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Physics Grade 9 — Chapter 7

Density and Temperature

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Independent practice MCQs from the supplied Class 9 Physics notes pack. Total: 50 questions. Each item has four options, the correct letter, and a short explanation.

A. Important / Main Topics

1. Density is defined as:

(A) Mass / volume
(B) Mass × volume
(C) Volume / mass
(D) Mass + volume

Correct Answer: A

Explanation: The text defines density as mass per unit volume, $\rho = m/V$.

2. The SI unit of density is:

(A) g/cm^3
(B) kg/m^3
(C) N/m^2
(D) J/kg

Correct Answer: B

Explanation: The text states that the SI unit of density is kilogram per cubic metre (kg/m^3).

3. Which state of matter generally has the highest density?

(A) Liquid
(B) Gas
(C) Solid
(D) Plasma

Correct Answer: C

Explanation: The text states that solids are denser than liquids and gases because their atoms are closely packed.

4. Which state of matter has a fixed shape and fixed volume?

(A) Liquid
(B) Gas
(C) Plasma
(D) Solid

Correct Answer: D

Explanation: The text states that solids have a fixed shape and volume.

5. Which state of matter takes the shape of its container but has a fixed volume?

(A) Liquid
(B) Solid
(C) Gas
(D) Plasma

Correct Answer: A

Explanation: The text states that liquids have no fixed shape and can adopt the shape of the container, but they have a fixed volume.

6. Which state of matter consists of ionized gas?

(A) Solid
(B) Plasma
(C) Liquid

(D) Gas

Correct Answer: B

Explanation: The text states that plasma is the ionized state of matter.

7. The temperature of a substance is directly proportional to the average:

(A) Potential energy of particles
(B) Mass of particles
(C) Kinetic energy of particles
(D) Volume of particles

Correct Answer: C

Explanation: The text states that the temperature of a substance is directly proportional to the average K.E. of its particles.

8. Absolute zero is equal to:

(A) 0°C
(B) 100°C
(C) 273 K
(D) 0 K or -273.15°C

Correct Answer: D

Explanation: The text states that absolute zero is 0 K on the Kelvin scale and -273.15°C on the Celsius scale.

9. Internal energy is the sum of:

(A) Kinetic energy and potential energy of particles
(B) Kinetic energy and mass
(C) Potential energy and volume
(D) Temperature and pressure

Correct Answer: A

Explanation: The text states that internal energy is the total kinetic and potential energy of the particles of a substance.

10. A thermometric property is a property that:

(A) Remains constant with temperature
(B) Changes with temperature
(C) Changes with pressure
(D) Changes with volume

Correct Answer: B

Explanation: The text states that variations in physical properties may be used to measure temperature, and these properties are called thermometric properties.

11. Which thermometer uses the volume expansion of a liquid?

(A) Thermocouple
(B) Gas thermometer
(C) Liquid-in-glass thermometer
(D) Bimetallic strip

Correct Answer: C

Explanation: The text states that liquid-in-glass thermometers use the expansion of a liquid.

12. Which thermometer uses the change in electrical resistance?

(A) Liquid-in-glass thermometer
(B) Gas thermometer
(C) Thermocouple
(D) Resistance thermometer

Correct Answer: D

Explanation: The text states that resistance thermometers measure temperature due to change in resistance.

13. Which thermometer uses the EMF generated at a junction of two different metals?

(A) Thermocouple
(B) Liquid-in-glass thermometer
(C) Gas thermometer
(D) Resistance thermometer

Correct Answer: A

Explanation: The text states that a thermocouple measures temperature due to change in its emf.

14. Liquid crystal thermometers change color with:

(A) Pressure
(B) Temperature
(C) Volume
(D) Mass

Correct Answer: B

Explanation: The text states that liquid crystals change color with a change in temperature.

15. Bimetallic strips measure temperature by:

(A) Volume expansion of a liquid
(B) Pressure change of a gas
(C) Differential expansion of two metals
(D) Electrical resistance

Correct Answer: C

Explanation: The text states that a bimetallic strip thermometer measures temperature by variation in volume expansion of two different metals.

16. If the mass of an object is 500 g and its volume is 125 cm³, its density is:

(A) 2 g/cm³
(B) 5 g/cm³
(C) 10 g/cm³
(D) 4 g/cm³

Correct Answer: D

Explanation: $\rho = 500/125 = 4\text{ g/cm}^3$, as calculated in the text.

17. A cube has a side length of 4 cm and a mass of 128 g. Its density is:

(A) 2 g/cm³
(B) 4 g/cm³
(C) 8 g/cm³
(D) 16 g/cm³

Correct Answer: A

Explanation: A cube has a side length of 4 cm and a mass of 128 g. Its density is 2 g/cm³.

18. A cuboid has dimensions 5 cm × 4 cm × 3 cm and a mass of 240 g. Its density is:

(A) 2 g/cm³
(B) 4 g/cm³
(C) 6 g/cm³
(D) 8 g/cm³

Correct Answer: B

Explanation: A cuboid has dimensions 5 cm × 4 cm × 3 cm and a mass of 240 g. Its density is 4 g/cm³.

19. A sphere has a radius of 3 cm and a mass of 904.8 g. Its density is approximately: (Take $\pi \approx 3.14$)

(A) 2 g/cm³
(B) 4 g/cm³
(C) 8 g/cm³
(D) 16 g/cm³

Correct Answer: C

Explanation: "8 g/cm³" is correct: it matches the idea asked in the question ("A sphere has a radius of 3 cm and a mass of 904.8 g. Its density is approximately: (Take \(\pi \approx 3.14\))"), while the other choices do not.

20. A rock has a mass of 80 g. Its volume, measured by displacement, is 20 cm³. Its density is:

(A) 2 g/cm³
(B) 8 g/cm³
(C) 16 g/cm³
(D) 4 g/cm³

Correct Answer: D

Explanation: A rock has a mass of 80 g. Its volume, measured by displacement, is 20 cm³. Its density is 4 g/cm³.

21. The volume of an irregularly shaped object is measured by:

(A) The displacement method
(B) Geometric formulas
(C) A ruler
(D) A balance

Correct Answer: A

Explanation: The text states that the displacement method is used for irregularly shaped solid objects like stones.

22. In the displacement method, the volume of the object is equal to:

(A) The initial volume of water
(B) The difference between the final and initial volumes
(C) The final volume of water
(D) The sum of the initial and final volumes

Correct Answer: B

Explanation: The text states that the volume of the object is found by subtracting the initial volume from the final volume.

23. A stone has a mass of 100 g. The initial water volume is 30 mL, and the final volume is 50 mL. The density of the stone is:

(A) 2 g/cm³
(B) 10 g/cm³
(C) 5 g/cm³
(D) 20 g/cm³

Correct Answer: C

Explanation: A stone has a mass of 100 g. The initial water volume is 30 mL, and the final volume is 50 mL. The density of the stone is 5 g/cm³.

24. When a substance is heated, its particles:

(A) Move slower
(B) Stop moving
(C) Change color
(D) Move faster

Correct Answer: D

Explanation: The text states that when we heat a substance, the speed and kinetic energy of its particles increase.

25. When a substance is cooled, its particles:

(A) Move slower
(B) Move faster
(C) Stop moving completely
(D) Increase in mass

Correct Answer: A

Explanation: The text states that when heat is removed, the speed and kinetic energy of the particles become slower.

B. Less Important / Secondary Topics

26. At absolute zero, the particles of a substance have:

(A) Minimum kinetic energy
(B) Maximum kinetic energy
(C) Zero mass
(D) Infinite velocity

Correct Answer: A

Explanation: The text states that at absolute zero, particles have least or no kinetic energy.

27. The Kelvin scale starts at:

(A) \(0^\circ\text{C}\)
(B) Absolute zero
(C) \(100^\circ\text{C}\)
(D) The boiling point of water

Correct Answer: B

Explanation: The Kelvin scale is an absolute temperature scale that starts at absolute zero.

28. The temperature remains constant during a change of state because:

(A) No heat is added
(B) The particles stop moving
(C) The added heat is used to overcome interparticle forces (increase potential energy)
(D) The mass changes

Correct Answer: C

Explanation: The text states that during melting and boiling, the added energy is used to increase the gap between molecules by decreasing intermolecular forces, not to increase kinetic energy.

29. The average kinetic energy of particles in a gas is given by:

(A) \(kT\)
(B) \(2kT\)
(C) \(\frac{1}{2}kT\)
(D) \(\frac{3}{2}kT\)

Correct Answer: D

Explanation: The average kinetic energy of particles in a gas is \(\frac{3}{2}kT\), where \(k\) is the Boltzmann constant and \(T\) is the absolute temperature.

30. Mercury is commonly used in thermometers because:

(A) It has a uniform expansion rate over a wide range
(B) It is cheap
(C) It is colorless
(D) It freezes at a high temperature

Correct Answer: A

Explanation: The text states that mercury is used because of its uniform expansion over a wide temperature range, and it does not wet glass.

31. Alcohol is used in thermometers for low-temperature measurements because:

(A) It is opaque
(B) It has a low freezing point
(C) It is toxic
(D) It does not expand

Correct Answer: B

Explanation: Alcohol is used in thermometers for low-temperature measurements because It has a low freezing point.

32. In a gas thermometer, the temperature must be measured in:

(A) Celsius

(B) Fahrenheit
(C) Kelvin
(D) Rankine

Correct Answer: C

Explanation: The gas laws are based on absolute temperature, which is measured in Kelvin.

33. A constant-volume gas thermometer uses:

(A) Charles's Law
(B) Ohm's Law
(C) Newton's Law
(D) Gay-Lussac's Law

Correct Answer: D

Explanation: The text states that a constant-volume gas thermometer uses Gay-Lussac's law ($P \propto T$) at constant volume).

34. A constant-pressure gas thermometer uses:

(A) Charles's Law
(B) Gay-Lussac's Law
(C) Ohm's Law
(D) Newton's Law

Correct Answer: A

Explanation: The text states that a constant-pressure gas thermometer uses Charles's law ($V \propto T$) at constant pressure).

35. Which of the following is the densest material at room temperature and pressure?

(A) Iron
(B) Osmium
(C) Gold
(D) Mercury

Correct Answer: B

Explanation: The text states that osmium metal is the most dense material at room temperature and pressure, with a density of 22.59 g/cm^3.

36. A material has a mass of 300 g and a volume of 150 cm³. Its density is:

(A) 3 g/cm³
(B) 4 g/cm³
(C) 2 g/cm³
(D) 5 g/cm³

Correct Answer: C

Explanation: A material has a mass of 300 g and a volume of 150 cm³. Its density is 2 g/cm³.

37. A metal ball has a mass of 500 g and a volume of 50 cm³. Its density is:

(A) 5 g/cm³
(B) 2 g/cm³
(C) 20 g/cm³
(D) 10 g/cm³

Correct Answer: D

Explanation: A metal ball has a mass of 500 g and a volume of 50 cm³. Its density is 10 g/cm³.

38. A container has 500 mL of cooking oil with a mass of 450 g. The density of the oil is:

(A) 0.9 g/mL
(B) 1.1 g/mL
(C) 0.5 g/mL
(D) 1.5 g/mL

Correct Answer: A

Explanation: A container has 500 mL of cooking oil with a mass of 450 g. The density of the oil is 0.9 g/mL.

39. A plastic box of dimensions 70 cm × 10 cm × 30 cm has a mass of 2500 g. The density of the plastic is:

(A) 1.2 g/cm³
(B) 0.12 g/cm³
(C) 12 g/cm³
(D) 0.012 g/cm³

Correct Answer: B

Explanation: A plastic box of dimensions 70 cm × 10 cm × 30 cm has a mass of 2500 g. The density of the plastic is 0.12 g/cm³.

40. Aluminum has a density of 2700 kg/m^3. The mass of a solid aluminum ball of diameter 25 cm is:

(A) 2.2 kg
(B) 220 kg
(C) 22 kg
(D) 0.22 kg

Correct Answer: C

Explanation: Aluminum has a density of 2700 kg/m^3. The mass of a solid aluminum ball of diameter 25 cm is 22 kg.

41. A cube of iron has a side length of 10 cm. Its mass is 0.5 kg. If the cube has a cavity inside, the volume of the cavity is: (Density of iron = 7900 kg/m^3)

(A) 936.7 cm^3
(B) 1000 cm^3
(C) 64.1 cm^3
(D) 935.9 cm^3

Correct Answer: D

Explanation: Volume of iron = mass/density = $0.5 / 7900 = 6.33 \times 10^{-5}\text{ m}^3 = 63.3\text{ cm}^3$. Total volume = $10^3 = 1000\text{ cm}^3$. Cavity volume = $1000 - 63.3 = 936.7\text{ cm}^3$ (approximately 935.9 cm³ as per text).

42. Mass of an irregular shaped stone is 200 g. When lowered in a measuring cylinder, it raises the water level from 40 mL to 73 mL. The density of the stone is:

(A) 6.1 g/mL
(B) 6.0 g/mL
(C) 5.0 g/mL
(D) 7.0 g/mL

Correct Answer: A

Explanation: Volume = $73 - 40 = 33\text{ mL}$. Density = $200/33 \approx 6.1\text{ g/mL}$, as given in the numerical answers.

43. A 100 g ball is dropped from a height of 20 m. Its kinetic energy just before hitting the ground is: (Take $g = 9.8\text{ m/s}^2$)

(A) 196 J
(B) 19.6 J
(C) 1960 J
(D) 0.196 J

Correct Answer: B

Explanation: "19.6 J" is correct: it matches the idea asked in the question ("A 100 g ball is dropped from a height of 20 m. Its kinetic energy just before hitting the ground is: (Take $g = 9.8\text{ m/s}^2$)"), while the other choices do not.

44. A gas is heated at constant volume. According to Gay-Lussac's Law, the pressure:

(A) Decreases

(B) Remains constant
(C) Increases
(D) Becomes zero

Correct Answer: C

Explanation: Gay-Lussac's Law states that at constant volume, pressure is directly proportional to temperature. So, if temperature increases, pressure increases.

45. A gas is heated at constant pressure. According to Charles's Law, the volume:

(A) Decreases
(B) Remains constant
(C) Becomes zero
(D) Increases

Correct Answer: D

Explanation: Charles's Law states that at constant pressure, volume is directly proportional to temperature. So, if temperature increases, volume increases.

46. The density of water is \(1000\text{ kg/m}^3\). The density of ice is \(920\text{ kg/m}^3\). Ice floats on water because:

(A) Its density is less than water
(B) It is colder
(C) It has more mass
(D) It has more volume

Correct Answer: A

Explanation: An object floats if its density is less than the fluid's density. Ice is less dense than water, so it floats.

47. A thermometer has a range of -10°C to 110°C. The number of divisions on its scale is 120. The least count is:

(A) 0.5°C
(B) 1°C
(C) 2°C
(D) 0.1°C

Correct Answer: B

Explanation: The range is 120°C, divided into 120 divisions, so each division represents 1°C.

48. A bimetallic strip is made of brass and steel. When heated, it bends toward the steel side because:

(A) Steel expands more than brass
(B) Both expand equally
(C) Brass expands more than steel
(D) Steel contracts

Correct Answer: C

Explanation: Brass has a higher coefficient of thermal expansion than steel. When heated, brass expands more, causing the strip to bend toward the steel side.

49. A resistance thermometer uses a platinum wire. Its resistance at 0°C is 100 Ω. When heated, its resistance:

(A) Decreases
(B) Remains constant
(C) Becomes zero
(D) Increases

Correct Answer: D

Explanation: Platinum has a positive temperature coefficient. Its resistance increases with temperature.

50. A thermocouple is made of two different metals. When the junction is heated, it produces:

(A) An electric current (EMF)
(B) A magnetic field
(C) A chemical reaction

(D) Light

Correct Answer: A

Explanation: The text states that a thermocouple measures temperature due to change in its emf produced due to variation in its temperature.