Multiple Choice Questions

1. Which one of the following sets of phenomena would increase on raising the temperature?

(a) Diffusion, evaporation, compression of gases

(b) Evaporation, compression of gases, solubility

(c) Evaporation, diffusion, expansion of gases

(d) Evaporation, solubility, diffusion, compression of gases

Answer : c) Evaporation, diffusion and expansion of gases

Explanation: Particles of matter are continuously moving as they possess kinetic energy. When temperature is raised particles of matter intermix with each other which is called diffusion.

Evaporation means conversion of liquid state into vapour state. When we increase temperature molecules move and vibrate so quickly that they escape into the atmosphere in the form of vapours.

Increase in temperature causes the molecules to move faster, which results in expansion of gases.

2. Seema visited a Natural Gas Compressing Unit and found that the gas can be liquefied under specific conditions of temperature and pressure. While sharing her experience with friends she got confused. Help her to identify the correct set of conditions

(a) Low temperature, low pressure

(b) High temperature, low pressure

(c) Low temperature, high pressure

(d) High temperature, high pressure

Answer is c) Low temperature, high pressure

Explanation: To compress gas into liquid, low temperature and high pressure are required. Between the particles of gas there is a lot of space. On applying pressure, particles get closer and they start attracting each other to form a liquid. A lot of heat is generated when

gas is compresses hence it is necessary to cool it. Cooling lowers the temperature of compressed gas and helps in liquefying it.

3. The property to flow is unique to fluids. Which one of the following statements is correct?

(a) Only gases behave like fluids

(b) Gases and solids behave like fluids

(c) Gases and liquids behave like fluids

(d) Only liquids are fluids

Answer: c) Gases and liquids behave like fluids

Explanation: In gases and liquids intermolecular force of attraction between the particles is less and they facilitate flow of these states of matter.

4. During summer, water kept in an earthen pot becomes cool because of the phenomenon of

(a) diffusion

(b) transpiration

(c) osmosis

(d) evaporation

Answer : d) evaporation

Explanation: Evaporation of water through pores of earthen pot reduces temperature of immediate surroundings. This makes the water cool after some time.

Movement of water through plants and evaporation through its aerial parts is called transpiration.

Diffusion is the movement of a substance from an area of higher concentration to an area of lower concentration

If molecules of a solvent tend to pass through a semipermeable membrane from a less concentrated solution into a more concentrated one, it is called osmosis.

5. A few substances are arranged in the increasing order of 'forces of attraction' between their particles. Which one of the following represents a correct arrangement?

(a) Water, air, wind

(b) Air, sugar, oil

(c) Oxygen, water, sugar

(d) Salt, juice, air

Answer : c) Oxygen, water, sugar

Explanation: The intermolecular force of attraction is less in gases than liquid and solid. Solids have higher intermolecular attraction compared to liquid. In the answer, oxygen is a gas which has lesser intermolecular attraction than water-a liquid and sugar- a crystalline solid.

6. On converting 25°C, 38°C and 66°C to kelvin scale, the correct sequence of temperature will be

(a) 298 K, 311 K and 339 K

(b) 298 K, 300 K and 338 K

(c) 273 K, 278 K and 543 K

(d) 298 K, 310 K and 338 K

Answer: a) 298 K, 311 K and 339 K

Explanation: Add 273 to respective temperature to get the temperature in kelvin. 25°-298K, 38°-311K, 66°-339K

7. Choose the correct statement of the following

(a) Conversion of solid into vapours without passing through the liquid state is called sublimation.

(b) Conversion of vapours into solid without passing through the liquid state is called vaporisation.

(c) Conversion of vapours into solid without passing through the liquid state is called freezing.

(d) Conversion of solid into liquid is called sublimation.

Answer: a) Conversion of solid into vapours without passing through the liquid state is called sublimation.

Explanation:

- Sublimation is a process in which a solid is converted into vapours without passing through a liquid state.
- Vaporisation is a phase transition from liquid to vapours.
- Conversion of liquid to solid at substance's freezing temperature is called as freezing.

8. The boiling points of diethyl ether, acetone and n-butyl alcohol are 35°C, 56°C and 118°C respectively. Which one of the following correctly represents their boiling points in kelvin scale?

(a) 306 K, 329 K, 391 K

(b) 308 K, 329 K, 392 K

(c) 308 K, 329 K, 391 K

(d) 329 K, 392 K, 308 K

Answer is c) 308 K, 329 K, 391 K

Explanation: The temperature in Celsius can be converted into temperature in kelvin by adding 273 to the Celsius value. Boiling points of diethyl ether, acetone and n-butyl alcohol are 308 K, 329 K, and 391 K, respectively.

9. Which condition out of the following will increase the evaporation of water?

(a) Increase in temperature of water

(b) Decrease in temperature of water

(c) Less exposed surface area of water

(d) Adding common salt to water

Answer is a) Increase in temperature of water

Explanation: Increase in temperature of water increases the kinetic energy of the water which will make more particles to attain enough energy to convert into the vapour state. This is how an increase in temperature favours evaporation.

On the other hand, the exposed surface is also responsible for the evaporation. Higher the exposed surface, higher will be the evaporation.

When common salt is added to water then the surface is occupied by the solvent as well as non-volatile solute particles.

This makes the escaping tendency of solvent particles decrease and thus the evaporation of water decreases. Hence options (b), (c) and (d) will decrease the evaporation of water.

10. In which of the following conditions, the distance between the molecules of hydrogen gas would increase?

(i) Increasing pressure on hydrogen contained in a closed container

(ii) Some hydrogen gas leaking out of the container

(iii) Increasing the volume of the container of hydrogen gas

(iv) Adding more hydrogen gas to the container without increasing the volume of the container

(a) (i) and (iii)

(b) (i) and (iv)

(c) (ii) and (iii)

(d) (ii) and (iv)

Answer : c) ii and iii

Explanation

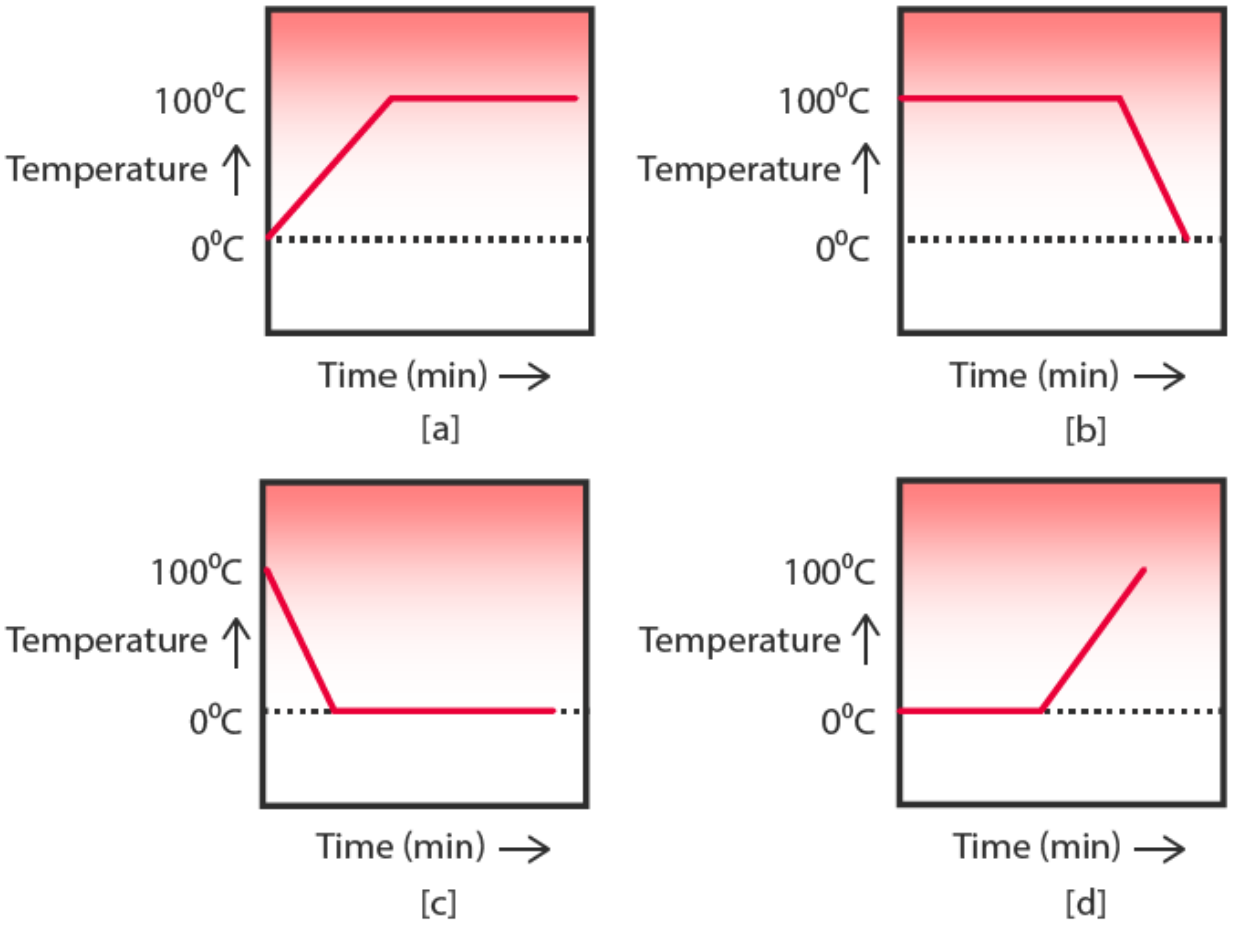
- To increase the intermolecular interaction either volume of Hydrogen gas should be reduced or container volume should be increase.
- By increasing the pressure or by adding Hydrogen without increasing container volume inter-molecular interaction would decrease.
- Water under study was found to boil at 102°C at normal temperature and pressure.

Short Answer Questions:

11. A sample of water under study was found to boil at 102°C at normal temperature and pressure. Is the water pure? Will this water freeze at 0°C? Comment.

Answer: The boiling point of pure water is 100 °C and the melting point is 0°C at 1 atmospheric pressure. Here the water boils at 102 °C hence it is not pure water and freezes at a temperature below 0°C.

12. A student heats a beaker containing ice and water. He measures the temperature of the content of the beaker as a function of time. Which of the following (Fig. 1.1) would correctly represent the result? Justify your choice.



Answer : d) because at the start of the experiment temperature of the mixture would be zero as water and ice will be in equilibrium. When students start heating initially latent heat will be utilised to melt the ice. Hence the temperature did not increase for a certain amount of time. When students heat the mixture further the temperature of the water increases gradually.

13. Fill in the blanks:

(a) Evaporation of a liquid at room temperature leads to a_____ effect.

(b) At room temperature the forces of attraction between the particles of solid substances are_____than those which exist in the gaseous state.

(c) The arrangement of particles is less ordered in the _____ state. However, there is no order in the _____state.

(d) _____ is the change of solid state directly to vapour state without going through the _____state.

(e) The phenomenon of change of a liquid into the gaseous state at any temperature below its boiling point is called_____.

Answer:

a. Cooling
b. Stronger
c. Liquid, gaseous
d. Sublimation, liquid
e. Evaporation

14. Match the physical quantities given in column A to their SI units given in column B:

A)	(B)
(a) Pressure	(i) cubic metre
(b) Temperature	(ii) kilogram
(c) Density	(iii) pascal
(d) Mass	(iv) kelvin
(e) Volume	(v) kilogram per cubic metre

Answer:

(a) — (iii) The SI unit of pressure is the pascal (denoted by P).

(b) — (iv) The SI unit of temperature is -Kelvin (denoted by K).

(c) — (v) The SI unit of density is kilogram per cubic metre (kg/m^3).

(d) — (ii) The SI unit of mass is the kilogram (kg).

(e) — (i) The SI unit of volume is m^3.

15. The non-SI and SI units of some physical quantities are given in column A and column B respectively. Match the units belonging to the same physical quantity:

A)	(B)
(a) Degree Celsius	(i) kilogram
(b) Centimetre	(ii) Pascal
(c) Gram per centimetre cube	(iii) metre
(d) Bar	(iv) kelvin
(e) Milligram	(v) kilogram per metre cube

Answer:

(a) — (iv) Degree Celsius and kelvin are the units of temperature.

(b) — (iii) Centimetre and metre are the units of length.

(c) — (v) Gram per centimetre cube and kilogram per metre cube are the units of density.

(d) — (ii) Bar and pascal are the units of pressure.

(e) – (i) Milligram and kilogram are the units of mass.

16. 'Osmosis is a special kind of diffusion'. Comment.

Answer: Diffusion in liquids and gases is the movement of particles from high concentration to low concentration. Osmosis is the movement of particles from the low concentration to high concentration through a semi-permeable membrane. This movement happens due to diffusion. Hence, osmosis is a special kind of diffusion.

17. Classify the following into osmosis/diffusion

(a) Swelling up of a raisin on keeping in water.

(b) Spreading of virus on sneezing.

(c) Earthworm dying on coming in contact with common salt.

(d) Shrinking of grapes kept in thick sugar syrup.

(e) Preserving pickles in salt.

(f) Spreading of smell of cake being baked throughout the house.

(g) Aquatic animals using oxygen dissolved in water during respiration

Answer:

a) Osmosis

b) Diffusion

c) Osmosis

d) Osmosis

e) Osmosis

f) Diffusion

g) Osmosis

Explanation:

a) Swelling up of a raisin on keeping in water is osmosis because the concentration of solutes is more outside. Hence, water moves water from higher to lower concentrations through a semipermeable membrane, causing the raisin to swell.

b) Spreading the virus through sneezing is diffusion because the virus enters the air in tiny droplets. They remain suspended for a long time and move here and there in the air from higher to lower concentrations.

c) Earthworms die on coming in contact with common salt is osmosis because of variations in the concentration of water and solute. When salt is sprinkled on them, their skin gets dried, due to which their body shrinks, and they die.

d) The shrinking of grapes in thick sugar syrup is Osmosis because water will move down from higher to lower concentrations via a semipermeable membrane.

e) The Preserving of pickles in salt is Osmosis because salt helps to remove water from the cells and helps to preserve pickles.

f) The spreading of the smell of cake being baked throughout the house is Diffusion because the particles of cake move from a region of higher concentration to lower concentration through diffusion hence, producing the smell.

g) Aquatic animals using oxygen dissolved in water during respiration is osmosis because fish absorb oxygen from water (high concentration) through gills and skin (semipermeable membrane) to the lower concentration.

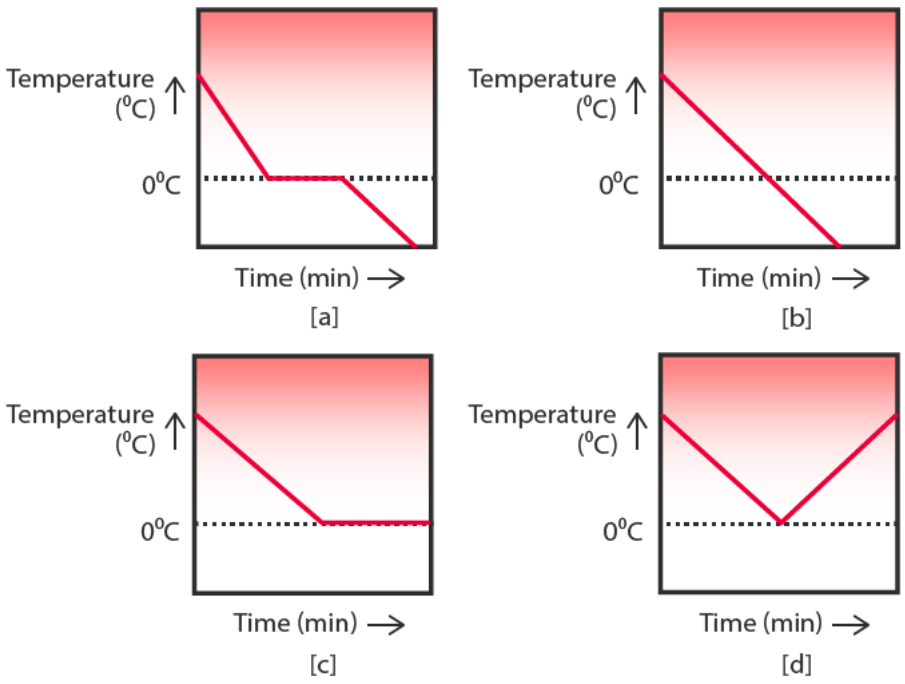
18. Water as ice has a cooling effect, whereas water as steam may cause severe burns. Explain these observations.

Answer: Water as steam has more latent heat as compared to water as solid and liquid. Hence it causes severe burns while water as ice causes a cooling effect.

19. Alka was making tea in a kettle. Suddenly she felt intense heat from the puff of steam gushing out of the spout of the kettle. She wondered whether the temperature of the steam was higher than that of the water boiling in the kettle. Comment.

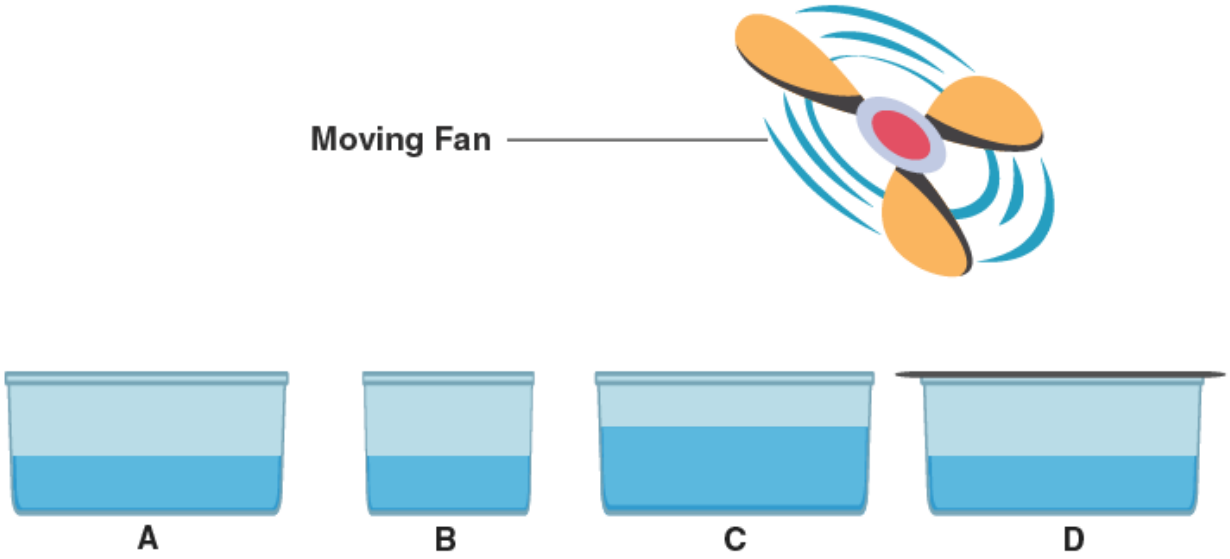
Answer: Steam and the temperature of water boiling in the kettle is the same. But the particles of steam have more energy in the form of latent heat of vaporisation than the particles of water. This energy is released when the steam condenses to water. Therefore, steam is hotter than boiling water.

20. A glass tumbler containing hot water is kept in the freezer compartment of a refrigerator (temperature < 0°C). If you could measure the temperature of the content of the tumbler, which of the following graphs (Fig.1.2) would correctly represent the change in its temperature as a function of time.



Answer: Graph (a) is the right answer because water will cool initially until its temperature reaches 0 °C. After reaching the freezing point (0 °C) temperature will remain constant until the water becomes ice. After that point temperature would decrease again.

21. Look at Fig. 1.3 and suggest in which of the vessels A,B, C or D the rate of evaporation will be the highest? Explain.



Answer: C because evaporation increases with an increase in the surface area. With an increase in wind speed particles of water vapour will move away hence the rate of evaporation will be the highest.

22.

(a) Conversion of solid to vapour is called sublimation. Name the term used to denote the conversion of vapour to solid.

(b) Conversion of solid state to liquid state is called fusion; what is meant by latent heat of fusion?

used to denote the conversion of vapour to solid.

Answer:

a) A deposition is the term used to denote the conversion of vapour to solid.

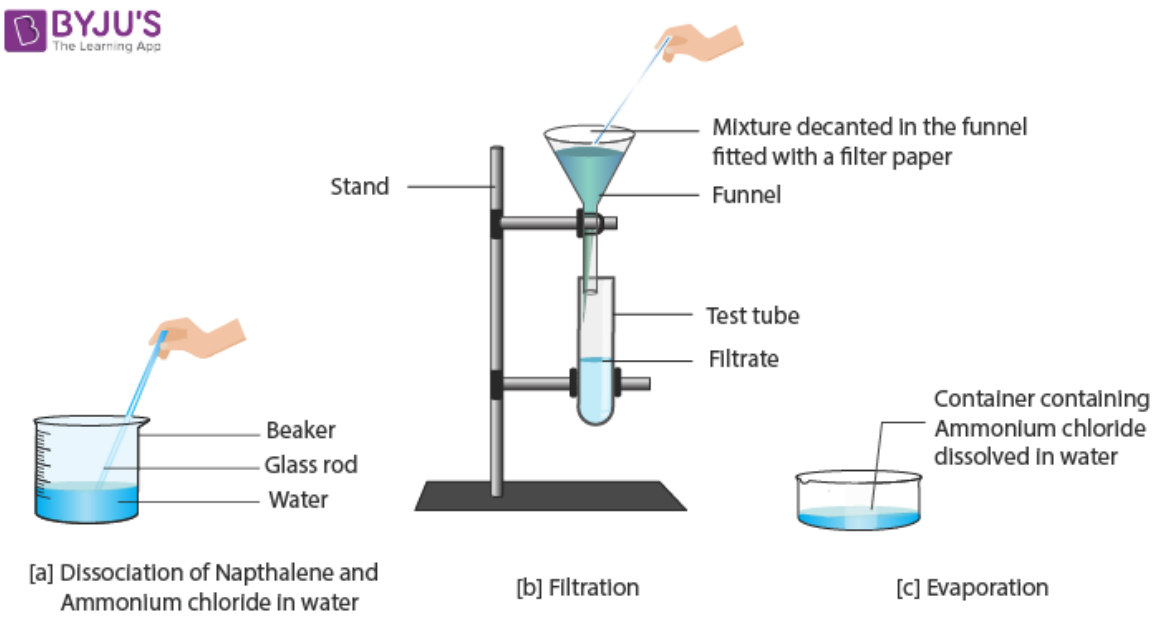
b) The amount of heat energy released or absorbed when a solid change to liquid at atmospheric pressure at its melting point is known as the latent heat of fusion.

Long Answer Questions:

23. You are provided with a mixture of naphthalene and ammonium chloride by your teacher. Suggest an activity to separate them with well-labelled diagram.

Answer: Naphthalene is a non-polar compound which will not dissolve in water. Similarly, ammonium chloride is a polar compound which is soluble in water. Naphthalene is volatile in room temperature whereas ammonium chloride is volatile at high temperature.

The mixture of Naphthalene and ammonium chloride can be separated by decantation of aqueous mixture. Naphthalene remains undissolved in water and can be taken out in a funnel. The filtrate of ammonium chloride can be evaporated to obtain dry ammonium chloride.



[a] Dissociation of Napthalene and Ammonium chloride in water

[b] Filtration

[c] Evaporation

24. It is a hot summer day, Priyanshi and Ali are wearing cotton and nylon clothes respectively. Who do you think would be more comfortable and why?

Answer: Hot summer leads to a lot of sweating. Cotton absorbs moisture whereas Nylon will not absorb the moisture as efficiently as cotton does. Hence cotton absorbs the sweat faster that Nylon does. Evaporation of moisture from the cotton cloth will give a cool feeling, especially when the wind blows. Hence, it can be concluded that Priyanshi will be more comfortable in summer days.

25. You want to wear your favourite shirt to a party, but the problem is that it is still wet after a wash. What steps would you take to dry it faster?

Answer: Drying of clothes is due to the process of evaporation hence the following steps should be taken to dry the shirt faster.

1. Dry the shirt under a fan with high speed. With an increase in the speed of fan, water vapours will move away. This decreases water vapour in the surroundings which will increase the evaporation and the shirt gets dried faster.
2. Spread the shirt on a hanger which will increase surface area. Increase in the surface area makes the shirt dry quickly.
3. Dry the shirt in sunlight. Because of high-temperature water evaporates faster. Thus the shirt gets dried easily.
4. Iron the shirt. Heat increases the speed of vaporization and evaporation. This dries the shirt faster.

26. Comment on the following statements:

(a) Evaporation produces cooling.

(b) Rate of evaporation of an aqueous solution decreases with increase in humidity.

(c) Sponge though compressible, is a solid.

Answer:

a) When a liquid evaporates it takes latent heat from the object it touches. This will make the object cooler. Hence evaporation causes cooling.

b) When there is an increase in the humidity water vapour in the atmosphere will be more. Hence the atmosphere will not take water vapours easily which decreases the process of evaporation.

c) Sponge is a solid because it has definite shape and volume which does not change until you press it. It has minute pores in which air is filled. When you press it, air passes out through pores this makes it a compressible solid.

27. Why does the temperature of a substance remain constant during its melting point or boiling point?

Answer: The temperature of a substance remains constant during melting and boiling points till the completion of melting and boiling because of the latent heat of fusion used by the substances. Latent heat of fusion helps to overcome the force of attraction between

particles of solid to change into a liquid when they melt. Hence temperature remains constant.

In the same way during the formation of vapours, latent heat helps solid substance to convert into a gaseous state. Hence temperature of a substance remains constant at boiling point.