルフェニルチオホスフェイト                                                                               |                                                                                                                                                                                          | Diethyl-p-dimethylamionosulfonylphenylthiophosphate                                                                                                               |                                                                                                                                                                                                                                                                                                                | 3078-97-5                                                                                                                                                                      |
| 10   | ジエチルパラニトロフェニルチオホスフェイト [特定毒物]                                                                                 | パラチオン                                                                                                                                                                                    | Diethyl parnitrophenyl thiophosphate<br>[Specified poisonous substances]                                                                                          | Parathion                                                                                                                                                                                                                                                                                                      | 56-38-2                                                                                                                                                                        |
| 10-2 | ジエチル-4-メチルスルフィニルフェニルチオホスフェイト<br>(但し、3%以下は劇物)                                                                 |                                                                                                                                                                                          | Diethyl-4-methylsulfinylphenyl-thiophosphate<br>[designated as deleterious substance at 3% or less]                                                               | Fensulfotion                                                                                                                                                                                                                                                                                                   | 115-90-2                                                                                                                                                                       |
| 10-3 | 1,3-ジクロロプロパン-2-オール                                                                                           |                                                                                                                                                                                          | 1,3-Dichloropropane-2-ol                                                                                                                                          |                                                                                                                                                                                                                                                                                                                | 96-23-1                                                                                                                                                                        |
| 10-4 | 2,3-ジシアノ-1,4-ジシアントラキノン<br>(但し、50%以下は劇物)                                                                      | ジチアノン                                                                                                                                                                                    | 2,3-Dicyano-1,4-dithiadihydroanthraquinone<br>[designated as deleterious substance at 50% or less]                                                                |                                                                                                                                                                                                                                                                                                                | 3347-22-6                                                                                                                                                                      |
| 11   | ジニトロクレゾール                                                                                                    | 4,6-ジニトロオルトクレゾール<br>ジニトロオルトクレゾール                                                                                                                                                         | Dinitroresol<br>Dinitro-o-cresol                                                                                                                                  | DNOC                                                                                                                                                                                                                                                                                                           | 534-52-1<br>1335-85-9                                                                                                                                                          |



Table 8 Poisonous Substances (Those Specified by the Cabinet Order for the Designation of the Poisonous and Deleterious Substances (2))

(As of May 30, 2014)

|                        | 毒物                                                                                                                                                                                       | 別名、物質(例)                                           | Chemical Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Synonym                                                                   | CAS                                           |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------|
| 12                     | ジニトロクレゾール塩類                                                                                                                                                                              | 4,6-ジニトロオルトクレゾールナトリウム                              | 4,6-dinitro-o-cresol sodium salt                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Sodium 4,6-dinitro-o-cresol                                               | 2312-76-7                                     |
| 12-2                   | ジニトロフェノール                                                                                                                                                                                |                                                    | Dinitrophenol                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Phenol, dinitro-                                                          | 25550-58-7                                    |
| 13                     | 2,4-ジニトロ-6-(1-メチルプロピル)-フェノール (但し、2%以下は劇物)                                                                                                                                                | ジノセブ                                               | 2,4-Dinitro-6-(1-methylpropyl)-phenol [designated as deleterious substance at 2% or less]                                                                                                                                                                                                                                                                                                                                                                                                   | Dinoseb                                                                   | 88-85-7                                       |
| 13-2                   | 2-ジフェニルアセチル-1,3-インダンジオン (但し、0.005%以下は劇物)                                                                                                                                                 | ダイファシノン                                            | 2-Diphenylacetyl-1,3-indandione [designated as deleterious substance at 0.005% or less]                                                                                                                                                                                                                                                                                                                                                                                                     | Diphacinone                                                               | 82-66-6                                       |
| 13-3                   | 四弗化硫黄                                                                                                                                                                                    | フッ化イオウ                                             | Sulfur tetrafluoride                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Sulfur fluoride                                                           | 7783-60-0                                     |
| 13-4                   | ジボラン                                                                                                                                                                                     | ボロエタン                                              | Diborane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Boroethane                                                                | 19287-45-7                                    |
| 13-5                   | ジメチル(イソプロピルチオエチル)-ジチオホスフェイト (但し、4%以下は劇物)                                                                                                                                                 | イソチオネート                                            | Dimethyl- (isopropylthioethyl)- dithiophosphate [designated as deleterious substance at 4% or less]                                                                                                                                                                                                                                                                                                                                                                                         | Isothionate                                                               | 36614-38-7                                    |
| 14                     | ジメチルエチルメルカプトエチルチオホスフェイト [特定毒物]                                                                                                                                                           | メチルジメトン                                            | Dimethyl(ethylmercapto ethylthiophosphate) [Specified poisonous substances]                                                                                                                                                                                                                                                                                                                                                                                                                 | Demeton-methyl                                                            | 8022-00-2                                     |
| 15                     | ジメチル(ジエチルアミド-1-クロロクロトニル)-ホスフェイト [特定毒物]                                                                                                                                                   | ホスファミドン                                            | Dimethyl-(diethylamido-1-chlorocrotonyl)- phosphate [Specified poisonous substances]                                                                                                                                                                                                                                                                                                                                                                                                        | Phosphamidon                                                              | 13171-21-6                                    |
| 15-2                   | 1,1'-ジメチル-4,4'-ジピリジニウムヒドロキシド及びその塩類                                                                                                                                                       | パラコートジメチルスルフェート                                    | 1,1'-Dimethyl-4,4'-bipyridinium dimethylsulfate                                                                                                                                                                                                                                                                                                                                                                                                                                             | Paraquat methosulfate                                                     | 2074-50-2                                     |
|                        |                                                                                                                                                                                          | パラコート                                              | 1,1'-Dimethyl-4,4'-bipyridinium                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Paraquat                                                                  | 4685-14-7                                     |
|                        |                                                                                                                                                                                          | パラコートジクロライド                                        | 1,1'-Dimethyl-4,4'-dipyridiniumdichloride                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Paraquat dichloride                                                       | 1910-42-5                                     |
| 16                     | ジメチルパラニトロフェニルチオホスフェイト [特定毒物]                                                                                                                                                             | メチルパラチオン                                           | Dimethyl(paranitrophenyl) thiophosphate [Specified poisonous substances]                                                                                                                                                                                                                                                                                                                                                                                                                    | Parathion-methyl                                                          | 298-00-0                                      |
| 16-2                   | 1,1-ジメチルヒドラジン                                                                                                                                                                            |                                                    | 1,1-Dimethylhydrazine                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                           | 57-14-7                                       |
| 16-3                   | 2,2-ジメチルプロパノイルクロライド                                                                                                                                                                      | トリメチルアセチルクロライド<br>ピバロイルクロライド<br>塩化ピバロイル            | 2,2-dimethylpropionyl chloride                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                           | 3282-30-2                                     |
| 16-4                   | 2,2-ジメチル-1,3-ベンゾジオキソール-4-イル-N-メチルカルバマート (但し、5%以下は劇物)                                                                                                                                     | ベンダイオカルブ                                           | 2,2-Dimethyl-1,3-benzodioxol-4-yl-N-methylcarbamate [designated as deleterious substance at 5% or less]                                                                                                                                                                                                                                                                                                                                                                                     | Bendiocarb                                                                | 22781-23-3                                    |
| 17                     | 水銀化合物 (但し、次に掲げるものを除く)<br>イ アミノ塩化第二水銀及びこれを含有する製剤<br>ロ 塩化第一水銀及びこれを含有する製剤<br>ハ オレイン酸水銀及びこれを含有する製剤<br>ニ 酸化水銀5%以下を含有する製剤<br>ホ 炭化第一水銀及びこれを含有する製剤<br>ヘ 硫酸第二水銀及びこれを含有する製剤<br>ト 酸化第二水銀及びこれを含有する製剤 | チメロサル、エチル水銀チオアリチル酸ナトリウム                            | Mercury compound excluding chemicals below:<br><br>a. Aminomercuric chloride and preparation containing the same<br>b. Mercury (I) chloride and preparation containing the same<br>c. Mercury oleate and preparation containing the same<br>d. preparation containing 5% or less Mercury oxide<br>e. Mercury (I) iodide and preparation containing the same<br>f. Mercury (II) fulminate and preparation containing the same<br>g. Mercury (II) sulfide and preparation containing the same | Thimerosal, Sodium ethylmercurithiosalicylate                             | 54-64-8                                       |
|                        |                                                                                                                                                                                          | 硝酸水銀Ⅱ、硝酸第一水銀                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercurous nitrate                                                         | 10415-75-5                                    |
|                        |                                                                                                                                                                                          | チオシアン酸水銀Ⅲ、チオシアン酸第二水銀                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercuric thiocyanate                                                      | 592-85-8                                      |
|                        |                                                                                                                                                                                          | シアン化水銀Ⅲ、シアン化第二水銀                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercuric cyanide                                                          | 592-04-1                                      |
|                        |                                                                                                                                                                                          | オキシシアン化水銀Ⅲ、オキシシアン化第二水銀                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercury oxycyanide                                                        | 1335-31-5                                     |
|                        |                                                                                                                                                                                          | 塩化水銀 (Ⅲ)、塩化第二水銀                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercuric chloride                                                         | 7487-94-7                                     |
|                        |                                                                                                                                                                                          | ヨウ化水銀Ⅲ、ヨウ化第二水銀                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercuric iodide                                                           | 7774-29-0                                     |
|                        |                                                                                                                                                                                          | 硝酸水銀Ⅲ、硝酸第二水銀                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercuric nitrate                                                          | 10045-94-0                                    |
|                        |                                                                                                                                                                                          | 臭化水銀Ⅲ、臭化第二水銀                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercuric bromide                                                          | 7789-47-1                                     |
|                        |                                                                                                                                                                                          | 酸化水銀Ⅱ、酸化第一水銀                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercurous oxide                                                           | 15829-53-5                                    |
|                        |                                                                                                                                                                                          | 酸化水銀Ⅲ、酸化第二水銀 (但し、5%以下は劇物)                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercuric oxide [designated as deleterious substance at 5% or less]        | 21908-53-2                                    |
|                        |                                                                                                                                                                                          | 酢酸水銀Ⅲ、酢酸第二水銀                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercuric acetate                                                          | 1600-27-7                                     |
|                        |                                                                                                                                                                                          | 酢酸フェニル水銀、アセトフェニル水銀Ⅲ                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mercurous acetate                                                         | 631-60-7                                      |
| Phenylmercuric acetate |                                                                                                                                                                                          | 62-38-4                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                           |                                               |
| 17-2                   | ストリキニーネ及びその塩類                                                                                                                                                                            | ストリキニーネ<br>硝酸ストリキニーネ                               | Strychnine and salts thereof                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Strychnine<br>Strychnine nitrate                                          | 57-24-9<br>66-32-0                            |
| 18                     | セレン化合物 (但し、次に掲げるものを除く)<br>イ 亜セレン酸ナトリウム0.00011%以下を含有する製剤<br>ロ ゲルマニウム、セレンおよび砒素からなるガラス状態の物質並びにこれを含有する製剤<br>ハ セレン酸ナトリウム0.00012%以下を含有する製剤                                                     | カドミウムレッド、硫セレン化カドミウム                                | Selenium excluding chemicals below:<br><br>a. preparation containing 0.00011% or less sodium selenite<br>b. vitrified substance composed of germanium, selenium and arsenic and preparation containing the same<br>c. preparation containing 0.00012% or less sodium selenate                                                                                                                                                                                                               | Cadmium selenide sulfide                                                  | 12214-12-9                                    |
|                        |                                                                                                                                                                                          | 亜セレン酸バリウム                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Barium selenite                                                           | 13718-59-7                                    |
|                        |                                                                                                                                                                                          | 亜セレン酸ナトリウム(5水和物)                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Sodium selenite                                                           | 26970-82-1                                    |
|                        |                                                                                                                                                                                          | 亜セレン酸ナトリウム<br>ハフツ化セレン                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Sodium selenite<br>Selenium hexafluoride                                  | 10102-18-8<br>7783-79-1                       |
|                        |                                                                                                                                                                                          | セレン酸<br>セレン化鉄<br>水素化セレンウム、セレン化水素<br>無水亜セレン酸、二酸化セレン |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Selenic acid<br>Ferrous selenide<br>Hydrogen selenide<br>Selenium dioxide | 7783-8-6<br>1310-32-3<br>7783-7-5<br>7446-8-4 |
| 19                     | テトラエチルピロホスフェイト [特定毒物]                                                                                                                                                                    | TEPP                                               | Tetraethylpyrophosphate [Specified poisonous substances]                                                                                                                                                                                                                                                                                                                                                                                                                                    | TEPP                                                                      | 107-49-3                                      |
| 19-2                   | 2,3,5,6-テトラフルオロ-4-メチルベンジル(2)-(1RS,3RS)-3-(2-クロロ-3,3,3-トリフルオロ-1-プロペニル)-2,2-ジメチルシクロプロパンカルボキシレート (但し、0.5%以下は劇物)                                                                             | テフルトリン                                             | 2,3,5,6-Tetrafluoro-4-methylbenzyl (2)-(1RS,3RS)-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropane carboxylate [designated as deleterious substance at 0.5% or less]                                                                                                                                                                                                                                                                                                         | Tefluthrin                                                                | 79538-32-2                                    |
| 19-3                   | テトラメチルアンモニウムヒドロキシド及びこれを含有する製剤                                                                                                                                                            |                                                    | Tetramethylammonium hydroxide and preparation containing the same                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                           | 75-59-2                                       |
| 19-4                   | 1-ドデシルグアニジニウムアセテート (但し、65%以下は劇物)                                                                                                                                                         | ドジン、ドグイン                                           | 1-Dodecylguanidium acetate [designated as deleterious substance at 65% or less]                                                                                                                                                                                                                                                                                                                                                                                                             | Dodine                                                                    | 2439-10-3                                     |
| 19-5                   | トリブチルアミン                                                                                                                                                                                 |                                                    | Tributylamine                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                           | 102-82-9                                      |
| 19-6                   | ナラシン及びその塩類 (但し、10%以下は劇物)                                                                                                                                                                 |                                                    | Narasin [designated as deleterious substance at 10% or less]                                                                                                                                                                                                                                                                                                                                                                                                                                | 4-Methylsalinomycin                                                       | 55134-13-9                                    |
| 20                     | ニコチン                                                                                                                                                                                     |                                                    | Nicotine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                           | 20033                                         |
| 21                     | ニコチン塩類                                                                                                                                                                                   | 硫酸ニコチン                                             | Nicotine and its salts                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Nicotine sulfate                                                          | 65-30-5                                       |
| 22                     | ニッケルカルボニル                                                                                                                                                                                | テトラカルボニルニッケル                                       | Nickel carbonyl                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Tetracarbonylnickel                                                       | 13463-39-3                                    |
| 22-2                   | S,S'-ビス(1-メチルプロピル)-O-エチルホスホロジチオアート (但し、10%以下は劇物)                                                                                                                                         | カズサホス                                              | S,S'-bis(1-methylpropyl) O-ethyl phosphorodithioate [designated as deleterious substance at 10% or less]                                                                                                                                                                                                                                                                                                                                                                                    | Cadusafos                                                                 | 95465-99-9                                    |



**Table 9 Deleterious Substances** (Those Specified in the Appended Table 2 of Poisonous and Deleterious Substances Control Law (1))

(As of May 30, 2014)

|    | 劇物                                    | 別名、物質(例)                                        | Chemical Name                                              | Synonym                                                                 | CAS        |
|----|---------------------------------------|-------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------|------------|
| 1  | アクリルニトリル                              |                                                 | Acrylonitrile                                              | Acrylic nitrile                                                         | 107-13-1   |
| 2  | アクロレイン                                | アクリルアルデヒド                                       | Acrolein                                                   |                                                                         | 107-02-8   |
| 3  | アニリン                                  | アミノベンゼン                                         | Aniline                                                    |                                                                         | 62-53-3    |
| 4  | アンモニア                                 | アンモニア水                                          | Ammonia water                                              |                                                                         | 1336-21-6  |
|    |                                       |                                                 | Ammonia                                                    |                                                                         | 7664-41-7  |
| 5  | 2-イソプロピル-4-メチルピリミジル-6-ジエチルチオホスフェイト    | ダイアジノン                                          | 2-Isopropyl-4-methylpyrimidyl-6-diethylthiophosphate       | Diazinon                                                                | 333-41-5   |
| 6  | エチル-N-(ジエチルジチオホスホリール)アセチル-N-メチルカルバメート | メカルバム                                           | Ethyl-N-(diethylthiophosphoryl acetyl)-N-methylcarbamate   | Mecarbam                                                                | 2595-54-2  |
| 7  | エチレンクロロヒドリン                           | 2-クロルエチルアルコール                                   | Ethylene chlorohydrin                                      |                                                                         | 107-07-3   |
| 8  | 塩化水素                                  | 塩酸、塩化水素酸                                        | Hydrogen chloride                                          | Hydrochloric acid                                                       | 7647-01-0  |
| 9  | 塩化第一水銀                                | 甘汞                                              | Mercury chloride                                           | Mercurous chloride                                                      | 7546-30-7  |
| 10 | 過酸化水素                                 | 過酸化水素水                                          | hydrogen peroxide solution                                 |                                                                         |            |
|    |                                       |                                                 | Hydrogen peroxide                                          |                                                                         | 7722-84-1  |
| 11 | 過酸化ナトリウム                              | 過酸化ソーダ                                          | Sodium peroxide                                            |                                                                         | 1313-60-6  |
| 12 | 過酸化尿素                                 | 過酸化尿素                                           | Urea peroxide                                              |                                                                         | 124-43-6   |
| 13 | カリウム                                  |                                                 | Potassium                                                  |                                                                         | 7440-09-7  |
| 14 | カリウムナトリウム合金                           |                                                 | Alloy of potassium and sodium                              |                                                                         | 11135-81-2 |
| 15 | クレゾール                                 | トリクレゾール                                         | Cresol                                                     | Tricresol                                                               | 1319-77-3  |
|    |                                       | メチルフェノール                                        |                                                            | Methylphenol                                                            |            |
|    |                                       | オルトクレゾール                                        |                                                            | o-Cresol                                                                | 95-48-7    |
|    |                                       | メタクレゾール                                         |                                                            | m-Cresol                                                                | 108-39-4   |
|    |                                       | パラクレゾール                                         |                                                            | p-Cresol                                                                | 106-44-5   |
| 16 | クロルエチル                                | 塩化エチル                                           | Ethyl chloride                                             | Chlorene                                                                | 75-00-3    |
| 17 | クロルスルホン酸                              | クロルスルホン酸                                        | Chlorosulfonic acid                                        |                                                                         | 7790-94-5  |
| 18 | クロルピクリン                               | クロルピクリン                                         | Chloropicrin                                               |                                                                         | 76-06-2    |
| 19 | クロルメチル                                | クロルメチル                                          | Methyl chloride                                            | Chloromethane                                                           | 74-87-3    |
| 20 | クロロホルム                                | トリクロロメタン                                        | Chloroform                                                 | Trichloromethane                                                        | 67-66-3    |
| 21 | 珪弗化水素酸                                | ケイフッ化水素酸、ヘキサフルオロケイ酸                             | Fluorosilicic acid                                         |                                                                         | 16961-83-4 |
| 22 | シアン酸ナトリウム                             | シアン酸ソーダ                                         | Sodium cyanate                                             |                                                                         | 917-61-3   |
| 23 | ジエチル-4-クロルフェニルメルカプトメチルジチオホスフェイト       | トリチオン                                           | Diethyl-4-chlorophenylmercaptomethyl dithiophosphat        | Carbophenothion                                                         | 786-19-6   |
| 24 | ジエチル-(2,4-ジクロルフェニル)-チオホスフェイト          | ジクロフェンチオン                                       | Diethyl-(2,4-dichlorophenyl)-thiophosphate                 | Dichlofenthion                                                          | 97-17-6    |
| 25 | ジエチル-2,5-ジクロルフェニルメルカプトメチルジチオホスフェイト    | フェンカプトン                                         | Diethyl-2,5-dichlorophenyl mercapto methyl dithiophosphate | Phenkapton                                                              | 2275-14-1  |
| 26 | 四塩化炭素                                 | 四塩化メタン                                          | Tetrachloromethane                                         | Carbon tetrachloride                                                    | 56-23-5    |
| 27 | シクロヘキシミド                              | 3-[2-(3,5-ジメチル-2-オキシシクロヘキシル)-2-ヒドロキシエチル]グルタリイミド | Cycloheximide                                              | 4-(2-(3,5-Dimethyl-2-oxocyclohexyl)-2-hydroxyethyl) 2,6-Piperidinedione | 66-81-9    |
| 28 | ジクロロ酢酸                                | ジクロロ酢酸                                          | Dichloroacetic acid                                        |                                                                         | 79-43-6    |
| 29 | ジクロロブチン                               |                                                 | Dichlorobutylene                                           | 1,4-Dichloro-2-butyne                                                   | 821-10-3   |
| 30 | 2,3-ジ-(ジエチルジチオホスホロ)-パラジオキサン           |                                                 | 2,3-di-(Diethylthiophosphoro)-paradoxan                    |                                                                         | 78-34-2    |
| 31 | 2,4-ジニトロ-6-シクロヘキシルフェノール               |                                                 | 2,4-Dinitro-6-cyclohexylphenol                             | Dinex                                                                   | 131-89-5   |
| 32 | 2,4-ジニトロ-6-(1-メチルプロピル)-フェニルアセテート      | 酢酸ジノセブ                                          | 2,4-Dinitro-6-(1-methylpropyl)-phenylacetate               | Dinoseb acetate                                                         | 2813-95-8  |
| 33 | 2,4-ジニトロ-6-メチルプロピルフェノールジメチルアクリレート     | ビナパクリル                                          | 2,4-Dinitro-6-methylpropylphenoldimethylacrylate           | Binapacryl                                                              | 485-31-4   |
| 34 | 2,2'-ジピリジリウム-1,1'-エチレンジブロミド           | ジクワット                                           | 2,2'-Dipyridinium-1,1'-ethylene-dibromide                  | Diquat dibromide                                                        | 85-00-7    |
| 35 | 1,2-ジブロムエタン                           | EDB                                             | 1,2-Dibromoethane                                          | Ethylene dibromide                                                      | 106-93-4   |
| 36 | ジブロムクロロプロパン                           | DBCP                                            | Dibromochloropropane                                       | 1,2-Dibromo-3-chloropropane                                             | 96-12-8    |
| 37 | 3,5-ジブロム-4-ヒドロキシ-4'-ニトロアゾベンゼン         | BAB                                             | 3,5-Dibromo-4-hydroxy-4'-nitroazobenzene                   | 3BAB                                                                    | 3281-96-7  |
| 38 | ジメチルエチルスルフィニソプロピルチオホスフェイト             | ESP                                             | Dimethyl ethylsulfinyl isopropyl thiophosphate             | ESP                                                                     | 2674-91-1  |
| 39 | ジメチルエチルメルカプトエチルジチオホスフェイト              | チオメトン                                           | O,O-dimethyl-S-ethylthioethyl-dithiophosphate              | Thiometon                                                               | 640-15-3   |
| 40 | ジメチル-2,2-ジクロルビニルホスフェイト                | ジクロルボス<br>DDVP                                  | Dimethyl-2,2-dichlorovinyl- phosphate                      | Dichlorvos                                                              | 62-73-7    |
| 41 | ジメチルジチオホスホリルフェニル酢酸エチル                 | フェントエート                                         | Dimethylthiophosphorylphenyl acetic acid ethylester        | Phenthoate                                                              | 2597-03-7  |
| 42 | ジメチルジブロムジクロルエチルホスフェイト                 | ナレド                                             | O,O-Dimethyl-1,2-dibromo-2,2-dichloroethylphosphate        | Naled                                                                   | 300-76-5   |
| 43 | ジメチルフタリルイミドメチルジチオホスフェイト               | ホスメット                                           | Dimethyl-phthalimide methylthiophosphate                   | Phosmet                                                                 | 732-11-6   |
| 44 | ジメチルメチルカルバミルエチルチオエチルチオホスフェイト          | バミドチオン                                          | Dimethyl- methylcarbamylethyl thioethyl thiophosphate      | Vamidothion                                                             | 2275-23-2  |
| 45 | ジメチル-N-メチルカルバミルメチル-ジチオホスフェイト          | ジメトエート                                          | O,O-Dimethyl-N- methylcarbamylmethyl-dithiophosphate       | Dimethoate                                                              | 60-51-5    |

Table 9 Deleterious Substances (Those Specified in the Appended Table 2 of Poisonous and Deleterious Substances Control Law (2))

(As of May 30, 2014)

|    | 劇物                                                                                                                                                                                             | 別名、物質(例)                                  | Chemical Name                                                                 | Synonym                                                    | CAS                                           |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------|
| 46 | ジメチル-4-メチルメルカプト-3-メチルフェニルチオホスフェイト                                                                                                                                                              | フェンチオン                                    | O,O-Dimethyl-O-4- (methylmercapto)-3-methylphenylthiophosphate                | Fenthion                                                   | 55-38-9                                       |
| 47 | ジメチル硫酸                                                                                                                                                                                         | 硫酸ジメチル                                    | Dimethyl sulfate                                                              |                                                            | 77-78-1                                       |
| 48 | 重クロム酸                                                                                                                                                                                          |                                           | Dichromic acid                                                                |                                                            | 13530-68-2                                    |
| 49 | 蓚酸                                                                                                                                                                                             | シュウ酸                                      | Oxalic acid                                                                   |                                                            | 144-62-7                                      |
| 50 | 臭素                                                                                                                                                                                             | ブロミン                                      | Bromine                                                                       |                                                            | 7726-95-6                                     |
| 51 | 硝酸                                                                                                                                                                                             |                                           | Nitric acid                                                                   |                                                            | 7697-37-2                                     |
| 52 | 硝酸タリウム                                                                                                                                                                                         |                                           | Thallium nitrate                                                              |                                                            | 10102-45-1                                    |
| 53 | 水酸化カリウム                                                                                                                                                                                        |                                           | Potassium hydroxide                                                           |                                                            | 1310-58-3                                     |
| 54 | 水酸化ナトリウム                                                                                                                                                                                       |                                           | Sodium hydroxide                                                              |                                                            | 1310-73-2                                     |
| 55 | スルホナール                                                                                                                                                                                         | ジエチルスルホンジメチルメタン                           | Sulfonal                                                                      | 2,2-Bis(ethylsulfonyl)propane                              | 115-24-2                                      |
| 56 | テトラエチルメチレンビスジチオホスフェイト                                                                                                                                                                          | エチオン                                      | Tetraethylmethylene bisdithiophosphate                                        | Ethion                                                     | 563-12-2                                      |
| 57 | トリエタノールアンモニウム-2,4-ジニトロ-6-(1-メチルプロピル)-フェノラート                                                                                                                                                    | ドルマント                                     | Triethanolammonium-2,4-dinitro-6-(1-methylpropyl)-phenolate                   |                                                            | 6420-47-9                                     |
| 58 | トリクロロ酢酸                                                                                                                                                                                        | トリクロロ酢酸                                   | Trichloroacetic acid                                                          | TCA                                                        | 76-03-9                                       |
| 59 | トリクロロヒドロキシエチルジメチルホスホネイト                                                                                                                                                                        | トリクロロホン                                   | Trichlorohydroxyethyl dimethylphosphonate                                     | Trichlorfon                                                | 52-68-6                                       |
| 60 | トリチオシクロヘプタジエン-3,4,6,7-テトラニトリル                                                                                                                                                                  | 1,2,5-トリチオシクロヘプタジエン-3,4,6,7-テトラニトリル       | 1,2,5-Trithiocycloheptadiene-3,4,6,7-tetracarbonitrile                        |                                                            | 49561-89-9                                    |
| 61 | トルイジン                                                                                                                                                                                          | メチルアニリン<br>オルトトルイジン<br>メタトルイジン<br>パラトルイジン | Toluidine                                                                     | Methyl anilin<br>o-Toluidine<br>m-Toluidine<br>p-Toluidine | 26915-12-8<br>95-53-4<br>108-44-1<br>106-49-0 |
| 62 | ナトリウム                                                                                                                                                                                          |                                           | Sodium                                                                        |                                                            | 7440-23-5                                     |
| 63 | ニトロベンゼン                                                                                                                                                                                        | ニトロベンゾール                                  | Nitrobenzene                                                                  |                                                            | 98-95-3                                       |
| 64 | 二硫化炭素                                                                                                                                                                                          |                                           | Carbon disulfide                                                              |                                                            | 75-15-0                                       |
| 65 | 飛煙硫酸                                                                                                                                                                                           |                                           | Sulfuric acid, fuming                                                         | Oleum                                                      | 8014-95-7                                     |
| 66 | パラトルイレンジアミン                                                                                                                                                                                    |                                           | p-Tolylene-diamine                                                            |                                                            | 95-70-5                                       |
| 67 | ハラフェニレンジアミン                                                                                                                                                                                    |                                           | p-Phenylenediamine                                                            |                                                            | 106-50-3                                      |
| 68 | ピクリン酸                                                                                                                                                                                          | 2,4,6-トリニトロフェノール                          | picric acid                                                                   |                                                            | 88-89-1                                       |
| 69 | ヒドロキシルアミン                                                                                                                                                                                      |                                           | Hydroxylamine                                                                 |                                                            | 7803-49-8                                     |
| 70 | フェノール                                                                                                                                                                                          |                                           | Phenol                                                                        |                                                            | 108-95-2                                      |
| 71 | ブラストサイジンS                                                                                                                                                                                      |                                           | Blasticidin S                                                                 |                                                            | 2079-00-7                                     |
| 72 | フロムエチル                                                                                                                                                                                         | 臭化エチル                                     | Ethyl bromide                                                                 | Bromoethane                                                | 74-96-4                                       |
| 73 | フロム水素                                                                                                                                                                                          |                                           | Hydrogen bromide                                                              |                                                            | 10035-10-6                                    |
| 74 | フロムメチル                                                                                                                                                                                         | 臭化水素酸、フロム水素酸<br>臭化メチル                     | Hydrobromic acid<br>Methyl bromide                                            | Bromomethane                                               | 74-83-9                                       |
| 75 | ヘキサクロルエポキシオクタヒドロエンドエキソジメタノナフタリン                                                                                                                                                                | ディルドリン                                    | Hexachloro-epoxy- octahydro-endo,exo-dimethanonaphthalene                     | Diieldrin                                                  | 60-57-1                                       |
| 76 | 1,2,3,4,5,6-ヘキサクロルシクロヘキサン(但し、1.5%以下は除く)                                                                                                                                                        | リンデン                                      | gamma-1,2,3,4,5,6-Hexachlorocyclohexane [excluding 1.5% or less]              | Lindane                                                    | 608-73-1<br>(γ)58-89-9                        |
| 77 | ヘキサクロルヘキサヒドロジメタノナフタリン                                                                                                                                                                          | アルドリン                                     | Hexachloro hexahydro dimethanonaphatalene                                     | Aldrin                                                     | 309-00-2                                      |
| 78 | ベタナフトール                                                                                                                                                                                        | β-ナフトール                                   | Beta-naphthol                                                                 | 2-Naphthol                                                 | 135-19-3                                      |
| 79 | 1,4,5,6,7-ペンタクロル-3a,4,7,7a-テトラヒドロ-4,7-(8,8-ジクロルメタノ)-インデン                                                                                                                                       | ヘプタクロール                                   | 1,4,5,6,7-Pentachloro- 3a,4,7,7a-tetrahydro-4,7- (8,8-dichloromethano)-indene | Heptachlor                                                 | 76-44-8                                       |
| 80 | ペンタクロルフェノール                                                                                                                                                                                    | PCP                                       | Pentachlorophenol                                                             | PCP                                                        | 87-86-5                                       |
| 81 | ホルムアルデヒド                                                                                                                                                                                       | ホルマリン                                     | Formaldehyde                                                                  | Formalin                                                   | 50-00-0                                       |
| 82 | 無水クロム酸                                                                                                                                                                                         | 三酸化クロム                                    | Chromium trioxide                                                             | Chromium trioxide                                          | 1333-82-0                                     |
| 83 | メタノール                                                                                                                                                                                          | メチルアルコール                                  | Methanol                                                                      |                                                            | 67-56-1                                       |
| 84 | メチルスルホナール                                                                                                                                                                                      | ジエチルスルホンメチルエチルメタン                         | Methyl sulfonal                                                               | 2,2-Bis(ethylsulfonyl)butane                               | 76-20-0                                       |
| 85 | N-メチル-1-ナフチルカルバメート                                                                                                                                                                             | カルバリル                                     | N-Methyl-1- naphthylcarbamate                                                 | Carbaryl                                                   | 63-25-2                                       |
| 86 | モノクロロ酢酸                                                                                                                                                                                        | クロロ酢酸                                     | Monochloroacetic acid                                                         |                                                            | 79-11-8                                       |
| 87 | 沃化水素                                                                                                                                                                                           | ヨウ化水素酸、ヨード水素酸                             | Hydrogen iodide                                                               | Hydroiodic acid                                            | 10034-85-2                                    |
| 88 | 沃素                                                                                                                                                                                             | ヨード                                       | Iodine                                                                        |                                                            | 7553-56-2                                     |
| 89 | 硫酸                                                                                                                                                                                             |                                           | Sulphuric acid                                                                | Sulfuric acid                                              | 7664-93-9                                     |
| 90 | 硫酸タリウム                                                                                                                                                                                         |                                           | Thallium sulfate                                                              |                                                            | 7446-18-6                                     |
| 91 | 燐化亜鉛                                                                                                                                                                                           | リン化亜鉛                                     | Zinc phosphide                                                                |                                                            | 1314-84-7                                     |
| 92 | ロダン酢酸エチル                                                                                                                                                                                       | チオシアノ酢酸エチルエステル                            | Ethyl thiocynoacetate                                                         |                                                            | 5349-28-0                                     |
| 93 | ロテノン                                                                                                                                                                                           |                                           | Rotenone                                                                      |                                                            | 83-79-4                                       |
| 94 | In addition to the substances given above, preparations containing those given above and other deleterious substances specified by the ordinance (For details, see the top page of the KUCRS.) |                                           |                                                                               |                                                            |                                               |

Table 10 Hazardous Substances (Fire Services Act)

(As of May 30, 2014)

| Classification                        | Properties                                                         | Name of product                                                                                                                                                                                                                                                                             | Properties/designated quantity                                                                                                                    |
|---------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Category I                            | Oxidizing solids                                                   | Chlorates<br>Perchlorates<br>Inorganic peroxides<br>Chlorites<br>Bromates<br>Nitrates<br>Iodates<br>Permanganates<br>Dichromates<br>Others specified by a Cabinet Order<br>Substances containing any of those listed in the preceding items                                                 | To be classified as follows by testing.<br>Class 1 oxidizing solids 50 kg<br>Class 2 oxidizing solids 300 kg<br>Class 3 oxidizing solids 1,000 kg |
| Category II                           | Combustible solids                                                 | Phosphorus sulfide                                                                                                                                                                                                                                                                          | 100 kg                                                                                                                                            |
|                                       |                                                                    | Red phosphorus                                                                                                                                                                                                                                                                              |                                                                                                                                                   |
|                                       |                                                                    | Sulfur                                                                                                                                                                                                                                                                                      | 500 kg                                                                                                                                            |
|                                       |                                                                    | Iron powder                                                                                                                                                                                                                                                                                 |                                                                                                                                                   |
| Category III                          | Spontaneously combustible substances and water-reactive substances | Metal powder<br>Magnesium<br>Others specified by a Cabinet Order<br>Substances containing any of those listed in the preceding items                                                                                                                                                        | To be classified as follows by testing.<br>Class 1 Combustible solids 100 kg<br>Class 2 Combustible solids 500 kg                                 |
|                                       |                                                                    | Flammable solids                                                                                                                                                                                                                                                                            | 1,000 kg                                                                                                                                          |
|                                       |                                                                    | Potassium<br>Sodium<br>Alkyl aluminums<br>Alkyl lithiums                                                                                                                                                                                                                                    | 10 kg                                                                                                                                             |
|                                       |                                                                    | Yellow phosphorus                                                                                                                                                                                                                                                                           | 20 kg                                                                                                                                             |
| Category IV                           | Flammable liquids                                                  | Special flammable materials                                                                                                                                                                                                                                                                 | 50 L                                                                                                                                              |
|                                       |                                                                    | Class I petroleum                                                                                                                                                                                                                                                                           | Water-insoluble liquids 200 L                                                                                                                     |
|                                       |                                                                    |                                                                                                                                                                                                                                                                                             | Water-soluble liquids 400 L                                                                                                                       |
|                                       |                                                                    | Alcohols                                                                                                                                                                                                                                                                                    | 400 L                                                                                                                                             |
|                                       |                                                                    | Class II petroleum                                                                                                                                                                                                                                                                          | Water-insoluble liquids 1,000 L                                                                                                                   |
|                                       |                                                                    |                                                                                                                                                                                                                                                                                             | Water-soluble liquids 2,000 L                                                                                                                     |
|                                       |                                                                    | Class III petroleum                                                                                                                                                                                                                                                                         | Water-insoluble liquids 2,000 L                                                                                                                   |
|                                       |                                                                    |                                                                                                                                                                                                                                                                                             | Water-soluble liquids 4,000 L                                                                                                                     |
| Class IV petroleum                    | 6,000 L                                                            |                                                                                                                                                                                                                                                                                             |                                                                                                                                                   |
| Oil extracted from animals and plants | 10,000 L                                                           |                                                                                                                                                                                                                                                                                             |                                                                                                                                                   |
| Category V                            | Self-reactive substances                                           | Organic peroxides<br>Nitrate esters<br>Nitro compounds<br>Nitroso compounds<br>Azo compounds<br>Diazo compounds<br>Hydrazine derivatives<br>Hydroxylamine<br>Hydroxylamine salts<br>Others specified by a Cabinet Order<br>Substances containing any of those listed in the preceding items | To be classified as follows by testing.<br>Class 1 self-reactive substances 10 kg<br>Class 2 self-reactive substances 100 kg                      |
| Category VI                           | Oxidizing liquids                                                  | Perchloric acid<br>Hydrogen peroxide<br>Nitric acid<br>Others specified by a Cabinet Order<br>Substances containing any of those listed in the preceding items                                                                                                                              | 300 kg                                                                                                                                            |

Table 10-2 Combination of Hazardous Substances Prohibited for Mixed Loading

|              | Category I | Category II | Category III | Category IV | Category V | Category VI |
|--------------|------------|-------------|--------------|-------------|------------|-------------|
| Category I   |            | x           | x            | x           | x          | ○           |
| Category II  | x          |             | x            | ○           | ○          | x           |
| Category III | x          | x           |              | ○           | x          | x           |
| Category IV  | x          | ○           | ○            |             | ○          | x           |
| Category V   | x          | ○           | x            | ○           |            | x           |
| Category VI  | ○          | x           | x            | x           | x          |             |

(○: Mixed loading allowed x: Mixed loading prohibited)

Reference: Attached Table 4 of the Regulations on Hazardous Materials Control

### Table 11 Classification of Collection and Storage of Experimental Waste Solutions

(Classification of collection and storage of organic waste chemicals)

| Classification of collection and storage | Code of KUCRS <sup>1</sup> | Details                                                                            |
|------------------------------------------|----------------------------|------------------------------------------------------------------------------------|
| Hazardous waste oil                      | WO-HO                      | Combustible waste solutions containing specified hazardous substances <sup>2</sup> |
| Waste oil (general)                      | WO-OO                      | Combustible waste solutions excluding hazardous waste oil and flammable waste oil  |
| Flammable waste oil                      | WO-IO                      | Combustible waste solutions with high flammability <sup>3</sup>                    |
| Hazardous dilute waste solutions         | WO-HAQ                     | Waste solutions containing specified hazardous substances                          |
| Dilute waste solutions (general)         | WO-OAQ                     | Waste solutions excluding hazardous dilute waste solutions                         |

(Notes)

Any classification does not include heavy metals.

\*1 Kyoto University Chemical Registration System

\*2 Organic compounds designated as specified hazardous substances by the law are as follows.

Trichloroethylene, tetrachloroethylene, dichloromethane, carbon tetrachloride, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, benzene, 1,3-dichloropropene, and 1,4-dioxane

\*3 Waste solution with flash point of 70°C or below

(Classification of collection and storage of organic waste chemicals and treatment criteria)

| Classification of collection           | Designated container                                                                   | Acceptance criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General heavy metallic waste solutions | 20-L polyethylene container designated by the Environmental Preservation Center (blue) | <ol style="list-style-type: none"> <li>1. Waste solutions not containing organic compounds interfering with disposal</li> <li>2. Solutions without extreme malodor</li> <li>3. Solutions not containing a substance with extreme bubbling</li> <li>4. Solutions not containing precipitates, suspended particles, or metallic mercury</li> <li>5. Solutions not containing beryllium, selenium, thallium, or osmium</li> <li>6. Solutions not containing dangerous/extremely poisonous substances (nickel carbonyl, alkyl aluminum, etc.)</li> <li>7. Solutions that have no risk of explosion or ignition</li> </ol> |
| Mercury waste solutions                | 20-L polyethylene container designated by the Environmental Preservation Center (gray) | Same as general heavy metallic waste solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cyanogen waste solutions               | 20-L polyethylene container designated by the Environmental Preservation Center (gray) | Same as general heavy metallic waste solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Fluorine waste solutions               | 20-L polyethylene container designated by the Environmental Preservation Center (gray) | Same as general heavy metallic waste solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Phosphoric acid waste solutions        | 20-L polyethylene container designated by the Environmental Preservation Center (gray) | Same as general heavy metallic waste solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

(Notes)

A solution corresponding to 2 or more categories of collection in the table must be treated in accordance with the relevant instructions.

**Table 12 Special material gases**

(Note) Special high-pressure gases are underlined.

|                   |                                               |                                                    |
|-------------------|-----------------------------------------------|----------------------------------------------------|
| Silicon series    | <u>Monosilane (SiH<sub>4</sub>)</u>           | Dichlorosilane (SiH <sub>2</sub> Cl <sub>2</sub> ) |
|                   | Trichlorosilane (SiHCl <sub>3</sub> )         | Silicon tetrachloride (SiCl <sub>4</sub> )         |
|                   | Silicon tetrafluoride (SiF <sub>4</sub> )     | <u>Disilane (Si<sub>2</sub>H<sub>6</sub>)</u>      |
| Arsenic series    | <u>Arsine (AsH<sub>3</sub>)</u>               | Arsenic trifluoride (AsF <sub>3</sub> )            |
|                   | Arsenic pentafluoride (AsF <sub>5</sub> )     | Arsenic trichloride (AsCl <sub>3</sub> )           |
|                   | Arsenic pentachloride (AsCl <sub>5</sub> )    |                                                    |
| Phosphorus series | <u>Phosphine (PH<sub>3</sub>)</u>             | Phosphorus trifluoride (PF <sub>3</sub> )          |
|                   | Phosphorus pentafluoride (PF <sub>5</sub> )   | Phosphorus trichloride (PCl <sub>3</sub> )         |
|                   | Phosphorus pentachloride (PCl <sub>5</sub> )  | Phosphorus oxychloride (POCl <sub>3</sub> )        |
| Boron series      | <u>Diborane (B<sub>2</sub>H<sub>6</sub>)</u>  | Boron trifluoride (BF <sub>3</sub> )               |
|                   | Boron trichloride (BCl <sub>3</sub> )         | Boron tribromide (BBr <sub>3</sub> )               |
| Metallic hydrides | <u>Hydrogen selenide (H<sub>2</sub>Se)</u>    | <u>Monogermane (GeH<sub>4</sub>)</u>               |
|                   | Hydrogen telluride (H <sub>2</sub> Te)        | Stibine (SbH <sub>3</sub> )                        |
|                   | Tin hydride (SnH <sub>4</sub> )               |                                                    |
| Halogen compounds | Nitrogen trifluoride (NF <sub>3</sub> )       | Sulfur tetrafluoride (SF <sub>4</sub> )            |
|                   | Tungsten hexafluoride (WF <sub>6</sub> )      | Molybdenum hexafluoride (MoF <sub>6</sub> )        |
|                   | Germanium tetrachloride (GeCl <sub>4</sub> )  | Tin tetrachloride (SnCl <sub>4</sub> )             |
|                   | Antimony pentachloride (SbCl <sub>5</sub> )   | Tungsten hexachloride (WCl <sub>6</sub> )          |
|                   | Molybdenum pentachloride (MoCl <sub>5</sub> ) | Hydrogen fluoride (HF)                             |
|                   | Fluorine (F <sub>2</sub> )                    |                                                    |
| Metal alkylates   | Trialkyl gallium (GaR <sub>3</sub> )          | Trialkyl indium (InR <sub>3</sub> )                |

\* R refers to methyl or ethyl group.

Mixtures of above gases

## Penal Provisions

When a violation was performed in the matters specified in the Industrial Safety and Health Act, the following penalties are applied.

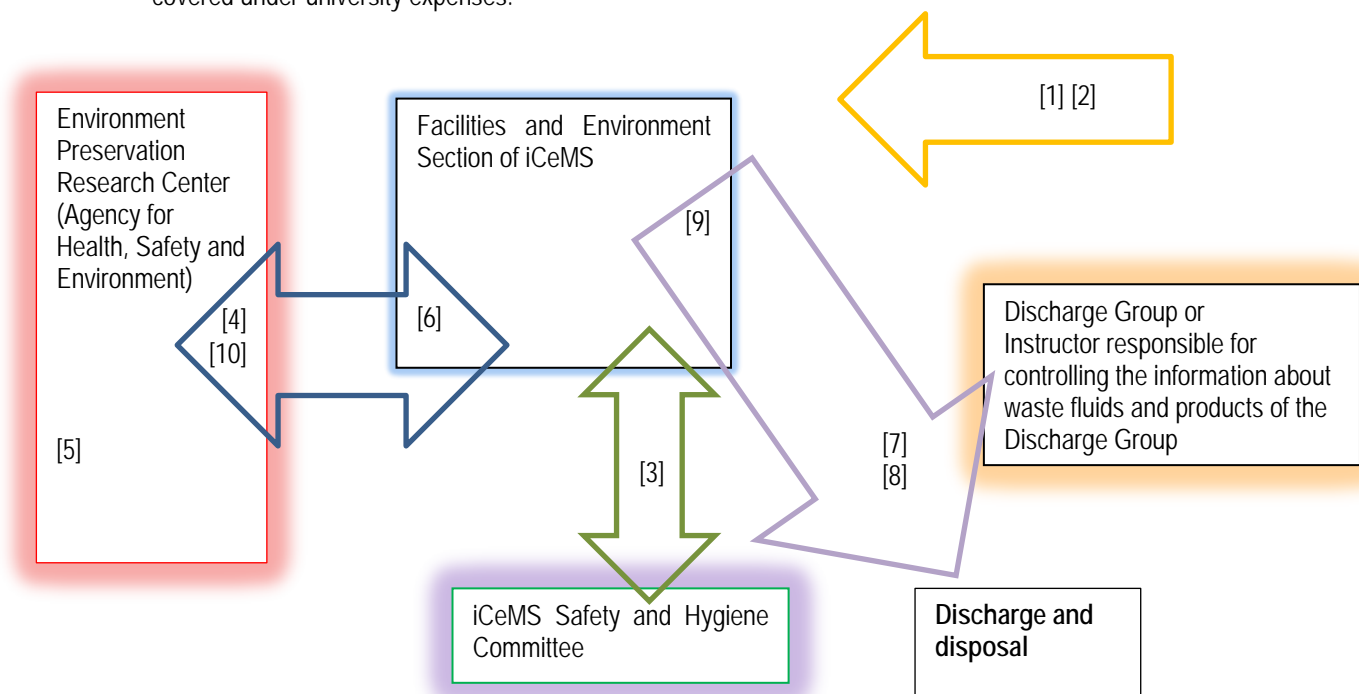
1. To be punished with a penal servitude not exceeding three years or with a fine not exceeding three million yen (Article 116, Industrial Safety and Health Act). When a person manufactured, imported, transferred, provided or used chemical substances which inflict serious health impairment.
2. To be punished with a penal servitude not exceeding one year or with a fine not exceeding one million yen (Article 117, Industrial Safety and Health Act).
  - (a) When a person was not permitted to manufacture machines, etc., did not take individual or registered type examination.
  - (b) When the person manufactured chemical substances without manufacturing permission.
  - (c) When an executive official or a member of the designated examination institution and a consultant for industrial safety and health disclosed confidential information which they have learned in the course of the implementation of the examination affairs.
  - (d) When the person conducted an operation while an agency of performance test for specified machines, etc. was suspended.
3. To be punished with a penal servitude not exceeding six months, or with a fine not exceeding 500,000 yen (Article 119, Industrial Safety and Health Act).
  - (a) When the employer did not perform the matters specified for prevention of hazard and health impairment.
  - (b) When the employer did not take inspection of specific machine at manufacturing or used machines, etc. that were not certified in individual or registered type examination.
  - (c) When the employer did not manufacture chemical substances that were required by manufacturing permission in accordance with the specified conditions.
  - (d) When the employer did not perform special training.
  - (e) When the employer did not conduct measurement of work environment.
  - (f) When the employer made a person with infectious disease work.
  - (g) When the employer discriminate against the worker who reported the fact of violation to the Chief of the Labor Standards Office.
  - (h) When the employer violated the order to recall machines such as structural regulations failure.
4. To be punished with a fine not exceeding one 500,000 yen (Article 120, Industrial Safety and Health Act).
  - (a) When the employer did not appoint a general safety and health manager.
  - (b) When the employer displayed false indications in machines, etc. that were not certified in individual or model examination.
  - (c) When the employer did not conduct safety and health education when a new worker is employed,.
  - (d) When the employer did not conduct regular and special health checkup.
  - (e) When the employer refused on-site inspection of the labor standards inspector and the expert officers in industrial safety and health, did not answer to their questions, or made false statement.
  - (f) When the employer refused to inform the chief of relevant labor standards supervision office, or did not report to the chief although the order.
  - (g) When the employer did not set and keep the records that are mandatory.
5. Punishment to both the juridical person and the perpetrator (Article 122, Industrial Safety and Health Act).

Where a violation stated in the above Paragraph 1 to 4 was committed, the punishment of a fine shall be imposed on the juridical person or said person in addition to the perpetrator.



## Reference 2 Flow Chart for Disposing of Unnecessary Chemicals

- [1] Register chemicals as unnecessary agents in the KUCRS. Mark with the KUCRS number of the chemicals to be disposed using a yellow label.
- [2] Submit the class, amount of wastes and waste liquids, and the name of the instructor responsible for controlling the waste information with the specific form.
- [3] The manager of special control industrial wastes in the iCeMS submits the contents and method of disposal to the iCeMS Safety and Hygiene Committee after confirming the license of a disposal subcontractor.
- [4] Report the review results of the iCeMS Safety and Hygiene Committee to the Kyoto University Environment Preservation Research Center.
- [5] Submit the Environment Preservation Research Center's report to the Agency for Health, Safety and Environment.
- [6] After confirmation of the documents, the permission for disposal outsourcing is notified to the director of iCeMS by the director of the Environment Preservation Research Center.
- [7] Carry out unnecessary chemicals for disposal outsourcing. Turn over wastes to the disposal subcontractor in the presence of the personnel of the Facilities and Environment Section of iCeMS, the manager of specific control industrial wastes, and the instructor responsible for controlling the information about waste fluids and products.
- [8] Release unnecessary chemicals in the KUCRS.
- [9] The invoice and manifest are sent after the completion of treatment (Treatment sometimes takes a long time). Deliver invoice to the discharge group.
- [10] Submit the report of treatment completion in the name of the director of iCeMS from the Facilities and Environment Section of iCeMS to the director of the Environment Preservation Research Center.
- [11] If procedures [1] to [10] are not completed by the end of the same fiscal year, the disposal fee cannot be covered under university expenses.



## Reference 3

### Precautions for Disposal of Unnecessary Chemicals

#### (1) Substances prohibited to be carried out

Radioisotopes cannot be discarded in accordance with this procedure. Please confirm that the radioisotopes are not included in the list of unnecessary chemicals or the group of the unnecessary chemicals to be carried out. Beryllium (Be), thallium (Tl) and osmium (Os) cannot be carried out. Store them in the site of Kyoto University.

(2) The approval of the Environment Preservation Research Center is required. It takes a long time.

#### (3) Registration of unnecessary chemicals

Register a chemical substance that is not to be used as unnecessary chemicals in the KUCRS. Use a yellow label for registration to easily distinguish it from other chemicals those have not been registered as unnecessary chemicals.

#### (4) Storage of unnecessary chemicals

- Poisonous/deleterious substances must be stored in a locked cabinet despite being unnecessary chemicals. Measures for such as preventing falls are necessary for hazardous substances. Build the effective check system by utilizing routine inspections by the health supervisor (weekly inspection is obligated by law).
- Store unnecessary chemicals in a container separately from other chemicals those have not been registered as unnecessary chemicals.
- Take preventive measures to prevent falls.
- Always store poisonous/deleterious substances in a locked cabinet.
- Pay special attention to hazardous substances for which mixed loading are prohibited by the Regulations on Hazardous Materials Control.

Table: Criteria for mixed loading in transferring hazardous substances

|              | Category I | Category II | Category III | Category IV | Category V | Category VI |
|--------------|------------|-------------|--------------|-------------|------------|-------------|
| Category I   |            | ×           | ×            | ×           | ×          | ○           |
| Category II  | ×          |             | ×            | ○           | ○          | ×           |
| Category III | ×          | ×           |              | ○           | ×          | ×           |
| Category IV  | ×          | ○           | ○            |             | ○          | ×           |
| Category V   | ×          | ○           | ×            | ○           |            | ×           |
| Category VI  | ○          | ×           | ×            | ×           | ×          |             |

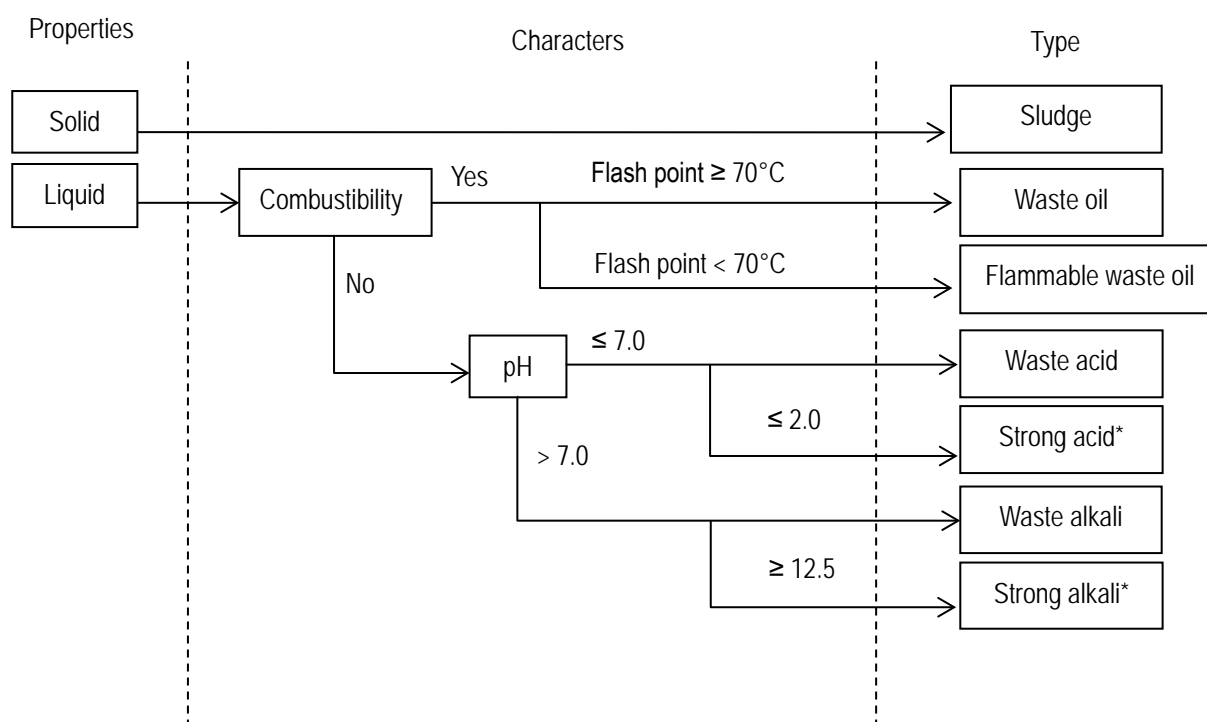
○ : Mixed loading allowed × : Mixed loading prohibited

#### (5) Consideration of disposal procedures

- Consider whether disposal in the university (inorganic waste fluid disposal; KMS) is available.
- Examples of chemicals liable to be misclassified are as follows:
  - Arsenic compounds
    - Sodium cacodylate
    - Sodium dimethylarsinate
    - Nelson reagent (arsenic molybdate)
  - Mercury-containing substance
    - Sodium merthiolate = Merthiolate = Thimerosal formulation = Thimerosal = Thimerosal  
→Thimerosal  $C_9H_9HgNaO_2S$  including mercury (merthiolate is  $CH_3S$  and does not contain.)
    - Vermilion= mercury sulfide
    - Nessler reagent = Nessler reagent → containing approx. 2.5% of mercury (II) chloride (specially disposed alkali hazard (mercury))
  - Chromium
    - Eriochrome Black T → A chelator not containing chromium. Disposal as sludge is allowed.

### Reference 3

#### (6) Classification chart of unnecessary chemicals



\* Specially controlled industrial waste

Note) In all cases, if the content of the following hazardous substances exceeds the reference value, substances are categorized as specified hazardous wastes (specially controlled industrial wastes).  
 Mercury, cadmium, lead, organic phosphorus compound, chromic trioxide, arsenic, cyanogen, PCB, trichloroethylene, tetrachloroethylene, dichloromethane, carbon tetrachloride, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,3-dichloropropene, thiram, simazine, thiobencarb, benzene, selenium, dioxins, 1,4-dioxane

| Reference Value (unit: mg/L)  |                          |
|-------------------------------|--------------------------|
| Types of hazardous substances | Waste oil [Content test] |
| Trichloroethylene             | 3                        |
| Tetrachloroethylene           | 1                        |
| Dichloromethane               | 2                        |
| Carbon tetrachloride          | 0.2                      |
| 1,2-Dichloroethane            | 0.4                      |
| 1,1-Dichloroethylene          | 2                        |
| cis-1,2-Dichloroethylene      | 4                        |
| 1,1,1-Trichloroethylene       | 30                       |
| 1,1,2-Trichloroethane         | 0.6                      |
| 1,3-Dichloropropene           | 0.2                      |
| Benzene                       | 1                        |
| 1,4-Dioxane                   | 0.5                      |

## Confirmation of Safety and Health Education and Training

Date of education & training (year/month/day): \_\_\_\_\_

**[Person in charge of this education and training must answer the following questions.]**

- (1) Did you explain the "iCeMS Safety and Health Guidelines" to the member?  
( Yes No )
- (2) When you instruct the member to use hazardous chemicals (including organic solvents, specified chemical substances, hazardous substances and poisonous/deleterious substances), did you explain the details to the member?  
( Yes No N/A )
- (3) When you instruct the member to use pipe line gases, high pressure gases, liquid nitrogen, and special material gases, did you explain the details to the member?  
( Yes No N/A )
- (4) When you instruct the member to use electromagnetic waves (including X ray, radiation and laser), did you explain the details to the member?  
( Yes No N/A )
- (5) Did you explain the actions in the case of an emergency including fire and accident?  
( Yes No )

**I have provided the education and training as above stated.**

Affiliation: \_\_\_\_\_ Name: \_\_\_\_\_  
Signature: \_\_\_\_\_

**[Member who received this education and training must answer the following questions.]**

- (1) Did you receive an explanation about the "iCeMS Safety and Health Guidelines" by the person in charge of safety education and training?  
( Yes No )
- (2) In the case of using hazardous chemicals (including organic solvents, specified chemical substances, hazardous substances and poisonous/deleterious substances), did you receive an instruction about the above substances?  
( Yes No N/A )
- (3) In the case of using pipe line gases, high pressure gases, liquid nitrogen, and special material gases, did you receive an instruction about the above substances?  
( Yes No N/A )
- (4) In the case of using electromagnetic waves (including X ray, radiation and laser), did you receive an instruction about the above substances?  
( Yes No N/A )
- (5) Did you receive an explanation about the actions in emergency including fire and accident?  
( Yes No )
- (6) Do you comply with the "iCeMS Safety and Health Guidelines"?  
( Yes No )

**I have received the education and training as above stated.**

Affiliation: \_\_\_\_\_ Name: \_\_\_\_\_  
Signature: \_\_\_\_\_

**[Decision of the Director]**

I confirmed that the person in charge of safety education and training fully explained the safety and health control and the participant in safety and health education and training understood it.

Institute for Integrated Cell-Material Sciences

Director: Susumu KITAGAWA

Signature: \_\_\_\_\_

Date (year/month/day): \_\_\_\_\_

## 自主検査チェック表

### Facilities Inspection Check List

|                         |                                                                                                                                                                                         |                         |                           |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------|
| 検査区域<br>(Location)      | <input type="checkbox"/> 本館(Main bldg.) <input type="checkbox"/> 研究棟(Research bldg.)<br><input type="checkbox"/> 1号館(Research bldg. No.1) <input type="checkbox"/> 1号館別館(RB No.1 ANNEX) | 部屋番号<br>(Room No.)      |                           |
| 検査実施者氏名 1 (Inspector 1) | 実施日<br>(Date)                                                                                                                                                                           | 検査実施者氏名 2 (Inspector 2) | 実施日<br>(Date)             |
|                         |                                                                                                                                                                                         |                         | 防火管理者確認<br>(Fire marshal) |

(↑施設記入)

| 実施項目及び確認箇所 (Areas and facilities to be inspected)                                   |                                                                                                                                                                                                                                                                | 検査結果<br>(Results)                                                                                                                                                                                                   |  |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 記入例(Example) ○:良(Approved) ×:不備・欠落(Problems found) ※:検査時不備・即時対応済(Fixed on the spot) |                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                     |  |
| 建物構造<br>(Buildings)                                                                 | (1) 柱・はり・壁・床 (Pillars, beams, walls and floors)<br>コンクリートに欠損・ひび割れ・脱落・風化等はないか。(Any concrete damage? Loss, cracks, etc.?)                                                                                                                                        |                                                                                                                                                                                                                     |  |
|                                                                                     | (2) 天井 (Ceilings)<br>仕上材に、はく落・落下のおそれのあるたるみ・ひび割れ等がないか。(Any ceiling damage? Sags or cracks?)                                                                                                                                                                     |                                                                                                                                                                                                                     |  |
|                                                                                     | (3) 窓枠・サッシ・ガラス (Window frames, sashes and panes)<br>窓枠・サッシ等には、ガラス等の落下、又は枠自体のはずれのおそれのある腐食、ゆるみ、著しい変形等がないか。(Any window damage? Deformation, corrosion, etc.?)                                                                                                     |                                                                                                                                                                                                                     |  |
|                                                                                     | (4) 外壁・ひさし・パラペット (Building exteriors)<br>貼石・タイル・モルタル等の仕上材に、はく落・落下のおそれのあるひび割れ・浮き上がり等が生じていないか。(Any exterior damage? Peeling, cracking, bulging, etc.?)                                                                                                           |                                                                                                                                                                                                                     |  |
| 避難施設<br>(Evacuation Facilities)                                                     | (1) 避難通路 (Evacuation routes)<br>① 避難通路の幅員が確保されているか。(Are routes sufficiently wide?)<br>② 避難上支障となる物品等を置いていないか。(Are corridors unobstructed?)                                                                                                                      |                                                                                                                                                                                                                     |  |
|                                                                                     | (2) 階段 (Stairways)<br>階段室に物品が置かれていないか。(Are stairways unobstructed?)                                                                                                                                                                                            |                                                                                                                                                                                                                     |  |
|                                                                                     | (3) 避難階の避難口(出入口) (Emergency exits)<br>① 扉の開放方向は避難上支障ないか。(Are fire exits in good operating condition?)<br>② 避難階段等に通じる出入口の幅は適切か。(Are exits sufficiently wide?)<br>③ 避難階段等に通じる出入口・屋外への出入口の付近に物品その他の障害物はないか。(Are exits to stairs and to the outside unobstructed?) |                                                                                                                                                                                                                     |  |
|                                                                                     | 化学物質取扱器具<br>(Chemical Handling Equipment)                                                                                                                                                                                                                      | 化学物質取扱器具 (Chemical handling equipment)<br>① 化学物質等取扱場所近辺が整理整頓されているか。(Are places for handling chemicals tidy and orderly?)                                                                                            |  |
|                                                                                     |                                                                                                                                                                                                                                                                | ② 不用な化学物質等を廃棄処理し、保管量を必要最小量に抑えているか。(Are chemical and waste containers in good condition and kept closed except during use?)                                                                                          |  |
|                                                                                     |                                                                                                                                                                                                                                                                | ③ 容器の落下・転倒防止措置されているか。(Tipping and falling prevention measures?)                                                                                                                                                     |  |
| ④ 混合危険薬品は分離保管されているか。(Are mixing hazards safely separated?)                          |                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                     |  |
| 電気設備<br>(Electrical Equipment)                                                      | 電気器具 (Electrical appliances)<br>① コードの亀裂、老化、損傷はないか。(Any cord damage? Cracking or fraying?)<br>② タコ足の接続を行っていないか。(Any unsafe use of multi-plug jacks?)<br>③ 許容電流の範囲内で電気器具を適正に使用しているか。(Are electrical appliances provided with sufficient current?)               |                                                                                                                                                                                                                     |  |
|                                                                                     | その他<br>(Other)                                                                                                                                                                                                                                                 | 危険物 (Hazardous materials)<br>① 容器の転倒、落下防止措置はあるか。(Tipping and falling prevention measures in place?)<br>② 危険物の漏れ、あふれ、飛散はないか。(Any chance of leakage or overflow?)<br>③ 整理清掃状況は適正か。(Overall cleanliness and tidiness?) |  |

不備、欠損がある場合には、直ちに防火管理者に報告すること。 Please report any problems to the fire marshal.

## 消防用設備等自主点検チェック表

### Fire-Extinguishing Equipment Check List

|                         |                                                                                                                                                                                         |                         |                           |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------|
| 検査区域<br>(Location)      | <input type="checkbox"/> 本館(Main bldg.) <input type="checkbox"/> 研究棟(Research bldg.)<br><input type="checkbox"/> 1号館(Research bldg. No.1) <input type="checkbox"/> 1号館別館(RB No.1 ANNEX) | 部屋番号<br>(Room No.)      |                           |
| 検査実施者氏名 1 (Inspector 1) | 実施日(Date)                                                                                                                                                                               | 検査実施者氏名 2 (Inspector 2) | 実施日(Date)                 |
|                         |                                                                                                                                                                                         |                         |                           |
|                         |                                                                                                                                                                                         |                         | 防火管理者確認<br>(Fire marshal) |

(↑施設記入)

| <b>確認箇所 (Points to inspect)</b>                                                     |                                                                                                           | 点検結果<br>(Results) |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------|
| 記入例(Example) ○:良(Approved) ×:不備・欠陥(Problems found) ⓧ:点検時不備・即時対応済(Fixed on the spot) |                                                                                                           |                   |
| 消火器<br>(Fire Extinguishers)                                                         | (1)設置場所に置いてあるか。(Are the extinguishers in appropriate places?)                                             |                   |
|                                                                                     | (2)消火薬剤の漏れ、変形、損傷、腐食等がないか。<br>(Extinguishers in working order?)                                            |                   |
|                                                                                     | (3)安全栓が外れていないか。安全栓の封が脱落していないか。<br>(Safety valves working?)                                                |                   |
|                                                                                     | (4)ホースに変形、損傷、老化等がなく、内部に詰まりがないか。(Any hose damage?)                                                         |                   |
|                                                                                     | (5)圧力計が指示範囲内にあるか。(Pressure gauges reading normally?)                                                      |                   |
| 屋内消火栓設備<br>(Indoor<br>Fire-Extinguishing<br>Equipment)                              | (1)使用上の障害となる物品はないか。(Equipment unobstructed?)                                                              |                   |
|                                                                                     | (2)消火栓扉は確実に開閉できるか。(Hydrant doors fully accessible?)                                                       |                   |
|                                                                                     | (3)ホース、ノズルが接続され、変形、損傷はないか。(Any fire hose damage?)                                                         |                   |
|                                                                                     | (4)表示灯は点灯しているか。(Status lamps properly lit?)                                                               |                   |
| 自動火災報知設備<br>(Automatic Fire<br>Alarms)                                              | (1)表示灯は点灯しているか。(Status lamps properly lit?)                                                               |                   |
|                                                                                     | (2)受信機のスイッチは、ベル停止となっていないか。(Alarms not switched off?)                                                      |                   |
|                                                                                     | (3)用途変更、間仕切り変更による未警戒部分がないか。<br>(Any areas lacking coverage due to changes in use patterns or layouts?)    |                   |
|                                                                                     | (4)感知器の破損、変形、脱落はないか。(Any alarms damaged?)                                                                 |                   |
| 誘導灯<br>(Emergency Lighting)                                                         | (1)改装等により、設置位置が不適正になっていないか。<br>(Are lights in the appropriate places?)                                    |                   |
|                                                                                     | (2)誘導灯の周囲には、間仕切り、衝立、ロッカー等があつて、視認障害となっていないか。(Are all lights properly visible and unobstructed?)            |                   |
|                                                                                     | (3)外箱及び表示面は、変形、損傷、脱落、汚損等がなく、かつ適正な取り付け状態であるか。(Are all lights in good condition and in good working order?) |                   |
|                                                                                     | (4)不点灯、ちらつき等がないか。<br>(Are all lights lighting properly, without flickering?)                              |                   |
| 備考 (Remarks)                                                                        |                                                                                                           |                   |

不備、欠陥がある場合には、直ちに防火管理者に報告すること。  
Please report any problems to the fire marshal.

## 遠心機 定期自主検査票 Centrifuge Periodical Voluntary Inspection

(保存3年) Preservation 3yrs

|                            |  |
|----------------------------|--|
| 部局名 Department             |  |
| 研究室・設置場所 Location in lab   |  |
| 機器型式・製造番号 Model/Serial No. |  |
| 検査年月日 Date                 |  |
| 検査実施者氏名 Inspector          |  |

## 1. 検査前確認事項 Pre-check list ○異常なし Satisfactory ×要改善(修理) Problems found

| 確認事項<br>Inspection Aspects | 評価方法・判定基準<br>Evaluation basis                                                                              | 判定<br>Results | 備考<br>Remarks | 改善(補修)記録<br>Repaired |
|----------------------------|------------------------------------------------------------------------------------------------------------|---------------|---------------|----------------------|
| 附属書類<br>Documents          | 管理に必要な取扱説明書等が保管されていること。Operation manual is present.                                                        |               |               |                      |
| 設置条件<br>Location           | 作業スペースが確保されていること。Sufficient space is available.                                                            |               |               |                      |
| 電源接続<br>Connection         | 電源コンセントが正しく接続され、周辺が清掃されていること。Power supply correctly connected and surroundings are clean.                  |               |               |                      |
| 使用状況記録<br>Records          | 回転体の最高回転速度、許容回転速度以上で使用していないこと。Rotors not used at speeds exceeding their maximum allowable rotating speeds. |               |               |                      |

## 2. 回転体 Rotors ○異常なし Satisfactory ×要改善(修理) Problems found

| ロータ検査項目<br>Rotor Inspection                                   | 判定<br>Result | 備考<br>Remarks | 補修記録(修理日)<br>Date repaired |
|---------------------------------------------------------------|--------------|---------------|----------------------------|
| 傷、変形、腐食<br>Damage, deformations or corrosion                  |              |               |                            |
| バランス修正鉛の飛び出し<br>Protrusion of the balance lead                |              |               |                            |
| 蓋ツマミねじの消耗<br>Wearing of the thumbscrew lid                    |              |               |                            |
| 駆動ピンの変形<br>Deformation of the drive pin                       |              |               |                            |
| ロータパッキンの変形、劣化<br>Deformation and wearing of the rotor packing |              |               |                            |
| バケットピン取付不良<br>Poor attachment of the bucket pin               |              |               |                            |
| バケット検査項目<br>Bucket Inspection                                 | 判定<br>Result | 備考<br>Remarks | 補修記録(修理日)<br>Date repaired |
| 底部辺の亀裂、腐食<br>Cracks or corrosion of the bottom                |              |               |                            |
| 引っ掛け部の亀裂、腐食<br>Cracks or corrosion of the hook                |              |               |                            |
| 変形<br>Deformations                                            |              |               |                            |
| バケットピン取付不良<br>Poor attachment of the bucket pin               |              |               |                            |
| シーリングパッキン変形、劣化<br>Seal degradation                            |              |               |                            |
| スイング不良<br>Swing degradation                                   |              |               |                            |
| グリス不足<br>Grease shortage                                      |              |               |                            |
| ラック検査項目<br>Rack Inspection                                    | 判定<br>Result | 備考<br>Remarks | 補修記録(修理日)<br>Date repaired |
| 傷、変形、腐食<br>Damage, modification or corrosion                  |              |               |                            |
| 引っ掛け部の亀裂、腐食<br>Crack or corrosion of the hook                 |              |               |                            |

## 3. 遠心機本体 Centrifuge body ○異常なし Satisfactory ×要改善(修理) Problems found

| 検査項目<br>Inspection                              | 評価方法・判定基準<br>Evaluation basis                                                                             | 判定<br>Result | 備考<br>Remarks | 補修記録(修理日)<br>Date repaired |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------|---------------|----------------------------|
| 主軸 Main shafts<br>シャフト/シャフトカラー<br>Shaft color   | 目視にて、曲がりや損傷のないこと。<br>駆動ピン折れ、グリス不足のないこと。 No visible bends, damage, broken drive pin, or shortage of grease |              |               |                            |
| 回転音、振動<br>Noise, vibrations                     | 運転時、異音や異常振動がないこと。 No abnormal sounds or vibrations                                                        |              |               |                            |
| ブレーキ機能<br>Brake                                 | 自然減速と比較して、ブレーキ機能が作用していること。 Brake works properly compared to natural deceleration.                         |              |               |                            |
| 本体外装<br>Outer frame                             | 各取付部に緩みやガタツキのないこと。 No looseness or shaking                                                                |              |               |                            |
| パッキン、カバー類<br>Sealing, cover                     | 傷や亀裂、劣化や硬化のないこと。 No cracks, deformations or stiffening                                                    |              |               |                            |
| 吸気口、熱交換部<br>Aspiration port, heat exchange part | 目視にて、ホコリの付着がないこと。 No visible dust                                                                         |              |               |                            |
| 蓋インターロック機能<br>Lid interlock                     | 蓋が開時に回転せず、回転時には蓋が開かないこと。 Interlock function works properly                                                |              |               |                            |

労働安全衛生規則第141条による。

小型圧力容器 定期自主検査票 Small-sized pressure vessel Periodical Voluntary Inspection  
(保存3年) Preservation 3yrs

|                               |  |
|-------------------------------|--|
| 部局名 Department                |  |
| 研究室・設置場所<br>Location in lab   |  |
| 機器型式・製造番号<br>Model/Serial No. |  |
| 検査年月日 Date                    |  |
| 検査実施者氏名 Inspector             |  |

1. 検査前確認事項 Pre-check list ○異常なし Satisfactory ×要改善(修理) Problems found

| Inspection Aspects           | 評価方法・判定基準<br>Evaluation basis                                                              | 判定<br>Results | 備考<br>Note | 改善(補修)記録<br>Repaired |
|------------------------------|--------------------------------------------------------------------------------------------|---------------|------------|----------------------|
| 附属書類 Documents               | 管理に必要な取扱説明書等が保管されていること。Operation manual is present.                                        |               |            |                      |
| 設置条件 Location                | 作業スペースが確保されていること。Sufficient space is available.                                            |               |            |                      |
| 電源接続 Connection              | 電源コンセントが正しく接続され、周辺が清掃されていること。Power supply correctly connected and surroundings are clean   |               |            |                      |
| 漏電ブレーカ Short circuit breaker | 漏電テストボタンを押した時、電源が遮断されること。Power is shut down when the short circuit test button is pressed. |               |            |                      |

2. 検査項目 Checklist ○異常なし Satisfactory ×要改善(修理) Problems found

| 検査項目<br>Inspection              | 評価方法・判定基準<br>Evaluation basis                                                                                                                                                         | 判定<br>Result | 備考<br>Remarks | 補修記録(修理日)<br>Date repaired |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------|----------------------------|
| 缶体<br>Vessel body               | 目視にて、缶体内壁及び缶体口に傷、凹み、亀裂や腐食のないこと。No existence of damage, cracking or corrosion of the inner wall of the vessel and at its aperture. 缶体口については、汚れのないこと。The vessel aperture is kept clean. |              |               |                            |
| フタ Lid                          | 目視にて、傷や凹み亀裂のないこと。No visible damage or cracks                                                                                                                                          |              |               |                            |
| アーム Arm                         | 目視にて、傷や亀裂や腐食のないこと。No visible damage, cracks or corrosion                                                                                                                              |              |               |                            |
| アームガイド ※1<br>Arm guide          | 目視にて、傷や亀裂や腐食のないこと。No visible damage, cracks or corrosion                                                                                                                              |              |               |                            |
| フタパッキン lid seal                 | 目視にて、傷や亀裂のないこと。No visible damage or cracks                                                                                                                                            |              |               |                            |
| アームシャフト ※1<br>Arm shaft         | 目視にて、傷や亀裂や腐食のないこと。No visible damage, cracks or corrosion                                                                                                                              |              |               |                            |
| フタロック機構 ※1<br>Locking lid       | 目視にて、腐食や損傷のないこと。フタ閉操作にて確実にフタがロックされること。No visible corrosion or damage. Locked tightly<br>ロック位置確認板に緩みがなく、ロック作動状態を正常に示すこと。<br>Locked tightly + sustains normal position                  |              |               |                            |
| アーム支柱締付ボルト<br>※1 Locking bolts  | 手で回してみても緩みがないこと。Locked tightly                                                                                                                                                        |              |               |                            |
| 内フタ締付ナット ※1<br>nut of inner lid | 手で回してみても緩みがないこと。Locked tightly                                                                                                                                                        |              |               |                            |
| 配管 Tubes                        | 目視にて、傷や亀裂や腐食のないこと。No visible damage, cracks or corrosion                                                                                                                              |              |               |                            |
| 安全弁 Valves                      | 目視にて、腐食や損傷のないこと。No corrosion or damage                                                                                                                                                |              |               |                            |

労働安全衛生規則第94条による。

※1 該当構造、機構を有する機体のみ実施する。インターロック機構のあるものはその作動も確認する。



局所排気装置(ドラフトチャンバー) 定期自主検査票

| 部局名              | 棟名・階                                                                                                                                     |                                                    | 実験室名                                                                                                                     | 平成 年 月 日                                                       |       |  |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------|--|
|                  | メーカー                                                                                                                                     | 型式番号                                               |                                                                                                                          | スクラバ                                                           | 点検者   |  |
| 対象物質             |                                                                                                                                          |                                                    | 有・無                                                                                                                      | 乾・湿                                                            |       |  |
| 区分               | 点検内容                                                                                                                                     | 点検方法                                               | 判定基準                                                                                                                     | 判定結果                                                           | 改善措置等 |  |
| ド<br>ラ<br>フ<br>ト | 1. 吸い込み流速の良否<br>・サッシ開口高さは下限ストッパーの位置とする。<br>・両端部と中央部の3箇所以上でスモークテストを行う。<br>・発煙位置はサッシ直下とする。<br>・発煙した白煙の流れた距離を時間で割って流速を求める。<br>・または風速計で測定する。 | スモークサー<br>または<br>風速計                               | ・吸い込み流速 V (m/sec)<br>・白煙の流れた距離 L (m)<br>・時間 t (sec)<br>・計算式 $V (m/sec) = L (m) / t (sec)$<br>・有機溶剤0.4m/sec、特化物0.5m/sec以上 |                                                                |       |  |
|                  | 2. 外觀の良否                                                                                                                                 | 目視                                                 | ・吸気の機能を低下させるような摩耗、腐食、くぼみその他損傷がないこと。<br>・腐食の原因となるような塗装等の損傷がないこと。                                                          |                                                                |       |  |
|                  | 3. 作業面の良否                                                                                                                                | 目視                                                 | ・不要な薬品装置等がないこと。                                                                                                          |                                                                |       |  |
|                  | 4. 開口面付近の障害物の有無                                                                                                                          | 目視                                                 | ・障害物がないこと。                                                                                                               |                                                                |       |  |
|                  | 5. サッシ作動の良否                                                                                                                              | 作動                                                 | ・軽い力で作動すること。                                                                                                             |                                                                |       |  |
|                  | 6. サッシストッパーの良否                                                                                                                           | 目視                                                 | ・破損等がないこと。                                                                                                               |                                                                |       |  |
|                  | 7. コンセント等の良否                                                                                                                             | 目視                                                 | ・腐食・損傷等がないこと。                                                                                                            |                                                                |       |  |
|                  | 8. 運転表示の良否                                                                                                                               | 目視                                                 | ・表示ランプが点灯すること。                                                                                                           |                                                                |       |  |
|                  | 搭載型<br>スクラバー                                                                                                                             | 9. 湿式スクラバーの良否<br>循環タンク<br>洗浄タンク<br>シャワー噴霧<br>配管系統  | 目視                                                                                                                       | ・水位が正常であり、洗浄液が汚れていないこと。<br>・正常に噴霧していること。<br>・水漏れの原因となる損傷がないこと。 |       |  |
|                  |                                                                                                                                          | 10. 乾式スクラバーの良否<br>フィルター                            | 目視                                                                                                                       | ・目詰まり等がないこと。<br>・差圧が正常であること。(差圧計がある場合)                         |       |  |
|                  | ダクト                                                                                                                                      | 11. (目視可能な場合)摩耗、腐食、くぼみ、接続部の外れ、ゆるみの良否               | 目視                                                                                                                       | ・摩耗、腐食、くぼみ、外れ、ゆるみがないこと。                                        |       |  |
|                  | ファン                                                                                                                                      | 12. ファンベルト作動状態の良否                                  | 目視<br>聴音                                                                                                                 | ・極端な摩耗、切れがないこと。<br>・作動時に異音がないこと。                               |       |  |
|                  | 別置型<br>スクラバー                                                                                                                             | 13. 湿式スクラバーの良否<br>循環タンク<br>洗浄タンク<br>シャワー噴霧<br>配管系統 | 目視                                                                                                                       | ・水位が正常であり、洗浄液が汚れていないこと。<br>・正常に噴霧していること。<br>・水漏れの原因となる損傷がないこと。 |       |  |
|                  |                                                                                                                                          | 14. 乾式スクラバーの良否<br>フィルター                            | 目視                                                                                                                       | ・目詰まり等がないこと。<br>・差圧が正常であること。(差圧計がある場合)                         |       |  |

判定結果欄の記入方法 ○:良好 △:その場で改善済み ✖:改善を要する -:該当無し

**Draft chamber Periodical Voluntary Inspection**

| Department            | Bldg., floor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Lab                                                        | Date                                                                                                                                                                                                                                                                                                                                                             | (y/m/d)                                                                                                                                                                       |  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Manufacture           | Model No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Scrubber                                                   | Present/ Not Present                                                                                                                                                                                                                                                                                                                                             | Dry- Wet                                                                                                                                                                      |  |
| Object                | Inspection Aspects                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Inspection Method                                          | Evaluation Basis                                                                                                                                                                                                                                                                                                                                                 | Result                                                                                                                                                                        |  |
| Classification        | Inspection Aspects                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Inspection Method                                          | Evaluation Basis                                                                                                                                                                                                                                                                                                                                                 | Result                                                                                                                                                                        |  |
| D<br>r<br>a<br>f<br>t | 1. Suction flow velocity<br><ul style="list-style-type: none"> <li>• Set the sash height to the position of the lower stopper.</li> <li>• Perform the smoke test at 3 or more positions, including both ends and the center.</li> <li>• Perform smoke emission from directly under the sash.</li> <li>• Calculate the flow velocity as the distance flowed by the emitted white smoke divided by time.</li> <li>• Alternatively, the measurement may be performed with an anemometer.</li> </ul> | Smoke tester or Anemometer                                 | <ul style="list-style-type: none"> <li>• Suction flow velocity <math>V</math> (m/sec)</li> <li>• Distance flowed by smoke <math>L</math> (m)</li> <li>• Time <math>t</math> (sec)</li> <li>• <math>V</math> (m/sec) = <math>L</math> (m) / <math>t</math> (sec)</li> <li>• Organic solvent 0.4m/sec</li> <li>• Specified chemical substances 0.5m/sec</li> </ul> |                                                                                                                                                                               |  |
|                       | 2. Appearance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Visual check                                               | <ul style="list-style-type: none"> <li>• No wear, corrosion, dents or other damage that would lead to decreased suction.</li> <li>• No damage to painted surfaces at which corrosion could occur.</li> </ul>                                                                                                                                                     |                                                                                                                                                                               |  |
|                       | 3. Work area condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Visual check                                               | <ul style="list-style-type: none"> <li>• No unnecessary chemicals or equipment.</li> </ul>                                                                                                                                                                                                                                                                       |                                                                                                                                                                               |  |
|                       | 4. Obstructions near the aperture                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Visual check                                               | <ul style="list-style-type: none"> <li>• No obstructions</li> </ul>                                                                                                                                                                                                                                                                                              |                                                                                                                                                                               |  |
|                       | 5. Sash condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Operation                                                  | <ul style="list-style-type: none"> <li>• Can be operated with a light force</li> </ul>                                                                                                                                                                                                                                                                           |                                                                                                                                                                               |  |
|                       | 6. Sash stopper condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Visual check                                               | <ul style="list-style-type: none"> <li>• No damage</li> </ul>                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                               |  |
|                       | 7. Power outletcondition                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Visual check                                               | <ul style="list-style-type: none"> <li>• No corrosion or damage</li> </ul>                                                                                                                                                                                                                                                                                       |                                                                                                                                                                               |  |
|                       | 8. Operation display condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Visual check                                               | <ul style="list-style-type: none"> <li>• Display lights illuminate</li> </ul>                                                                                                                                                                                                                                                                                    |                                                                                                                                                                               |  |
|                       | Scrubber (built-in)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9. Wet Scrubber                                            | Visual check                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Water level is normal and cleaning water is clean.</li> <li>• Spray works normally</li> <li>• No damage leading to leaks</li> </ul>  |  |
|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10. Dry Scrubber                                           | Visual check                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• No clogs</li> <li>• Differential pressure is normal (when differential pressure gauge is installed)</li> </ul>                       |  |
|                       | Duct                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11. Visible wear, corrosion, a hollow, looseness of joints | Visual check                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• No wear, corrosion, dents, looseness</li> </ul>                                                                                      |  |
|                       | Fan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12. Fan belt condition                                     | Visual check<br>Noise check                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• No extreme wear or tear</li> <li>• No abnormal noise</li> </ul>                                                                      |  |
|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 13. Wet scrubber                                           | Visual check                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Water level is normal and cleaning water is clean.</li> <li>• Spray works properly</li> <li>• No damage leading to a leak</li> </ul> |  |
|                       | Scrubber (external)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 14. Dry scrubber                                           | Visual check                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• No clogs</li> <li>• Differential pressure is normal (when differential pressure gauge is installed)</li> </ul>                       |  |

How to fill out the results ○ : satisfactory △ : repaired at time of inspection \* : needs to be repaired — : N/A

#### 【List of References】

- 1) 国立大学法人京都大学「安全衛生管理指針」改訂版、(平成 22 年 3 月 31 日)
- 2) 東大資料「安全衛生教育テキスト」、平成 16 年(同英語版)
- 3) 東京大学全学安全衛生管理室、「安全衛生テキスト(実験系)」(同英語版)
- 4) 東京大学安全衛生管理室「有機溶剤を使用した実験を始めるにあたっての注意事項」(同英語版)
- 5) 環境安全保健機構・環境科学センター「環境科学センターによる有機廃液外部処理代行マニュアル」(平成 25 年 6 月発行)
- 6) 環境安全保健機構・環境科学センター「廃液および廃棄物の情報管理の手引き」(平成 25 年 11 月発行)
- 7) 環境安全保健機構・環境科学センター「京都大学無機廃液処理装置(KMS)利用の手引き(改訂7版)」(平成 23 年 6 月発行)