

**EXAM
DRILL**

Matter in Our Surroundings

ANSWERS

- Lowering temperature (or cooling).
- (i) Liquefied Petroleum Gas (ii) Compressed Natural Gas.
- (i) : Dust particles
- (ii) : Air
- (iii) : Brownian motion
- (iv) : The fast moving air molecules are constantly hitting the tiny dust particles causing them to move rapidly in a very haphazard manner.
- (i) : Gas
- (ii) : Sublimation
- (iii) (d) : Sublimation
- (iv) (a) : The particles are very closely packed, *i.e.*, spacing between particles is extremely small.
- (b) : The diffusion is fastest in gases because the gas particles move very rapidly. They possess high kinetic energy.

OR

- (a) Melting requires heat and thus cooling is not produced.
- (d) : Increase in humidity decreases the rate of evaporation.
 - (b) : Liquefaction of a gas can be caused by decreasing the interparticle spaces between the molecules.
 - (d)

OR

- (c) Since H_2 is the lightest gas it diffuses at the fastest rate.
- (a) : Evaporation is a surface phenomenon.
 - (b) : Impurities increase the boiling point of a liquid.
 - (b) : Temperature remains constant during boiling, *i.e.* 99.5°C .
 - (a) : The unit of latent heat is J/kg or kcal/kg.

OR

(d) : When a candle is lighted, the candle wax near the wick melts. The wick absorbs the liquid wax. The heat of the flame vaporises the wax, and it is the wax vapour in the wick that burns.

13. (c) : During evaporation of a liquid, the temperature of the liquid falls.

14. (c) : Diffusion rate of oxygen is smaller than nitrogen as molecular mass of oxygen is greater than nitrogen, as

$$\text{rate} \propto \frac{1}{\sqrt{M}}.$$

Molecular size of oxygen is smaller than nitrogen.

- (a) Particles of sugar crystals occupy the space between the particles of water.
- (b) The excess heat from the body is taken by high latent heat of vaporisation of water. As a result, temperature of body decreases.
- (c) Evaporation of saliva causes cooling.
- (i) (a) Benzoic acid begins to melt at 20 min.
- (b) Benzoic acid begins to boil at 50 min.
- (ii) The melting point of benzoic acid is 250°C .
- (iii) The physical state of benzoic acid is liquid during the time interval of 35-45 min.

OR

- (a) The property of gases that helps aquatic plants and animals to survive in water is called diffusion. Due to diffusion, the oxygen present in atmosphere which is essential for every living organism, can diffuse into water and dissolved in it. Thus, enabling aquatic organism to survive.
- (b) After, some physical exercise, when our body temperature rises, our sweat glands give out moisture on our skin (perspiration). When this sweat evaporates, it takes latent heat of vaporisation from our body. This keeps our body cool.
- (c) The melting point of a solid decreases with decrease in pressure.

- (a) Gaseous state
- (b) Solid state
- (c) Liquid state
- (d) Solid state
- (e) Liquid state
- (f) Gaseous state

$$18. (a) \quad ^\circ\text{C} = \frac{5}{9} (^\circ\text{F} - 32) = \frac{5}{9} (68 - 32) = 20^\circ\text{C}$$

$$(b) \quad ^\circ\text{C} = \frac{5}{9} (^\circ\text{F} - 32) = \frac{5}{9} (140 - 32) = 60^\circ\text{C}$$

$$(c) \quad ^\circ\text{C} = \text{K} - 273 = 253 - 273 = -20^\circ\text{C}$$

OR

Boiling is a bulk phenomenon because on heating a liquid at its boiling point the particles present in the bulk of the liquid gain enough energy to change into vapour state.

On the other hand, in evaporation the molecules present on the surface of the liquid having higher kinetic energy leave the surface of the liquid and convert into vapours. Since, surface particles contribute to evaporation, therefore it is a surface phenomenon.

19. (a) The factors that determine state of a substance are
 (i) The interparticle space
 (ii) The force of attraction between the particles *i.e.*, interparticle force.

(iii) The kinetic energy of particles due to their motion.

(b) (i) **Latent heat of fusion** : It is defined as the amount of heat energy required to change 1 Kg of a solid into a liquid at atmospheric pressure without any change in temperature at its melting point.

(ii) **Boiling** : The process in which a liquid substance changes into a gas on heating is called boiling. The temperature at which a liquid boils and changes into gas at atmospheric pressure is called boiling point of the liquid.

20. (i) Ammonia is lighter (vapour density = molecular weight / 2; $17 / 2 = 8.5$) than hydrochloric acid gas (vapour density = mol. weight / 2; $36.5 / 2 = 18.25$) and hence diffuse faster.

(ii) Humidity is high in the monsoon season. Since the air is already saturated with water vapours, it cannot hold more water vapours, hence the rate of evaporation is less in monsoon season. In dry season the rate of evaporation is high.

21. (i) Cotton is a better absorber of water than nylon. So, during summer, cotton clothes absorb sweat, which on evaporation causes a cooling sensation in the body.

(ii) According to the kinetic particle theory, the forces of attraction between the particles of a liquid are weaker than those in a solid. The particles of a liquid also have more kinetic energy than particles of the same substance in the solid state. The particles of a liquid are further away from one another than the particles of a solid. However, the particles of a liquid are still packed quite closely together. Thus, a liquid has a fixed volume. The particles of a liquid are not held in fixed positions. They can move freely by sliding over one another. That is why, a liquid does not have a fixed shape.

22. (i) Wood and stone.

(ii) Naphthalene balls disappear with time without leaving any solid because they undergo sublimation *i.e.* they directly change into vapours without passing through the liquid state.

(iii) No, dry ice is solid carbon dioxide while ordinary ice is solid water.

23. Rigidity means inflexibility. A solid is a rigid form of matter, hence it does not require a container to keep it. Due to this rigidity, solids have a tendency to maintain their shape when subjected to outside force.

Fluidity is a property by which a material can flow easily and require a vessel to keep it. A liquid is a fluid form of matter which takes the shape of container while a gas is a fluid form of matter which fits the container. Due to fluidity, liquids and gases change their shapes readily when subjected to outside force.

24. (i) The particles of matter are continuously moving.
 (ii) They have interparticle spaces between them.
 (iii) The particles of matter attract each other.

OR

Density is defined as the mass of a substance per unit its volume. $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$. Its unit are kg/m^3 or g/cm^3 .

Solids are denser than liquids and gases because in solids, the particles are very closely packed. As a result the number of particles present per unit volume is quite large, hence it becomes denser.

25. (a) This happens because of sublimation. Naphthalene balls sublime and become smaller in size. It is a physical change in which a solid converts directly into vapours without passing through liquid state.

(b) A saturated solution is converted into unsaturated solution by adding large quantities of the solvent into the solution.

(c) Due to presence of dissolved salts in sea water its freezing point decreases and boiling point increases.

OR

The conversion of a gas into liquid by applying pressure and lowering the temperature is called liquefaction of gases.

When a high pressure is applied to a gas, it gets compressed to a smaller volume, consequently interparticle distances decrease and interparticle forces increase. By lowering temperature the kinetic energy decreases and the particles slow down. As a result, interparticle distances decrease and interparticle forces of attraction increase which pull the gas particles close to form a liquid.

26. (a) Rain water takes heat from road to get evaporated leaving road dry.

(b) Cotton being good absorber of water, helps in absorbing the sweat and expose to the atmosphere for easy evaporation.

(c) In summer, trees absorb more water and minerals from the soil as the rate of transpiration increases.

(d) Acetone evaporates by taking heat from palm leaving it cool.

(e) Water evaporates from the roof taking heat from surroundings on hot summer day leaving roof cool.

27. The difference in properties of solids, liquids and gases can be explained by using kinetic theory or particle theory of matter. According to kinetic theory of matter, the matter is made up of small particles which possess kinetic energy and are always moving.

The properties of particles which decide the state of matter are :

(i) Interparticle distance - minimum in solids, a little more in liquids and maximum in gases.

(ii) Forces of attraction between the particles- strongest in solids, less strong in liquids, very weak in gases.

- (iii) Kinetic energy of the particles - kinetic energy of particles is minimum in solids, more in liquids and maximum in gases.
 (b) Boiling point of a liquid is an indicator of the strength

of intermolecular forces between the molecules of the liquid. It shows that the strength of intermolecular forces of water is likely to be maximum and that of alcohol is minimum.

28.	S. No.	Property	Solid	Liquid	Gas
	(i)	Nature	Solids have a fixed volume and a definite shape.	Liquids have a fixed volume but have no fixed shape. They take the shape of the container but they do not fill it.	Gases have neither a fixed shape nor a fixed volume. They take the shape and volume of the vessel. They fill the container.
	(ii)	Interparticle forces	The interparticle forces of attraction are strongest in solids.	Interparticle forces of attraction in liquids are weaker than those in solids but stronger than those in gases.	Interparticle forces of attraction are the weakest.
	(iii)	Diffusion	Solids do not diffuse.	Liquids can diffuse more than solids.	Gases have strong tendency for diffusion.
	(iv)	Fluidity	Solids do not flow.	Liquids generally flow easily.	Gases flow more easily.
	(v)	Compressibility	Solids are rigid and are not compressible.	Like solids, liquids cannot be compressed much.	Gases are easily compressible.

OR

When a substance melts, it absorbs heat for the conversion of solid state into liquid state. As we continue heating, the heat supplied is used up in converting the solid state into liquid state by overcoming the forces of attraction between the particles and there is no change in temperature till the whole solid is converted into liquid. This heat absorbed by the solid which does not result in increase in temperature, is called latent heat of fusion. When a liquid is heated, it starts converting into vapours. Further heat given to the liquid is used in changing the state and there is no increase in the temperature till the liquid starts boiling. This heat is known as latent heat of vaporisation. Hence, the temperature of a substance remains constant at its melting point or boiling point until all the substance melts or boils.

29. Besides solids, liquids and gases, there are two other states of matter, i.e., Plasma and Bose-Einstein condensate. Plasma state of matter consists of highly energetic and electrically charged particles of matter. This state is formed when the gases are either heated to a very high temperature or very high voltage electric current is passed through gases at very low pressure. Sun and stars glow due to presence of plasma. Glow tubes containing neon or argon glow by giving different colours depending on the nature of gas. BEC is formed by cooling a gas of extremely low density of the order of $1/100^{\text{th}}$ – $1/1000^{\text{th}}$ of the density of the normal air to super low temperature.

30. (a) **Similarity** : Liquid state changes into the gaseous state in both evaporation and boiling.

Difference :

Evaporation	Boiling
Evaporation can take place at all temperatures.	Boiling takes place only at a fixed temperature.

- (b) Four factors on which evaporation depends are :
 (i) Surface area of the liquid exposed to atmosphere
 (ii) Temperature of the liquid
 (iii) Wind velocity
 (iv) Humidity.
 (c) Take ice cold water or crushed ice in a dry tumbler. Allow it to stand undisturbed for some time in the atmosphere. You will observe that small drops of water appear on the outer surface of the tumbler. The water vapour present in air touches the cold surface of the tumbler. They lose their energy and get converted to water (liquid state). These water droplets appear outside the tumbler. This activity shows that water is present in the air.

OR

- (i) The freezing point of the substance is 5°C .
 (ii) The boiling point of the substance is 80°C or 353 K .
 (iii) The physical states of the substance are :
 at P : solid, Q : solid and liquid, R : liquid, S : liquid and vapour, T : gas.
 (iv) Line ab represents that temperature remains constant during the conversion of solid into liquid.
 (v) Line cd represents that temperature remains constant during the conversion of liquid into gas.



