ICSE CLASS 10 EXAMINATION

SAMPLE PAPER 2 · QUESTION PAPER

PHYSICS

(SCIENCE PAPER 1)

Maximum Marks: 80 **Time allowed: Two hours**

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 this Paper is the time allowed for writing the answers.

*4. **Section A** is compulsory. Attempt **any four** questions from **Section B**.*

5. The intended marks for questions or parts of questions are given in brackets [ ].

6. Take $g = 10\ m\ s^{-2}$ and the speed of light in vacuum $c = 3 \times 10^8\ m\ s^{-1}$ wherever required. Figures are for completion and labelling on the answer sheet.

SECTION A (40 Marks)

(Attempt all questions from this Section.)

Question 1

Choose the correct answers to the questions from the given options. *(Do not copy the question, write the correct answers only.)* **[15]**

(i) A ray of light travels from air into glass of refractive index $\sqrt{3}$ with an angle of incidence of 60°. The angle of refraction is:

(a) 30° (b) 45°
(c) 60° (d) 90°

(ii) A body of mass 4 kg is moving with a speed of 3 m s^{-1}. Its kinetic energy is:

(a) 6 J (b) 12 J
(c) 18 J (d) 36 J

(iii) A lever has an effort arm of 60 cm and a load arm of 20 cm. Its mechanical advantage is:

(a) 0.33 (b) 3
(c) 40 (d) 80

(iv) A convex lens has a power of +2.5 D. Its focal length is:

(a) 2.5 cm (b) 25 cm
(c) 40 cm (d) 250 cm

(v) Out of the colours of white light, the one which travels with the greatest speed in glass is:

(a) violet (b) green
(c) red (d) yellow

(vi) The specific latent heat of vaporisation of water is 2260 J g^{-1}. The heat required to change 5 g of water at 100 °C into steam at 100 °C is:

(a) 452 J (b) 2265 J
(c) 11300 J (d) 45200 J

(vii) The loudness of a sound depends mainly on its:

(a) frequency (b) amplitude
(c) waveform (d) speed

(viii) A sound wave of frequency 170 Hz travels in air with a speed of 340 m s^{-1}. Its wavelength is:

(a) 0.5 m (b) 2 m
(c) 20 m (d) 57 800 m

(ix) Assertion (A): In a series circuit the same current flows through every resistor.
Reason (R): In a series circuit the potential difference across every resistor is the same.
(a) (A) is true and (R) is false.
(b) (A) is false and (R) is true.
(c) Both (A) and (R) are true, and (R) is the correct explanation for (A).
(d) Both (A) and (R) are true, but (R) is not the correct explanation for (A).

(x) Two resistors of 6 Ω and 12 Ω are connected in parallel to a 12 V battery, as shown in Fig. 1. The ammeter in the main circuit reads:

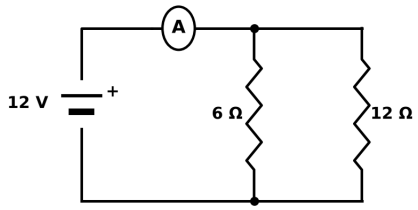


Fig. 1

(a) 1 A (b) 2 A
(c) 3 A (d) 4 A

(xi) A 100 W lamp is used for 5 hours. The electrical energy consumed is:

(a) 0.05 kWh (b) 0.5 kWh
(c) 5 kWh (d) 500 kWh

(xii) The device that converts mechanical energy into electrical energy is a:

(a) motor (b) generator
(c) transformer (d) fuse

(xiii) The domestic a.c. supply has a frequency of 50 Hz. Its time period is:

(a) 0.5 s (b) 0.2 s
(c) 0.02 s (d) 0.002 s

(xiv) When a nucleus emits a β-particle, its atomic number:

(a) decreases by 2 (b) increases by 1
(c) remains the same (d) decreases by 1

(xv) Isotopes of an element have the same number of:

(a) neutrons (b) protons
(c) mass number (d) nucleons

Question 2

(i) Complete the following by choosing the correct answers from the bracket: **[6]**

(a) When the speed of a body is doubled, its kinetic energy becomes _____ times [*2 / 4*].

(b) A concave lens always forms a _____ image of a real object [*virtual / real*].

(c) The speed of sound is the greatest in _____ [*solids / gases*].

(d) The S.I. unit of specific latent heat is _____ [*J kg⁻¹ / J kg⁻¹ K⁻¹*].

(e) The direction of the induced current in a conductor is given by Fleming's _____ hand rule [*right / left*].

(f) In a three-pin plug, the earth pin is connected to the _____ of the appliance [*metal body / heating element*].

(ii) Match the phenomenon in **Column A** with its application in **Column B**. **[2]**

Column A	**Column B**
(a) Multiple reflection of sound	1. Stethoscope
(b) Electromagnetic induction	2. Transformer
	3. Electric motor

(iii) Fig. 2 shows how two forms of mechanical energy, X and Y, of a ball dropped from a height of 10 m vary with its height above the ground. **[2]**

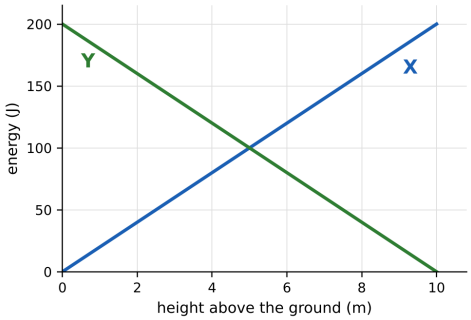


Fig. 2

(a) Identify the energies X and Y.

(b) Using the graph, calculate the mass of the ball.

Question 3

(i) Fig. 3 shows two children sitting on a uniform plank of length 4 m, pivoted at its centre. (a) Calculate the moment of the weight of the 40 kg child about the pivot. (b) Calculate the distance d at which the 30 kg child must sit to balance the plank. **[2]**

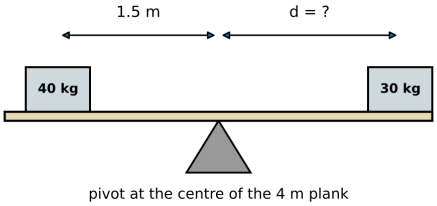


Fig. 3

(ii) A girl of mass 40 kg runs up a flight of 30 steps, each 20 cm high, in 12 s. Calculate (a) the work done against gravity and (b) her power. **[2]**

(iii) Fig. 4 shows a pulley system in which a load of 80 N is raised by an effort of 50 N. Calculate (a) the velocity ratio and (b) the efficiency of the system. **[2]**

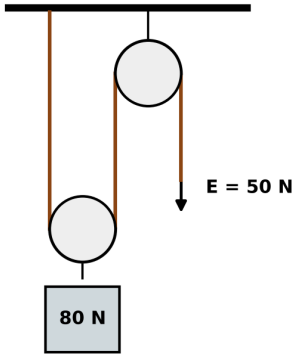


Fig. 4

(iv) An electric geyser is rated 2.2 kW, 220 V. It is used for 2 hours every day. Calculate (a) the current drawn by the geyser and (b) the electrical energy consumed in 30 days, in kWh. **[2]**

(v) (a) Define the specific latent heat of fusion of a substance. (b) Calculate the heat energy released when 20 g of steam at 100 °C condenses to water at 100 °C. [Specific latent heat of vaporisation of steam = 2260 J g^{-1}] **[2]**

(vi) (a) Define the half-life of a radioactive substance. (b) A sample contains 80 g of a radioactive element of half-life 6 hours. Calculate the mass of the element remaining undecayed after 18 hours. **[2]**

(vii) Fig. 5 shows three rays A, B and C of light, from a point source S under water, falling on the water–air surface. Ray B just grazes the surface after refraction. [Refractive index of water = 4/3] (a) Name the phenomenon undergone by ray C. (b) What is the angle of incidence of ray B called? (c) Calculate the value of this angle. **[3]**

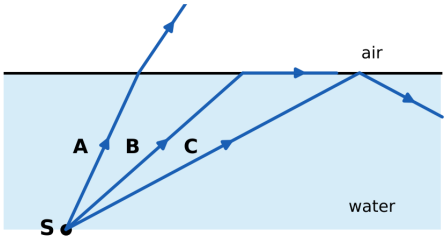


Fig. 5

SECTION B (40 Marks)

(Attempt any four questions from this Section.)

Question 4

(i) A coin lies at the bottom of a tank containing water (refractive index 4/3) to a depth of 18 cm, as shown in Fig. 6. **[3]**

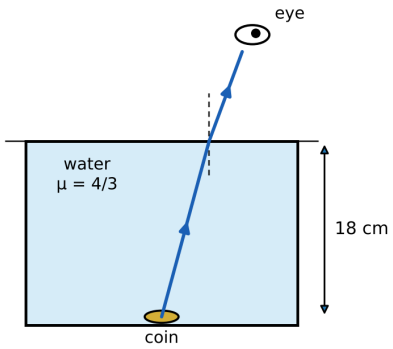


Fig. 6

(a) Calculate the apparent depth of the coin.

(b) By how much does the coin appear to be raised?

(c) Name the phenomenon due to which the coin appears raised.

(ii) Fig. 7 shows the variation of the angle of deviation (δ) with the angle of incidence (i) for a glass prism. The minimum deviation is 40° and it occurs when the angle of incidence is 50°. [sin 50° = 0.766; sin 30° = 0.5] **[3]**

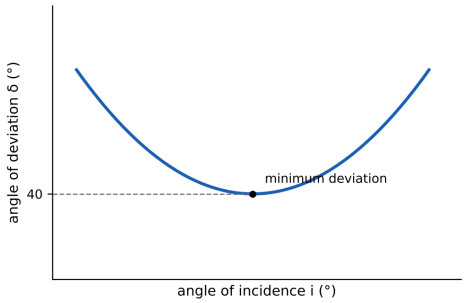


Fig. 7

(a) State the angle of emergence at the minimum deviation.

(b) Calculate the angle of the prism.

(c) Calculate the refractive index of the glass.

(iii) An object 5 cm high is placed 15 cm from a concave lens of focal length 10 cm. Using the lens formula and the Cartesian sign convention, calculate (a) the image distance, (b) the magnification, (c) the height of the image, and (d) state the nature of the image. **[4]**

Question 5

(i) Draw a ray diagram to show the formation of the image of an object placed in front of a concave lens, between infinity and the optical centre. Mark the principal focus and state the nature of the image. **[3]**

(ii) 200 g of a liquid loses heat at a constant rate of 50 J s^{-1} and cools and then solidifies. Fig. 8 shows its cooling curve. **[3]**

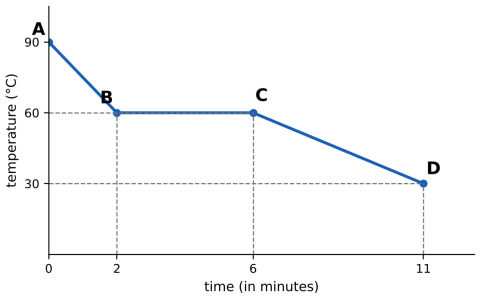


Fig. 8

(a) State the freezing point of the substance.

(b) Calculate the specific heat capacity of the substance in the liquid state, in J g^{-1} $°C^{-1}$.

(c) Calculate the specific latent heat of fusion of the substance, in J g^{-1}.

(iii) 100 g of a metal at 100 °C is quickly dropped into 150 g of water at 20 °C kept in a calorimeter of negligible heat capacity. The final temperature of the mixture is 25 °C. [Specific heat capacity of water = 4.2 J g^{-1} $°C^{-1}$] (a) Calculate the heat gained by the water. (b) State the principle of calorimetry used. (c) Calculate the specific heat capacity of the metal. (d) Give one reason why the calorimeter is placed in a wooden box packed with cotton. **[4]**

Question 6

(i) Fig. 9 shows a crowbar used to lift a load of 500 N. The load is at a distance of 0.2 m, and the effort E at a distance of 1.0 m, from the fulcrum. **[3]**

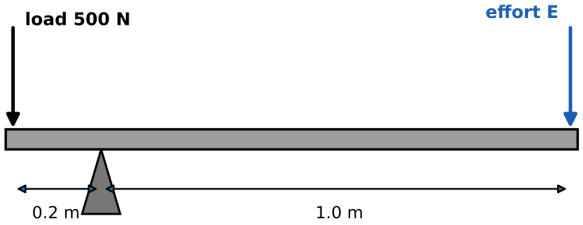


Fig. 9

(a) State the class of the lever.

(b) Calculate the effort E needed to just lift the load.

(c) Calculate the mechanical advantage and the velocity ratio of the crowbar.

(ii) Fig. 10 shows the variation of the force F acting on a body with the displacement s of the body along the direction of the force. **[3]**

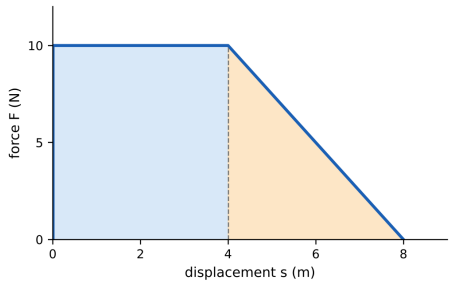


Fig. 10

(a) Calculate the work done in the first 4 m.

(b) Calculate the work done between s = 4 m and s = 8 m.

(c) Calculate the total work done and the average power if the whole displacement takes 12 s.

(iii) A pendulum bob of mass 200 g is released from rest at a point A, which is 0.45 m above its lowest point B. Ignore air resistance. Calculate (a) the potential energy of the bob at A, (b) its kinetic energy at B, and (c) its speed at B. (d) State the energy conversion from A to B. **[4]**

Question 7

(i) In Fig. 11, five light pendulums A, B, C, D and E are hung from a stretched string. The pendulum A is set into oscillation. **[3]**

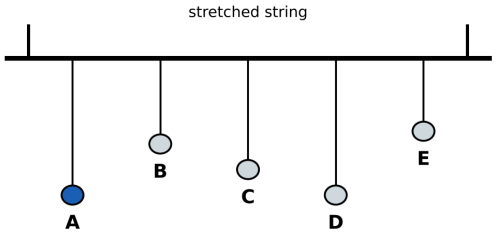


Fig. 11

(a) Which pendulum will oscillate with the maximum amplitude?

(b) Name the phenomenon responsible.

(c) Name the type of vibrations performed by B, C and E.

(ii) Fig. 12 shows the displacement–distance graph of a wave travelling with a speed of 340 m s^{-1}. **[3]**

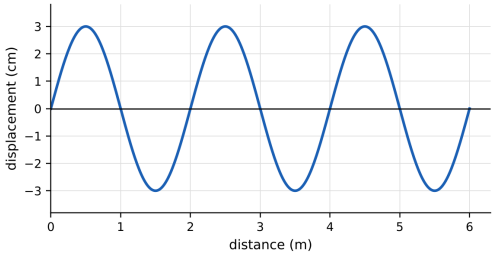


Fig. 12

(a) Find the amplitude of the wave.

(b) Find the wavelength of the wave.

(c) Calculate the frequency of the wave.

(iii) A bat sends out an ultrasonic pulse of frequency 40 kHz towards a wall and hears the echo 0.06 s later, as shown in Fig. 13. [Speed of sound in air = 340 m s^{-1}] (a) Calculate the distance d of the wall from the bat. (b) Calculate the wavelength of the ultrasonic wave. (c) Why can a human not hear this pulse? (d) Name one device used by man which works on the same principle as the bat. **[4]**

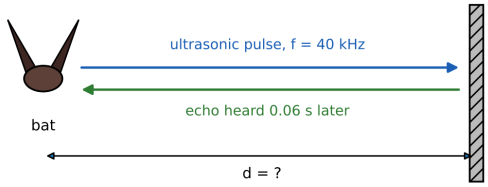


Fig. 13

Question 8

(i) In the circuit of Fig. 14 the battery has negligible internal resistance. **[3]**

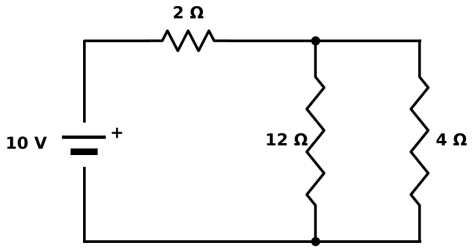


Fig. 14

(a) Calculate the equivalent resistance of the 12 Ω and 4 Ω resistors.

(b) Calculate the total current drawn from the battery.

(c) Calculate the current through the 12 Ω resistor.

(ii) Fig. 15 shows the three wires of a mains cable connected to a three-pin plug. (a) Name the pin A and the wire connected to it. (b) Which wire is the live wire? Where should the fuse be placed? (c) Why is the pin A made longer and thicker than pins B and C? **[3]**

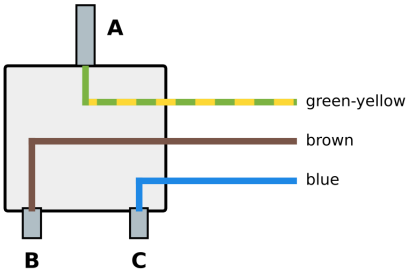


Fig. 15

(iii) An electric toaster of resistance 55 Ω is connected to a 220 V supply for 6 minutes. Calculate (a) the current drawn, (b) the power of the toaster, (c) the heat produced in joule, and (d) the electrical energy consumed in kWh. **[4]**

Question 9

(i) A bar magnet is moved away from a coil connected to a galvanometer G, with its N-pole facing the coil, as shown in Fig. 16. **[3]**

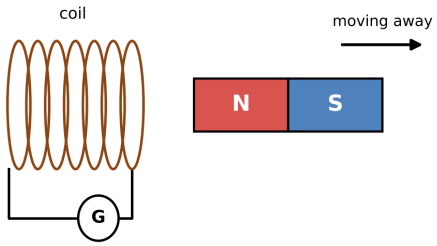


Fig. 16

(a) Name the phenomenon due to which the galvanometer shows a deflection.

(b) State the polarity of the end of the coil which faces the magnet. Name the law you used.

(c) State two ways of increasing the e.m.f. induced in the coil.

(ii) Fig. 17 shows the e.m.f. generated by an a.c. generator plotted against time. **[3]**

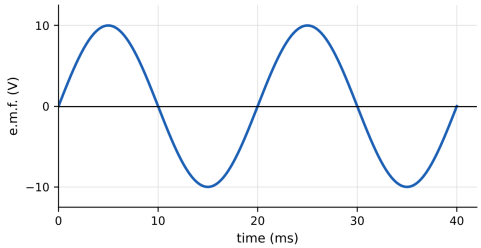


Fig. 17

(a) State the peak value of the e.m.f.

(b) Calculate the frequency of the a.c.

(c) How many times does the e.m.f. reverse its direction in one second?

(iii) Fig. 18 shows three radiations P, Q and R, emitted by a radioactive source kept in a lead box, passing through an electric field between two charged plates. **[4]**

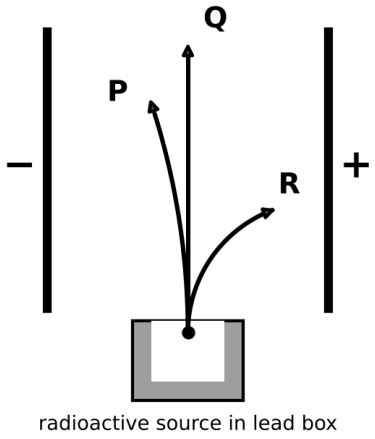


Fig. 18

(a) Name the radiation P. Give a reason for your answer.

(b) Name the radiation Q. Give a reason for your answer.

(c) Name the radiation R and the particle that constitutes it.

(d) Which of the three radiations has the highest ionising power?

— End of Question Paper —