

まんがでわかる

# 化学物質 取扱の基本

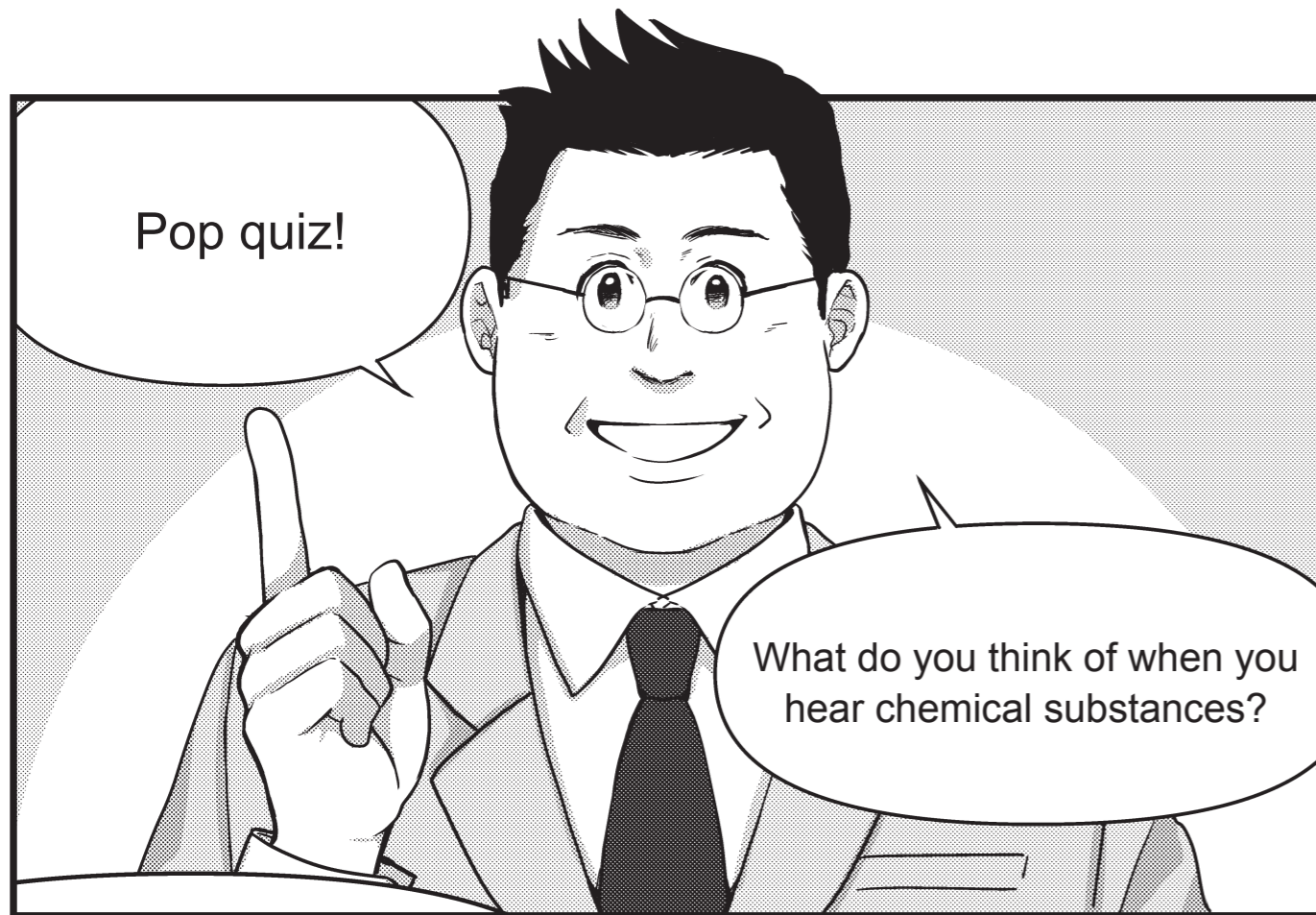


Learn through Manga  
Basics of Chemical Substances Handling

English  
英語版

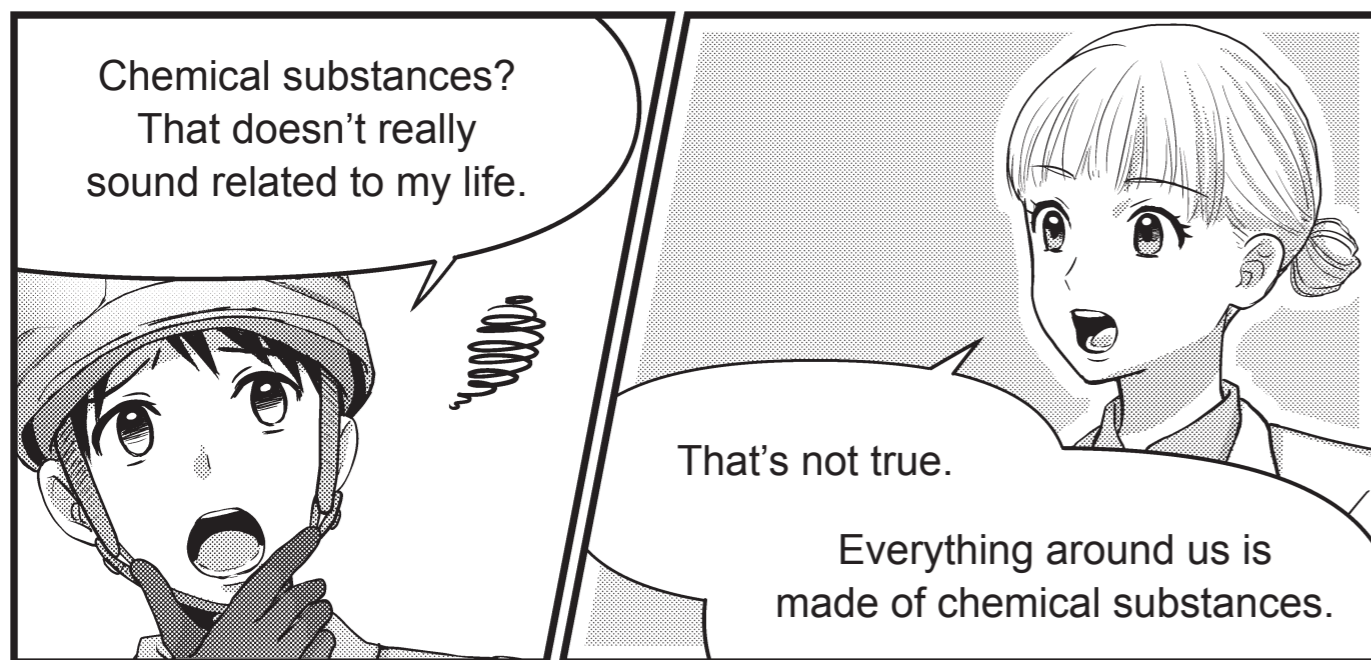


This audiovisual material has been created for the purpose of learning the basic knowledge necessary to observe safety precautions for physical hazards and health hazards of chemical substances, as well as points to keep in mind when working, and emergency measures.



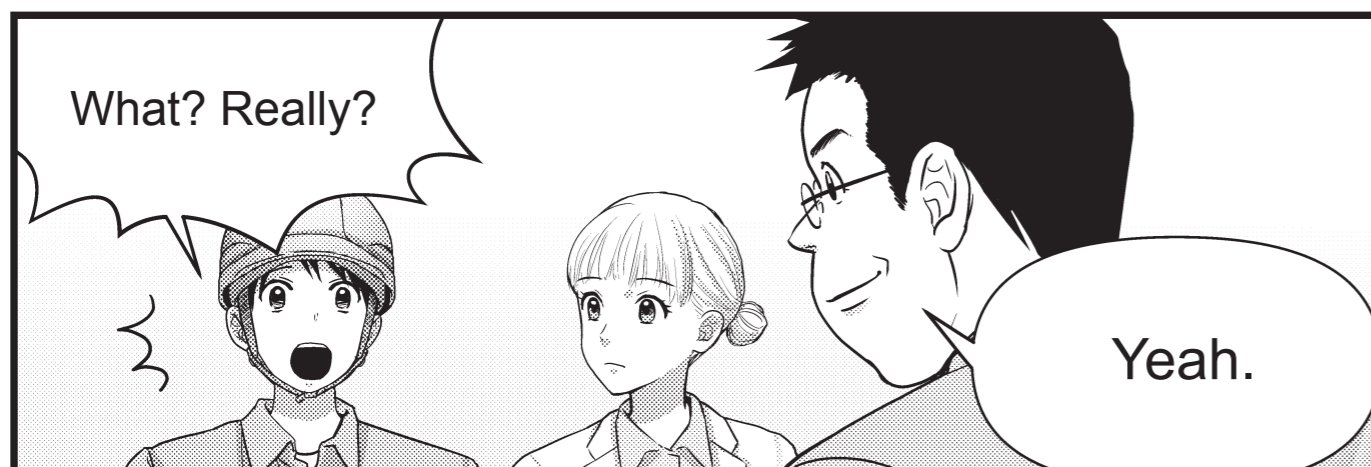
Pop quiz!

What do you think of when you hear chemical substances?



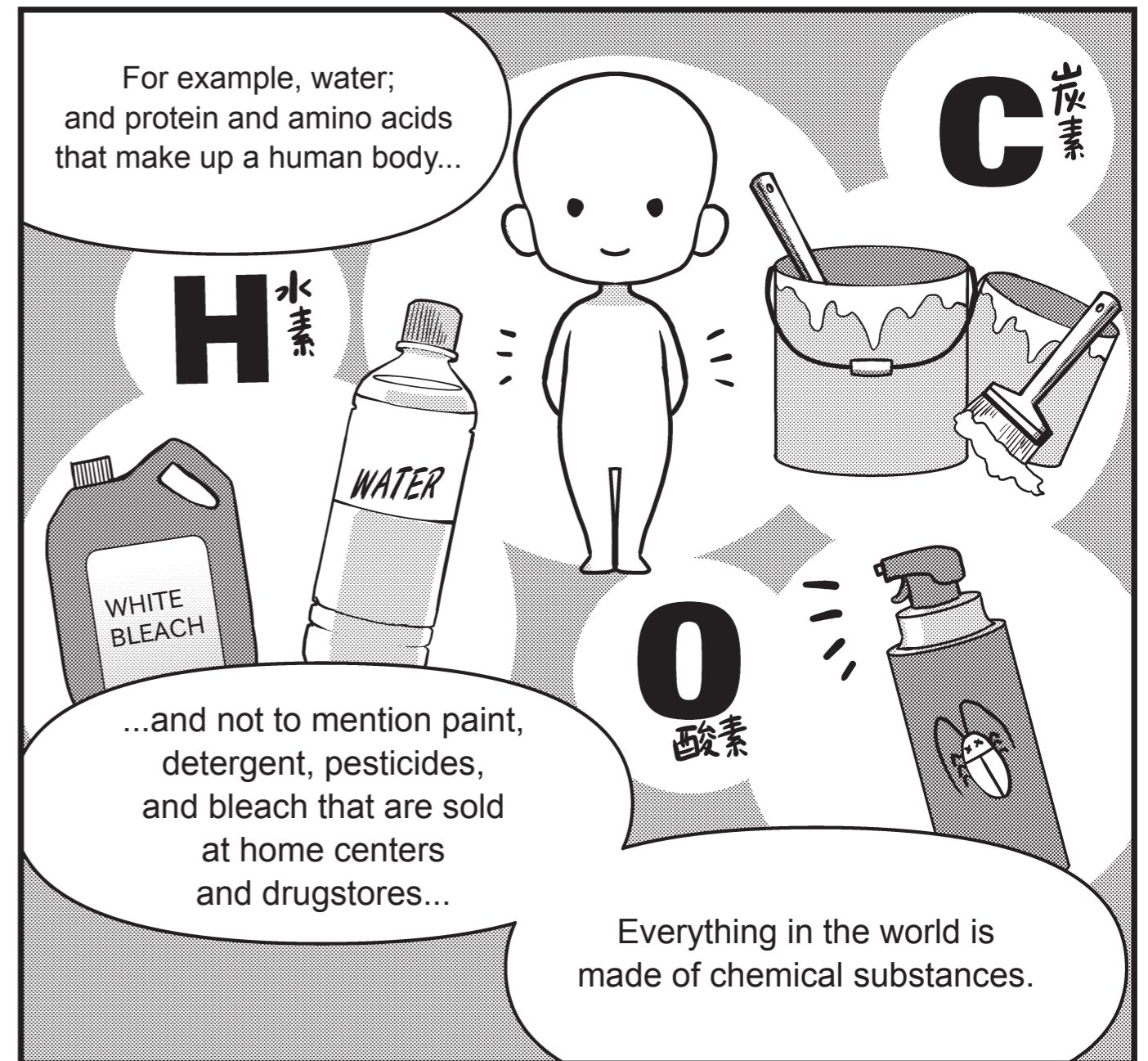
Chemical substances?  
That doesn't really sound related to my life.

That's not true.  
Everything around us is made of chemical substances.



What? Really?

Yeah.



For example, water; and protein and amino acids that make up a human body...

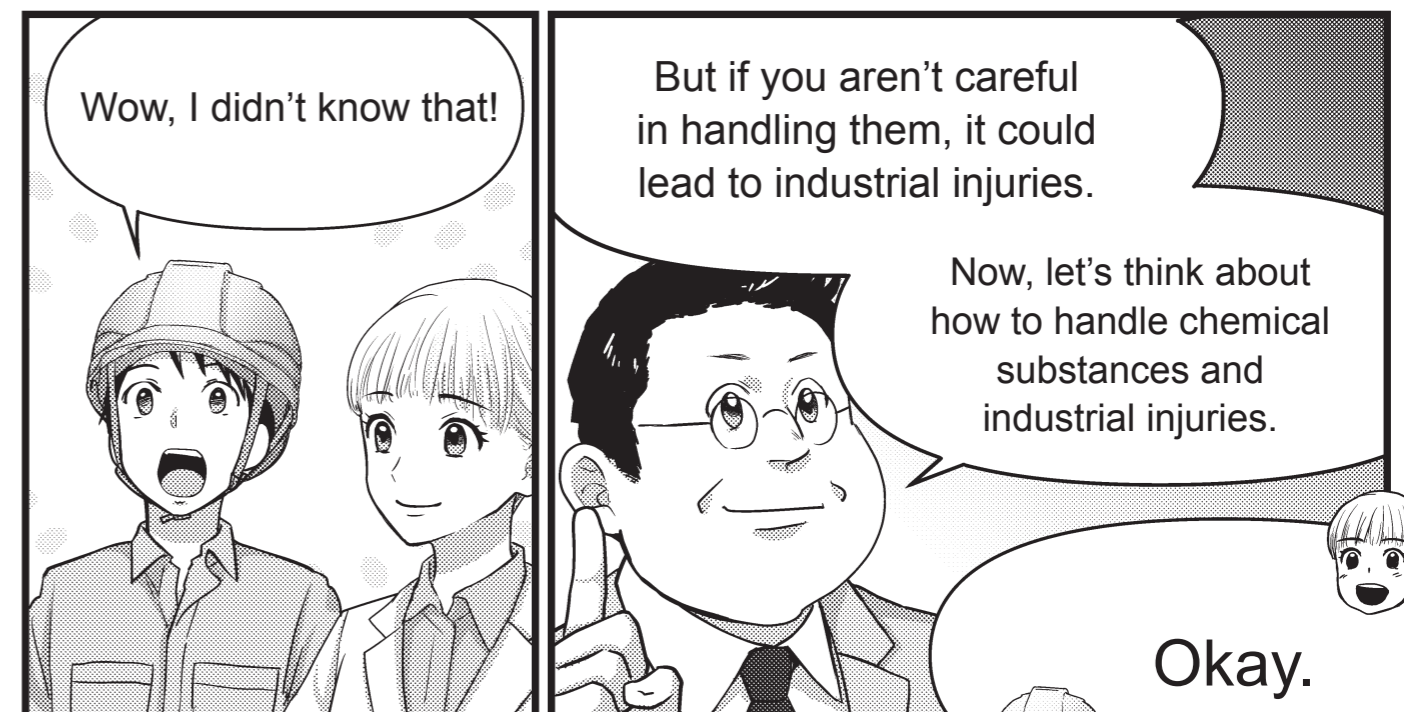
H 水素

C 炭素

O 酸素

...and not to mention paint, detergent, pesticides, and bleach that are sold at home centers and drugstores...

Everything in the world is made of chemical substances.



Wow, I didn't know that!

But if you aren't careful in handling them, it could lead to industrial injuries.

Now, let's think about how to handle chemical substances and industrial injuries.

Okay.

The properties of chemical substances that could cause industrial injuries...

...are broadly classified into two categories, "physical hazards" and "health hazards."

"Physical hazards" are properties that could cause...

BOOM!

...a fire, such as ignition and explosion.

"Health hazards" are properties that could cause acute poisoning by inhaling through the nose or mouth as well as irritation (chemical burns) by coming in contact with skin or eyes.

Sounds scary.

Yes.

Also, "health hazards" do not only include acute poisoning, but also chronic poisoning, which causes health damage without knowing it, such as when chemical substances are inhaled for a long period of time. For example, such exposures could cause cancer.

**CANCER**

Even products such as pesticides and bleach which we use in our daily lives, if you misuse them, it could have fatal consequences, so great care is necessary.

Let's look at the statistics of industrial injuries related to chemical substances.

**Number of industrial injuries caused by chemical substances** (per substance causes)

1	Hazardous substances	213 cases
2	Combustible substances	164 cases
3	Flammable gases	59 cases
4	Explosive substances, etc.	14 cases

Reference: Tallying the above 4 substance causes from "Reports of Worker Deaths, Illnesses, or Injuries" in 2019

The most common incidents involve hazardous substances and combustible substances.

In any case, in order to help prevent industrial injuries, it's important to follow the rules.

For example...

Wear appropriate protective gear for the purpose.

Check in advance for information like warnings and pictograms on the containers of chemical substances you'll be handling.

If you have any worries or if there's anything unusual, report it immediately to your supervisor.

Odors

Tools

Sounds

Health

Equipment

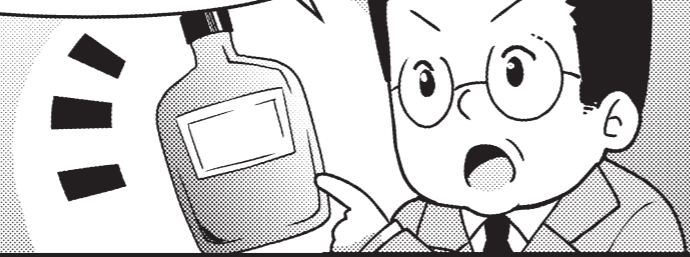
Make sure to observe the three actions I just mentioned.

Understood!

Now, let's take a look at what we should pay attention to when handling chemical substances.

# Labels

Labels for chemical substances note the minimum information required to handle the chemical substances.



# GHS\* pictograms

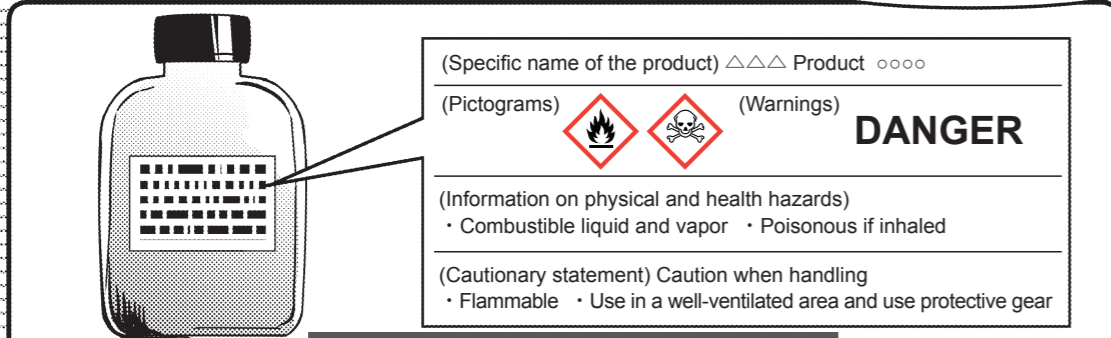
Here, we'll take a look at pictograms used on labels.



\* GHS = Globally Harmonized System of Classification and Labeling of Chemicals

Let's check out an actual label.

It's easy to get all the necessary info!



### Items on labels

- Pictograms to represent physical and health hazards
- Warnings
- Information on physical and health hazards
- Cautionary statement
- Name of the chemical substance
- Information to identify the supplier
- Any other items that need to be displayed according to the laws and regulations

For pictograms, please refer to the next page.

Pictograms categorize the physical hazards and health hazards of

chemical substances and display them as pictures in an easy-to-understand manner, right?

Yes. By putting them on labels and SDS, they help ensure the health and safety of workers.

There are 9 pictograms in total. We'll introduce the most common 4 pictograms.



Flammable/Combustible

Corrosive

Toxic

Health hazard

# Safety Data Sheet

Labels may not provide full information,

so make sure to check the Safety Data Sheet (SDS).

Okay!

The SDS is an instruction manual that notes the physical hazards and health hazards of chemical substances.

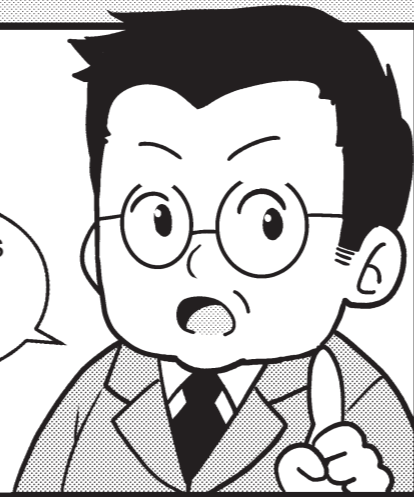
For the rest, please refer to the appendix.

Make sure to memorize pictograms for just in case, and work safely!

# Physical hazards

Some chemical substances

have dangerous properties such as being explosive, inflammable, or corrosive.

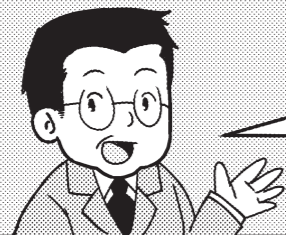


Explosive	Compressed gas	Flammable	Oxidizing
Pyrophoric liquids/solids	Self-reactive substances	Substances, which in contact with water, emit flammable gases	Organic peroxides



There are so many physical hazards for chemical substances.

How can we use them safely?



First, standard precautions to remember.

**Do not place these substances near fire.**

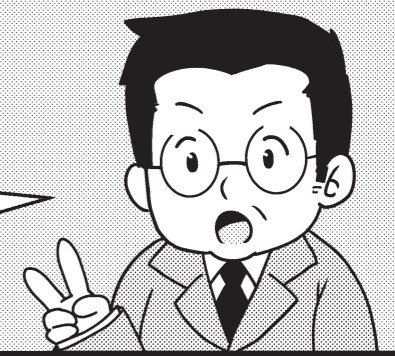
**Store them in dedicated storage locations.**

**Do not put metal powder or oil soaked paper and cloth in direct sunlight.**

**Avoid buildup of static electricity.**

It's good to remember that combustion occurs when combustibles, oxygen (air), and an ignition source are available.

We should especially be aware of the following two things.



## Combustibles

Lids of containers need to be closed tightly. Do not store them in easy-to-break containers.

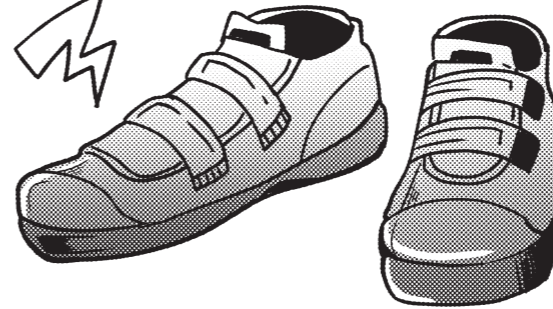
## Oxidizing substances

They don't burn, but they harshly oxidize other substances. Because they sometimes react violently, do not subject them to impact, friction, fire, or heating.



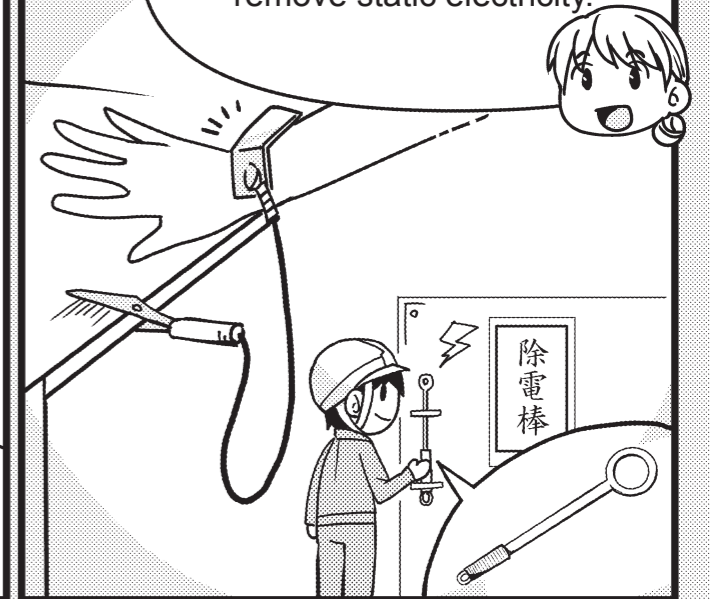
You'll also have to be careful of compressed gases and substances which emit flammable gases on contact with water.

Static electricity sometimes acts as a source of ignition, so make sure to avoid static buildup.



Make sure to utilize static control protective clothes and shoes.

When electrical grounding is available, you can use it to remove static electricity.



\* Reference: "Put in Practice Right Away Series: Handling Chemical Substances Safely and Correctly - How to Read SDS" by Japan Industrial Safety & Health Association

# Health hazards

Ugh...I feel sick...

Are you okay?!  
There are many harmful  
chemical substances!

Let's take a look at main health  
hazards of chemical substances.

## ■ Acute toxicity

Substances in this category damage human health in a short time.  
E.g., cyanogen compounds, carbon monoxide, hydrogen sulfide, etc.

## ■ Eye irritation and serious eye damage/Skin irritation and skin corrosion

Substances in these categories cause damage to human eyes and skin.  
E.g., hydrochloric acid, sulfuric acid, ammonia, sodium hydroxide, etc.

## ■ Carcinogenicity

Exposure to substances in this category may cause cancer.  
E.g., benzene, 1,2-Dichloropropane, hexavalent chromium, etc.

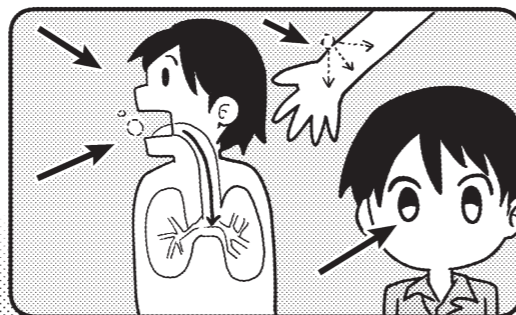
There is also  
■ reproductive toxicity  
■ germ cell  
mutagenicity, etc.

## ■ Sensitizer

Substances in this category cause airway hyperresponsiveness (asthma) if inhaled, and allergic reaction from contact to skin.  
E.g., isocyanates, amines, etc.

Routes through which chemical substances can enter the body are mainly through breathing (inhalation) and contact to the skin or eyes.

Routes through which chemical substances enter the body



How can we prevent these hazards to our health?

There are a lot of ways,  
but the most basic are ventilation  
and wearing protective gear.

## ■ Point 1: Ventilation

You can use local exhaust ventilation, turn on a fan, or work in an airy and well-ventilated area.

This is a local exhaust ventilation setup in use.

## ■ Point 2: Protective gear

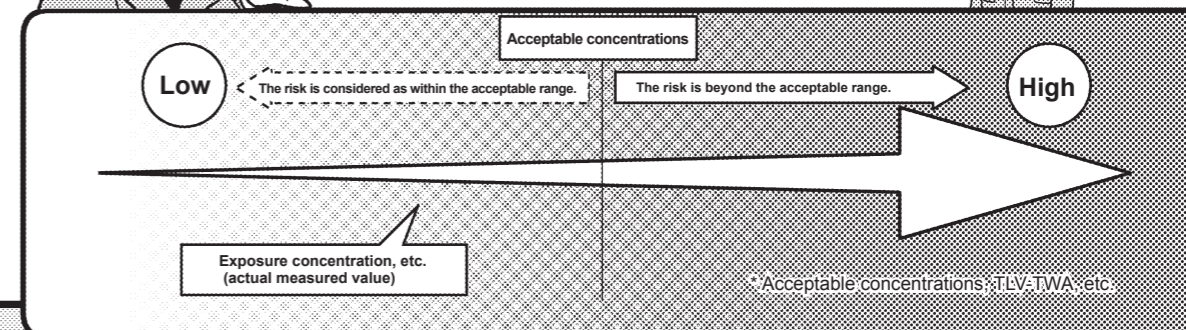
Depending on the site, the protective gear you use can be different.

Make sure to check before you start working. Check also the next "protective gear" page.

If concentrations of chemical substances are properly controlled, even if the chemical substances are harmful, you can prevent any health damage.

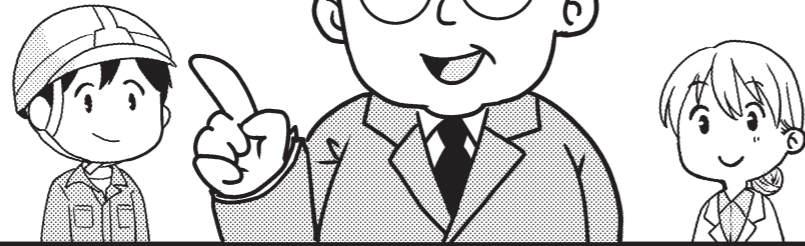
Concentrations that are judged not to have adverse health effects are called acceptable concentrations (occupational exposure limit values).

It's important to check the concentrations of chemical substances in the air often when working.

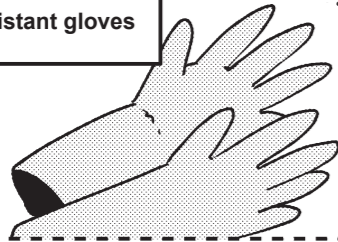


**Occupational health and safety protective gear/ Special health checkups**

Protective gear is one of the measures taken to prevent inhalation or skin and eye contact with chemical substances from happening.



**Chemical resistant gloves**



They prevent chemical substances from coming in contact with the skin (chemical burns and skin absorption).

**Protective goggles**



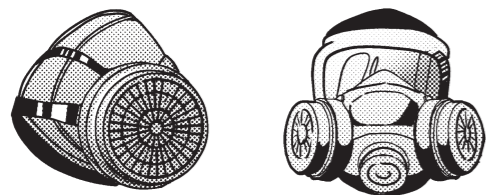
They protect your eyes.

**Respirators**

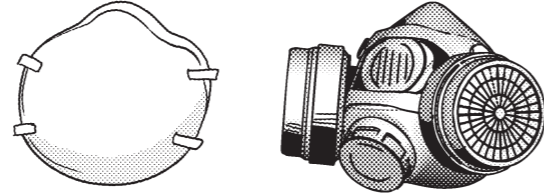
Please refer to "How to wear a respirator" for how to properly wear respirators!

They prevent chemical substances from being inhaled.

**Respirators (anti-gas)**

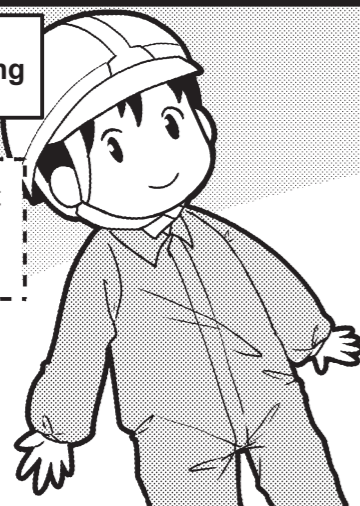


**Respirators (anti-dust)**



**Protective clothing**

Wear it to protect yourself when working.



There are also shoes and clothes to prevent electrostatic discharge from happening.



Even if you have great protective gear, if you don't wear it properly, it won't mean anything.

**Point 1**  
Understand how to correctly put it on and take it off.

**Point 2**  
Choose the protective gear that is rated for the chemical substances you're handling.

**Point 3**  
Check when the protective gear needs to be replaced (service life).

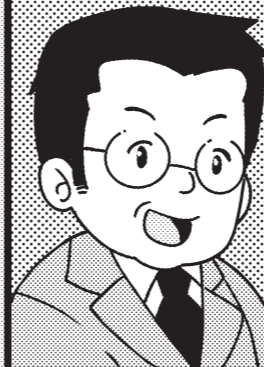


Please refer to "Learn through Manga: Health, Safety, and Injury Prevention for Workers (common teaching materials)" for explanations on other protective gear.

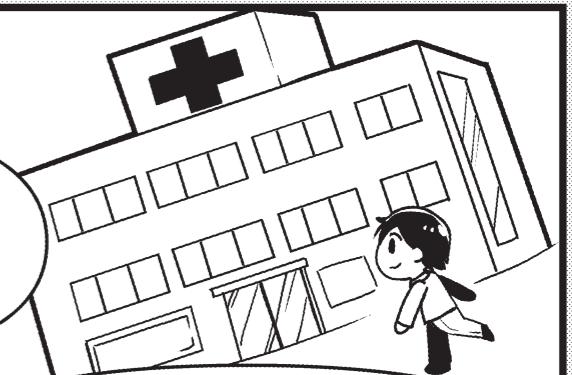


When handling some chemical substances, the business operator is required to conduct special health checkups.

This checkup looks for specific health signs, so be sure to take it.



By taking a special health checkup, it can detect any health damage by chemical substances early and prevent it from getting worse.



Wearing protective gear and taking a special health checkup... Okay, I've memorized!



This is all to protect yourself, so make sure to put in practice.



If you feel anything unusual, make sure to report it to your supervisor immediately.





# Emergency measures

What should you do if an accident occurs?



Fires



Feeling sick



Coming in contact with a chemical substance



Ideally, try not to panic and deal with a sudden accident as calmly as possible.

That's right. Regarding emergency measures, we'll take a look at what to do if a fire or poisoning occurs.

If a fire breaks out

HELP!

First, report it to the people around you. Then, call 119.

During the initial fire-extinguishing effort, if you use water on a chemical substance,

it could backfire and be dangerous. Make sure to use a correctly rated fire extinguisher.

If you feel sick



We have to hurry outside.

Let's secure ventilation.



OK

If a chemical substance comes in contact with your eyes or skin

It burns!

First, we have to wash it off thoroughly.

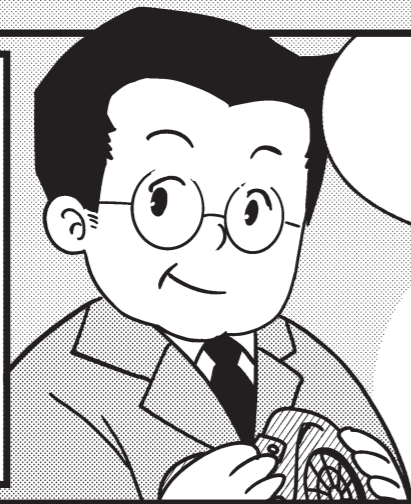
If possible, take off the clothes.

Try to remain calm if a sudden accident occurs.

If there is anything unusual, immediately report it to your supervisor. This is the golden rule!

Okay!

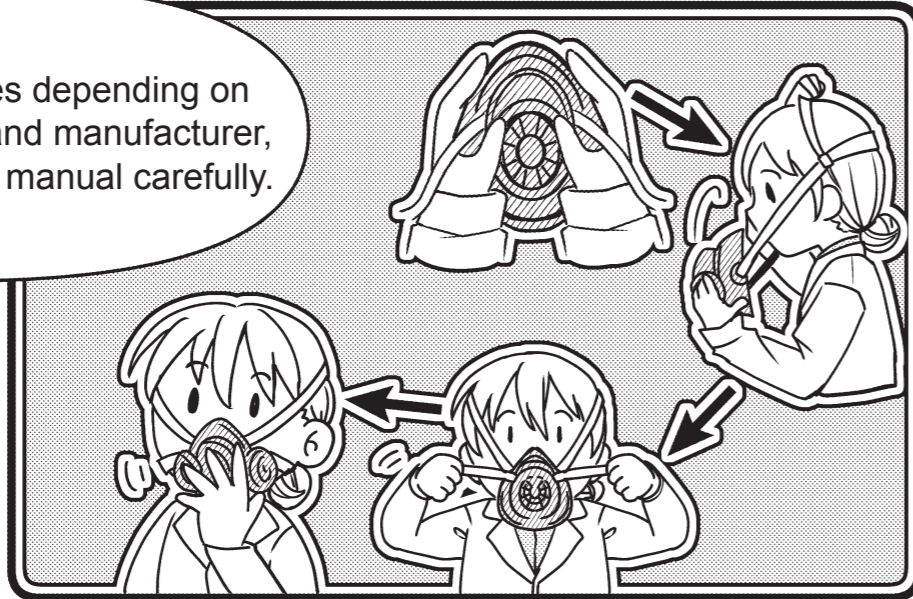
# How to wear a respirator



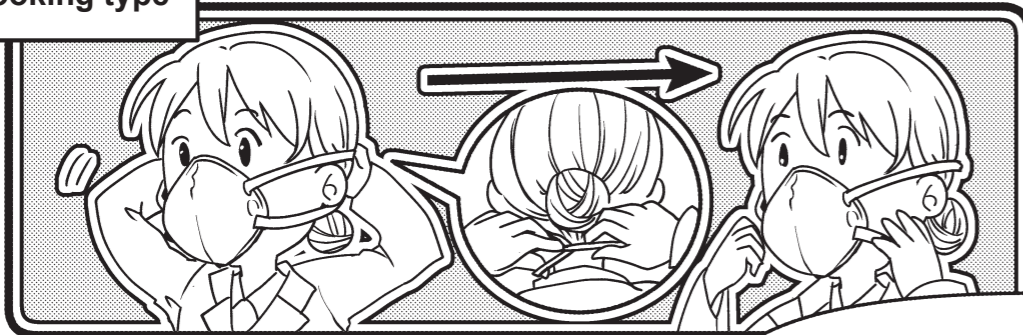
Depending on the chemical substances you handle, wear a correctly rated respirator.



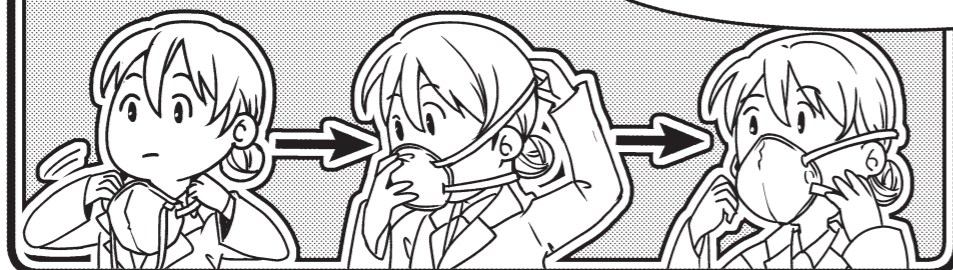
How to put it on varies depending on the type of respirator and manufacturer, so read the instruction manual carefully.



Hooking type



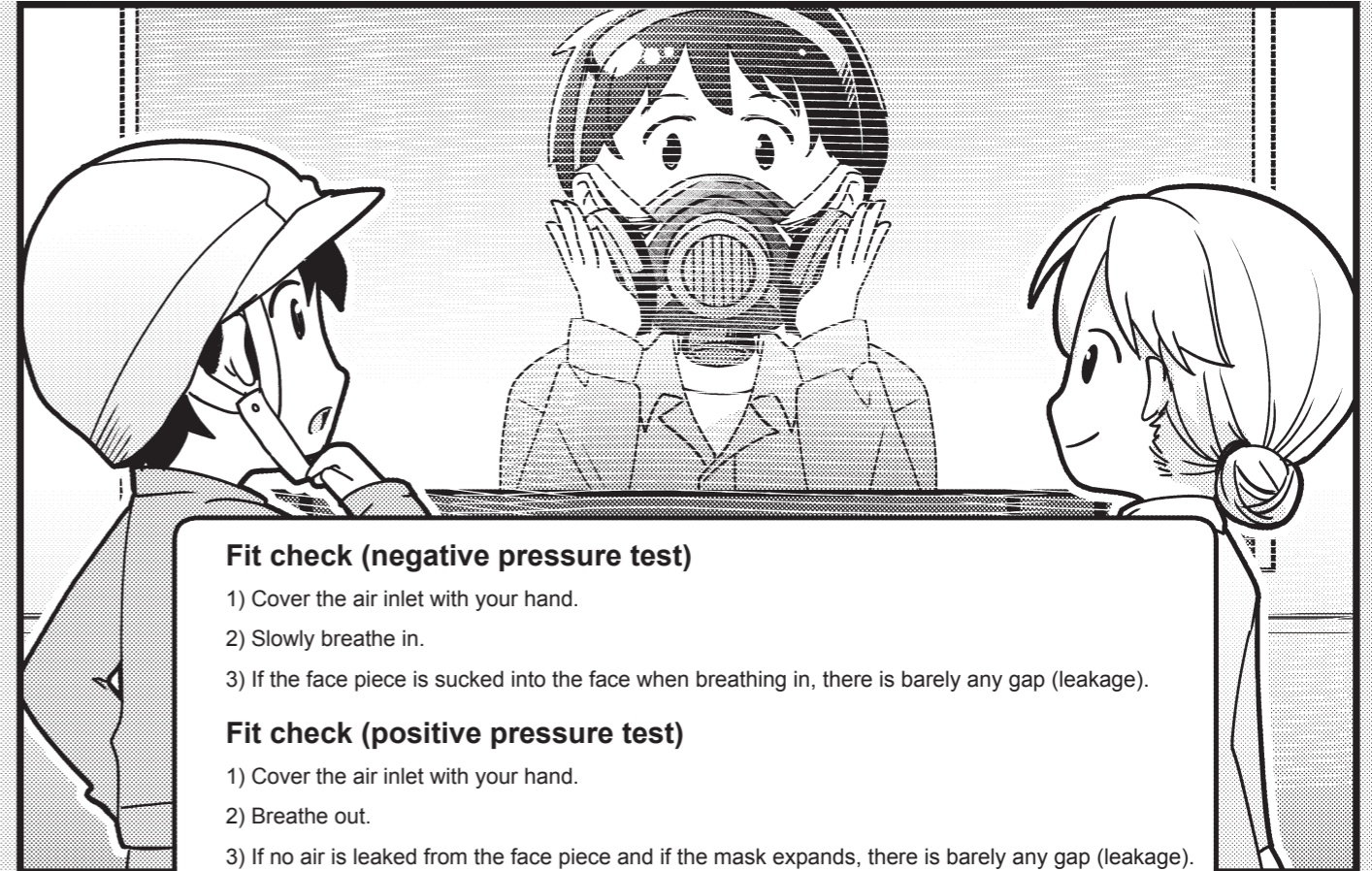
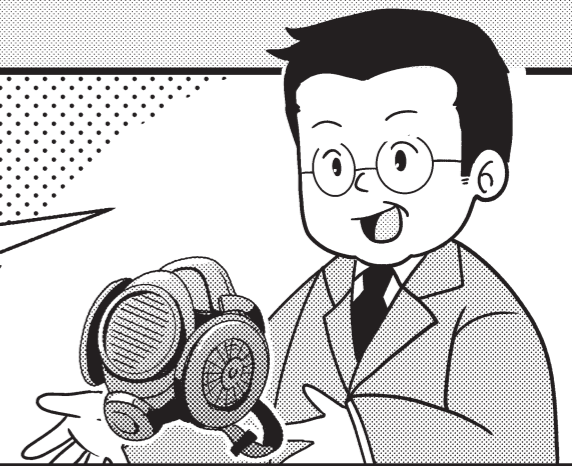
Two-string type



Wear a respirator that closely and firmly fits your face.



If a respirator has an air inlet, make sure to perform a fit check.



### Fit check (negative pressure test)

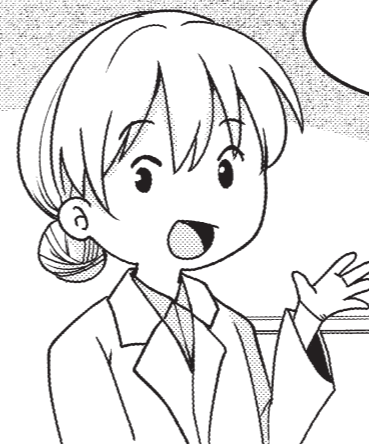
- 1) Cover the air inlet with your hand.
- 2) Slowly breathe in.
- 3) If the face piece is sucked into the face when breathing in, there is barely any gap (leakage).

### Fit check (positive pressure test)

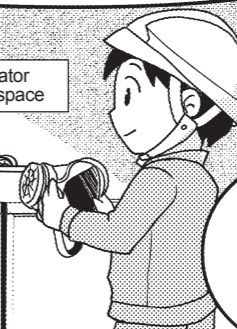
- 1) Cover the air inlet with your hand.
- 2) Breathe out.
- 3) If no air is leaked from the face piece and if the mask expands, there is barely any gap (leakage).

\* If there seems to be a gap (leakage), adjust the position of the face piece and tighten the chin straps.

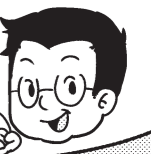
After use, make sure to store it in its designated place.




Respirator storage space



Make sure you use respirators correctly and protect your health!



## Check the pictograms before handling a chemical substance!

	Pictogram	Typical physical and health hazards	Examples of typical precautions
Physical hazards	 (A picture of an explosive blowing up)	Explosive: Mass detonation hazard Explosive: Fire, minor blast or fragment hazard Risk of explosion when heated	No smoking. Do not store at high temperatures and keep away from sparks or sources of ignition. When a fire occurs, immediately evacuate. Contents and containers must be disposed of according to the laws and regulations.
	 (A picture of a fire)	Highly flammable gases and aerosols Combustible liquids and vapors Flammable solids Risk of fire when heated Pyrophoric when coming in contact with air Substances, which in contact with water, emit flammable gases	No smoking. Do not store at high temperatures and keep away from sparks or sources of ignition. Store in a well-ventilated area.
	 (A picture of a circular fire)	Risk of ignition or fueling a fire Risk of fire or explosion	No smoking. Keep away from burning objects. Store on its own isolated from everything else.
	 (A picture of a gas canister)	Compressed gas: Risk of explosion when heated Refrigerated liquefied gases: Risk of frostbite or injury	Store in a well-ventilated area out of direct sunlight. Wear cold resistant gloves and a face shield or protective goggles.
	 (A picture of corrosiveness)	Corrosive to metals	Do not transfer between containers.
Health hazards	 (A picture of corrosiveness)	Serious chemical burns on the skin Serious damage to eyes	Do not let it come in contact with skin or eyes. After handling, wash your body thoroughly. Wear protective clothing, protective gloves, and protective goggles.
	 (A picture of a skull)	Danger to life or toxic if drunk, inhaled, or on contact with skin	Do not inhale. Do not put in mouth or on skin. Use only outside or in a well-ventilated area. Wear a respirator, protective clothing, and protective gloves. Store in a secure environment.
	 (A picture of health hazards)	Germ cell mutagenicity Carcinogenicity Reproductive toxicity (harmful to reproductive ability or a fetus) Aspiration hazard (risk of causing allergy, asthma, respiratory distress when inhaled) Specific target organ toxicity (organ damage) Danger to life if swallowed or aspirated into the airway	Do not let it come in contact with skin. Do not inhale. Wear a respirator, protective gloves, and protective clothing. Use in a well-ventilated area. If there are any abnormalities in the body or if exposure is suspected, immediately consult a physician.
	 (A picture of an exclamation mark)	Harmful when swallowed, inhaled, or on contact with skin Strong eye and skin irritant Skin sensitization (risk of allergic skin reaction) Respiratory tract irritation or narcotic effects	Do not inhale. Consult a physician if feeling sick. Wear protective gear.
Environmental hazards	 (A picture of an exclamation mark)	Destroys ozone layer and harmful to health and environment	Contact the manufacturer or supplier regarding the information on collection or recycling.
	 (A picture of environment)	Acute hazards to the aquatic environment	Avoid leakage or disposal into the environment. Contents and containers must be disposed of according to the laws and regulations.

Note: Only representative items are listed.

2020.9

Learn through Manga

## Basics of Chemical Substances Handling

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