

# Handbook of Chemical Substance Management and Waste Disposal

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Environment Preservation Center,  
Kanazawa University

# Handbook of Chemical Substance Management and Waste Disposal

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## I Preface

### 1. Background of the Revision

At Kanazawa University, our education, research, and medical practices generate a variety of waste that must be properly disposed of in accordance with the Basic Environment Act, the Waste Management and Public Cleansing Act, and related laws and regulations to ensure environmental preservation, people's health and safety, and effective utilization of resources. In addition, we must make our utmost efforts to suppress the generation of waste and promote recycling of resources in accordance with the Industrial Safety and Health Act. For this purpose, it is most important for everyone who studies or works at the university to be fully aware of his or her own obligations and responsibilities regarding safely and properly disposing of waste.

The Environment Preservation Center prepared a tentative version of the 'Handbook of Disposal of Chemical Waste' in August 1981 and issued its official version in March 1984. The center was then subject to revisions of laws and regulations related to the disposal of waste, publication of a revised version of the 'Guide for Waste Management at Universities in Japan' (by the then Ministry of Education in November 1992), update of processing systems at the center, review and revision of related rules, and introduction of a Chemical Substance Management System; and revised the handbook in March 1995, March 1999, and March 2005 to comply with these changes. In addition, requirements related to environmental preservation and the handling of chemical substances became stricter. At the same time, the university had completed various rules and regulations related to the handling of chemical substances by establishing the Environment Management Regulations, Bylaws of Chemical Substance Management, and Bylaws of Waste Management. In August 2015, organic liquid waste treatment equipment (incinerator) became unusable due to deterioration over the years and reached the end of operation. We then outsourced organic liquid waste treatment to external processing companies. Based on a study conducted in FY2015 of our future liquid waste treatment, we determined to outsource both organic and inorganic liquid waste treatment to external processing companies, and obtained approval of the president of the university. An annual outsourcing contract agreement for organic liquid waste (including solvent waste and dilute organic solutions) was entered into in October 2016. The deteriorated inorganic liquid waste treatment equipment ceased operation in April 2017, and the waste treatment was outsourced to an external processing company.

The handbook was then determined to be comprehensively revised to ensure consistency with these changes. The name was changed to the 'Handbook of Chemical Substance Management and Waste Disposal,' and covers entire management of chemical substances. Under these circumstances, we would greatly appreciate parties related to the university cooperating in the proper management of chemical substances and waste disposal.

### 2. Chemical Substances and Waste

Chemical substances covered by this handbook are defined as chemical substances (chemicals, cleaning agents, fuel, etc.) handled at the university, including synthetic compounds as well as commercially available products in the form of solids, liquids, or gases. Pharmaceutical products and radioactive isotopes (RI) require independent management by law and are currently managed by a specialized section at the university. Therefore, descriptions of the management of these substances are omitted here. Waste covered by this handbook is defined as waste specified by the 'laws related to the disposal and cleaning of waste.' Infectious waste is managed mainly by an independent university committee, and the details are thus omitted here.

Chemical substances contain a variety of potential risks. These risks can be broadly divided into those that cause fire or explosions, those that are poisonous or hazardous to human health, and those that damage the environment. These substances must be handled by appropriate persons only after sufficiently understanding their potential risks.

Users of chemical substances, regardless of whether they are faculty members, staff, or students,

must fully recognize their responsibilities to understand the risks of using chemical substances, make efforts to use alternatives or reduce consumption, prevent hazards and environmental impact, process or dispose of the chemical substances in appropriate ways (under users' responsibility to understand how the chemical substances they use are to be disposed of or processed), and properly manage them (throughout their handling of steps from the point of purchase through to use and disposal).

※ This handbook is posted on the Environment Preservation Center website.

(<http://hozen2.epc.kanazawa-u.ac.jp/>)

## II Precautions for the Purchase, Storage, and Handling of Chemical Substances

To recognize that chemical substances are harmful and hazardous in nature and to handle them safely, users must sufficiently understand the characteristics, properties, and degree of risk of the chemical substances they use. All steps through acquisition (purchase), storage, use, and disposal are specified by applicable laws and regulations, and users are required to take responsibility for their management. Under such circumstances, a plan must be formed at the experimental planning stage by taking acquisition, use, and disposal into consideration. In addition, the specific precautions as listed below shall be observed in addition to other related laws and regulations and general precautions.

### 1. Precautions for purchase and storage

- 1) Purchase and store chemicals in the minimum required quantities. Only store necessary chemicals.
- 2) Study the safety data sheets (SDSs) of the chemical substances to understand their details (such as applicable laws and regulations, methods of handling, and methods of disposal) before you purchase them.
- 3) Upon receiving chemicals, check the containers and packaging, confirm that they are free of damage or liquid leaks, and register them in the Chemical Substance Management System.
- 4) Classify storage sites according to properties of the chemicals (toxic and deleterious substances, acid or alkaline substances, solid or liquid, organic or inorganic substances, etc.) by following precautions on labels or SDSs, and sort them by properties in chemical cabinets to prevent mix-ups.
- 5) Fix chemical cabinets to the floor or wall, and take preventive measures against falling.
- 6) To prevent damage or falls due to collision of chemical bottles in the cabinet, place appropriate partitions and rails, and provide each shelf with anti-slip measures and falling prevention rails. In addition, use trays to collect drippings.
- 7) Store and handle specified chemicals according to the specified standards.
- 8) Do not store chemicals designated as hazardous substances in a large quantities unnecessarily. (Use specified hazardous substance cabinets instead.)
- 9) Use refrigerators to store chemicals that become unstable at room temperature. Note that solvent vapor may leak from them during storage and become a source of ignition if they are stored at room temperature.
- 10) If a label is about to come off, securely re-attach it.
- 11) Periodically conduct inventory checks of chemicals.

## 2. Precautions for use and disposal

- 1) Many chemicals are subject to restriction of laws and regulations when they are used or disposed of. Make sure to observe applicable laws and regulations by referring to the items below:
  - As for mercury, its compounds and products containing mercury, observe VII-7.
  - As for toxic and deleterious substances, observe the 'Handling Procedure for the Management of Toxic and Deleterious Substances at Kanazawa University.'
  - As for chemical substances specified by the Ordinance on the Prevention of Organic Solvent Poisoning and the Ordinance on the Prevention of Hazards Due to Specified Chemical Substances (other hazardous substances), handle them in draft chambers.
- 2) All chemical substances pose some kind of hazard. Learn about the characteristics and properties (including methods of disposal) of chemicals to be used in advance by referring to SDSs in order to prevent accidents. Sufficiently understand the hazards, risks, and precautions for handling, storage, and disposal before using chemicals, and handle them carefully and safely.
- 3) Improper handling of chemical substances will cause health hazards or environmental disruption, resulting in problems not only for users but other people as well. Please keep in mind that the use of chemical substances always accompanies social liability.
- 4) Strictly observe safety guidelines and accident prevention manuals specified by your section or department.
- 5) Do not allow any student to conduct experiments by him/herself. This must be strictly observed during night-time or holidays in particular.
- 6) Most chemicals used in laboratories are hazardous. In conducting experiments or hands-on training, students shall follow the instructions of their teachers or instructors and shall not attempt to conduct any experiments beyond their abilities or without instructions.
- 7) Plan the scale of study appropriate for the purpose. Do not use more chemicals than necessary. Always keep workspaces tidy and neat in laboratories. In particular, be sure to place only necessary items on lab benches.
- 8) Make a mental note of where fire extinguishers and other fire prevention equipment are located, and become proficient in how to use them.
- 9) When completing experiments, never leave used chemicals on lab benches, and make sure to return them to the original storage sites. Do not place unnecessary chemicals at or near experiment sites.
- 10) Be sure to clean up the lab after conducting experiments (turn off the gas, water, and power supplies), and lock up the area. Pay attention to water pressure rises during the night, and water pressure fluctuations and water leakage when conducting experiments.
- 11) Post the management organization chart, actions to be taken in case of a disaster/accident, emergency contact information, and other necessary information at appropriate locations in the laboratories.
- 12) In the case of an accident, the person who caused it may be upset and cannot implement necessary measures appropriately; so those nearby shall take action. Be sure to notify faculty members and university staff.
- 13) Please keep in mind that any chemical substance, if improperly handled, has a risk to lead to an accident.

Specific examples are provided below:

- A substitute chemical was used, or the wrong chemical was erroneously used, resulting in poisoning and/or explosion.
- The scale of the experiment (such as concentration or consumption) was enhanced from the existing level, resulting in poisoning and/or explosion.
- The reaction conditions (such as drip speed, temperature, or agitation speed) were changed, resulting in poisoning and/or explosion.
- Lab coats stained with hazardous substances were dry-cleaned, resulting in poisoning.

- Substitute or different pressure regulators for gas cylinders other than those specified were used, resulting in an explosion.
- Paper stained with a small quantity of a water prohibitive substance was discarded in a trash can, resulting in a fire (since it reacted with water in the atmosphere).

3. Major laws and regulations related to the handling of chemical substances

Poisonous and Deleterious Substances Control Act

Basic Environment Act

Water Pollution Prevention Act

Sewerage Act

Air Pollution Control Act

Offensive Odor Control Act

Fire Service Act

High Pressure Gas Safety Act

Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR Act)

Industrial Safety and Health Act

Ordinance on the Prevention of Organic Solvent Poisoning

Ordinance on the Prevention of Hazards Due to Specified Chemical Substances

Ordinance on the Prevention of Lead Poisoning

Ordinance on the Prevention of Tetraalkyl Lead Poisoning

Ordinance on the Prevention of Hazards Due to Dust

Waste Management and Public Cleansing Act

Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc.

Pharmaceutical Affairs Act (Act on Securing Quality, Efficacy and Safety of Products Including Pharmaceuticals and Medical Devices)

Agricultural Chemicals Control Act

Food Sanitation Act

Narcotics and Psychotropics Control Act

Stimulants Control Act

Act on Promotion of Global Warming Countermeasures

Act on Rational Use and Appropriate Management of Fluorocarbons

Act on prevention of Environmental Pollution by Mercury

### III Chemical Substance Management System

The Chemical Substance Management System employed by Kanazawa University is outlined below:

#### 1. Objective

The system aims at ensuring appropriate chemical substance management used within Kanazawa University and enhance precise management of consumption and discharge.

#### 2. Overview of the system

##### 1) Chemical Substance Management System

System to manage the handling of chemical substances at all steps from purchase to disposal by utilizing the university LAN and personal computers (Refer to the Chemical Substance Management System flow chart on the page after next.)

##### 2) Client (personal computers to be used)

- (1) Personal computers with the browser indicated below and connected to the university LAN
- (2) Browser: Internet Explorer 5.0 or later versions or Netscape 4.7 or later versions
- (3) In addition, the group managers require software to view CSV data for the output of collected results (such as EXCEL).

##### 3) Chemical substances covered by the Chemical Substance Management System (chemicals)

All chemical substances handled at Kanazawa University (including newly-purchased chemical substances, inventory, and synthetic substances in solid, liquid, and gas form). They are registered and managed by containers.

Note that the chemical substances listed below are excluded:

- (1) Pharmaceutical products (chemical substances to be administered to humans or animals)
- (2) Radioactive substances (substances that require management as RI)
- (3) The consumption, destination of discharge, and discharge quantity of the substances listed below are managed separately and individually:
  - Chemical substances used only for neutralization in monitor tanks or the like;
  - Substances used for combustion such as fuel oil A, kerosene, gasoline, and light oil; and
  - Other chemical substances purchased by tank lorry, etc. and stored in large storage reservoirs

##### 4) Research groups

- (1) All research groups and all departments that handle chemical substances at Kanazawa University
- (2) Chemicals are registered by each group that manages them. (The respective groups can only use chemicals that they registered for storage.)
- (3) Basic matters required for registration (campus, section, building, and department) are described on the Group Data Registration Sheet on page 17 (Appendix 1).

##### 5) Center manager

Manager of the entire Chemical Substance Management System (Environment Preservation Center is in charge as the manager).

##### 6) Group manager (Faculty members and university staff)

The responsible person in each research group who collects data and requests the disposal of liquid and other waste. Several managers can be appointed. Fill in the Group Data Registration Sheet on page 17 (Appendix 1) and send it to the Environment Preservation Center for registration.

##### 7) Chemical substance manager (Faculty members and university staff)

The person in charge of the management of chemical substances such as purchasing, storage, and disposal shall be appointed from group managers. Register him/her to the Environment Preservation Center by using the Group DATA Registration Sheet.

##### 8) General user (graduate students, undergraduates, etc.)



Those who obtain IDs and passwords from group managers and can use the system

9) Chemical container (Container filled with chemical substances)

Containers controlled with chemical container number labels (barcode labels) and containing chemical substances, such as bottles, plastic containers, 18-liter metal square cans, gallon containers, ampoules, paper boxes, kits, gas cylinders, etc.

10) Containers for liquid and solid waste

Containers controlled with liquid/solid waste container number labels (barcode labels: Waste) and specifically designated

3. Registration to the Chemical Substance Management System

Research groups that handle chemical substances at Kanazawa University must register in the Chemical Substance Management System.

<Registration procedure for the system>

1) Contact the Environment Preservation Center and obtain the Group Data Registration Sheet shown on page 17 (Appendix 1).

2) Fill in the Group Data Registration Sheet and send it to the Environment Preservation Center (by e-mail).

3) The Environment Preservation Center will send a notification of registration completion and ask about the number of required container number labels for chemical containers and waste containers (barcode labels).

4) Please notify the Environment Preservation Center of the number of required labels for these containers.

5) The Environment Preservation Center will send the container number labels.

4. Registration and use of chemical substances

Chemical substances to be handled at Kanazawa University become usable after they are registered in the Chemical Substance Management System. The group manager shall send information necessary for the registration of substances (refer to Appendix 2: Information for the Registration of Chemicals (pure substances and compounds) on page 18) to the Environment Preservation Center, which in turn registers the substances in the Chemical Substance Management System.

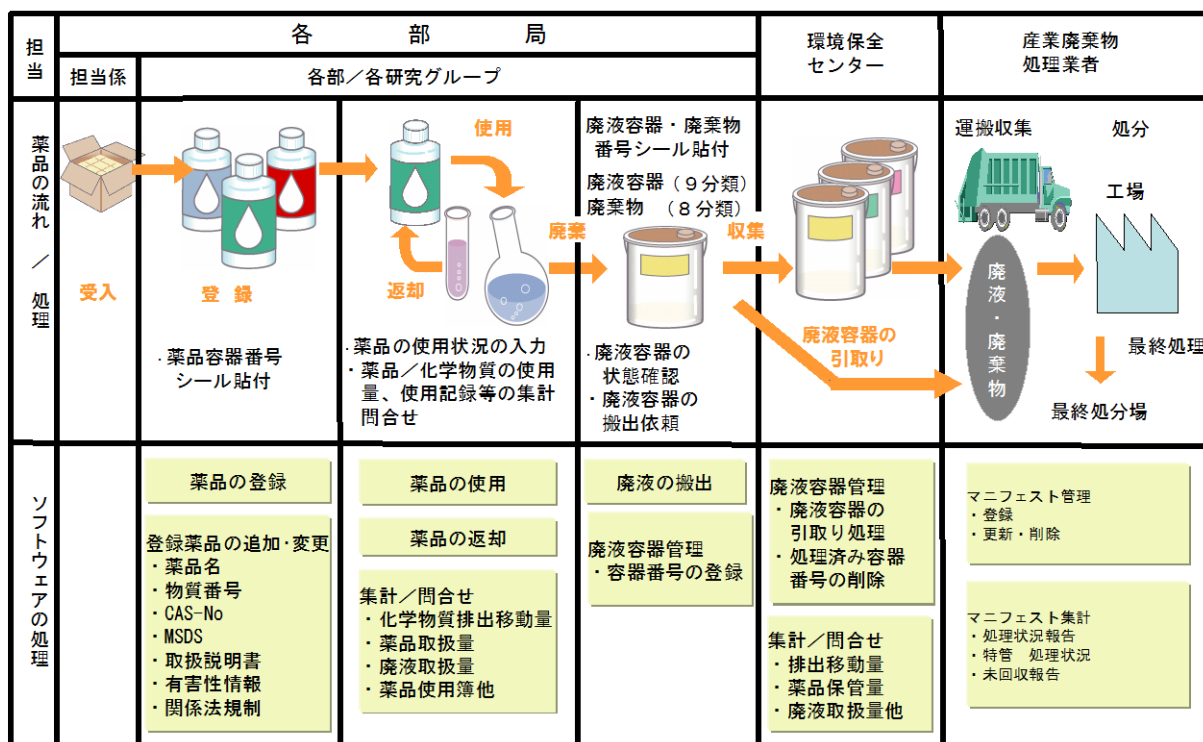
Application for registration shall include the Japanese name, English name, CAS No., and information about applicable laws and regulations (Poisonous and Deleterious Substances Control Act, Act on Hazardous Materials, PRTR Act, Ordinance on the Prevention of Organic Solvent Poisoning, Ordinance on the Prevention of Hazards Due to Specified Chemical Substances, Ordinance on the Prevention of Lead Poisoning, Water Pollution Prevention Act, Air Pollution Control Act, Rules for the Use of Internationally Controlled Materials, and Hazards [Carcinogenicity] of Narcotics and Psychotropics). However, chemical substances can be registered even with some items remaining blank (CAS No. [excluding compounds]; necessary for poisonous and deleterious substances). Missing data will be supplemented afterwards once they become known. Component names and component ratios are also necessary for compounds.

When using chemical substances and storing liquid or solid waste after use, be sure to use the Chemical Substance Management System.

5. Specific operation procedures

The outline of operation is described in Sections 5-1 through 5-8 below. The Operation Manual of the Chemical Substance Management System can be viewed on the menu screen after you log into the system.

# 化学物質管理システム処理フロー図



## 5-1 Login screen

化学物質管理システム V1.2L11 - Windows Internet Explorer

http://ptr.epckanazawa-u.ac.jp/cmsys/

化学物質管理システム V1.2L11

金沢大学

Welcome to Kanazawa University  
Kanazawa University

化学物質管理システム  English

ID:  パスワード:

↑ ログイン/LOGIN ↑

Enter ID and password.

To display the pages in English, check the English box.

## 5-2 Menu screen

化学物質管理システム V1.2L11

http://prtr.epcc.kanazawa-u.ac.jp/cmsys/script/login.asp

化学物質管理システム

ようこそ

環境保全センター/Environment Preservation Center 環境保全センター/Environment Preservation Center 環境保全センター  
環境 保全 さん

薬品	廃液	集計・問合せ	構成定義・変更
<ul style="list-style-type: none"> <li>●薬品・容器登録</li> <li>●薬品の使用</li> <li>●薬品の返却</li> <li>●排出先保留薬品の処理</li> <li>●薬品容器の欠番化</li> </ul>	<ul style="list-style-type: none"> <li>●廃液・廃棄物容器の登録</li> <li>●廃出処理</li> <li>●廃液・廃棄物容器の欠番化</li> </ul>	<ul style="list-style-type: none"> <li>●問合せ</li> <li>●化学物質排出・移動量</li> <li>●薬品取扱・保管量</li> <li>●薬品使用簿</li> <li>●薬品保管簿</li> <li>●廃液・廃棄物保管簿</li> </ul>	<ul style="list-style-type: none"> <li>●ID追加・変更</li> <li>●使用法定義追加・変更</li> </ul>

ログインページへ戻る      操作マニュアル参照

If a chemical is to be returned on receipt or after collection, a message appears in red here.

Operation instructions

## 5-3 Registration of chemicals and containers

### [薬品・容器登録]

検索条件を設定してください

CAS NO	毒劇物	危険物	日本語薬品名	Name-Eng
	すべて	すべて	クロロホルム	

マスから検索    グループ内検索

薬品の「日本語薬品名」の領域を選択してください

CAS-NO	日本語薬品名	Name-Eng	区分	純物/混合物
67-66-3	クロロホルム	Chloroform	P 1, 特化 2, 劇物, 大気, 変異, 癌疑, 急性毒性 (低), 腐食性, 発がん性, 水生環境有毒性, RA (労働安全衛生リスクアセスメント)	純物
10025-78-2	シロクロロホルム	Trichlorosilane	劇物, 危険	純物
865-49-6	クロロホルム-d1	Chloroform-d1	P 1, 特化 2, 劇物	純物
57-15-8	アセトクロロホルム	Acetonechloroform		純物
67-66-3	クロホルム(脱水)	Chloroform	P 1, 特化 2, 劇物, 大気, 変異, 癌疑, 急性毒性 (低), 腐食性, 発がん性, 水生環境有毒性, RA (労働安全衛生リスクアセスメント)	純物
865-49-6	クロロホルム-d1 TMS 1%添加	Chloroform-d1, TMS 1%	P 1, 特化 2, 劇物	純物
865-49-6	クロロホルム-d1 TMS 0.05%添加	Chloroform-d1, TMS 0.05%	P 1, 特化 2, 劇物	純物
865-49-6	クロロホルム-d1 TMS 0.03vol%添加	Chloroform-d1, TMS 0.03%	P 1, 特化 2, 劇物	純物
	クロロホルム/イソアミルアルコール (CIA 49/1)	Chloroform/isoamylalcohol(CIA 49/1)	P 1, 特化 2	混合物
	クロロホルム/イソアミルアルコール (CIA 24/1)	Chloroform/isoamylalcohol(CIA 24/1)	P 1, 特化 2, 劇物	混合物
1470-61-7	ジエチルジチオカルバミン酸銀-ブリン-シンクロホルム溶液	Silver diethyldithiocarbamate-burucine-chloroform solution	P 1, 有 2, 大気	混合物

Select chemicals and containers from the chemicals database. For those not included in the database, fill in and send Appendix 2 on page 18 to the Environment Preservation Center.

If a chemical is a compound, click 'Compound,' and component names and component ratios

appear.

Compounds that have different compositions depending on the manufacturer shall be registered when necessary (please consult with the Environment Preservation Center). The Center will distinguish them based on manufacturer name and concentration.

### [薬品・容器登録]

登録する薬品の情報を設定し、ボタンを押してください 履歴検索

日本語薬品名	クロロホルム
Name-Eng	Chloroform
MSDS	MSDSへのリンク
取扱説明	区分
	注意喚起語 <b>危険</b>
CAS-NO	67-66-3
登録日	2017/10/02
容器形状	容器容量
容器色	全体重量
保管場所	比重
使用量の計量方法	登録薬品数

Red arrows point to the following fields: 全体重量, 比重, 登録薬品数.

Mandatory field

Mandatory field

In the registration of chemical containers, the container shape, container color, manufacturer name, grade, and container capacity vary according to the user, so their default values can be used unless changing them is necessary. The container capacity (size of bottle, for example) must be entered since no default value is set. When 'Enter the quantity of consumption (capacity)' is selected with regard to the calculation method for the quantity of consumption, or when 'ml' is selected as the unit for the default capacity, the entry of specific gravity is indispensable. If you select options other than the above, the default value of 1 may be used without any changes.

The red arrows in the above figure indicate mandatory fields.

In particular, values and units for the entire weight and capacity shall be entered carefully since they cannot be changed later. It is recommended to use g as the unit of weight and ml for volume wherever possible.

If any entry errors are found after registration but before the start of use, the chemical number shall be designated as a missing number, and a new chemical No. will be used to register it from the beginning. If the chemical container has already started to be used, consult with the Environment Preservation Center.

The chemical container is registered with regard to its capacity by designating ml as the unit of initial capacity at the time of container registration, and the residual quantity is shown in ml thereafter. In this case, no specific gravity is required to be entered (it must be set for each chemical container).

MSDS (SDS) can be viewed by clicking the 'Link to MSDS.'

Carefully handle the chemicals and their containers by referring to MSDSs and GHS pictograms.

In principle, chemicals shall be registered by each container. When the entire capacity of a container is consumed at one time, however, they can be registered by a box containing containers.

Numbers in a barcode look as if they are divided by 4 digits, but are continued. For example, 1 1124 is 11124.

If purity does not significantly deviate from 100%, it may be entered as 100%.

## 5-4 Registration of liquid and solid waste containers

# [廃液・廃棄物容器の登録]

下記の情報を指定して「登録実行」のボタンを押してください

分割化登録	<input checked="" type="radio"/> しない <input type="radio"/> する 分割元の容器番号 <input type="text"/>
管理者	環境 保全 <input type="text"/>
容器形状	ポリタンク <input type="text"/>
容器色	茶(褐色) <input type="text"/>
容器容量	<input type="text"/> L(リットル)
分類	水銀系化合物 <input type="text"/>
保管場所	分析室 <input type="text"/>
容器番号(コメント)	<input type="text"/> ( <input type="text"/> )
容器本数	1 <input type="text"/> (1~10本)

### < 廃液の分類 >

水銀系化合物：水銀及びその化合物  
 酸クロム系：酸、クロムおよび重金属  
 シアンヒ素系：シアン化物、シアン錯化合物及びヒ素化合物  
 アルカリ系：アルカリ系  
 フッ化水素酸系：無機系フッ化水素酸及びその塩  
 水銀試薬

廃溶媒類：廃溶媒類  
 難燃不燃性：難燃性、不燃性溶媒類  
 廃油類：廃油類  
 希薄有機：希薄有機水溶液  
 写真定着液：定着液

### < 廃棄物の分類 >

(水銀系)  
 Hg汚泥類：汚泥類(スラッジ)  
 Hgガラス類：ガラス類(陶器類含む)  
 Hgプラ類：ゴム/プラスチック類  
 Hg金属製類：金属製容器類

(非水銀系)  
 汚泥類：汚泥類(無機スラッジ)  
 ガラス類：ガラス類(陶器類含む)  
 プラ類：ゴム/プラスチック類  
 有機汚泥類：汚泥類(有機スラッジ)

登録実行

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Liquid and solid waste containers shall be registered before starting to use chemicals.

The comment field beside the container No. may be used to facilitate the classification of liquid waste containers.

Since classification cannot be changed later, it shall be registered with care.

Up to 10 containers can simultaneously be registered at one time. In such a case, enter the first number of the serial numbers in the Container No. field and the number of containers to register in the Number of Containers field.

Liquid waste in a currently used liquid waste container No. can equally be divided to 1 to 10. In such a case, check 'Yes' in the Division Registration field, enter the manager of the currently-used liquid waste container number and container shape in the container No. before division as usual. Also enter the first number of the new serial container numbers of a required quantity in the Container No. field and the number of divisions (1 to 10) in the Number of Containers field.

If classification must be changed, the content can be emptied and then replaced by selecting 1 for the number of divisions in the above method.

If necessary serial container numbers are not available, notify the Environment Preservation Center of the necessary quantity of liquid waste container numbers by e-mail. In the notification, please specify the section name, research group name, manager name, and address (only when sent to a destination other than the manager).

## 5-5 Use and return of chemicals

化学物質管理システム V1.2L11

化学物質管理システム

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環境 保全 さん

薬品	廃液	集計・問合せ	構成定義・変更
<ul style="list-style-type: none"> <li>●薬品・容器登録</li> <li>●<b>薬品の使用</b></li> <li>●薬品の返却</li> <li>●排出先保留薬品の処理</li> <li>●薬品容器の欠番化</li> </ul>	<ul style="list-style-type: none"> <li>●廃液・廃棄物容器の登録</li> <li>●搬出処理</li> <li>●廃液・廃棄物容器の欠番化</li> </ul>	<ul style="list-style-type: none"> <li>●問合せ</li> <li>●化学物質排出・移動量</li> <li>●薬品取扱・保管量</li> <li>●薬品使用簿</li> <li>●薬品保管簿</li> <li>●廃液・廃棄物保管簿</li> </ul>	<ul style="list-style-type: none"> <li>●ID追加・変更</li> <li>●使用法定義追加・変更</li> </ul>

[ログインページへ戻る](#) [操作マニュアル参照](#)

Use refers to the act of taking chemicals out of the chemical cabinet or other storage location.

Unless a chemical is used, it cannot be returned (e.g. entry of consumption).

Location of use and intended use can only be selected from the options and cannot be entered. If no applicable option is available, consult with the Environment Preservation Center by e-mail. The center will add the option.

### [薬品の使用]

情報を確認の上、必要情報を指定してボタンを押してください

容器番号	478	現有コード	
日本語薬品名	クロロホルム		
Name-Eng	Chloroform		
MSDS	MSDSへのリンク	区分	
取扱説明			
		注意喚起語 (GHS)	<b>危険</b>
CAS-NO	67-66-3	管理者	○道上 義正
登録日	2005/3/11	容器容量	500 mL(ミリリットル)
容器形状	ビン	使用前全体重量	1066.5 g(グラム)
容器色	茶(褐色)	使用前内容量	750 g(グラム)
保管場所	薬品庫劇物保管庫左	メーカー等級	関東化学/特級
比重	1.5	純度	90%
使用量の計量方法	使用前後の重量差		

使用場所:

使用目的:

Select 'To Return Process' on the above screen to proceed to the 'Return of Chemical' screen shown below:

化学物質管理システム V1.2L10 - Microsoft Internet Explorer

ファイル(F) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H) リンク >>

## [薬品の返却]

情報を確認の上、必要情報を指定してボタンを押してください

容器番号	161	現有コード	
日本語薬品名	クロロホルム		
Name - Eng	Chloroform		
MSDS		区分	<input type="radio"/> P1 <input type="radio"/> 劇物 <input type="radio"/> 水質 <input type="radio"/> 大気 <input type="radio"/> 腐食 <input type="radio"/> 有1
取扱説明			<input type="radio"/> 変異
CAS-NO	67-66-3	管理者	道上 義正
登録日	2002/5/20	容器容量	500 mL(ミリリットル)
容器形状	ビン	使用前全体重	1019.8 g(グラム)
容器色	茶(褐色)	使用前内容量	740 g(グラム)
保管場所	薬品庫 創物保管庫左	メーカー/等級	ナカライテスク/特級
比重	1.48	純度	100%
使用量の計量方法	使用前後の重量差		

使用場所 測定室  
 使用法 フー  
 使用後重量 1000.0 単位 g(グラム)  
 この容器は空容器として廃棄

ページが表示されました インターネット

Use correct units for quantities. It is recommended to use g as the unit for weight and ml for volume wherever possible.

Check 'Dispose of this container as an empty container' when the chemical container becomes empty. The container cannot be used thereafter.

When a chemical is returned, the storage site can be changed.

If the usage is defined, select a usage. Once the usage is selected, the discharge destination and discharge factor will be auto-populated with predetermined values. The usage can be defined with the Define/Change Usage function on the menu screen by the manager. If chemicals are routinely used or discharged to the same place, it will be convenient to define the usage.

There are two registration methods: Register the discharge destination and discharge factor now (by selecting 'Next (designate the discharge destination)' and proceed to the next screen); or return the chemical (so that the next person can use it), and register the discharge destination and discharge factor later (by selecting 'Return (withhold selecting the discharge destination)').

When selection of the discharge destination is withheld, the discharge destination, discharge factor, and liquid waste container can be entered in the 'Processing of chemicals with their discharge destination withheld' on the menu screen. The withheld quantity can be partially discharged in percentage increments.

化学物質管理システム V1.2L10 - Microsoft Internet Explorer

ファイル(F) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H) リンク

## [薬品の返却]

排出係数を定義・変更してください

使用重量 = 0 g

含有成分				排出係数(%)													
PRTR物質番号	CAS-NO	物質名	含有率	大気	下水	土壌	河川	転化	水銀系化合物	酸クロム系	シアンヒ素系	アルカリ系	廃溶媒類	難燃不燃性	廃油類	希薄有機	写真着
P1-95	67-66-3	クロロホルム	100											100			
廃液・廃棄物容器番号														2843			

< 廃液の分類 >

水銀系化合物：水銀及びその化合物  
 酸クロム系：酸、クロムおよび重金属  
 シアンヒ素系：シアン化物、シアン錯化合物及びヒ素化合物  
 アルカリ系：アルカリ系

廃溶媒類：廃溶媒類  
 難燃不燃性：難燃性、不燃性溶媒類  
 廃油類：廃油類  
 希薄有機：希薄有機水溶液  
 写真着：定着液

< 廃棄物の分類 >

(水銀系)  
 Hg汚泥類：汚泥類(スラッジ)  
 Hgガラス類：ガラス類(陶器類含む)  
 Hgプラスチック類：ゴム/プラスチック類  
 Hg金属製類：金属製容器類

(非水銀系)  
 汚泥類：汚泥類(無機スラッジ)  
 ガラス類：ガラス類(陶器類含む)  
 プラスチック類：ゴム/プラスチック類  
 有機汚泥類：汚泥類(有機スラッジ)

処理実行

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インターネット

Select the No. of the liquid/solid waste container in which used chemical is stored.

Click the flask-shaped icon, and the contents stored in the container can be confirmed.

Set the discharge factor to 100%.

Use the option 'Discharge to soil' if a chemical was inadvertently spilled on the ground or discarded, or an agricultural chemical was sprayed. Discharge to the soil is prohibited in principle.

The option 'Discharge to rivers' refers to discharge via routes other than sewers such as dumping to rainwater ditches or washing used instruments. (Discharge to public waters [including the ocean, lakes, and swamps]) Discharge to rivers is prohibited in principle.

The option 'Conversion' refers to transformation to substances other than the original materials (by synthesis or combustion). (E.g. from benzene to nitrobenzene) In principle, converted substances shall be registered to this system. (However, converted substances after combustion do not require registration.)

If converted substances will not be used, do not select 'Conversion,' and enter that the original substance was discharged. In this case, enter the details in the Remarks field on the discharge screen when requesting discharge. (For example, iron hydroxide is generated by iron sulfate and sodium hydroxide. Iron sulfate and sodium hydroxide are sorted to solid waste (sludge) and liquid waste, respectively. In actuality, however, the sludge and liquid waste is iron hydroxide and sodium sulfate, respectively.)

When samples obtained by preparing dissolved samples are to be registered in the system, select 'Conversion' as a destination of the original substance (to avoid double registration). When sulfuric acid is diluted to prepare a 30% sulfuric acid solution and the chemical container is registered for 30% sulfuric acid, for example, the discharge destination of the original 100% sulfuric acid must be 'Conversion.' Alternatively, there is a method for discharge registration to withhold the sulfuric acid discharge destination and apply processing for the destination-withheld chemical as though using the original sulfuric acid.



## 5-6 Request for collection of liquid waste

化学物質管理システム V1.2L11

http://prtr.epc.kanazawa-u.ac.jp/cmsys/script/login.asp

### 化学物質管理システム

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環境保全センター  
環境 保全 さん

薬品	廃液	集計・問合せ	構成定義・変更
<ul style="list-style-type: none"> <li>●薬品・容器登録</li> <li>●薬品の使用</li> <li>●薬品の返却</li> <li>●排出先保留薬品の処理</li> <li>●薬品容器の欠番化</li> </ul>	<ul style="list-style-type: none"> <li>●廃液・廃棄物容器の登録</li> <li>●搬出処理</li> <li>●廃液・廃棄物容器の欠番化</li> </ul>	<ul style="list-style-type: none"> <li>●問合せ</li> <li>●化学物質排出・移動量</li> <li>●薬品取扱・保管量</li> <li>●薬品使用簿</li> <li>●薬品保管簿</li> <li>●廃液・廃棄物保管簿</li> </ul>	<ul style="list-style-type: none"> <li>●ID追加・変更</li> <li>●使用法定義追加・変更</li> </ul>

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化学物質管理システム V1.2L11

http://prtr.epc.kanazawa-u.ac.jp/cmsys/Script/Waste/Waste/WasteOut3.asp?WasteID=2491

### [搬出処理]

搬出の情報指定してボタンを押してください

容器番号	管理者	内容物種類	容器形状	容器色	容器容量	保管場所
2491	道上 義正	廃液媒類	ポリタンク	白	8 L	分析室

依頼日	依頼者名	搬出化学物質重量	搬出内容量	pH	含水率(%)	搬出先	内容物
2008/05/07	環境 保全	984.435 g	L(リットル)			環境保全センター	表示

※業者へ搬出した場合は業者名を設定してください 処分業者名

備考(最大128文字、行の終端で改行入力)

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搬出依頼の実行

The pH level and moisture content must be entered. (If the pH level cannot be measured in the case of solids, for example, enter 7.)

Enter a message to the Environment Preservation Center. (Such as information about pre-treatment or substances that cannot be registered to the system and their quantities. Substances such as plastic sludge can be registered with an entry in the Remarks field without entering content details.)

As for the discharge destination, select an option from the dropdown list. (If no applicable option is

available, consult with the Environment Preservation Center and the Center will add the option.)

When you select the disposal waste contractor, select a contractor name. (If no applicable option is available, consult with the Environment Preservation Center.)

## 5-7 Inquiry

学科	グループ	保管場所	管理者	依頼者	状態	搬出依頼日	受付日	不備返却日	収集予定日時	収集日	収集後返却予定日時	処理完了日	容器形状	容器色	容器容量	搬出先	処分業者	内容物	備考
環境保全センター Environment Preservation Center	環境 保全 センター	測定室	道上義正	道上義正	処理済	2007/4/4	2007/4/4	--	2007/5/9 10:00	2007/5/9	--	2007/6/21	ポリタンク	赤	16L	環境 保全 センター	--	表示	表示
環境保全センター Environment Preservation Center	環境 保全 センター	分析室	道上義正	道上義正	処理済	2007/5/2	2007/5/2	--	2007/5/9 10:00	2007/5/9	--	2007/6/21	ポリタンク	赤	16L	環境 保全 センター	--	表示	表示
環境保全センター Environment Preservation Center	環境 保全 センター	測定室	道上義正	道上義正	処理済	2007/6/1	2007/6/1	--	2007/6/6 10:00	2007/6/6	--	2007/7/17	ポリタンク	赤	16L	環境 保全 センター	--	表示	表示
環境保全センター Environment Preservation Center	環境 保全 センター	分析室	道上義正	道上義正	収集済	2007/6/20	2007/6/20	--	2007/6/27 10:00	2007/6/27	--	--	ポリタンク	赤	16L	環境 保全 センター	--	表示	表示

When the request is accepted, the reception date app

When the collection date is determined, the date and time of collection appear.

Whether a requested liquid/solid waste container is accepted and the scheduled collection date and time can be confirmed by this table. To confirm, two search methods are available: Designate the period for the requested discharge date, and select 'All' for the state; or designate 'Accepted' or 'Scheduled to be collected' for the state, and start the search.

If a container is improperly returned at the time of receipt, search it with the state of 'Returned on receipt' or 'Returned after collection.' {MSG, Yes} appears in red in the Remarks field. When View in the Remarks field is clicked, the reason for returning appears.

## 5-8 Calculation of Total Values

Only managers can calculate the total values for their own research groups.

Period within the fiscal year can only be designated for the calculation (from April 1 to March 31 of the next year).

Total values cannot be calculated over the fiscal year end.

To print the results, output them by CSV and print by using spreadsheet software such as Excel.

## 6. Other precautions

When you request the issuance of container numbers for chemical or liquid waste containers (barcode labels) or make an inquiry to the Environment Preservation Center, make sure to convey your department, name, and research group name.

When treatment is outsourced to external contractors, the manifest management system that coordinates with this system can be used. For details of usage, please consult with the Environment Preservation Center.

When mixed chemicals are used for a long period of time, the three methods described below under 1) to 3) are available. In the description, a chloroform-phenol mixture (hereinafter abbreviated as  $\text{CHCl}_3$ -PhOH liquid mixture) is used for several months.

### 1) Method to register a new chemical database

Request registration of '  $\text{CHCl}_3$ -PhOH liquid mixture' in the chemical database as a new mixture. Prepare the  $\text{CHCl}_3$ -PhOH liquid mixture. Enter the consumed amounts of chloroform and phenol used for preparation in grams (or mls) in the system, respectively, and designate 'Conversion' as the discharge destination. Then, attach the chemical barcode label to the prepared  $\text{CHCl}_3$ -PhOH liquid mixture and register it as a chemical in the system. Register other necessary information including usage in the system as in procedures for ordinary chemicals.

Note: Once a chemical is registered as liquid mixture, it can be used with the compound name thereafter, and the component ratios are automatically calculated by the system. (This method is also effective when subdividing to several portions or preparing dilutions.)

### 2) Method of using the discharge destination withholding option

Prepare a  $\text{CHCl}_3$ -PhOH liquid mixture. Register chloroform and phenol used for preparation as Use/Return in the system and select Discharge Destination Withheld on returning. When the mixture is stored as liquid waste in a tank or when you request disposal of the liquid waste tank, select original chloroform for discharge from the discharge destination withheld chemical list, and designate the quantity of discharge by percentage. Select a liquid waste tank to which chloroform is discharged as in other ordinary discharge cases, and discharge it. Carry out the same procedure for phenol. Complete the procedure until no chemicals are withheld.

### 3) Method to temporarily store a mixture in a liquid waste tank and discharge it by subdividing it later

Prepare a  $\text{CHCl}_3$ -PhOH liquid mixture. Register chloroform and phenol used for preparation as Use/Return in the system and designate as though the mixture will be discharged to a single liquid waste tank. Once the discharge destination is determined, divide the liquid waste tank and request disposal. In this method, you must pay attention to the liquid waste acceptance criteria. It is effective when decomposition is required.

## Appendix 1

## Group Data Registration Sheet

(1) Research group name (up to 20 double-byte characters)	(8) Campus	(9) Building (Select the liquid waste collection site.)	(10) Section (Select one.)	(11) Department (up to 20 double-byte characters. Refer to the description example.)	
Enter the research group name in Japanese using double-byte characters. (Up to 20 characters can be entered.)	Select one from the pulldown menu. If no applicable option is available, consult with the Environment Preservation Center.	Corresponding to the liquid waste collection site. Select one from the pulldown menu.	Select one from the pulldown menu. If no applicable option is available, consult with the Environment Preservation Center.	Refer to the table on the attached sheet (description omitted). If no applicable option is found in the table on the attached sheet, consult with the Environment Preservation Center.	
(2) Group manager (up to 20 double-byte characters)	(3) ID (up to 12 single-byte alphanumeric characters)	(4) Password (up to 12 single-byte alphanumeric characters)	(5) Job title (up to 20 double-byte characters)	(6) Telephone number (up to 20 single-byte alphanumeric characters)	(7) E-mail (up to 64 single-byte alphanumeric characters)
<p>Enter the full name of the group manager in Japanese using double-byte characters. (Up to 20 characters can be entered.)</p> <p>* Only faculty members can serve as group managers.</p> <p>* Several group managers can be registered. Use one line per manager. Add lines if necessary.</p>	<p>Enter the ID of the group manager in single-byte alphanumeric characters to log into the Chemical Substance Management System. (Up to 12 characters can be entered.)</p> <p>* A change may be requested due to overlap.</p> <p>Note: Entry is case-insensitive.</p>	<p>Enter the password of the group manager using single-byte alphanumeric characters to log in the Chemical Substance Management System. (Up to 12 characters can be entered.)</p> <p>* Enter a tentative password, and change it before actual use. ID may be used as the tentative password.</p> <p>Note: Entry is case-insensitive.</p>	<p>Enter the job title of the group manager in Japanese using double-byte characters. (Up to 20 characters can be entered.)</p>	<p>Enter the telephone number of the group manager using single-byte alphanumeric characters and single-byte hyphens. (Up to 20 characters can be entered.)</p>	<p>Enter the e-mail address of the group manager using single-byte alphanumeric characters. (Up to 64 characters can be entered.)</p> <p>The domain (kanazawa-u.ac.jp) may be omitted.</p>
(12) Storage site (up to 64 double-byte characters)	(13) Location of use (up to 64 double-byte characters)	14) Intended use (up to 64 double-byte characters)	(15) Storage site of liquid/solid waste containers (up to 64 double-byte characters)		
<p>Enter the chemical storage site in Japanese using double-byte characters. (Up to 64 double-byte characters can be entered.) Use one cell for each site.</p>	<p>Enter the location of use of chemicals in Japanese using double-byte characters. (Up to 64 double-byte characters can be entered.)</p>	<p>Enter the intended use of the chemicals in Japanese using double-byte characters. (Up to 64 double-byte characters can be entered.) If university-wide standards become necessary, reconsider the intended use.</p>	<p>Enter the storage site of the liquid/solid waste container in Japanese using double-byte characters. (Up to 64 double-byte characters can be entered.)</p>		

\* If you have any questions, please consult the Environment Preservation Center.



#### IV Collection and Storage of Liquid Waste

Among chemical substance waste discharged from the university, that which can be collected by the Environment Preservation Center mainly consists of liquid-state waste from experimental facilities (liquid waste) and is sorted into inorganic and organic liquid waste groups for collection. However, infectious waste and radioactive waste is not included. Since waste generators know the properties and history of liquid waste the most, they are responsible for properly collecting and classifying waste when it is generated.

In storing and accumulating liquid waste, observe applicable laws and regulations, and prevent scattering, leakage, and fire. When you request the disposal of liquid waste, the Chemical Substance Management System shall be used.

**Wait a moment! Check it again before discarding it!!**  
**Properly dispose of hazardous substances on your own responsibility.**

- Do not throw liquid waste down the drain!!
- Check it again before getting rid of it!

##### 1. Collection and storage of inorganic liquid waste

Store inorganic liquid waste according to the liquid waste group specified in Table 1. Observe the precautions below in collecting and storing inorganic liquid waste.

- 1) Applicable liquid waste is listed under Groups Nos. 1 through 5 in Table 1.
- 2) In the case of compounds, components with a higher toxicity or that are more hazardous shall be prioritized, and shall be classified accordingly.
- 3) Liquid waste containing chemical substances that may react with each other and cause an explosion if mixed should not be comingled.


Refer to Table 2, and confirm the combination before storage (or before moving liquid waste into specified containers).

- 4) When liquid waste is moved from experimental containers to specified containers, it is said that 99 to 99.9% or more per container volume is transferred when the first waste washing liquid is collected. To ensure safety, waste washing liquid shall be collected up to the third washing.
- 5) Organic substances shall be excluded in principle. If such substances are inseparable, their content shall be limited to 3% at a maximum.
- 6) Liquid waste in groups other than 'Mercury and Mercury Compounds' should not contain mercury and mercury compounds in principle. If the mercury contained is inseparable, convert liquid waste to inorganic mercury and decrease the concentration to 10 ppb at a maximum.
- 7) Since ammonia forms a complex when reacting with heavy metals and makes processing difficult, ensure that it is processed as liquid waste under the dilute organic aqueous solutions group described later (ammonia content of 10% at a maximum) if no metal is contained. If metals are present, dilute the liquid to ensure an ammonia content of 10% at a maximum, and change it to 'alkaline liquid waste.'

Table 1 Collection and classification of **INORGANIC** liquid waste from experimental facilities

No. and ID card color	Group/Contents of Liquid Waste	Remarks
1	<p><b>MERCURY and MERCURY COMPOUNDS</b> Inorganic mercury, organic mercury, and their compounds (Acid)</p>	<p>Wash the emptied vessel that contained the liquid waste at least three times and store the washing liquid with the waste at <math>\text{pH} \leq 2</math>. Filter off any precipitates. →Store the precipitates as “mercury sludge” in a separate sealed vessel. Request disposal. →The center will collect it in a timely fashion.</p> <ul style="list-style-type: none"> <li>• <b>Organic mercury and its compounds:</b> Decompose organic compounds (see note 1) in principle. If the organic compounds present are inseparable, restrict the organic compound content to 3% at a maximum.</li> <li>• <b>Mercury metals and mercury amalgam:</b> Store in a separate sealed vessel. Request disposal as mercury sludge. →The center will collect it in a timely fashion.</li> </ul>
2	<p><b>ACID, CHROMIUM and HEAVY METALS</b> Chromium, lead, copper, zinc, cadmium, iron, manganese, silver, cobalt, nickel, etc. and their compounds Mineral acid waste solutions such as hydrochloric acid, sulfuric acid, and nitric acid (Acid)</p>	<p>Wash the emptied vessel that contained the liquid waste at least three times and store the washing liquid with the waste at <math>\text{pH} \leq 4</math>. Filter off any precipitates. →Store the precipitates as “non-mercury sludge” in a separate sealed vessel. Request disposal. →The center will collect it in a timely fashion.</p> <ul style="list-style-type: none"> <li>• Hydrochloric acid or sulfuric acid without harmful compounds and their alkali salts: If waste is not excessively concentrated (not more than 5%) or in large quantities, it could be carefully disposed of after neutralization or dilution (<math>\text{pH} 5-9</math>) and confirmation of safety.</li> <li>• It should not contain <b>mercury</b>. If the mercury contained is inseparable, however, restrict the content to 10 ppb at a maximum.</li> <li>• It should not contain hydrofluoric acid or its compounds.</li> <li>• It should not contain <b>cyanides</b>. If the cyanide contained is inseparable, restrict the content of cyanide to 1 ppm at a maximum.</li> <li>• For boron, refer to the Precautions Common to All the Groups.</li> </ul>
3	<p><b>CYANIDES, CYANIDE COMPLEX COMPOUNDS and ARSENIC COMPOUNDS</b> Cyanides, cyanide complex compounds, arsenic compounds, selenium compounds (Alkaline)</p>	<p>Wash the emptied vessel that contained the liquid waste at least three times and store the washing liquid with the waste at <math>\text{pH} \geq 9</math>. Filter off any precipitates. →Store the precipitates as “non-mercury sludge” in a separate sealed vessel. Request disposal in a timely fashion</p> <ul style="list-style-type: none"> <li>• <b>Cyanides:</b> Decompose them in principle (see note 2). (Ensure an inorganic cyanide concentration of 80 ppm at a maximum.) The compounds include ferricyanide salts and ferrocyanide salts.</li> <li>• It should not contain <b>mercury</b>. If the mercury contained is inseparable, however, restrict its content to 10 ppb at a maximum.</li> <li>• Cyanides and arsenic compounds should be stored in separate containers.</li> </ul>
4	<p><b>ALKALINE SOLUTIONS</b> Sodium hydroxide, potassium hydroxide, ammonium hydroxide, alkaline solutions containing heavy metals, etc. (Alkaline)</p>	<p>Wash the emptied vessel that contained the liquid waste at least three times and store the washing liquid. Filter off any precipitates. →Store the precipitates as “non-mercury sludge” in a separate sealed vessel. Request disposal. →The center will collect it in a timely fashion.</p> <ul style="list-style-type: none"> <li>• Sodium hydroxide, potassium hydroxide aqueous solution, etc. without harmful compounds: If waste is not excessively concentrated (not more than 5%) or in large quantities, it could be carefully disposed of after neutralization or dilution (<math>\text{pH} 5-9</math>) and confirmation of safety.</li> <li>• It should not contain <b>mercury</b>. If the mercury contained is inseparable, however, restrict the content to 10 ppb at a maximum.</li> <li>• It should not contain <b>cyanides</b>. If the cyanide contained is inseparable, however, restrict the content to 1 ppm at a maximum.</li> </ul>
5	<p><b>HYDROGEN FLUORIDE and its salts</b> Hydrogen fluoride and solutions containing its salts (Acid)</p>	<p>Wash the emptied vessel that contained the liquid waste at least three times and store the washing liquid.</p>
	<p><b>Precautions Common to All the Groups</b></p>	<p><b>Organic compounds (including chelating agent, etc.):</b> Decompose them in principle (see note 3). If the organic compounds present are inseparable, however, restrict their content to 3% at a maximum.</p> <p><b>Boron and its compounds:</b> Boron should be restricted to 200 ppm at a maximum.</p> <p><b>Osmium, thallium and beryllium</b> (see Out-of-scope liquid waste section) should not be present.</p> <p><b>Water-prohibitive substances and flammable compounds</b> (see Out-of-scope liquid waste section) should not be present.</p> <p><b>Nuclear fuel materials and radioactive waste</b> should not be present.</p>

## Collection and classification of **INORGANIC** liquid waste from experimental facilities

No and Class color	Group/Contents	Container Color Volume	Remarks
1	<b>MERCURY and MERCURY COMPOUNDS</b> Inorganic mercury compounds Organic mercury compounds (Acidification)	Gray or White 20L or 10L	<b>Wash the emptied vessel which contained the liquid wastes at least thrice, store the washing with the wastes at pH&lt; 2.</b> Filter off any precipitate →Store the precipitate as “mercury sludge” in other sealed vessel. • <b>Organic mercury compounds</b> ; Decompose organic compounds (see note 1). (>3% organic compounds) • <b>Mercury metals and mercury amalgam</b> ; Add water and store in other sealed vessel.
2	<b>ACID, CHROMIUM and HEAVY METALS</b> Bismuth, copper, cobalt, chromium, cadmium, iron, lead, manganese, nickel, silver, tin, zinc, etc. and their salts Mineral acid waste solutions, such as hydrochloric acid, sulfuric acid, nitric acid, etc. (Acidification)	Red 20L	<b>Wash the emptied vessel which contained the liquid wastes at least thrice, store the washing with the wastes at pH&lt; 4.</b> Filter off any precipitate →Store the precipitate as “non-mercury sludge” in other sealed vessel. • Liquid wastes of less than 5% sulphuric acid or hydrochloric acid without harmful compounds could be carefully disposed off after neutralization (pH 5-9). • <b>Inorganic fluoride</b> ; Do not store in container. • <b>Mercury compounds</b> ; Store the liquid wastes after ensuring the concentration below 10ppb of mercury. • <b>Cyanide and their compounds</b> ; Store the liquid wastes after ensuring the concentration below 1 ppm of cyanide.
3	<b>CYANIDE and ARSENIC COMPOUNDS</b> Cyanide compounds, cyanide complex compounds, arsenic, selenium compounds (Alkaline condition)	Orange 20L	<b>Wash the emptied vessel which contained the liquid wastes at least thrice, store the washing with the wastes at pH&gt;9.</b> Filter off any precipitate →Store the precipitate as “non-mercury sludge” in other sealed vessel. • <b>Cyanide and their compounds</b> ; Store the liquid wastes after ensuring the concentration below 80 ppm of cyanide. (see note 2) Cyanide and their compounds and arsenic compounds should be stored in separate containers.
4	<b>ALKALINE SOLUTIONS</b> Potassium hydroxide, sodium hydroxide, sodium carbonate, potassium carbonate, ammonium compound, alkaline solutions containing heavy metals, etc.	Blue 20L	<b>Wash the emptied vessel which contained the liquid wastes at least thrice, store the washing with the wastes.</b> Filter off any precipitate →Store the precipitate as “non-mercury sludge” in other sealed vessel. • Liquid wastes of less than 5 % sodium hydroxide, potassium hydroxide or their salts without harmful compounds could be carefully disposed off, after neutralization (pH 5-9). • <b>Mercury compounds</b> ; Store the liquid wastes after ensuring the concentration below 10 ppb of mercury. • <b>Cyanide and their compounds</b> ; Store the liquid wastes after ensuring the concentration below 1 ppm of cyanide.
5	<b>HYDROGEN FLUORIDE and INORGANIC FLUORIDE</b> Hydrogen fluoride, etc	White or Red with black line 20L	<b>Wash the emptied vessel which contained the liquid wastes at least thrice, store the washing with the wastes.</b>
<b>Do not store in container</b> 		Over 3 % <b>organic compounds</b> (contained cheating reagent); Decompose organic compounds. (see note 3) <b>Waterless compounds</b> (alkali metals, carbide, etc.) and <b>ignitable compounds</b> (organic lithium, organic aluminum, etc.) Over200 ppm of <b>Boron</b> <b>Osmium, thallium and beryllium</b> and their compounds ; they should be carefully stored at the user's laboratory. <b>Radioactive wastes</b>	



Notes for Table 1: List of decomposition methods

**Note 1: Organic mercury and its compounds, and inorganic mercury containing organic mercury and its compounds**

Add sulfuric acid to liquid waste to acidify it, further add potassium permanganate solution, and heat at 70°C for 2 to 3 hours to decompose the organic compounds. (The purple color of the potassium permanganate will remain.) After the processing, reduce excess potassium permanganate with a reducing agent, resulting in liquid waste containing mercury and its compounds. Since mercury vapor may be generated during heating, an activated carbon absorbing device shall be installed to remove it.

Other methods to decompose organic substances include using sodium hypochlorite in an alkaline state from sodium hydrochloride (pH 11 or higher) or by adding sodium/potassium dichromate in an acidic state from sulfuric acid, leaving the mixture for a month or more to completely decompose the organic substances, and reducing excess amounts of hexavalent chromium.

**Note 2: Cyanides**

Dilute the liquid waste to decrease the concentration of cyanide to approx. 500 ppm at a maximum, adjust the pH to 10.5 or more with sodium hydroxide, add 6% sodium hypochlorite, and shake well. Allow to stand for one hour or more, add sulfuric acid while agitating to attain a pH of 8 to 9, further add 6% sodium hypochlorite, and allow to stand for several hours. Reduce residual chlorine by using sodium sulfite, and store the mixture at a pH of 9 or more as cyanide and arsenic liquid waste. (If the mixture is acidified, highly poisonous hydrogen cyanide gas will be released.) Make sure to conduct all operations in a draft chamber.

As for liquid waste that contains persistent cyanide complexes [(RAg(CN)<sub>2</sub>, R<sub>2</sub>Ni(CN)<sub>4</sub>, R<sub>3</sub>Cu(CN)<sub>4</sub>, RAu(CN)<sub>2</sub>, R<sub>3</sub>Fe(CN)<sub>6</sub>, R<sub>4</sub>Fe(CN)<sub>6</sub>, R<sub>3</sub>Co(CN)<sub>6</sub>, etc.; R:K or Na), add approx. 25-fold volume of iron (II) sulphate heptahydrate for cyanide, adjust to a pH of 5 to 6, allow to stand, and store at a pH of 9.0 to 9.5. If precipitation occurs, filter it off. Request separate disposal of the filtered precipitates as ‘sludge (non-mercury sludge).’

**Note 3: Heavy metals containing chelating agents (complexing agent) or organic substances**

Decompose organic substances with potassium permanganate (see note 1), and handle it as liquid waste containing ‘Acid, chromium and heavy metals.’

Or, add sodium carbonate or sodium hydroxide so the mixture becomes alkaline (by selecting a pH optimal for precipitation), allow to stand for a full day and night, and filter off the precipitates. Use the metal content or the like to generate precipitates at an optimum pH (around a pH of 8, for example, for coagulation sedimentation by using copper bearing iron (II)). Care must be taken to avoid influence from ligands if complexes form. Request disposal of the filtered precipitates separately as ‘sludge (non-mercury sludge).’ Confirm that the total quantity of heavy metals is 100 mg or less, and classify the filtrate as a ‘dilute organic aqueous solution.’ It is also preferable to use PAC (poly-aluminum chloride), ferric chloride (III), iron sulfate, or polymer coagulant to facilitate the generation of precipitates.

## 2. Collection and storage of organic liquid waste

Applicable organic liquid waste includes all organic substances discharged from university laboratories, including not only flammable liquid waste but also organic flame-retardant liquid waste. Applicable liquid waste is listed under Group Nos. 1 through 5 in Tables 3 and 4.

Notes for Tables 3 and 4: List of decomposition methods

### **Note 11: Carbon disulphide**

Add potassium hydroxide to ethanol, dissolve the solution while heating (taking care not to ignite the ethanol), cool the solution with ice, and add liquid waste containing carbon disulphide to generate precipitates (potassium xanthate). Filter off the generated precipitates, and dissolve potassium xanthate in water to prepare a dilute organic aqueous solution. The filtrate shall be classified as waste solvent or a dilute organic aqueous solution according to water content. In addition, there are methods that generate ammonium xanthate salt and dithiocarbamic acid derivatives, followed by dissolving them in water.

### **Note 12: Organic aqueous solution containing heavy metals**

Decompose organic substances with potassium permanganate (see note 1), and handle it as liquid waste containing 'Acid, chromium and heavy metal.'

Or, add sodium carbonate or sodium hydroxide to induce alkaline conditions (by selecting the optimum pH for precipitation), allow to stand for a full day and night, and filter off the precipitates. Use the metal content or the like to generate precipitates at the optimum pH (around a pH of 8, for example, for coagulation sedimentation by using copper bearing iron (II)). Care must be taken to avoid influence from ligands if complexes form. Request disposal of the filtered precipitation separately as 'sludge (non-mercury sludge).' Confirm that the total quantity of heavy metals is 100 mg or less and classify the filtrate as a 'dilute organic aqueous solution.' It is also preferable to use PAC (poly-aluminum chloride), ferric chloride (III), iron sulfate, or polymer coagulant to facilitate the generation of precipitates.

### **Note 13: Photographic processing liquid waste**

This refers to photographic developers and fixing solutions for monochrome photographs used for electron micrography and medical X-ray photography in the education, research, and medical care fields. Photographic developers and fixing solutions shall be stored separately.

Fixing solution (the major component of which is sodium thiosulfate, and which contains a small quantity of sodium sulfite and acetic acid and a large quantity of silver): Outsource treatment of fixing solution to external contractors.

Photographic developers (the major components of which are hydroquinone, p-methyl aminophenol sulfate, and phenidone, and which also contains sodium sulfite, ascorbic acid, borax, and sodium hydroxide): If the solution contains no metal, classify it as a dilute organic aqueous solution. If the solution contains a large quantity (100 mg or more) of silver, classify it as a fixing solution (with a clear description that it contains a photographic developer).

## Notes

### 1. Liquid waste containing **organic mercury compounds**

Add excess potassium permanganate solution to liquid wastes and heat at 70°C for 2-3 hours to decompose organic compounds, reduce excess potassium permanganate with sodium oxalate and treat as inorganic mercury compounds.

### 2. Liquid waste containing **cyanide and their compounds**

Add sodium hypochlorite solution at pH >11, allow to stand for 1 hour and store the waste after ensure to achieve a concentration below 80 ppm of total cyanide.

(If liquid waste was made acidic, toxic cyanogen gas would be released.)

To liquid wastes containing non decomposable cyanide complexes, such as  $KAg(CN)_2$ , etc., add about 25 folds amounts of iron(II) sulphate heptahydrate for cyanide, adjust to pH 5-6 and allow to stand, store at pH 9.0-9.5 after ensure to achieve a concentration below 80 ppm of total cyanide. If precipitation occurs, filter off the precipitate.

### 3. Liquid waste containing **heavy metals containing chelating agents**

- Decompose organic compounds with potassium permanganate. (see note 1)
- Add sodium carbonate or sodium hydroxide to optimum pH, allow to stand and filter off, treat the precipitate as inorganic sludge, and treat the filtrate as dilute organic aqueous solutions group.

Table 2 Chemicals at risk of causing explosions when combined (A + B)

Chemical A	Chemical B	Chemical A	Chemical B
Alkali metals, powdered aluminum or magnesium and other substances	Carbon tetrachloride and other carbon chlorides, carbon disulphide and halogens	Inflammable liquid	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide and halogen
Chromic acid	Acetic acid, naphthalene, camphor, glycerin, turpentine oil, alcohols, oxidizable substances	Ammonia (anhydrous)	Mercury (e.g. mercury in manometer) chlorine, calcium hypochlorite, iodine, bromine, anhydrous hydrofluoric acid, silver compounds
Copper	Acetylene, hydrogen peroxide	Anhydrous hydrofluoric acid	ammonia (aqueous or anhydrous)
Silver	Acetylene, oxalic acid, tartaric acid, fulminic acid, ammonium compounds	Potassium or sodium	Carbon tetrachloride, carbon dioxide, water
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane, other petroleum gases, hydrogen, sodium, carbide, turpentine oil, benzene, finely ground metals	Potassium permanganate	Ethanol or methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulphide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Bromine	Same as with chlorine	Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, cyanic acid, hydrogen sulphide, inflammable liquid, inflammable gas
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen	Hydrocarbon (butane, propane, benzene, gasoline, turpentine oil and others)	Fluorine, bromine, chromic acid, sodium peroxide
Fluorine	Reaction rate is high for all types of compounds	Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulphide	Cumene hydroperoxide	Various types of acids (organic or inorganic)
Chlorate	Ammonium salts, various types of acids, powdered metals, sulfur, finely ground organic substances or combustible materials	Perchlorate	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood
Aniline	Nitric acid, hydrogen peroxide	Oxalic acid	Silver, mercury
Hydrogen peroxide	Copper, chromium, iron, many other metals or their salts, alcohol, acetone, organic substances, aniline, combustible materials, inflammable liquids, nitromethane	Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium/sodium permanganate, permanganate of light metals such as lithium
Mercury	Acetylene, oxalic acid, ammonia, fulminic acid	Sodium azide	Acid, heavy metals (lead, copper, mercury, silver)

## Chemicals in danger of exploding in combination (A + B)

Chemical A	Chemical B	Chemical A	Chemical B
Alkali metals, powdered aluminum or magnesium and other substances	Carbon tetrachloride and other carbon chlorides, carbon disulphide and halogen	Hydrogen peroxide	Copper, chromium, iron, many other metals or their salts, alcohol, acetone, organic substances, aniline, combustible materials, inflammable liquid, nitromethane
Metal potassium or sodium	Carbon tetrachloride, carbon dioxide, water	Ammonia (anhydrous)	Mercury(e.g. mercury in manometer) chlorine, calcium hypochloride, iodine, bromine, anhydrous hydrofluoric acid, silver compounds
Copper	Acetylene, hydrogen peroxide	Chromic acid	Acetic acid, naphthalene, camphor, glycerin, turpentine oil, alcohols, oxidizable substances
Silver	Acetylene, oxalic acid, tartaric acid, fulminic acid, ammonium compounds	Anhydrous hydrofluoric acid	ammonia (aqueous or anhydrous)
Mercury	Acetylene, oxalic acid, fulminic acid, ammonia	Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, cyanic acid, hydrogen sulphide, inflammable liquid, inflammable gas
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane, other kerosene gases, hydrogen, sodium, carbide, turpentine oil, benzene, finely ground metal	Sulphuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (or permanganate of light metals such as sodium and lithium)
Bromine	Same as the case of chlorine	Hydrocarbon (butane, propane, benzene, gasoline, turpentine oil and others)	Fluorine, bromine, chromic acid, sodium peroxide
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen	Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Fluorine	Reaction rate is high for all kinds of compounds	Aniline	Nitric acid, hydrogen peroxide
Chlorine dioxide	ammonia, methane, phosphine, hydrogen sulphide	Oxalic acid	Silver, mercury
Chlorate	Ammonium salts, various kinds of acids, powdered metal, sulphur, finely ground organic substances or combustible materials	Cumene hydroperoxide	Various kinds of acids (organic or inorganic)
Perchlorate	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood	Inflammable liquid	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide and halogen
Potassium permanganate	Ethanol or methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulphide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural	Sodium azide	Acid, lead, copper, mercury, silver

Table 3 Collection and classification of **ORGANIC** liquid waste **A** from experimental facilities

No and ID card color	Group/Contents of Liquid Waste	Remarks
1	<p><b>Waste solvents</b> Hydrocarbons, alcohols, ketones, aldehydes, esters, weak acids (such as acetic acid), weak bases (such as pyridine), volatile oils, kerosene, light oil, etc.</p>	<p>Waste solvents with a flash point of 70°C or less Set the water content to 50% or less.</p>
4	<p><b>Dilute organic aqueous solution</b> Aqueous organic acid solution, other dilute aqueous waste solvents (such as alcohol or amine) Ethers (such as diethyl ether, tetrahydrofuran, dioxane, or dimethoxyethane) Collodion Carbon disulfide  Organic aqueous solutions containing heavy metals Photographic developer (for monochrome photos)</p>	<p>Set the water content to 50% or more. Dilute formaldehyde or paraformaldehyde to 4% or less.  Make sure to dilute it with at least a 20-fold quantity of water. Do not mix with other waste solvents (to prevent electrostatic charge, superoxide production, or explosion due to decomposition). Decrease collodion content to 1% or less. Decompose it in principle (see note 11).  Decompose them in principle (see note 12). Store developers and fixers separately (see note 13).</p>
<p><b>Precautions Common to All the Groups</b></p>		<p><b>Heavy metals</b> should not be present. If the heavy metals present are inseparable, restrict the total quantity to 250 mg at a maximum in a 20-liter container. <b>Mercury should never be present.</b> <b>Flame-retardant substances, non-combustible solvents</b> and <b>waste oils</b> should not be present. However, if they are present but inseparable, restrict the content to 10% at a maximum. The same applies to organic halogen compounds. <b>Inorganic substances should not be present.</b> If they are present but inseparable, however, restrict the content to 10% at a maximum. Dilute fluorine compounds (including organic fluorine compounds) to 1% fluorine at a maximum. Follow the precautions common to all the groups in Table 1 for boron compounds. <b>Solid substances</b> (including gelatinous substances) should not be present. Liquid waste that may solidify during storage or when mixed with liquid waste containing similar groups shall be properly treated. <b>Self-decomposition explosive substances</b> (see Out-of-scope liquid waste section) should not be present. <b>Hazardous reactants</b> (see Out-of-scope liquid waste section) should not be present. <b>PCBs</b> (see Out-of-scope liquid waste section) should not be present. <b>Nuclear fuel materials and radioactive waste</b> should not be present.</p>

## Collection and classification of **ORGANIC** liquid waste A from experimental facilities

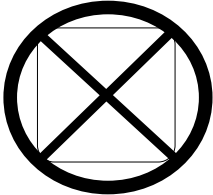
No and Class color	Group /Contents	Container Color Volume	Remarks
1	<b>WASTE ORGANIC SOLVENTS</b> Hydrocarbons, alcohols, ketones, aldehydes, esters, weak acids, amines, gas oil, kerosene, etc.	White 20L	<b>Waste solvent with flash point lower than 70°C.</b> Water content should be below 50 %.
4	<b>DILUTE AQUEOUS ORGANIC SOLUTIONS</b> Aqueous organic acid solutions Dilute aqueous organic solvents (alcohols, formalin, amines, etc.) Ethers(diethyl ether, tetrahydrofuran, dioxane, dimethoxyethane, etc.) Collodion Carbon disulphide Aqueous organic solutions containing metals Photographic developer	White 20L	Water content should be greater than 50 % Content of compounds having formaldehyde or praformaldehyde should be less than 4%.  Ethers should be diluted with over 20-folds of water and mixed with no other waste solvents.  Collodion content should be less than 1 %. Convert carbon disulphide to xanthate or dithiocarbamate and dissolve in water. Add sodium carbonate or sodium hydroxide to the optimum pH, allow to stand and filter off, treat precipitate as inorganic sludge, treat filtrate as dilute organic aqueous solutions group. (see note 5) Fixer and developer should be stored in separate containers.
<b>Do not store in container</b> 			More than 250 mg of <b>total heavy metals</b> . Especially <b>mercury</b> and mercury compounds. More than 10% of other <b>inorganic compounds</b> . Waste organic solvents should be free from slightly and <b>non combustibile organic solvents</b> and <b>waste oil</b> groups. Especially more than 1% of <b>fluoride</b> and their inorganic and organic compounds.. <b>Precipitate and sludge.</b> <b>Polychlorinated biphenyls (PCB)</b> , Polychlorinated naphthalene (chlorine number more than 3) and Hexachlorobenzene ; they should be carefully stored at the user's laboratory. Explosive substances by self-decomposition, such as polynitrocompounds peroxides, etc. <b>Highly reactive and dangerous substances,</b> such as styrene monomer, etc.

Table 4 Collection and classification of **ORGANIC** liquid waste B from experimental facilities

No and ID card color	Group/Contents of Liquid Waste	Remarks
2	<p><b>Flame-retardant substances and non-combustible solvents</b> Halides such as chloroform, dichloromethane, and carbon tetrachloride</p>	CN compounds such as acetonitrile should not be present.
3	<p><b>Waste oils</b> Lubricant, gear oil, cylinder oil, turbine oil, animal and vegetable oils, etc.</p>	Waste oil with a flash point of 70°C or more CN compounds such as acetonitrile, flame-retardant substances, and non-combustible solvents should not be present.
5	<p><b>Photographic fixer</b> Photographic fixer (for monochrome photos)</p>	Store developers and fixers separately (see note 13).
<p><b>Precautions Common to All the Groups</b></p>		<p><b>Heavy metals</b> should not be present.  <b>Mercury should never be present.</b>  <b>Inorganic substances should not be present.</b> If they are present but inseparable, however, restrict the content to 10% at a maximum. Dilute fluorine compounds (including organic fluorine compounds) to 1% fluorine at a maximum. Follow the precautions common to all the groups in Table 1 for boron compounds.  <b>Solid substances</b> (including gelatinous substances) should not be present. Liquid waste that may solidify during storage or when mixed with liquid waste containing similar groups shall be properly treated.  <b>Self-decomposition explosive substances</b> (see Out-of-scope Liquid Waste section) should not be present.  <b>Hazardous reactants</b> (see Out-of-scope Liquid Waste section) should not be present.  <b>PCBs</b> (see Out-of-scope Liquid Waste section) should not be present.  <b>Nuclear fuel materials and radioactive waste</b> should not be present.</p>

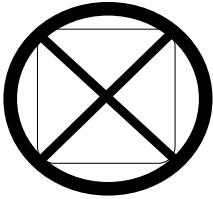


3. Out-of-scope liquid waste (waste that cannot be disposed of)
  - 1) Nuclear fuel materials and radioactive waste (including substances that were converted to radioactive waste in the course of conducting experiments)
  - 2) Infectious waste and possibly infectious waste
  - 3) PCB (polychlorinated biphenyl), polychlorinated naphthalene (with 3 chlorines or more), hexachlorobenzene (necessary to store under strict control at the site of generation; refer to reference 9), and dioxins
  - 4) Self-decomposition explosive substances (such as explosives, poly-nitro compounds, acetylenic compounds, or peroxides)
  - 5) Hazardous reactants (such as substances that will burn or explode due to decomposition when mixed with other substances such as an organic substance with concentrated acid, or an organic substance with benzoyl peroxide, or monomers that can easily polymerize such as styrene monomers)
  - 6) Water-prohibitive substances (such as alkali metals, organic metal compounds like organic lithium compounds, metal hydrides, or carbides) and combustible substances (such as organic lithium, organic aluminum, yellow phosphorus, reduced nickel, reduced platinum, or reduced palladium)
  - 7) Chemical substances that may cause health problems or accidents during work at treatment facilities
  - 8) Osmium tetroxide and thallium (for which a treatment method has not been established; necessary to store under strict control at the site of generation)

In addition, beryllium treatment is difficult and is recommended to be carried out at the site of generation wherever possible. Since beryllium carbonates or phosphates are insoluble in water, their salts can be separated and then disposed of.

The above-mentioned substances and liquid waste that contain these substances even in small quantities shall be stored under strict control at the site of generation. If a treatment method for some substances has been established, it shall be followed.

## Collection and classification of **ORGANIC** liquid waste B from experimental facilities

No and Class color	Group /Contents	Container Color Volume	Remarks
2	<b>SLIGHTLY and NON COMBUSTIBLE ORGANIC SOLVENTS</b> Chloroform, carbon tetrachloride, dichloromethane, etc.	White 8L	Slightly and non combustible organic solvents should be free from CN compounds such as acetonitrile, etc.
3	<b>WASTE OILS</b> Machine oils, etc.	White 8L	<b>Waste oil with flash point higher than 70°C</b> Waste oils should be free from CN compounds such as acetonitrile, etc. Waste oils should be free from slightly and non combustible organic solvents group.
5	<b>Photographic fixer</b>	White 8L	Fixer and developer should be stored in separate containers.
<b>Do not store in container</b> 		<b>Total heavy metals and mercury</b> , mercury compounds. More than 10% of other <b>inorganic compounds</b> . Especially more than 1% of <b>fluoride</b> and their inorganic and organic compounds.. <b>Precipitate and sludge.</b> <b>Polychlorinated biphenyls (PCB)</b> , Polychlorinated naphthalene (chlorine number more than 3) and Hexachlorobenzene ; they should be carefully stored at the user's laboratory. Explosive substances by self-decomposition, such as polynitrocompounds peroxides, etc. <b>Highly reactive and dangerous substances</b> , such as styrene monomer, etc.	

#### 4. Designated containers and collection system

##### 1) Designated containers

###### (1) Size and materials

Organic A (waste solvents and dilute organic aqueous solution): 20-liter plastic container designated by contractors; to be loaned

Organic B (flame-retardant or non-combustible solvents, waste oils, fixers, etc.): 10-liter polyethylene containers (160 x 260 mm; height: 340 mm; thickness: 1.0 mm or more)

Inorganic (excluding mercury and mercury compounds): 20-liter polyethylene container (160 x 350 mm; height: 410 mm; thickness: 1.3 mm or more)

Inorganic (mercury and mercury compounds): Either the above-mentioned 10- or 20-liter polyethylene container can be used (will not be returned).

Note that polyethylene is easily corroded by organic solvents (such as chloroform and ether, in particular). Periodically renew the designated containers.

###### (2) Color: See Table 5.

Table 5 Designated colors and colors of ID cards

	Classification of liquid waste	Storage capacity	Container color or band color	Colors of ID cards
<b>Inorganic liquid waste</b>	Mercury and mercury compounds	10/20 L	Gray/white (gray band)	Gray
	Acid, chromium and heavy metals	20 L	Red	Red
	Cyanides, cyanide complex compounds and arsenic compounds	20 L	Orange	Orange
	Alkaline	20 L	Blue	Blue
	Hydrogen fluoride and its salts	20 L	White/red (black band)	Violet
<b>Organic liquid waste</b>	Waste solvents	20 L	White	Yellow
	Dilute organic aqueous solutions	20 L	White	White
	Flame-retardant/non-combustible solvents	8 L	White	Olive
	Waste oils	8 L	White	Ivory
	Photographic fixer	8 L	White	Pink

###### (3) Returning after treatment

Among the above classifications, containers other than 'Mercury and mercury compounds' shall be returned after treatment, and can be used for the next storage requirement. However, it can take several months until being returned since treatment is outsourced to external contractors.

Sometimes containers from other groups may be returned. To ensure the return of containers to their own group, attach a group name label at a readily-identifiable location on the container or take other measures to prevent mix-ups.

**Containers for ‘Mercury and mercury compounds’ will not be returned.** Therefore, either 10- or 20-liter plastic white containers can be used (with a gray tape band).

2) ID card

(1) Colored section-specific cards: Shown on the next page and Table 5.

(2) Card case and section-specific colors

Use a size-A5 soft non-vinyl chloride case (222 x 155 mm) as the card case. Attach plastic section -specific colored tape (see Table 6) near the opening on the front and back sides of the case. Make a hole on one side of the opening to allow a cord to pass through.

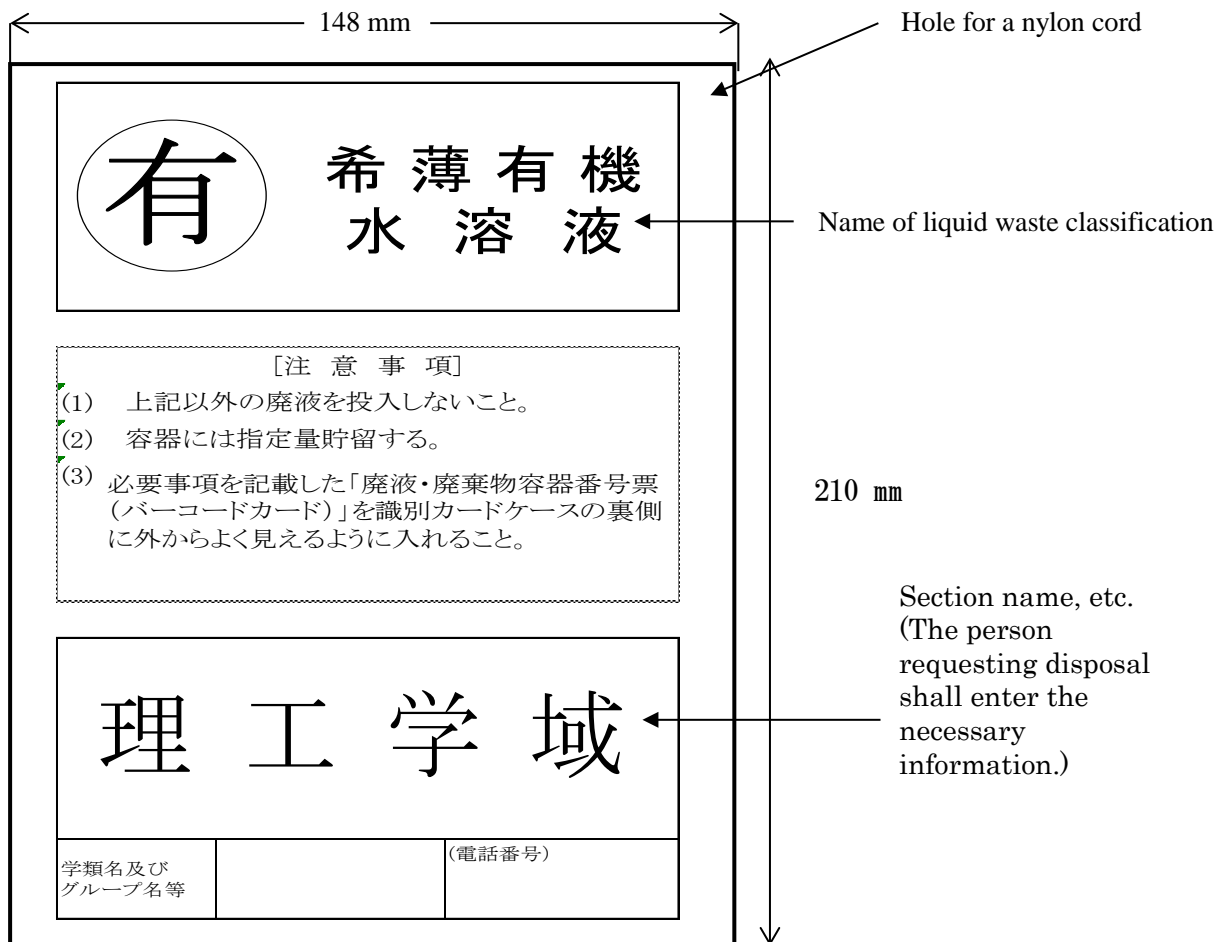
(3) Attachment position

Attach the ID card case with a polyethylene (or nylon) cord (with a diameter of 3 mm) tied to the handle of the designated container.

Be sure to use liquid waste classification ID cards and section identification tape as designated.

Table 6 Identification colors of sections and collection sites

Section (collection site) name	Color	Section (collection site) name	Color
Institute of Science and Technology, Institute of Nature and Environment Technology (Natural Science & Technology Building)	Orange	Graduate School of Medical Sciences, Takara-machi Campus, Advanced Science Research Center, Cancer Research Institute (Medical Building D, Building AB (Blue tape on the handle), Building C (Pink tape on the handle))	Blue
Institute of Science and Technology, No.5 Building Advanced Science Research Center (Natural Science No.5 Building)	Sky blue	Graduate School of Medical Sciences, Kakuma Campus, Advanced Science Research Center (Natural Science & Technology Building)	Brown
Graduate School of Human and Social Sciences (Human Science (formerly the College of Education) Building/Senior High School)	Green	Graduate School of Medical Sciences, Tsuruma Campus (Health Science Building)	Gray
Cancer Research Institute (Cancer Research Institute Building)	White	Kanazawa University Hospital (University Hospital Building)	Red
Institute of Liberal Arts and Science (General Education Building)	Yellow	Others (Administrative Office Building, etc.)	Black



ID card (size A5)

List of liquid waste classification names

	<p>* Users must prepare card cases and cords by themselves.          Request ID cards from the Environment Preservation Center.</p>	

5. Collection and storage of the sludge

Precipitates or sludge (such as hydroxides of heavy metals or calcium fluoride) generated from pre-treatment of liquid waste are disposed of as sludge. Therefore, designate them as waste ‘sludge’ in the Chemical Substance Management System and request disposal. If the contents of the sludge are not registered at the time of the request for discharge, enter the name of the contents in the remarks field, as well as the total weight and water content (with a pH of 7), and store the sludge in a thick, transparent plastic bag for each group. Filter paper used to filter the precipitates shall be stored with the sludge.

Among non-mercury waste (sludge), ‘glass’ and ‘plastics’ contaminated with hazardous substances shall be sufficiently washed with acid, organic solvent, or water wherever possible. Confirm that no hazardous substances are soluble, and dispose of them as general industrial waste. When disposing of washing solutions used for these substances, separately request from the Environment Preservation Center disposal as liquid waste categorized as washing solvents and hazardous substances.

The table below indicates the classification of liquid waste (sludge) to be collected by the Environment Preservation Center. If you directly outsource disposal to an external disposal waste contractor, observe the description of ‘V-1 Sorting of waste.’

As for mercury waste, you must always request disposal from the Environment Preservation Center.

Table 7 Classification of waste at the Environment Preservation Center

Classification		Remarks
Mercury	<b>Hg sludge</b> Mercury-contaminated sludge	Sludge containing mercury (such as precipitates and sludge), metal mercury, amalgam, etc.; including paper used for filtering
	<b>Hg glass</b> Mercury-contaminated glass (including ceramics)	Glassware contaminated with mercury, mercury thermometers, etc.
	<b>Hg plastics</b> Mercury-contaminated rubber/plastic	Rubber products or plastic products, etc. contaminated with mercury
	<b>Hg metal products</b> Mercury-contaminated metal containers	Iron or other metal containers, etc. contaminated with mercury. Metal mercury is classified as ‘Hg sludge.’
Non-mercury	<b>Sludge</b> Sludge (inorganic sludge)	Sludge contaminated with inorganic hazardous substances such as heavy metals (such as precipitates and sludge), heavy metals used in experiments; including paper used for filtering
	<b>Glass</b> Glass contaminated with hazardous substances (including ceramics)	Glassware contaminated with hazardous substances such as heavy metals, silica gel, etc.
	<b>Plastics</b> Rubbers/plastics contaminated with hazardous substances	Rubber products or plastic products contaminated with hazardous substances such as heavy metals
	<b>Organic sludge</b> Sludge (organic sludge)	Sludge contaminated with organic hazardous substances (such as precipitates and sludge); including paper used for filtering Waste activated carbon (Do not mix with other substances.)

The paragraphs below describe examples of the disposal of used plastic containers and waste silica.

1) Used plastic containers

If plastic containers borrowed from contractors (20-liter white container with the contractor's name on it) are no longer necessary, return them to the Environment Preservation Center. (The center records the number of containers loaned out to each section.)

If plastic containers other than the above become unnecessary due to dirt or damage, wash them as described below, and securely tie the same group of five containers at a maximum with a strap. Classify them as the waste 'plastics' according to the Chemical Substance Management System (or 'Hg plastics' in the case of gray or mercury-contaminated containers), enter '(Group name) Plastic container: Number of containers.' Also enter the total weight and water content (with a pH of 7) with no content, and request discharge. The Environment Preservation Center will collect used containers and outsource disposal. Never discharge them as ordinary landfill waste.

If you have any questions, consult with the Environment Preservation Center.

(1) **10-liter white plastic containers** (limited to organic liquid waste containers (flame-retardant/non-combustible, waste oil, or fixer)):

- ① Thoroughly wash with water and air dry. (Removal of solids: Separately request the disposal of solids as 'sludge' or 'organic sludge'.)
- ② Designate the washing solution as 'dilute organic aqueous solution' liquid waste. (In a request for discharge via the Chemical Substance Management System, enter the plastic container washing solution as the group name in the remarks field, the presumed mixed component names and maximum quantity of the respective components.)

(2) **Red plastic containers** (excluding contamination with mercury):

- ① Thoroughly wash with acid (such as several moles of hydrochloric acid) to remove heavy metals completely, wash with water and air dry.
- ② Designate the washing solution as 'acid, chromium and heavy metal' liquid waste. (As with white containers, enter in the Chemical Substance Management System.)

(3) **Orange/blue plastic containers** (excluding contamination with mercury):

- ① Thoroughly wash with water and air dry.
- ② Designate the washing solution as 'cyanides, cyanide complex compound and arsenal compound' liquid waste. (As with white containers, enter in the Chemical Substance Management System.)

(4) **Gray plastic containers:**

- ① Gray plastic containers are collected as 'Hg plastics' without washing. However, designate liquid in the container as 'mercury and mercury compounds' liquid waste and separately request disposal.

Note 1: Handle 10-liter white plastic containers contaminated with heavy metals as red containers as described above.

Note 2: Handle white plastic containers contaminated with cyanides or arsenal compounds as orange/blue containers as described above.

Note 3: Handle other plastic containers contaminated with mercury as gray containers as described above.

Clearly write or label mercury-contaminated containers as [Mercury-contaminated] or the like at a readily visible location.

## 2) Waste silica

As for the method to request disposal in the Chemical Substance Management System, please refer to the section on 'Used plastic containers' on the previous page.

- (1) Request disposal as ordinary sludge.
- (2) Store waste silica in a thick, transparent plastic bag, and prevent the contents from leaking. The weight shall be limited to below 10 kg.
- (3) Enter XX-adhered (absorbed) silica (gel) in the remarks field with the names of the adhered (absorbed) substances and their presumed quantity. Enter the gross weight. Classify it as glass, and enter the presumed water content.
- (4) Separately store silica mounted on plates for thin-layer chromatography. (It is preferable to separate silica from plates wherever possible, and divide the materials into silica, glass plates, and aluminum plates for classified storage.) If silica remains on a plate, enter XX-adhered (absorbed) silica gel with glass (or aluminum) plate for thin-layer chromatography in the remarks field, and handle it as described above.

Optimum disposal methods shall be outsourced to and conducted by external contractors.

Follow similar disposal request procedures and collection methods for sludge. The date of collection will separately be notified by taking the requested disposal quantity into consideration. (The frequency of sludge collection and disposal is usually once in several years.)

For other sludge, also enter the names of adhered (absorbed) or possibly adhered (absorbed) hazardous substances and their presumed quantities in the remarks field. Be sure to enter the gross weight.

## 6. Disposal of liquid waste of unknown content

If there is a reagent, liquid waste, or solid waste of unknown content, outsource its disposal to external disposal waste contractors.



## 7. Other precautions

### 1) Waste

- ① Observe V-2 'Disposal of industrial waste.'
- ② When outsourcing the collection, transportation, or disposal of waste, in particular, follow the description from 'outsourcing of disposal' in the previous section. Registration in the manifest management of the Chemical Substance Management System is necessary.
- ③ Polymerized acrylamide and media used in experiments shall be disposed of as industrial waste. (Never discard as general refuse.)

### 2) Laboratory safety

- (1) Observance of 5S: Always maintain the laboratories and chemical substances in an organized state
  - ① Conduct the 5S activity (Sort, Set in order, Scrub, Standardize, and Sustain).
  - ② 'Sort' means 'to distinguish necessary items from unnecessary ones and dispose of (discard) the latter.'
  - ③ 'Set in order' means 'to place necessary items in easy-to-understand and safe manner so that they can be taken out in required quantities at the required time.'
  - ④ 'Scrub' means 'to remove dirt and dust and suppress their occurrence, and to inspect the condition of facilities and fixtures.'
  - ⑤ 'Standardize' means 'to maintain the sorted, organized, and clean state mentioned above.'
  - ⑥ 'Sustain' means 'to promote a habit of carrying out the above activities (Sort, Set in order, Scrub, and Standardize).'
- (2) Local ventilators
  - ① In principle, handle designated chemical substances in the draft chamber.
  - ② Conduct necessary periodic and start-up inspections to ensure maximum performance of the draft chamber. Store the inspection record for the specified period.
  - ③ Close the door of the draft chamber during experiments. If the door must be opened, open it only half way. Do not put your face in the chamber while conducting experiments.
  - ④ Install exhaust gas treatment equipment in the draft chamber wherever possible.
- (3) Assurance of evacuation routes
  - ① Ensure a width of 80 cm or more for passageways in laboratories.
  - ② Ensure that there are at least two entrances/exits for each room.
  - ③ Do not leave items in the hallways and passageways.
  - ④ Clearly indicate the evacuation routes.
- (4) Emergency response
  - ① Install shower units and eye washing devices for emergency, and confirm their locations.
  - ② Always make gas masks (of the appropriate type), gloves, and safety goggles available.
- (5) High-pressure gas cylinders
  - ① Ensure that the total capacity of high-pressure gas cylinders does not exceed the level specified by applicable laws and regulations. Do not put in place unnecessary gas cylinders.
  - ② Take fall prevention measures for gas cylinders. Make sure to stand them upright; do not

lay them down. When storing them upright, fix them at two locations using chains.

- (6) Education on safety, use of procedure manuals, and storage of records
  - ① Prepare work instructions and operation manuals, and always make them available. Emergency responses shall be described in the manuals. Store records for the specified time periods.
  - ② Provide education on safety. Hazardous points shall be easily recognizable.
- (7) Other precautions for laboratories
  - ① Separate laboratories from living spaces. Eating and drinking in laboratories is strictly prohibited.
  - ② Avoid connecting many devices to a single outlet via a power strip.
  - ③ Prevent the risk of falls from high places.
- 3) Others
  - (1) Experiments require careful preparation. Always assume that experiments carry risk (burns, explosions, fires, etc.), and check for appropriate measures in the case of accidents (such as checking for evacuation routes) before starting any experiment. Also be prepared to take action against possible accidents.
  - (2) Wear gloves and safety goggles in the laboratory since foreign matter such as reaction solution splattering due to bumping may enter the eye. Exercise due caution since alkaline solutions or substances (such as ethylenediamine or sodium hydroxide) in particular may cause loss of vision. Safety goggles shall preferably be made of plastic. Wear a designated protective mask or gas mask as required.
  - (3) Wear a lab coat made of natural fibers such as cotton in the laboratory. Always wear clothes that are properly buttoned-up or suitable for experiments. Minimize skin exposure and be careful not to allow chemicals to adhere to the skin. Wear sneakers or other shoes that firmly catch the laboratory floor and are easy to move around in.
  - (4) Check glassware for any cracks before using it. Since glassware is easy to break, closely pay attention to handling to prevent cuts or other injuries. Since glass pipettes break quite easily, avoid handling them roughly.
  - (5) Place plastic trays below glassware or filtration equipment to prevent reaction liquids or filtrates from flowing into the sink even when they inadvertently fall.
  - (6) Glassware does not turn color even when heated. Be careful not to burn yourself on any hot glassware.
  - (7) Sufficiently check reagent names. Mix or add reagents in small quantities while observing the condition of the solution. Cool it if necessary.
  - (8) When heating a water bath (cold or hot) with a blowtorch, ensure that inflammable organic solvent (such as alcohol or acetone) is not placed in the surrounding area. Be careful not to allow any instrument such as a beaker to fall down into the water bath. If it falls down, be careful not to allow reaction liquid or hot water to splatter onto you. In principle, do not use heating equipment that generates a flame in the same room where organic solvents are used.
  - (9) Prepare designated liquid waste containers. Check them for any cracks or damage before commencing storage. Do not use excessively dirty containers. Remove dirt wherever possible. Check that containers are provided with ID cards and liquid waste container

number labels (barcode labels).

- (10) Liquid waste containers deteriorate through long-time use. Deterioration accelerates if containers are subject to direct sunlight exposure and deterioration rate may vary depending on the chemicals stored. If you notice that a container has become hard or wall thickness has become thinner, do not use it.
- (11) Properly treat liquid waste containing chemicals, place them in specified liquid waste containers and store them. Do not casually discard liquid waste into sewers. When the quantity reaches the specified level, take necessary measures. Do not store liquid waste over the specified quantity.
- (12) Note that some types of liquid waste may cause explosions, intense reactions, or generation of toxic gas and may be very dangerous when mixed. Precipitates may form when some types of waste are mixed. Before mixing liquid waste, first mix them in small quantities and confirm there is no abnormal generation of heat. If possible, distinguish liquid waste containers for each experiment, and color-code them with stickers to prevent mix-ups. Dilute highly-concentrated liquids before storage to prevent accidents.
- (13) Place a tray below liquid waste containers just in case liquid waste spills occur.
- (14) Store filled liquid waste containers at specified places. (Some waste groups or contents may be designated as hazardous substances according to the Fire Service Act.)
- (15) Since 20-liter plastic containers designated by contractors are borrowed items, handle them with care, and never use them for purposes other than the storage of liquid waste outsourced to the contractors for disposal.
- (16) If a chemical enters the eye, thoroughly wash the eye and seek medical care from an ophthalmologist. If an alkali enters the eye, immediately wash the eye under running water for at least 10 minutes and seek medical care from an ophthalmologist.
- (17) If a chemical adheres to the skin or you are burned, thoroughly wash the skin with water and seek medical care.
- (18) Learn general first-aid skills for chemical poisoning, injury due to broken glass, and electric shock.

## V Disposal of Waste

### 1. Classification of waste

Kanazawa University has established the 'Bylaws of Waste Disposal at Kanazawa University' (hereinafter referred to as 'the Bylaws') to suppress the discharge of waste from the university, promote waste recycling, and properly manage waste.

The Bylaws define waste as substances that are discarded or discharged in the course of performing activities at the university such as in education, research, and medical practice (excluding radioactive substances and those contaminated with radioactive substances) and specified by the Waste Management and Public Cleansing Act. We usually handle substances used in experiments, research, and medical practice as industrial waste or specially-controlled industrial waste, in principle. Those who discharge waste or who move waste are considered to be waste handlers regardless if they are faculty members or students. Regional managers shall serve as persons in charge of waste (persons who are responsible for waste) for both general waste and recyclable waste. Entities that discharge waste or their representatives shall serve as persons in charge of industrial waste. Waste handlers shall observe the items specified by the Bylaws as indicated below and the rules set forth in each region and shall properly dispose of waste.

- 1) Make efforts to recycle and recover waste to use as resources.
- 2) Recognize that waste may harm people's lives and health, and the environment.
- 3) In discharging waste, observe laws and regulations, and university standards, and follow measures taken by the persons in charge of environmental management and regional managers.
- 4) Properly sort, store, and discharge waste, and make efforts to maintain a good university environment and prevent contamination of the external environment.
- 5) Classify waste according to the tables provided from the next page onward, and discharge waste to specified storage facilities (such as trash cans and dumpsites).
- 6) Make efforts to tidy up storage facilities.
- 7) Prevent scattering, leakage, underground penetration, and release of odors when discharging waste. If there is a risk of any of the above, immediately take appropriate measures to prevent it, and make efforts to prevent accidents.
- 8) Dispose of waste containing chemical substances according to the 'Bylaws of Chemical Substance Management at Kanazawa University.'
- 9) Set forth those who discharge industrial waste and their contents.
- 10) Waste to be disposed of by the university includes only that which is generated by activities at the university. Never carry in waste from outside the university.
- 11) If you uncover a waste-related accident, take necessary measures and report the accident and its details to the regional manager or the like without delay.

'Guideline for classification and how to throw out trash (for undergraduates)' (in Japanese and English) and 'Guideline for classification of waste (for faculty members and graduate students)' (in Japanese and English) can be viewed on the university's website

(<http://www.kanazawa-u.ac.jp/university/corporation/kankyuu>).

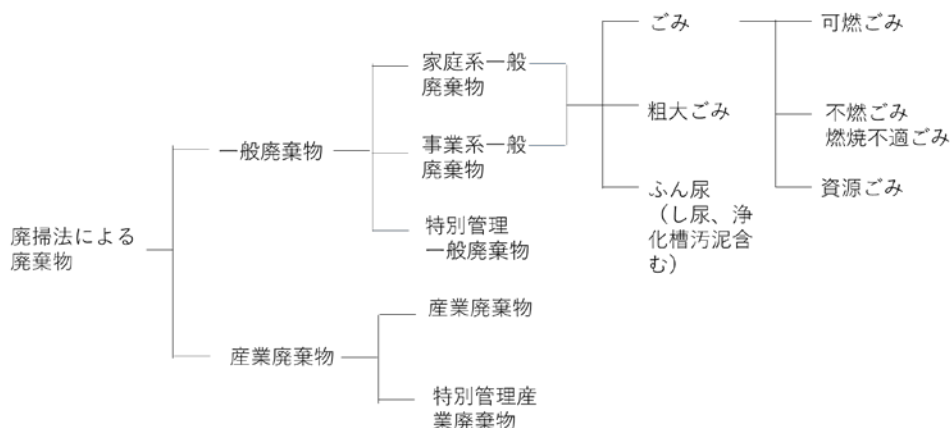
## 2. Disposal of industrial waste

### 1) Applicable laws and regulations

Disposal of industrial waste is set forth by the Waste Management and Public Cleansing Act (Law No. 137 of 1970) and its related ordinances. The act is amended almost every year.

### 2) Definition and classification of waste

According to the act, waste is defined as solid or liquid matter generated by persons who discharge it and which has no use since it cannot be sold to others for value. The chart below shows an example of waste classification.



#### (1) Specially-controlled general waste

Among general waste items, those which may be explosive, toxic, or infectious and that have properties that may harm people's health or the living environment

Those listed in the table below are specified under this category.

Type of specially-controlled general waste	Remarks	Specific examples, etc. (mainly in the university)
Parts using PCBs	Parts using PCBs incorporated in waste air conditioners, waste TV receivers, and waste microwave ovens	
Waste mercury	Waste mercury collected from general waste pertaining to products that use mercury	
Soot and dust	Soot and dust collected by dust collecting facilities at general garbage incineration facilities (with a processing capacity of 5 tons/day or more) and not classified as industrial waste	
Soot and dust, burnt residue, and sludge	Waste collected from waste incinerators that are specified facilities under the Act on Special Measures concerning Countermeasures against Dioxins, and waste containing dioxins exceeding 3 ng/g	
Infectious general waste	Waste containing or bearing infectious pathogens or waste with such a possibility at hospitals, universities, and their affiliate research institutes (medical, pharmaceutical or veterinary science) and not classified as industrial waste	Absorbent cotton, gauze, etc.

#### (2) General waste from business activities

Waste generated from the business activities and not classified as industrial waste

(3) Industrial waste

Waste generated from the business activities listed below

Type of industrial waste	Specific examples, etc. (mainly in the university)
Burnt residue	Wood ash, waste carbon, waste activated carbon, soot, incineration ash
Sludge	Grinding sludge, metal hydroxide sludge, waste clay, waste pigments, other sludge from liquid waste treatment (such as calcium fluoride), sludge caused by biological treatment of drainage, papermaking sludge, sludge from sewage treatment plants, etc.
Waste oil	Waste oil with a flash point of 70°C or more (mainly hazardous substances of grade 4-3 or higher), machine oil, waste oil paint/ink, glycerin, triethanolamine, aniline, formamide, cresol, cooking oil, lard, etc. (excluding those classified as specially-controlled industrial waste) Crayon, solid fatty acid, solid soap, asphalt, paraffin wax, etc.
Waste acid	Waste acid at a pH of 2–7, liquid waste of sulfuric acid, chloric acid, or nitric acid and their salts, organic acid liquid waste from acetic acid or the like, waste photographic fixer, waste salt solutions from various acids, etc.
Waste alkali	Liquid waste at a pH of 7–12.5, liquid waste such as ammonia or sodium hydroxide, waste photographic developer, waste salt solutions from various alkalis, etc.
Waste plastics	Resins such as polyethylene resin and polypropylene resin (including styrene foams), synthetic fibers such as nylon/polyester fibers (including blended fabric containing less than 50% natural fibers), synthetic leather, waste solid paints, waste adhesive agents, fiber-reinforced plastics (FRPs), celluloid, waste ion-exchange resin, waste synthetic rubber, waste chemical scraps, synthetic rubber products, etc.
Waste rubber	Waste natural rubber, waste ebonite, waste latex, etc.
Waste metal	Emptied cans, waste galvanized iron or tin plate, metal waste such as waste iron or aluminum, etc.
Waste glass and ceramic ware	Light bulbs (including fluorescent lamps, etc.), glassware (window glass, bottles, glass wool, laboratory glassware, vials, thermometers, etc.), waste ceramics, brick, ceramic ware, waste concrete products, etc.
Slag	Metal slag, waste casting sand, etc.
Debris	Concrete debris, stone, brick, slate, tile, and other similar waste released due to structure removal (excluding waste wood from construction sites)
Soot and dust	Soot and dust generated from soot- and smoke-emitting facilities or industrial waste incineration facilities specified by the Air Pollution Control Act and collected by dust collecting facilities
Waste paper	Limited to industries such as construction, paper manufacturing, publication and printing industries
Waste wood	Limited to industries related to construction and lumber industries
Waste fiber (limited to natural fiber)	Limited to industries related to construction and textile industries
Animal and plant residue	Limited to industries such as food, pharmaceutical products, and perfumery industries
Unnecessary solid animal substances	Unnecessary solid substances from livestock and poultry slaughtered at abattoirs and poultry processing plants
Excreta from livestock	Limited to those related to the stock-raising industry
Livestock carcasses	Limited to those related to the stock-raising industry
Waste under Ordinance No. 13	Waste produced after treatment of any of the above-mentioned industrial waste and not classified as belonging to any of the listed industrial waste categories (such as solidified concrete, etc.)

\* Separate fluorescent lamps and dry cells, and discard them using the specified methods.

**Among the above waste items, refer to ‘TV Collection and Storage of Liquid Wastes’ if any can be collected by the Environment Preservation Center.**

(4) Specially-controlled industrial waste

Among industrial waste items, specially-controlled industrial waste is defined as that which has explosive, toxic, and infectious potential and that which may harm people's health or the living environment, including industrial waste listed in the table below.

Specially-controlled industrial waste	Specific examples, etc.
Waste oil	Volatile oil or light oil industrial waste with a flash point of 70°C or less (mainly hazardous substances of grade 4-2 or lower), gasoline, kerosene, light oil, heavy oil, benzene, toluene, thinner, ethers, alcohols, ketones, esters and other organic solvents (Those with a flash point of 70°C or more, however, are classified as industrial waste.)
Waste acid	Waste acid with excessive corrosiveness and a pH of 2.0 or less
Waste alkali	Waste alkali with excessive corrosiveness and a pH of 12.5 or more
Infectious industrial waste	Industrial waste containing or possibly containing infectious pathogens such as blood or used injection needles discharged by medical institutions
Specified hazardous industrial waste Waste PCBs, etc.	Waste PCBs and waste oil containing PCBs
Specified hazardous industrial waste Waste contaminated by PCBs	Waste paper, waste wood, or waste fibers coated with PCBs or with absorbed PCBs, waste plastics or waste metal with adherent or sealed in PCBs, or waste ceramic ware with adherent PCBs
Specified hazardous industrial waste Waste used for PCB treatment	Substances used for treating waste PCBs or PCB-contaminated substances
Specified hazardous industrial waste Waste mercury, etc.	Waste mercury produced at specified facilities (including universities and their research institutes), etc. Industrial waste containing mercury or mercury compounds, or waste mercury collected from industrial waste pertaining to mercury-containing products
Specified hazardous industrial waste Specified sewage sludge	Sludge specified by the provision of Paragraph 4, Order for Enforcement of the Sewerage Act No. 13
Specified hazardous industrial waste Waste asbestos, etc.	Scattering sprayed-on asbestos and heat insulating materials containing asbestos, etc. removed from buildings, and plastic sheets discharged from asbestos disposal work Scattering asbestos, etc. collected by dust collecting equipment at business entities having specified dust discharging facilities designated by the Air Pollution Control Act
Specified hazardous industrial waste Burnt residue	Those not conforming to the 'Judgment criteria of industrial waste containing metals' (see the next page)
Specified hazardous industrial waste Soot and dust	Those not conforming to the 'Judgment criteria of industrial waste containing metals' (see the next page)
Specified hazardous industrial waste Waste acid/waste alkali Sludge	Waste from facilities designated by the ordinance and not conforming to the 'Judgment criteria of industrial waste containing metals' (see the next page)
Specified hazardous industrial waste Slag	Those not conforming to the 'Judgment criteria of industrial waste containing metals' (see the next page)
Specified hazardous industrial waste Waste oil	Waste solvents from 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, benzene, or 1,4-dioxane (regardless of the contents)

**\* Among the above waste items, refer to 'IV Collection and Storage of Liquid Wastes' if any of them can be collected by the Environment Preservation Center.**

(5) Judgment criteria for industrial waste containing metals

Name of metal	Burnt residue, slag, and soot and dust	Sludge and waste under Ordinance No. 13	Waste acid and waste alkali
	Dissolution test (mg/L)	Dissolution test (mg/L)	Content test (mg/L)
1 Alkyl mercury compounds (R-Hg)	No detection	No detection	No detection
Mercury or mercury compounds (Hg)	0.005 or less	0.005 or less	0.05 or less
2 Cadmium or cadmium compounds (Cd)	0.09 or less	0.09 or less	0.3 or less
3 Lead or lead compounds (Pb)	0.3 or less	0.3 or less	1 or less
4 Organic phosphorous compounds (O-P)	—	1 or less	1 or less
5 Hexavalent chromium compounds (Cr <sup>6+</sup> )	1.5 or less	1.5 or less	5 or less
6 Arsenic or arsenic compounds (As)	0.3 or less	0.3 or less	1 or less
7 Cyanides (CN)	—	1 or less	1 or less
8 PCBs	—	0.003 or less	0.03 or less
9 Trichloroethylene (TCE)	—	0.1 or less	1 or less
10 Tetrachloroethylene (PCE)	—	0.1 or less	1 or less
11 Dichloromethane	—	0.2 or less	2 or less
12 Carbon tetrachloride (CCl <sub>4</sub> )	—	0.02 or less	0.2 or less
13 1,2- dichloroethane	—	0.04 or less	0.4 or less
14 1,1- dichloroethylene	—	1 or less	10 or less
15 cis-1,2- dichloroethylene	—	0.4 or less	4 or less
16 1,1,1- trichloroethane	—	3.0 or less	30 or less
17 1,1,2- trichloroethane	—	0.06 or less	0.6 or less
18 1,3-dichloropropene (D-D)	—	0.02 or less	0.2 or less
19 Thiuram	—	0.06 or less	0.6 or less
20 Simazine (CAT)	—	0.03 or less	0.3 or less
21 Thiobencarb (Benthiocarb)	—	0.2 or less	2 or less
22 Benzene (C <sub>6</sub> H <sub>6</sub> )	—	0.1 or less	1 or less
23 Selenium or selenium compounds (Se)	0.3 or less	0.3 or less	1 or less
24 1,4- dioxane	0.5 or less	0.5 or less	5 or less
25 Dioxins	3 ngTEQ/g or less	100 pgTEQ/L or less	—

3) Responsibilities of business entities for disposal

Applicable laws specify the responsibilities as described below:

Business entities shall properly dispose of waste produced in relation to their business activities under their own responsibility. The term 'own responsibility' means that business entities shall take responsibility for the waste until they are properly disposed of at final disposal.

Business entities shall be dedicated to reducing the quantity of waste produced in relation to their business activities by utilizing recycling or other measures. Business entities shall cooperate with the policies of local public bodies in terms of reduction or other appropriate treatment of waste.

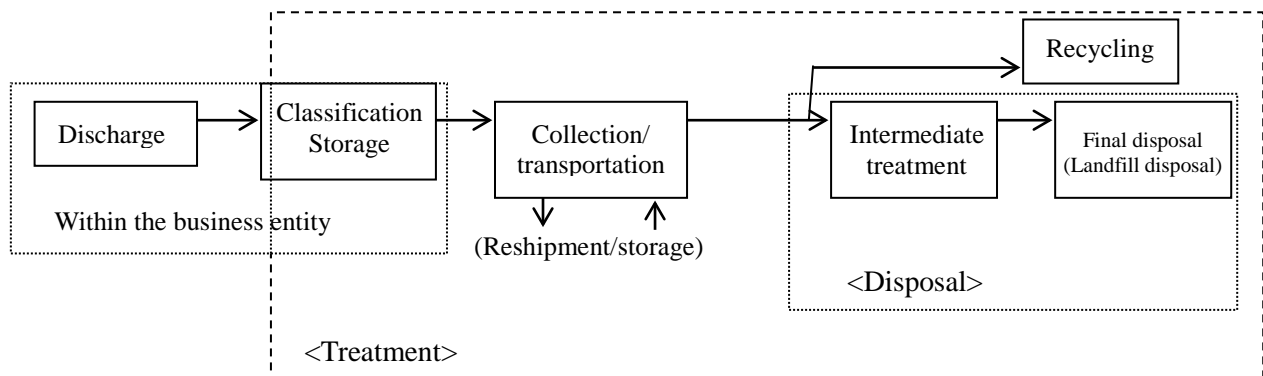
(1) Responsibilities of business entities in discharging waste

- ① Business entities shall dispose of industrial waste by themselves.
- ② Business entities producing specially-controlled industrial waste shall appoint a



specially-controlled industrial waste manager who holds the qualifications specified by the ordinance of the Ministry of the Environment.

- ③ When business entities dispose of waste by themselves,
  - A) They shall observe the disposal standards;
  - B) They shall observe the storage standards until industrial waste is removed; and
  - C) They shall submit a notification if they store industrial waste outside their premises.
- ④ When business entities outsource the disposal of industrial waste,
  - A) They shall observe the outsourcing standards;
  - B) They shall outsource disposal to contractors whose scope of business includes the disposal of industrial waste;
  - C) They shall enter into direct contract agreements with collecting and transporting contractors and disposal waste contractors;
  - D) They shall enter into contract agreements in writing;
  - E) They shall store the outsourcing contract agreements (for five years after termination of the contract agreement); and
  - F) They shall notify information related to industrial waste in writing before commencing with outsourcing of the disposal of specially-controlled industrial waste.
- ⑤ When outsourcing disposal, business entities shall issue a manifest for industrial waste.
  - A) Issue and check the manifest for industrial waste (electronic or paper).
  - B) Monitor the progress of proper disposal in the course until the final disposal of the waste.
  - C) If the manifest used is in paper form, archive it (for five years) and issue an annual report on the issuance of the manifest.
- ⑥ Business entities shall be dedicated to monitoring the actual disposal of waste by contractors and taking action to ensure proper disposal.
- ⑦ Business entities that discharge vast quantities of waste
  - A) Business entities that discharge 1,000 tons or more of industrial waste, or 50 tons or more of specially-controlled industrial waste (Business entities that discharge vast quantities of waste) shall submit disposal plans and reports on the actual disposal in specified forms to the prefectural governors of their places of business.
- ⑧ Business entities shall ensure the proper disposal of waste products or containers (They shall ensure proper disposal when substances manufactured or used for experiments must be disposed of as waste and shall instruct employees or students to do so as well.)
- ⑨ Business entities shall notify and educate employees (or faculty members and students) about the proper disposal of industrial waste.



- ✧ Try to reduce the quantity of waste by utilizing recycling processes.
- ✧ Ensure proper disposal when substances manufactured or used for experiments must be disposed of as waste.
- ✧ When treating or disposing of specially-controlled industrial waste, report it to the specially-controlled industrial waste manager of each section, and follow his/her instructions.
- ✧ When treating or disposing of industrial waste other than that scheduled for periodic collection, consult with the office clerk in charge, and follow his/her instructions.

## (2) Storage standards

### ① Storage standards for industrial waste

Storage standards for industrial waste before transportation

- A) Enclosures shall be installed around the storage site.
- B) Signs satisfying the requirements below shall be posted at easy-to-recognize sites.
  - a) The width and length of the sign shall be 60 cm or more.
  - b) The sign shall include the information listed below:
    - i) The fact that it is a storage site for industrial waste;
    - ii) Type of industrial waste stored
    - iii) Name of the manager in charge of the storage site, storage site name, and contact information
    - iv) Maximum storage height if industrial waste is stored outdoors without the use of containers
- C) Take measures to prevent industrial waste from scattering, leaking, or penetrating into the ground from the storage site and from generating odors.
- D) If polluted water could be generated from the stored industrial waste, provide drain ditches or other facilities necessary for preventing contamination of public water bodies and underground water, and cover the bottom of the storage site with impermeable materials.
- E) Prevent mice and rats, and harmful insects such as mosquitos and flies from entering the storage site.
- F) Prevent piled waste from exceeding the specified height limit when storing it outdoors without the use of containers.
- G) Take special measures for industrial waste containing asbestos as described below:
  - a) Take necessary measures such as installing partitions to isolate industrial waste containing asbestos from other waste at the storage site.
  - b) Install a cover for packed industrial waste containing asbestos as a measure to prevent it from scattering.

### ② Specially-controlled industrial waste

Take the measures listed below depending on the type of waste involved.

- A) to G) Same as the industrial waste storage standards
- H) Take necessary measures such as installing partitions to isolate specially-controlled industrial waste from other waste at the storage site.
- I) Take special measures for specially-controlled industrial waste according to their type as described below:
  - a) For waste oils, PCB-contaminated substances, or substances used for PCB treatment, take necessary measures for preventing volatilization and exposure to high temperatures. (E.g. place in containers and seal them.)
  - b) For waste acid or waste alkali, take necessary measures for preventing corrosion. (E.g. place in containers and seal them.)
  - c) For PCB-contaminated substances or substances used for PCB treatment, take necessary measures for preventing corrosion.
  - d) For waste asbestos, take necessary measures for preventing it from scattering. (E.g., pack them.)
  - e) For waste that may corrode, take necessary measures for for preventing corrosion. (E.g., place in containers and seal them.)

## (3) Outsourcing standards

### ① Outsourcing standards

- A) Contractors to which you will outsource treatment/disposal shall be licensed for waste disposal.
- B) Contractors to which you will outsource treatment/disposal shall include disposal of industrial waste in their scope of business.
- C) The outsourcing contract shall be entered into in writing.
- D) When outsourcing treatment/disposal of specially-controlled industrial waste, notify the contractor of the type, quantity, properties, packaging, and handling precautions of the specially-controlled industrial waste.

- E) Archive the written contract agreement and documents attached to it for five years from the date of contract termination.
  - F) For outsourcing collection and transportation, enter into separate contract agreements with a contractor licensed for collection and transportation of waste and another contractor licensed for intermediate (including recycling) or final disposal of waste.
- ② Outsourcing procedure
- A) Before outsourcing
    - a) Confirm the licenses of the industrial waste collectors and transporters and the industrial waste disposal operator.  
Receive copies of the industrial waste collectors and transporters and the industrial waste disposal operator to be outsourced, check the items listed below, and determine whether waste to be outsourced for treatment (including transportation, disposal, and recycling; the same applies to the following descriptions) can be properly treated by the contractors.
      - i) Classification of treatment and types of waste (whether contractors can handle waste to be outsourced);
      - ii) Type and processing capacity of the treatment facilities; and
      - iii) Condition and period of licensing
 Select appropriate contractors for waste properties to be discharged and the contractor's treatment methods.
    - b) For hazardous waste, check by analyzing hazardous components in advance.
    - c) For industrial waste, hazardous substances shall be analyzed in advance (particularly for waste oils, waste acid, waste alkali, sludge, and burnt residue). (If waste plastic, waste rubber, waste metal, waste glass, or waste ceramic ware come into contact or may come into contact with hazardous substances, they shall be neutralized.)
    - d) Visit the disposal sites to conduct an on-site inspection as required (to confirm processing and landfill capacity of the final disposal sites).
    - e) Enter into the outsourcing contract agreements in writing (with the industrial waste disposal operator and the industrial waste collector and transporter).  
The outsourcing contract shall be entered into in writing and include the provisions listed below:
      - i) Common descriptions
        - (a) Type and quantity of industrial waste
        - (b) Effective period of the outsourcing contract
        - (c) Charges to be paid by the contract giver to the contract receiver
        - (d) Range of business permitted for the contract receiver
        - (e) Information concerning the matters listed below that is necessary for the proper treatment of industrial waste outsourced by the contract giver
          - i) Matters related to the properties and packaging of industrial waste
          - ii) Matters related to property changes pertaining to the industrial waste such as corrosion or volatilization under ordinary storage conditions
          - iii) Matters related to problems caused by mixture with other waste
          - iv) Matters related to the display of content labels if industrial waste is included in the categories described below and provided with content labels specified by the Japan Industrial Standard C0950  
(Applicable products: Waste personal computers, waste air-conditioner units, waste TV receivers, waste microwave ovens, waste clothes drying machines, waste refrigerators, waste washing machines, etc.  
Applicable hazardous substances: Lead or lead compounds, cadmium and cadmium compounds, hexavalent chromium or hexavalent chromium compounds, PCBs, polybrominated diphenyl ether)
          - v) Matters related to industrial waste containing asbestos, if any
          - vi) Other matters to be noted in handling industrial waste
    - f) Matters related to the communication method if information concerning industrial waste is changed during the effective period of the outsourcing contract
    - g) Matters related to the report of the contract receiver to the contract giver on the completion of outsourcing activities
    - h) Matters related to the handling of untreated waste at the time of termination of the

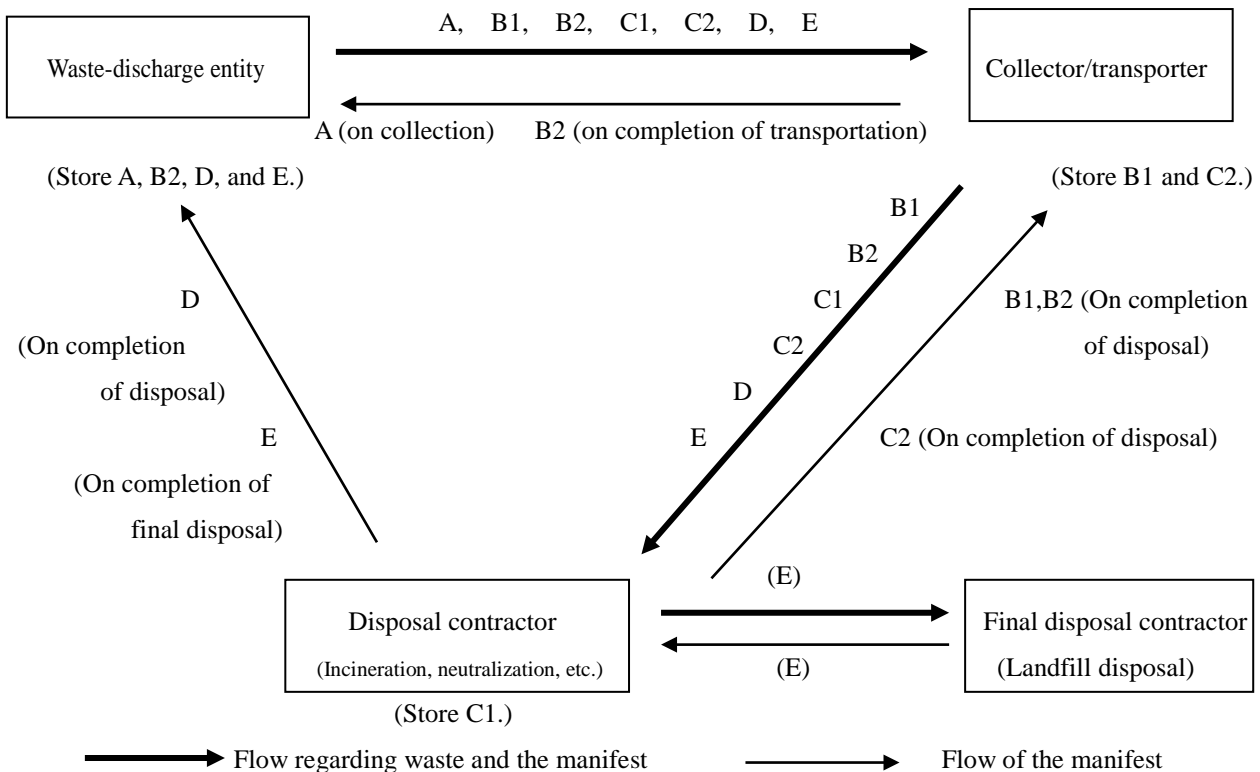
- outsourcing contract
- i) Descriptions of the transportation outsourcing contract agreement
    - (a) Address of the final transportation destination
    - (b) Address of reshipment or storage site, types of industrial waste that can be stored at the site, the maximum storage capacity for reshipment if the contract receiver reships or stores the industrial waste
    - (c) For stable industrial waste, matters related to the prohibition of mix-ups with other waste at the reshipment or storage site
  - ii) Descriptions of the disposal outsourcing contract agreement
    - (a) Address of the site of disposal or recycling, disposal or recycling method, and the facility's processing capacity when disposal or recycling of industrial waste is outsourced
    - (b) Site of final disposal of industrial waste after intermediate treatment, final disposal method, and the processing capacity of the facility in charge of the final disposal
    - (c) When outsourcing treatment of specially-controlled industrial waste, the contract giver shall notify the contract receiver of the type, quantity, properties, packaging, and handling precautions of the specially-controlled industrial waste in writing in advance.
- B) In outsourcing
- a) Confirm the collector/transporter and their transportation vehicles, and reconfirm the waste.
  - b) The contract giver shall enter necessary items on the manifest for industrial waste except for the contract receiver's signature and final signature fields. (Make sure to enter the name of the collector/transporter, disposal contractor, and classification of industrial waste. The weight may be measured by the disposal contractor that possesses measurement certification.) Issue the manifest to the collector/transporter.
- C) After outsourcing
- a) Confirm the disposal.
    - i) Receive the manifest from the disposal contractor and check whether the waste was disposed of as specified in the contract agreement.  
If you do not receive a manifest within 60 days (for specially-controlled industrial waste) or 90 days (for industrial waste) after the manifest issuance date, report the delay to the mayor of Kanazawa City (or the Governor of Ishikawa Prefecture in regions other than Kanazawa City) by using the specified form.  
An on-site inspection is conducted as required.
    - ii) Confirm with the manifest that the final disposal of outsourced industrial waste after intermediate treatment was completed.  
If you do not receive a manifest within 180 days after its issuance date, investigate the transportation and disposal of the outsourced industrial waste and take appropriate measures.
- Note: If the industrial waste was disposed of in ways that are nonconforming to the treatment of such waste and problems pertaining to preservation of the living environment occurred or may occur, an administrative order will apply to the waste-disposing entity as described below:
- Waste-disposing entity that outsourced matters against the outsourcing standards;
  - Waste-disposing entity that violated obligations set forth in the manifest in the course of treatment of the industrial waste such as violation of the manifest issuance obligation; or
  - Waste-disposing entity that did not directly violate the above-mentioned matters but for which it is determined that taking necessary measures to solve problems under their own responsibility is appropriate, such as when it is difficult for the actual disposal contractor to take measures to solve problems and the waste-disposing entity does not pay proper compensation for disposal of the industrial waste.
- b) Records retention
- 7) Record and archive disposal results so that they can readily be referred to at a later date.
  - 4) Store outsourcing contract agreements and manifests for five years.
  - 7) Submit status reports including the issuance of manifests for a year (from April to the following March) to the mayor (or governor). Kanazawa University usually submits a report covering the entire university to the mayor by the end of June

every year.

#### 4) Manifest for industrial waste

The manifest system was established to clarify the responsibilities of waste-disposing entities in the outsourcing of industrial waste and to prevent illegal dumping. Industrial waste shall be properly disposed of under the responsibility of waste-disposing entities. If disposal is outsourced to a third party, the waste-disposing entities shall issue a manifest (manifest for industrial waste) containing the name of the industrial waste, the name of the transporter or disposer, and handling precautions, and attach it to the industrial waste. The manifest thus conveys accurate information about the industrial waste. When the manifest is returned, the waste-disposing entities shall confirm that the outsourced industrial waste was properly disposed of. Electronic and paper versions can be used for the manifest.

Flow regarding the paper manifest (7 copies of Forms A, B1, B2, C1, C2, D, and E)



#### 5) Specially-controlled industrial waste manager

- (1) Business entities with workplaces that generate specially-controlled industrial waste shall appoint a specially-controlled industrial waste manager for each workplace so that work related to the treatment of specially-controlled industrial waste can be properly handled.
- (2) The specially-controlled industrial waste manager shall possess legally-specified qualifications.
- (3) When a specially-controlled industrial waste manager is appointed or changed, a report shall be submitted to the mayor (or governor) within 30 days (by using the specified form).
- (4) The duties of the specially-controlled industrial waste manager are to execute work related to entire scope of management of specially-controlled industrial waste according to the Waste Management and Public Cleansing Act.
  - ① Understand the discharge of specially-controlled industrial waste.
  - ② Form treatment plans.
  - ③ Ensure proper treatment (by checking storage conditions, selecting proper contractors, properly outsourcing treatment to contractors, and issuance and archiving of manifests).

- 6) Industrial waste treatment plans of business entities discharging vast quantities of waste  
 Business entities with workplaces that discharge vast quantities of waste (1,000 tons or more of industrial waste, or 50 tons or more of specially-controlled industrial waste) are obliged to form a plan for treatment including the reduction of industrial waste for each workplace, submit the the plan to the mayor (or the governor) by June 30, and report the disposal results by June 30 of the next fiscal year.  
 The contents of the disposal plan [planned period, management system, suppression of discharge, classification of waste, recycling, matters related to treatment, and measures to be taken for proper treatment (for specially-controlled industrial waste)]
- 7) Penalties (if any)
- (1) A maximum of five years imprisonment or a maximum fine of 10 million JPY, or both
    - ① Violation of the prevention of waste dumping (including general waste; the same applies to the descriptions below) (including attempted) (No. 14, Article 25 of the Act)
    - ② Violation of the prohibition of incineration of waste (including attempted) (No. 15 of the same)
    - ③ Unconfirmed exports (including attempted) (No. 12 of the same)
    - ④ Violation of outsourcing standards (No. 6 of the same)
    - ⑤ Violation of prohibition of the storage and treatment of specified hazardous waste (No. 16 of the same)
  - (2) Maximum of three years imprisonment or a maximum fine of 3 million JPY, or both
    - ① Violation of outsourcing standards or violation of the prohibition of re-outsourcing (No.1, Article 26 of the Act)
    - ② Violation of an order of facility improvement, violation of an order of termination of use, or violation of an order of improvement (No.2 of the same)
    - ③ Collection and transportation for the purpose of illegal dumping or illegal incineration (No. 6 of the same)
  - (3) Maximum of six months imprisonment or a maximum fine of 500 thousand JPY, or both
    - ① Violation of manifest issuance obligations, violation of description obligations, or issuance of misstatements (No. 3, Article 29 of the Act)
    - ② Violation of the storage obligation of copies of the manifest (No. 7 of the same)
    - ③ Issuance of a misstated manifest (No. 8 of the same)
    - ④ Transfer of industrial waste without transmitting a manifest (No. 9 of the same)
    - ⑤ Transmission or reporting of a misstated manifest (No. 10 of the same)
    - ⑥ Violation of the obligation to notify difficulties in industrial waste treatment or false reporting (No. 14 of the same)
  - (4) Maximum of 300 thousand JPY fine
    - ① Violation of the obligation to appoint a disposal manager or a person in charge of management (including the specially-controlled industrial waste manager) (No. 5, Article 30 of the Act)
    - ② Refusal of reporting or false reporting (No.6 of the same)
  - (5) Dual liability for corporations (Article 32 of the Act)
    - ① If an employee commits a violation subject to a professional penalty, the penalty is not only imposed on the employee but a fine is also imposed on the company. For unconfirmed exports, illegal dumping of waste, and illegal incineration, a fine of 300 million JPY will be imposed.
  - (6) Maximum of 200 thousand JPY administrative penalty
    - ① Violation of the obligation to submit a waste reduction plan by a business entity discharging a vast amount of waste, misstatements, or false reporting (Nos. 2 and 3, Article 33 of the Act)

The above-mentioned penalties are an example.

For details, refer to the Waste Management and Public Cleansing Act

☆ Example of illegal dumping (excerpt from the Kanazawa City brochure)

Casually discarding trash on the road, in a park, or places other than those specified  
Littering an empty can or cigarette

8) Other laws and regulations related to waste

Other laws and regulations related to waste are enacted as listed below according to the Basic Act on Establishing a Sound Material-Cycle Society (on June 2, 2000). For details, refer to the respective laws.

Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging (1995), Act on Recycling of Home Appliances (1998), Act on the Promotion of Effective Utilization of Resources (enforced in April 2001), Construction Material Recycling Act (enforced in November 2000), Law for Promotion of Recycling and Related Activities for Treatment of Cyclical Food Resources (enforced in May 2001), Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (enforced in April 2001), Act on Recycling, etc. of End-of-Life Vehicles (enforced in January 2005), Act on Promotion of Recycling of Small Waste Electrical and Electronic Equipment (enforced in April 2013)

## VI Chemical Substance Managers

### 1. Chemical substance managers and their appointment

Chemical substance managers shall be appointed in accordance with Paragraph 2, Article 4 of the 'Bylaws of Chemical Substance Management at Kanazawa University' (Bylaws No. 997 enforced on January 1, 2008). A chemical substance manager is appointed and registered when a research group is registered to the Chemical Substance Management System. As specified by Paragraph 2, Article 4 of the Bylaws, chemical substance managers shall manage the purchase, storage, management, use, and disposal of chemical waste. Responsible and qualified persons shall be appointed for such a post. If a manager or deputy manager is appointed in accordance with Paragraph 3, Article 3 of the Procedures of Management of Poisonous and Deleterious Substances, avoid these persons.

Chemical substance managers shall understand the current storage, use, and disposal conditions of chemical substances used within their groups and provide caution statements, instructions or education to those who handle chemical substances within their groups as required while observing laws, regulations, and university standards. They shall regularly report storage conditions to the head of the department/section as in the case of poisonous and deleterious substances.

### 2. Handover when the chemical substance manager leaves the office or is transferred to another department

If a chemical substance manager cannot execute his/her responsibilities due to resignation or transfer, a successor shall promptly be appointed according to Paragraph 3, Article 4 of the Bylaws, and that fact shall be notified to the Environment Preservation Center. If no successor can be appointed, the manager shall dispose of all chemical substances in his/her possession under his/her responsibility. For disposal, chemical substances that can be transferred to other research groups shall be handed over to them. Otherwise, disposal shall be outsourced to external contractors. If the substances are handed over, follow the necessary procedures.

Disposal by external contractors can be requested via the Environment Preservation Center. For details, please consult with the center.