

**Sample Paper 20**  
**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 [ ].
- 

**SECTION - A**

(Attempt all questions from this Section.)

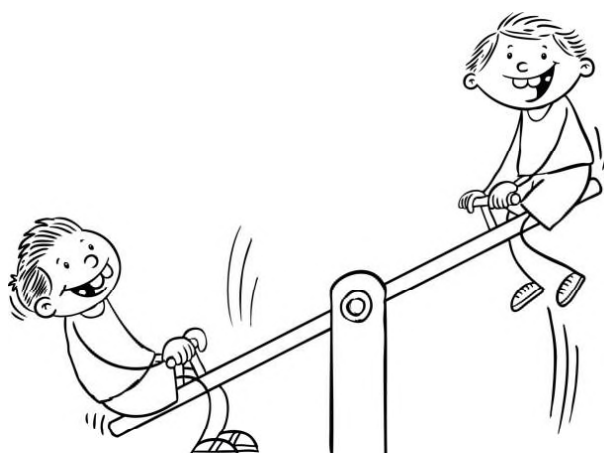
**QUESTION 1.**

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

[15]

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

- (i) Manoj of mass 55 kg and Ashok of mass 40 kg are sitting on a see saw at a distance of 2 m and 1.5 m respectively from the centre of the see saw in an amusement park as shown in the figure. Is the see saw in rotational equilibrium ?



- |                     |                       |
|---------------------|-----------------------|
| (a) data incomplete | (b) Yes               |
| (c) No              | (d) None of the above |

- (ii) When camphor sublimates .....
- (a) it simply converts into gaseous state without attaining the liquid state
  - (b) entire energy is lost to the surroundings
  - (c) chemical energy changes into heat energy
  - (d) Potential energy gets converted into kinetic energy.
- (iii) In a hydroelectric power station, 1000 kg of water is allowed to drop a height of 100 m in 1 s. If the conversion of potential energy to electric energy is 60%, calculate the output power. [Take  $g = 10 \text{ ms}^{-2}$ ]
- (a)  $4 \times 10^5 \text{ W}$
  - (b)  $1.5 \times 10^5 \text{ W}$
  - (c)  $8 \times 10^5 \text{ W}$
  - (d)  $6 \times 10^5 \text{ W}$
- (iv) During  $\beta$ -emission :
- (a) the mass number remains unchanged, but atomic number decreases by 1 amu.
  - (b) the mass number increases by 1 amu, but atomic number remains same
  - (c) the mass number remains unchanged, but atomic number increases by 1 amu.
  - (d) the mass number and atomic number decrease by 1 amu.
- (v) **Assertion :** A small source of light casts a sharp shadow of an opaque object.  
**Reason :** Light travels in straight lines.
- (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
  - (b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
  - (c) Assertion is true but Reason is false.
  - (d) Both Assertion and Reason are false.
- (vi) A stone placed at the bottom of a water tank appears raised by 80 cm. If the refractive index of water is  $4/3$ , find the actual depth of water in the tank ?
- (a) 320 cm
  - (b) 150 cm
  - (c) 250 cm
  - (d) 50 cm
- (vii) Name the machine seen in the figure using the principle of echo.



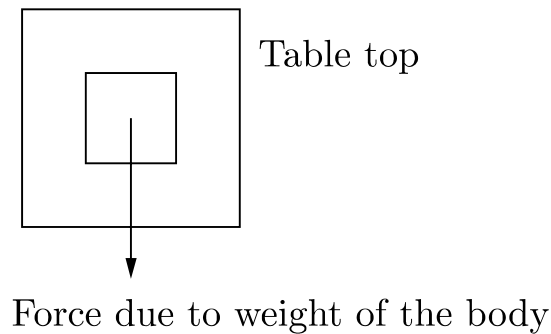
- (a) sonography
- (b) echo cardiogram
- (c) intra venous machine
- (d) electro cardiogram

- (viii) When a car of mass  $M$  passes through a convex bridge of radius  $r$  with velocity  $v$ , then it exerts a force on it. What is the magnitude of the force ?
- (a)  $\frac{Mv^2}{r}$  (b)  $Mg - \frac{Mv^2}{r}$   
(c)  $Mg + \frac{Mv^2}{r}$  (d)  $Mg$
- (ix) A potentiometer is connected to a cell through switch in series. To one end of the potentiometer is attached a voltmeter with the help of connecting wire and a jockey. When the jockey is moved over the potentiometer wire from zero end to 100 cm the reading shown by voltmeter is likely to :
- (a) increase (b) decrease  
(c) does not change (d) none of these
- (x) A conductor has a resistivity of  $2.63 \times 10^{-8} \Omega \text{ m}$  at  $20^\circ \text{C}$ . If the temperature of conductor is raised to  $200^\circ \text{C}$ , its resistivity will :
- (a) decrease (b) increase  
(c) remain unaffected (d) none of these
- (xi) A conductor at 4.2 K is found to offer no resistance. Such a conductor is called
- (a) zero conductor (b) absolute conductor  
(c) superconductor (d) none of these
- (xii) A liquid  $x$  of specific heat capacity  $1050 \text{ J kg}^{-1} \text{K}^{-1}$  and at  $90^\circ \text{C}$  is mixed with a liquid  $y$  of specific heat capacity  $2362.5 \text{ J kg}^{-1} \text{K}^{-1}$  and  $20^\circ \text{C}$ , when the final temperature recorded is  $50^\circ \text{C}$ . Find in what proportion the weights of the liquids are mixed.
- (a) 16 : 27 (b) 37 : 16  
(c) 27 : 16 (d) 47 : 16
- (xiii) A single fixed pulley is used because
- (a) it changes the direction of applied effort conveniently  
(b) it multiplies speed  
(c) it multiplies effort  
(d) its efficiency is 100%
- (xiv) A coconut tree appears to be ..... when viewed by a sea diver from below the water surface.
- (a) same size (b) distorted  
(c) taller (d) shorter
- (xv) If a part of the lens is covered, its focal length .....
- (a) decreases (b) remains unchanged  
(c) increases (d) none of the above

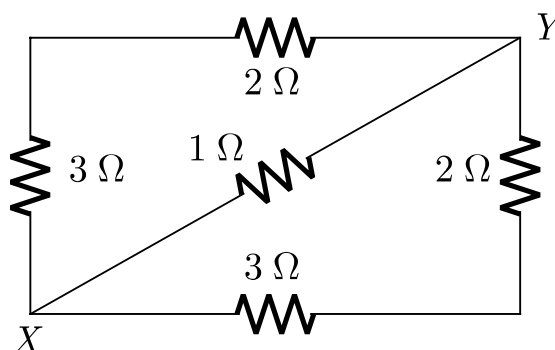
Continue on Next Page...

**QUESTION 2.**

- (i) Why do we use a long handle with a screw jack ? [3]
- (ii) When a body is placed on a table top, it exerts a force equal to its weight downwards on the table top but does not move or fall. [2]



- (a) Name the force exerted by the table top.  
(b) What is the direction of the force ?
- (iii) A simple machine enables us to lift a load of 10000 N by the application of an effort of 500 N. However, when the point of application of the effort moves through 2.5 m, the load gets raised through 10 cm only. What are the values of the (a) M.A. (b) V.R. and? [2]
- (iv) Does a coolie carrying load on his head do any work while standing or while moving? If not, why? [2]
- (v) The work done by a fielder when he takes a catch in a cricket match is negative. Explain. [2]
- (vi) Calculate the resistance between the points  $X$  and  $Y$  in the network shown below : [2]



- (vii) (a) Draw a graph between displacement and the time for a body executing free vibrations.  
(b) Where can a body execute free vibrations ? [2]

**QUESTION 3.**

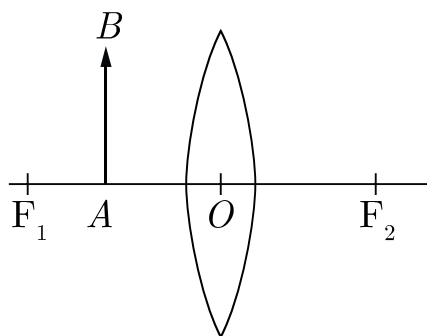
- (i) (a) Define the power of a lens. [2]  
(b) The lens mentioned in 16 above is of focal length 25 cm. Calculate the power of the lens
- (ii) Of the three connecting wires in a household circuit. [2]  
(a) Which two wires are at the same potential ?  
(b) In which of the three wires should the switch be connected ?
- (iii) How does earthing prevent electrical shock ? [2]
- (iv) Water falls from a height of 50 m. Calculate the rise in the temperature of water when it strikes the bottom. (Take  $g = 10 \text{ m s}^{-2}$ ; specific heat capacity of water =  $4200 \text{ J/kg}^\circ\text{C}$ ). [2]
- (v) A radioactive substance emits either an alpha or a beta particle only. Then why is radioactive radiations divided into three parts by applying electric or magnetic fields ? [2]

**SECTION - B**

(Attempt any four questions.)

**QUESTION 4.**

- (i) (a) State the laws of refraction of light. [3]  
(b) Write a relation between the angle of incidence ( $i$ ), angle of emergence ( $e$ ), angle of prism ( $A$ ) and angle of deviation ( $\delta$ ) for a ray of light passing through an equilateral prism.
- (ii) Figure below shows an object  $AB$  placed on the principal axis of a convex lens placed in air.  $F_1$  and  $F_2$  are the two foci of the lens. Copy the diagram : [3]  
(a) Draw a ray of light starting from  $B$  and passing through  $O$ . Show the same ray after refraction by the lens.  
(b) Draw another ray from  $B$  which passes through  $F_2$  after refraction by the lens.  
(c) Locate the final image formed.  
(d) Is the image real or inverted ?

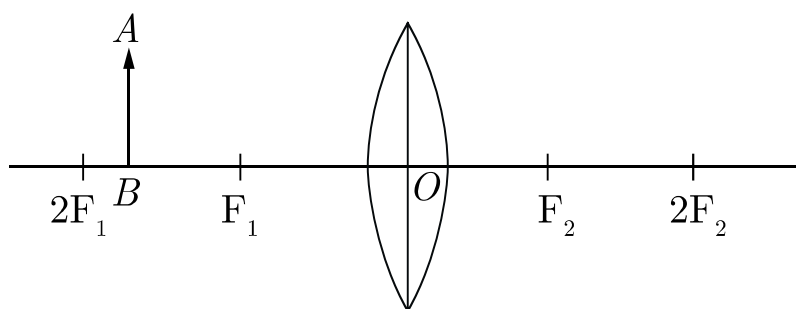


(iii) (a) Name the radiations :

[4]

1. that are used for photography at night.
2. used for detection of fracture in bones.
3. whose wavelength range is from  $100 \text{ \AA}$  to  $4000 \text{ \AA}$  (or  $10 \text{ nm}$  to  $400 \text{ nm}$ ).

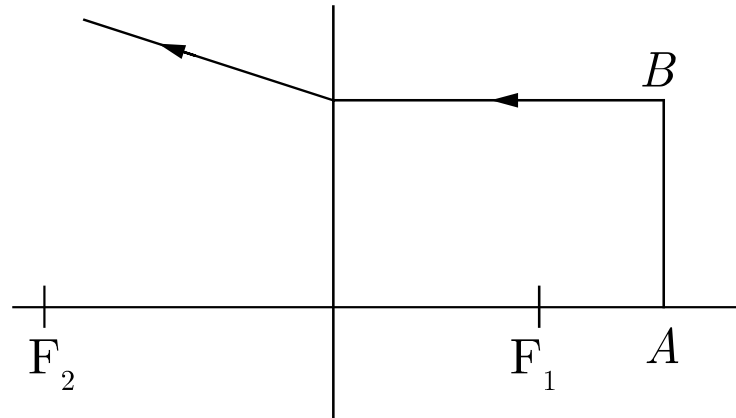
(b) An object  $AB$  is placed between  $2F_1$  and  $F_1$  on the principal axis of a convex lens as shown in the diagram:



Copy the diagram and using three rays starting from point  $A$ , obtain the image of the object formed by the lens.

### QUESTION 5.

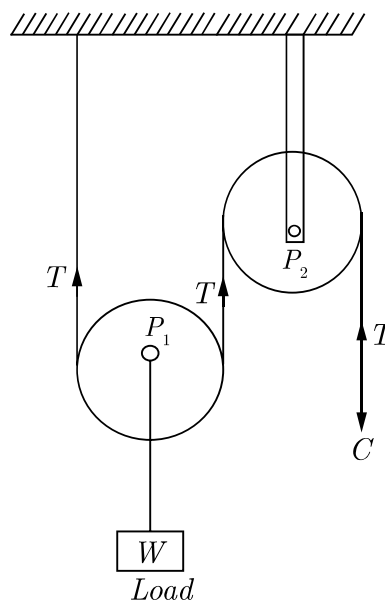
- (i) In a meter rod half of it is made of copper and rest half of steel. Weights of copper and steel are  $9 \text{ N}$  and  $8 \text{ N}$  respectively. Is the center of gravity of the rod at its geometric center? If not, where is it ? [3]
- (ii) (a) Show through a properly labelled diagram that the apparent depth of water in its real depth. How is the refractive index of water related to real and apparent depth of the object in the water ? [3]
- (b) Copy the figure and complete it to show the formation of the image of the object  $AB$ . Name the lens used in the figure.



- (iii) (a) Mention one practical use of echoes. [4]  
 (b) Write the factors on which the frequency of a stretched string depends.

### QUESTION 6.

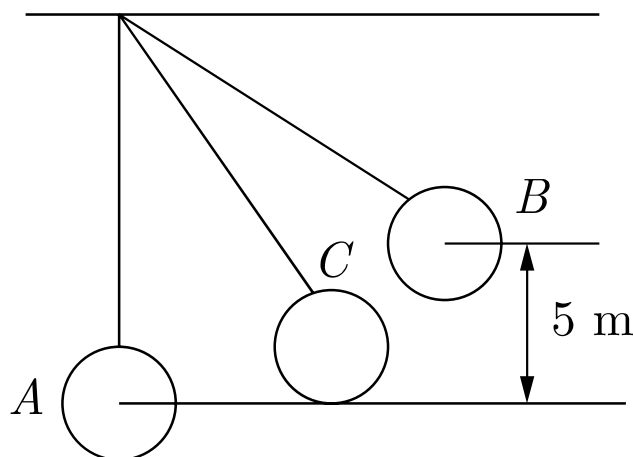
- (i) Consider the combination of a movable Pulley  $P_1$  with a fixed pulley  $P_2$  used for lifting a load  $w$ . [3]



- (a) What is the function of the fixed pulley  $P_2$  ?  
 (b) If the free end of the string moves through a distance  $y$ , find the distance by which the load  $w$  is raised.  
 (c) Calculate the force to be applied at  $C$  to just raise the load  $w = 30$  kgf, neglecting the weight of the pulley  $P_1$  and friction.

Continue on Next Page...

- (ii) The height of a new truck is 1.5 m. A drum of 200 kg mass is to be lifted on it using an inclined plane. The effort applied is 1500 N parallel to the plank and the force of friction is 250 N. Calculate: (a) the M.A. (b) V.R. and (c)  $\eta$  of the plank as a machine as an inclined plane (d) the length of the plank. [3]
- (iii) The figure shows a simple pendulum of mass 200 g. It is displaced from the mean position  $A$  to the extreme position  $B$ . The potential energy at position  $A$  is zero. At the position  $B$ , the pendulum bob is raised by 5 m. [4]



- (a) What is the potential energy of the pendulum at position  $B$  ?  
 (b) What is the total mechanical energy at point  $C$  ?  
 (c) What is the speed of the bob at position  $A$  when released from  $B$  ?  
 (Take  $g = 10 \text{ m s}^{-2}$  and there is no loss of energy)

## QUESTION 7.

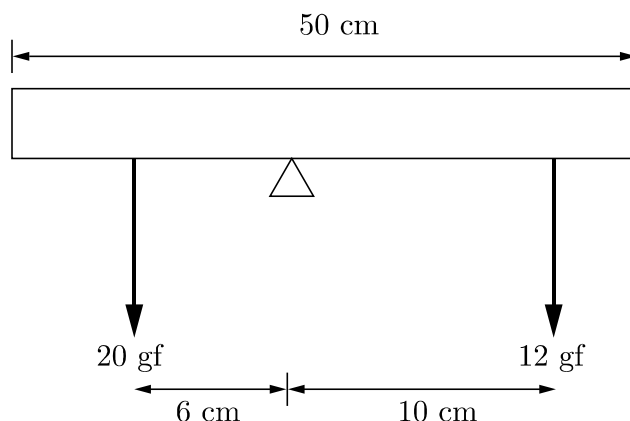
- (i) (a) [3]
- Name the type of waves which are used for sound ranging.
  - Why are these waves mentioned in (a) above, not audible to us ?
  - Give one use of sound ranging.
- (b) A man standing 25 m away from a wall produces a sound and receives the reflected sound.
- Calculate the time after which he receives the reflected sound if the speed of sound in air is  $350 \text{ ms}^{-1}$ .
  - Will the man be able to hear a distinct echo? Give a reason for your answer.
- (ii) (a) Complete the following nuclear changes : [3]
- ${}_{11}^{24}\text{Na} \longrightarrow \text{Mg} + {}_{-1}^0\beta$
  - ${}_{92}^{238}\text{U} \longrightarrow {}_{90}^{234}\text{Th} + {}_2^4\text{He} + \text{Energy}$



(b)

1. Which radiation produces maximum biological damage ?
2. What happens to the atomic number of an element when the radiation named by you in part (a) above, are emitted ?

- (iii) A half meter rod is pivoted at the centre with two weights of 20 gf and 12 gf suspended at a perpendicular distance of 6 cm and 10 cm from the pivot respectively as shown below: [3]



- (a) Which of the two forces acting on the rigid rod causes clockwise moment ?
- (b) Is the rod in equilibrium ?
- (c) The direction of 20 kgf force is reversed. What is the magnitude of the resultant moment of the forces on the rod ?

### QUESTION 8.

- (i) (a) In what unit does the domestic electric meter measure the electrical energy consumed ? State the value of this unit in S.I. unit. [3]  
(b) Why should switches always be connected to the live wire?  
(c) Give one precaution that should be taken while handling switches.
- (ii) State the kind of nuclear reaction taking place in a nucleus during the emission of a  $\beta$ -particle. [3]
- (iii) (a) Calculate the quantity of heat that will be produced in a coil of resistance  $75\ \Omega$  if a current of 2 A is passed through it for 2 minutes. [3]  
(b)
  1. A substance has nearly zero resistance at a temperature of 1 K. What is such a substance called?
  2. State any two factors which affect the resistance of a metallic wire.

**QUESTION 9.**

- (i) A refrigerator converts 100 g of water at  $20^{\circ}\text{C}$  to ice at  $-10^{\circ}\text{C}$  in 35 minutes. [3]

Calculate the average rate of heat extraction in terms of watt.

Given, Specific heat capacity of ice =  $2.1 \text{ J g}^{-1}^{\circ}\text{C}^{-1}$

Specific heat capacity of water =  $4.2 \text{ J g}^{-1}^{\circ}\text{C}^{-1}$

Specific latent heat of fusion of ice =  $336 \text{ J g}^{-1}$

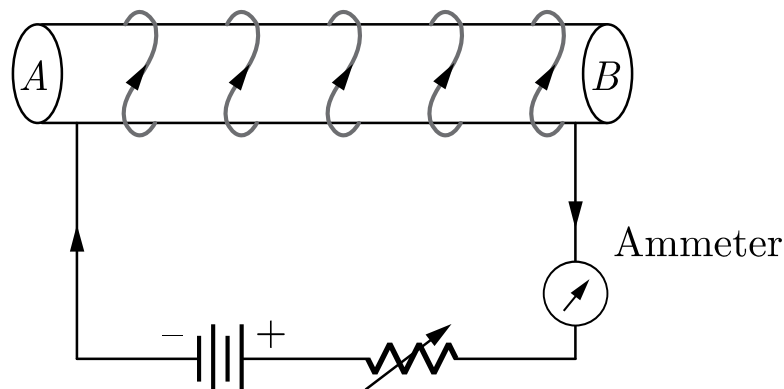
- (ii) Explain the following : [3]

(a) Bottled drinks are cooled more effectively when surrounded by lumps of ice than iced water.

(b) Why does atmospheric temperature fall after a hail storm ?

(c) Why does the weather become pleasant when it starts freezing in cold countries ?

- (iii) Diagram below shows a circuit containing a coil wound over a long and thin hollow cardboard tube. Copy the diagram. (a) Show the polarity acquired by each face of the solenoid. (b) Draw the magnetic field lines of force inside the coil and also show their direction. (c) Mention two methods to increase the strength of the magnetic field inside the coil. [4]



\*\*\*\*\*