Mohamed Khidir University – Biskra **academic year 2023/2024**

College of Science and Technology **1st year State Engineer**

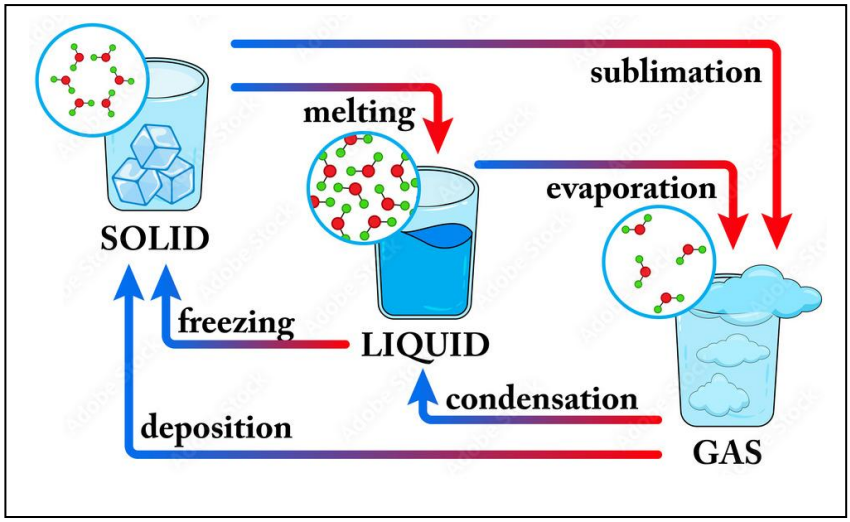
Practical work No. 2; State change of water

1. Goals

- To observe changes of state from solid to liquid to gas
- Construct the solid-liquid and liquid-vapor state change curve
- To study the evolution of temperature during changes of state in order to determine their characteristics.

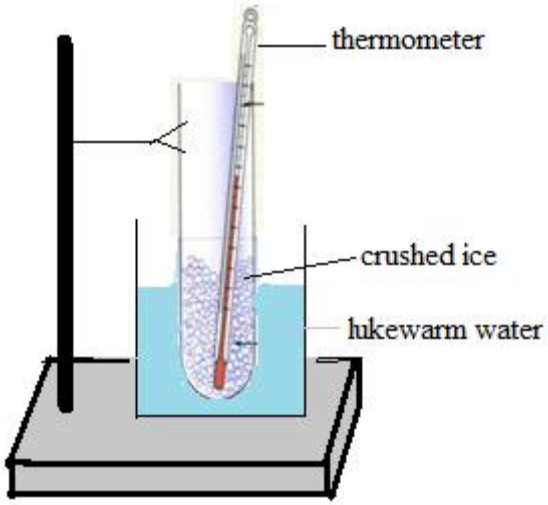
2. Introduction:

Trois états physiques sont possibles pour la matière : l'état solide, l'état liquide et l'état gazeux. Le passage d'un état physique à un autre correspond à un changement d'état qu'on peut regrouper sur le schéma ci-dessous :



3. Study of water fusion

- Place a test tube containing crushed ice (Distilled water ice or Salt water ice) in warm water.
- Then measure the temperature in the tube every 30 seconds, proceeding as in the previous experiment.



Time (min)	0	0.5	1	1.5	2	2.5	3	3,5	4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	9	9,5	10
Température (°c)																					
Water state																					

4. Change state liquid- vapor

Safety precautions

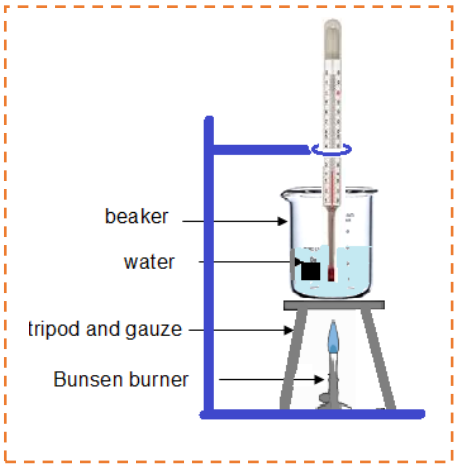
• Your teacher will demonstrate how to handle the Bunsen burner safely.

• Remember that boiling water can cause painful burns.

• The thermometer is made of very thin glass. Hold it gently, and do not use it to stir the water. Be careful not to drop it or bump it against the bottom or sides of the beaker.

5. Method:

1. Set up your apparatus as shown in the image below. Remember that when you want to take the temperature, the thermometer must not be touching the sides



2. Take a measurement of the water temperature before you start heating the water.

This will be your measurement at time 0 min.

3. Light the burner and heat the water.

4. Measure the temperature of the water at regular intervals (every 1minute). Record the temperature in the table provided.

Time (min)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Température (°c)																
Water state																

5. After a while you will notice that the temperature of the water becomes constant (this is when the temperature stops going up). Continue to take the temperature three more times (once every three minutes) after this happens. What do you notice about the water?

6. Results and Observations:

Record your results in the table. We are now going to draw a graph of the results recorded in the table. Here are some guidelines for drawing the graph:

1. The title of your graph should be
2. The independent variable should be
3. The dependent variable should be.
4. Plot the data on a line graph using the graph paper - each data point must be marked with a small, neat cross.

7. Analysis:

Solid- liquid change

1. How long did it take for all ice to disappear?
2. How could you describe the contents of the beaker at that point ?
3. Draw graphs representing the change in temperature over time to:

   - pure water;

   - salt water
4. to the theoretical value (T of solidification of pure water: 0°c under a pressure of 1.013 bar)

Liquid- vapor change

1. What did you see when the water started to boil?
2. What do you think happened to the water when it boiled?

3. Describe the shape of your graph. Is it a straight line?

4. How did the temperature of the water change over time?

5. How does the shape of the graph show the way the temperature changed over time?

6. What happened to the temperature of the water when it started to boil?

7. What happened as the temperature of the water approached 100°C?

8. How long did it take the water to start boiling?

9. At what temperature did the water boil?

10. What do we call the temperature at which the water boils? Indicate this temperature on your graph.

11. Suppose we used a Bunsen burner with a bigger flame.

Do you think the water would boil at a temperature that is higher, lower or the same as the boiling point you just measured? Why do you say so?

12. Compare the boiling value of water under the conditions of the experiment to the theoretical value (Boiling temperature of pure water: 100°c under a pressure of 1.013 bar)

How to write a lab report

The following are the sections of a proper lab report in chemistry:

a. **Aim or Objective:** This is usually just a short, clear description of the purpose of the experiment.
b. **Theory or Principle:** This section describes the principle on which the experiment is based or on the principle it demonstrates.
c. **Procedure or methods:** This section records exactly how the experiment was performed; it will normally coincide with the procedure given in this manual, but at times changes may be made. It will also include a list of materials (equipment, chemicals) used. Write this section in the past tense and do not simply copy the manual but use your own words as much as possible.
d. **Results and Data analysis :** This section should give the experimental data collected. Record these data clearly, preferably using tables. This section further includes the manipulation of the collected data to make them more meaningful; this may involve use of chemical equations, calculations, graphs, etc.
e. **Discussion:** This section includes matter as: problems encountered in the experiment and their possible causes, sources of errors in the experiment and their possible influence on the results and suggestions for improvement of the experiment.

   (Note: do not confuse this section with the next section – conclusion).

f. **Conclusion:** In this section you must answer the problem stated in the Aim/Objective.

   Conclusion can be drawn from the results, considering the shortcomings listed in the discussion. This section should be short and to the point, leaving all reasons for failure, etc. in the discussion.