

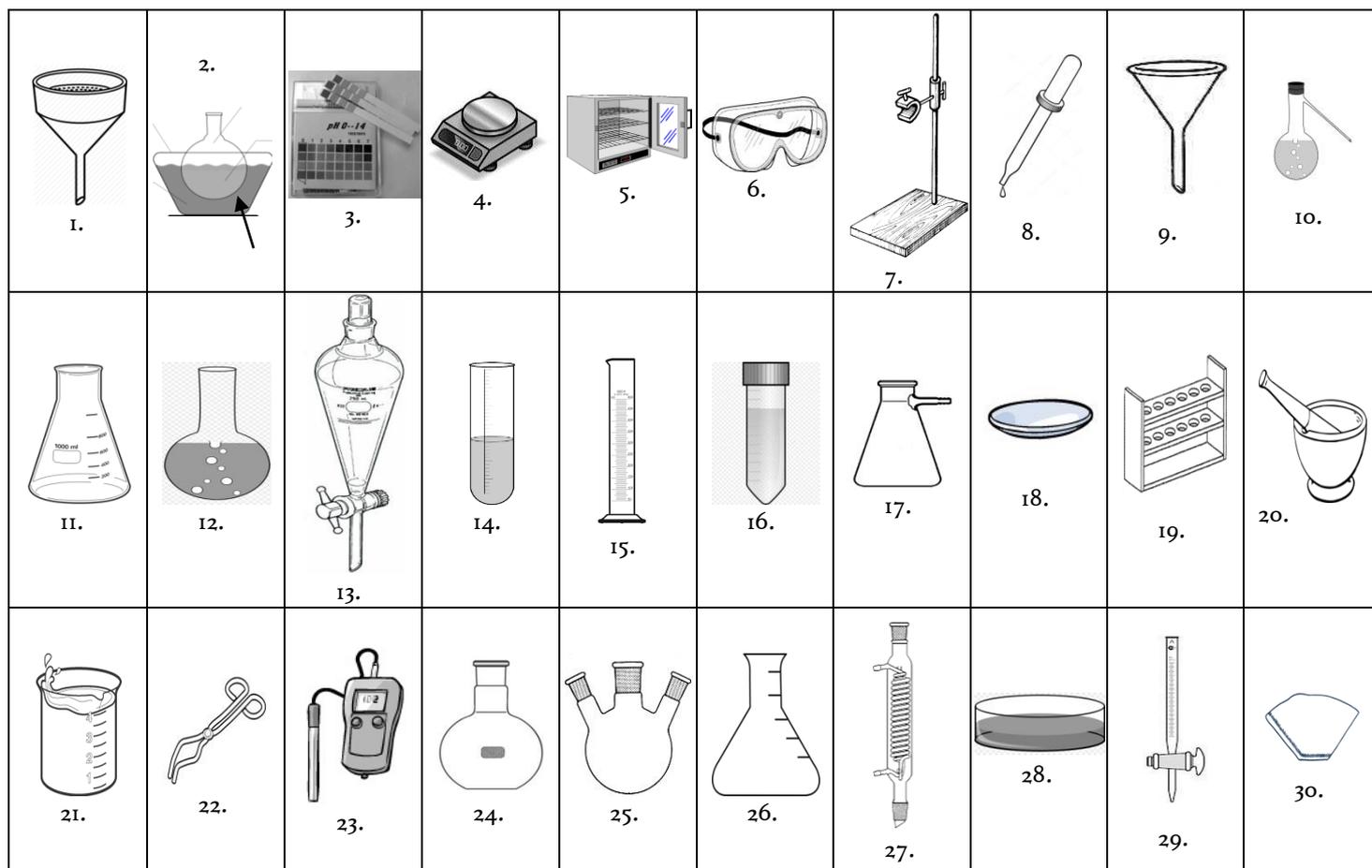
# LABORATORY

Vocabulary Focus: Laboratory Equipment    Lab Safety Rules    Lab Precautions  
Language Focus: Modals

## VOCABULARY FOCUS

### I. Laboratory Equipment

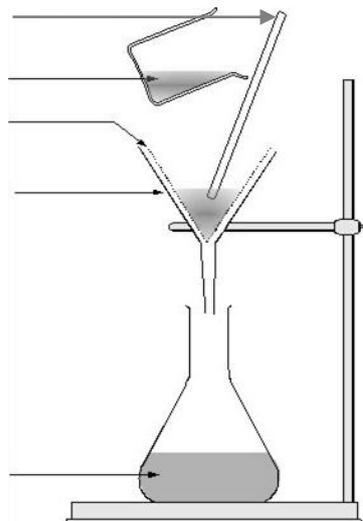
Match the following expressions with pictures. What are their French equivalents?



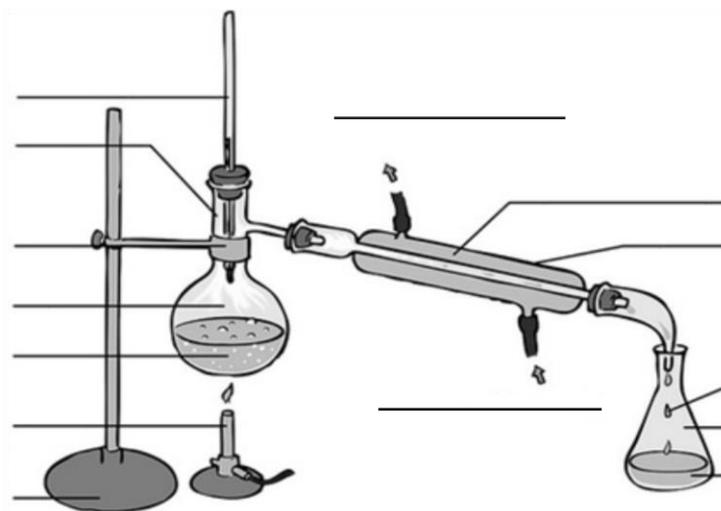
- |                                  |                                |                      |
|----------------------------------|--------------------------------|----------------------|
| 1. Single neck flat bottom flask | 10. Burette (buret)            | 20. Watch glass      |
| 2. Buchner funnel                | 11. Beaker                     | 21. Test tube rack   |
| 3. Erlenmeyer flask              | 12. Oven                       | 22. Goggles          |
| 4. Crucible                      | 13. Round bottom boiling flask | 23. Condenser        |
| 5. Graduated cylinder            | 14. Separatory funnel          | 24. Buchner flask    |
| 6. Mortar and pestle             | 15. Stand                      | 25. Petri dish       |
| 7. Filtering flask               | 16. Test tube                  | 26. Pipette          |
| 8. Ph sticks                     | 17. Bath                       | 27. Volumetric flask |
| 9. Three neck round bottom flask | 18. Ph meter                   | 28. Funnel           |
|                                  | 19. Analytical balance         | 29. Vial             |
|                                  |                                | 30. Filter paper     |

Fill the following schemes with suitable expressions:

Funnel – Filter – Paper – Mixture – Residue – Glass Rod – Filtrate



Bunsen Burner – Condenser – Cooling Water – Condensed Water – Thermometer – Mixture – Stand – Distillate  
 – Distillation Flask – Water Outlet – Steam – Cold Water Inlet – Clamp – Receiving Flask



Fill in the gaps with the following words in their appropriate forms:

Item – glassware – neck – laboratory – approximate – boiling tube – container – mass – weight – experiment – weigh

1. Laboratory \_\_\_\_\_ refers to a variety of equipment, traditionally made of glass, used for scientific \_\_\_\_\_ and other work in science, especially in chemistry and biology \_\_\_\_\_. There are many different kinds of laboratory glassware \_\_\_\_\_.
2. A \_\_\_\_\_ is essentially a scaled-up test tube, being about 50% larger in every aspect.
3. A bottle is a small \_\_\_\_\_ with a \_\_\_\_\_ that is narrower than the body and a "mouth."
4. Rounded numbers are only \_\_\_\_\_.
5. \_\_\_\_\_ is a measurement of how much matter is in an object; \_\_\_\_\_ is a measurement of how hard gravity is pulling on that object. Your \_\_\_\_\_ is the same wherever you are - on Earth, on the moon, floating in space. But your \_\_\_\_\_ depends on how much gravity is acting on you at the moment. You would \_\_\_\_\_ less on the moon than on Earth.

## II. Laboratory Safety Symbols

The idea of using symbols is to transmit information regarding your safety inside the laboratory clearly and easily. The safety symbols that will be presented in this module are the most familiar ones. These symbols are accompanied by explanations.

SAFETY	SYMBOLS	HAZARD	EXAMPLES	PRECAUTION
DISPOSAL		Special disposal considerations required	Chemicals, broken glass, living organisms such as bacterial cultures, protests, etc.	Dispose of wastes as directed by your teacher
BIOLOGICAL		Organisms or organic materials that can harm humans	Bacteria, fungus, blood, raw organs, plant material	Avoid skin contact with organisms or material. Wear dust mask or gloves. Wash hands thoroughly
EXTREME HEAT		Objects that can burn skin by being too cold or too hot	Boiling liquids, hot plates, liquid nitrogen, dry ice, all burners	Use proper protection when handling. Remove flammables from the area around open flames or spark sources
SHARP OBJECT		Use of tools or glassware that can easily puncture or slice skin	Razor blade, scalpel, nails, push pins, etc.	Practice common sense behavior and follow guidelines for use of the tool
FUME		Potential danger to olfactory tract from fumes	Ammonia, heating sulfur, moth balls, nail polish remover, acetone, any volatile substances	Make sure there is good ventilation and never smell fumes directly
ELECTRICAL		Possible danger from electrical shock or burn	Improper grounding, liquid spills, short circuits	Double-check setup with instructor. Check condition of wires and apparatus
CORROSIVE		Substances (acids and bases) that can react with and destroy tissue and other materials	Acid such as vinegar, hydrochloric acid, hydrogen peroxide, sodium hydroxide, soap	Wear goggles and an apron

TOXIC		Poisonous substances that can be acquired through skin absorption, inhalation, or ingestion	Mercury, many metal compounds, iodine, poinsettia leaves	Follow your teacher instructions. Always wash hands thoroughly after use
RADIOACTIVE		Radioactive substances such as uranium and plutonium	Uranium, thorium, plutonium and other elements that emit radiation	Be careful in handling. Notify your teacher of spills or excess substances
FLAMMABLE		Combustible materials that may ignite if exposed to an open flame or spark	Alcohol, powders, kerosene, potassium permanganate	Avoid heat and flame sources. Be aware of locations of fire safety equipment
HYGIENE				Always wash your hands after completing an experiment.

### III. LABORATORY PRECAUTIONS

#### 1. Inside the Laboratory:

- Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
- Wear safety goggles and aprons
- Always keep the working area clean and orderly.
- Know the locations and operating procedures of all safety equipment.
- Notify the instructor immediately of any unsafe conditions you observe.

#### 2. Handling Chemicals

- All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemical unless specifically instructed to do so.
- Check the label on chemical bottles twice before removing any of the contents.
- Never return unused chemicals to their original containers.
- Acids must be handled with extreme care. ALWAYS ADD ACID SLOWLY TO WATER.
- Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.

#### 3. Handling Glassware and Equipment

- Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper.
- When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Keep your hands dry when working with electricity.
- Do not immerse hot glassware in cold water; it may shatter.
- Report damaged electrical equipment immediately.

#### 4. Heating Substances

- TURN OFF THE GAS AT THE GAS OUTLET VALVE after using.
- Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended.
- Use tongs or heat-protective gloves when holding or touching heated apparatus.

**Multiple Choice Questions: Choose the letter of the best answer.**

1. When doing an experiment like heating or anything that uses fire, what should you be ready with?
- a. an apron
  - b. a pail of water
  - c. a damp cloth
  - d. a wet tissue paper
2. Acids must be handled with extreme care. In diluting an acid, what should you do?
- a. Do it in any way you want.
  - b. Always add the water to the acid.
  - c. Always add acid slowly to water
  - d. Mix the acid to the water by stirring



3. You have come across this icon  pasted on a bottle. What does this mean?
- a. It is a metal
  - b. It is a nonmetal
  - c. It is radioactive
  - d. It is poisonous/toxic



4. While inside the hospital's laboratory area, you saw this icon  in one of the rooms. What does this mean?
- a. The room is strictly for nurses.
  - b. The room is only for technician.
  - c. The room is used for X-ray purposes.
  - d. The room is used for storage of hazardous chemicals.



5. While reading the procedure of an activity, you happen to come across this icon . What does it mean?
- a. Always wash your hands after an experiment.
  - b. "CLOSE THE FAUCET AFTER USE."
  - c. Always use water in all experiments.
  - d. Water is a universal solvent.



6. You have come across this icon . What does this mean?
- a. It is poisonous/hazardous.
  - b. It is a nonmetal.
  - c. It is radioactive.
  - d. It is a metal.

7. One of the most important safety rules is to:
- a. Avoid heating objects.
  - b. Read the procedure of the activity.
  - c. Follow your classmates' directions.
  - d. follow the instructions carefully as advised

8. Which of the following symbols suggests that you are working with flammable substances in a laboratory?



a.



c.



b.



d.

9. All of the following laboratory instructions are correct EXCEPT:
- a. Always add acid slowly to water.
  - b. Always wear your lab gown or apron.
  - c. Start the experiment without being told.
  - d. Taste substances in the laboratory room when you are not told to do so.

# Language Focus: Modals

## WHAT ARE MODAL VERBS?

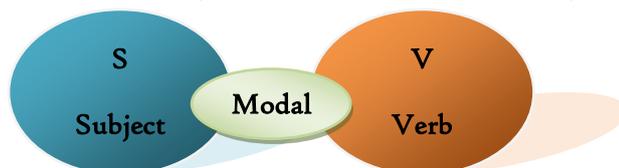
• Can • Could • May • Might • Must • Shall • Should • Ought to • Will • Would

They are auxiliary verbs that provide additional and specific meaning to the main verb of the sentence

## HOW DO WE USE MODALS?

**Example:** *Mary could play the piano.* ➔ They do not accept conjugation.

➔ They do not need other auxiliary verbs.



## FORM

There is no "s" in singular  
There is no "do / does" in the question  
There is no "don't / doesn't" in the negative

⚙ He can ski.

He ~~can~~s ski.

He can ~~skis~~.

⚙ Would you like to come with me?

~~Do~~ you would like to come with me?

⚙ They can't be serious.

They ~~don't~~ can be serious.

Modal verbs do not have **infinitives** or **-ing** forms

⚙ ~~To~~ can / ~~Caning~~

⚙ ~~To~~ must / ~~Musting~~

Modal verbs are followed by an infinitive **without to**

⚙ She **must** study.

➔ strong obligation

⚙ We **should** have gone the other way.

➔ recommendation

⚙ He **could** play football in his youth.

➔ ability in the past

Modal verbs **do not** have **all the tenses**

Modal verbs use other verbs to complete the tenses

**Can** is completed with **be able to**

**Must** is completed with **have to**

⚙ They **can** play the piano.

➔ They will **be able to** play the piano in the future.

⚙ You **must** come early.

➔ You **had to** come early yesterday.

## WHAT DO THEY EXPRESS?

They can have more than one meaning depending on the situations

1. **Single Concept Modal:** they have **one** meaning
2. **Double Concept Modal:** they have **two** meanings
3. **Modals in past:** They are used to express a situation in the past

### Single Concept Modal

Modal	Concept	Examples
Will	Future	Joe will travel to NY next week
Might	Small probability	I might move to Canada some day
Should	Recommendation	You should go to the doctor
Ought to	Formal recommendation	We ought to know about first aids
Had better	Warning	I had better study or I will fail the test

### Double Concept Modal

Modal	Concept	Examples
May	Permission	May I come in?
	Good probability	We may visit Mexico this summer
Must	Responsibility	Everyone must pay taxes
	Assumption	She didn't arrive. She must be sick.
Would	Past (used to)	When I was young, I would play football.
	Present unreal	I would buy the car but I can't afford it.
Shall	Offer	Shall I clean it?
	Contractual obligation	The company shall pay on January 1 <sup>st</sup> .
Could	Unreal ability	I could go if I had time.
	Past ability	She could play the piano. (But she can't anymore.)
Can	Present ability	We can speak English.
	Permission	Can I have a candy?

**Modals in the Past:** They are modals referred to actions that happened in the past

#### MODAL + HAVE + verb in past participle

It **must have been** a difficult decision

They **should have invited** her to their wedding

Modal perfect	Uses	Examples
Must have + P.P.	Logical conclusion on a past event	Peter has arrived late. He <b>must have been</b> in a traffic jam.
May/ might have + P.P.	Deduction on a past event	Joe <b>may / might have taken</b> the wrong train.
Could have + P.P.	Possibility to do something, gone unfulfilled	You <b>could have played</b> better.
Couldn't have + P.P.	Certainty that something couldn't have happened	He <b>couldn't have passed</b> because you hadn't studied enough.
Would have + P.P.	Desire to do something, but impossibility to do it for external causes	I <b>would have visited</b> you, but I forgot your address.
Should / ought to have + P.P.	Lament on something that should have been done	You <b>should / ought to have warned</b> me earlier.
Shouldn't have + P.P.	Critique on something that shouldn't have happened	He <b>shouldn't have told</b> them.
Needn't have + P.P.	Something that wasn't necessary doing	You <b>needn't have bought</b> it.

## Let's Practice

Match the modals or modal perfects in A with their uses in B.

### A

1. Shall I help you with that heavy bag?
2. You should have done all the homework.
3. She didn't answer the phone so she must have left.
4. I need to clean my room. I promised my mum that I would.
5. I think that they might have left.
6. Would you sign your name here, please?
7. It's not fair. I ought to have received a prize too.
8. You mustn't use this computer.

### B

- a. a logical conclusion about a past event
- b. formal request
- c. prohibition
- d. offer
- e. unfulfilled expectation
- f. Obligation
- g. advice which was not followed
- h. a guess about something which happened

Fill in the blanks with suitable modals from the ones given in the box below.

should	might	can	could	have to	must
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1. Rita's flight from Morocco took more than 11 hours. She \_\_\_\_\_ be exhausted after such a long flight. She \_\_\_\_\_ prefer to stay in tonight and get some rest.
2. If you want to get a better feeling for how Thames is laid out, you \_\_\_\_\_ walk down town and explore the riverside.
3. You \_\_\_\_\_ research the route a little more before you set sail.
4. When you have a small child in the house, you \_\_\_\_\_ leave small objects lying around.
5. Anna: \_\_\_\_\_ you hold your breath for more than a minute?  
Bobby: No, I can't.
6. Mary's engagement ring is enormous! It \_\_\_\_\_ have cost a fortune.
7. Please make sure to feed the fish while I am gone. If they don't get enough food, they \_\_\_\_\_ die.
8. I \_\_\_\_\_ speak Spanish fluently when I was a child.
9. The teacher said we \_\_\_\_\_ read the book if we needed extra credit.
10. The spatula \_\_\_\_\_ be in this cupboard but it's not here.

Complete the sentences with the correct form of the verbs in brackets. Use a modal in the past.

1. Nobody told her anything about the argument. She \_\_\_\_\_ (know) about it.
2. We arrived too early. We \_\_\_\_\_ (be) in such a hurry.
3. She \_\_\_\_\_ (leave) the office because her coat and bag aren't here.
4. I \_\_\_\_\_ (drive) to work, but the weather was so nice that I decided to walk.
5. It's possible that I \_\_\_\_\_ (forget) to tell Joe about the meeting.
6. You \_\_\_\_\_ (call) her on her birthday. She never forgets to call you.