

**Sample Paper 3**  
**ICSE Class X 2023-24**  
**Physics**  
**Science Paper - 1**

**Time: 2 Hours**

**Max. Marks: 80**

**General Instructions:**

1. Answer to this Paper must be written on the paper provided separately.
  2. You will not be allowed to write during first 15 minutes.
  3. This time is to be spent in reading the question paper.
  4. The time given at the head of this Paper is the time allowed for writing the answers.
  5. Section A is compulsory. Attempt any four questions from Section B.
  6. The intended marks for questions or parts of questions are given in brackets [ ].
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**SECTION - A**

(Attempt all questions from this Section.)

**QUESTION 1.**

Choose the correct answers to the questions from the given options.

[15]

(Do not copy the questions, write the correct answer only.)

- (i) Moment of force is given by
- (a) force  $\times$  parallel distance between axis of rotation
  - (b) force  $\times$  perpendicular distance
  - (c) Torque  $\times$  perpendicular distance
  - (d) None of these
- (ii) Power rating of a pump =
- (a) power output / power input
  - (b) power output  $\times$  power input
  - (c) power input / power out put
  - (d) power output / time
- (iii) An electric pump is 60% efficient and is rated 2 HP. Calculate the maximum amount of water it can lift through a height of 5 m in 40 s.  
[Take  $g = 10 \text{ ms}^{-2}$  and 1 HP = 750 W]
- (a) 25 kg
  - (b) 38 kg
  - (c) 720 kg
  - (d) 280 kg

- (iv) In fission of one uranium-235 nucleus, the loss in mass is 0.2 amu. Calculate the energy released.
- (a) 156.4 MeV (b) 182.6 MeV  
(c) 186.2 MeV (d) 189.1 MeV
- (v) **Assertion :** The 200 W bulbs glow with more brightness than 100 W bulbs.  
**Reason :** A 100 W bulb has more resistance than 200 W bulb.
- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).  
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).  
(c) Assertion (A) is true but reason (R) is false.  
(d) Assertion (A) is false but reason (R) is true.
- (vi) If two convex lenses are in contact with each other,
- (a) the diverging power increases (b) the converging power decreases  
(c) the converging power increases (d) the diverging power decreases
- (vii) Sound waves are waves that are produced due to .....
- (a) vibrations of particles (b) disturbance of particles  
(c) turbulence of particles (d) all of the above
- (viii) The pressure amplitude in sound wave from a radio receiver is  $2.0 \times 10^{-2} \text{ N/m}^2$  and the intensity at a point is  $5.0 \times 10^{-7} \text{ W/m}^2$ . If by turning the volume knob, then the pressure amplitude increased to  $2.5 \times 10^{-2} \text{ N/m}^2$ . Evaluate the intensity
- (a)  $7.8 \times \text{W/m}^2$  (b)  $7.8 \times 10^{-6} \text{ W/m}^2$   
(c)  $7.8 \times 10^{-8} \text{ W/m}^2$  (d)  $7.8 \text{ W/m}^2$
- (ix) On reversing the direction of current in a wire the magnetic field produced by it
- (a) get reversed in direction  
(b) remains unchanged in strength and direction  
(c) increases in strength  
(d) decreases in strength
- (x) An immersion heating rod is rated 220 V and can bring certain amount of water to its boiling point in 15 min. When this immersion rod is actually connected to an electric circuit, it brings the water to boil in 18.15 min. Calculate the line voltage.
- (a) 805 V (b) 300 V  
(c) 560 V (d) 200 V
- (xi) In an electric motor :
- (a) electric energy changes to mechanical energy.  
(b) mechanical energy changes to heat energy.  
(c) mechanical energy changes to electric energy.  
(d) electric energy changes to magnetic energy

- (xii) A solid of mass 80 g and at  $80^{\circ}\text{C}$  melts completely to form liquid at  $80^{\circ}\text{C}$  by absorbing 640 J of heat energy. What is the specific latent heat of fusion of solid ?
- (a)  $8 \text{ Jg}^{-1}$  (b)  $4 \text{ Jg}^{-1}$   
(c)  $2 \text{ Jg}^{-1}$  (d)  $10 \text{ Jg}^{-1}$
- (xiii) The base of cooking pans is made thicker and heavy because
- (a) it increases the heat capacity of pan.  
(b) the food does not get charred and keeps hot for long time  
(c) it lowers the heat capacity of pan.  
(d) both (a) and (c)
- (xiv) If the rays from a point object after refraction through the lens do not actually meet at a point, but they appear to diverge from a point the image is .....
- (a) imaginary (b) beautiful  
(c) virtual (d) real
- (xv) A coin is placed at a depth of 15 cm in a beaker containing water. The refractive index of water is  $\frac{4}{3}$ , calculate height through which the image of the coin is raised.
- (a) 3.75 cm (b) 1.75 cm  
(c) 2.75 cm (d) 0.75 cm

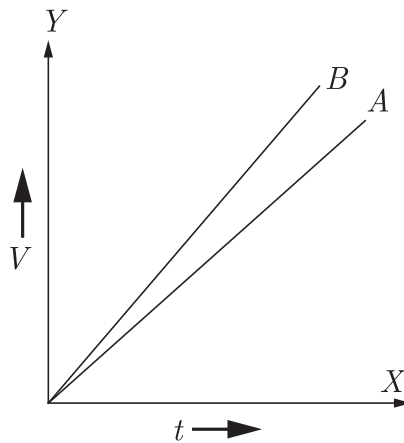
## QUESTION 2.

- (i) (a) Name the two simple types of machines. [3]  
(b) A radioactive substance is oxidized. Will there be any change in the nature of its radioactivity ? Give a reason for your answer.  
(c) Name two important discoveries led by 'nuclear reactions'.
- (ii) A boy weighs 360 N on the earth. [2]  
(a) What would be his approximate weight on the moon?  
(b) What is the reason for your answer?
- (iii) (a) What is meant by an ideal machine? [2]  
(b) Write a relationship between the mechanical advantage (M.A.) and velocity ratio (V.R.) of an ideal machine.
- (iv) A body is thrown vertically upwards. Its velocity keeps on decreasing. What happens to its kinetic energy as its velocity becomes zero ? [2]
- (v) (a) An electric bulb is marked 100 W, 250 V. What information does this convey ? [2]  
(b) How much current will the bulb draw if connected to a 250 V supply ?
- (vi) Give an example in which force does no work on the body. [2]

- (vii) Two waves of the same pitch have amplitudes in the ratio 1: 3. [2]  
What will be the ratio of their:  
(a) intensities and  
(b) frequencies?

**QUESTION 3.**

- (i) (a) Define critical angle. [2]  
(b) State one important factor which affects the critical angle of a given medium.
- (ii) The  $V-I$  graph for a series combination and for a parallel combination of two resistors is shown in the figure below. Which of the two  $A$  or  $B$ , represents the parallel combination? Give a reason for your answer. [2]



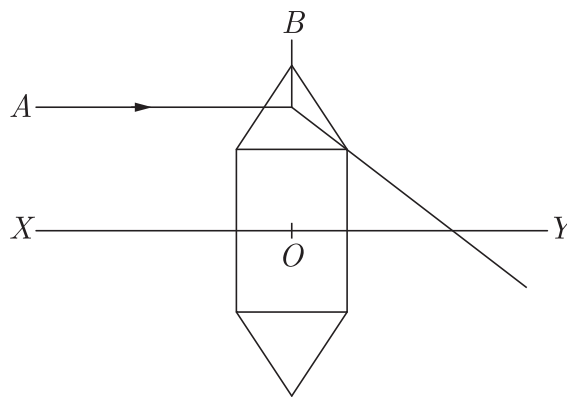
- (iii) What is the commercial unit of electrical energy? Convert it into joule. What is the other name of the commercial unit? [2]
- (iv) Heat energy is supplied at a constant rate to 100 g of ice at  $0^{\circ}\text{C}$ . The ice is converted into water at  $0^{\circ}\text{C}$  in 2 minutes. How much time will be required to raise the temperature of water from  $0^{\circ}\text{C}$  to  $20^{\circ}\text{C}$ ? [2]  
[Given: specific heat capacity of water =  $4.2 \text{ J g}^{-1} ^{\circ}\text{C}^{-1}$ , specific latent heat of ice =  $336 \text{ J g}^{-1}$ ]
- (v) What will an alpha particle change into when it absorbs : (a) one electron and (b) two electrons? [2]

## SECTION - B

(Attempt any four questions.)

### QUESTION 4.

- (i) (a) Where should an object be placed in front of a convex lens in order to get (i) an enlarged real image (ii) enlarged virtual image ? [3]  
(b) A pond appears to be  $2.7\text{ m}$  deep. If the refractive index of water is  $4/3$ , find the actual depth of the pond.
- (ii) What do you mean by dispersion of light? Explain its cause. [3]
- (iii) The diagram below shows a lens as a combination of a glass block and two prisms. Copy the diagram and answer the following questions : [4]

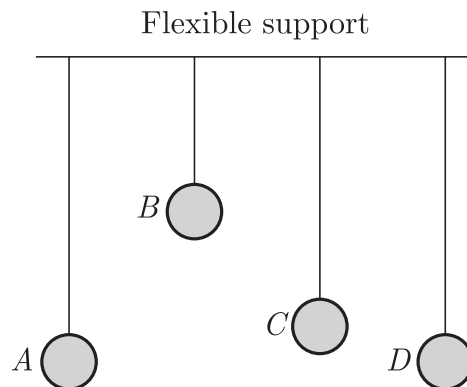


- (a) Name the lens formed by the combination.  
(b) What is the line  $XY$  called ?  
(c) Complete the ray diagram and show the path of the incident ray  $AB$  after passing through the lens.  
(d) The final emergent ray will either meet  $XY$  at a point or appear to come from a point on  $XY$ . What is the point called ?

### QUESTION 5.

- (i) A point object is placed at a distance of  $12\text{ cm}$  from a convex lens on its principal axis. Its image is formed on the other side of the lens at a distance of  $18\text{ cm}$  from the lens. Find the focal length of the lens. Is the image magnified ? Justify your answer. [3]
- (ii) A glass slab is placed over a piece of paper on which VIBGYOR is printed with each letter into its corresponding colours. [3]  
(a) Will the image of all the letters be in the same place ?  
(b) The letter of which colour appears to be raised maximum and of which colour minimum? Explain your answer.

- (iii) In the given figure pendulum (A) is set into vibrations, which of the other three will vibrate with maximum amplitude and why? [4]



### QUESTION 6.

- (i) [3]



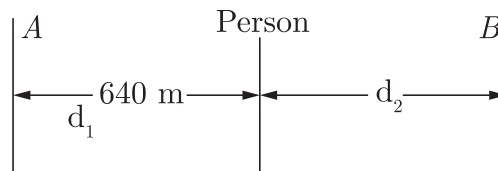
Sumit and Sachin went for a trek and during the journey they visited a cottage. They suspended their bags to the two ropes hangill, from  $P$  and  $Q$  on a wheel capable of rotating around  $Q$ . Sumit suspended his bag to the rope  $Q$  and Sachin suspended his bag from the rope  $P$ . The wheel remained in equilibrium.

- State with a reason who is carrying a heavier bag.
  - Based on the principle of moments, write a mathematical relation that can be used to determine the weight ( $w$ ) of Sachin's bag, given that the weight of Sumit's bag is 18 kgf.
- (ii) A pulley system with V.R. = 4 is used to lift a load of 175 kgf through a vertical height of 15 m. The effort required is 50 kgf in the downward direction, ( $g = 10 \text{ N kg}^{-1}$ ). [3]
- Calculate :
- Distance moved by the effort.
  - Work done by the effort.
  - M.A. of the pulley system.
  - Efficiency of the pulley system.

- (iii) (a) A stone of mass 64.0 g is thrown vertically upward from the ground with an initial speed of 20.0 m/s. The gravitational potential energy at the ground level is considered to be zero. Apply the principle of conservation of energy and calculate the potential energy at the maximum height attained by the stone. (Take  $g = 10 \text{ ms}^{-2}$ ) [4]
- (b) Using the same principle, state what will be the total energy of the body at its half-way point?

### QUESTION 7.

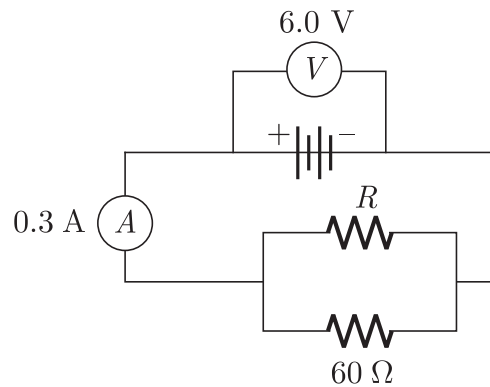
- (i) A person standing between two vertical cliffs and 640 m away from the nearest cliff shouted. He heard the first echo after 4 seconds and the second echo 3 seconds later. Calculate [3]
- (a) the velocity of sound in air and
- (b) the distance between the cliffs.



- (ii) (a) What are free electrons ? [3]
- (b) Why do they not leave the metal surface on their own ?
- (c) How can they be made to leave the metal surface? (State any two ways)
- (iii) Draw a diagram to show how a single pulley can be used so as to have its ideal M.A. = 2. Derive a relationship between mechanical advantage, velocity ratio and efficiency of a machine. [4]

### QUESTION 8.

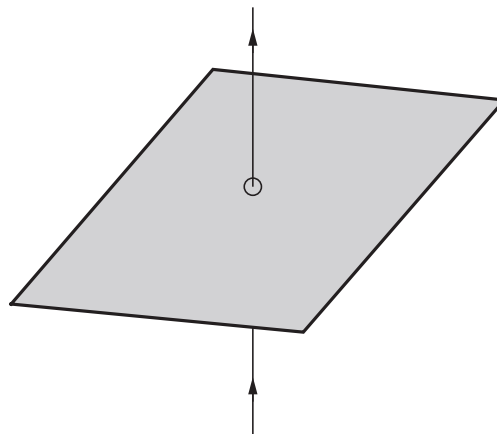
- (i) (a) Name the colour code of the wire which is connected to the metallic body of an appliance. [3]
- (b) (i) Explain the meaning of the statement 'current rating of a fuse is 5 A.' [3]
- (ii) In the transmission of power the voltage of power generated at the generating stations is stepped up from 11 kV to 132 kV before it is transmitted. Why ?
- (ii) In the reaction  ${}_{12}^{27}\text{Mg} \xrightarrow{\beta} \text{Al} \xrightarrow{\gamma} \text{---}$  [3]
- (a)  ${}_{12}^{27}\text{Mg}$  emits a beta particle and is transformed into aluminium. Write the mass number and the atomic number of Aluminium.
- (b) Aluminium emits a gamma ray. What is the resulting nucleus ?
- (iii) In given the figure below, the ammeter A reads 0.3 A. [4]



Calculate: (a) the total resistance of the circuit. (b) the value of  $R$ .  
(c) the current flowing through  $R$ .

### QUESTION 9.

- (i) The amount of heat required to convert 1 kg of ice at  $-10^{\circ}\text{C}$  to steam at  $100^{\circ}\text{C}$  is 30,37,000 J. Calculate the specific latent heat of vaporisation of steam. [3]  
Given : (Sp. heat capacity of ice =  $2,100 \text{ J/kg K}$ ; Sp. heat capacity of water =  $4,200 \text{ J/kg K}$ ; Specific latent heat capacity of ice =  $3,36,000 \text{ J/kg}$ ).
- (ii) State in brief, the meaning of each of the following: [3]  
(a) The heat capacity of a body is  $50 \text{ J}^{\circ}\text{C}^{-1}$ .  
(b) The specific latent heat of fusion of ice is  $336000 \text{ J kg}^{-1}$ .  
(c) The specific heat capacity of copper is  $0.4 \text{ J g}^{-1}^{\circ}\text{C}^{-1}$
- (iii) (a) (i) A straight wire conductor passes vertically through a piece of cardboard sprinkled with iron filings. Copy the diagram and show the setting of iron filings when a current is passed through the wire in the upward direction and the cardboard is tapped gently. Draw arrows to represent the direction of the magnetic field lines. [4]



- (ii) Name the law which helped you to find the direction of the magnetic field lines.
- (b) (i) State two ways by which the magnetic field of a solenoid can be made stronger.
- (ii) What material is used for making the armature of an electric bell ? Give a reason for using this material.



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