ICSE Board
Class X Physics
Silver Series
Sample Paper - 5

Time: 1½ 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 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 [ ].*

Section I (40 Marks)
Attempt *all* questions from this section

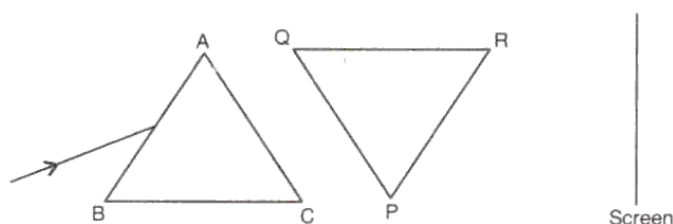**Question 1**   **[10]**

(a) What should be the change in the velocity of a body if its mass becomes four times the original mass and the kinetic energy remains constant?

(b) Suppose your mass is 42 kg. Express your weight in SI units (Take g = 9.8 ms^{-2}).

(c) Write two characteristics of the second class lever.

(d) Why is it preferred that a water pump have a long handle?

(e) Mention any two properties of non-contact forces.

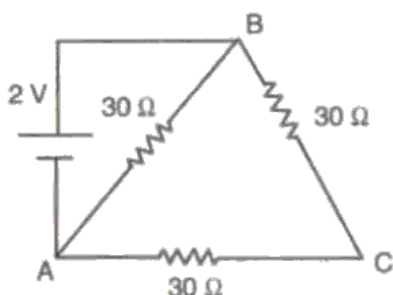**Question 2**   **[10]**

(a) On what factor does the limiting value of contact forces depend? What happens if this limit is exceeded?

(b) Show with the help of a ray diagram how a right angled isosceles prism can be used to invert the rays.

(c) An empty truck and a loaded truck are moving with the same velocity. On applying brakes which truck will stop first and why?

(d) Monochromatic light is refracted from air into a glass of refractive index μ. Find the ratio of the wavelengths of the incident and refractive waves.

(e) Complete the figures shown below with appropriate rays.

Question 3 **[10]**

    (a) Calculate the minimum distance required between the source and the large obstacle for a distinct echo to be heard. Take speed of sound = 340 m/s. Time taken by sound to reach the listener after reflection = 0.1 s.

    (b) In what respect is the roaring of a lion different from the buzzing of a mosquito?

    (c) Why are coins stamped and not cast?

    (d) An iron ball requires 6000 J of heat to raise its temperature by 20°C. Calculate the heat capacity of the iron ball.

    (e) Calculate the current in the circuit shown in the figure below.

Question 4 **[10]**

    (a) What is the function of a split ring in a DC motor?

    (b) Two lamps of power P_1 and P_2 ($P_1 > P_2$) are connected in series. Which one glows brighter and why?

    (c) A transformer is used to step down an AC voltage. What appliance will you use to step down a DC voltage?

    (d) Why are α-particle tracks observed in a cloud chamber found to be much shorter than β-particle tracks in the same chamber, though they emerge from a radioactive sample with almost the same speed?

    (e) When does the nucleus of an atom become radioactive?

Section II (40 Marks)
Attempt *any four* questions from this section

Question 5 **[10]**

(a) A uniform meter rod of weight 50 g f is to be balanced at a 40 cm mark, and a weight of 100 g f is suspended at the 5 cm mark. Where should one suspend a weight of 80 g f to balance the meter rod?

(b) A three-pulley system has an efficiency of 75%. Calculate
   i. MA
   ii. Effort required for lifting a load of 1000 N
   iii. Resistance due to the movable parts and the friction of the pulley system

(c) An elephant (mass = 5 tonne) takes tourists to a hill resort 0.4 km above the ground level. The elephant carries a 2000 kg load of tourists and luggage and takes 60 minutes. Calculate the
   i. Work done by the elephant
   ii. Potential energy gained by the tourists and luggage
   iii. Efficiency of the operation
   iv. Power of the elephant in horsepower

Question 6 **[10]**

(a) A ray of light is incident on the face AB of a rectangular glass slab as shown in the diagram:
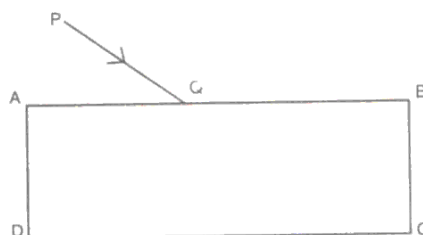
   i. Copy the diagram and draw the path of the ray through the block.
   ii. Write the relation between the refractive index of glass, i and r.
   iii. In the diagram, label the angle of incidence and the angle of refraction.

(b) What is the wavelength of an electromagnetic wave whose frequency is 10^{12} Hz? Name the electromagnetic wave.

(c) The diagram below shows an object 'O' and its image 'I' formed by the lens. In the diagram, draw the lens and the rays to show how the image is formed. Also, mark the focus of the lens and name the lens.
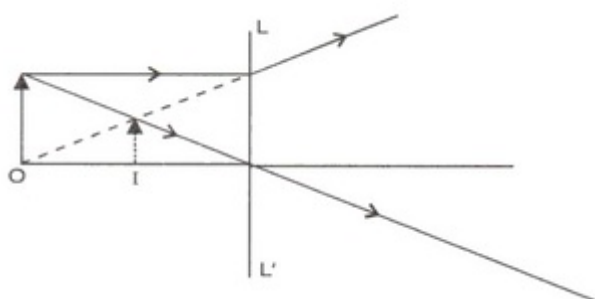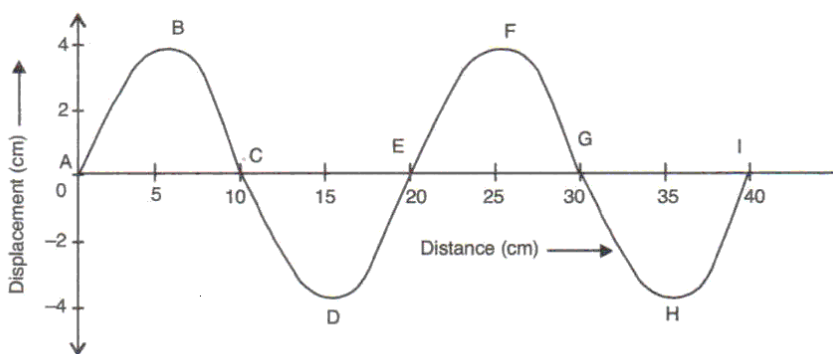
Question 7   **[10]**

(a) Two simple pendulums A and B of different lengths are suspended from the same string as shown in the figure. When A is displaced from its mean position and is let go, it is found that B also starts vibrating.
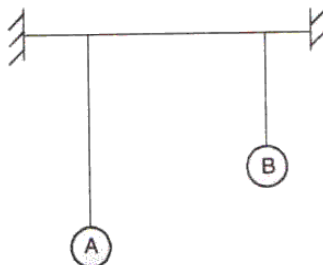
i. Name the phenomenon that is responsible for the vibrations of B.
ii. Does the frequency of the vibration of B depend on its own length or on the frequency of the vibration of A?
iii. What would happen to the amplitude of the vibration of B if its string length was made equal to the string length of A?
iv. Name the phenomenon which occurs when the string length of B is made equal to the string length of A.

(b) The diagram below shows a wave of frequency of 50 Hz. The numbers in the diagram represent the distance in centimetres.

Find: (i) Wavelength (ii) Amplitude (iii) Velocity

(c)

i. On what factors do loudness and pitch of a sound wave depend?
ii. State the relation between velocity, frequency and wavelength of sound waves.

Question 8 [10]

(a) Compare the quantity of heat required to raise the temperature of water by a certain amount, with the heat required to raise the temperature of the same mass of iron by the same amount.

(b) What do you understand by the term specific latent heat of fusion of a substance? Calculate the heat energy required to melt 10 kg of ice at 0°C into water at 0°C.

(c) A copper calorimeter of mass 100 g contains a lump of ice at −4°C. When 520 calories of heat is supplied to the calorimeter and its contents, the temperature is raised from −4°C to −2°C. The addition of another 41540 calories of heat brings the temperature of the calorimeter and its contents to +2°C. Determine the specific heat capacity of copper and ice present in the calorimeter.
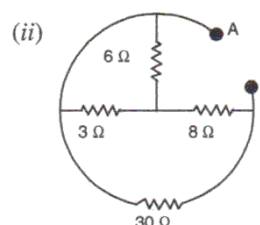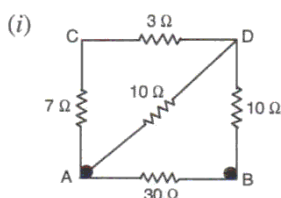
Given: Latent heat of fusion of ice = 80 cal g^{-1}

Specific heat capacity of ice = 0.5 cal g^{-1} C^{-1}

Question 9 [10]

(a) A resistance coil is made by joining two resistors each of 10Ω in parallel. An emf of 1.0 V is applied between the two ends of the coil for 5 minutes. Calculate the heat produced in calories (1 cal = 4.2 J).

(b) Find the effective resistance between point A and point B.

(c)
  i. Why is the armature of an electric bell made of soft iron?
  ii. How can you demagnetise a magnet using an alternating current?

Question 10 [10]

(a) Explain the destructive and constructive use of fission.

(b) Give two differences between isotopes and isobars.

(c) A nucleus of an element X which has the symbol $^{200}_{80}X$ emits an alpha particle and then a β-particle. What would the final nucleus be?