

**Sample Paper 2**  
**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.

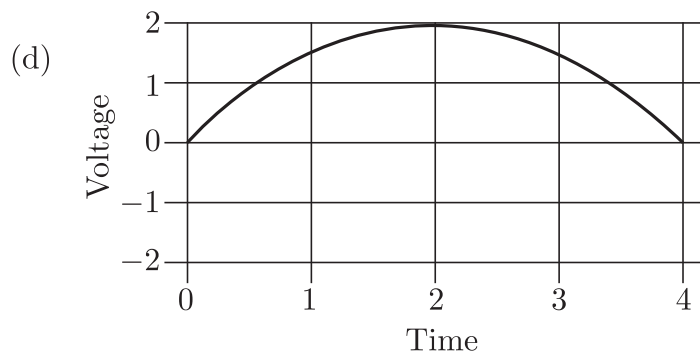
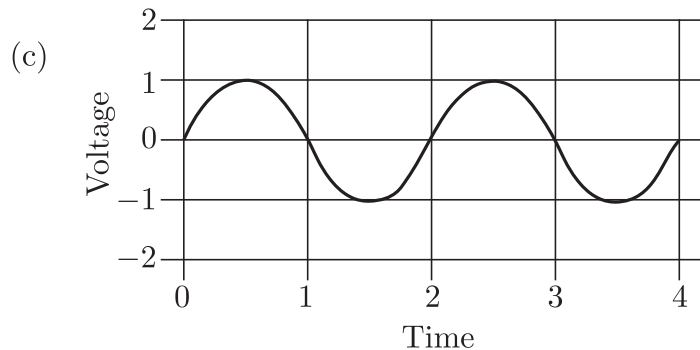
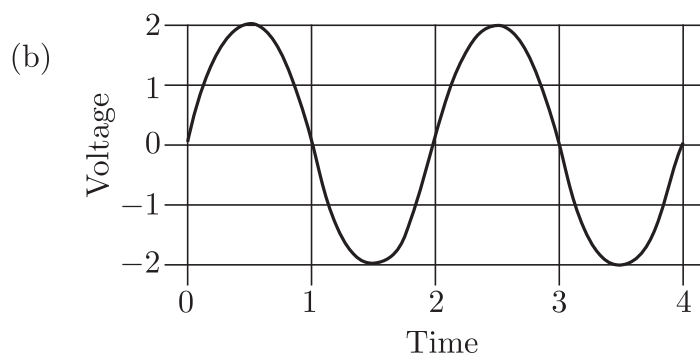
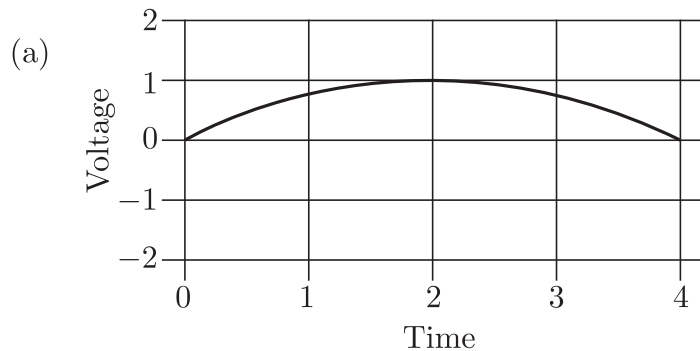
[15]

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

- (i) When a body moves in a circular path, outward force is called a .....
- (a) Centripetal force
  - (b) Reaction force
  - (c) Centrifugal force
  - (d) Pseudo force
- (ii) SI unit of power is .....
- (a) joule hour.
  - (b) watt
  - (c) watt hour
  - (d) kilowatt
- (iii) What force must be applied to a body through a distance of 10 m, such that it does a work of 4000 J. If the mass of the body is 20 kg, what is the acceleration of the body ?
- (a)  $20 \text{ ms}^{-2}$
  - (b)  $10 \text{ ms}^{-2}$
  - (c)  $40 \text{ ms}^{-2}$
  - (d)  $30 \text{ ms}^{-2}$

- (iv) During  $\beta$ -emission an electron is ejected from the atom of radioactive substance. The electron is ejected from the:
- (a) the innermost orbit of atom
  - (b) the nucleus of the atom
  - (c) the outermost orbit of atom
  - (d) none of these
- (v) **Assertion :** When the length of a wire is doubled, then its resistance also gets doubled.  
**Reason :** The resistance of a wire is directly proportional to its length.
- (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) Which is not a source of ultraviolet radiations ?
- (a) Sun
  - (b) Arc lamp
  - (c) Star
  - (d) Electric heater
- (vii) Sound travels in the form of .....
- (a) crest
  - (b) trough
  - (c) compression and rarefactions
  - (d) all of the above
- (viii) The speed of sound is  $310 \text{ ms}^{-1}$ . A person fires a gun. An echo is heard after 1.5 s. Calculate the distance of person from the cliff from which echo is heard.
- (a) 132.5 m
  - (b) 332.5 m
  - (c) 232.5 m
  - (d) 432.5 m

- (ix) A simple AC generator produces a voltage that varies with time as shown below :  
Which graph shows how the voltage varies with time when the generator rotates at twice the original speed ?



- (x) Which is not the property of a solenoid ? The magnetic field of solenoid can be increased
- (a) by increasing the number of turns in the solenoid.
  - (b) by placing a laminated soft iron core within the solenoid.
  - (c) by increasing the strength of current flowing through the solenoid.
  - (d) by placing a stainless steel core within the solenoid

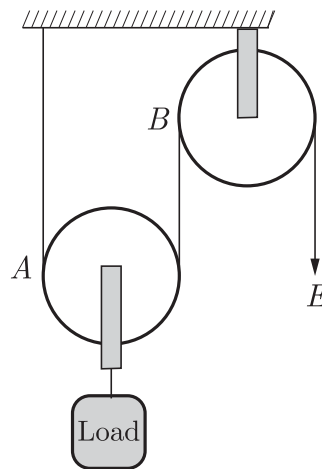
- (xi) Commutator is a device in a D.C. motor which :
- (a) reverses direction of current after half rotation of coil.
  - (b) increases the strength of electromagnet.
  - (c) increases the power.
  - (d) reverses direction of current coil after full rotation of coil.
- (xii) Two identical calorimeters A and B contain equal quantity of water at  $20^{\circ}\text{C}$ . A 5 g piece of metal X of specific heat  $0.2 \text{ cal g}^{-1} (^{\circ}\text{C})^{-1}$  is dropped into A and a 5 g piece of metal Y into B. The equilibrium temperature in A is  $22^{\circ}\text{C}$  and in B is  $23^{\circ}\text{C}$ . The initial temperature of both the metals is  $40^{\circ}\text{C}$ . Find the specific heat of metal Y in  $\text{cal g}^{-1} (^{\circ}\text{C})^{-1}$ .
- (a)  $\frac{27}{85} \text{ cal/g}^{\circ}\text{C}$
  - (b)  $26 \text{ cal/g}^{\circ}\text{C}$
  - (c)  $27 \text{ cal/g}^{\circ}\text{C}$
  - (d)  $\frac{85}{27} \text{ cal/g}^{\circ}\text{C}$
- (xiii) S.I. unit of thermal capacity is :
- (a)  $\text{Jkg}^{-1}$
  - (b)  $\text{Jkg}^{-1} \text{K}^{-1}$
  - (c)  $\text{kJ Kg}^{-1}$
  - (d)  $\text{cal } ^{\circ}\text{C}^{-1}$
- (xiv) A point on the principal axis of a lens such that a ray of light passing through this point emerges parallel to its direction of incidence is called as:
- (a) Optical centre
  - (b) Centre of curvature
  - (c) Radius of curvature
  - (d) Focus
- (xv) During spear fishing a fisherman aims at the :
- (a) head of fish
  - (b) slightly ahead of the head of fish
  - (c) tail of fish
  - (d) none of these

## QUESTION 2.

- (i) (a) What is a single fixed pulley? Give its one use. [3]  
(b) Is it possible for a hydrogen ( ${}^1_1\text{H}$ ) nucleus to emit an alpha particle ? Give a reason for your answer.  
(c) What is the use of a photograph taken with a metallic plate in front of the screen ?
- (ii) A uniform meter scale can be balanced at the 70.0 cm mark when a mass of 0.05 kg is hung from the 94.0 cm mark. [2]  
(a) Draw a diagram of the arrangement and  
(b) find the mass of the meter scale.

(iii) The diagram below shows a pulley arrangement :

[2]



(a) Copy the diagram and mark the direction of tension on each strand of the string.

(b) What is the velocity ratio of the arrangement?

(iv) A man having a box on his head, climbs up a slope and another man having an identical box walks the same distance on a levelled road. Who does more work against the force of gravity and why ? [2]

(v) When an arrow is shot from its bow, it has kinetic energy. From where does it get the kinetic energy ? [2]

(vi) A music system draws a current of 400 mA when connected to a 12 V battery. [2]

(a) What is the resistance of the music system?

(b) The music system is left playing for several hours and finally the battery voltage drops and the music system stops playing when the current drops to 320 mA. At what battery voltage does the music system stop playing?

(vii) It is observed that during march-past we hear a base drum distinctly from a distance compared to the side drums. [2]

(a) Name the characteristic of sound associated with the above observation.

(b) Give a reason for the above observation.

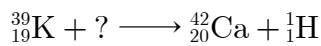
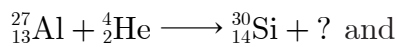
### QUESTION 3.

(i) A lens forms an upright and diminished image of an object when the object is placed at the focal point of the given lens. [2]

(i) Name the lens.

(ii) Draw a ray diagram to show the image formation.

- (ii) Identify the following wires used in a household circuit: [2]  
(a) The wire is also called as the phase wire.  
(b) The wire is connected to the top terminal of a three-pin socket.
- (iii) What is earthing of electric appliance? Why is it essential ? [2]
- (iv) 50 g of ice at  $0^{\circ}\text{C}$  is added to 300 g of a liquid at  $30^{\circ}\text{C}$ . What will be the final temperature of the mixture when all the ice has melted? The specific heat capacity of the liquid is  $2.65 \text{ J g}^{-1}^{\circ}\text{C}^{-1}$  while that of water is  $4.2 \text{ J g}^{-1}^{\circ}\text{C}^{-1}$ . Specific latent heat of fusion of ice  $= 336 \text{ J g}^{-1}$ . [2]
- (v) Two important nuclear reactions are described incompletely by the following equations : [2]



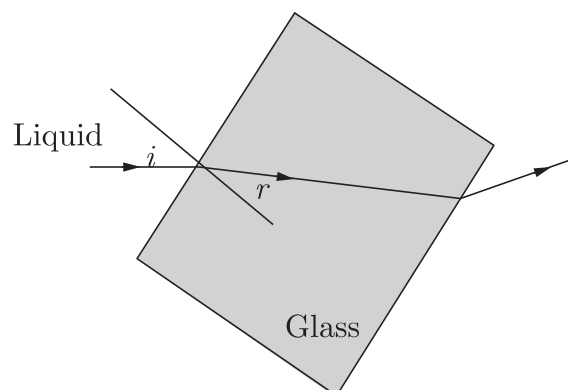
Fill in the gaps in these equations by employing the conservation of the masses and atomic number of the reacting species and products.

## SECTION - B

(Attempt any four questions.)

### QUESTION 4.

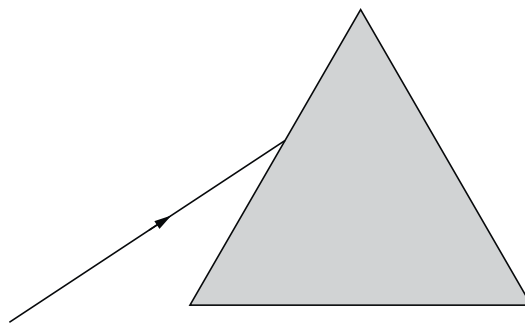
- (i) Draw a ray diagram to illustrate the determination of the focal length of a convex lens using an auxiliary plane mirror. [3]
- (ii) (a) Draw a diagram to show that white light can be split up into different colours. [3]  
(b) Draw another diagram to show how the colours can be combined to give the effect of white light.  
(c) How will you show the presence of ultraviolet and infrared rays in the spectrum?
- (iii) (a) The given diagram shows the path of a ray of light through a rectangular glass block placed in a liquid of uniform density. [4]



- (i) Does the light speed up or slow down in glass?
- (ii) Give reasons for your answer.
- (b) What is the angular deviation of the emergent ray from the glass block with respect to the incident ray?
- (c) Show with the help of a ray diagram the path of the ray when incident normally on the first surface of the glass block, through the block and the liquid.

**QUESTION 5.**

- (i) In a hospital, an ultrasonic scanner is used to locate tumours in a tissue. What is the wavelength of sound in a tissue in which the speed of sound is  $1.7 \text{ km s}^{-1}$  ? The operating frequency of the scanner is 4.2 MHz. [3]
- (ii) (a) The diagram below shows a ray of light incident on an equilateral glass prism placed in minimum deviation position. [3]

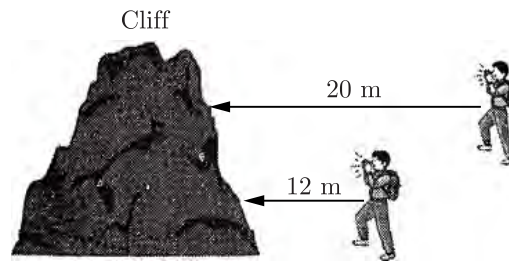


Copy the diagram and complete it to show the path of the refracted ray and the emergent ray.

- (b) How are angle of incidence and angle of emergence related to each other in this position of the prism?
- (iii) What do you mean by musical sound and noise? Give two examples of each. Also represent musical sound and noise graphically. [4]

**QUESTION 6.**

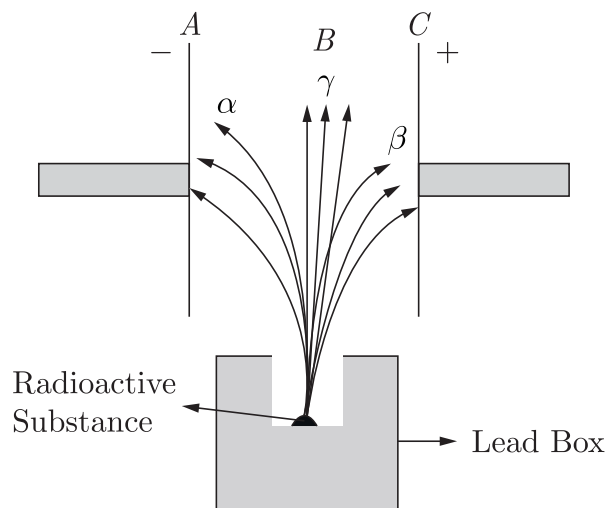
- (i) Uttam and Nitesh are standing at a distance of 12 m and 20 m respectively from a cliff. They start shouting their names. They want to hear clear echo of their sound ? [3]
  - (a) Will Nitesh and Uttam be able to hear a clear echo of their own sound?
  - (b) Can you explain the condition for a sound to form an echo?



- (ii) A block and tackle system has V.R. = 5. [3]
- Draw a neat labelled diagram of a system indicating the direction of its load and effort.
  - Rohan exerts a pull of 150 kgf. What is the maximum load he can raise with this pulley system if its efficiency = 75% ?
- (iii) A pump is used to lift 500 kg of water from a depth of 80 m in 10 s. Calculate : [4]
- work done by the pump.
  - the power at which the pump works.
  - the power rating of the pump if its efficiency is 40%.

### 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 (a) the velocity of sound in air and (b) the distance between the cliffs. [3]
- (ii) Radiations given out from a source when subjected to an electric field in a direction perpendicular to their path are shown below in the diagram. The arrows show the path of the radiation  $A$ ,  $B$  and  $C$ . Answer the following questions in terms of  $A$ ,  $B$  and  $C$ . [3]
- Name the radiation  $B$  which is unaffected by the electrostatic field.
  - Why does the radiation  $C$  deflect more than  $A$  ?



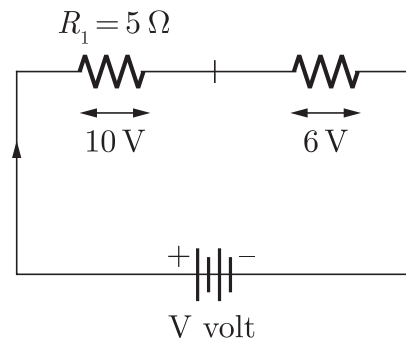
- Which among the three causes the least biological damage externally ?
- Name the radiation which is used in carbon dating.



- (iii) (a) Draw a simplified diagram of a lemon crusher, indicating direction of load and effort. [4]  
 (b) A nut is opened by a wrench of length 20 cm. If the least force required is 2 N, find the moment of force needed to loosen the nut.

### QUESTION 8.

- (i) (a) Write one advantage of connecting electrical appliances in parallel combination. [3]  
 (b) What characteristics should a fuse wire have?  
 (c) Which wire in a power circuit is connected to the metallic body of the appliance?
- (ii) (a) Why is a nuclear fusion reaction called a thermo nuclear reaction ? [3]  
 (b) Complete the reaction :  
 ${}^3\text{He}_2 + {}^2\text{H}_1 \longrightarrow {}^4\text{He}_2 + \dots\dots\dots + \text{Energy}$
- (iii) Two resistors are connected in series as shown in the diagram : [4]

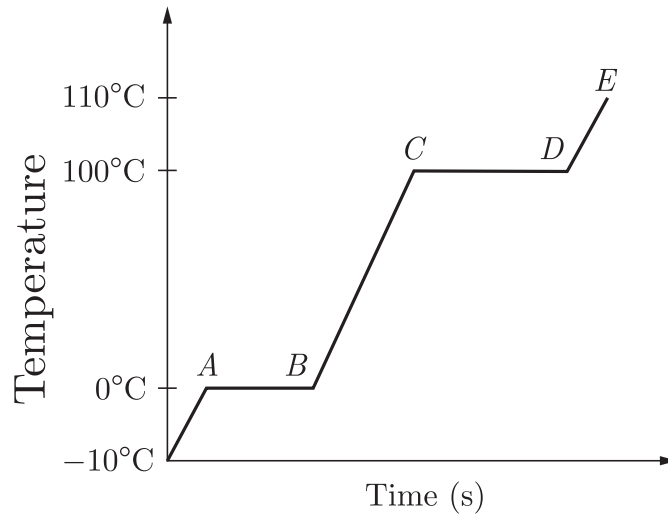


- (a) What is the current through the 5 ohm resistor ?  
 (b) What is the current through  $R$  ?  
 (c) What is the value of  $R$  ?

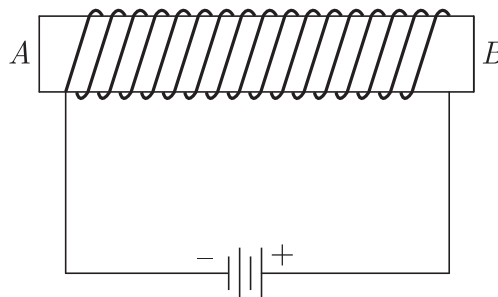
### QUESTION 9.

- (i) How much heat energy is released when 5 g of water at  $20^\circ\text{C}$  changes to ice at  $0^\circ\text{C}$  ? [3]  
 [Specific heat capacity of water =  $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$ , Specific latent heat of fusion of ice =  $336 \text{ J g}^{-1}$ ]

- (ii) A piece of ice at  $-10^{\circ}\text{C}$  is heated at a constant rate. The variation of temperature with heat input is shown in the graph below : [3]
- (a) What is represented by  $AB$  and  $CD$  ?
- (b) What conclusion can you draw regarding the nature of ice from the given graph ?



- (iii) (a) You have been provided with a solenoid AB. [4]
- (i) What is the polarity at end A?
- (ii) Give one advantage of an electromagnet over a permanent magnet.
- (b) (i) Name the device used to protect the electric circuits from overloading and short-circuits.
- (ii) On what effect of electricity does the above device work?



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