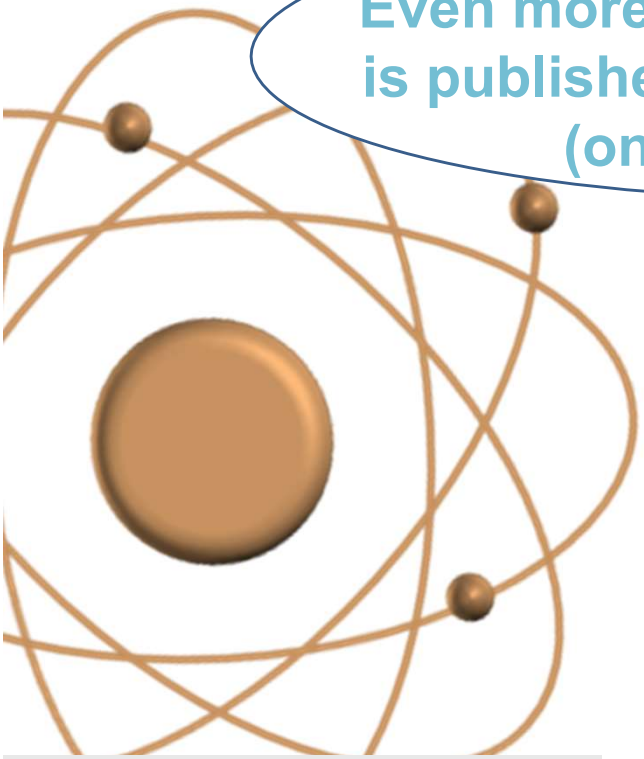
With illustrations to make it even easier to understand

Safe Handling Guide for Radioactive Reagents:

For Those Using Radioisotopes for the First Time

Even more detailed information is published in the web version (only Japanese).



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Overview of Handling Radioactive Reagents

We have prepared this guide to help researchers who will handle radioactive reagents to safely and smoothly conduct experiments. Each item is explained in even more detail in J-RAM (a comprehensive information site for radioactive reagents) operated by the Japan Radioisotope Association as a web version.
Please access J-RAM from the QR code on the right o the following URL: https://j-ram.org/.

Overview of Handling Radioactive Reagents

First, let's get an overview of handling radioactive reagents and then learn about each matter on the subsequent pages.

1. Learn about the Characteristics of Radioactive Reagents (p. 3 to p. 8)
1) Basic Knowledge

We explain about radiation, exposure, protection and the main Radioisotopes. It is easy to confuse radiation, radioactive and Radioisotopes, so we carefully explain these.

2. Make an Experiment Plan (p. 9)
2) Preparations Before Entering a Controlled Area

Make an experiment plan and then check with the Radiation Safety Manager whether you can handle the radioactive reagent you wish to use in the controlled area.

3. Register As a Radiation worker (p. 10)
2) Preparations Before Entering a Controlled Area

To conduct an experiment at a facility, you need to become a Radiation worker at that facility. Undergo a medical examination and training to become a Radiation worker.

4. Order the Radioactive Reagents (p. 10)
2) Preparations Before Entering a Controlled Area

Prepare a purchase order and obtain the approval of the Radiation Protection Supervisor. After that, the Radiation Safety Manager will place an order with the Japan Radioisotope Association to complete it. Please refer to J-RAM for details.

5. Enter the Controlled Area (p. 11)

3) Method of Entering a Controlled Area)

You will conduct your experiment in a laboratory (work room) in a controlled area unlike with regular experiments. Fill in the entry record book, make advance preparations and check the method of entering the controlled area/use room.

6. Receiving the Radioactive Reagents (p. 12)

4) Receipt and Storage of Radioactive Reagents

In most cases, radioactive reagents are carried to a designated location (e.g., a Radioisotope control room). The Radiation Safety Manager will receive the radioactive reagents. However, the user will have to understand the method of storing them.

7. Start the Experiment (p.13 to 16)

5) Handling of Radioactive Reagents

Take the radioactive reagents from the storage room into the laboratory.
It is very important to have the expertise to prevent contamination unlike with regular experiments.

8. Clean Up the Things You Have Used (p.17 to 19)

6 to 8) Contamination and Disposal

Measure the contamination at the end of your experiment. Return the radioactive reagents you have finished using to the storage room. Properly dispose of contaminated equipment. If a laboratory bench is contaminated, contact the Radiation Safety Manager and take appropriate action.

9. Exit the Controlled Area (p. 20)

9) Method of Exiting a Controlled Area

Wash your hands and then test your body and the articles you will take out of the controlled area for contamination in the contamination test room. After that, change your clothes and return your personal dosimeter. Finally, fill in the entry record book and exit the controlled area.

Radioactive reagents may be different from normal reagents, but they are not complicated if you organize them.

Features of Radioisotope Experiments

(1) Diverse Research Areas Where Radioisotopes Are Used

- It is possible to use Radioisotopes in diverse research areas – from the elucidation of specific life phenomena to drug discovery research.
- In particular, there has been progress in recent years on imaging technologies using positron emission tomography (PET) and single photon emission computed tomography (SPECT). Accordingly, the areas in which Radioisotope experiments are used are expanding.

Basic research: Molecular cell biology and biochemistry
Applied research: Medical science, pharmacy, veterinary medicine, nutritional science and agriculture

(2) Lineup of Diverse Radioactive Reagents

- Radioisotope can label various compounds. Therefore, there are many product lineups. This means it is possible to conduct experiments to meet various needs.
- It is also possible to label compounds by themselves using Radioisotopes. Therefore, there is a wide range of possibilities here.
- It is possible to manufacture desired Radioisotopes with an accelerator. It is also possible to use these in experiments as standalone Radioisotopes.

Diverse labeling targets: DNA, RNA, peptides, proteins, antibodies, compounds and cells

(3) Chemical Behavior

- Chemical behavior is almost the same as the original compound even if labeled. Therefore, Radioisotopes display strengths in experiments to analyze the dynamic state of compounds (e.g., pharmacokinetic analysis).

(4) High Sensitivity

- Radioisotope experiments have an extremely high detection sensitivity. This means it is possible to detect very small amounts of substances. Accordingly, even a very small dose may be sufficient.

(5) Quantification

- Radioisotope experiments are characterized by high quantification. If you require quantification, you should consider a Radioisotope experiment.

1-2) Basic Knowledge

Main Experiment Techniques Possible Using Radioisotopes

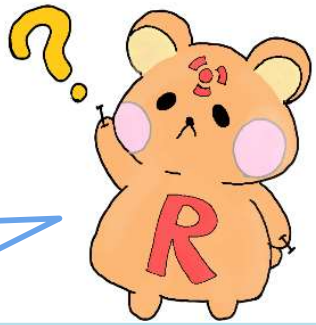
- It is possible to conduct various experiments according to the research purpose and application. These all **feature excellent sensitivity and quantification** compared to other techniques.

Experiment	Experiment Overview
Radiometric ligand-binding	Measure the binding of radiolabeled ligands to cells or cell membranes including the desired receptor.
^{35}S GTP binding	This is a technique(method) to measure the activity of G protein-coupled receptors (GPCRs).
Radioimmunoassays	Radioimmunoassays (RIAs) use antibodies to detect and quantitate the amount of antigen (analyte) in a sample. It is possible to quantify proteins(a method of high sensitive protein quantification) with a principle similar to the ELISA – a non-Radioisotope technique.
Thymidine incorporation	This is a technique(method) to assess(study) cell proliferation. Assess natural or synthetic compounds that stimulate or inhibit the proliferation of cells (e.g., lymphocytes).
^{51}Cr release assay	This is a technique(method) to quantify cytotoxicity in tumors and viral cells(cytolysis) in particular.
DNA and RNA labeling in vitro	Radioisotope labeled nucleic acid probe makes possible to detect nucleic acid and nucleic acid binding proteins with specific base sequences.
^{125}I Labeling of proteins	Iodize proteins and use them for receptor binding assays.
ADME test using rats and mice	This is a technique(method) to assess absorption, distribution, metabolism and excretion using Radioisotope labeled compounds.
Plant Radioisotope imaging	This is a technique(method) to assess the distribution and movement of chemical elements themselves in plants.

Reference: Fundamental Method Guide of Life-science Experiment Using Radioisotope

- We are currently preparing an experiment guide for beginners containing the experiment techniques used in the life science field. (We plan to release this in FY2019.)

Make a second choice with radioactive reagents if you wish to acquire data with high sensitivity or quantification or if you are not able to obtain data as you desired with a fluorescent reagent.



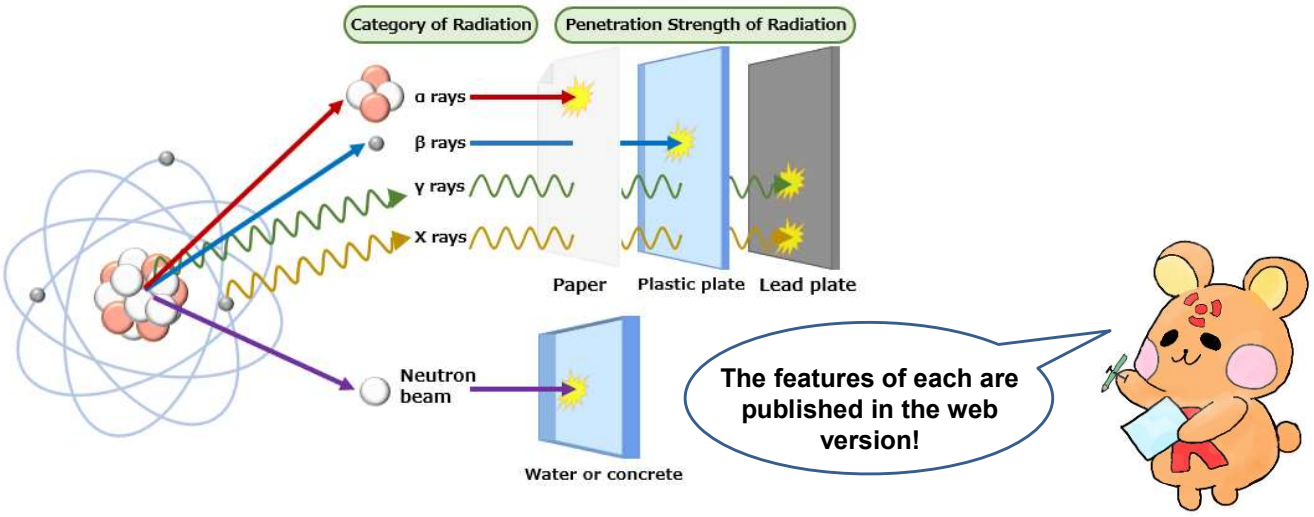
What Are Radiation and Radioisotopes?

(1) Familiar Radiation

- Radiation exists in nature. Humans live in that.
- The feature of radiation is that we cannot feel it with our five senses
  – **we cannot see it, we cannot hear it and it is tasteless and odorless.**

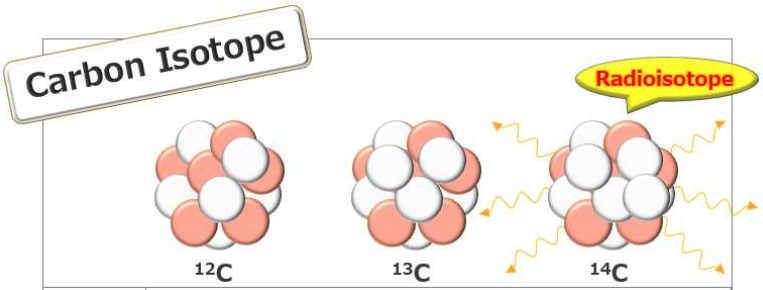
(2) Radiation Categories and Their Characteristics

- We can classify radiation into **α rays, β rays, γ rays and neutron rays**.
  The experiment characteristics and handling precautions differ depending on the category.
- Radiation has the property of penetrating substances.
  The penetration strength and distance differ depending on the category.
  Accordingly, the detection methods and protection methods differ.



(3) Radioisotopes (Radioisotopes)

- **Atoms with the same number of protons but a different number of neutrons are said to have a mutual isotopic relationship.**
- **When the nucleus emits radiation and changes (radioactive decay) in that, we call this a radioisotope (Radioisotope).**
- Radioisotopes cause radioactive decay and change to an even more stable atom.
- This property is called **radioactive**. We use becquerels (Bqs) as the unit for this.

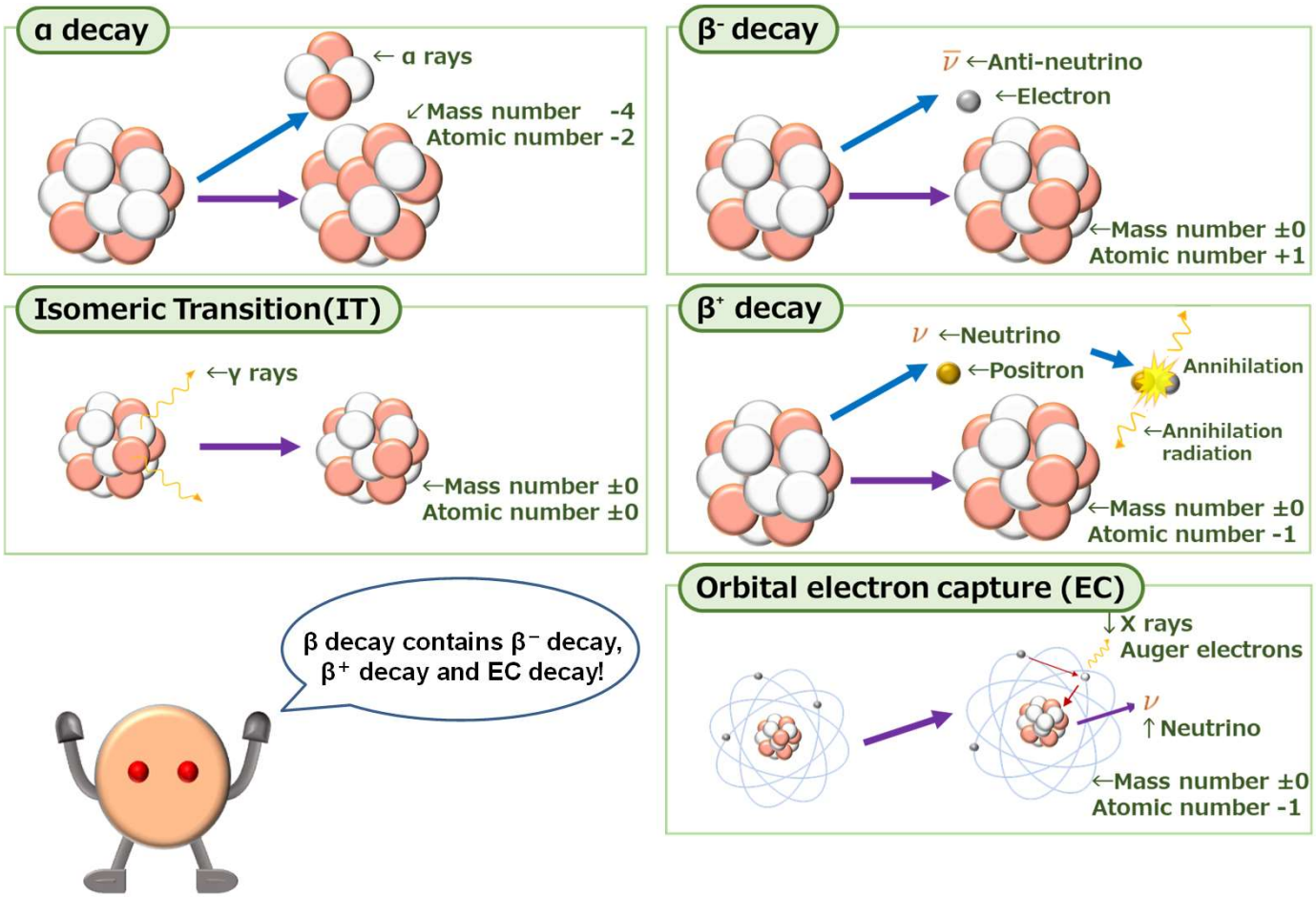


	^{12}C	^{13}C	^{14}C
Mass number	12	13	14
Abundance ratio	98.9%	1.1%	Very small amount

1-4) Basic Knowledge

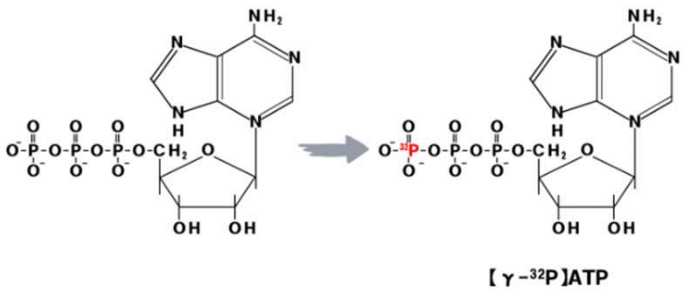
(4) Radioactive Decay

- **Radioactive decay refers to the phenomenon in which Radioisotopes change into stable nuclei by emitting radiation.**
- The main forms of radioactive decay are α decay, β decay and γ ray emission.
- β decay contains β^- decay, β^+ decay and orbital electron capture.



(6) Radioactive Reagents

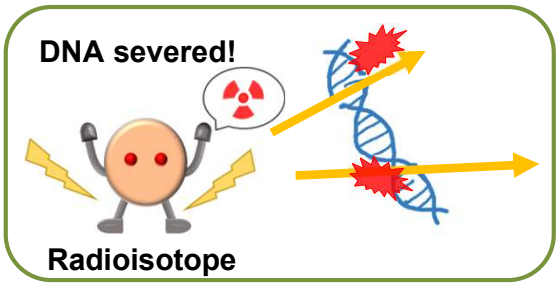
- **Radioactive reagents indicate reagents for which some of the atoms of the target compound have been replaced with Radioisotopes.**
- It is possible to investigate the chemical behavior (movement and distribution) in the system and the chemical reaction process by measuring the radiation emitted from these Radioisotopes.



1-5) Basic Knowledge

What Is Exposure?

- When radiation enters the human body, it **ionizes and excites** the atoms that constitute the biopolymers.
- If DNA is damaged during this process, it may affect cells as well as organs and the human body.
- If radioactive reagents are handled and protected properly, the effect on the human body is extremely small. Therefore, there is no need for excessive worry.
- Radioisotopes are found outside the body. Receiving radiation from outside the body is called external exposure while receiving radiation from inside the body is called internal exposure.

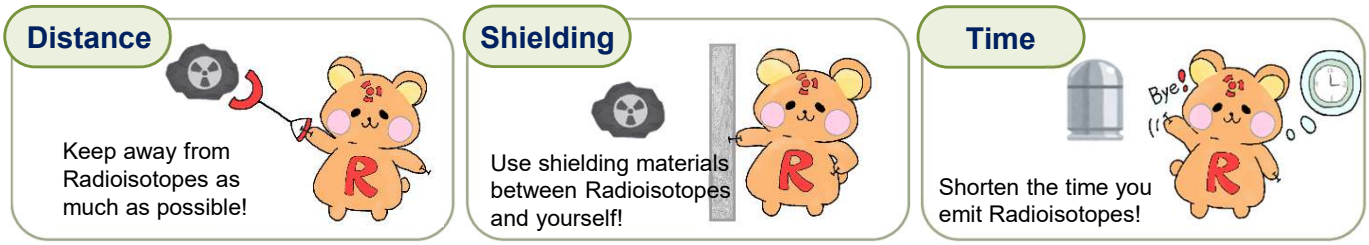


*Exposure from radioactive reagents is about **several μSv** at most.

What Is Radiation Protection?

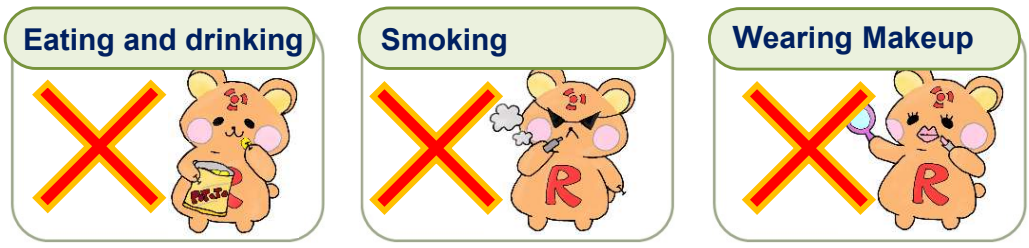
(1) External Exposure Protection

- It is possible to reduce external exposure by paying attention to **distance, shielding and time.**



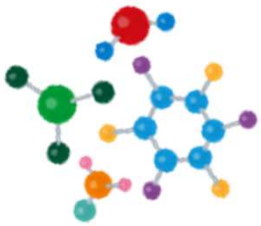
(2) Internal Exposure Protection

- Radiation is continuously emitted until discharged outside your body.
  Therefore, there is a high possibility of a greater effect on your body.
- The following acts are prohibited inside controlled areas because Radioisotopes may be taken into your body.



1-6) Basic Knowledge

Radioisotope Lineup



(1) Overview

- Radioactive reagents have various characteristics for each category of Radioisotope used for the labeling.
- **It is possible to reduce exposure and safely conduct experiments by handling according to the characteristics for each Radioisotope.**
- We list only a lineup here. We introduce the features in the web version.

(2) Life Science Experiment Applications

	^{3}H	^{14}C	^{32}P	^{35}S	^{51}Cr	^{125}I
Half-life	12.3 years	5,700 years	14.3 days	87.5 days	27.7 days	59.4 days
Shielding*	Not necessary	1 cm-thick acrylic plate	1 cm-thick acrylic plate	1 cm-thick acrylic plate	Halved with a 3 mm lead plate	Halved with 0.02 mm lead foil
Category of radiation	β^-	β^-	β^-	β^-	γ and X rays	γ and X rays

*Shield to prevent external exposure in regular Radioisotope experiments.

(3) Molecular Imaging Research Applications

	^{11}C	^{13}N	^{15}O	^{18}F	^{67}Ga	^{99m}Tc	^{111}In	^{201}Tl
Half-life	20 minutes	10 minutes	2 minutes	110 minutes	3.3 days	6 hours	2.8 days	3days
Experiment application	PET	PET	PET	PET	SPECT	SPECT	SPECT	SPECT
Category of radiation	β^+	β^+	β^+	β^+	γ	γ	γ	γ

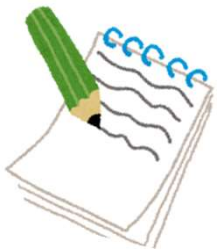
(4) Cancer Treatment Research Applications

	^{90}Y	^{131}I	^{177}Lu	^{211}At	^{223}Ra	^{225}Ac
Half-life	2.7days	8 days	6.7 days	7.2 hours	11.4 days	10 days
Category of radiation	β^-	β^-	β^-	α	α	α

2-1) Preparations Before Entering a Controlled Area

1. Make an Experiment Plan

(1) Experiment Plan

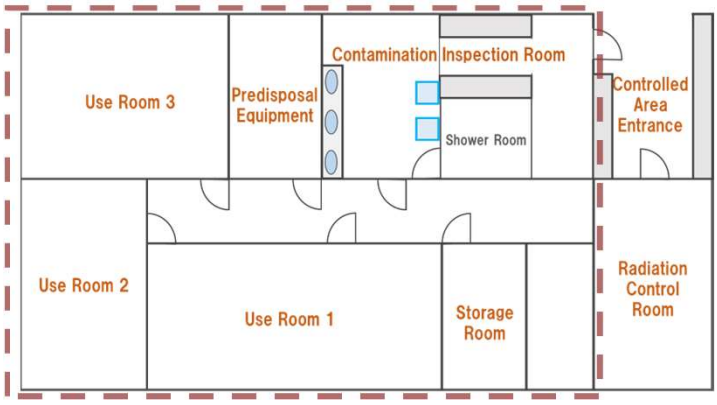


- Make an experiment plan and then check with the Radiation Safety Manager whether you can handle the radioactive reagent you wish to use in the controlled area.
- **You may not be able to conduct your desired experiment at the facility, so please consult with the Radiation Safety Manager on the content of your experiment.**
- Please refer to the Basic Life Science Experiment Guide for details of how to make your experiment plan. (Released in December 2019.)

(2) Controlled Area

- The controlled area is the location where the Radioisotopes are handled.
  It refers to the special area established so that regular people cannot enter it indiscriminately.
- Radioactive reagents are handled in the **work room (hereinafter referred to as the "use room")** within the controlled area be provided for in the law .

Controlled area→



(Differs depending on the site)

***Radioisotope Usage Precautions**

- **You cannot take out from the controlled area and** use even small amounts of radioactive reagents.
- However, if use outside the controlled area would be useful (e.g., if using a device installed outside the controlled area or radioisotopes below the exemption level) use outside the controlled area may be permitted by obtaining the permission of the Nuclear Regulation Authority in advance.

We recommend reading the textbook on the right if you wish to lean more detailed basic knowledge (only Japanese).

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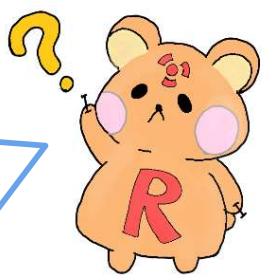


2-2) Preparations Before Entering a Controlled Area

2. Register as a Radiation worker

- To conduct an experiment at a facility, **you need to become a Radiation worker at that facility.**
- Please apply to register with the facility's Radiation Safety Manager and submit the necessary documents (e.g., usage plan).

2-1. Medical Examination

- **Undergo a medical examination before entering the controlled area and for each period not exceeding one year after entering it.**

Oral interview ：exposure history, etc.
Test or medical examination: Blood, skin and eye tests, etc.

2-2. Education and Training (At the Number of Hours Specified by the Facility)

- The number of hours differs depending on the facility, but please take the following training courses.
- **Take the training courses before entering the controlled area and for each period up to the end of the fiscal term in which the previous training was given after entering it.**

Effects of radiation on human body (30 minutes or more)
Safe handling of radioisotopes, etc. or radiation generating apparatuses (1 hour or more)
Acts and regulations on the prevention of radiation hazards and a radiation hazards prevention program (30 minutes or more)

3. Request an Order

- Request the order for radioactive reagents to a Radiation Safety Manager.
- If purchasing from the Japan Radioisotope Association : Radiation Safety Manager places an order with the Radiopharmaceuticals and Labeled Compounds Section of the Japan Radioisotope Association.
  Please refer to J-RAM for details.

J-RAM 放射性試薬の総合情報サイト

- **Check in advance with the Radiation Safety Manager so that your personal dosimeter can be prepared on the day.**

* You can also obtain radioactive reagents by transferring between facilities.
However, please check with the facility's Radiation Safety Manager about the necessary procedures.

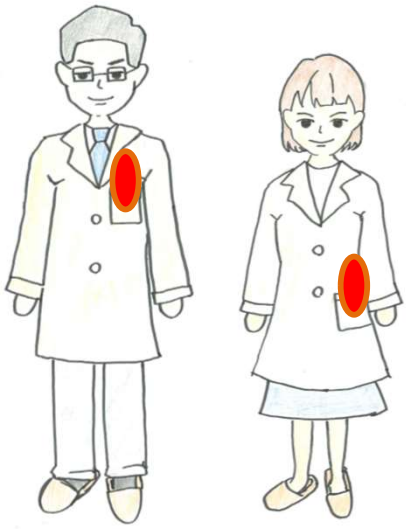
3) Method of Entering a Controlled Area

1. Completion of the Entry Record Book

- Fill in your name, purpose, entry location and time.
- There are also some facilities that manage this with key cards.

2. Advance Preparations

- Put on your experiment clothes and wear a personal dosimeter to monitor the amount of radiation you are exposed to. (As a rule, **men should attach it to their chest while women should attach it to their abdomen.)**



Personal Dosimeter Attachment Position

(3) Entry into the Controlled Area

- Take off your shoes and put on slippers for the controlled area.

(4) Entry into the Use Room

- Properly put on protective equipment (e.g., gloves and masks) before handling radioactive reagents.

How to Wear Rubber Gloves

How to Take Off Rubber Gloves

4) Receipt and Storage of Radioactive Reagents

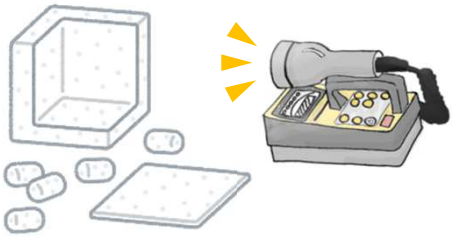
1. Delivery and Receipt

- In most cases, radioactive reagents are carried to **a designated location (e.g., the Radioisotope control room)** by the operator. The Radiation Safety Manager will receive the radioactive reagents.
- Manage the schedule to avoid it not being possible to receive or check the radioactive reagents for a long time after they have been carried.

2. Product Check

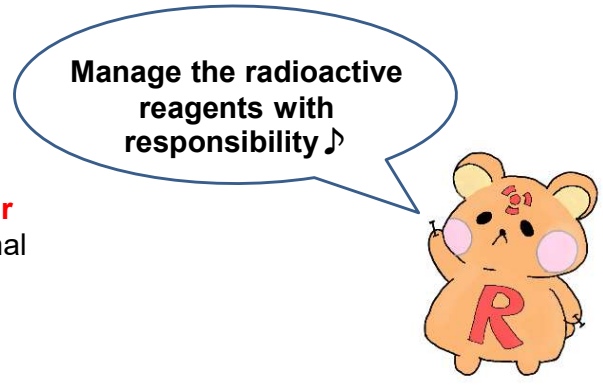
- Remove the security bottle (outer container) after putting on your gloves in the designated location (e.g., in the draft chamber) and visually check there are no liquid leakages.
- **Check that the compounds described on the vial label and shipping voucher are actually what have been ordered.**

3. Contamination Check and Cardboard Disposal



- Check with a radiation survey meter that the removed shielding container and cardboard are not contaminated.
- **Discard the cardboard after removing the labels, marks and other stickers that indicate it is a radioactive substance.**

4. Storage and Record of Radioactive Reagents

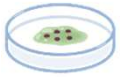


- Store and record radioactive reagents according to the procedures of the facility.
- Fill out the Radioisotope name, amount of radioactivity, date and your name on the container.
- Store in the **storage facility (e.g., storage room or storage box)** at the appropriate temperature (normal temperature, refrigerated or frozen) until use.

5-1) Handling of Radioactive Reagents

1. Preparation of the Necessary Materials

- Prepare in advance the things you will take into the controlled area based on your experiment plan.
- **Take in as few things as possible** and minimize the equipment you put out on the laboratory bench to reduce the risk of contamination.
- Once contaminated, you cannot take out anything no matter how expensive (e.g., watches) if they cannot be decontaminated.
- The following gives examples of what you will take into the controlled area.

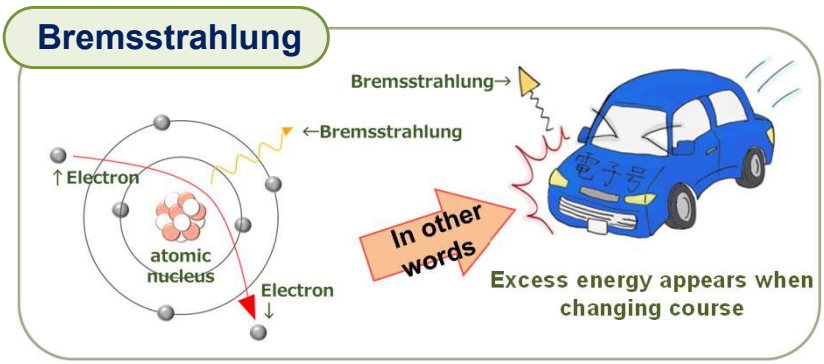
Micropipettes 	**Tips** 	**Tubes** 
Garbage bags and other consumables 	**Non-Radioisotope reagents** 	**Writing materials** 

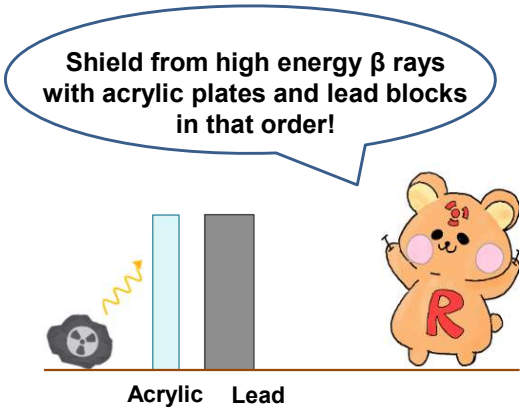
2. Measures Against Contamination

- **Perform work in a tray (affixing filter paper or similar to it is recommended)** to prevent the spread of contamination.
- If using polyethylene filter paper, you can prevent Radioisotope permeation contamination by using it so that the polyethylene is on the bottom and the filter paper is on the top.

3. Preparation of Shielding Materials

- In general, use an acrylic plate for Radioisotopes that emit β rays and use lead blocks for those that emit γ rays.
- Take care because high energy β rays emit **bremsstrahlung rays** with the same properties as γ rays.

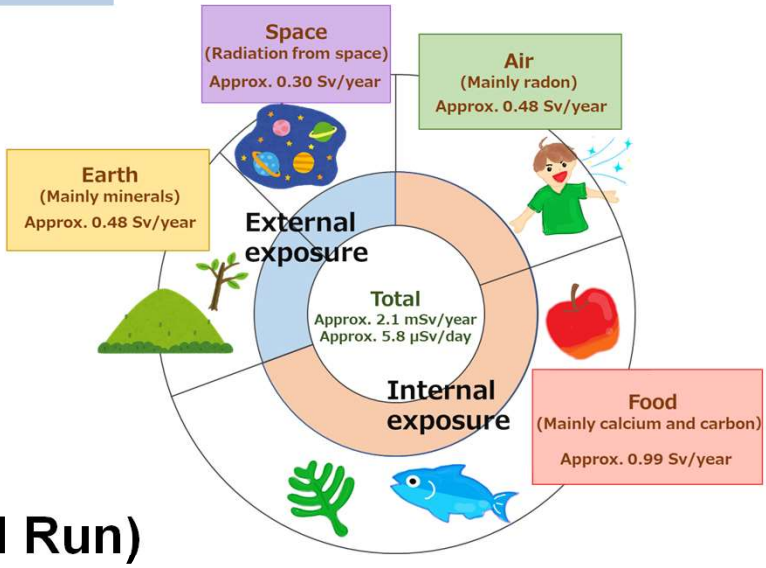




5-2) Handling of Radioactive Reagents

4. Background (BG) Measurement Before the Start of Your Experiment

- Natural radiation exists as BG.
- This also serves as the index when conducting a contamination test. Therefore, **please measure it before conducting your experiment.**
- Set the radiation survey meter to a mode that produces sound. If you also leave the power on during your experiment, it will help to prevent the spread of contamination.



5. Mock Experiment (Cold Run)

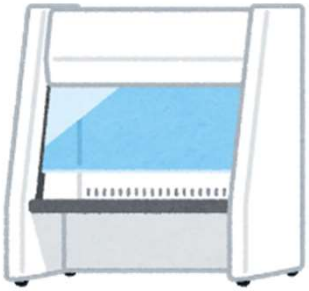
- We recommend you conduct a mock experiment in advance using colored water as the radioactive reagent to reduce the experiment time and to understand where contamination is likely to occur.

Is the equipment in a safe and easy-to-use position? Have you assembled everything you need? Is there anything unnecessary or wasteful

6. Final Confirmation of Protective Measures and Carrying the Reagents

- Check that you are properly wearing the protective equipment (e.g., masks and arm covers).
- Take the radioactive reagents out of the storage room.
- Are there things you need to carry and move around in the laboratory? If so, **put them in a tray to carry them around. This reduces the risk dropping them. At the same time, it ensures a distance with the Radioisotopes to lessen the risk of contamination and exposure.**

Also check that there is a negative pressure inside the draft chamber. This is very important to prevent contaminated air from flowing into the room



Please check with the Radiation Safety Manger for the method to check there is negative pressure.

5-3) Handling of Radioactive Reagents

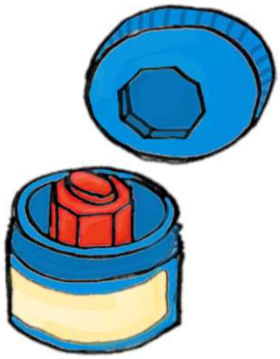
7. Opening of the Radioactive Reagents

- Remove the vial containing the radioactive reagent from the shielded container using tweezers in the draft chamber.
- If handling a radioactive reagent in the form of a solution, please open it after centrifuging it and collecting the solution at the bottom of the container.
- There is a risk of contamination by opening and closing a vial repeatedly, so avoid this.
- Please use a clean pipette tip or syringe when removing the solution from the vial.

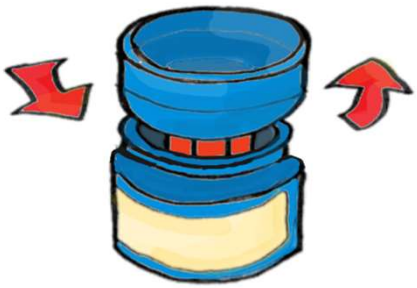
Example of Opening a Vial

You can easily open the vial lid by using a security bottle.

1) Open the lid of the security bottle.



2) Place the octagonal wrench on the lid of the vial so it engages with the cap.



3) Turn the octagonal wrench counterclockwise and remove the cap.

8. Method of Fractionating Radioactive Reagents

- Place the vial in a centrifuge and collect the solution at the bottom.
- Adjust the differential pressure while paying attention to venting from the container and then carefully open the lid.
- Fractionate the solution with a pipette.
- **Take care when opening and closing the lid because contamination is liable to occur.**

We have published the method of fractionating radioactive reagents using syringes, needles and charcoal filters on the web version. We will also upload videos in turn♪

5-4) Handling of Radioactive Reagents

9. Handling of Various Materials to Prevent Contamination

- Basically, handle radioactive reagents in the same way as normal reagents. There is a risk of **contamination** in the same way as with normal reagents.
- In addition, **there is a risk of unintentional exposure due to contamination**.
- Please frequently check for contamination with a radiation survey meter while working.
- We give tips for handling micropipettes below. We introduce conical tubes, microtubes and syringes in the web version.

Micropipette Usage to Prevent Contamination

1) Volume

- Allow for a surplus suction volume or use a tip with filter.

2) Tips for Suction and Discharge

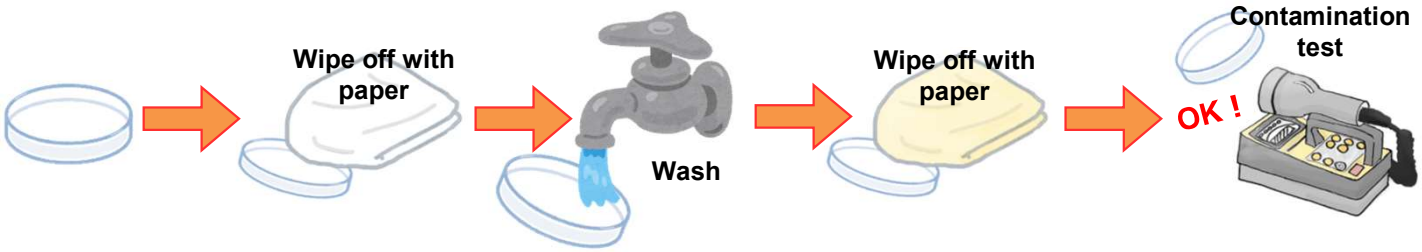
- Slowly and smoothly press the push button in.

3) Tip

- Do not insert the tip deeply into the solution.
- Do not leave in a state in which the tip with radioactive reagent attached is inserted.
- Remove the tip using a tip injector without directly removing by hand.

10. Cleaning Up

- Wash washable glass equipment.
- **Carefully wash so that water does not splash outside after wiping off the attached solution with paper in order from the equipment with the least amount of contamination.**
- Conduct a contamination test on the equipment and locations you used to check that there are no problems compared with the BG after washing and then return the equipment to its original location.
- Store the remaining radioactive reagent in the storage room or dispose of it.



6) Contamination Measurement

1. Overview

There is a direct method of measuring directly and an indirect method of measuring what has been wiped off with smear filter paper.

- Radiation survey meters cannot measure everything. Therefore, select a measuring instrument and measurement method appropriate for each measurement target.

2. Direct Method

- Use a radiation survey meter to check the strength of the radiation in the space and the surface contamination of objects.

Types of Survey Meter	Measurement Targets	Overview
GM tube (For measuring surface contamination)	β, X and γ rays	Use to detect normal β rays with a general radiation survey meter.
Scintillation (For measuring the dose rate)	X and γ rays: NaI radiation survey meter A rays: ZnS radiation survey meter ^{125}I: ^{125}I radiation survey meter	A device that measures the air dose per unit time. Other than ZnS: basically used to detect γ rays

3. Indirect Method (Smear Method)

^{3}H and ^{14}C cannot be measured with the direct method. Wipe off with the smear method and then measure with a liquid scintillation counter.

- Select the smear method if it is not possible to measure it as it is or if your measurement target is α rays and β rays (low energy β rays).
- Use special filter paper to wipe off rough surfaces.

4. Contamination Assessment

- **You can determine that there is no contamination if there is no significant difference with the BG count rate.**
- The assessment method differs depending on the radiation survey meter. Accordingly, please check that assessment method.

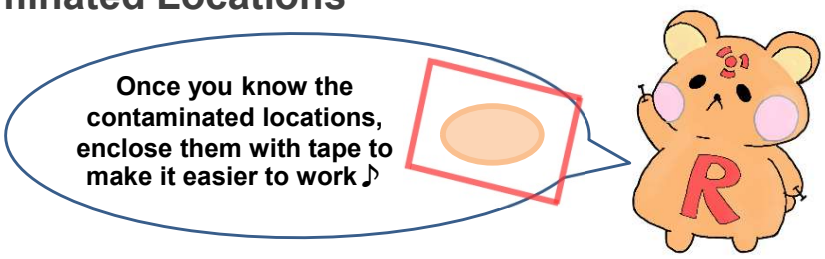
7) What to Do If There Is Contamination

Flow of What to Do If There Is Contamination

- No matter how much care you take of contamination, it will still actually occur.
- If you confirm there is contamination, please **seek the cooperation of those around you** without tackling it alone to prevent the spread of contamination.
- It is important to **not be afraid, to not panic and to not take it lightly** when dealing with contamination.

(1) Clarification of the Contaminated Locations

- Use a radiation survey meter to clarify the contaminated locations.

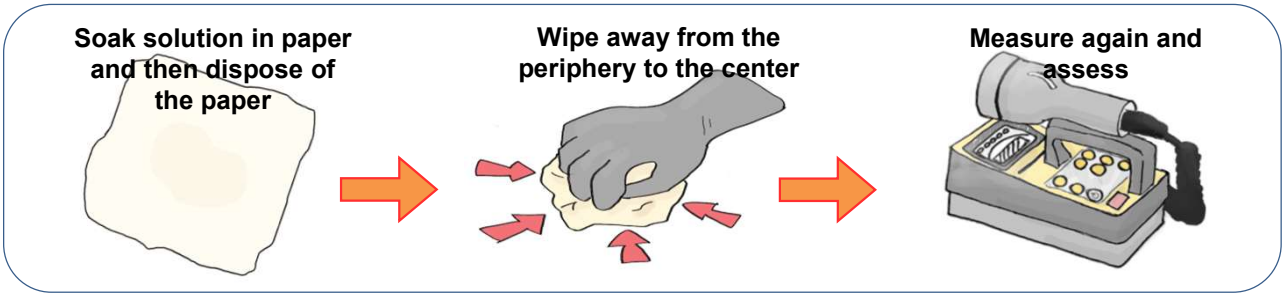


(2) Contact

- Contact the people and places specified by the facility (e.g., Radiation Safety Manager and control room).

(3) Removal Work

- **Perform removal work from the locations with the least amount of contamination so that the contamination does not spread** according to the instructions of the Radiation Safety Manager.
- **Please repeatedly decontaminate until the contamination drops to the BG level.**



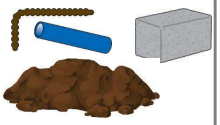
(4) Report

- Once you have finished removing the contamination, report the date, your name, results and other details to the Radiation Safety Manager.
- Contamination is inevitable. What is very important is dealing with it afterward.
- **Contamination may remain even with a small amount of contamination you dealt with by yourself.**
  Therefore, please make sure to report incidents to the Radiation Safety Manager.
- We have uploaded the detailed method of dealing with contamination in the web version. Please check it out.

8) Disposal of Radioactive Reagents

Contaminated Waste

- Radioisotope waste produced in experiments using radioactive reagents **has a different method of disposal to regular waste.**
- Please make sure to check the sorting and disposal methods with the Radiation Safety Manager.
- Please **treat samples** that have finished undergoing a series of operations **as contaminated waste.**
- Although it differs by facility, basically, garbage cans are established for each category below.

Category	Targets
Combustibles	Papers, cloths and wood chips 
Flame retardant materials	Plastic tubes and poly-vials (please remove the remaining liquid), poly-sheets, Styrofoam and other plastic products, rubber gloves and other rubber products 
Incombustibles	Glass vials (please remove the remaining liquid), glass instruments and other glass products, vinyl chloride products, hypodermic needles, aluminum foil and other metal products, silicon products and Teflon products 
Non-compressed incombustibles	Metal lumps, steel frames, concrete pieces, cast metals, machines and equipment, large quantities of beta plates, small quantities of TLC plates, and large quantities of activated charcoal 
Inorganic liquids	Inorganic liquids, (e.g., waste washing liquids and cell culture liquids) (please do not mix with organic liquids) 
Organic liquids	Waste scintillator liquid (please do not mix with other organic liquids) 
Animals	Dried animals, and bedding, floor coverings and sawdust to which feces and urine are stuck 

Non-contaminated Waste

- Dispose of non-contaminated waste with the same disposal method as in regular experiments.

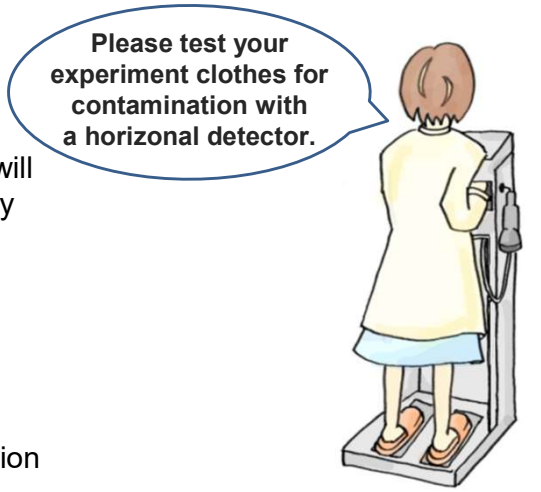
9) Method of Exiting a Controlled Area

1. Enter the Contamination Test Room and Wash Your Hands

- Wash your hands before the contamination test. Please thoroughly wash even up to your wrists.

2. Test Your Body and Articles for Contamination

- Test your hands, feet and experiment clothes for contamination with a hand and foot cross monitor.
- In addition, check the contamination of articles you will take out of the controlled area with a radiation survey meter.
- **You cannot exit the controlled area without undergoing a contamination test.**
- Moreover, you cannot take out articles from the controlled area unless they fall below the take-out standards.
- If there is contamination, contact the facility's Radiation Safety Manager and make sure to decontaminate before exiting the controlled area.



It is not possible to measure contamination from ^{3}H and ^{14}C with this method.

3. Return Your Experiment Clothes and Personal Dosimeter

- **Leave your experiment clothes in the controlled area and store your personal dosimeter outside the controlled area after checking the reading.**
- Leaving your personal dosimeter affixed to your experiment clothing or leaving it in the non-designated position may lead to incorrect measurement results.

4. Complete the Entry Record Book

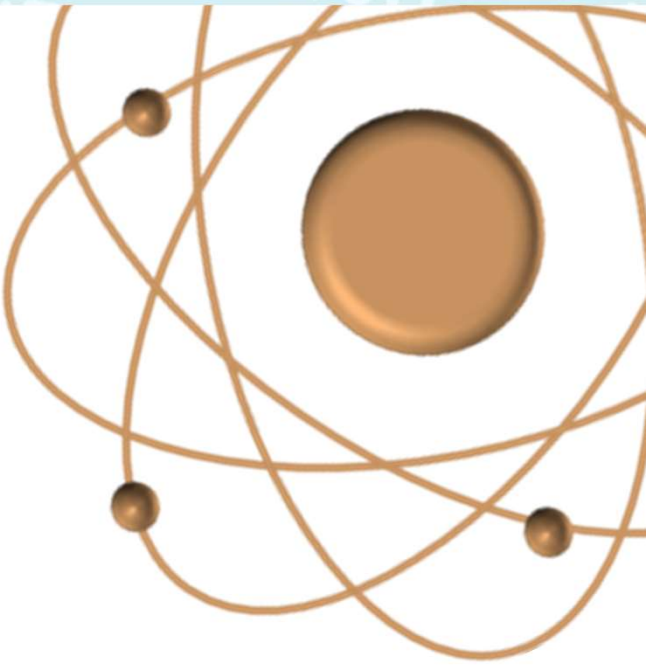
- Fill in the usage records, disposal records and time.
- There are some facilities that automatically record information with IC cards.

(only Japanese)

5. Exit the Controlled Area

- MEMO -

- MEMO -



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