SchoolOkay

CBSE CLASS 9 • SCIENCE

IMPORTANT QUESTIONS

Chapter 1: Matter in Our Surroundings

QUESTION BANK WITH ANSWERS
Conceptual • Reasoning • Application-based • Numericals

Prepared by SchoolOkay

A fresh, student-friendly study resource designed for revision and practice.

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How to use this question bank

Read each question first and try answering it without looking at the solution. Then compare your response with the answer and revise the key scientific terms. Practise the reasoning and application questions in your own words.

Chapter topics

1. Matter and its characteristics
2. Particles of matter, diffusion and Brownian motion
3. States of matter and their properties
4. Density, compressibility, rigidity and fluidity
5. Temperature and change of state
6. Latent heat, evaporation and sublimation
7. Application-based and value-based questions

Note: This resource is based on the question material supplied for this chapter. Always follow the latest CBSE syllabus and your school's instructions for examination coverage.

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Revision checklist

- ■ I can define matter and describe the characteristics of its particles.
- ■ I can explain diffusion and Brownian motion with examples.
- ■ I can compare solids, liquids and gases.
- ■ I can use the density formula and convert °C to K.
- ■ I can explain melting, boiling, latent heat and sublimation.
- ■ I can describe evaporation, its factors and its cooling effect.

1. Matter and its characteristics

Q1. What is matter?

Answer: Anything that has mass and occupies space is called matter. Examples include a chair, water, air and a book.

Q2. Name the three common states of matter and give one example of each.

Answer: The three common states are solid (ice), liquid (water) and gas (oxygen).

Q3. List the important characteristics of particles of matter.

Answer: Particles of matter are very small, have spaces between them, are continuously moving and attract one another.

Q4. Which of the following are forms of matter: chair, air, love, almonds, thought, cold and cold drink?

Answer: Chair, air, almonds and cold drink are matter because they have mass and occupy space. Love, thought and cold are not matter.

Q5. A diver can move through water in a swimming pool. What property of matter does this show?

Answer: It shows that particles of matter have spaces between them and that the particles of a liquid can move past one another.

Q6. What does mixing sugar in water demonstrate about particles of matter?

Answer: It demonstrates that matter is made of tiny particles and that spaces exist between those particles. Sugar particles occupy some of the spaces between water particles.

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2. Diffusion and Brownian motion

Q7. What is diffusion?

Answer: Diffusion is the movement and mixing of particles from a region of higher concentration to a region of lower concentration. It occurs in gases and liquids, and very slowly in solids.

Q8. What provides evidence for the random motion of particles in matter?

Answer: Diffusion and Brownian motion provide evidence that particles are in continuous, random motion.

Q9. Why does the smell of hot sizzling food travel farther than the smell of cold food?

Answer: At a higher temperature, particles have greater kinetic energy and move faster. The smell-producing particles therefore diffuse through air more quickly.

Q10. Which process explains the spreading of the smell of an incense stick throughout a room?

Answer: Diffusion. Fragrance particles move through the air from a region of higher concentration to regions of lower concentration.

Q11. What happens when potassium permanganate crystals are placed in water? What does it show?

Answer: The purple colour gradually spreads through the water even without stirring. This is diffusion and shows that particles move continuously and mix with one another.

Q12. Give two everyday examples of diffusion.

Answer: The smell of perfume spreading through a room, and a drop of ink spreading through water.

Q13. What is Brownian motion?

Answer: Brownian motion is the continuous random movement of tiny particles suspended in a fluid, caused by collisions with the moving particles of the fluid. Robert Brown observed the random movement of pollen grains in water in 1827.

Q14. Why does diffusion become faster when temperature increases?

Answer: An increase in temperature raises the kinetic energy of particles. They move faster, so mixing takes place more quickly.

Q15. Why does ink from a fountain pen spread into blotting paper?

Answer: Blotting paper has tiny spaces between its fibres. The liquid ink is drawn into these spaces by capillary action, helping the paper absorb excess ink.

3. The three states of matter

Q16. Describe solids, liquids and gases with one example each.

Answer: Solids have a definite shape and volume; their particles are closely packed. Examples: stone and wood. Liquids have a definite volume but no definite shape; they take the shape of their container. Examples: water and milk. Gases have neither a definite shape nor a definite volume and spread to fill their container. Examples: air and oxygen.

Q17. Which state of matter is most easily compressed? Why?

Answer: Gases are most easily compressed because their particles have large spaces between them.

Q18. How do solids, liquids and gases differ in shape and volume?

Answer: A solid has a fixed shape and volume. A liquid has a fixed volume but takes the shape of its container. A gas has neither a fixed shape nor a fixed volume.

Q19. Which state has the maximum movement of particles?

Answer: Gas, because gas particles have high kinetic energy and move freely in all directions.

Q20. In which state are forces of attraction strongest and spaces between particles smallest?

Answer: In solids, where particles are closely packed and forces of attraction are generally strongest.

Q21. How can ice, water and steam be considered three states of the same substance?

Answer: Ice melts to form water, and water changes into steam on heating. Steam can condense into water, which can freeze into ice. All three are forms of water.

Q22. Name two gases commonly supplied in compressed or liquefied form and state their uses.

Answer: LPG is supplied in cylinders for cooking. CNG is stored under pressure and used as a vehicle fuel. Helium is also compressed for filling balloons.

Q23. Why does ice float on water?

Answer: Ice has an open structure with spaces between its particles. It is less dense than liquid water, so it floats.

Q24. Arrange oxygen, water and sugar in increasing order of force of attraction between their particles.

Answer: Oxygen < water < sugar. Oxygen is a gas, water is a liquid and sugar is a solid; particle attraction is generally weakest in gases and strongest in solids.

Q25. Give two reasons why water is a liquid at room temperature.

Answer: Water has a definite volume but no fixed shape. It flows and takes the shape of its container.

Q26. Give two reasons why an iron almirah is a solid at room temperature.

Answer: It has a definite shape and a definite volume. It is rigid and cannot be compressed easily.

Q27. Define density and write its SI unit.

Answer: Density is mass per unit volume. Density = mass ÷ volume. Its SI unit is kilogram per cubic metre (kg/m³).

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Q28. What is meant by rigidity, compressibility and fluidity?

Answer: Rigidity is the tendency to resist a change in shape. Compressibility is the ability to decrease in volume when pressure is applied. Fluidity is the ability to flow; liquids and gases are fluids.

Q29. Why are gases generally less dense than solids?

Answer: Gas particles are much farther apart, so a given volume of gas usually contains less mass than the same volume of a solid.

Q30. What are physical properties of a substance? Give examples.

Answer: Physical properties can be observed or measured without changing a substance into a different substance. Examples include colour, smell, density, solubility, melting point, boiling point and conductivity.

4. Temperature and change of state

Q31. Which units are commonly used to measure temperature? State the SI unit.

Answer: Temperature is commonly measured in degree Celsius (°C) and kelvin (K). The SI unit is kelvin (K).

Q32. Write the relation between Celsius and Kelvin scales.

Answer: Temperature in kelvin = temperature in °C + 273 (approximately).

Q33. What is interconversion of states of matter?

Answer: It is the reversible change of matter from one physical state to another by changing conditions such as temperature or pressure.

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Q34. Define melting point.

Answer: The melting point is the temperature at which a solid changes into a liquid at a given pressure.

Q35. Define boiling point.

Answer: The boiling point is the temperature at which a liquid changes into a gas throughout the liquid at a given pressure.

Q36. What is latent heat of fusion?

Answer: It is the heat required to change 1 kg of a solid into liquid at its melting point without changing its temperature.

Q37. What is latent heat of vaporisation?

Answer: It is the heat required to change 1 kg of a liquid into gas at its boiling point without changing its temperature.

Q38. Are latent heat of fusion and latent heat of vaporisation the same? Explain.

Answer: No. Latent heat of fusion is involved in changing a solid into a liquid, whereas latent heat of vaporisation is involved in changing a liquid into a gas.

Q39. Convert 36°C into kelvin.

Answer: K = 36 + 273 = 309 K.

Q40. Convert 78°C into kelvin.

Answer: K = 78 + 273 = 351 K.

Q41. What is the Celsius temperature corresponding to 0 K?

Answer: °C = K – 273 = 0 – 273 = –273°C (approximately).

Q42. What is normal room temperature in Celsius and kelvin?

Answer: A commonly used value is 25°C, which is approximately 298 K.

Q43. Why is the kelvin scale useful for scientific temperature measurements?

Answer: Kelvin is the SI temperature scale and begins at absolute zero, the lowest theoretical temperature.

Q44. Which is more volatile, water or alcohol? Give a reason.

Answer: Alcohol is generally more volatile because it has a lower boiling point (about 78°C) than water (about 100°C) at normal atmospheric pressure.

Q45. On which two factors does the change of state of matter mainly depend?

Answer: The change of state mainly depends on temperature and pressure.

Q46. Is dry ice the same as ordinary ice?

Answer: No. Dry ice is solid carbon dioxide, whereas ordinary ice is solid water.

5. Sublimation, evaporation and cooling

Q47. What is sublimation? Give two examples.

Answer: Sublimation is the direct change of a solid into gas without passing through the liquid state. Examples include camphor and naphthalene.

Q48. Describe an activity to demonstrate sublimation of ammonium chloride.

Answer: Place a small amount of ammonium chloride in a china dish and cover it with an inverted funnel whose stem is plugged with cotton. Heat gently. Ammonium chloride forms vapour and then deposits as solid on the cooler inner surface of the funnel.

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Q49. Why does camphor disappear without leaving a residue?

Answer: Camphor sublimes: it changes directly from solid to vapour, so it does not need to melt into a liquid first.

Q50. Why do we feel cool when we touch a piece of ice?

Answer: Ice absorbs heat from our hand to melt. The loss of heat from our hand makes it feel cool.

Q51. Differentiate between evaporation and boiling.

Answer: Evaporation is a slow process that occurs only at the surface and can happen at temperatures below the boiling point. Boiling occurs throughout the liquid at a fixed temperature (for a given pressure) and is generally rapid.

Q52. How can you show that evaporation causes cooling?

Answer: Put a little acetone or spirit on your palm. As it evaporates, it absorbs heat from the skin, making the palm feel cool.

Q53. Define evaporation. How does temperature affect it?

Answer: Evaporation is the change of a liquid into vapour from its surface, and it can occur below the boiling point. Increasing temperature increases the rate of evaporation.

Q54. What are the factors affecting evaporation?

Answer: The rate of evaporation increases with higher temperature, larger surface area and greater wind speed. It decreases when humidity is high.

Q55. What does the latent heat of fusion of ice, 3.34 × 10■ J/kg, mean?

Answer: It means 3.34 × 10■ joules of heat are required to convert 1 kg of ice at 0°C into water at 0°C without changing its temperature.

Q56. What is the process in which a solid changes directly into gas? What is the reverse process called?

Answer: Solid changing directly into gas is sublimation. Gas changing directly into solid is deposition (also called desublimation).

Q57. Why are cotton clothes recommended in summer?

Answer: Cotton absorbs sweat and spreads it over a larger surface. This helps sweat evaporate faster, removing heat from the body and producing a cooling effect.

Q58. Why are desert coolers less effective during the rainy season?

Answer: During the rainy season, humidity is high. The air already contains more water vapour, so evaporation occurs more slowly and the cooler produces less cooling.

Q59. Explain the cooling effect of sweating.

Answer: Sweat evaporates from the skin by absorbing heat from the body. This heat loss cools the body.

Q60. Explain how an earthen pot (matka) cools water.

Answer: Water seeps through tiny pores in the pot and evaporates from its outer surface. Evaporation absorbs heat from the pot and the water inside, cooling the water.

Q61. Why does tea cool faster in a saucer than in a cup?

Answer: A saucer spreads tea over a larger surface area, increasing evaporation and heat loss, so it cools faster.

6. Pressure and other applications

Q62. How does pressure affect gases?

Answer: When pressure on a gas increases, its volume generally decreases because gas particles have large spaces between them and can be brought closer together.

Q63. Why are solids and liquids difficult to compress?

Answer: Their particles are already closely packed, leaving very little space to reduce when pressure is applied.

Q64. What happens to a gas when it is compressed?

Answer: Its particles are forced closer together and its volume decreases.

Q65. Why is wet air generally denser than dry air at the same temperature and pressure?

Answer: This statement is not generally correct: water vapour has a lower molar mass than the main components of dry air, so humid air is usually slightly less dense than dry air at the same temperature and pressure.

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7. Value-based and application questions

Q66. Ammonia gas is released in one corner of a laboratory. Soon, people in other parts of the room can smell it. Explain.

Answer: Ammonia particles move randomly and diffuse through air from a region of higher concentration to regions of lower concentration. This is why the smell spreads through the room.

Q67. Water boils at 100°C at normal atmospheric pressure. Can it boil at 95°C or 105°C? Explain.

Answer: Yes. The boiling point depends on pressure. At a pressure lower than normal atmospheric pressure, water can boil below 100°C; at a higher pressure, it can boil above 100°C.

Q68. Two ice cubes are pressed firmly together. When the pressure is released, they may stick together. Explain.

Answer: Pressure can lower the melting point of ice slightly at the contact surface. A thin layer melts under pressure and refreezes when the pressure is released, joining the cubes.

Quick revision checklist