

Std – VIII Physics Question Bank & Competency Assessments

THEME 1: States of Matter on the Basis of Kinetic Theory

A. Multiple Choice Questions (MCQs)

1. The shape of the meniscus formed by water in a test tube is –
 - a) concave
 - b) spherical
 - c) convex
 - d) circular

2. When a spoonful of common salt is added to a beaker full of water and stirred gently, it dissolves completely without causing any change in the initial watermark of the container. This is primarily because:
 - a) The water molecules expand to absorb the incoming salt mass.
 - b) Cohesive forces between salt particles instantly turn into adhesive forces.
 - c) Salt molecules occupy the pre-existing intermolecular spaces between the water molecules.
 - d) Salt molecules increase the overall surface tension of the fluid matrix.

3. Consider a substance where the molecules possess fixed positions, vibrate strictly about their mean positions, and have highly compact packing. If you try to deform its boundary, it offers extreme rigidity. This substance is in a:
 - a) Gaseous state
 - b) Solid state
 - c) Liquid state
 - d) Gaseous state transitioning into a plasma state

4. The kinetic energy of a gas decreases with –
 - a) fall in temperature
 - b) rise in temperature
 - c) decrease in pressure
 - d) increase in temperature

5. Inside a chemical laboratory, you pour liquid mercury in a test tube. It forms a _____ meniscus.

- a) Convex
- b) Concave
- c) Flat
- d) Circular

6. Why does the internal pressure of a car tire increase when more air molecules are squeezed and packed into the exact same fixed volume of the tire?

- a) Squeezing the gas causes the molecules to grow physically in size.
- b) Squeezing the gas doubles the cohesive force between the air and rubber.
- c) Squeezing increases the number of molecules per unit volume, doubling the rate of random impacts against the interior walls.
- d) Squeezing locks the gaseous molecules into absolute stationary states.

7. The force of attraction between the molecules of a given substance is called –

- a) Adhesive force
- b) Intermolecular force
- c) Intramolecular force
- d) Magnetic force

8. When water is heated from the bottom of a flask, the fluid at the bottom expands, absorbs heat, and rises upward while the colder, denser water from top layers sinks down to fill the gap. This circulation is known as:

- a) Linear conduction current
- b) Latent evaporation stream
- c) Convection currents
- d) Surface tension migration

B. Fill in the Blanks

1. The force of attraction acting between two completely similar kinds of molecules is scientifically designated as the force of _____.
2. The kinetic energy of the constituent molecules of any specimen of matter increases automatically with an increase in _____.
3. If the overall volume of an enclosed gas is compressed to exactly half of its initial volume using an air-tight piston, its internal gas pressure will immediately become _____.

4. The specific temperature at which a gaseous substance transfers back into its liquid state with the release of thermal energy is formally called its _____ point.
5. A _____ is defined precisely as the gaseous state of a liquid when it exists below its standard boiling point.
6. The process by which a gas, upon cooling, transforms instantly and directly into a solid state without ever touching the liquid state is known as _____ or desublimation.
7. The phenomenon due to which the exposed top surface of a liquid acts exactly like an elastic stretched membrane is called _____.
8. In a solid material, molecules vibrate continuously about their _____ positions without ever permanently leaving them.

C. One-Word Answer Questions

1. Name the ancient Indian Rishi who first hypothesized that all physical matter is composed of unimaginably tiny, indivisible particles termed 'anu'.
2. What specific term is given to the inter-molecular force of attraction that exists between two different kinds of molecules?
3. What is the approximate structural size order (in meters) of a typical molecule, making it invisible under conventional microscopes?
4. Which state of matter features particles that move completely independently and can fully fill up any size container in which they are locked?
5. What type of meniscus is formed by liquid alcohol when it is poured inside a narrow glass tube?
6. What name is given to the thermal energy required to change a liquid to its gaseous state at its boiling point without any change in temperature?
7. What is the state of a substance called when it is in its gaseous phase at or above its boiling point?
8. Name the phase transition process when solid camphor turns directly into a gas upon heating.

D. Numerical Questions

1. Calculate the total amount of heat energy (in Joules) required to completely melt 5 kg of pure ice kept at its melting point of 0°C into water at 0°C . (Take the specific latent heat of fusion of ice as $336,000\text{ J/kg}$).
2. An industrial heater transfers heat to a container containing boiling water at 100°C to transform it into steam at 100°C . If the total mass of water converted to steam is 2.5 kg, calculate the latent heat absorbed during this phase change. (Take the specific latent heat of vapourisation of steam as $2,260,000\text{ J/kg}$).

E. Short Answer Questions (2 Marks Each)

1. Contextual Application: Why do wet clothes dry much faster when spread out widely under direct sunlight compared to when they are left bundled up in a shady area? Justify using the kinetic theory principles.

2. Concept Distinction: Explain why a steam burn at 100°C causes much more agonizing and severe injury to human skin than a burn caused by liquid water at the exact same temperature of 100°C .

F. Assertion-Reason Questions

Directions: Choose (a) if both Assertion and Reason are true and Reason is the correct explanation, (b) if both are true but Reason is not correct, (c) if Assertion is true but Reason is false, and (d) if Assertion is false but Reason is true.

1. Assertion: When a solid block of ice is heated, its temperature stays stuck at 0°C until every single piece of ice turns completely to liquid water.

Reason: The heat energy supplied during melting is entirely utilized to increase the kinetic energy of the molecules, raising their temperature.

2. Assertion: Water forms a concave meniscus when placed inside a narrow glass test tube.

Reason: The adhesive force of attraction between water molecules and glass is significantly stronger than the cohesive force among water molecules themselves.

3. Assertion: Convection currents cannot form inside a highly rigid solid block of iron when heated from below.

Reason: The constituent molecules of a solid are very tightly packed and cannot leave their mean positions to move around freely.

4. Assertion: If you decrease the volume of a gas inside an air-tight container, the gas pressure rises.

Reason: Reducing the volume decreases the number of gas molecules per unit area, reducing the total collision frequency.

THEME 2: Measurement of Density, Floatation, and Sinking

A. Multiple Choice Questions (MCQs)

1. You have three identical cubes made of iron, zinc, and wood, where each cube has an exact side length of 1 cm. Upon weighing them on a physical balance, you record different masses: Iron = 7.8 g, Zinc = 4.2 g, and Wood = 0.8 g. This variation exists because:

a) Iron experiences an altered gravitational constant.

b) Wood contains massive intermolecular spaces that eliminate its mass.

c) The constituent matter (atoms/molecules) is much more densely packed inside iron than in zinc or wood.

d) Zinc molecules undergo an endothermic reaction on a physical balance.

2. A student needs to convert a density value from the CGS system (g/cm^3) to the standard SI system (kg/m^3). The correct mathematical conversion factor to multiply by is:

- a) 10^{-3}
- b) 1
- c) 10^3
- d) 10^6

3. To determine the density of an irregularly shaped stone, you first measure its mass as 150 g. Next, you lower it into a graduated measuring cylinder filled with water. The water level rises from an initial mark of 50 cm^3 to a final mark of 75 cm^3 . The density of this stone is:

- a) 2.0 g/cm^3
- b) 6.0 g/cm^3
- c) 3.0 g/cm^3
- d) 7.8 g/cm^3

4. While using a Eureka can to find the volume of a solid item, water must be filled up to what precise level before lowering the solid?

- a) Exactly half-filled.
- b) Right up to the point of overflowing through its spout.
- c) Below the spout line by 10 cm^3 .
- d) Completely to the brim so that the lid touches the water surface.

5. A density bottle is a specially engineered small glass bottle with a capacity of 50 mL featuring a close-fitting ground glass stopper. This stopper contains a fine capillary tube running through it to:

- a) Ensure air can continuously enter to vaporize the liquid.
- b) Allow any excess liquid to rise up and drain out, ensuring an identical volume is maintained each time.
- c) Provide a way to stir the liquid while it sits on the balance.
- d) Maintain a high vacuum state inside the glass base.

6. When the temperature of a liquid or gas sample is raised significantly, its overall mass stays constant, but its volume expands. Consequently, its density will:

- a) Increase linearly.
- b) Remain completely unchanged.
- c) Decrease.
- d) Fluctuate randomly depending on surface tension.

7. The density of a solid object hardly changes even if the surrounding temperature fluctuates by 20°C to 40°C. Why does this happen?

- a) Solids do not contain thermal kinetic energy.
- b) The expansion of volume in a solid with a minor rise in temperature is so small that it is virtually negligible.
- c) The mass of solids decreases to counteract any expansion.
- d) Solids are completely immune to any heat changes.

8. Look at the table provided in the text. Which of the following solid elements has the absolute highest packing density?

- a) Iron (7800 kgm⁻³)
- b) Gold (19300 kgm⁻³)
- c) Lead (11500 kgm⁻³)
- d) Silver (10300 kgm⁻³)

9. A liquid X has a mass of 150 g and a volume of 100 cm³ at 0°C. When heated up to 100°C, its volume stretches to 110 cm³. What is its calculated density at 100°C?

- a) 1.50 g/cm³
- b) 1.36 g/cm³
- c) 1.00 g/cm³
- d) 1.25 g/cm³

10. Which planet in our solar system holds the highest average density value (5514 kg/m³)?

- a) Jupiter
- b) Mercury
- c) Earth
- d) Saturn

B. Fill in the Blanks

1. Density is fundamentally defined as the _____ per unit volume of a given substance.

2. In the CGS metric framework, the standard unit for recording density values is _____.

3. Equal volumes of different physical substances will always possess _____ masses due to differences in particle packing.

4. To calculate the volume of a completely irregular small solid, a laboratory technician utilizes a _____ cylinder or a Eureka can.

5. When a density bottle is weighed totally empty on a physical balance, its recorded mass is represented as M_1 . If filled with pure water, its mass becomes _____.
6. The density of liquid water reaches its standard benchmark value of 1 g/cm^3 specifically at a temperature of _____.
7. With a significant rise in temperature, the density of liquids and gases will automatically _____.
8. Convection currents within a fluid layer are triggered precisely due to changes in _____ across different layers.
9. The volume of an irregular solid is equal to the volume of the water that is _____ when the solid is immersed in a Eureka can.
10. The mass of a solid is measured very accurately using a _____ balance.

C. One-Word Answer Questions

1. Write down the absolute mathematical formula used to compute density (D) if mass is M and volume is V .
2. What is the equivalent value of a density of 1 g/cm^3 when converted into the SI system (kg/m^3)?
3. Name the specific scientific glass container used to accurately measure the density of liquids using a capillary stopper.
4. When a gas is heated inside a flexible balloon, what happens to its internal volume?
5. If an object has a mass of 42 g and a volume of 50 cm^3 , what is its density in g/cm^3 ?
6. Which liquid substance mentioned in the density chart has a value of 13.6 g/cm^3 ?
7. Do solids expand more or less than liquids when given the exact same increase in temperature?
8. What parameter must remain constant for a fluid sample to show a decrease in density as its volume grows under heat?
9. What happens to the water level inside a graduated cylinder if a thread-tied solid is lowered completely into it?
10. Name the liquid that has a density of exactly 0.78 g/cm^3 at room temperature.

D. Numerical Questions

1. An empty density bottle weighs 30 g (M_1). When completely filled with pure water, its mass is 80 g (M_2). When filled with an unknown experimental oil, its mass is 72 g (M_3). Calculate: (a) The mass of water inside the bottle, (b) The mass of the oil inside the bottle, (c) The density of the oil.
2. A rectangular block of wood has a mass of 68 g . If its length is 5 cm , width is 4 cm , and height is 5 cm , determine its total volume and find its density in g/cm^3 . Check if it matches the textbook chart value for wood.

3. An irregular metal casting is lowered into a full Eureka can. The overflowing water is collected in a small measuring cylinder, which reads exactly 40 cm^3 . If the casting has a mass of 312 g on a balance, calculate the density of the metal in both g/cm^3 and kg/m^3 .

4. A fluid sample Y occupies a space of 200 cm^3 and has a mass of 250 g at a cold temperature. Upon being placed on a heat plate, its temperature shoots up, causing its volume to expand to 220 cm^3 while its mass remains constant. Calculate its initial density and its final density after expansion.

E. Short Answer Questions (2 Marks Each)

1. Contextual Application: You are given two identical-looking vials: one containing pure water and the other containing pure glycerine. Without tasting them, how can you use a physical balance and a 50 mL density bottle to systematically tell them apart?

2. Concept Distinction: Explain why a hot air balloon rises up into the sky when the air burner inside the balloon is ignited. Base your explanation on the relationship between temperature, volume, and density.

F. Assertion-Reason Questions

1. Assertion: The density of an iron block remains practically the same even if the temperature goes up by 25°C .

Reason: The thermal expansion of solids with minor temperature changes is so minimal that its change in volume is considered negligible.

2. Assertion: If you fill a density bottle completely with liquid and insert the stopper, some fluid overflows through the capillary tube.

Reason: The capillary tube acts as an overflow escape mechanism to guarantee that a constant volume of fluid is measured every single time.

3. Assertion: A piece of cork floats easily on water while an aluminum cube sinks down instantly.

Reason: According to the text, cork has a much higher density value (0.25 g/cm^3) compared to aluminum (2.7 g/cm^3).

4. Assertion: When a fluid layer is heated from the bottom, the density of the fluid at the bottom decreases.

Reason: Heating causes fluid molecules to contract tightly together, forcing more mass into a smaller volume layer.

Answer Key & Explanatory Solutions

Theme 1 Solutions

A. MCQs: 1. b | 2. c | 3. c | 4. b | 5. b | 6. c | 7. b | 8. c

B. Fill in the Blanks: 1. Cohesion | 2. Temperature | 3. Double (twice) | 4. Condensation | 5. Vapour | 6. Deposition | 7. Surface tension | 8. Mean

C. One-Word Answers: 1. Rishi Kanada | 2. Adhesion | 3. 10^{-9} m | 4. Gas | 5. Concave meniscus | 6. Latent heat of vaporisation | 7. Gas | 8. Sublimation

D. Numerical Solutions (Theme 1)

Question 1: $Q = m * L_f = 5 \text{ kg} * 336,000 \text{ J/kg} = 1,680,000 \text{ Joules.}$

Question 2: $Q = m * L_v = 2.5 \text{ kg} * 2,260,000 \text{ J/kg} = 5,650,000 \text{ Joules.}$

E. Short Answers & F. Assertion-Reason (Theme 1)

Short Answer 1: Spreading clothes increases surface area, and sunlight increases temperature. Both factors drastically accelerate the rate of evaporation because more surface molecules gain enough kinetic energy to break away.

Short Answer 2: Steam at 100°C carries an enormous amount of extra hidden heat energy known as the latent heat of vaporisation (2260 J/g) compared to liquid water at the same temperature. Upon hitting the skin, it releases this massive excess energy as it condenses, causing severe burns.

Assertion-Reason: 1. c (Reason is false because latent heat alters potential energy, not kinetic energy during phase change)

2. a

3. a

4. c (Reason statement is inverted; reducing volume increases molecules per unit area)

Theme 2 Solutions

A. MCQs: 1. a | 2. c | 3. b | 4. b | 5. b | 6. c | 7. b | 8. b | 9. b | 10. c

B. Fill in the Blanks: 1. Mass | 2. g/cm^3 | 3. Different | 4. Measuring | 5. M_2 | 6. 4°C | 7. Decrease | 8. Temperature | 9. Displaced (overflown) | 10. Physical

C. One-Word Answers: 1. $D = M/V$ | 2. 1000 kg/m^3 | 3. Density bottle | 4. It expands (increases) | 5. 0.84 g/cm^3 | 6. Mercury | 7. Less | 8. Mass | 9. It rises | 10. Alcohol

D. Numerical Solutions (Theme 2)

Question 1: Mass of water = $80 - 30 = 50$ g. Mass of oil = $72 - 30 = 42$ g. Density of oil = Mass of oil / Volume of bottle = $42 \text{ g} / 50 \text{ cm}^3 = 0.84 \text{ g/cm}^3$.

Question 2: Volume = $5 * 4 * 5 = 100 \text{ cm}^3$. Density = $68 \text{ g} / 100 \text{ cm}^3 = 0.68 \text{ g/cm}^3$. (Matches textbook value precisely).

Question 3: Volume = 40 cm^3 . Density = $312 \text{ g} / 40 \text{ cm}^3 = 7.8 \text{ g/cm}^3$. In SI units = $7.8 * 1000 = 7800 \text{ kg/m}^3$ (Identifies the metal as Iron).

Question 4: Initial Density = $250 / 200 = 1.25 \text{ g/cm}^3$. Final Density = $250 / 220 = 1.136 \text{ g/cm}^3$.

E. Short Answers & F. Assertion-Reason (Theme 2)

Short Answer 1: Fill the clean, dry density bottle completely with fluid 1, insert the stopper, wipe it, and weigh it to find the net liquid mass ($M_{\text{liquid}} = M_{\text{full}} - M_{\text{empty}}$). Repeat for fluid 2. Since the volume is fixed (50 mL), the fluid that yields a significantly higher net mass is glycerine ($D = 1.25 \text{ g/cm}^3$) while the other is water ($D = 1.00 \text{ g/cm}^3$).

Short Answer 2: Activating the burner heats up the air trapped inside the balloon fabric. As air heats up, it expands in volume, which reduces its overall density relative to the surrounding cooler atmospheric air. This creates a net upward buoyant force, causing the balloon to float up.

Assertion-Reason: 1. a

2. a

3. c (Cork has a lower density than water, but statement in reason incorrectly claims it has a higher value than aluminum)

4. c (Reason is completely false; heating causes fluids to expand and separate, not contract)