

Sample Paper 13
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) The gate of a building is 3 m broad. It can be opened by applying 100 N force at the middle of the gate. Calculate the least force required to open this gate, (at a point 6 m).
- | | |
|----------|----------|
| (a) 20 N | (b) 30 N |
| (c) 50 N | (d) 10 N |
- (ii) Energy is
- | | |
|---------------------------------------|-------------------------------|
| (a) capacity to produce power | (b) capacity to do work |
| (c) capacity to do work per unit time | (d) the capacity to use power |
- (iii) A boy P has a mass of 20 kg and is moving with a velocity of 5 ms^{-1} . Another boy Q has a mass of 5 kg and is moving with a velocity of 20 ms^{-1} . Calculate the ratio of the momentum of P and Q.
- | | |
|-----------|-----------|
| (a) 1 : 1 | (b) 2 : 1 |
| (c) 3 : 2 | (d) 1 : 2 |
- (iv) The heaviest nuclear radiation is.
- | | |
|-------------------------|-------------------------|
| (a) X-radiation | (b) α -radiation |
| (c) γ -radiation | (d) β -radiation |

(v) **Assertion :** A tube light emits white light.

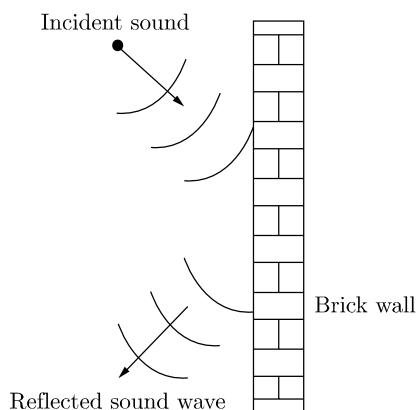
Reason : Emission of light in a tube takes place at a very high temperature.

- (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) The highest refractive index is of :

- (a) glass (b) cold air
 (c) diamond (d) water

(vii) A sound wave is reflected from a brick wall. Compared with the incident wave, the reflected wave has



- (a) a greater amplitude (b) a shorter wavelength
 (c) the same velocity (d) the same speed

(viii) Two particles of equal masses are revolving in circular paths of radii r_1 and r_2 respectively, with the same speed. The ratio of their centripetal forces is

- (a) $\left(\frac{r_1}{r_2}\right)^2$ (b) $\sqrt{\frac{r_2}{r_1}}$
 (c) $\left(\frac{r_2}{r_1}\right)^2$ (d) $\frac{r_2}{r_1}$

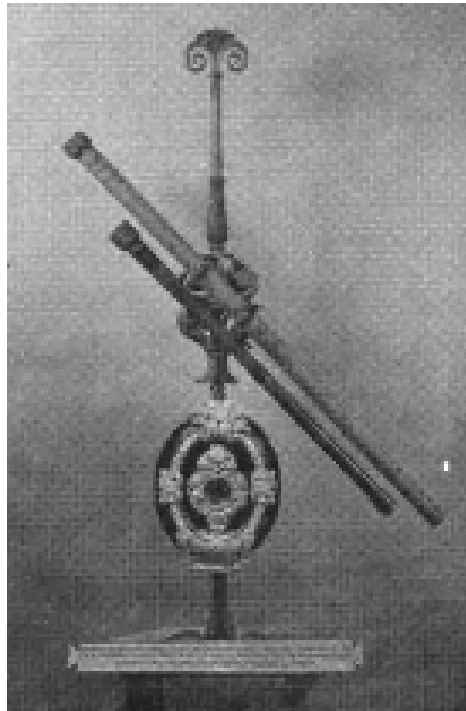
(ix) When the current is drawn from a cell in a closed circuit, the potential difference between the terminals of cell is called :

- (a) Potential difference (b) E.m.f.
 (c) Terminal voltage (d) Both (a) and (b)

(x) An electric device consumes 8640 J of energy in 30 min. while operating at 24 V. Calculate the current drawn by the device.

- (a) 0.5 A (b) 0.3 A
 (c) 0.4 A (d) 0.2 A

- (xi) According to new convention, the colour of live wire is :
(a) light blue (b) brown
(c) green (d) yellow
- (xii) Heat energy is given to 100 g of water, such that its temperature rises by 10 K. When the same heat energy is given to a liquid L of mass 50 g its temperature rises by 50 K. Calculate
(a) heat energy given to water (b) the specific heat capacity of liquid L .
Take specific heat capacity of water = 4200
(a) $1068 \text{ J Kg}^{-1}\text{k}^{-1}$ (b) $1086 \text{ J Kg}^{-1}\text{k}^{-1}$
(c) $1860 \text{ J Kg}^{-1}\text{k}^{-1}$ (d) $1680 \text{ J Kg}^{-1}\text{k}^{-1}$
- (xiii) A block and tackle system of pulleys is used to lift a load of 360 kgf by applying an effort of 200 kgf such that load is lifted to a height of 2 m and effort is applied through a distance of 8 m. Find MA and VR of the system.
(a) $MA = 1.8$ and $VR = 4$ (b) $MA = 4$ and $VR = 6$
(c) $MA = 3.6$ and $VR = 2$ (d) $MA = 2$ and $VR = 8$
- (xiv) The plano-convex lens has
(a) Both surfaces convex (b) Both concave
(c) One plane, one convex (d) One convex, one concave
- (xv) Which was the lens used in the original Galilean telescope ?



- (a) both convex (b) one convex and one concave
(c) both concave (d) none of the above

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QUESTION 2.

- (i) A small coin is placed on a rotating record. The coin does not slip on the record. Where does it get the centripetal force from ? [3]
- (ii) (a) What is meant by the term 'moment of force' ? [2]
(b) If the moment of force is assigned a negative sign then will the turning tendency of the force be clockwise or anticlockwise ?
- (iii) 6.4 kJ of energy causes a displacement of 64 m in a body in the direction of force in 2.5 seconds. Calculate: [2]
(a) the force applied
(b) power in horse power (hp). (Take 1 hp = 746W)
- (iv) The work done in lifting a box on to a platform does not depend upon how fast it is lifted up. Explain your answer giving proper reasoning. [2]
- (v) A body is acted upon by a force. State two conditions when the work done is zero. [2]
- (vi) Find the cost of operating an electric toaster for two hours if it draws 8 A current on a 110 volt circuit. The cost of electrical energy is ₹ 2.50 per kWh. [2]
- (vii) Two waves of the same pitch have their amplitudes in the ratio 2 : 3. [2]
(a) What will be the ratio of their loudness ?
(b) What will be the ratio of their frequencies ?

QUESTION 3.

- (i) (a) When does a ray of light falling on a lens pass through it undeviated ? [2]
(b) Which lens can produce a real and inverted image of an object ?
- (ii) Which of the two wires of similar dimension, copper or nichrome, would you use for the electric heater ? Give reasons to justify your answer. [2]
- (iii) (a) Which of the two wires of similar dimensions, of copper or nichrome, would you use for the electric heater element ? Give reasons to justify your answer. [2]
(b) Two fuse wires of the same length are rated 5 A and 20 A. Which of the two fuse wires is thicker and why ?

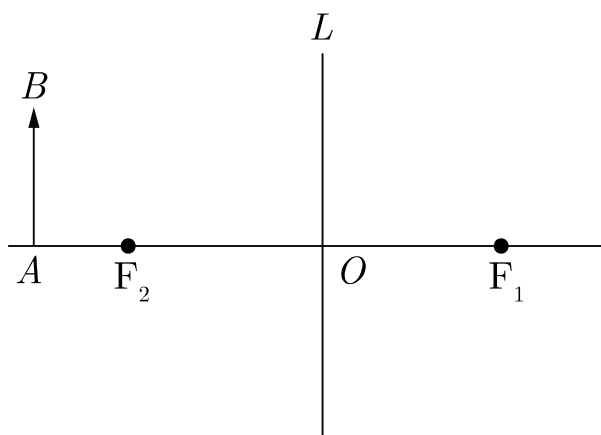
- (iv) Heat energy is supplied at a constant rate to 100 g of ice at 0°C . The ice is converted into water at 0°C in 2 minutes. How much time will be required to raise the temperature of water from 0°C to 20°C ? [2]
[Given: specific heat capacity of water = $4.2 \text{ J g}^{-1}^{\circ}\text{C}^{-1}$, specific latent heat of ice = 336 J g^{-1}]
- (v) Explain the following : [2]
(a) Nucleus,
(b) Nucleons.

SECTION - B

(Attempt any four questions.)

QUESTION 4.

- (i) (a) What is meant by refraction ? [3]
(b) Express the refractive index n of a medium :
1. in terms of the velocity of light;
2. in terms of the angle of incidence i in air and the angle of refraction r in a denser medium.
(c) If a ray of light passes from medium I to medium II without any change of direction, what can be said about the refractive indices of these media (angle i is not 0°) ?
- (ii) Figure below shows an object AB placed on the principal axis of a lens L . The two foci of the lens are F_1 and F_2 . The image formed by the lens is erect, virtual and diminished. Copy the diagram and answer the following questions : [3]
(a) Draw the outline of lens (L) used.
(b) Draw a ray from B and passing through O . Show the ray after refraction by the lens.



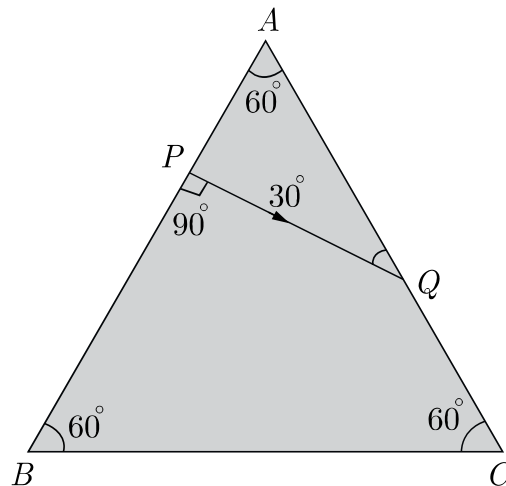
- (c) Draw a ray of light starting from B , which after passing parallel to the principal axis, is incident on the lens and emerges after refraction from it.
(d) Locate the final image formed.

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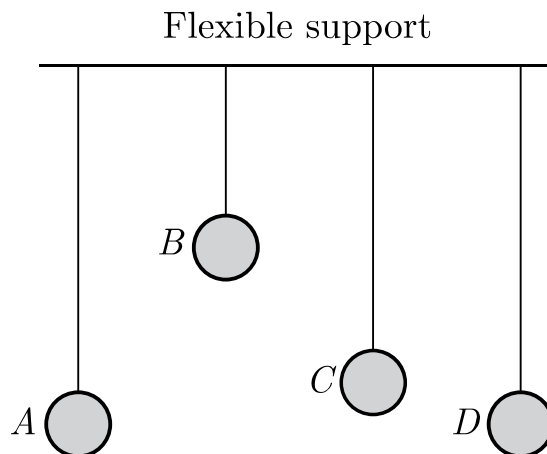
- (iii) Red light of wavelength 6600 \AA traveling in air gets refracted in water. If the speed of light in air is $3 \times 10^8 \text{ ms}^{-1}$ and refractive index of water is $4/3$, find (a) the frequency of light in air, (b) the speed of light in water and (c) the wavelength of light in water. [4]

QUESTION 5.

- (i) In the given nuclear reaction : [3]
 $A + B \rightarrow C + D + \text{Energy}$,
 The masses of A, B, C and D are $5 \times 10^{-27} \text{ kg}$, $2 \times 10^{-27} \text{ kg}$, $3 \times 10^{-27} \text{ kg}$ and $1.9 \times 10^{-27} \text{ kg}$ respectively. Calculate the energy released in the process.
- (ii) (a) What two conditions must be fulfilled for total internal reflection of light to occur ? [3]
 (b) Complete the path of the ray from Q onwards in the adjoining figure of a glass prism.

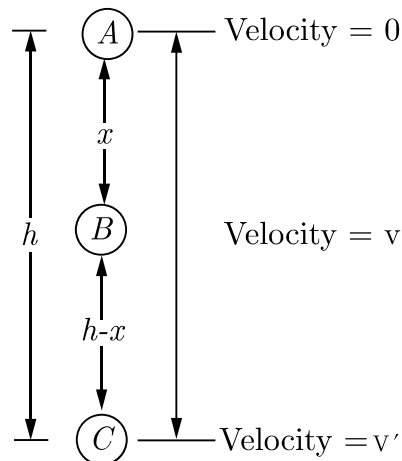


- (iii) In the given figure pendulum (A) is set into vibrations, which of the other three will vibrate with maximum amplitude and why ? [4]



QUESTION 6.

- (i) Ankit and Ramesh are playing on a multistory building. Suddenly Rahul throws a toy of mass 1 kg the toy is falling under the affect of gravity and after sometimes, it reaches on the ground. [3]



- (a) What is the momentum of the toy after 6 s ?
 (b) What is the height of the freely falling body ?
- (ii) Figure-2 given below gives an arrangement of single moving pulleys. Copy the diagram. If the effort applied at the free end of the string is E , [3]

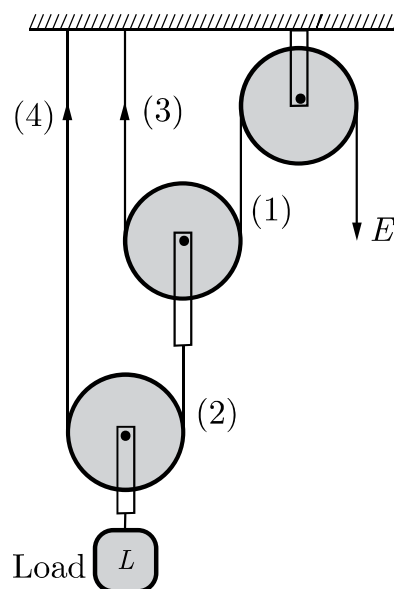


Fig.2

- (a) Show the direction and the magnitude of the forces exerted by the four strings marked (1) to (4)
 (b) What is the load that can be lifted by the effort
 (c) Calculate the mechanical advantage of the system of pulleys.

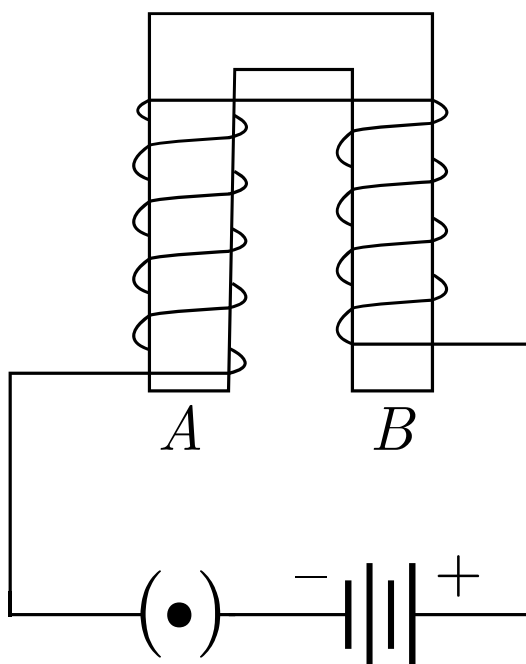
- (iii) (a) A stone of mass 64.0 g is thrown vertically upward from the ground with an initial speed of 20.0 ms^{-1} . The gravitational potential energy at the ground level is considered to be zero. Apply the principle of conservation of energy and calculate the potential energy at the maximum height attained by the stone. ($g = 10 \text{ ms}^{-2}$) [4]
- (b) Using the same principle, state what will be the total energy of the body at its half-way point?

QUESTION 7.

- (i) The wavelength of waves produced on the surface of water is 20 cm. If the wave velocity is 24 ms^{-1} , calculate : [3]
- (a) the number of waves produced in one second and
- (b) the time required to produce one wave.
- (ii) (a) What is radioactivity ? [3]
- (b) Mention any two differences between nuclear energy and chemical energy.
- (iii) Explain the following : [4]
- (a) You always keep your feet wide apart when receiving the charge from an opponent at football.
- (b) It is easier to knock over a person who is standing on one foot than one who is standing on two.
- (c) Why do the wine glasses have a heavy and broad base?

QUESTION 8.

- (i) The diagram shows a coil wound around a *U*-shape soft iron bar *AB*. [3]
- (a) What is the polarity induced at the ends A and B when the switch is pressed?
- (b) Suggest one way to strengthen the magnetic field in the electromagnet.
- (c) What will be the polarities at *A* and *B* if the direction of current is reversed in the circuit ?



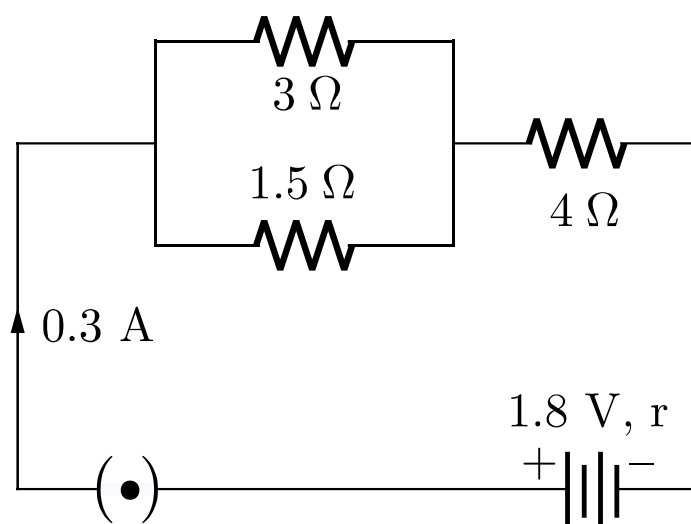
(ii) Define the terms : (a) atomic number and (b) Give reasons for the following : [3]

(a) Beta particles are deviated to a greater extent in a magnetic field than alpha particles.

(b) Gamma rays are not deflected in an electric field.

(iii) The diagram above shows three resistors connected across a cell of emf 1.8 V and internal resistance r . [4]

Calculate :



(a) Current through $3\ \Omega$ resistor.

(b) The internal resistance r .

QUESTION 9.

- (i) A copper vessel of mass 100 g contains 150 g of water at 50°C . How much ice is needed to cool it to 5°C ? [3]

Given: Specific heat capacity of copper = $0.4 \text{ J g}^{-1} ^{\circ}\text{C}^{-1}$

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

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

- (ii) (a) Explain why the weather becomes very cold after a hail storm. [3]
(b) What happens to the heat supplied to a substance when the heat supplied causes no change in the temperature of the substance ?

- (iii) (a) [4]

1. Why does a magnetic needle show a deflection when brought close to a current carrying conductor ?
2. A wire bent into a circle carries current in an anticlockwise direction. What polarity does this face of the coil exhibit ?

(b)

1. Sketch a graph to show the change in potential difference across the ends of an Ohmic resistor and the current flowing in it. Label the axes of your graph.
2. What does the slope of the graph represent ?
