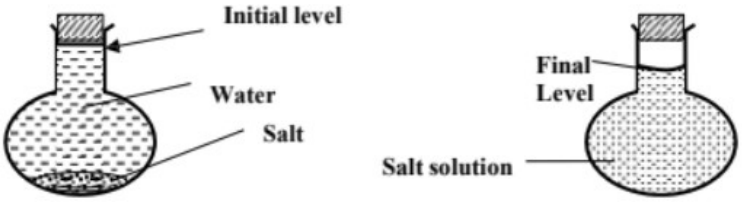
9. Particulate Nature of Matter

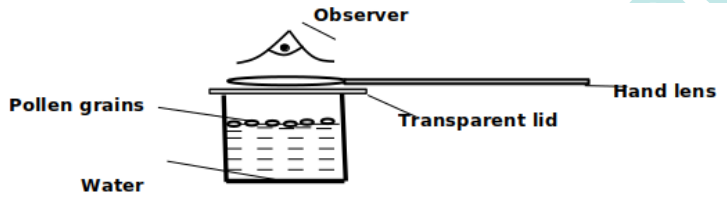
1. What do you understand by the term "particulate nature of matter?"
2. State the evidence to show that matter is made up of very small particles.
3. State the reason why it is easier to separate water into drops than to separate a solid into smaller pieces.
4. You are provided with a beaker, a crystal of potassium permanganate and water. Describe a simple experiment how you can verify that matter is made up of small
5. Fifteen grams of common salt were added to **1000 cm^3** of water. After all the salt had dissolved the volume of solution was found to be **998 cm^3**. Account for the decrease in volume of the solution.
6. Water was added to fill a flask containing some mass of salt. The container was sealed with a cork and shaken thoroughly to dissolve the salt. It was noticed that the level of the liquid dropped.



Explain the observation made above

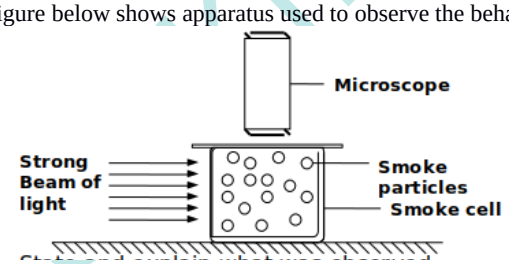
BROWNIAN MOTION

1. What is Brownian motion?
2. Explain the reason why a dropping dust particle in a still room does not trace a straight vertical path (1 mark)
3. In the Brownian motion experiment, smoke particles are observed to move randomly. Explain how this motion is caused.
4. Name **one** state of matter in which Brownian motion occurs.
5. A student observed some pollen grains on the surface of water in a beaker as shown below.



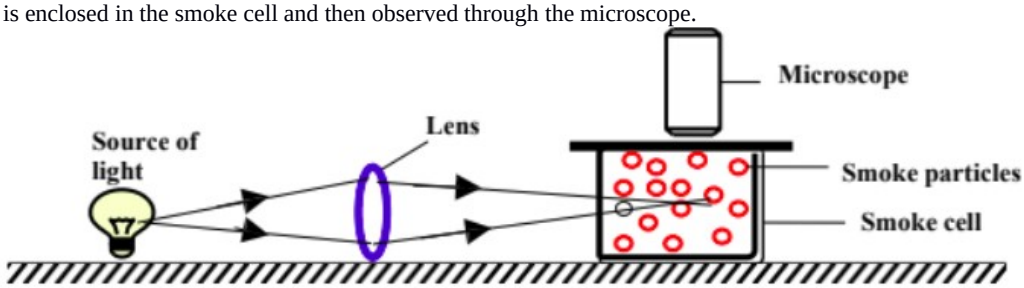
(i) State the observation made
(ii) Explain the observation in (i) above
(iii) State the changes observed when the temperature of the water above is increased

6. Explain the cause of random motion of smoke particles as observed in Brownian motion experiment using smoke cell.
7. In an experiment to demonstrate Brownian motion, smoke was placed in a smoke cell and observed using a microscope. Bright specks were seen moving randomly in a cell. Explain the observation.
8. The figure below shows apparatus used to observe the behaviour of smoke particles in a smoke cell.



a) State and explain what was observed
b) Explain what would be happen if the temperature was raised.

9. Brownian motion of smoke particles can be studied by using the apparatus shown below. To observe the motion, some smoke is enclosed in the smoke cell and then observed through the microscope.

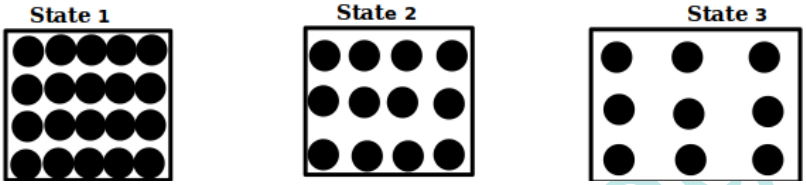


(a) State and explain the observation made.
(b) State what will be observed if the temperature surrounding the smoke cell is increased.
(c) What is the function of the following in the experiment above.
i) Microscope.
ii) The Lens.

10. When smoke particles are observed through a microscope in a smoke cell which is illuminated from the side.
    (a) What observation is made?
    (b) How can you tell which particles are larger?
    (c) What change on their motion would be observed if the temperature of the smoke cell is increased?
11. Smoke was trapped in a smoke cell and viewed through a lens. State the change in movement of the smoke particles when the temperature of the room was lowered.
12. Smoke particles in an air cell is suitably illuminated and viewed through a microscope.
    a) State and explain what is observed.
    b) What change is expected in the observations as the contents in the air cell were warmed?
13. In the smoke cell experiment to show Brownian motion in gases, white specks in constant random motion are seen in the cell. What changes would be observed if the same set up is viewed at room temperature of about **25 ^{0}C** and the then at a temperature of **14 ^{0}C**. Explain your observation.
14. What happens to the motion of smoke particles in the smoke cell experiment when the set up is Moved from an environment at 27 ^{0}c to an environment at **47 ^{0}C**.

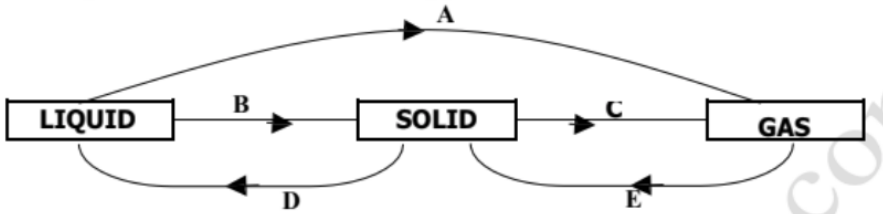
KINETIC THEORY

1. State the kinetic theory of matter.
2. Use kinetic theory of matter to differentiate between solids and liquids.
3. Distinguish between solid, gas and liquid states of matter in terms of intermolecular forces.
4. Distinguish between solid, gas and liquid states of matter in terms of intermolecular distances.
5. Using the kinetic theory of matter, explain why liquids expand more than solids when heated through the same temperature
6. In terms of intermolecular distances, explain why it is easier to compress a gas than a solid
7. Use the kinetic theory of matter to explain thermal expansion in liquids.
8. Using kinetic theory of matter, explain why solids expand when heated.
9. The figure below shows arrangement of molecules in the three different states of matter.

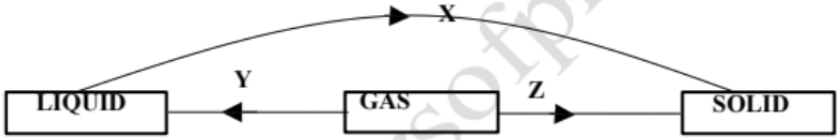


(a) Name the process represented by the arrow.
(b) State the reason for the arrangement of molecules in state **3**

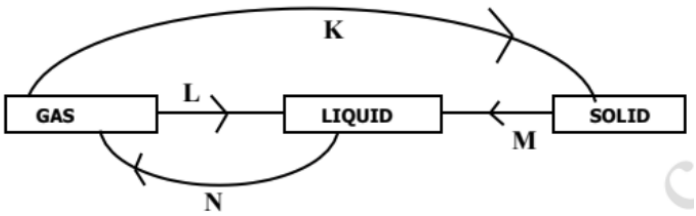
10. Name the processes **A, B, C, D** and **E** taking place below.



11. Name the processes **X, Y,** and **Z** taking place below.



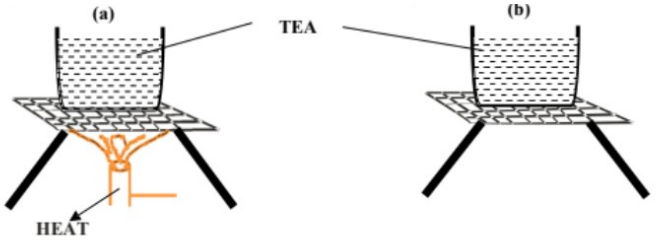
12. Name the processes **K, L, M** and **N** taking place below.



DIFFUSION

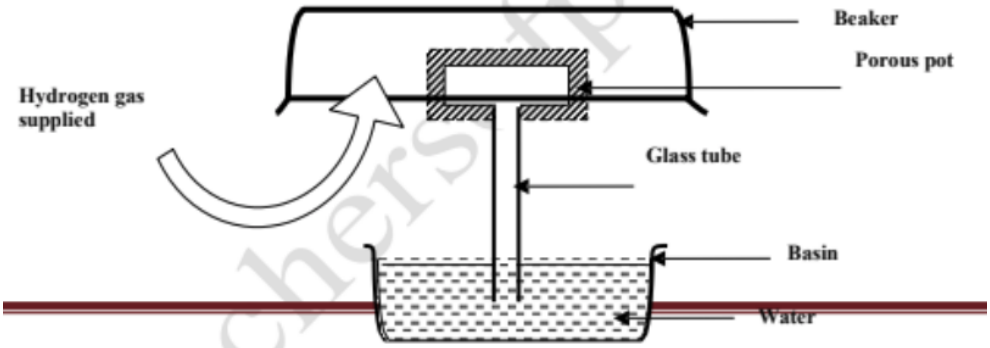
1. Define the term diffusion.
2. State and explain **two** factors that affect the rate of diffusion.
3. A drop of blue ink is introduced at the bottom of a beaker containing water. It is observed that after some time all the water in the beaker turn blue. Name the process that takes place.
4. A crystal of potassium permanganate was carefully introduced at the bottom of water column held in a gas jar. After sometimes the whole volume of water was coloured.
    i) Explain this observation.
    ii) State the effect of using warm water on the observation above.
5. Two identical containers **X** and **Y** are filled with water. **X** is filled with cold water while **Y** is filled with hot water. A crystal of potassium permanganate is then put in both containers at the same time. In which container did the potassium permanganate spread fastest? Explain

6. Two samples of bromine vapour are allowed to diffuse separately under different conditions, one in a vacuum and the other in air. State with reasons the conditions in which bromine diffuse slower.
7. A bottle containing a smelling gas is opened at the front bench of a Classroom in the afternoon. State the reason why the gas is detected throughout the room shortly.
8. State one reason why diffusion in gases is faster than diffusion in liquids.
9. Two beakers contain equal volumes of water and ethanol. A crystal of potassium permanganate is placed in the liquids at the bottom of each of the beakers. In which beaker will the diffusion be faster given that the two liquids are at the same temperature? Explain.
10. Two identical tubes A and B held horizontally contain air and water respectively. A small quantity of coloured gas is introduced at one end of A while a small quantity of coloured water is introduced at one end of B. State with reason the tube in which the colour will reach the other end faster.
11. Study the set-ups below and use it to answer the questions that follow:



A student placed one teaspoonful of sugar in each of the identical cups with equal volume of tea as shown above. With a reason which cup of tea will taste sugary after 2 minutes?

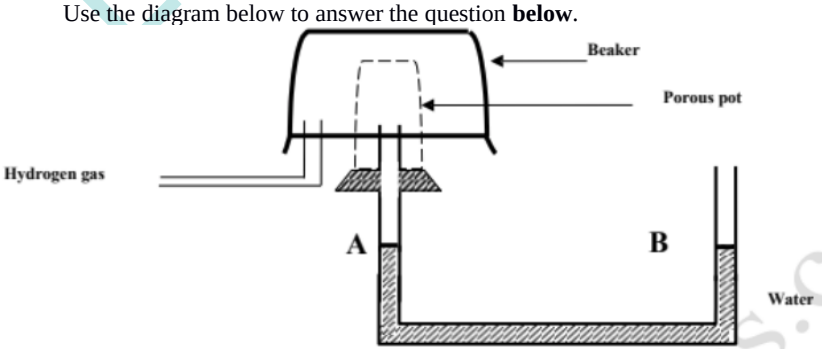
12. A bottle containing ammonia solution is placed at the back of the laboratory. **Give a reason** why its smell may not be detected in other parts of the laboratory if the temperature of the solution is kept very low.
13. The figure below shows an arrangement to demonstrate diffusion through solids:-



The hydrogen gas is supplied for sometimes then stopped and the beaker removed. State and explain what is likely to be observed when the hydrogen gas supply is stopped

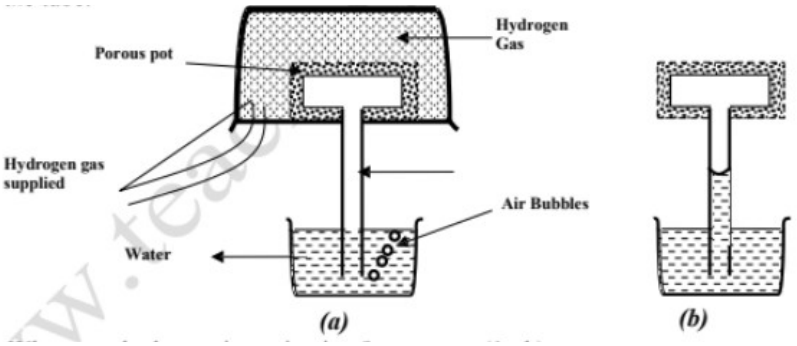
14. The figure below shows two gases **A** and **B** put in a tube at the same time. If gas **B** is heavier than gas **A,** indicate on the diagram where the two gases are likely to meet

15. Use the diagram below to answer the question **below**.



(i) State the aim of this experiment.
(ii) At the start of the experiment, the region below the beaker had no hydrogen gas. The hydrogen gas from a gas generator is now introduced for sometime. State the observation made.
(iii) Give a reason for your answer

16. The set up in figure below shows some observation made by a form two student in their school laboratory during a physics class. In fig (a) bubbles were coming out of water when hydrogen gas was allowed to flow over the porous pot whereas, fig (b) shows water having risen through the tube.



(i) What was the lesson investigating ?

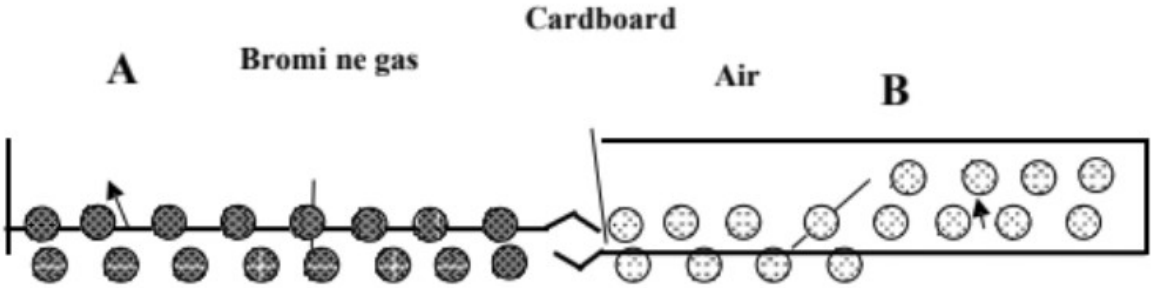
(ii) Briefly explain each observation made in :

I Fig (a)

II Fig (b)

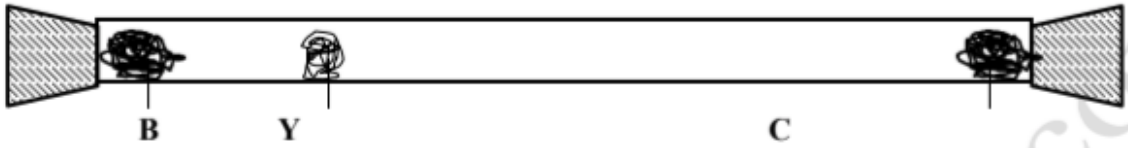
(iii) Name two factors that would affect the observation made in the experiment set up, in figure above.

17. Bromine (Reddish brown vapour) and air were trapped in gas jars A and B and the apparatus arranged as shown in figure 4 below.



Explain what is observed if the jars are left for some time.

18. The set-up shown in the figure below is used to investigate the rate of diffusion of two gases. **B** and **C** are cotton wools soaked in hydrochloric acid and ammonia solution respectively.



A white deposit **Y** is formed between **B** and **C**. Compare the densities of the two gases.

RANDOM QUESTIONS

1. Diffusion in gases is faster than in liquids; state two reasons why this is so.

- Density of gases is lower than in liquids

- Intermolecular forces in gases are weaker than in liquids.

-Kinetic energy of gas particles is higher than that of liquids

2. Compare diffusion of chlorine gas into air and into vacuum then explain your comparison

- Diffusion of chlorine gas is faster in vacuum than in air. This is because in vacuum there is no air particles to interfere with the diffusion.

3. Use kinetic theory of matter to differentiate between solids and liquids.

- In solids particles are closely packed together in an organized manner and in fixed position. Particles in solid do not move randomly but instead vibrate about their fixed positions (vibratory motion) because of very strong intermolecular force (cohesive force) while Particles in liquids are not closely fixed as in solids but move about randomly (Brownian motion). This is because the intermolecular forces in liquids are weaker than those in solids.