

Sample Paper 1
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.

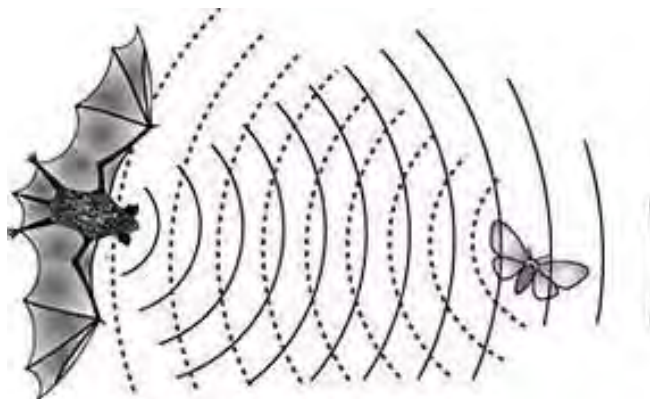
Choose the correct answers to the questions from the given options.

[15]

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

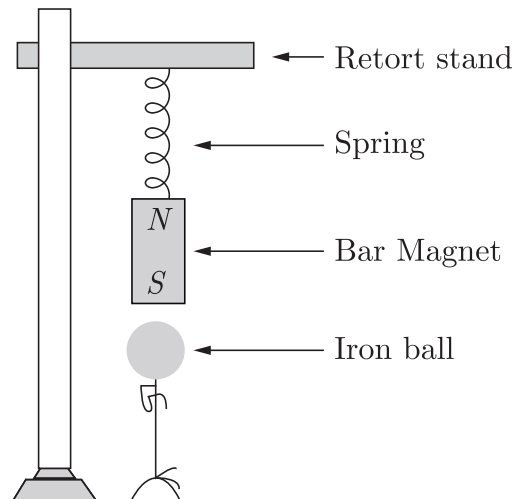
- (i) The weight of an object lies at the
- (a) Geometric center always
 - (b) Centre of gravity
 - (c) Centre of buoyancy
 - (d) Centre of mass
- (ii) Work done = force \times
- (a) displacement
 - (b) distance
 - (c) time
 - (d) velocity
- (iii) Kilo-calorie is the amount of heat required to raise the temperature of :
- (a) 1 kg of water through 10°C
 - (b) one kg of water through 1°C
 - (c) one gram of water through 1°C
 - (d) 1 kg of water through 100°C

- (iv) The gravitational force between a H-atom and another particle of mass m will be given by Newton's law $F = G\frac{M \cdot m}{r^2}$, where r is in meter and
- $M = m_{\text{proton}} + m_{\text{electron}}$
 - M is not relate to the mass of the hydrogen atom
 - $M = m_{\text{proton}} + m_{\text{electron}} - \frac{|V|}{c^2}$
 - $M = m_{\text{proton}} + m_{\text{electron}} - \frac{B}{c^2} (B = 13.6 \text{ eV})$
- (v) **Assertion :** The connecting wires are made of copper.
Reason : The electrical conductivity of copper is high.
- Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
 - Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
 - Assertion (A) is true but reason (R) is false.
 - Assertion (A) is false but reason (R) is true.
- (vi) When white light is dispersed by a prism, compared with blue light, the red light is
- slowed down less and refracted more
 - slowed down more and refracted less
 - slowed down less and refracted less
 - slowed down more and refracted more
- (vii) Echo occurs when the distance between source and listener is
- 17 m
 - greater than 17 m
 - 10 m
 - 34 m
- (viii) Bats use this technique to detect their prey and hunt them.



- flapping their wings
- reflection of sound waves
- echo
- both (b) and (c)

- (ix) The graph between voltage and current for a conductor is a straight line. The slope of the graph represents :
- (a) electric potential (b) resistance
(c) resistivity (d) none of these
- (x) Ravi designed the toy shown below using a bar magnet, a spring and an iron ball.

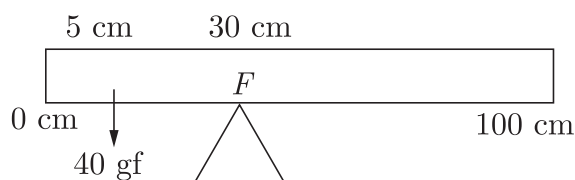


- Which of the following correctly shows how the forces are interacting to keep the ball floating ?
- (a) Magnetic force is equal to gravitational force
(b) The sum of elastic spring force and gravitational force is equal to frictional force
(c) Elastic spring force is equal to magnetic force
(d) The sum of elastic spring force and magnetic force is equal to gravitational force
- (xi) In which of the following cases emf is not induced ?
- (a) A magnet is moved through a loop of wire
(b) A loop of wire is held near a magnet
(c) A current is started in a wire held near a loop of wire
(d) The current is switched off in a wire held near a loop of wire
- (xii) How many grams of ice at -14°C are needed to cool 200 g of water from 25°C to 10°C ?
(Take, specific heat of ice = $0.5 \text{ cal g}^{-1} \text{ }^{\circ}\text{C}^{-1}$ and latent heat of ice = 80 cal g^{-1})
- (a) 27 g (b) 20 g
(c) 30 g (d) 31 kg
- (xiii) 272 calories of heat is required to heat 0.02 kg of a metal of specific heat capacity $170 \text{ cal kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$ to a temperature T . If the initial temperature of the metal is 20°C , Calculate the final temperature T ?
- (a) 25°C
(b) 75°C
(c) 100°C
(d) 90°C

- (xiv) A concave lens forms the image of an object which is
(a) virtual, upright and diminished (b) virtual, inverted and enlarged
(c) virtual, inverted and diminished (d) virtual, upright and enlarged
- (xv) When a ray of light travelling in an optically denser medium, emerges into an optically less denser medium it
(a) deviates towards the normal
(b) gets reflected
(c) deviates away from normal
(d) does not deviate

QUESTION 2.

- (i) (a) What is a pulley ? [3]
(b) State one safety precaution in the disposal of nuclear waste.
(c) What is radioactivity ?
- (ii) A uniform half meter rule balances horizontally on a knife-edge at 29 cm mark when a weight of 20 gf is suspended from one end. [2]
(a) Draw a diagram of the arrangement.
(b) What is the weight of the half meter rule?
- (iii) A uniform meter scale is in equilibrium as shown in the diagram : [2]

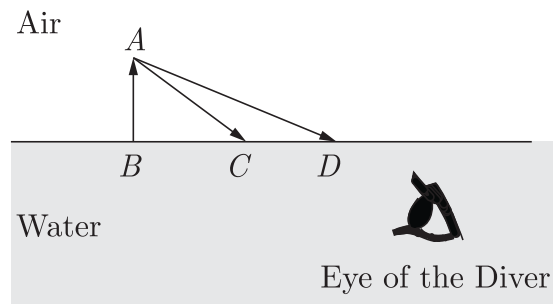


- (a) Calculate the weight of the metre scale.
(b) Which of the following options is correct to keep the ruler in equilibrium when 40 gf wt is shifted to 0 cm mark?
 F is shifted towards 0 cm or F is shifted towards 100 cm.
- (iv) Give one example of each when : [2]
(a) Chemical energy changes into electrical energy.
(b) Electrical energy changes into sound energy.
- (v) If the speed of a car is halved, by which factor does its kinetic energy change? [2]
- (vi) If a wire of resistance 2Ω gets stretched to thrice its original length [2]
(a) Calculate the new resistance of the wire.
(b) What happens to the specific resistance of the wire?

- (vii) (a) Name the system which enables us to locate underwater objects by transmitting ultrasonic waves and detecting the reflecting impulse. [2]
(b) What are acoustically measurable quantities related to pitch and loudness?

QUESTION 3.

- (i) A diver in water looks obliquely at an object AB in air. [2]



- (a) Does the object appear taller, shorter or of the same size to the diver?
(b) Show the path of two rays AC and AD starting from the tip of the object as it travels towards the diver in water and hence obtain the image of the object.
- (ii) How does an increase in the temperature affect the specific resistance of a : [2]
(a) Metal and
(b) Semiconductor ?
- (iii) Which part of an electrical appliance is earthed? [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) In β -emission from a radioactive substance an electron is ejected. Where from does this electron come from ? [2]

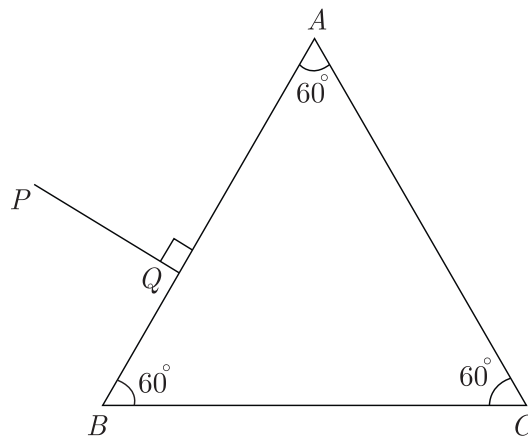
SECTION - B

(Attempt any four questions.)

QUESTION 4.

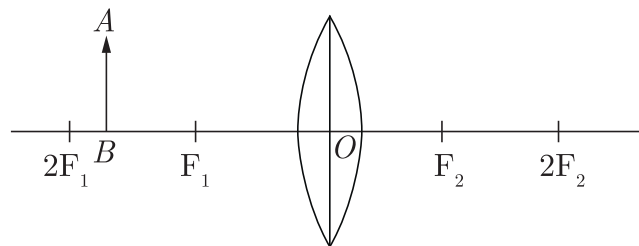
- (i) Jatin puts a pencil into a glass container having water and is surprised to see the pencil in a different state. [3]
(a) What change is observed in the appearance of the pencil ?
(b) Name the phenomenon responsible for the change.
(c) Draw a ray diagram showing how the eye sees the pencil.

- (ii) (a) Copy the diagram given below and complete the path of light ray till it emerges out of the prism. The critical angle of glass is 42° . In your diagram mark the angles wherever necessary. [3]



- (b) State the dependence of angle of deviation:
1. On the refractive index of the material of the prism.
 2. On the wavelength of light.

- (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 \AA to 4000 \AA (or 10 nm to 400 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:



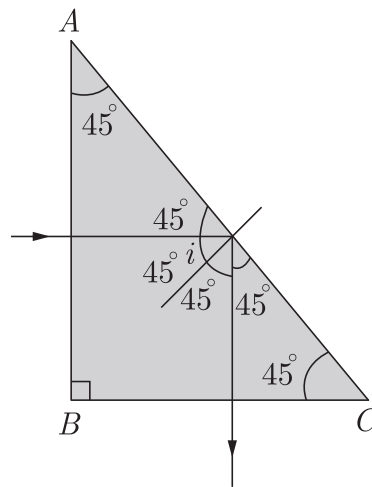
Copy the diagram and using three rays starting from point A , obtain the image of the object formed by the lens.

QUESTION 5.

- (i) (a) Can the absolute refractive index of a medium be less than one ? [3]
- (b) A coin placed at the bottom of a beaker appears to be raised by 4.0 cm. If the refractive index of water is $4/3$, find the depth of the water in the beaker.

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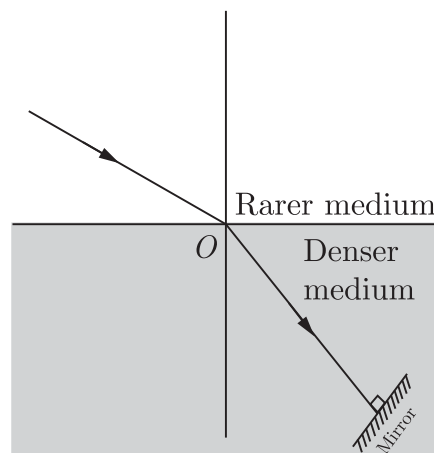
- (ii) (a) Define 'critical angle'. [3]
 (b) A ray of light passes through a right angled prism as shown in the figure. State the angles of incidence at the faces AC and BC .



- (iii) What do you understand by the term "quality" of a musical note ? Illustrate your answer with a diagram. [4]

QUESTION 6.

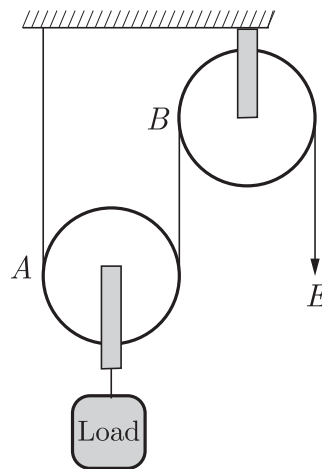
- (i) Rohit wants to study the phenomena of a ray of light moving from rarer to a denser medium and strikes a plane mirror placed at 90° to the direction of the ray as shown in the figure. And when a light ray after suffering any number of reflections and refractions, its final path has reversed, it travels back along its entire initial path. This is called principle of reversibility of light. [3]



- (a) Copy the diagram and mark the arrows to show the path of the ray of light after it is reflected from the mirror.
 (b) Name the principle you have used to mark the arrow to show the direction of the ray.

(ii) The diagram below shows a pulley arrangement :

[3]



- Copy the diagram and mark the direction of tension on each strand of the string.
- What is the velocity ratio of the arrangement?
- If the tension acting on the string is T , then what is the relationship between T and effort E ?
- If the free end of the string moves through a distance x , find the distance by which the load is raised.

(iii) A block and tackle of 5 pulleys is used to raise a load of 50 kg-f steadily through a height of 20 m. The work done against friction is 2000 J. Calculate:

[4]

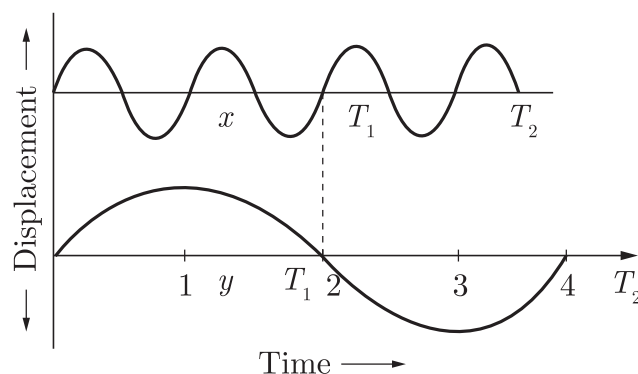
- the work done by the effort
- the efficiency of the system
- mechanical advantage.

QUESTION 7.

(i) In the figure below, (x) and (y) are two waves which are represented graphically with displacement-time curves.

[3]

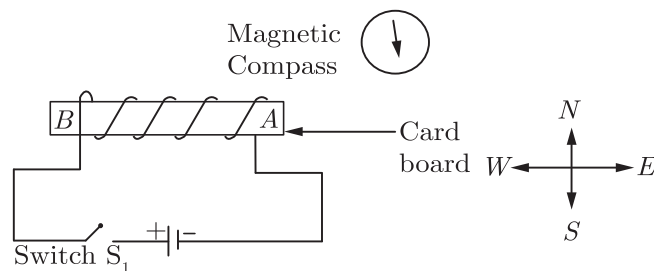
Calculate the ratio of their (a) Velocity (b) Wavelength (c) Frequency. Also, give reason which produces (d) Shrill sound and (e) Louder sound.



- (ii) An atomic nucleus A is composed of 84 protons and 128 neutrons. The nucleus A emits an alpha particle and is transformed into a nucleus B . [3]
- What is the composition of B ?
 - The nucleus B emits a beta particle and is transformed into a nucleus C . What is the composition of C ?
 - What is mass number of the nucleus A ?
 - Does the composition of C change if it emits gamma radiations?
- (iii) From the diagram given below, answer the questions that follow: [4]
- What kind of pulleys are A and B?
 - State the purpose of pulley B.
 - What effort has to be applied at C to just raise the load $L = 20 \text{ kg f}$? (Neglect the weight of pulley A and friction).

QUESTION 8.

- (i) The diagram below shows a magnetic compass kept closer to a coil AB wound around a hollow cylindrical cardboard. [3]



- After studying the circuit and the magnetic compass carefully, state whether the switch S_1 is open or closed.
 - How did you arrive at the conclusion in (i)?
 - What is the purpose of placing the magnetic compass in the above setup?
- (ii) (a) Define nuclear fission. [3]
- (b) Rewrite and complete the following nuclear reaction by filling in the atomic number of Ba and mass number of Kr :
- $${}_{92}^{235}\text{U} + {}_0^1n \longrightarrow \text{.....Ba} + {}_{36}^{144}\text{Kr} + 3{}_0^1n + \text{Energy}$$
- (iii) Four lamps of 200 watt, 100 watt, 60 watt and 40 watt are connected to a power supply of 220 volts; calculate : [4]
- total current consumed.
 - total resistance of this arrangement and
 - the cost of keeping them lighted for 7 hours daily for 30 days, the cost of electricity being 30 paise per unit.

QUESTION 9.

- (i) A refrigerator converts 100 g of water at 20°C into ice at -10°C in one hour. Determine the quantity of heat extracted per second. [3]
[Given : specific latent heat of ice = 336 J/g and specific heat capacity of ice = $2.1\text{ J/g }^{\circ}\text{C}$, specific heat capacity of water = $4.2\text{ J/g }^{\circ}\text{C}$.]
- (ii) Specific heat capacity of substance A is $3.8\text{ J g}^{-1}\text{K}^{-1}$ whereas the specific heat capacity of substance B is $0.4\text{ J g}^{-1}\text{K}^{-1}$. [3]
(a) Which of the two is a good conductor of heat?
(b) How is one led to the above conclusion?
(c) If substances A and B are liquids, then which one would be more useful in car radiators?
- (iii) (a) Two sets A and B of three bulbs each, are glowing in two separate rooms. When one of the bulbs in set A is fused, the other two bulbs also cease to glow. But in set B, when one bulb fuses, the other two bulbs continue to glow. Explain why this phenomenon occurs. [4]
(b) Why do we prefer arrangements of set B for house circuiting?

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