2026
EXAMINATION

ICSE
CLASS 10

LAST 10 YEARS' SOLVED PAPERS
(2025-2015)

Physics, Chemistry, Mathematics, Biology, Economics, History & Civics, Geography, English Paper–1, English Paper–2

FEATURES

- Latest ICSE 2025 Board Paper
- Detailed Solutions
- All PYQs Covered Till Date
- Weightage Analysis of Last 5 Years
- Competency Tagging of all PYQs

Weightage and Trend Analysis of
ICSE Past 5 Years' Papers

PHYSICS

Unit Name	2020	2021	2022 Sem-I	2022 Sem-II	2023	2024	2025
Force, Work, Power and Energy	18	Exam not conducted	15	0	25	23	19
Light	26		16	0	24	21	22
Sound	10		5	10	8	10	10
Electricity and Magnetism	23		0	20	23	23	29
Heat	14		2	10	10	10	12
Modern Physics	6		2	11	10	13	8

CHEMISTRY

Unit/Chapter Name	2020	2021	2022 Sem-I	2022 Sem-II	2023	2024	2025
Periodic Properties and variations of Properties – Physical and Chemical	6	Exam not conducted	9	0	7	11	10
Chemical Bonding	6		3	0	3	12	10
Study of Acids, Bases and Salts	12		10	2	8	14	4
Analytical Chemistry	12		2	2	10	5	18
Mole Concept and Stoichiometry	13		5	0	11	11	12
Electrolysis	11		8	0	8	7	9
Metallurgy	9		0	11	9	11	2
Study of Compounds - Hydrogen Chloride	5		1	4	2	3	2
Study of Compounds - Ammonia	2		0	7	9	3	8
Study of Compounds - Nitric Acid	3		0	3	1	2	2
Study of Compounds - Sulphuric Acid	2		0	9	6	6	8
Organic Chemistry	18		0	17	13	15	15

MATHEMATICS

Unit Name	2020	2021	2022 Sem-I	2022 Sem-II	2023	2024	2025
Commercial Mathematics	10	Exam not conducted	8	-	9	11	14
Algebra	46		26	9	49	42	45
Geometry	21		6	11	17	21	18
Mensuration	6		-	7	5	9	8
Trigonometry	11		-	11	9	10	10
Statistics	13		-	14	16	13	11
Probability	3		-	8	4	4	4

BIOLOGY

Chapter Name	2020	2021	2022 Sem-1	2022 Sem-2	2023	2024	2025
Structure of chromosomes, cell cycle and cell division	3.5	Exam not conducted	10	0	8	5	8
Genetics	8.5		5	0	7	5	6
Absorption by roots- the process involved	2		5	0	6	5	4
Transpiration	7		10	0	7	5	6
Photosynthesis	8		10	0	6	9	9

**The marks allotment mentioned above is Unit/Chapter-wise and includes internal choice questions as well. Therefore, the total might not match the Maximum Marks of the respective Previous Year Paper.*

CONTENTS

SCAN FOR LATEST & UPCOMING SPECIMEN PAPERS

ECONOMICS

ENGLISH

2025 PHYSICS

ICSE Solved Paper

Time allowed: 2 hours **Maximum Marks : 80**

GENERAL INSTRUCTIONS:

Read the following instructions carefully and follow them:

(*i*) Answers to this paper must be written on the paper provided separately.

(*ii*) You will **not** be allowed to write during first **15** minutes.
This time is to be spent in reading the question paper.

(*iii*) The time given at the head of this paper is the time allowed for writing the answers.

(*iv*) **Section I** is compulsory. Attend **any four** questions from **Section II**.

(*v*) The intended marks for questions or parts of questions are given in brackets [ ].

SECTION-A

(*Attempt **all** questions from this **Section.***)

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

(*i*) A body is acted upon by two equal and opposite forces, that are NOT along the same straight line. The body will: **(*Un*) [1]**

(*a*) remain stationary
(*b*) have only rotational motion
(*c*) have only rectilinear motion
(*d*) have both rectilinear and rotational motion

(*ii*) Which among the following is a vector quantity? **(*Re*) [1]**

(*a*) work (*b*) power
(*c*) energy (*d*) moment of couple

(*iii*) What is the correct energy transformation during burning of a candle? **(*Ap*) [1]**

(*a*) heat → kinetic + potential
(*b*) heat → chemical + light
(*c*) chemical → heat + light
(*d*) mechanical → chemical + heat

(*iv*) when a ray of light passes from one optical medium to another, which of the following physical quantities does NOT change? **(*Re*) [1]**

(*a*) Amplitude of the wave
(*b*) Frequency of the wave
(*c*) Wavelength of the wave
(*d*) Speed of the wave

(*v*) Which one of the following combinations is the correct ascending order of electromagnetic waves in terms of wavelength? **(*Re*) [1]**

(*a*) gamma-rays, visible light, microwaves
(*b*) microwaves, visible light, gamma-rays
(*c*) gamma-rays, microwaves, visible light
(*d*) microwaves, gamma-rays, visible light

(*vi*) For a lever, a graph is plotted with load on Y-axis and effort on X-axis. Which of the following represents the slope of the graph? **(*An*) [1]**

(*a*) Mechanical advantage
(*b*) Velocity ratio
(*c*) 1/Velocity ratio
(*d*) 1/Mechanical advantage

(*vii*) For a real image formed by a convex lens, the ratio of I : O = 2 : 5, then the object is: (*I* is the height of the image and O is the height of the object) **(*An*) [1]**

(*a*) between O and F (*b*) beyond 2F
(*c*) at F (*d*) between F and 2F

(*viii*) A ray of light is incident normally on a face of an equilateral prism. The ray gets totally reflected at the second refracting surface. The total deviation produced in the path of the ray is: **(*Ev*) [1]**

(*a*) 30° (*b*) 60°
(*c*) 90° (*d*) 120°

(*ix*) In a closed circuit containing a bulb and a cell, the electromotive force (ε) and the terminal voltage (V) is related as **(*Re*) [1]**

(Given I is current and r is internal resistance.)

(*a*) $V = \varepsilon + Ir$ (*b*) $V = \varepsilon - Ir$

(*c*) $V = \varepsilon \not\propto Ir$ (*d*) $V = \varepsilon \times Ir$

(*x*) A metal piece of mass 5 g has thermal capacity 2.5 JK^{-1}. If the mass of the metal is tripled, then its specific heat capacity will be: **(*Ev*) [1]**

(*a*) 7.5 JK^{-1} (*b*) 2.5 JK^{-1}

(*c*) 1.5 $Jg^{-1}K^{-1}$ (*d*) 0.5 $Jg^{-1}K^{-1}$

(*xi*) Assertion (*A*): As the level of water in a tall measuring cylinder kept under running tap rises, the pitch of sound gradually increases.

Reason (R): Frequency of sound is inversely proportional to the length of the water column.

(*Un*) [1]

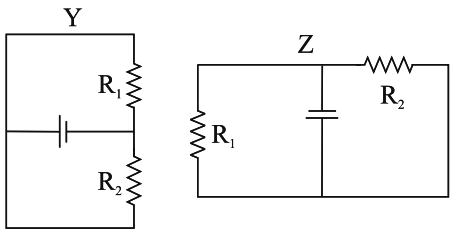
(*a*) Both (A) and (R) are true and (R) is correct explanation of (A)

(*b*) Both (A) and (R) are true and (R) is not the correct explanation of (A)

(*c*) (A) is true but (R) is false

(*d*) (A) is false but (R) is true

(*xii*) In the given circuits Y and Z, the resistors, R_1 and R_2, are connected in: **(*An*) [1]**



(*a*) series in both the circuits

(*b*) parallel in both the circuits

(*c*) parallel in Y and series in Z

(*d*) series in Y and parallel in Z

(*xiii*) A radioactive element P emits one α-particle and transforms to a new element Q.

What will be the position of the element Q in the periodic table? **(*Un*) [1]**

(*a*) One group to the left of P

(*b*) One group to the right of P

(*c*) Two groups to the right of P

(*d*) Two groups to the left of P

(*xiv*) Each of the substances given below is supplied with same amount of heat. Which one will attain the highest temperature? **(*An*) [1]**

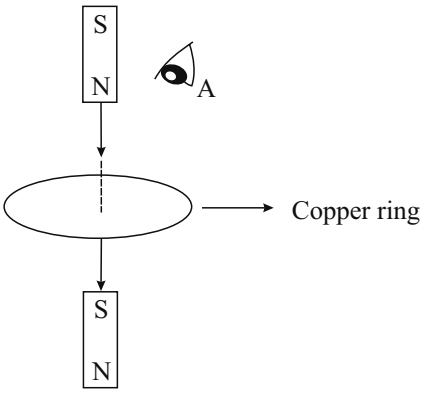
Substance	Lead	Aluminium	Copper	Iron
Specific heat capacity (cal/g°C)	0.031	0.21	0.095	0.115

(*a*) Aluminium (*b*) Copper

(*c*) Iron (*d*) Lead

(*xv*) The following figure shows a small bar magnet falling freely through a copper ring. For the observer at A, the direction of the induced current will be:

(*An*) [1]



(*a*) clockwise when magnet is above and below the ring

(*b*) anticlockwise when magnet is above and below the ring

(*c*) anticlockwise when magnet is above the ring and clockwise when the magnet is below the ring

(*d*) clockwise when magnet is above the ring and anticlockwise when the magnet is below the ring

2. (*i*) Complete the following by choosing the correct answers from the bracket :

(*a*) In uniform circular motion the centrifugal force acts _____

[towards the centre / away from the centre / along the tangential direction] **(*Re*) [1]**

(*b*) Refractive index of a medium is independent of _____

[temperature / angle of incidence / wavelength of light] **(*Re*) [1]**

(*c*) Heat absorbed during change of phase depends on _____

[mass / change in temperature / specific heat capacity] of the substance. **(*Re*) [1]**

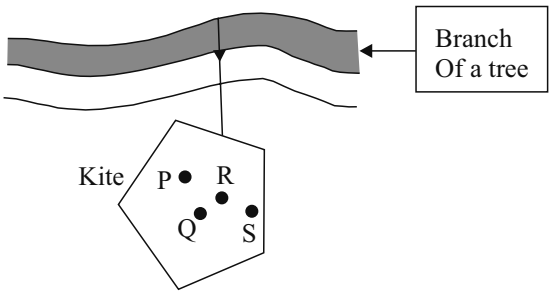
(*d*) Emf of a cell is _____ [greater than / less than / equal to] the terminal voltage when the cell is in open circuit. **(*Un*) [1]**

(*e*) In a step-up transformer the turns ratio is _____ [more than 1 / less than 1 / equal to 1]

(*Re*) [1]

(*f*) The nuclear radiation with lowest ionizing power is _____ [α / β / γ] **(*Re*) [1]**

(*ii*) A non-uniform kite is hanging freely from the branch of a tree as shown. Study the figure and answer the following : **(*An*) [2]**



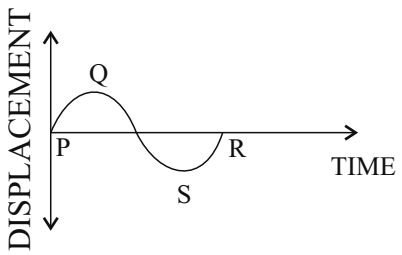
(*a*) Fill in the blank

_____ (*P*, Q, R or S) is the most probable position of its centre of gravity. **(*An*)**

(*b*) Support your answer to (*a*) with a reason. **(*Un*)**

(*iii*) The displacement-time graph of a sound wave produced by a vibrating wire is shown below

[2]



(*a*) How will you adjust the tension in the wire to reduce the length of PR? **(*Un*)**

(*b*) Which characteristic of sound is affected by the reduction in the length of PR? **(*Re*)**

3. (*i*) A ray of light enters a rectangular glass slab submerged in water at an angle of incidence 55°. Does this ray undergo total internal reflection when it moves from water to glass? Justify your answer. (This critical angle for glass-water interface is 54°.)

(*Un*) [2]

(*ii*) According to the NEW colour convention which colour of wire is connected to: **[2]**

(*a*) the metal body of the appliance **(*App*)**

(*b*) the switch of the appliance? **(*App*)**

(*iii*) (*a*).Which of the two, alternating current or direct current, produces a varying magnetic field when it flows through a conductor? **(*Un*) [2]**

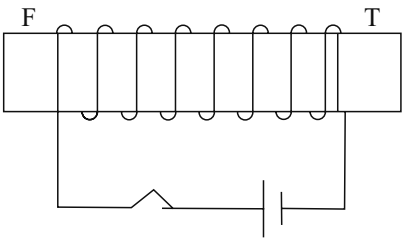
(*b*) State the frequency of the alternating current supply in India. **(*Re*)**

(*iv*) Calculate the amount of heat absorbed by 200 g of paraffin wax to melt completely at its melting point. [Specific latent heat of fusion of paraffin wax = 146 Jg^{-1}] **(*Ev*) [2]**

(*v*) Copper wire is wound a steel bar FT. Current is allowed to pass through the coil for some time and then the bar is removed. **[2]**

(*a*) Draw only the magnetic bar FT and mark its poles. **(*Cr*)**

(*b*) Trace two magnetic lines of force around FT clearly indicating the direction. **(*Cr*)**

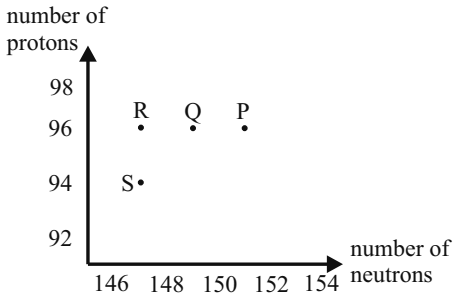


(*vi*) A current flows through a metalling conductor for a long period of time. State the change you would expect in its: **(*Un*) [2]**

(*a*) Resistance

(*b*) Resistivity

(*vii*) Curium is a radioactive element with the symbol $^{247}_{96}Cm$ named in honour of Madam Curie. The graph of number of protons vs number of neutrons for some elements are shown below: **(*An*) [3]**



(*a*) Which point on the graph indicates the element Cm?

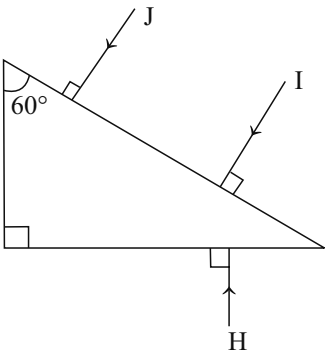
(*b*) Which point on the graph indicates daughter nucleus after Cm undergoes radioactive decay of 1 α followed by 2β?

(*c*) State the mass number of the daughter nucleus.

SECTION-B

(*Attempt **any four** questions from this **Section.***)

4. (*i*)

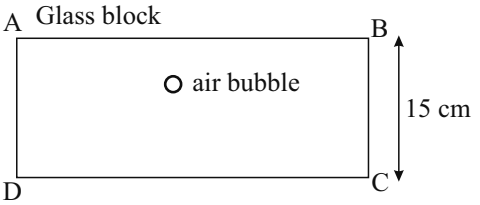


(3)

(*a*) Out of the three rays (*I*, J, H) shown in the diagram, which ray will suffer Total Internal Reflection while inside the prism? (Critical angle of the prism is 42°) **(*An*)**

(*b*) Copy the diagram to complete the path of the ray which you have named in (*a*) till it comes out of the prism. **(*Cr*)**

(*ii*) A rectangular glass block of refractive index 1.5 has an air bubble trapped inside it as shown in the diagram. When seen from the surface AB, it appears to be 4 cm deep. **[3]**



(*a*) Calculate the actual depth of the air bubble from the surface AB. **(*Ev*)**

(*b*) For which colour of light, blue or yellow, the apparent depth will be greater? **(*Un*)**

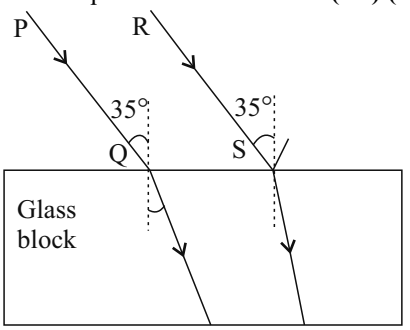
(*c*) Turning the glass block upside down, DOES NOT change the apparent depth of the air bubble. State True or False. **(*Un*)**

(*iii*) (*a*) An object is placed at 2F position of a convex lens. Draw a ray diagram showing the formation of the image. **(*Cr*) [4]**

(*b*) How will the size of the image change if we, ONLY replace the lens in the above arrangement with another lens of a greater focal length? **(*An*)**

5. (*i*) An object is placed in front of a concave lens at a distance of 45 cm from it. If its image is formed at a distance of 30 cm from the lens, calculate the focal length of the lens. **(*Ev*) [3]**

(*ii*) Two rays PQ and RS are incident on a rectangular glass block as shown in the diagram. Observe the diagram and answer the questions that follow. **(*An*) (*3Marks*)**



Which of thee two rays will :

(*a*) have greater lateral displacement on emerging out of the block?

(*b*) travel with greater speed in the block?

(*c*) Scatter more in the atmosphere?

(*iii*) (*a*) Name the radiations: **(*Re*) [4]**

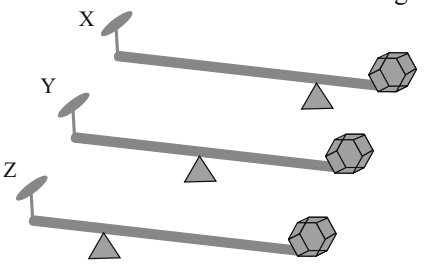
1. for which a quartz prism is used to study the spectrum.
2. which are used in remote sensing devices.
3. which are used in traffic signals in India.

(*b*) Name one property common to all electromagnetic radiations.

6. (*i*) Akash takes a uniform meter scale and suspends a weight of 2 N at one end 'X' and a weight of 5 N on the other end 'Y'. He then balances the ruler horizontally on a knife edge placed at 70 cm from X. Draw a diagram of the arrangement and calculate the weight of the ruler. **(*Cr*) [3]**

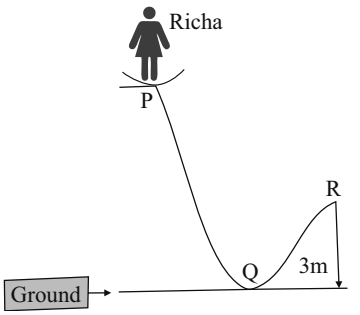
(*ii*) Three levers X, Y, Z of equal lengths are shown in the diagram. **(*An*) [3]**

(*a*) Which class of lever do these belong to?



(*b*) Among these (*X*, Y or Z) which one will give the maximum mechanical advantage? Justify your answer. **(*Un*)**

(*iii*)



Richa weighing 40 kgf leaves point P on her skateboard and reaches point Q on the ground with velocity 10 ms^{-1}. Calculate: **(*Ev*) [4]**

(*a*) The kinetic energy of Richa at point Q.

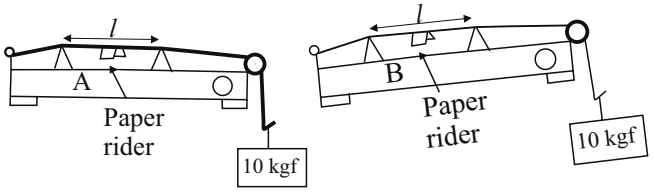
(*b*) The vertical height of point P above the ground. (*U*se g as 10 m/s^2 and neglect friction)

(*c*) The kinetic energy of Richa at point R. (*W*hile moving from Q to R, she loses 500 J of energy against friction.)

7. (*i*) Draw a block and tackle system of pulleys with velocity ratio equal to 3. **(*Cr*) [3]**

(*ii*) A submarine in the sea, sends ultrasonic ping and a stopwatch is started simultaneously. The stopwatch stops on receiving the reflected wave from an obstacle and reads 1 minute 40 seconds. Calculate the distance of the obstacle from the submarine. (*S*peed of sound in water 1500 ms^{-1}.) **(*Ev*) [3]**

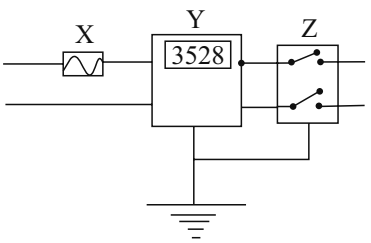
(*iii*) The diagrams given below show two sound boxes A and B with wires of same length (l) and tension (10 kgf) but different cross-sectional areas. Simultaneously, vibrating tuning forks of frequency 300 Hz are placed on the boxes A and B. The paper rider falls off in case of B but not in case of A. **(*Un*+*An*) [4]**



(*a*) Name and explain the phenomenon responsible for the falling off of the paper rider in B.

(*b*) The wire A resonates with a tuning fork of frequency 'f'. Is 'f' greater than, less than or equal to 300 Hz? Justify your answer.

8. (*i*) The diagram shows wiring in a meter room of a building. **(*An*+*Un*) [3]**

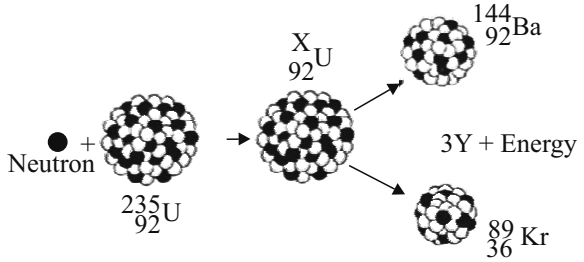


(*a*) What is the current rating of device X?

(*b*) What is the difference between the switch Z shown in the diagram and the switches you use to operate different appliances at home?

(*c*) What is the unit of the physical quantity displayed in Y?

(*ii*) Study the diagram given below and answer the questions that follow: **(*An*+*Un*) [3]**

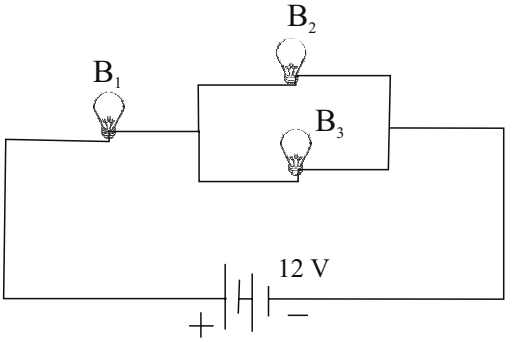


(*a*) Name the process depicted in the diagram.

(*b*) What is the value of X?

(*c*) Identify Y, the missing product of the reaction.

(*iii*) Three identical bulbs B_1, B_2 and B_3 each of power rating 18 W, 12 V are connected to a battery of 12 V. **[4]**



(*a*) Calculate: **(*Ev*)**

1. the resistance of each bulb
2. the current drawn from the cell

(*b*) If the bulb B_3 is removed from the circuit, then will the brightness of the bulb B_1 increase, decrease or remain the same? **(*An*)**

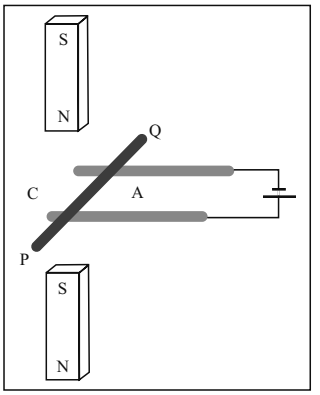
9. (*i*) 30 g of ice at 0°C is used to bring down the temperature of a certain mass of water at 70°C to 20°C. Find the mass of water. [Specific heat capacity of water = 4.2 $Jg^{-1}°C^{-1}$ and specific latent heat of ice = 336 Jg^{-1}] **(*Ev*) [3]**

(*ii*) (*a*) A certain amount of heat will warm 1 g of material X by 10°C and 1 g of material Y by 40°C. Which material has higher specific heat capacity? **(*Un*) [3]**

(*b*) Which material, X or Y, would you select to make a calorimeter? **(*Un*)**

(*c*) The specific heat capacity of a substance remains the same when it changes its state from solid to liquid. State True or False. **(*Un*)**

(*iii*) A copper rod PQ carrying current is kept in a magnetic field as shown in the diagram. **(*An*+*Un*) [4]**



(*a*) The copper rod PQ will move towards C. State True or False.

(*b*) Name the law used to determine the direction of motion of PQ.

(*c*) What will be the effect on the force experienced, if the rod PQ is replaced by another copper rod of same length but of greater cross-sectional area?

(*d*) Justify your answer in (*c*).

SECTION-A

1. (*i*) (*b*)When a body is acted upon by two equal and opposite forces that are not along the same straight line, these forces create a couple, resulting in rotational motion without translational movement.

(*ii*) (*d*) The tendency of a couple of forces describes the turning effect of a force, and is a vector quantity because it has both magnitude and direction.

(*iii*) (*c*) When a candle burns, the chemical energy stored in the wax is transformed into heat and light energy through combustion.

(*iv*) (*b*) When a ray of light transitions between different optical media, its frequency remains unchanged.

(*v*) (*a*) In the electromagnetic spectrum, microwaves have longer wavelengths than visible light, while gamma rays possess the shortest wavelengths.

(*vi*) (*a*) Mechanical advantage (MA) is the ratio of load to effort: $MA = \frac{\text{Load}}{\text{Effort}}$

(*vii*) (*b*) If the object is placed beyond 2F, the image is real, inverted and diminished.

(*viii*) (*a*) $\delta = i + e - A$. Here, $i = 0°$, $e = 90°$, $A = 60°$

(*ix*) (*b*) The relationship between the terminal voltage V, electromotive force ε, current I, and internal resistance r is given by the equation in b.

(*x*) (*d*) The formula relating thermal capacity (C), mass (m), and specific heat capacity (c) is: $C = mc$

(*xi*) (*c*) The frequency of sound in this context is inversely proportional to the length of the air column above the water, not the water column itself.

(*xii*) (*b*)

(*xiii*) (*d*) When a radioactive element emits an alpha (α) particle, its nucleus loses 2 protons and 2 neutrons. This results in a decrease of 2 in its atomic number and 4 in its mass number. Consequently, the new element formed occupies a position two places to the left of the original element in the periodic table.

(*xiv*) (*d*)

(*xv*) (*c*) anticlockwise when magnet is above the ring and clockwise when the magnet is below the ring.

2. (*i*) (*a*) away from the centre

(*b*) angle of incidence

(*c*) mass

(*d*) equal to

(*e*) more than 1

(*f*) γ

(*ii*) (*a*) R

(*b*) Since the kite hanging at point R from the branch is in equilibrium, hence net force and torque acting on it are zero. Therefore, most probable position of centre of gravity is point R.

(*iii*) (*a*) Reducing length of PR means decreasing the period. So decreasing the tension is effective as it increase the wave speed which in turn decreases the time period.

(*b*) Shortening the length of the wire increases the frequency of vibration which result in higher pitched sound.

3. (*i*) No, the given ray does not experience total internal reflection while transitioning from water ($\mu = 1.33$) to glass ($\mu = 1.5$). This is because water is optically less dense than glass, and total internal reflection occurs only when light travels from a denser to a less dense medium.

(*ii*) (*a*) The wire connected to metal body is Earth wire which is identified by green or yellow insulation.

(*b*) The wire connected to switch is Live wire which is distinguished by brown insulation.

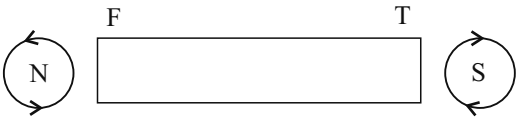
(*iii*) (*a*) Alternating current generates a changing magnetic field when passing through a conductor.

(*b*) In India, the frequency of the AC supply is 50 Hz.

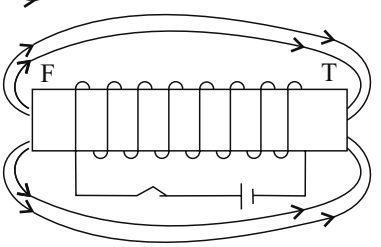
(*iv*) The formula for heat absorbed during a phase change is $Q = mL$, where Q is the heat absorbed, m is the mass and L is specific heat of fusion.

$\Rightarrow Q = L \times m = 146 \times 200 = 29.2$ kJ

(*v*) (*a*)



(*b*)



(*vi*) (*a*) The resistance of a metallic conductor rises over time due to the increase in temperature. As time progresses, the conductor's temperature elevates, leading to a corresponding rise in resistance.

(*b*) The resistivity of a metallic conductor increases over time because, as time passes, the temperature of the conductor rises, and resistivity is directly proportional to temperature in metallic conductors.

(*vii*) (*a*) P represents the element Cm.

(*b*) $^{247}_{96}\text{Cm} \xrightarrow{\text{á-decay}} {}^{243}_{94}\text{Cm} + {}^{4}_{2}\text{He}$

$^{247}_{94}\text{Cm} \xrightarrow{\beta\text{-decay}} {}^{243}_{95}\text{Cm} + {}^{0}_{-1}\text{e}$

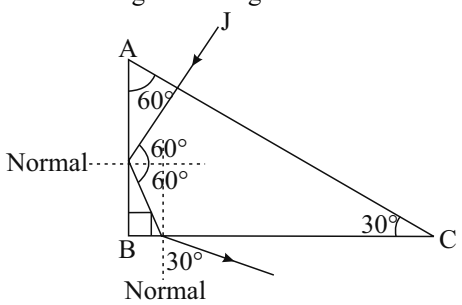
$^{243}_{95}\text{Cm} \xrightarrow{\beta-\text{decay}} {}^{243}_{96}\text{Cm} + {}^{0}_{-1}\text{e}$

(*c*) Mass number of the daughter nucleus is 243.

SECTION-B

4. (*i*) (*a*) Out of the three rays (I, J, H), ray J will undergo total internal reflection, provided it travels from a denser medium to a rarer medium at an angle greater than the critical angle for the given interface. **[Cr]**

(*b*)



(*ii*) (*a*) Apparent depth $= \dfrac{\text{Actual depth}}{\mu}$

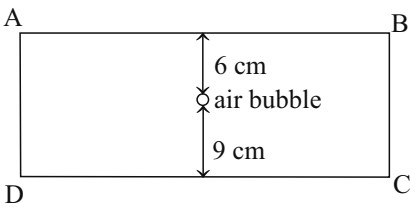
$\therefore$ Actual depth $= 4 \times 1.5 = 6$ cm

(*b*) $v = f\lambda = \dfrac{c}{\mu}$

We have, $\lambda \propto \dfrac{1}{\mu}$ or $\mu \propto \dfrac{1}{\lambda}$

The apparent depth will be greater for yellow light because the refractive index of a medium decreases for longer wavelengths, causing less bending of light and making objects appear deeper.

(*c*) False,

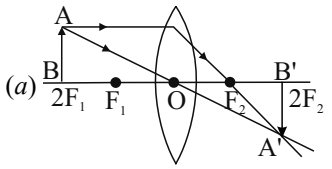


If the observer sees the air bubble from surface DC then,

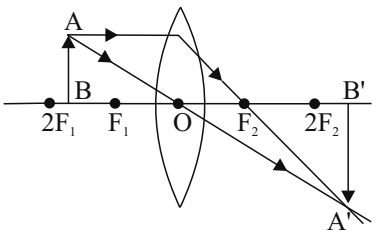
Apparent depth $= \dfrac{9}{1.5} = 6\text{cm}$

When the glass block is inverted, the apparent depth increases from 4 cm to 6 cm.

(*iii*) (*a*)



(*b*) Let us assume that the object distance remains constant.



$\therefore$ The size of the image will increase.

5. (*i*) According to given question

u = –45 cm, v = –30 cm, f = ?

By applying, lens formula

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-30} + \frac{1}{45} = \frac{1}{f}$$

$$\frac{-1}{90} = \frac{1}{f}$$

f = 90 cm

(*ii*) (*a*) RS

Lateral displacement $(d) = \dfrac{t}{\cos r}\sin(i - r)$

(*b*) PQ

(*c*) RS

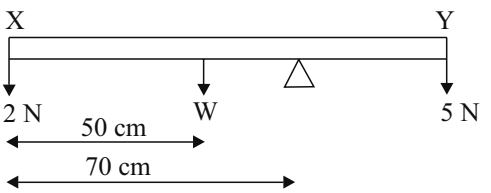
(*iii*) (*a*) (1) Quartz prism for spectrum study: Ultraviolet (UV) radiation.

(2) Remote sensing devices: Infrared (IR) radiation.

(3) Traffic signals in India: Visible light.

(*b*) They can travel through vacuum.

6. (*i*)



Since the ruler is in equilibrium, the net torque acting on it must be zero

Net torque = $2 \times 70 + W \times (70 - 50) - 5 \times (30) = 0$

$W = 0.5$ N

Hence, Weight of the ruler is 0.5 N

(*ii*) (*a*)Class I lever

(*b*) Lever X provides the highest mechanical advantage because, for maximum mechanical advantage, the ratio of the effort arm to the load arm must be as large as possible.

(*iii*) (*a*) K.E. at $Q = \frac{1}{2}mv^2$

$= \frac{1}{2} \times 40 \times (10)^2$

$= 2$ kJ

(*b*) The decrease in potential energy from point P to point Q is equal to the kinetic energy gained at point Q, following the principle of conservation of energy.

$mgh = 2$ kJ

$h = \frac{2000}{40 \times 10} = 5m$

(*c*) Total mechanical energy at point Q = Total mechanical energy at point R

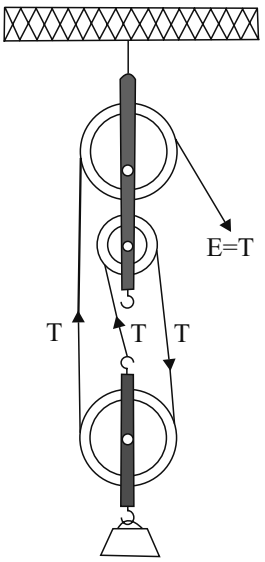
$KE_Q + PE_Q = KE_R + PE_R$ + loss in energy against friction

$2000 + 0 = KE_R + 40 \times 10 \times 3 + 500$

Hence,

The kinetic energy of richa at point R (KE_R) = 300 J

7. (*i*)



L = 3T

V.R. = 3

Mechanical Advantage = 3

(*ii*) $v = \frac{2d}{t}$

$1500 = \frac{2 \times d}{t}$

$d = 75000$ m

Thus, the distance of the obstacle from the submarine is 75 km.

(*iii*) (*a*) The paper rider in B falls off due to resonance. When the natural frequency of the wire matches the frequency of the tuning fork, the wire vibrates with greater amplitude, causing the paper rider to be displaced.

(*b*) Since wire A resonates with a tuning fork of frequency f, its frequency must be less than 300 Hz. In resonance, the frequency of the external force matches the natural frequency of the vibrating body. Given that wire A is thicker than wire B, its natural frequency is lower, making it less than 300 Hz.

8. (*i*) (*a*) 30 A

(*b*) Switch Z is a double-pole switch, whereas household switches are typically single-pole. A single-pole switch disconnects only the live wire from the appliance, while a double-pole switch disconnects both the live and neutral wires simultaneously, ensuring greater safety.

(*c*) kWh

(*ii*) (*a*) The given process depicted in diagram is of Nuclear fission of $^{235}_{92}U$ nucleus

(*b*) According to conservation of mass number

$235 + 1 = X$

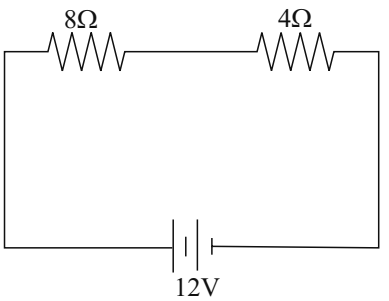
$\therefore X = 236$

(*c*) the missing product must be Y = neutron ($^{1}_{0}n$)

(*iii*) (*a*) 1. $R = \frac{V^2}{P}$

$R = \frac{(12)^2}{18} = 8\ \Omega$

2.



Now, total resistance of the circuit

$R_{net} = 12\ \Omega$

$\therefore I = \frac{12}{12} = 1A$

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