CLS 281

Basic Biochemistry and Biomolecules

جامعة الملك سعود
King Saud University
1957

# Introduction to Basic Biochemistry and Biomolecules Laboratory

# Marks Distribution

| Assessment | Marks |
| --- | --- |
| Safety and behavior in the lab | 1 |
| Lab report | 5 |
| Quiz | 4 |
| Final lab exam | 15 |
| | Total marks= 25 |

# Course Syllables

| Week | Exp. | Lecture Topic |
|---|---|---|
| 1 | | Introduction |
| 2 | 1 | General Color Tests of Proteins |
| 3 | 2 | Color Tests of Amino Acids |
| 4 | 3 | Precipitation of Proteins |
| 5 | 4 | General Color Tests of Carbohydrates |
| 6 | 5 | Reducing Properties Tests of Carbohydrates<br>Quiz (covering Introduction, Exp. 1,2,3) – Wed 12/4/2023 at 1 pm |
| 7 | 6 | Color Tests for Specific Carbohydrates: Ketoses, Pentoses, and Polysaccharides. |
| 8 | 7 | Determination of Reducing Sugars by Somogyi-Nelson Method |
| 9 | 8 | Rancidity Testing Methods of Fat |
| 10 | | Final Exam (Wed 21/5/2023 at 10 PM) |

# Outline

1. Laboratory regulations.
2. Emergency procedure.
3. Safety rules and first aid procedures.
4. Laboratory tools and equipment.
5. Laboratory and Workplace Safety Signs

# 01 *Laboratory regulations*

1. Read each experiment thoroughly before entering the lab.
2. Discard solids into the waste crocks.
3. Always work in the fume hood.
4. Read the labels.
5. Avoid using excessive amounts of reagents.

# 01 *Laboratory regulations*

6. Never return unused chemicals to the stock bottle.
7. Don't lay down the stopper of a bottle.
8. Don't heat heavy glassware.
9. Always maintain a clean work area in the laboratory.
10. Wash glassware with water and a cleaner if needed.
11. When heating a liquid in a test tube, point it away in case it pumps.

# 02 *Emergency procedure*

1. Notify the instructor or demonstrator immediately in case of any emergency.
2. Learn the location and proper use of fire extinguishers, blankets, first-aid kits, emergency showers, and eye wash stations.
3. Spillage of corrosive chemicals must be reported by filling down the incidence report.

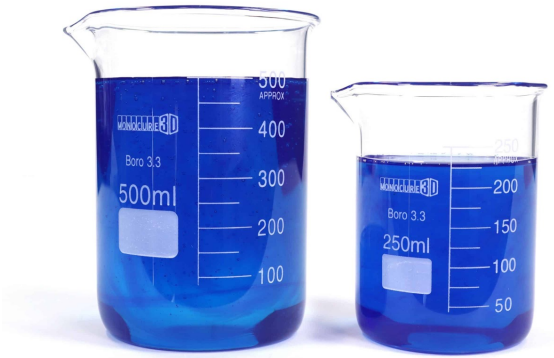
# 03 Safety rules and first aid procedures

1. Don't eat or drink in the lab.
2. Wear safety goggles in the lab and gloves.
3. Never attempt unauthorized experiments.
4. Never leave heated laboratory reactions unattended.
5. No practical jocks.
6. Never dip pipets or spatulas into reagent bottles,
7. Don't return the unused portion to the stock bottles.
8. Be familiar with emergency exits.
9. Be prepared to administer first aid.

# 04 *Lab Tools and Equipment's*

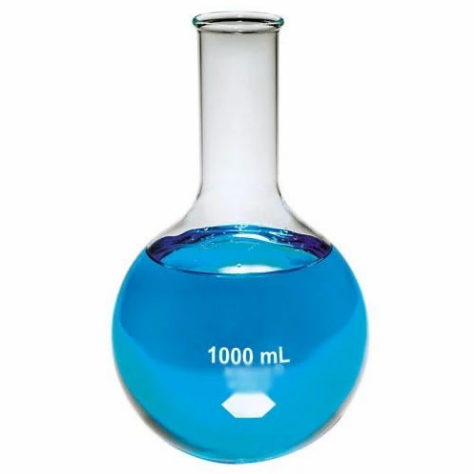
# 4.1 *Beaker*

- It is a simple container for **stirring** and **heating liquids**.
- They are generally cylindrical in shape, with a flat bottom.



# 4.2 *Florence flask*

- It is also known as a **boiling flask**.
- It is designed to be used for **uniform heating** and **ease of swirling**; it is produced in a number of different glass thicknesses to stand different types of use.



# 4.3 *Erlenmeyer flask*

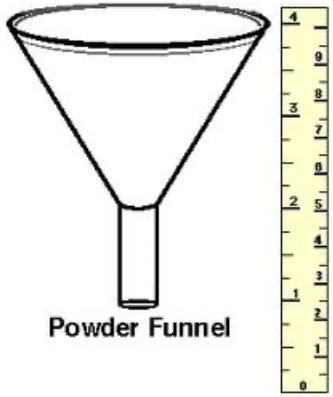
- The Erlenmeyer is usually marked on the side (**graduated**) to indicate the approximate volume of contents, and has a spot of ground glass or enamel where it can be **labeled** with a pencil.
- It differs from the beaker in its tapered body and narrow neck.

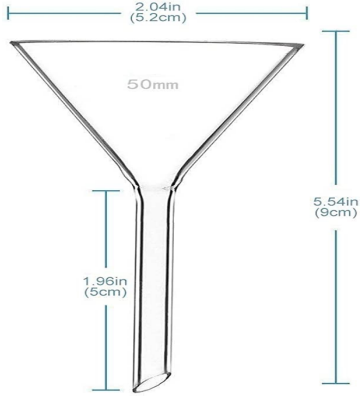
# 4.4 *Funnel*

- Different kinds of funnels have been adapted for these specialized applications in the laboratory.

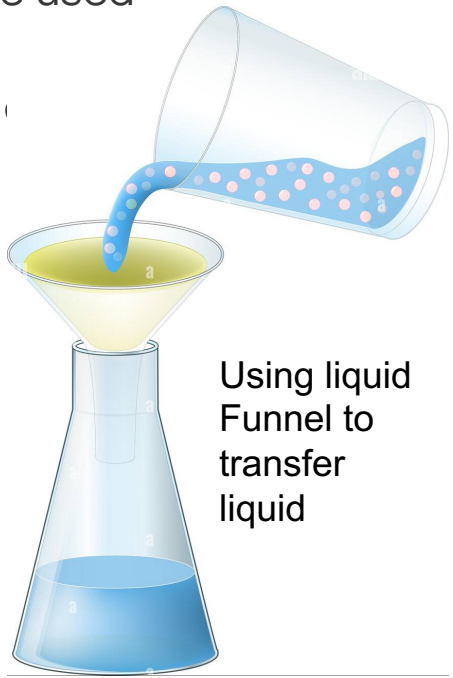
1. **Liquid funnel:** used to transfer liquids to other containers and can be used for filtration with the aid of filter paper.
2. **Powder funnel:** has a small and wide neck used to aid past pouring powders.
3. **Buchner funnel:** It is used in filtrations.

Buchner Funnel



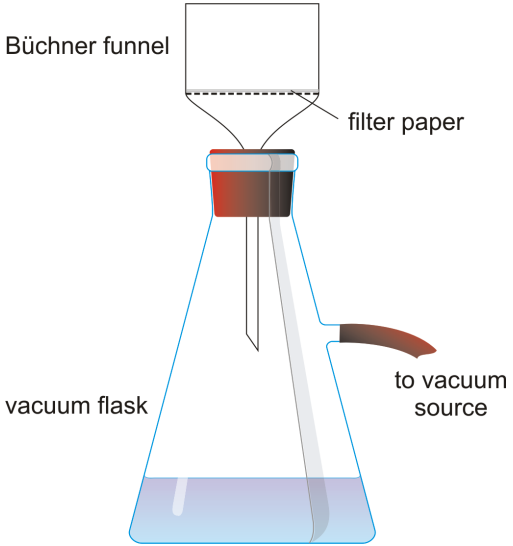

Liquid Funnel



Using liquid Funnel to transfer liquid

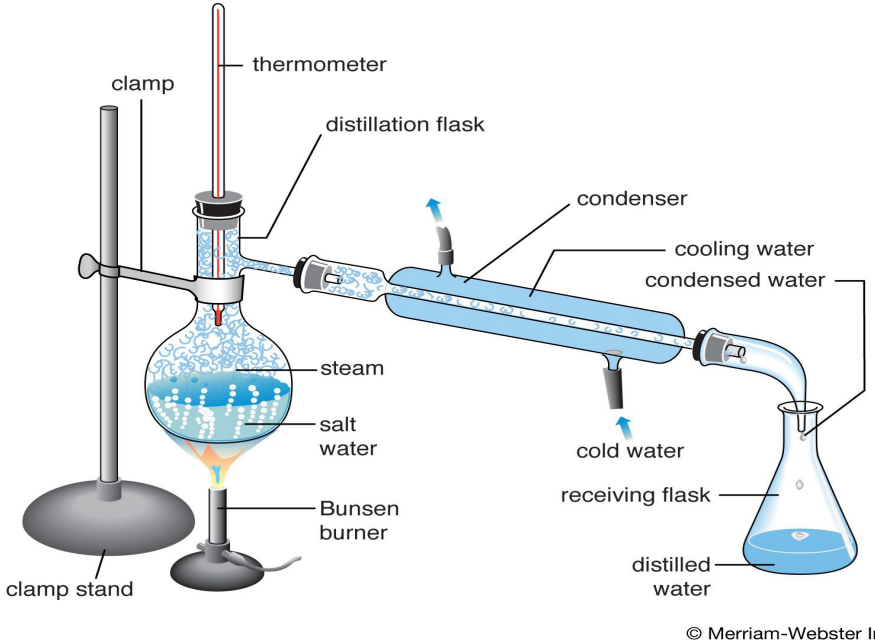
# 4.5 *Filter Flask*

- A filter flask is a flask **fitted with a side arm** for connecting to a vacuum source for fast filtering.



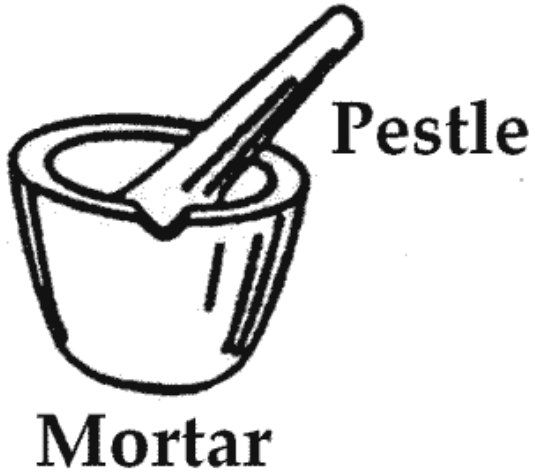

# 4.6 Distilling flask

- It is used to <u>separate mixtures of two liquids</u> with different boiling points.
- Distillation occurs when the flask is heated and the components of the mixture change from liquid to gas, with the lowest boiling point liquids changing first and liquids with the highest boiling points changing last.



# 4.7 *Mortar and pestle*

- It is a tool used **to grind and mix substances**.



# 4.8 *Crucible and cover*

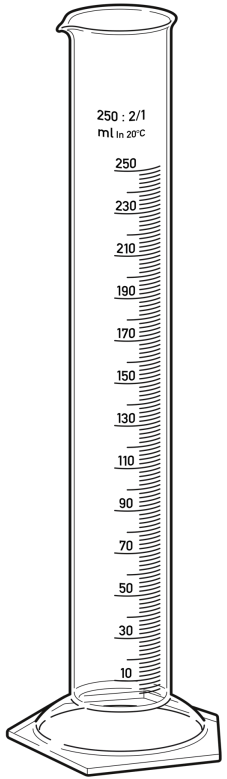
- A crucible is a ceramic container capable of withstanding extreme temperatures, whilst the cover is designed to prevent heat from escaping from the crucible itself.

# 4.9 Evaporating dishes

- They are used to evaporate excess solvents - most commonly to evaporate water – in order to produce a concentrated solution or a solid precipitate of the dissolved substance.

# 4.10 *Graduated cylinder*

- Used to measure the volume of a liquid.
- Graduated cylinders are generally **more accurate** and precise than laboratory flasks and beakers.



# 4.11 Test tubes

- Test tubes are widely used by chemists to hold, mix, or heat small quantities of solid or liquid chemicals, especially for qualitative experiments and assays.

# 4.12 Test tubes holder

- The test tube holder is used to hold test tubes.
- They are used by squeezing the handles to open the other end and inserting the test tube.
- Test tube holders are typically used when heating the test tube is necessary or when caustic materials are being handled.

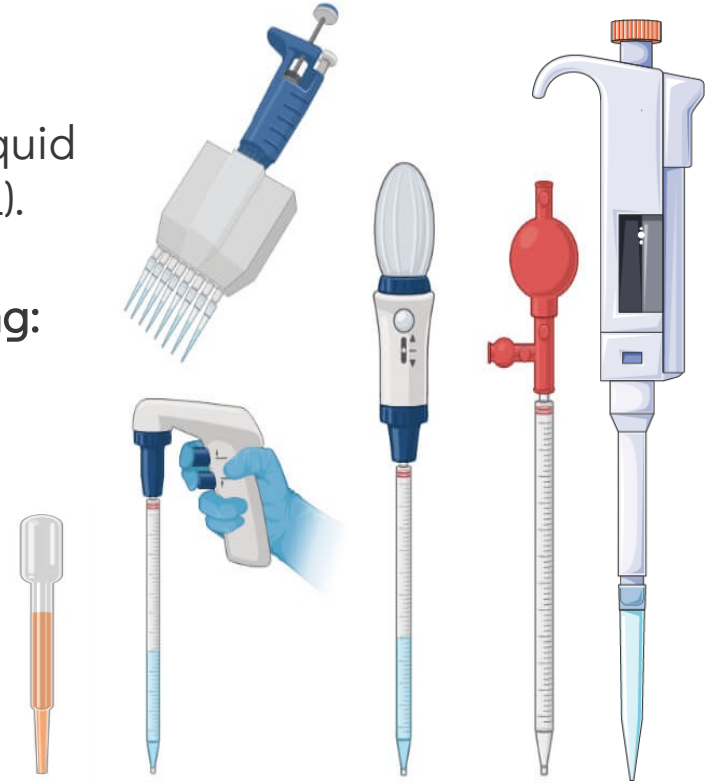
# 4.13 Test tubes rack

- It is used to hold/support test tubes containing chemicals waiting for further operations.

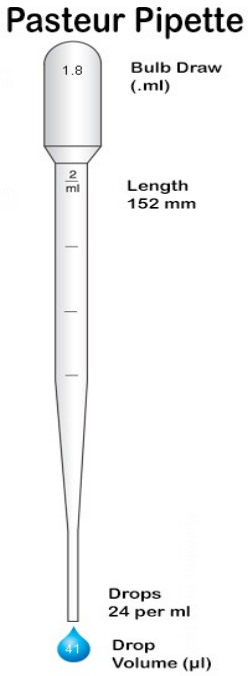
# 4.14 Pipettes

- A **pipette** is a laboratory instrument used to measure out or transfer small quantities of liquid in volumes of milliliters (mL), or microliters (µL).

- **There are different types of pipettes, including:**
  1. Graduated pipettes (milliliters).
  2. Micropipettes (microliters).
  3. Transfer pipettes (Pasteur pipettes).



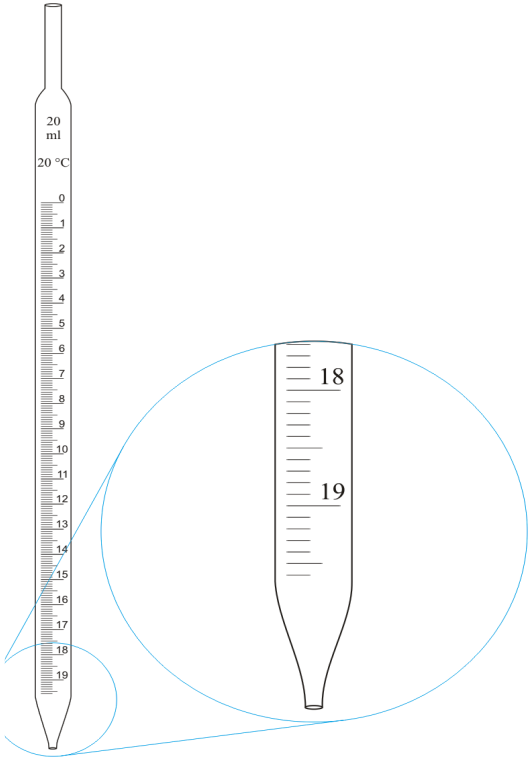
# 4.15 Pipettes




Pasteur Pipette (used to transfer liquids)


| Size | Range |
|---|---|
| P-10 | 0.5-10 µl |
| P-20 | 2-20 µl |
| P-200 | 20-200 µl |
| P-1000 | 200-1000 µl |

Micropipette ( used for small volumes 0.5 ul – 1000 ul)

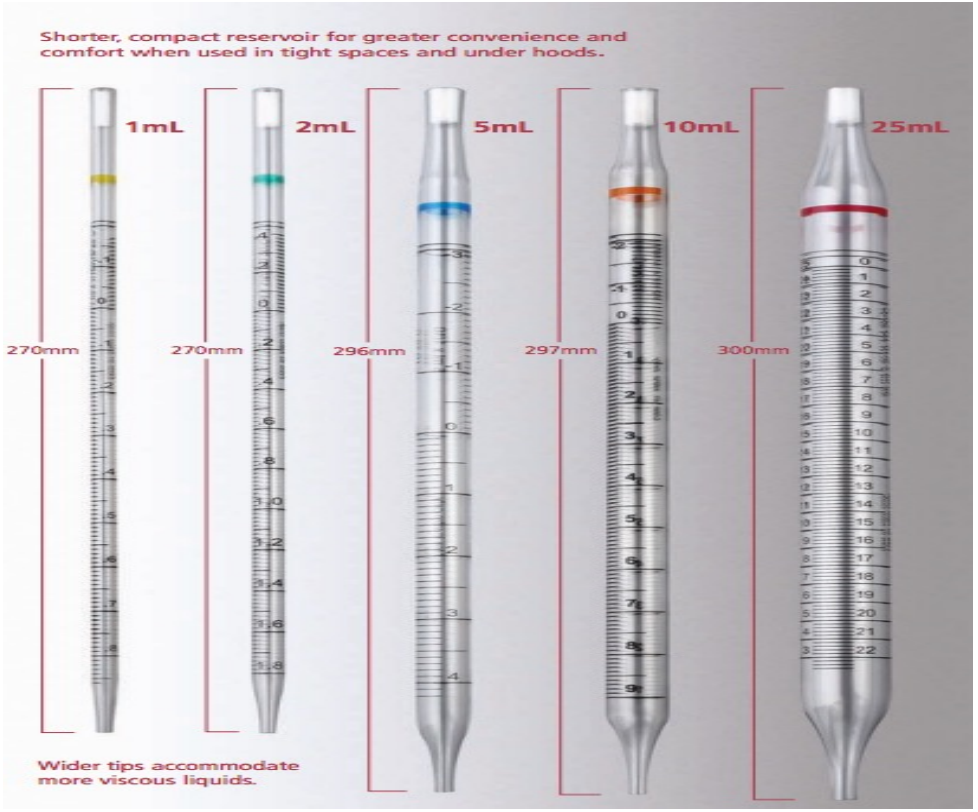



Graduated pipette ( used for large volumes in 1 – 25 ml)

# 4.16 Graduated pipette

- Also known as a **Mohr pipette**
- It is used to measure the volume of the liquid dispensed, although not as accurately as a volumetric pipette.


**Volumetric pipette.**




**Mohr pipette (graduated pipette)**

# 4.17 Pipette aid

- Manual pipette aid: pipette aid pump, bulb pipette.
- Motorized pipette aid: Pipette gun


Pipette gun

PIPETTE PUMP

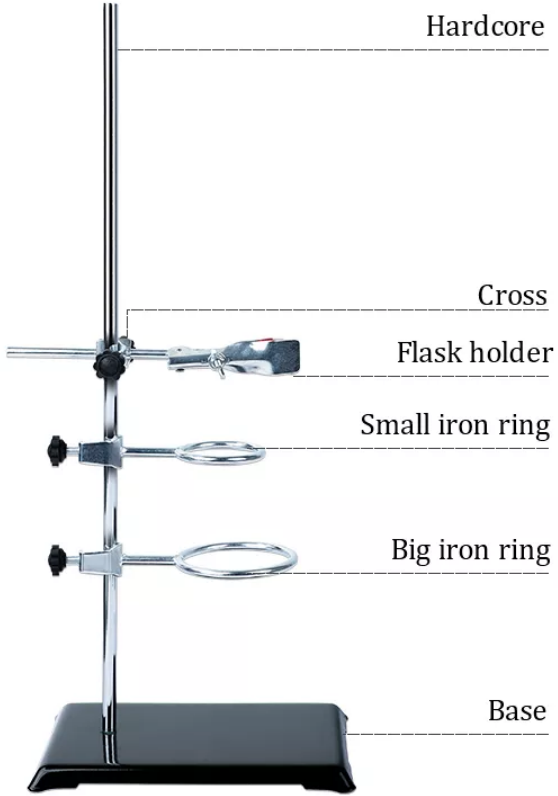

BULB PIPETTE

# 4.18 Burette

- Burette is used to deliver and precisely measure variable amounts of liquid added into another chemical.
- Commonly used in the acid-base titration.

# 4.19 The ring stand

- Used to support laboratory apparatus.



# 4.20 Burette clamp

- A burette clamp is used to fasten glassware into place on a ring stand.

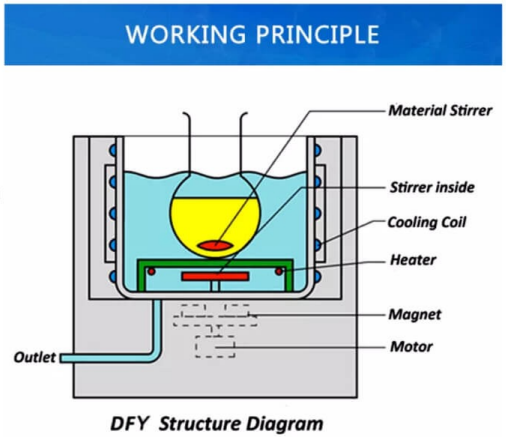
# 4.21 Thermometer

- It is a device that is used to measure temperature.

# 4.22 Water Bath/ Heat block

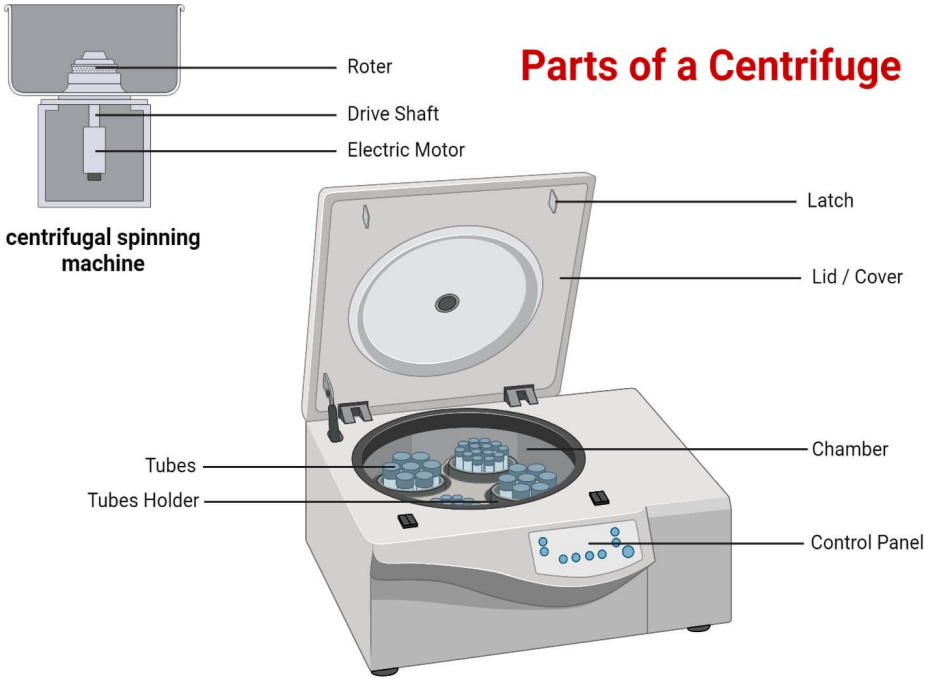
- These are two instruments that can be used to heat your samples.



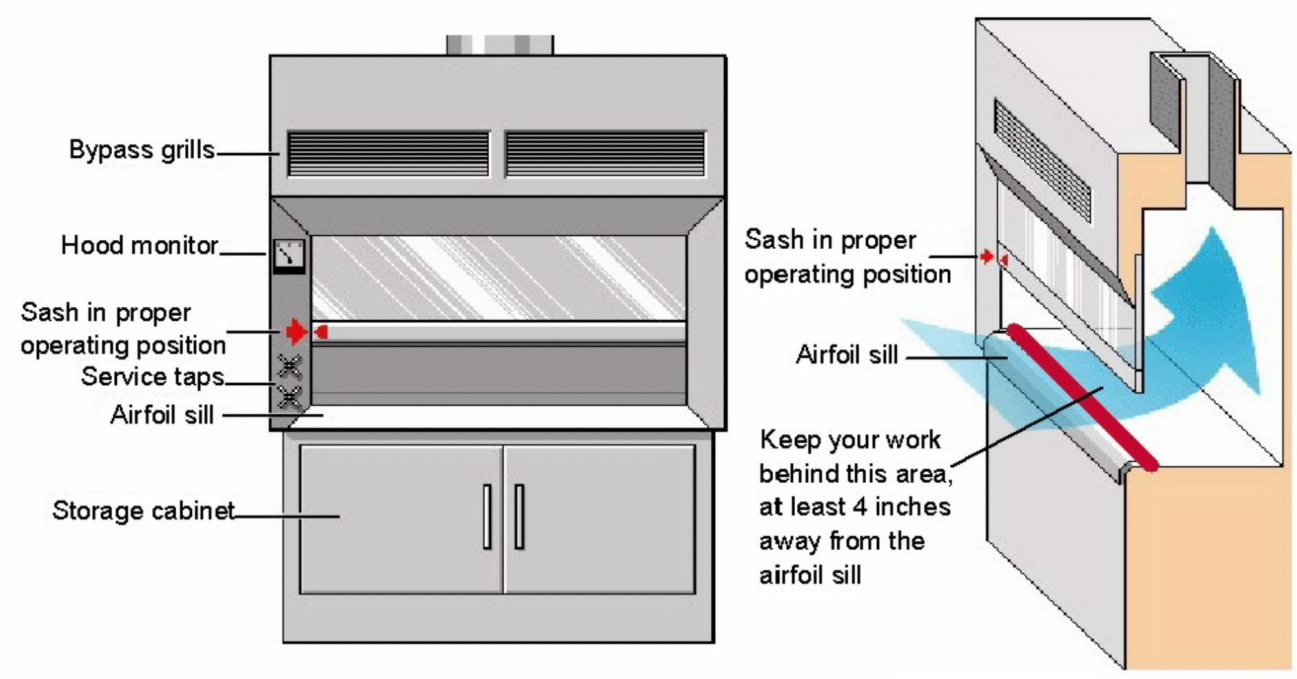


# 4.23 Centrifuge

- A centrifuge is an instrument that puts an object in rotation (spins it in a circle) around a fixed axis.
- The Separating components of the sample are based on density.

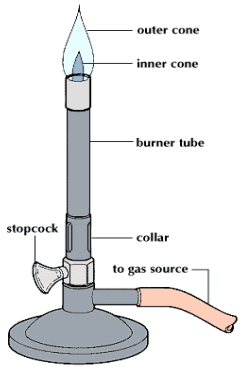


# 4.24 Chemical hood



# 4.25 Lab Tools and Equipment

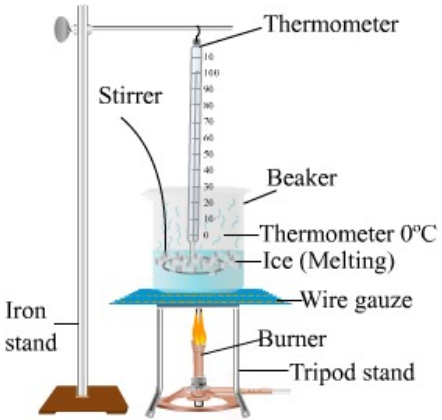
- **Bunsen burner**: It is used for heating and sterilization.
- **A wing top**: is an accessory that can be used with a Bunsen burner to provide a more uniform flame.
- **Wire gauze with asbestos center:** it can be used to support a container (such as a beaker or flask) during heating as it helps to spread the heat evenly over the container.




Bunsen burner

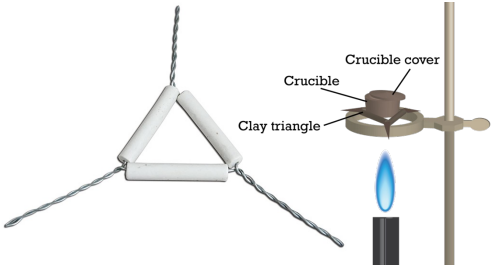

A wire top

Wire gauze

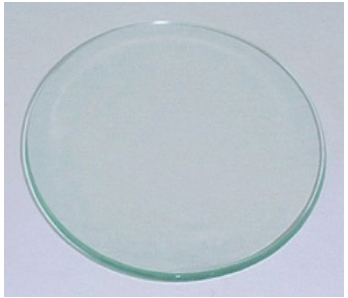


# 4.26 Lab Tools and Equipment

- **Wire triangle:** It's composed of twisted wire running through three clay pipes in the shape of an equilateral triangle and is used to hold a crucible over the flame of a Bunsen burner.
- **Watch glass:** used in chemistry as a surface to evaporate a liquid, to hold solids while being weighed, or as a cover for a beaker.
- **Laboratory balance:** This is an instrument that can be used to determine the weight and mass of an object.
- **Test tube brush: d**esigned to clean test tubes.



Wire triangle

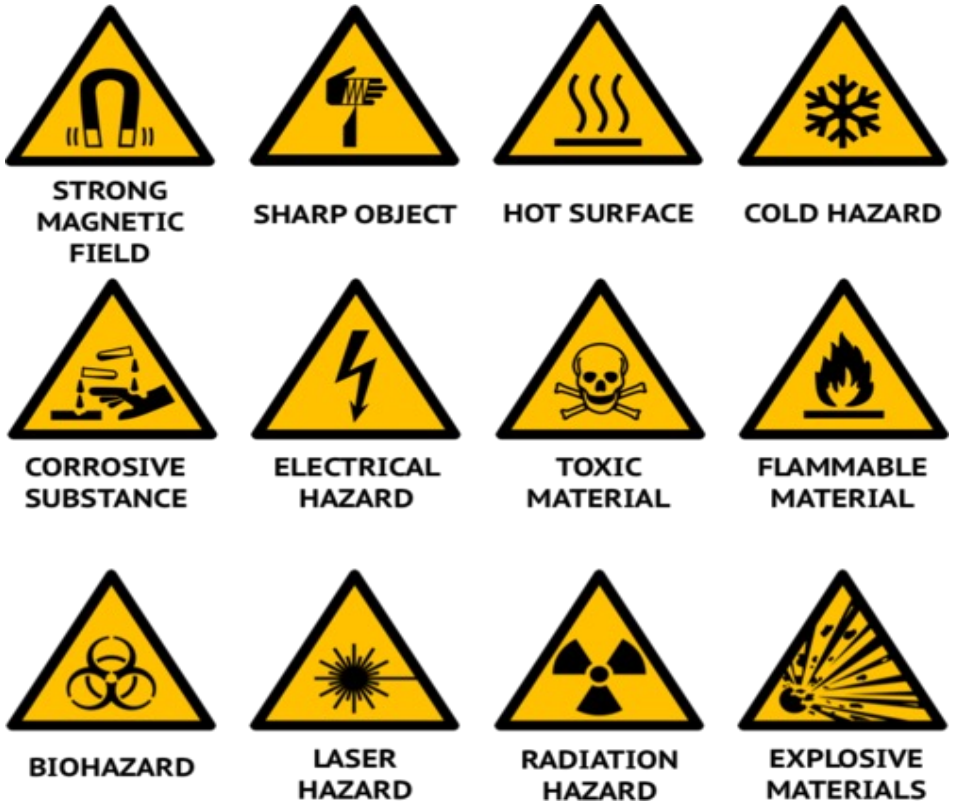

Watch glass

Balance


Brush

# 05 *Laboratory and Workplace Safety Signs*

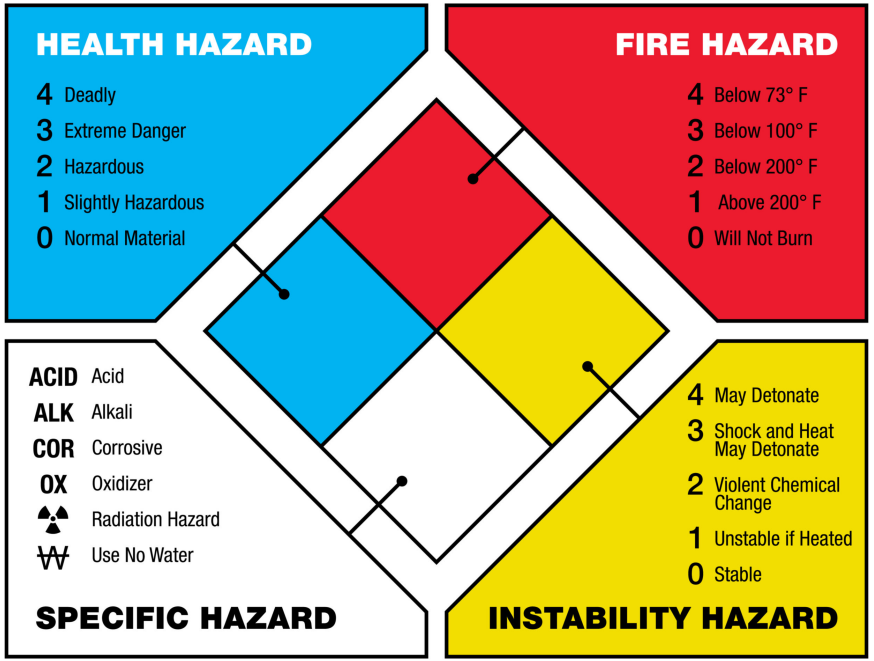
# 5.1 Laboratory and Workplace Safety Signs



# 5.2 NFPA Hazard Diamond

- NFPA system identifies specific hazards of a material and the severity of the hazard.

- The system addresses four hazards:
  - Health.
  - Flammability.
  - Instability.
  - Special hazards.



# Guideline for writing the lab report

**Total: 5 marks**

All the following information should be included in your report:

a) Course # (CLS 281)
b) Experiment title
c) Date of the experiment
d) Student's names and university ID#
e) Section #

The lab report is broken down into 6 sections:

1. Experiment **title**
2. The **aim** of the experiment (objective, or what the test detects specifically) (1 mark)
3. **Principle** (chemical reaction) (1 mark)
4. **Methodology** (written in **steps**, not in tables)
5. **Result** (1 mark)
6. **Interpretation or Comme**nt (2 mark)

Deadline: Next lab  Submission: Handout next lab

# Pipetting Exercise

- Practice using the different pipettes using Distilled Water (D.W). The following are some exercises you can try:

- **Exercise 1:**

1. Pipette 387.5µl using a P1000 into a 1.5ml tube.
2. Remove 150µl using a P200
3. Check if the remaining volume is 237.5µl or not using the P1000.
4. Can you measure 387.5µl using the P1000? Why?

- **Exercise 2:**

1. Pipette 200µl five times using a P200, and weigh the 1.5ml tube. Compare the weight of this tube to
2. the weight of a tube containing 1000 µl, measured out using a P1000.
3. Which is more accurate? Why?

- **Exercise 3:**

1. Pipette 100 µl using the P200 into a 1.5 ml tube, and remove 20 µl aliquots using the P20.
2. Are you able to get five complete aliquots?

1ml of D.W = 1g

# Pipetting Exercise

- Exercise 4:

1. Use four different pipette combinations (micropipettes and regular pipettes) to measure out 1150 µl of water.
2. Which do you think is the most accurate?
3. Take a scale with an empty 1.5ml tube, and determine which of your four methods was the most accurate.

- Exercise 5:

1. Inspect all available graduated pipettes in the lab and record the largest and smallest volumes you can use for each graduated pipette.