

**SAMPLE QUESTION PAPER
SOLUTIONS
PHYSICS**

(SCIENCE PAPER 1)

Section A

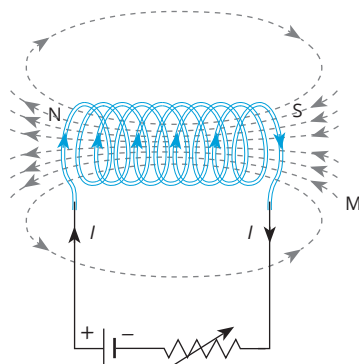
Answer 1

- | | | | | |
|--------|---------|----------|--------|-------|
| i. c. | ii. b. | iii. c. | iv. b. | v. d. |
| vi. c. | vii. b. | viii. a. | ix. a. | x. b. |

Section B

Answer 2

- i. a. $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{20} + \frac{1}{20} = \frac{2}{20} = \frac{1}{10}$
 $R_p = 10 \Omega$
 Equivalent resistance = $10 \Omega + 10 \Omega = 20 \Omega$
- b. Potential difference (V) = 220 V, Resistance (R) = 1100 Ω , Current I = ?
 $V = I \times R$
 $220 = I \times 1100$
 $I = \frac{220}{1100} = 0.2 \text{ A}$
- ii. Specific heat capacity of 'A' 3.8 J/g/K
 Specific heat capacity of 'B' 0.4 J/g/K
- Substance B is a good conductor of heat.
 - Since specific heat capacity is the amount of heat required to raise the temperature of unit mass of a substance through unit degree. So, less heat energy passes through the substance.
 - Substance A which has more specific heat will be preferable for car radiators as it will act as a coolant.
- iii. a. Solenoid. A coil of many circular turns of insulated copper wire wound closely in the shape of a cylindrical tube whose diameter is less in comparison to its length is called a solenoid.
 b. Pattern of magnetic field lines of a solenoid through which a steady current flows.



- c. Magnetic field lines produced inside the solenoid indicate a few things. The pattern of the magnetic field lines of a current carrying solenoid is similar to that of a bar magnet. They originate from north pole and ends at south pole.

Answer 3

- i. a. The outer and inner vessels of a calorimeter are highly polished to prevent the transference of heat energy by radiation.
 b. Metal B with specific heat capacity $380 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$ should be selected to make a calorimeter. By selecting this metal, the heat capacity of the calorimeter will be reduced and the amount of heat energy consumed by it from its contents to acquire their final temperature will also be negligible.
- ii. a. • Due to poor insulation of wires.
 • When the electric gadget is touched with wet hands.
 b. • Use wire of good quality for insulation and check it from time to time.
 • All electrical gadgets must be properly earthed.
- iii. a. Since temperature remains constant during change of phase, the average kinetic energy of the molecules of the substance will not change.
 b. Energy absorbed during the phase change is called latent heat.
 c. Heat lost by 170 g water,

$$H_L = m_c \Delta T = 170 \times 10^{-3} \times 4200 \times (50 - 5) = 32130 \text{ J}$$

$$\text{Heat gain by ice, } H_G = m_i + m_c \Delta T = m \times (336000 + 4200 \times 5) = m \times 357000 \text{ J}$$

$$\therefore \text{Mass of ice} = \frac{32130}{357000} = 0.09 \text{ kg} = 90 \text{ g}$$

Answer 4

- i. a. The first sound heard at 2 seconds comes directly from the observer to the man. Hence, the distance of the observer to the sea shore
 $= v \times t_1$
 $= 2 \text{ s} \times 320 \text{ m/s} = 640 \text{ m}$
- b. The second sound is due to an echo. Distance travelled by the sound is $640 + 2d$, where d is the distance between the observer and the cliff.
 Time taken, $t_2 = 3 \text{ s}$
 $\therefore \text{Speed of sound} = \frac{\text{total distance}}{\text{time}}$
 $320 = 640 + \frac{2d}{3}$
 $960 = 640 + 2d$
 $2d = 320$
 $d = 160 \text{ m}$
- ii. a. The needle will deflect towards the east.
 b. A deflection is produced because a current carrying conductor produces a magnetic field.
 c. In this case when the magnetic needle is kept just above the conductor AB and the key is closed, the needle will deflect towards the west.
- iii. a. Radiation B which is unaffected by the electrostatic field is gamma radiation.
 b. Radiation C is beta radiation and it is nothing but electrons. The mass of electrons is much smaller than alpha particles (radiation A). Hence, beta radiation (radiation C) deflects more.
 c. Radiation A, which is alpha radiation, causes the least biological damage externally.
 d. Beta radiation (radiation C) is used for carbon dating.

Answer 5

- i.
 - a. Electrons are responsible for current in conductors
 - b. Earth wire of a cable in a power circuit should the metal case of a geyser be connected.
 - c. Live wire
- ii.
 - a. Ultrasonic waves
 - b. Ultrasonic waves can penetrate water to long distances because of their very high frequency and very short wavelength, but ordinary sound waves cannot penetrate water to such long distance.
 - c. The ultrasonic waves are not audible to us because they have frequency of more than 20,000 Hz.
- iii.
 - a. Fomentation means heating the swollen parts of body at a moderate temperature of about 50 °C as it brings lot of relief. Due to its high specific heat capacity, water can store large quantities of heat energy for a longer time period in the water bottle.
 - b.
 - i. The radiations from cobalt (${}^{60}_{27}\text{Co}$) is used to treat certain types of cancer by killing the cells in a malignant tumour of a cancer patient.
 - ii. Radioactive iodine is used for the treatment of hyperactive thyroid gland (as the hyperactive thyroid gland absorbs twice as much iodine as the normal one).

Answer 6

- i.
 - a. Mass number of A = 128 + 84 = 212
Nucleus A can be represented as ${}^{212}_{84}\text{A}$
$${}^{212}_{84}\text{A} \xrightarrow{\alpha\text{-decay}} {}^{212-4}_{84-2}\text{B} + {}^4_2\text{He} + Q_\alpha$$
Nucleus B \longrightarrow ${}^{208}_{82}\text{B}$ (Neutrons = 126)
 - b. ${}^{208}_{82}\text{B} \xrightarrow{\beta\text{-decay}} {}^{208}_{83}\text{C} + {}^0_{-1}\text{e} + Q_\beta$ (Neutrons = 125)
 - c. If atom C emits γ radiations, then there is no change in the composition of C.
 - ii.
 - a. Amplitude
 - b. Waveform
 - c. Frequency
 - iii.
 - a. $P = 5.5 \text{ kW} = 5500 \text{ W}$ $V = 220 \text{ V}$
$$I = \frac{P}{V} = \frac{5500}{220} = 25 \text{ A}$$
 - b. $R = \frac{V^2}{P} = \frac{220 \times 220}{5500} = 8.8 \text{ W}$
 - c. $t = 5 \text{ h}$
$$E = \frac{P \times t}{1000} = \frac{5500 \times 5}{1000}$$

$$= 27.5 \text{ kWh}$$
 - d. Cost @ ₹ 3 per unit
Cost = 27.5 × ₹ 3 = ₹ 82.50