

**CHRIST KING HR. SEC. SCHOOL, KOHIMA**  
**CLASS 9**  
**Science (Chemistry and Physics)-First Term**

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**CHAPTER-1 (MATTER IN OUR SURROUNDINGS)**

TEXTBOOK EXERCISES (Page number: 12-13)

**1. Convert the following temperature to Celsius scale.**

- (a) 293K                      (b) 470K

Solution:

$$0^{\circ}\text{C} = 273\text{K}$$

- (a)  $293\text{K} = (293 - 273)^{\circ}\text{C} = 20^{\circ}\text{C}$   
(b)  $470\text{K} = (470 - 273)^{\circ}\text{C} = 197^{\circ}\text{C}$

**2. Convert the following temperatures to the Kelvin scale.**

- (a)  $25^{\circ}\text{C}$                       (b)  $373^{\circ}\text{C}$

Solution:

$$0^{\circ}\text{C} = 273\text{K}$$

- (a)  $25^{\circ}\text{C} = (25 + 273)\text{K} = 298\text{K}$   
(b)  $373^{\circ}\text{C} = (373 + 273)\text{K} = 646\text{K}$

**3. Give reason for the following observations:**

- (a) Naphthalene balls disappear with time without leaving any solid.  
(b) We can get the smell of perfume while sitting several metres away.

Answers: (a) Naphthalene balls disappear with time without leaving any solid because naphthalene balls undergo sublimation and directly change into vapour state without leaving any solid.

(b) This is because perfumes contain volatile solvent which carries pleasant smelling vapours. They diffuse quite fast and can reach to people sitting several metres away.

4. Arrange the following in increasing order of forces of attraction between the particles – water, sugar, oxygen.

Ans: Oxygen < water < sugar

**5. What is the physical state of water at**

- (a)  $25^{\circ}\text{C}$  (b)  $0^{\circ}\text{C}$  (c)  $100^{\circ}\text{C}$ ?

Answers:

- (a) At  $25^{\circ}\text{C}$ , the water will be in liquid form.  
(b) At  $0^{\circ}\text{C}$ , the water is at its freezing point, hence both solid and liquid phases are observed.

(c) At 100°C, the water is at its boiling point, hence both liquid and gaseous state of water is observed.

**6. Give two reasons to justify –**

(a) Water at room temperature is a liquid.

(b) An iron almirah is a solid at room temperature.

Answers: (a) (i) because water has fixed volume but not fixed shape. It takes the shape of the container.

(ii) Water can flow from higher level to lower level.

(b) Because melting point of iron is higher than the room temperature.

**7. Why evaporation is considered as a surface phenomenon?**

Ans: This is because it takes place only on the surface of the liquid. If the surface area is increased, the rate of evaporation also increases.

**8. It is seen that, people get comfort when they sprinkle water on the roof or open ground after a hot sunny day. Why?**

Ans: This is because the large latent heat of vapourisation of water helps to cool the hot surface.

**9. Why does a wet khus-khus screen hung at the door keep the room cool?**

Ans: The wet khus-khus hung undergoes the process of evaporation which provides cooling effect. As the air passes, it absorbs energy and provides cooling effect.

**10. Give reason to explain, why water is considered a compound and not a mixture?**

Ans: Water is considered as a compound because of the following reasons:

(a) Its constituents hydrogen and oxygen are always present in the same ratio.

(b) Its properties are different from its constituent elements.

(c) Its constituent cannot be separated by simple physical means.

**11. Which characteristic of solids is present in liquids also and which makes them resemble liquids?**

Ans: Both are non-compressible.

**12. What are the conditions when there is no change in the temperature of a substance even when it is being heated?**

Ans: Latent heat of fusion and latent heat of vaporization.

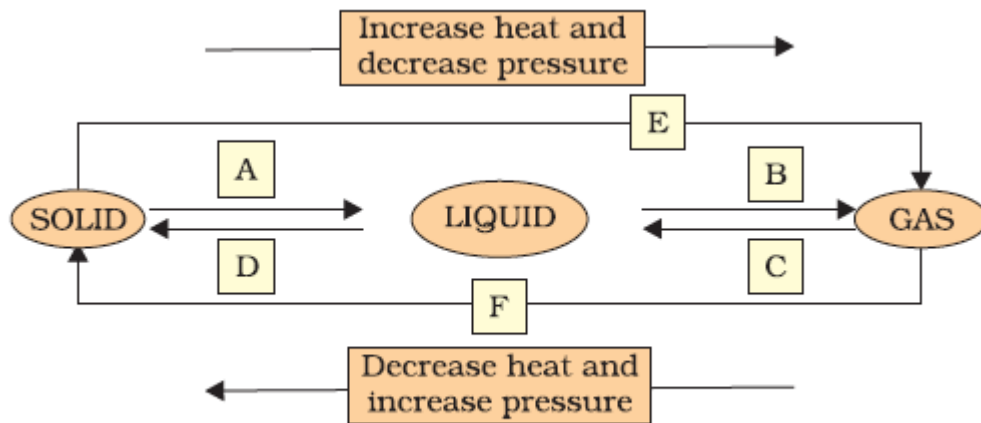
**13. Why is ice at 273K more effective in cooling than water at the same temperature?**

Ans: Ice at 273 K is more effective in cooling than water at 273 K because in ice, the molecules have lower energy as compared to particles in the liquid water at the same temperature. It requires latent heat of fusion for melting.

**14. What produces more severe burns, boiling water or steam?**

Ans: Steam produces severe burns. It is because it is an exothermic reaction that releases high amount of heat which it had consumed during vaporization.

15. Name A, B, C, D, E and F in the following diagram showing a change in its state.



Answers:

A: Melting (or) fusion

B: Evaporation (or) vaporization

C: Condensation

D: Solidification

E: Sublimation

F: Sublimation

Tick the correct option:

1. (ii) 2. (ii) 3. (i) 4. (ii)

In-text questions page-3

1. Ans: Chair, Air, Almonds, cold-drink are matters.

2. Ans: Particles in the air, if fueled with higher temperatures, acquire high kinetic energy which aids them to move fast over a stretch. Hence the smell of hot sizzling food reaches a person even at a distance of several meters.

3. Ans: The diver is able to cut through water in the swimming pool. This shows that the particles of water have large intermolecular space and has less force of attraction.

4. Ans: The characteristics of particles of matter are:

- (a) Presence of intermolecular spaces between particles
- (b) Particles are in constant motion
- (c) They attract each other

In-text questions page-6

1. Ans: The order of increasing density is: Air < Exhaust from chimney < Cotton < Water < Honey < Chalk < Iron.

2. Answers:

(a) The difference in the characteristics of the three states of matter.

Characteristics	Solid	Liquid	Gas
Shape	Fixed shape	No Fixed shape	No Fixed shape
Volume	Fixed volume	Fixed volume	No Fixed volume
Intermolecular force	Maximum	Less than solids	Very less
Intermolecular space	Very less	More than solids	maximum
Rigidity/Fluidity	Rigid/cannot flow	Can flow/not rigid	Can flow/not rigid
Compressibility	negligible	compressible	Highly compressible

(b) Rigidity: The tendency of a substance to remain its shape when subjected to outside force is known as rigidity.

Compressibility: The property due to which a substance reduced to its lower volume when force is applied is called compressibility.

Fluidity: It is the ability of a substance to flow or move about freely.

Filling the gas container: The particles in a container take its shape as they randomly vibrate in all possible directions.

Shape: It is the definite structure of an object within an external boundary

Kinetic energy: Motion allows particles to possess energy which is referred to as kinetic energy. The increasing order of kinetic energy possessed by various states of matter is: Solids < Liquids < Gases

Density: It is the mass of a unit volume of a substance. The density in different states decreases as: solids > liquids > gases.

3. Answers: a) Kinetic energy possessed by gas particles is very high which allows them to randomly move across all directions when contained, hence the particles fill the gas vessel entirely.

b) Gas molecules possess high kinetic energy, due to which they are under constant motion inside the container in random directions which causes them to hit the walls of the container and hence create vibrations. These collisions with the walls of the container generate pressure.

c) A wooden table is called a solid because it has a definite mass, volume and shape.

d) Molecules in gases are loosely packed as compared to solid molecules which are densely packed. Hence we are easily able to break the force of attraction when we move our hand through air but find it difficult to break through a solid (because of greater forces of attraction between molecules) which a karate expert is able to smash with the application of a lot of force.

4. Ans: Density of ice is less than the density of water. The molecules in ice make a cage like structure with lot of vacant spaces, this make ice float on water.

In-text questions page-9

1. Solution: We have,  $0^{\circ}\text{C} = 273\text{K}$

(a)  $300\text{K} = (300 - 273)^{\circ}\text{C} = 27^{\circ}\text{C}$

(b)  $573\text{K} = (573 - 273)^{\circ}\text{C} = 300^{\circ}\text{C}$

2. Answers:

(a) Gaseous state.

(b) Gaseous state.

3. Ans: It is due to the latent heat as the heat supplied to increase the temperature of the substance is used up to transform the state of matter of the substance hence the temperature stays constant.

4. Ans: The atmospheric gases can be liquefied by cooling under pressure.

In-text questions page – 10

1. Ans; It is because the temperature is high and it is less humid on a hot dry day which enables better evaporation. High levels of this evaporation provide better cooling effects.

2. Ans: An earthen pot is porous in nature. These tiny pores facilitate penetration of water and hence their evaporation from the pot surface. The process of evaporation requires energy which is contributed by water in the pot as a result of which water turns cooler.

3. Ans: Acetone, petrol, and perfume are volatile substances that get evaporated when they come in contact with air. Evaporation is facilitated as it uses energy from palm hence leaving a cooling effect on our palms.

4. Ans: A saucer has a larger surface area than a cup which promotes quicker evaporation hence the tea or milk in a saucer cools down faster.

5. Ans: This is because cotton is good absorber of water and therefore it helps in absorbing sweat from our body. It also exposes it to the atmosphere for easy evaporation. The evaporation of the sweat cools our body. Therefore, our body feels cool.

## CHAPTER-2

### IS MATTER AROUND US PURE

TEXTBOOK EXERCISES (Page number: 29 -32)

1. Which separation techniques will you apply for the separation of the following?

(a) Sodium chloride from its solution in water.

(b) Ammonium chloride from a mixture containing sodium chloride and ammonium chloride.

(c) Small pieces of metal in the engine oil of a car.

(d) Different pigments from an extract of flower petals.

(e) Butter from curd.

(f) Oil from water.

(g) Tea leaves from tea.

(h) Iron pins from sand.

(i) Wheat grains from husk.

(j) Fine mud particles suspended in water.

Answers:

- (a) Evaporation.
- (b) Sublimation.
- (c) Filtration.
- (d) Chromatography.
- (e) Centrifugation.
- (f) Separating funnel.
- (g) Filtration.
- (h) Magnetic separation.
- (i) Sedimentation/ Winnowing.
- (j) Filtration / Decantation.

2. Write the steps you would use for making tea. Use the words solution, solvent, solute, dissolve, soluble, insoluble, filtrate, and residue.

Ans:

- (a) Take a cup of water (solvent) in a container and heat it.
- (b) Add sugar (solute) in it. Heat it till all sugar dissolves.
- (c) Water and sugar is a solution.
- (d) Sugar is soluble in water completely.
- (e) Add  $\frac{1}{2}$  tea spoon of leaves which is insoluble in water.
- (f) Add milk which is soluble in water. Boil the content.
- (g) Filter the tea with a strainer and the tea collected is known as filtrate while tea leaves in the strainer are residue.

3. Why crystallization method is considered better than the simple distillation method?

Ans: This is because in crystallization, the solvent does not boil off; it just evaporates and takes less time.

4. Which of the following solutions will be more stable and why?

- (i) Saturated and unsaturated solution
- (ii) Aqueous and Non-aqueous solution
- (iii) True solution and Suspension

Answers: (i) Saturated solution will be more stable because no more solute can be added at a particular temperature.

(ii) Non-aqueous solution will be more stable because Hydrogen- Hydrogen bond in this solution is very strong.

(iii) True solution will be more stable because in solution, solute particles do not settle down when left undisturbed.

5. What kind of parameters are taken into account to classify a substance into a solute or a solvent?

Ans: First, we must know the amount of components present in a solution. We will observe two parts in the solution. The part in lesser amount by weight will be solute while the part in larger amount by weight will be solvent.

6. What would happen if you were to take a certain saturated solution at a certain temperature and cool it slowly? What is the nature of such solution?

Ans: Some of its dissolved solute will separate out in the form of solid crystals.

The nature of solution is super saturated solution.

7. Name the following;

(a) Which can dissolve others?

(b) Which get dissolves in others?

(c) Which forms a clear liquid formed by the combination of two compounds?

Answers: (a) Solvent.

(b) Solute.

(c) True solution.

8. Pragya tested the solubility of three different substances at different temperatures and collected the data as given below (results are given in the following table, as grams of a substance dissolved in 100 grams of water to form a saturated solution).

Substance dissolved	Temperature in K				
	283	293	313	333	353
	Solubility				
Potassium nitrate	21	32	62	106	167
Sodium chloride	36	36	36	37	37
Potassium chloride	35	35	40	46	54
Ammonium chloride	24	37	41	55	66

(a) What mass of potassium nitrate would be needed to produce a saturated solution of potassium nitrate in 50 grams of water at 313K?

(b) Pragya makes a saturated solution of potassium chloride in water at 353 K and leaves the solution to cool at room temperature. What would she observe as the solution cools? Explain.

(c) Find the solubility of each salt at 293 K. Which salt has the highest solubility at this temperature?

(d) What is the effect of change of temperature on the solubility of a salt?

Solution:

(a) Given:

Mass of potassium nitrate required to produce a saturated solution in 100 g of water at 313 K = 62g

Mass of potassium nitrate required to produce a saturated solution in 50 g of water =?

Required amount =  $62 \times 50/100 = 31$

Hence 31 g of potassium nitrate is required.

(b) Crystals of potassium chloride will be obtained on cooling the saturated solution.

(c) Solubility of different salts in 100g water at 293 K is:

Potassium nitrate — 32 g

Sodium chloride — 36 g

Potassium chloride — 35 g

Ammonium chloride — 37g

Ammonium chloride has the highest solubility.

(d) The solubility of salts increase with increase in temperature.

9. Explain the following giving examples.

(a) Saturated solution

(b) Pure substance

(c) Colloid

(d) Suspension

Ans :(a) In a given solvent, when no more solute can dissolve further at a given temperature is called Saturated solution.

(b) Pure substance consists of a single type of particles.

Example: Gold.

(c) Colloid is a solution in which the size of solute particles is bigger than that of true solution. Example: Ink.

(d) Suspension is a heterogeneous mixture in which the solute particles are big enough to settle down. Example: Chalk powder in water.

10. Classify each of the following as a homogeneous or heterogeneous mixture.

Soda water, wood, air, soil, vinegar, filtered tea.

Ans:	Homogenous mixture	Heterogenous mixture
	soda water	wood
	vinegar	
	filtered tea	
	air	Soil

11. How would you confirm that a colourless liquid given to you is pure water?

Ans: By finding its boiling point. If the colourless liquid boils at 100°C at atmospheric pressure, then it is pure water.

12. Which of the following materials fall into the category of “pure substance”?

(a)Ice

(b)Milk

(c)Iron

(d)Hydrochloric acid

(e)Calcium oxide

(f)Mercury

(g)Brick

(e)Wood

(f) Air.

Ans: Pure substances are: Iron, Ice, Hydrochloric acid, Calcium oxide and Mercury.

13. Identify the solutions among the following mixtures.



- (a) Soil
- (b) Sea water
- (c) Air
- (d) Coal
- (e) Soda water

Ans: Solutions are: Sea water, Air and Soda water

14. Which of the following will show the “Tyndall effect”?

- (a) Salt solution
- (b) Milk
- (c) Copper sulphate solution
- (d) Starch solution.

Ans: Milk and starch solution.

15. Classify the following into elements, compounds and mixtures.

- (a) Sodium
- (b) Soil
- (c) Sugar solution
- (d) Silver
- (e) Calcium carbonate
- (f) Tin
- (g) Silicon
- (h) Coal
- (i) Air
- (j) Soap
- (k) Methane
- (l) Carbon dioxide
- (m) Blood.

Answers:

Elements

Sodium

Silver

Tin

Silicon

Compounds

Calcium carbonate

Carbon dioxide

Methane

Soap

Mixture

Soil

Sugar solution

Coal

Air

Blood

16. Which of the following are chemical changes?

(a) Growth of a plant (b) Rusting of iron

(c) Mixing of iron fillings and sand (d) Cooking of food (e) Digestion of food (f) freezing of water (g) Burning of a candle

Ans: (a), (b), (d), (e), (g) are chemical changes.

Tick the correct option:

1. (iii) 2. (i) 3. (iii) 4. (iii) 5. (i)

In-text questions page – 16

1. Ans: A substance is a pure single form of matter.

2. Answer:

Homogeneous mixture	Heterogeneous mixture
(i)It has a uniform composition.	(i)It has a non-uniform composition.
(ii)It consists of only one phase.	(ii)It consists of more than one phase.

In-text questions page – 19

1. Ans:

Heterogeneous mixture	Homogeneous mixture
(i)Has irregular composition.	(i)Has a uniform composition.
(ii)Noticeable boundaries of division. Example: seawater, blood, etc.	(ii)No apparent boundaries of division Example: rainwater, vinegar, etc.

2. Ans:

Sol(Colloid)	Solution	Suspension
Heterogenous nature	Homogenous nature	Heterogenous nature
Stable	Stable	Unstable

3. To make a saturated solution, 36g of sodium chloride is dissolved in 100 g of water at 293 K. Find its concentration at this temperature.

Solution:

Mass of solute (NaCl) = 36 g

Mass of solvent (H<sub>2</sub>O) = 100 g

Mass of solution (NaCl + H<sub>2</sub>O) = 136 g

Concentration = Mass of solute/Mass of solution x 100

Concentration = 36/136 x 100 = 26.47%

Hence, the concentration of the solution is 26.47%

In-text questions page – 25

1. Ans: Since the mixture contains two liquids which are miscible with each other and have a boiling point difference of more than 25°C, these can be separated by simple distillation method.

2. Answers:

a) Centrifugation

b) Evaporation

c) Sublimation

3. Ans: Crystallization technique is used to purify solid with some impurities in it.

In-text questions page – 25

1. Answers:

Physical change

- Cutting the trees
- Boiling of water to form steam
- Melting of butter in a pan
- Making a fruit salad with raw fruits
- Dissolving common salt in water

Chemical change

- Rusting of almirah
- Passing of electric current through water, and water breaking into hydrogen and oxygen gases
- Burning of paper and wood

2. Answers:

Pure substance

Water

Salt

Iron

Diamond

Mixture

Soil

Salad

Air

Steel