

ICSE Board
Class X Physics

Time: 2 hrs

Total Marks: 80

General Instructions:

1. Answers to this paper must be written on the paper provided separately.
 2. You will **not** be allowed to write during the first **15** minutes. This time is to be spent in reading the question paper.
 3. The time given at the head of the paper is the time allotted for writing the answers.
 4. Attempt **all** questions from **Section I** and **any four** questions from **Section II**.
 5. The intended marks of questions or parts of questions are given in brackets [].
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Section 1 (40 Marks)

Attempt all questions from this section.

Question 1

[10]

- (a) State Snell's law of refraction of light.
- (b) The refractive index of glass is 1.5 and that of water is 1.3. If the speed of light in water is $2.25 \times 10^8 \text{ms}^{-1}$, what is the speed of light in glass?
- (c) State the difference between music and noise.
- (d) The coolant in a chemical or nuclear plant (i.e. the liquid used to prevent different parts of a plant from getting too hot) should have high specific heat. Comment.
- (e) The refractive indices of four substances P, Q, R and S are 1.20, 1.36, 1.77 and 1.31, respectively. The speed of light is maximum in which substance?

Question 2

[10]

- (a) Sound waves travel with a speed of about 330 m/s. What is the wavelength of sound whose frequency is 550 Hz?
- (b) If you want to hear a train approaching from far away, why is it more convenient to put your ear to the track?
- (c) How is skating possible on snow?
- (d) Can water be boiled without heating? If yes, explain how it is possible?
- (e) Explain the importance of using in a household electric circuit (1) a fuse and (2) an earthing wire.

Question 3**[10]**

- (a) An object is placed at a distance of 20 cm in front of the convex mirror of radius of curvature of 30 cm. Find the position and nature of the image.
- (b) How many electrons pass through a lamp in 2 minutes if the current is 300 mA? Given charge on electron is $1.6 \times 10^{-19} \text{C}$
- (c) A battery of emf 12 V and internal resistance 5Ω is connected to a resistor. If the current through the circuit is 0.3A, what is the resistance of the resistor? What is the terminal voltage of the battery when the circuit is closed?
- (d) Two resistors, R_1 and R_2 , are first connected in series and then in parallel across the same source.
- In which case is the current through the source greater?
 - In which case is the rate of conversion of electrical energy to heat energy greater?
- (e) Mention two factors on which the emf of a cell depends.

Question 4**[10]**

- (a) Write the conditions necessary for the formation of an echo.
- (b) A body of mass 5 kg initially at rest is subjected to a force of 20 N. What is the kinetic energy acquired by the body at the end of 10 s?
- (c) A bullet of mass 50 g moving with a velocity of 400ms^{-1} strikes a wall and goes out from the other side with a velocity of 100ms^{-1} . Calculate work done in passing through the wall.
- (d) Energy released by the fission of one atom is 200 MeV. Calculate the energy released in kWh when one gram of uranium undergoes fission.
- (e) Calculate the energy equivalent of 1 g of substance.

Section 2 (40 Marks)

Attempt *any four* questions from this section.

Question 5

[10]

- (a) A ray of light passes from air to glass ($\mu=1.5$) at an angle of 30° . Calculate the angle of refraction. What is the speed of light in glass?
- (b) Find the critical angle of light going from paraffin oil to air. Given that the refractive index of paraffin oil with respect to air is 1.44.
- (c) Describe the difference between image formed by a convex lens and a concave lens.

Question 6

[10]

- (a) An electric heater of power 1,000 W raises the temperature of 5 kg of a liquid from 25° to 31° in 2 minutes. Calculate the heat capacity of the liquid and its specific heat.
- (b) Determine the resulting temperature when 150 gram of ice at 0°C is mixed with 300 gram of water at 50°C . Given the latent heat of fusion of ice = 336 J per gram.
- (c)
- In cold countries, juice bottles are placed underwater so as to avoid freezing. Why?
 - Water is used as an effective coolant. Why?

Question 7

[10]

- (a)
- What is an echo? How is an echo formed?
 - The echo of a sound is heard after 5 seconds. If the speed of sound in air is 342 m/s^{-1} , then calculate the distance of the reflecting surface. What is the minimum distance in air required from a sound reflecting surface to hear an echo?
- (b)
- A man standing 825 m away from a cliff fires a gun. After how long will he hear its echo? Speed of sound in air is 330 m/s.
 - State two differences between forced and resonant vibrations.
- (c)
- What is SONAR? Explain its use.
 - A sonar station picks up a return signal after 3 seconds. How far away is the object? (Speed of sound in water = 1440 m/s)

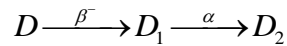
Question 8**[10]**

(a)

- i. Among alpha, beta and gamma radiations, which are affected by a magnetic field?
- ii. Arrange α -rays, β -rays and γ -rays in the ascending order of their penetrating power.

(b)

The radioactive isotope D decays according to the sequence



If the mass number and atomic number of D_2 are 176 and 71, respectively, what are their corresponding values for D?

(c)

- i. State some uses of nuclear fission.
- ii. State two differences between nuclear fission and fusion.

Question 9**[10]**

(a)

- i. A resistor has a resistance of 176 ohm. How many of these resistors should be connected in parallel so that their combination draws a current of 5 amperes from a 220-volt supply line?
- ii. Calculate the power used in a 2-ohm resistor in each of the following circuits:
 - (a) A 6-V battery in series with 1- Ω and 2- Ω resistors
 - (b) A 4-V battery in parallel with 12- Ω and 2- Ω resistors

(b)

- i. An electric kettle rated at 220 V, 2.2 kW works for 3 hours. Find the energy consumed and the current drawn.
- ii. What is the SI unit of
 - (i) Electric Energy
 - (ii) Electric power

(c)

Two conducting wires of the same material, equal length and equal diameter are first connected in series and then in parallel. Compare the equivalent resistance in these two cases.

Question 10

[10]

(a)

- i. State three differences between potential energy and kinetic energy.
- ii. Name five different forms of energy.

(b)

- i. Identify the energy changes in the following:
 - a. Glowing electric bulb
 - b. Microphone
 - c. Photovoltaic cell
 - d. Electric cell
 - ii. A body of mass 2 kg is thrown vertically upwards with an initial velocity of 20 m/s. What will be its potential energy at the end of 2 s?
- (c) A boy weighing 42 kg makes a high jump of 1.5 m
- i. What is his kinetic energy at the highest point?
 - ii. What is his potential energy at the highest point? ($g = 10 \text{ m/s}^2$)