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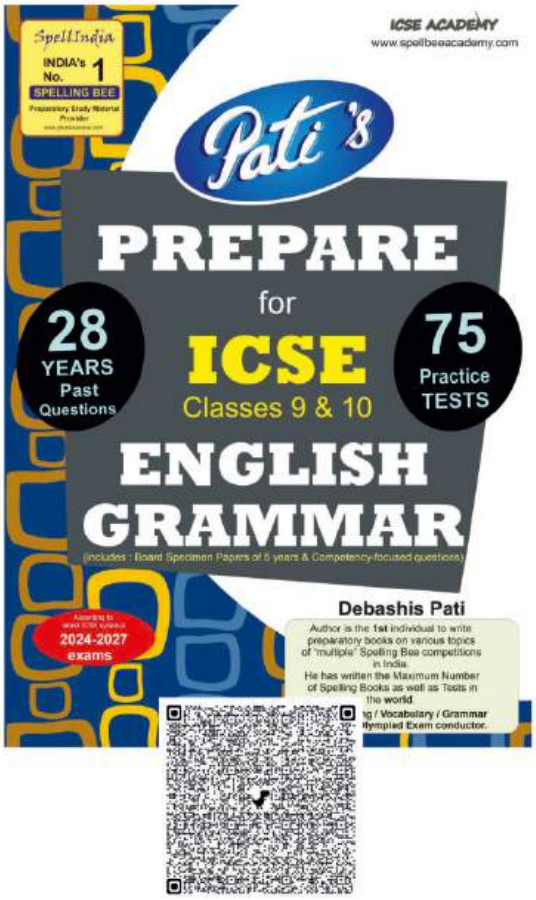

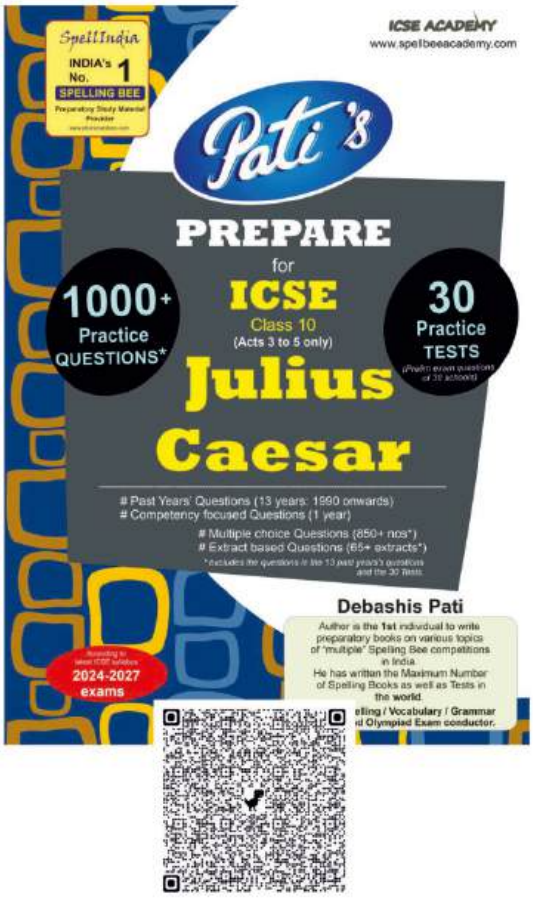

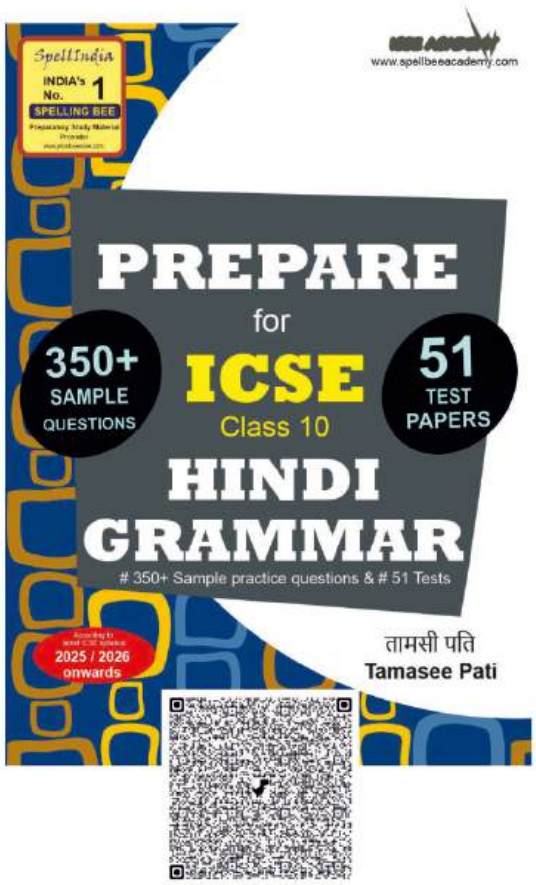

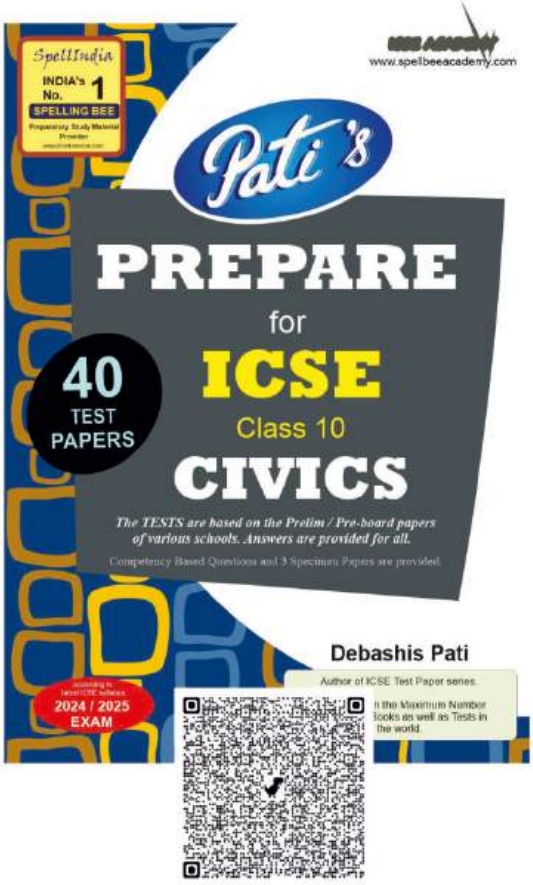

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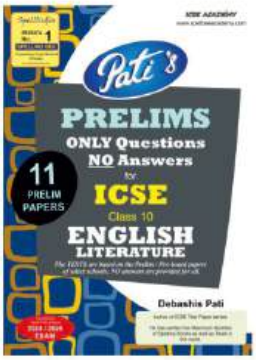

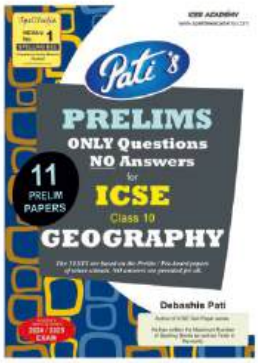

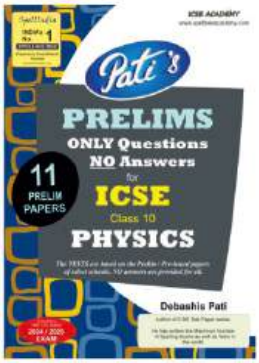

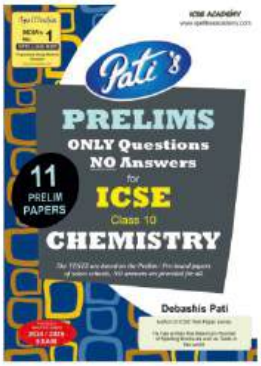

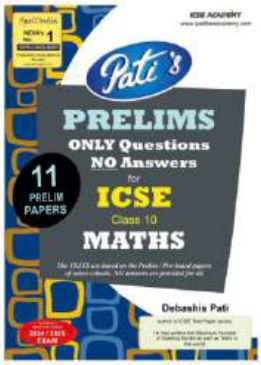

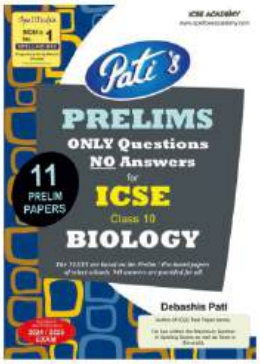

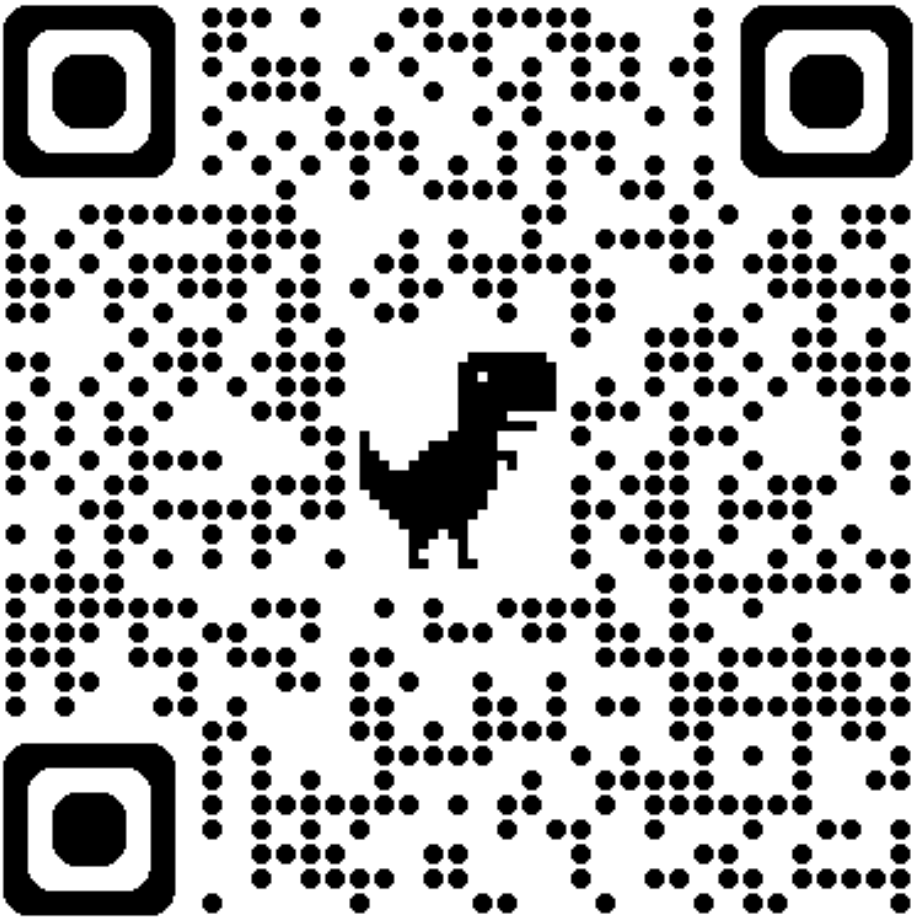

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2026 paper will be shared here in June 2026

PHYSICS

(SCIENCE PAPER – 1)

Maximum Marks: 80

Time allowed: Two hours

1. *Answers 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 [ ].*

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

This Paper consists of 16 printed pages.

SECTION A (40 Marks)

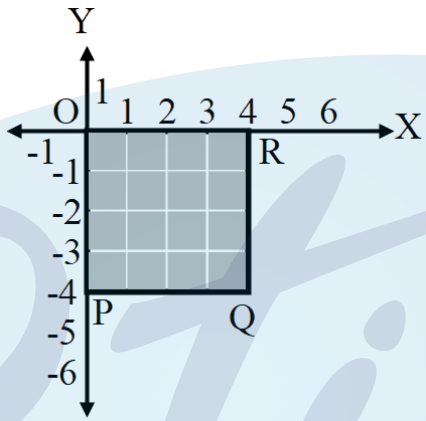
*(Attempt **all** questions from this **Section**.)*

Question 1

Choose the correct answers to the questions from the given options. [15]

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

(i) **Centre of gravity** of the given square **PQRO** lies at:



(a) (2, –2)

(b) (3, –2)

(c) (–2, 2)

(d) (–2, 1)

(ii) An object is thrown vertically up. It reaches the highest point and then comes down. The work done by the **force of gravity** on the object is:

(a) positive for both the way up and way down

(b) negative for both the way up and way down

(c) negative for the way up and positive for the way down

(d) positive for the way up and negative for the way down

(iii) 10 eV is _____.

(a) 1.6×10^{-18} J

(b) 1.6×10^{-19} J

(c) 6.25×10^{19} J

(d) 6.25×10^{18} J

(iv) A crowbar of length 1.0 m has its fulcrum at a distance of 0.2 m from the load. The **mechanical advantage** of the crowbar is:

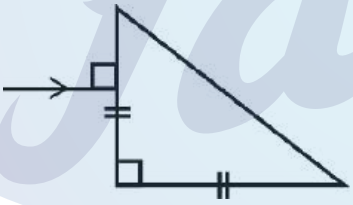
(a) 5

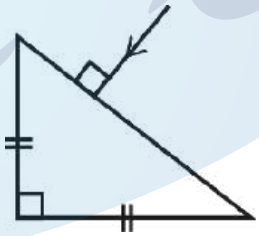
(b) 4

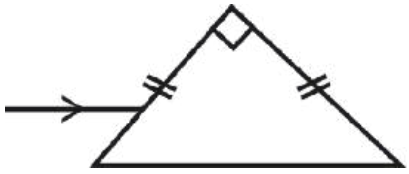
(c) 3

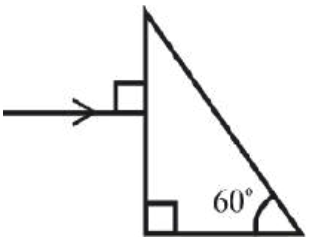
(d) 2

(v) Which of the following figures will depict deviation of a ray of light through 90° when it emerges out of the prism.

(a) 

(c) 

(b) 

(d) 

(vi) Which of the following values can represent the magnification of a **simple microscope**?

(a) +1

(b) –1

(c) +2

(d) –2

(vii) An object placed at a distance 30 cm in front of a lens produces clear inverted image at a distance 60 cm from the lens. If the object is placed at 60 cm from the lens, then it producesa clear inverted image ata distance of _____ from the lens.

(a) 20 cm

(b) 30 cm

(c) 60 cm

(d) 90 cm

(viii) **Assertion (A):** Quartz prism is used to study ultraviolet spectrum.

Reason (R): Quartz does not absorb ultraviolet radiations.

(a) Both (A) and (R) are true and (R) is the 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 and (R) is true.

(ix) The amplitude of a sound wave is **reduced** from 2 mm to 1 mm. The **intensity** of the sound will:

(a) become four times the initial

(b) remain the same

(c) become half of the initial

(d) become one fourth of the initial

(x) According to the **NEW** international convention, what is the colour coding for the live, neutral and earth wires in household circuits?

(a) Live – red, Neutral – black, Earth – green

(b) Live – green, Neutral – yellow, Earth – black

(c) Live – brown, Neutral – blue, Earth – yellow

(d) Live – red, Neutral – blue, Earth – yellow

(xi) An alloy ***constantan*** has resistivity $5 \times 10^{-7}\ \Omega$ m at 25°C. If the temperature of this alloy is increased to 50°C then its **resistivity** will be:

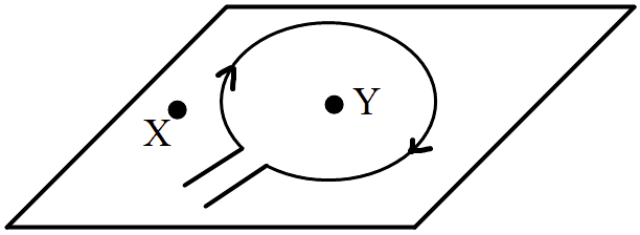
(a) $2.5 \times 10^{-7}\ \Omega$ m

(b) $5 \times 10^{-7}\ \Omega$ m

(c) $10 \times 10^{-6}\ \Omega$ m

(d) $20 \times 10^{-6}\ \Omega$ m

(xii) A current carrying circular loop is lying in a horizontal plane as shown in the diagram. Which of the following is the correct statement with respect to the direction of magnetic lines of force.



(a) upward at X and downward at Y

(b) downward at X and upward at Y

(c) upward at both X and Y

(d) downward at both X and Y

(xiii) For a body of mass ***m*** the relationship between the heat capacity ***(C')*** and specific heat capacity ***(c)*** is:

(a) $C' = mc$

(b) $C' = c/m$

(c) $C' = mc^2$

(d) $C' = m/c$

(xiv) A piece of a cake and a watermelon of the same mass are taken out of the freezer at the same time. Which of the following statement is correct?

(a) Cake and watermelon will attain the room temperature at the same time.

(b) Watermelon will attain the room temperature faster.

(c) Cake will attain the room temperature faster.

(d) Which one comes to the room temperature first, depends on the atmospheric pressure at that time.

(xv) During β emission the parent and daughter nuclei will be:

(a) isomers

(b) isotopes

(c) isotones

(d) isobars

Question 2

(i) Complete the following by choosing the correct answers from the bracket: [6]

(a) The **ideal** mechanical advantage of a single movable pulley is _____ *[less than 1 / more than 1 / equal to 1]*.

(b) If different colours of light strike a rectangular glass block at same angle of incidence, then **maximum** lateral displacement will be shown by _____ *[Red / Green / Blue]* colour.

(c) **1 joule** equals to _____ *[0.24 / 0.48 / 4.2]* **calorie**.

(d) The hole in the **right side** of the socket is for connection to the _____ *[live / neutral / earth]* wire.

(e) The direction of the **induced current** in the coil of an AC generator is determined by _____ *[Fleming's left-hand rule / Fleming's right-hand rule / Clock Rule]*.

(f) In a nuclear reactor, the **fission** reaction is initiated by bombardment with _____ *[a proton / a neutron / an α particle]*.

(ii) Will the position of the centre of gravity change if a hollow sphere is **completely** filled with mercury? Give a reason for your answer. [2]

(iii) Calculate the minimum distance needed in water to hear the echo. [2]
(*Speed of sound in water is 1500 ms^{-1}. Persistence of hearing is 0.1 s.)*

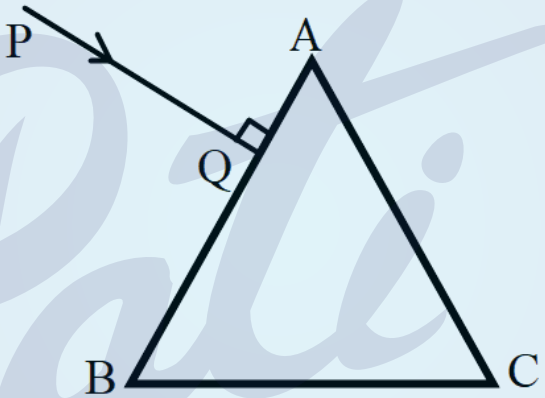
Question 3

(i) State the potential of the wire connected to the right hand side terminal of the **three pin plug** and also state its colour. [2]

(ii) State **two** properties of magnetic lines of force around a straight conductor carrying current. [2]

(iii) The heat capacity of a milk cooker is 450 J/K. Calculate the rise in the temperature when it absorbs 9000 J of heat. [2]

(iv) A ray of light **PQ** is incident normally on the face **AB** of an equilateral prism. The ray gets totally reflected from the surface **AC**. [2]

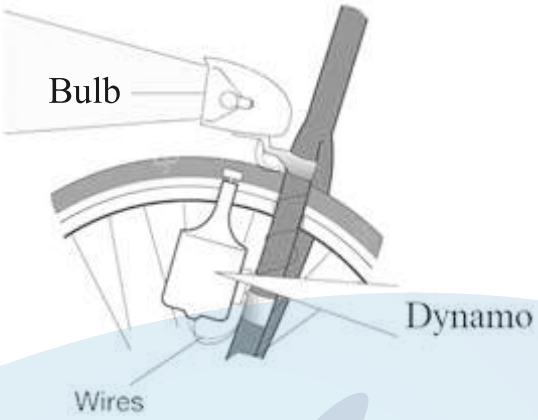


Calculate:

(a) the angle of deviation at **AC**.

(b) the angle of incidence at **BC**.

(v) The figure below shows a bicycle dynamo which is fitted to the tyre. When the wheels of the bicycle rotate, the spindle of dynamo attached to magnets rotate and the bulb glows. [2]

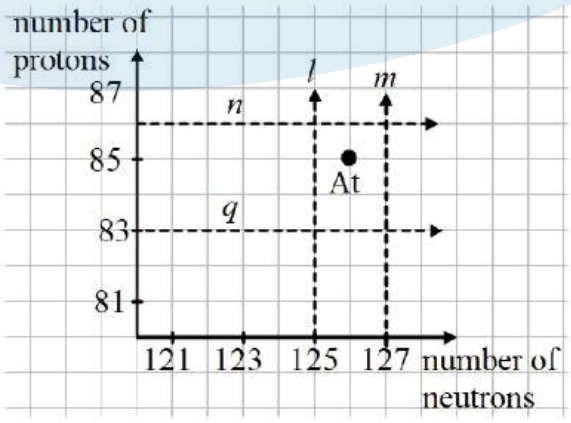


(a) Name the **phenomenon** that takes place when the bulb glows while the person rides the bicycle.

(b) What will be the effect on the brightness of the bulb when the rider **increases** the speed of the bicycle?

(vi) Define background radiation. Give one **internal** source of this radiation. [2]

(vii) Astatine *(At)* is a radioactive element. Study the graph given below showing the number of protons vs the number of neutrons of radioactive nuclei. [3]



(a) Identify the mass number of the nucleus Astatine *(At)*.

(b) Which line on the graph *(l, m, n, or q)* will never pass through the position of the daughter nuclei, regardless of **any number** of α, β, or γ emissions?

(c) Give a reason for your choice in (b).

SECTION B (40 Marks)

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

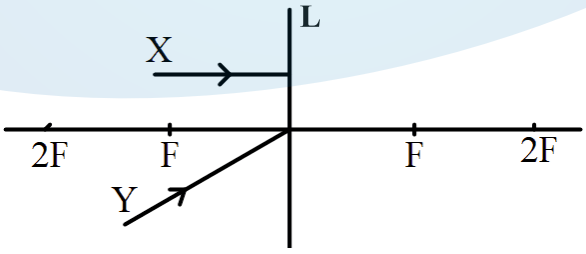
Question 4

(i) (a) A coin lies at the bottom of a beaker. Water is poured into the beaker upto a height of 8 cm. Calculate the shift seen in the position of the coin. [3]
(The refractive index of water is 4/3. The width of the glass wall of the beaker is negligible.)

(b) How will the **apparent depth** be affected if the temperature of water is increased?

(ii) Draw a ray diagram to invert the image **without deviation** of light using right angle isosceles prism. [3]

(iii) Answer the following with respect to a **concave lens (L)**. [4]



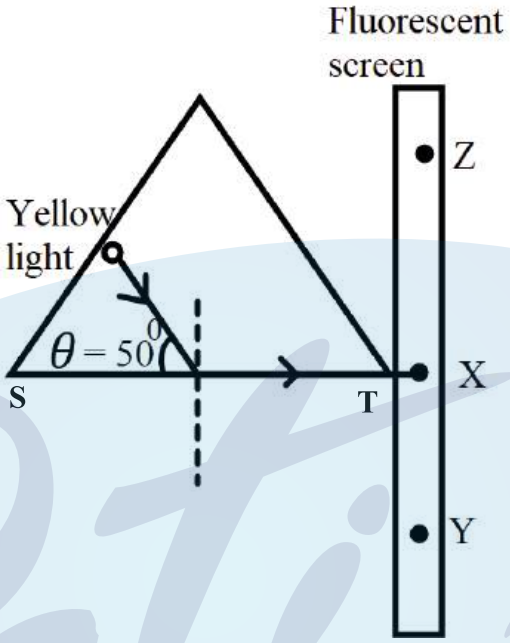
(a) **Describe** the path of the rays **X** and **Y** through the lens.

(b) Give one use of this lens.

(c) Calculate its power if the focal length of this lens is 20 cm.

Question 5

(i) The diagram given below shows a triangular prism of a certain material with fluorescent screen placed adjacent to it. The yellow light ray striking the surface **ST** of the prism shows a fluorescent spot at point **X**. [3]



(a) Calculate the **critical angle** of the material of the prism for yellow colour.

(b) To move the fluorescent spottowards **Y,** the value of ***θ*** should be _____ *(>50, <50 or = 50).*

(c) Which direction will the florescent spot move if yellow light is replaced with indigo light? *(towards **Y** or towards **Z**)*

(ii) An object is placed at a distance of 10 cm from a convex lens of focal length 20 cm. [3]

(a) Find the position of the image.

(b) What is the nature of the image?

(iii) (a) Name the electromagnetic radiations which are used for **sterilising water** in a water purifier. [4]

(b) State any one property of the radiations mentioned by you in part (a).

(c) Why are the danger signals red in colour?

Question 6

(i) A **uniform metre ruler** is balanced horizontally on a knife edge placed at 60 cm mark when a mass ***m*** is suspended from 75 cm mark. **Draw** the diagram of the arrangement. State with reason *(through mathematical steps)* whether the mass of the scale *is greater than, less than or equal to the mass* ***m***? [3]

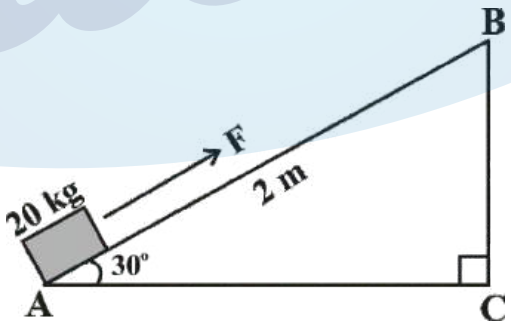
(ii) State the energy conversions taking place: [3]

(a) during photosynthesis

(b) in a thermocouple

(c) during bursting a cracker

(iii) An inclined plane makes an angle of 30° with the horizontal as shown in the figure. A box of mass 20 kg is taken from point **A** to point **B** along the inclined plane of length 2 m. [4]

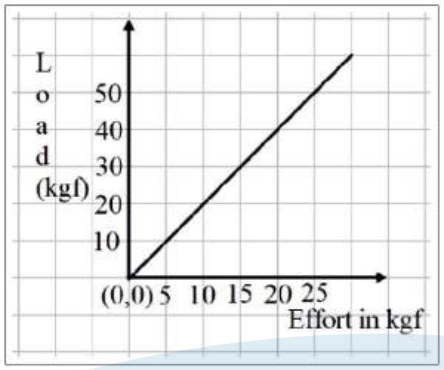


(a) Calculate the potential energy gained by the box.

(b) If 10 J of work is done again stfriction, in moving the bo x from **A** to **B** then calculate the force **F** needed to pull the block from **A** to **B**. *[g = 10 ms^{-2}]*

Question 7

(i) The graph shows load against effort for a lever with load and effort on the **same side** of the fulcrum. [3]



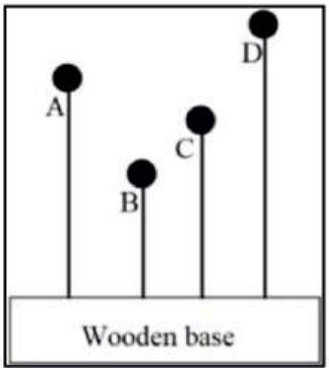
(a) Which attribute of the load vs effort graph must be calculated to determine the mechanical advantage?

(b) Which class does this lever belong? How did you arrive at this conclusion?

(ii) (a) A man fires a gun and hears its echo after 3 s. The man then moves 80 m towards the hill and fires his gun again. This time he hears the echo after 2.5 s. Calculate the speed of the sound. [3]

(b) State **one** reason of using ultrasonic waves in SONAR.

(iii) The diagram below displays four solid plastic balls attached to wires, all mounted on a wooden base. When a person shakes the wooden base back and forth at a steady pace, the balls begin to vibrate as well. It is noted that while all the balls vibrate, only one of them vibrates vigorously. [4]

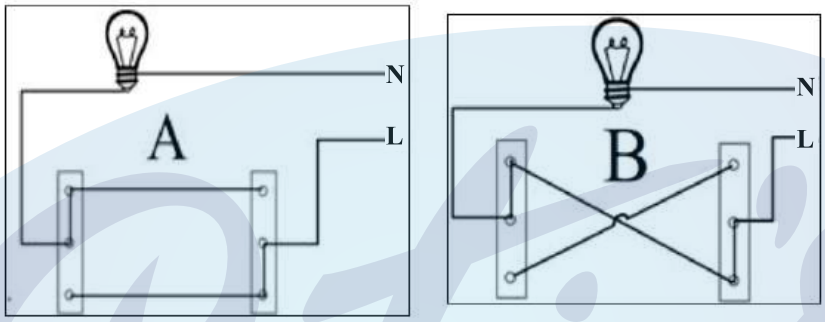


(a) Explain why only one ball vibrates vigorously.

(b) If f_A, f_B, f_C, and f_D are the natural frequencies of vibration of the wires, then arrange them in the increasing order of their frequencies and **justify**.

Question 8

(i) The diagram given below shows a bulb connected by dual control switches. Observe the diagrams and answer the questions that follow. [3]

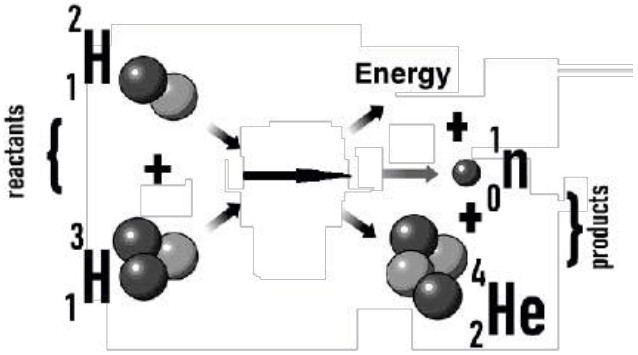


(a) Which switch can successfully turn the bulb **ON** or **OFF**? (Circuit **A**, Circuit **B**, or both)

(b) At present, in which circuit is the bulb glowing?

(c) If the **L** and **N** wires are swapped in the circuit (your answer to (b)), will the circuit still function?

(ii) Study the diagram and answer the questions that follow: [3]



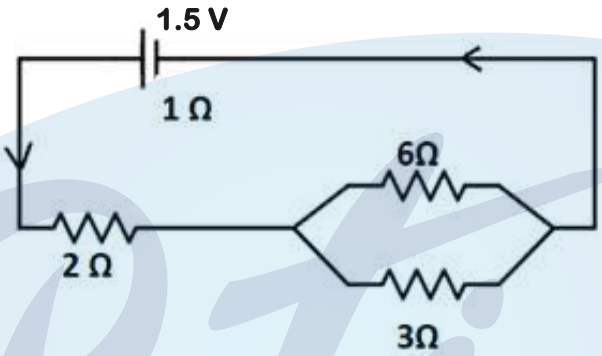
(a) Name the nuclear process displayed in the diagram.

(b) Is it possible to conduct this process at room temperature?

(c) Mass of reactants _____ mass of the products.

[Fill in the blank using <, > or =]

(iii) A cell of e.m.f 1.5 V and internal resistance 1 Ω is connected to two resistors of resistances 6 Ω and 3 Ω in parallel and a resistor of resistance 2 Ω in series as shown in the diagram. [4]



Calculate the current through:

(a) 2 Ω resistor

(b) 6 Ω resistor

Question 9

(i) A spirit lamp supplying heat at a rate of 50 W is used to melt 0.025 kg of ice at 0°C taken in a container. If all the ice in the container is melted in 168 s, then what is the specific latent heat of fusion of ice? [3]

(The heat capacity of the container is negligible.)

(ii) (a) State the principle of calorimetry. [3]

(b) Why should the surface of the calorimeter be polished?

(c) Why should the calorimeter be made of a material o**fow** specific heat capacity?

(iii) A student wants to design a **device** to connect a bulb rated 10 W, 22 V, to the mains 220 V, so that the bulb operates at its rated voltage. [4]

(a) Name the device he uses.

(b) **State** the principle involved in the working of this device.

(c) When the bulb is connected to the output of the device, calculate:

1. Current drawn
2. Resistance of the bulb

2025

PHYSICS

(SCIENCE PAPER – 1)

Maximum Marks: 80

Time allowed: Two hours

1. *Answers 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 [ ].*

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

This Paper consists of 16 printed pages.

SECTION A (40 Marks)

*(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 answers only.)

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

(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?

(a) work

(b) power

(c) energy

(d) moment of couple

(iii) What is the correct energy transformation during burning of a candle?

(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?

(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**?

(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?

(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)*

(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:

(a) 30°

(b) 60°

(c) 90°

(d) 120°

(ix) In a closed circuit containing a bulb and a cell, the electromotive force ($\boldsymbol{\varepsilon}$) and the terminal voltage ($\boldsymbol{V}$) is related as.

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

(a) $V = \varepsilon + Ir$

(b) $V = \varepsilon - Ir$

(c) $V = \varepsilon \div Ir$

(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:

(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 inversly proportional to the length of the water column.

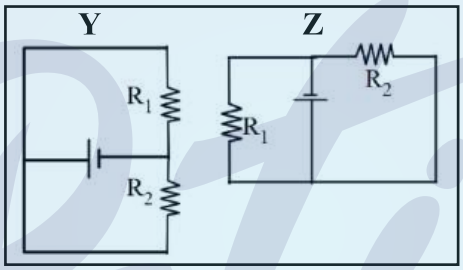
(a) Both (A) and (R) are true and (R) is correct explanation of (A).

(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, $\mathbf{R_1}$ and $\mathbf{R_2}$, are connected in:



(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**?

(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?

Substance	Lead	Aluminium	Copper	Iron
Specific heat capacity (cal/g^{o}C)	0.031	0.21	0.095	0.115

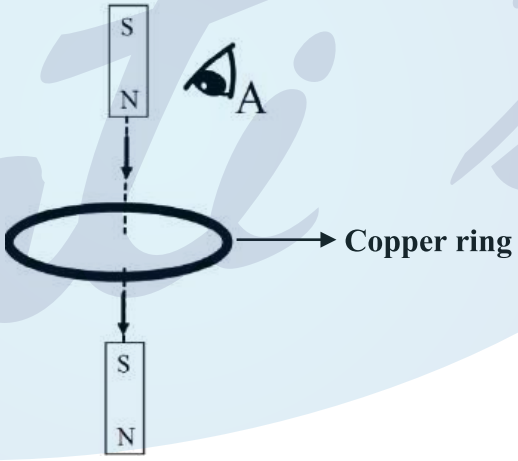
(a) Aluminium

(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:



(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

Question 2

(i) Complete the following by choosing the correct answers from the bracket: [6]

(a) In uniform circular motion the **centrifugal force** acts _____ *[towards the centre /away from the centre /along the tangential direction]*.

(b) Refractive index of a medium is **independent** of _____ *[temperature / angle of incidence / wavelength of light]*.

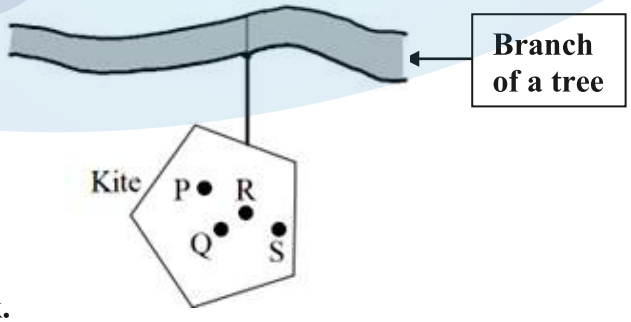
(c) Heat absorbed during **change of phase** depends on _____ *[mass / change in temperature / specific heat capacity]* of the substance.

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

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

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

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

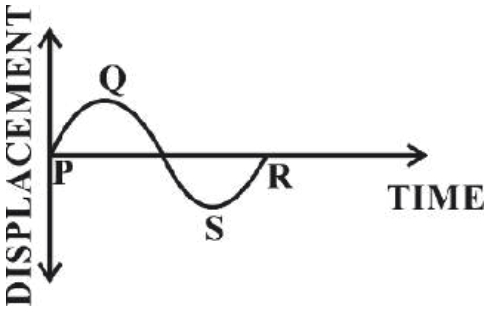


(a) **Fill in the blank.**

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

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

(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**?

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

Question 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. *(The critical angle forglass -water interface is 54°.)* [2]

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

(a) the metal body of the appliance

(b) the switch of the appliance?

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

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

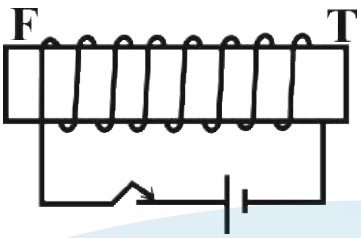
(iv) Calcuate the amount of heat absorbed by 200 g of paraffin wax to melt completely at its melting point. [2]

[Specific latent heat of fusion of paraffin wax = 146 Jg^{-1}]

(v) Copper wire is wound around 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 magnetised bar **FT** and mark its poles.

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

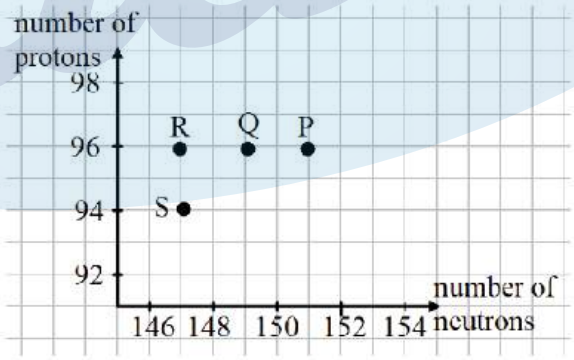


(vi) A current flows through a metallic conductor for a **long period** of time. State the change you would expect in its: [2]

(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: [3]



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

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

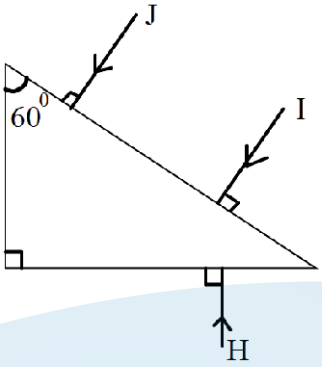
(c) State the mass number of the daughter nucleus.

SECTION B (40 Marks)

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

Question 4

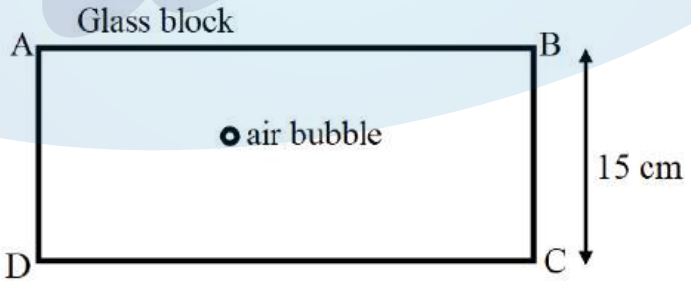
(i) [3]



(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°.)*

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

(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**.

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

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

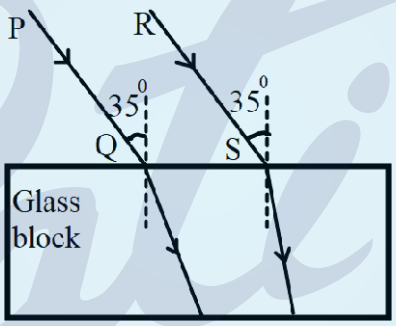
(iii) (a) An object is placed at **2F** position of a convex lens. Draw a ray diagram showing the formation of the image. [4]

(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**?

Question 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. [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. [3]



Which of these 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**: [4]

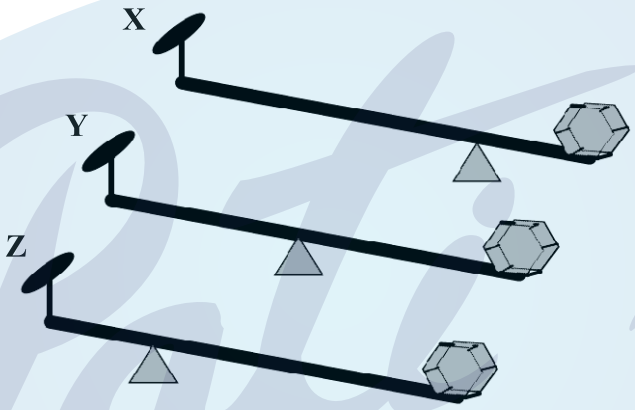
1. for which a quartz prism is used to study the spectrum.
2. which are used in remote sensing devices.
3. which are used in traffic signals in India.

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

Question 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. [3]

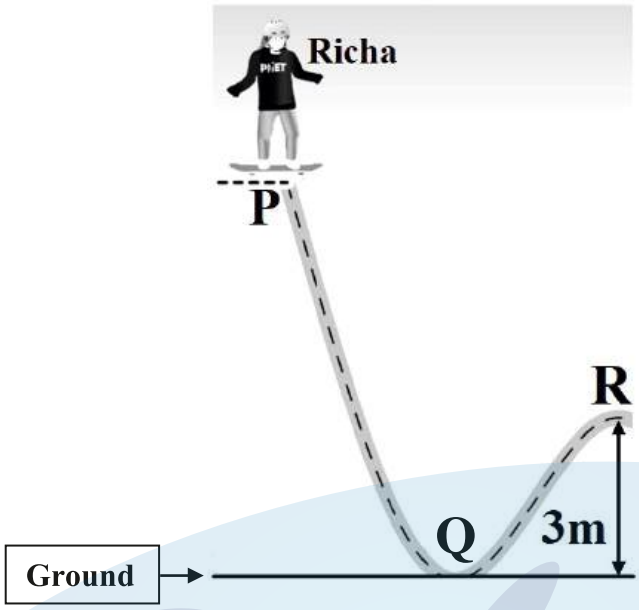
(ii) Three levers **X, Y, Z** of **equal lengths** are shown in the diagram. [3]



(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.

(iii) [4]



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

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

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

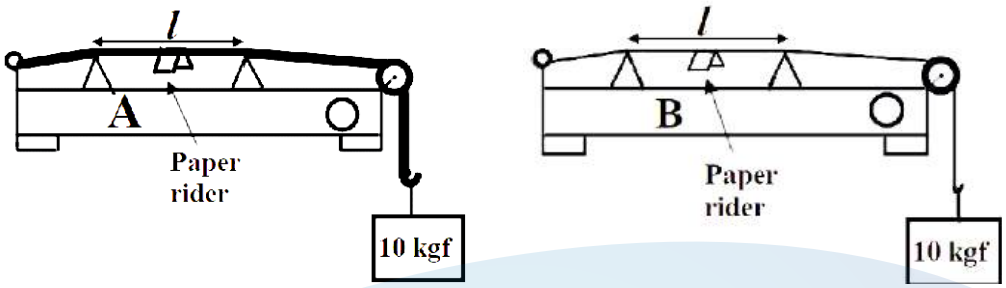
(c) the kinetic energy of Richa at point **R** . *(While moving from **Q** to **R**, she loses 500 J of energy against friction.)*

Question 7

(i) Draw a block and tackle system of pulleys with **velocity ratio equal to 3**. [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. *(Speed of sound in water 1500 ms^{-1}.)* [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**. [4]

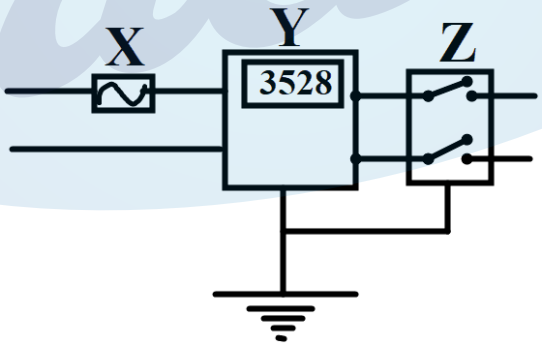


(a) **Name** and **explain** the phenomenon responsible for the falling off of the paper rider in **B**.

(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.

Question 8

(i) The diagram shows wiring in a meter room of a building. [3]

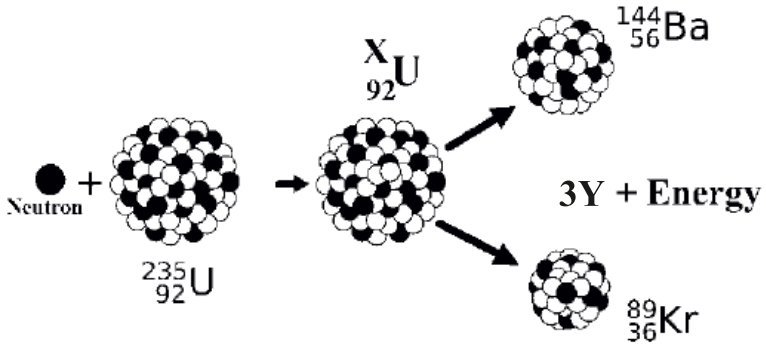


(a) What is the current rating of device **X**?

(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: [3]

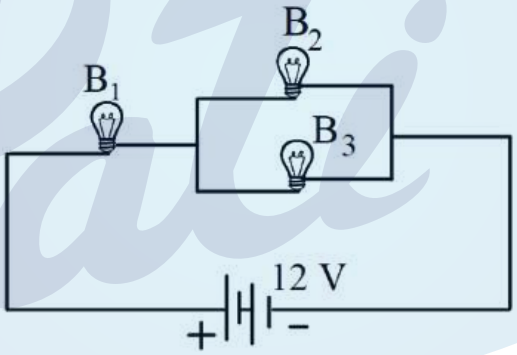


(a) Name the process depicted in the diagram.

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

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

(iii) [4]



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.

(a) Calculate:

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*?

Question 9

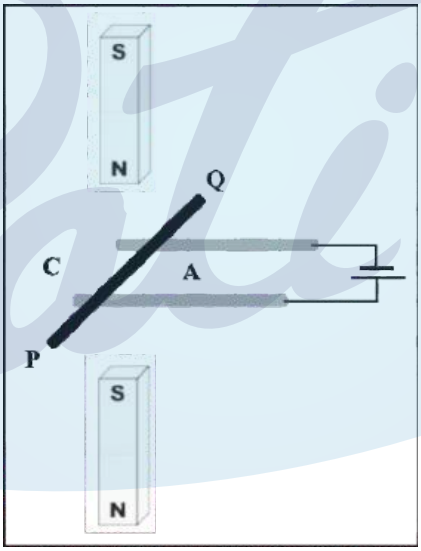
(i) 30 g of ice at 0°C is used to bring down the temperature of a certain mass of water at 70°C to 20°C. Find the mass of water. *[Specific heat capacity of water = 4.2 $Jg^{-1}°C^{-1}$ and specific latent heat of ice = 336 Jg^{-1}.]* [3]

(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? [3]

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

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

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

2024 Improvement

PHYSICS

(SCIENCE PAPER 1)

Maximum Marks: 80

Time allowed: Two hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section A** is compulsory. Attempt **any four** questions from **Section B**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A (40 Marks)

*(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 answers only.)

(i) A solar cell converts solar energy into:

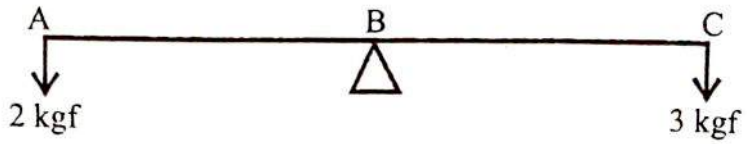
(a) heat energy

(b) mechanical energy

(c) chemical energy

(d) electrical energy

(ii) In the diagram given below, the rod AC pivoted at B is in equilibrium.



Choose appropriate relation.

(a) $AB = \frac{2}{3} BC$

(b) $AB = \frac{3}{2} BC$

(c) $AB = \frac{3}{5} BC$

(d) $AB = \frac{2}{5} BC$

(iii) A Bass drum produces wave '**X**', when struck with a force of 20 N and wave '**Y**', when struck with a force of 40 N, at the same point on the drum. Which of the following statement is **correct** with respect to the characteristics of sound?

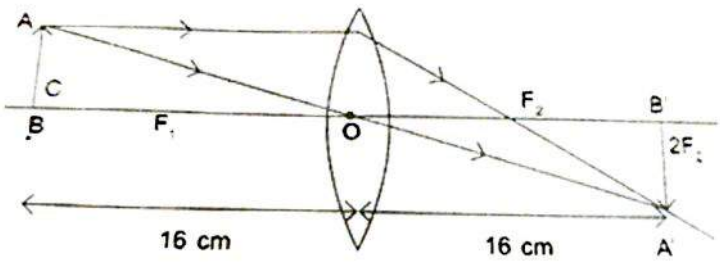
(a) X is shriller than Y.

(b) Y is louder than X.

(c) X is louder than Y.

(d) Y is shriller than X.

(iv) In the diagram given below AB is the object and A'B' is the image. If the size of the image is same as the size of the object, then the focal length of the given lens will be:



(a) 4 cm

(b) 16 cm

(c) 32 cm

(d) 8 cm

(v) Light of wavelength λ enters from air into glass of refractive index μ. Inside glass the wavelength of light is:

(a) $\mu\lambda$

(b) λ/μ

(c) μ/λ

(d) λ

(vi) Assertion (A): A thicker convex lens has smaller focal length than a thinner convex lens of same material.

Reason (R): A thicker lens bends light lesser than a thinner lens.

(a) A and R are true.

(b) A is true and R is false.

(c) A is false and R is true.

(d) A and R are false.

(vii) The radiations used in remote controls of T.V. sets are:

(a) Ultraviolet

(b) Radio waves

(c) Microwaves

(d) Infra-red

(viii) Four strings are stretched equally as given below. Which one will produce the sound of highest pitch on plucking:

(a) Thick string of length 10 m.

(b) Thin string of length 1 m.

(c) Thin string of length 10 m.

(d) Thick string of length 1 m.

(ix) Which of the following statement is **not true** for free vibrations:

(a) its amplitude is constant.

(b) Its frequency is constant.

(c) it takes place in a friction less medium.

(d) it has an external force of constant magnitude acting on it.

(x) Three substances A, B, C have equal thermal capacities. Given $M_A > M_B > M_C$ (where M_A, M_B & M_C are masses of A, B & C respectively). Which of the following gives the correct relation of their specific heat capacities. C_A, C_B & C_C are specific heat capacities of A, B & C respectively:

(a) $C_A = C_B = C_C$

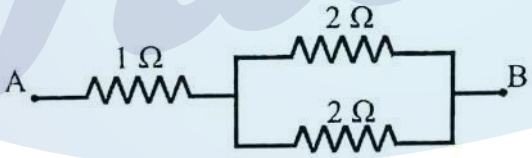
(b) $C_A > C_B > C_C$

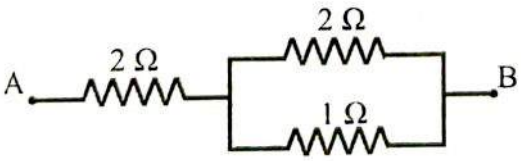
(c) $C_A < C_B < C_C$

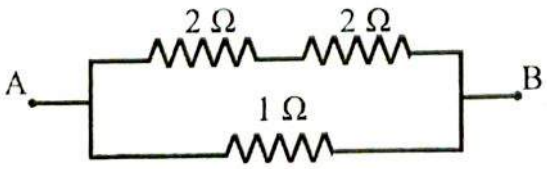
(d) None of the above.

(xi) Which combination gives 2 Ω resistance across AB:

(a) 

(b) 

(c) 

(d) 

(xii) A transformer **cannot** raise or lower the voltage of a D.C. supply because:

(a) There is no need to change the D.C. voltage.

(b) D.C. circuit has more losses.

(c) There is no variation of magnetic flux over time.

(d) Only A.C. is required to be altered.

(xiii) The direction of force experienced by a conductor carrying current, when placed in a magnetic field, is given by:

(a) Clock rule

(b) Lenz's law

(c) Flemings left hand rule

(d) Flemings right hand rule

(xiv) If a radioactive element is placed in an evacuated chamber, then the rate of radioactive decay will:

(a) Decrease

(b) Increase

(c) Remains unchanged

(d) Depends on the surrounding temperature

(xv) The nuclear radiations which are **deflected** by a magnetic field are:

(a) only α, γ

(b) only α, β

(c) only β, γ

(d) α, β & γ

Question 2

(i) (a) Which class of lever always gives V.R. > 1? [3]

(b) Along which marking the centre of gravity of a 6 inch plastic ruler lie?

(c) If the same ruler is made of steel, will there be a change in the position of the centre of gravity?

(ii) A pinball of mass 2 kg is rolling with momentum 5 $kgms^{-1}$. Calculate: [2]

(a) its velocity

(b) its Kinetic energy

(iii) A magician during a magic show, makes a lens of a particular material disappear by placing it in a bowl of liquid at room temperature: [2]

(a) Under what condition will this happen?

(b) If the liquid is heated through 20°C, then what significant change will you observe?

(iv) Copy and complete the following equation: [2]

$$^{A}_{B}X \rightarrow {}^{}_{}Y + {}^{4}_{2}He + {}^{}_{}Z + 2\,{}^{0}_{-1}e$$

(v) (a) State the function of the split ring commutator in a DC motor. [2]

(b) What is the effect on speed of rotation when the strength of the magnetic field is increased?

(vi) State **two** differences between sound and light waves. [2]

(vii) *Two bodies of equal specific heat capacities are supplied with equal amount of heat, then the rise in the temperature of both will be the same.* Justify this statement. [2]

Question 3

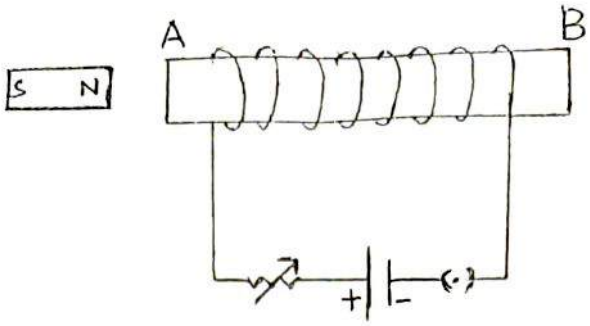
(i) Specific heat capacity of aluminium is 0.882 $Jg^{-1o}C^{-1}$. [2]

(a) Calculate the thermal capacity of an aluminium bowl of mass 80 g.

(b) Express the specific heat capacity of aluminium in S.I. unit.

(ii) A small bar magnet is placed near an electromagnet as shown in the diagram. [2]

(a) In which direction will the magnet move, when current is allowed to flow through the circuit?



(b) Name the law used to find the polarities of the electromagnet?

(iii) An electric oven, rated at 500 W, is connected to a 220 V line and used for 2 hours daily. Calculate the cost of electric energy consumed for 30 days at the rate of Rs. 5 per kWh. [2]

(iv) Two bulbs of same rating are connected first in **series** and then in **parallel** combination across the same supply. [2]

(a) In which case, the power consumed is more?

(b) Which combination is preferred in connecting household appliances?

(v) Give **two** differences between nuclear fission and nuclear fusion. [2]

SECTION B (40 Marks)

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

Question 4

(i) Study the table below and answer the questions that follow: [3]

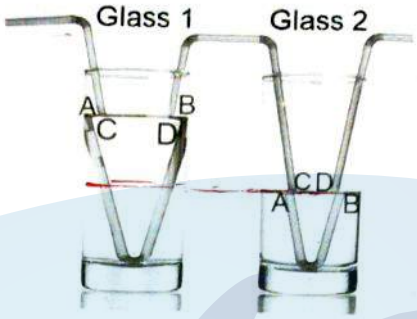
Fluid	Refractive index
Water	1.33
Glycerin	1.47
Ethyl Alcohol	1.36
Vegetable oil	1.45

(a) In which medium the speed of light will be minimum?

(b) How will the ray bend with respect to the normal, while entering **into** glycerin **from** vegetable oil?

(c) For a ray to suffer Total Internal Reflection in ethyl alcohol, what should be the pairing medium from the above table?

(ii) The diagram shows image of straws in **Glass 1** and **Glass 2** filled with water. [3]

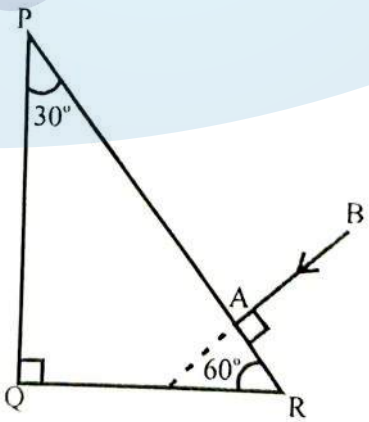


(a) Name the phenomenon which is responsible for discontinuous appearance of straw in water.

(b) Why is the difference, (AB – CD) **greater** in **Glass 1** as compared to the difference in **Glass 2**?

(c) If we replace water with a liquid of higher optical density, then what will be the effect on the difference (AB – CD)?

(iii) [4]



(a) Complete the path of the ray AB through the given prism of critical angle 42°, till it emerges out of the prism.

(b) State the angle of refraction at the surface PR.

Question 5

(i) An object is kept at a distance of 14 cm, in front of a concave lens of focal length 21 cm. [3]

(a) Calculate the position of the image formed.

(b) If the object is moved further away from the lens, what will be the effect on the size of the image?

(ii) A uniform half metre ruler is balanced at 30 cm mark when a weight of 50 gf is suspended from 40 cm mark. Calculate the weight of metre ruler. Draw the diagram of the arrangement. [3]

(iii) (a) When sunlight enters earth's atmosphere, which colour of the light is scattered the **most** and why? [4]

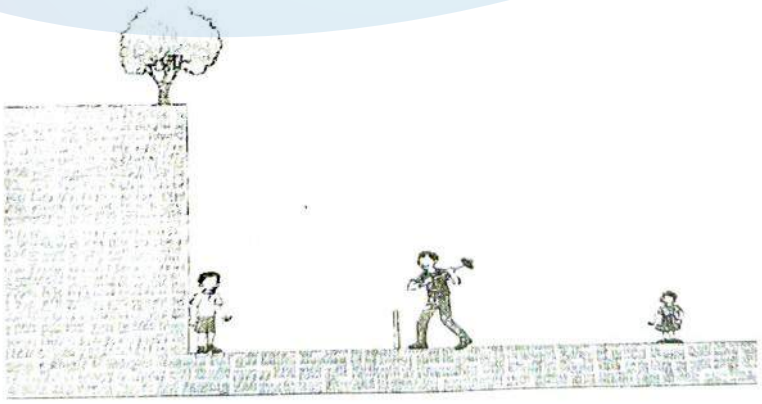
(b) Arrange the following radiations in the **decreasing order** of their wavelength:

X rays, infrared, microwaves, ultraviolet

(c) Name the radiation used to detect the purity of gems.

Question 6

(i) A workman is hammering a lamp post into the ground. Some distance ahead is a vertical wall. A boy is standing at the base of the wall. The speed of sound in air is 330 ms^{-1}. It takes 1.5 second for the sound of hammer to reach the boy. [3]



A girl is standing at the same distance behind the post as shown in the diagram above.

(a) How long after the hammer strikes, will the girl be able to hear its echo?

(b) What is the distance of girl from the wall?

(ii) During the initiation of spinning of the tub in a washing machine, the machine experience violent jolts and the side panels begin to vibrate loudly. [3]

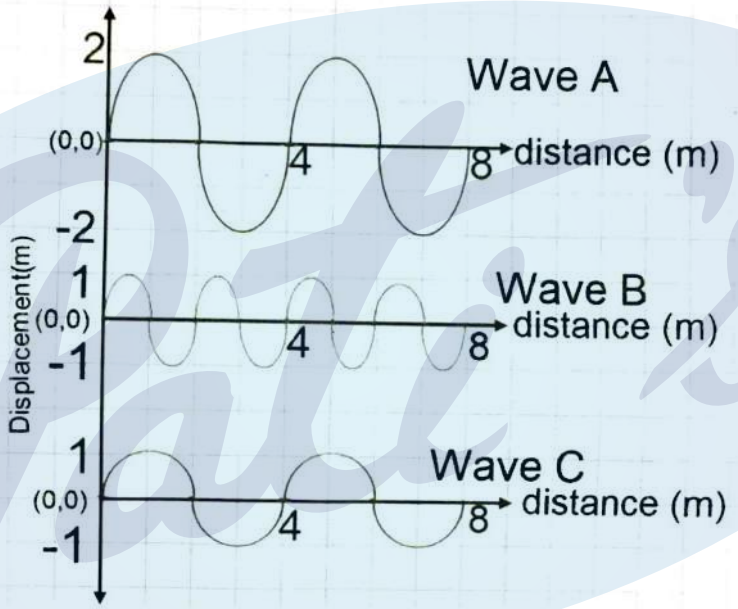
(a) Name the phenomenon which is responsible for this.

(b) How will you explain the cause of this loud noise to your mother?

(c) Why does the loud noise stop after some time?

(iii) (a) Define quality of sound. [4]

(b)



Study the above wave diagram and answer the questions that following:

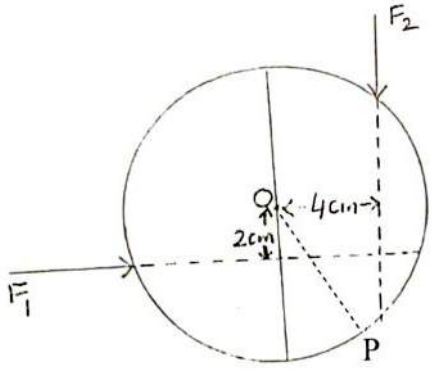
Among the waves A, B, C:

1. Which one is the loudest?
2. Which one is the shrillest?
3. A string instrument produces wave C. In order to produce wave B, what change needs to be made in the **same** string?

Question 7

(i) The figure below shows a disc of radius 6 cm that can rotate freely about its centre O. [3]

It is in **equilibrium** due to forces F_1 and F_2 acting on it.

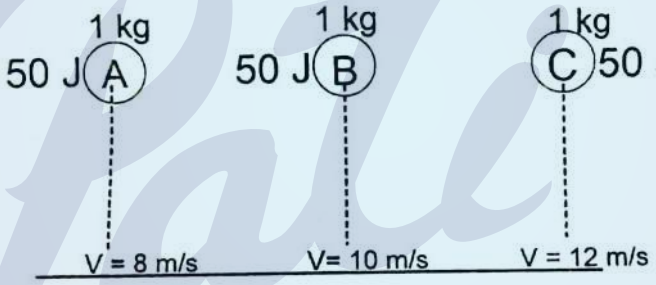


(a) Which of the two forces F_1 or F_2 is greater?

(b) What is the ratio of the magnitudes of F_1 and F_2?

(c) If the point of application of F_1 is changed to 'P' along PO then, state the direction of rotation of the wheel.

(ii) [3]



Three balls A, B and C of mass 1 kg each are released from a certain height as shown in the diagram. Their initial potential energy is 50 J each. The velocities with which they touch the ground are given in the diagram.

(a) Which ball is **contradicting** the law of conservation of energy? 1

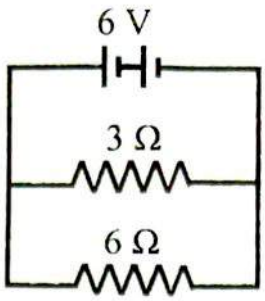
(b) Justify your answer. +2

(iii) (a) Draw a labelled diagram of block and tackle system of pulley with V.R. = 3. In the diagram, mark the direction of L, E and tension. [4]

(b) Why is there no **unit** to Mechanical Advantage?

Question 8

(i) Study the circuit diagram carefully and answer the questions that follow: [3]



Calculate:

(a) The resistance of the circuit.

(b) The current drawn from the cell.

(c) The ratio of the currents through 3 Ω & 6 Ω.

(ii) Name the following with respect to the household circuit: [3]

(a) the device that protects the main ring circuit.

(b) the accidental contact between live and neutral wire.

(c) the thickest pin in a three pin plug.

(iii) (a) In general what is the frequency of the domestic supply voltage in India? [4]

(b) An A.C. dynamo of a cycle, is a small device which is located near the wheel of the bicycle. As the cycle is peddled, the rotation of the wheel causes the internal components of the dynamo to move, producing electric current.

1. Name the principle on which dynamo works.
2. What is the energy conversion that occurs in a dynamo.
3. How does the speed of the bicycle affect the output of the dynamo?

Question 9

(i) 'x' g of hot water at 50° C is mixed with 'y' g of cold at 5° C. If the final temperature of the mixture is 20°C then calculate the ratio $x : y$. (Neglect the heat taken by the calorimeter) [3]

(ii) (a) Define specific latent heat of fusion. [3]

(b) State the SI unit of specific latent heat of fusion.

(c) Why is there no change in the temperature during the change of phase of a substance?

(iii) (a) To reduce the radiation emitted from a radioactive source a student suggests to store it in a freezing unit which is maintained at – 30 °C. Is the given suggestion correct? Give a reason for your answer. [4]

(b) A beta particle is a high-energy electron. Which part of an atom emits this electron?

(c) Name a nuclear radiation with highest ionizing power.

2024

PHYSICS

(SCIENCE PAPER 1)

Maximum Marks: 80

Time allowed: Two hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section A** is compulsory. Attempt **any four** questions from **Section B**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A (40 Marks)

*(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 answers only.)

(i) When a bell fixed on a cycle rings, then the energy conversion that takes place is:

(a) gravitational potential energy to sound energy

(b) kinetic energy to sound energy

(c) sound energy to electrical energy

(d) sound energy to mechanical energy

(ii) A door lock is opened by turning the lever (handle) of length 0.2 m. If the moment of force produced is 1 Nm, then the minimum force required is:

(a) 5 N

(b) 10 N

(c) 20 N

(d) 0.2 N

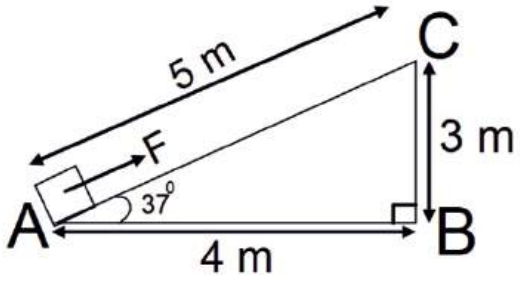
(iii) A force **'F'** moves a load from **A** to **C** as shown in the figure below. For the calculation of the work done, which of these lengths would you use as the displacement?

(a) 3m

(b) 4m

(c) 5m

(d) 7m



(iv) A radioactive nucleus containing 128 **nucleons** emits a β – particle. After β – emission the number of **nucleons** present in the nucleus will be:

(a) 128

(b) 129

(c) 124

(d) 127

(v) **Assertion (A):** Ultraviolet radiations are scattered more as compared to the microwave radiations.

Reason (R): Wavelength of ultraviolet radiation is more than the wavelength of microwave radiation.

(a) Both A and R are true.

(b) A is true but R is false.

(c) A is false but R is true.

(d) Both A and R are false.

(vi) When the stem of vibrating tuning fork is pressed on a table, the tabletop starts vibrating. These vibrations are **definitely** an example of:

(a) resonance

(b) natural vibrations

(c) forced vibrations

(d) damped vibrations

(vii) Which of the following is a class III lever?

(a) Pair of scissors

(b) Wheelbarrow

(c) Crowbar

(d) Human forearm

(viii) The specific resistance of a conductor depends on its:

(a) length

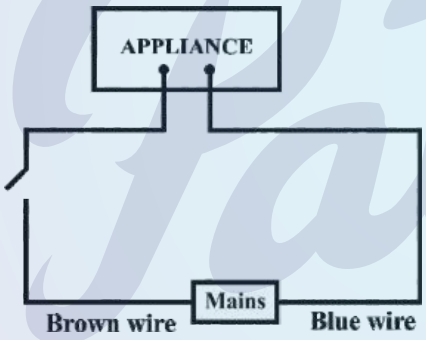
(b) material

(c) area of cross section

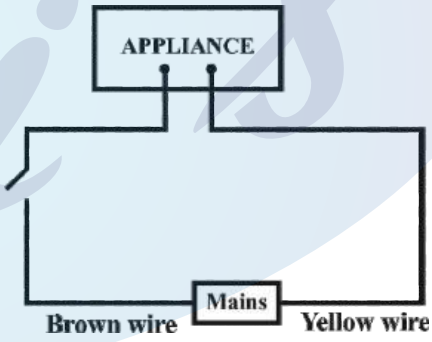
(d) radius

(ix) Identify the option that displays the **correct wiring** with **correct colour code**:

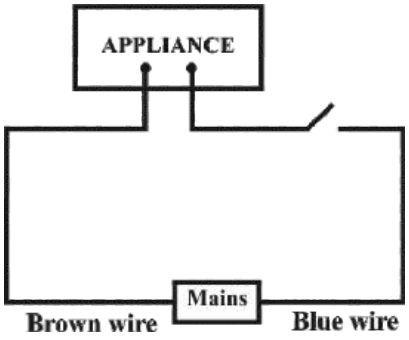
(a)



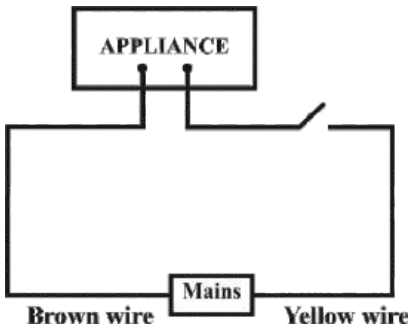
(b)



(c)



(d)



(x) The potential difference between terminals of a cell in a closed electric circuit is:

(a) terminal voltage

(b) electro motive force

(c) voltage drop

(d) none of these

(xi) During melting of ice at 0°C the:

(a) energy is released and temperature remains constant.

(b) energy is absorbed and temperature remains constant.

(c) energy is released and temperature decreases.

(d) energy is absorbed and temperature increases.

(xii) Linear magnification(m) produced by a concave lens is:

(a) $m < 1$

(b) $m > 1$

(c) $m = 1$

(d) $m = 2$

(xiii) A radioactive element is placed in an evacuated chamber. Then the rate of **radioactive decay** will:

(a) Decrease

(b) Increase

(c) Remain unchanged

(d) Depend on the surrounding temperature

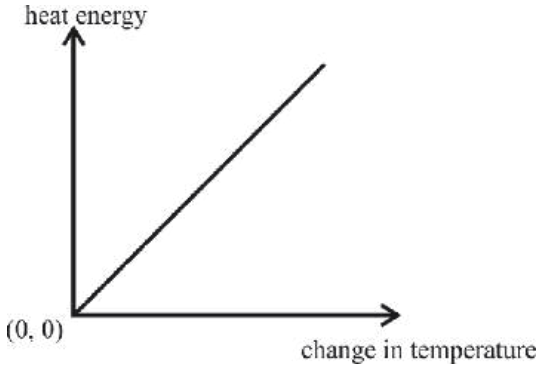
(xiv) The graph given below shows heat energy supplied against change in temperature when no energy is lost to the surrounding. The slope of this graph will give:

(a) Specific heat capacity

(b) Latent heat of fusion

(c) Latent heat of vaporization

(d) Heat capacity



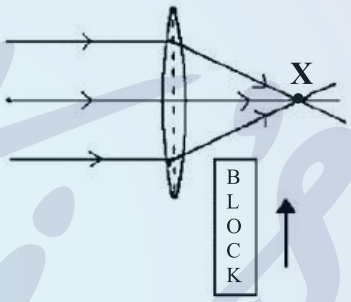
(xv) A block of glass is pushed into the path of the light as shown below. Then the converging point **X** will:

(a) Move away from the slab

(b) Move towards the slab

(c) Not shift

(d) Move towards the left side of the lens

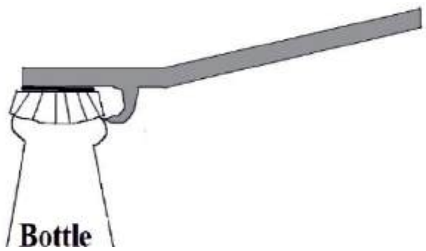


Question 2

(i) (a) In the following atoms, which one is a radioisotope? Give *one* use of this isotope. [3]

O^{16}, C^{14}, N^{14}, He^{4}

(b) Name the class of the lever shown in the picture below:

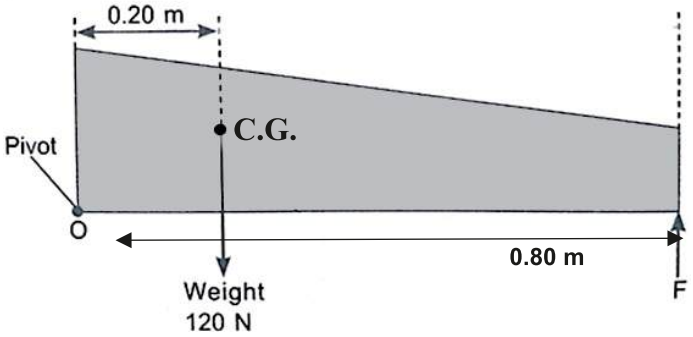


(ii) Fill in the blanks: [2]

(a) When a stone tied to a string is rotated in a horizontal plane, the tension in the string provides _____ force necessary for circular motion.

(b) Work done by this force at any instant is _____.

(iii) A non uniform beam of weight 120 N pivoted at one end is shown in the diagram below. Calculate the value of **F** to keep the beam in equilibrium. [2]



(iv) Meera chose to use a block and tackle system of **'9'** pulleys instead of a single movable pulley to lift a heavy load. [2]

(a) What is the advantage of using a block and tackle system over a single movable pulley?

(b) Why should she connect more number of pulleys in the upper fixed block?

(v) Sumit does 600 J of work in 10 min and Amit does 300 J of work in 20 min. Calculate the ratio of the powers delivered by them. [2]

(vi) 5 bulbs are connected in **series** in a room. One bulb is fused. It is removed and remaining 4 bulbs are again connected in **series** to the same circuit. What will be the effect on the following physical quantities? (Increases, Decreases, Remain Same) [2]

(a) Resistance

(b) Intensity of light

(vii) Rohan conducted experiments on echo in different media. He observed that a minimum distance of **'*x*'** meters is required for the echo to be heard in oxygen and **'*y*'** meters in benzene. Compare **'*x*'** and **'*y*'**. Justify your answer. [2]

Speed of sound in oxygen: 340 ms^{-1}

Speed of sound in benzene: 200 ms^{-1}

Question 3

(i) (a) In a reading glass what is the position of the object with respect to the convex lens used? [2]

(b) Why can we **not** use concave lens for the same purpose?

(ii) A fuse is rated 5 A. Can it be used with a geyser rated 1540 W, 220 V. Write **Yes** or **No**. Give supporting calculations to justify your answer. [2]

(iii) State *two* factors affecting the speed of rotation of the coil in a D.C. motor. [2]

(iv) How much heat is required to convert 500 g of ice at 0°C to water at 0°C? The latent heat of fusion of ice is 330 Jg^{-1}. [2]

(v) Copy and complete the nuclear reaction by filling in the blanks. [2]

$$_{92}U^{235} + {}_{0}n^{1} \longrightarrow {}_{56}Ba^{---} + {}_{---}Kr^{92} + 3\ {}_{0}n^{1}$$

SECTION B (40 Marks)

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

Question 4

(i) The image of a **candle flame** placed at a distance of 36 cm from a spherical lens, is formed on a screen placed at a distance of 72 cm from the lens. Calculate the focal length of the lens and its power. [3]

(ii) Below is an incomplete table showing the arrangement of **electromagnetic spectrum** in the increasing order of their wavelength. Complete the table. [3]

Gamma ray	X – ray	U V rays	Visible rays	Infrared	**A**	Radio waves

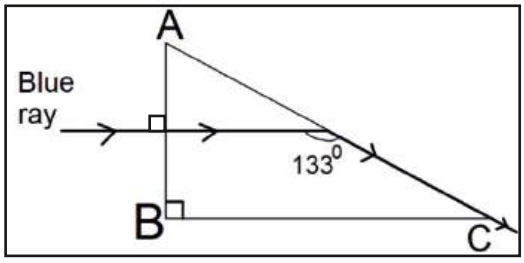
(a) Identify the radiation **A**.

(b) Name the radiation used to detect fracture in bones.

(c) Name *one* property common to both **A** and Radio waves.

(iii) (a) Why do we use red colour as a danger signal on the top of a skyscraper? [4]

(b) The diagram below shows the path of a blue ray through the prism:



1. Calculate the critical angle of the material of the prism for blue colour.
2. What is the measure of the angle of this prism (A)?
3. Which colour should replace the blue ray, for the ray to undergo Total Internal Reflection?

Question 5

(i) (a) Refractive index of glass with respect to water is $\frac{9}{8}$. [3]

Find the refractive index of water with respect to glass.

(b) Name the principle used to find the value in part (a).

(c) If we change the temperature of water, then will the ratio $\frac{9}{8}$ remain the same? Write **Yes** or **No.**

(ii) Light travels a distance of ***'10x'*** units in time ***'t_1'*** in vacuum and it travels a distance of ***'x'*** units in time ***'t_2'*** in a denser medium. Using this information answer the question that follows: [3]

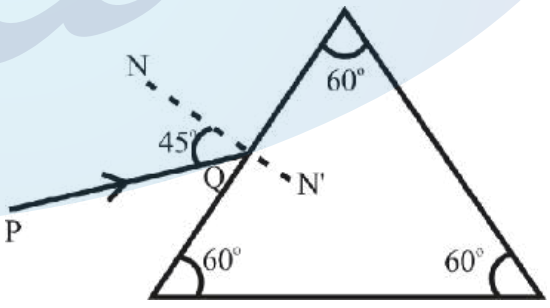
(a) *'Light covers a distance of* ***'20x'*** *units in time* ***'t_1'*** *in diamond.'* State true or false.

(b) Calculate the refractive index of the medium in terms of *'t_1'* and *'t_2'*.

(iii) A monochromatic ray of light is incident on an equilateral prism placed at **minimum deviation position** with an angle of incidence 45° as shown in the diagram. [4]

(a) Copy the diagramand complete the path of the ray PQ.

(b) State *two* factors on which the angle of deviation depends.



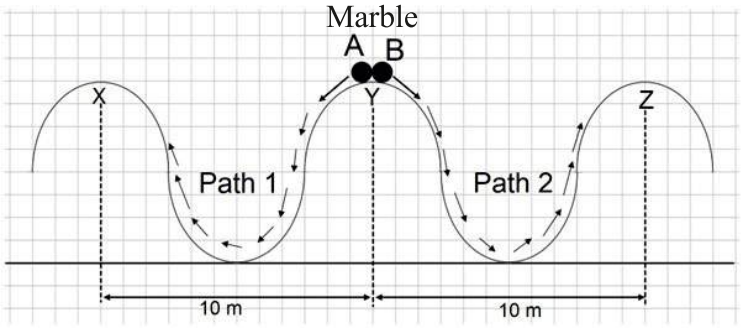
Question 6

(i) (a) Define Centre of Gravity. [3]

(b) A hollow ice cream **cone** has height 6 cm.

1. Where is the position of its centre of gravity from the **broad base**?
2. Will its position change when it is filled completely with honey? Write **Yes** or **No**.

(ii) [3]



Two identical marbles A and B are rolled down along Path 1 and Path 2 respectively. Path 1 is **frictionless** and Path 2 is **rough**.

(a) Which marble will **surely** reach the next peak?

(b) Along which path/s the **mechanical energy** will be conserved?

(c) Along which path/s is the law of **conservation of energy** obeyed?

(iii) Given are two pulleys. [4]

(a) Copy and complete the labelled diagram connecting the two pulleys with a tackle to obtain Velocity Ratio = 2.

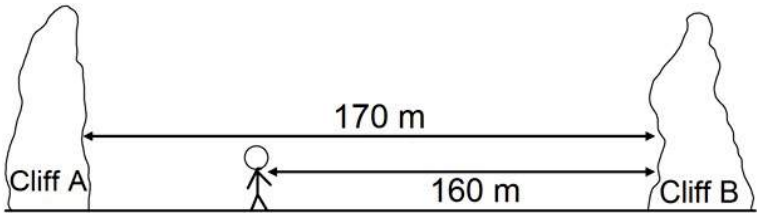
(b) If Load = 48 kgf and efficiency is 80% then calculate:

1. Mechanical Advantage.
2. Effort needed to lift the load.

Question 7

(i) (a) Name the waves used in SONAR. [3]

(b)



In the above diagram Lata stands between two cliffs and claps her hands. Determine the time taken by her to hear the **first** echo.

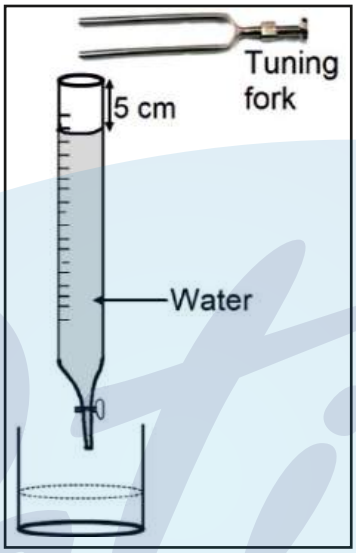
Speed of sound in air 320 ms^{-1}.

(ii) (a) Complete the following radioactive reaction: [3]

$$\_^{-}X \rightarrow Y\square + {}^{4}_{2}He \rightarrow {}^{234}_{91}Z + \_^{o}_{-1}e$$

(b) Uranium is available in two forms U-235 and U-238. Which of the two isotopes of Uranium is **more** fissionable?

(iii) In the given diagram, a vibrating tuning fork is kept near the mouth of a burette filled with water. The length of the air column is adjusted by opening the tap of the burette. At a length of 5 cm of the air column, a **loud sound** is heard. [4]



(a) Name the phenomenon illustrated by the above experiment.

(b) Why is a loud sound heard at this particular length?

(c) If the present tuning fork is replaced with a tuning fork of higher frequency, should the length of the air column increase or decrease to produce a **loud sound**? Give a reason.

Question 8

(i) The voltage - current readings of a certain material are shown in the table given below: [3]

Voltage (V)	10 V	20 V	30 V
Current (I)	2 A	3 A	4 A

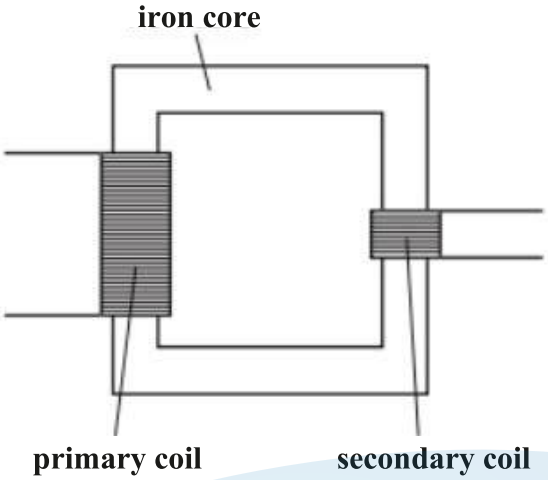
Study the table.

(a) State whether the conductor used is ohmic or non-ohmic.

(b) Justify your answer.

(c) State Ohm's law.

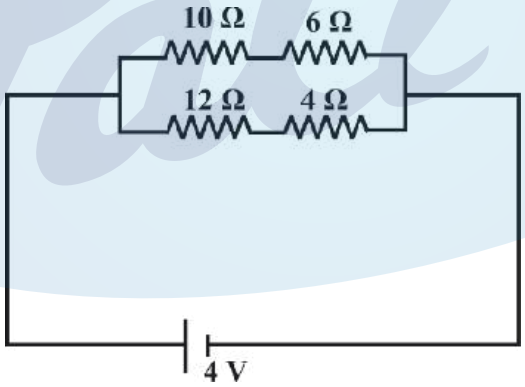
(ii) Below is the diagram of a transformer: [3]



(a) Identify the type of transformer.

(b) In this type of transformer which of the wire is thicker, the primary or the secondary? Give a reason.

(iii) Study the diagram: [4]



(a) Calculate the total resistance of the circuit.

(b) Calculate the current drawn from the cell.

(c) State whether the current through 10 Ω resistor is greater than, less than or equal to the current through the 12 Ω resistor.

Question 9

(i) 85 g of water at 30°C is cooled to 5°C by adding certain mass of ice. Find the mass of ice required. [3]

[Specific heat capacity of water = 4.2 $Jg^{-1}{}^{o}C^{-1}$, Specific latent heat of fusion = 336 Jg^{-1}]

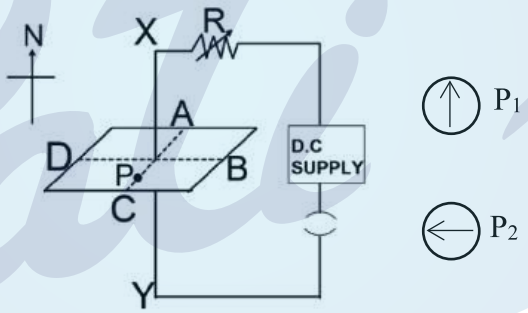
(ii) (a) Why does it become pleasantly warm when the lakes start freezing? [3]

(b) Water freezes to form ice. What change would you expect in the average kinetic energy of the molecules?

(c) Which will contain more heat energy 1 g of ice at 0°C or 1 g water at 0°C?

(iii) (a) State one factor that affects the magnitude of induced current in an AC generator. [4]

(b) Given below is a circuit to study the magnetic effect of electric current. ABCD is a cardboard kept perpendicular to the conductor XY. A magnetic compass is placed at the point **P** of the cardboard. $\mathbf{P_1}$ and $\mathbf{P_2}$ are the positions of the magnetic compass, before and after passing a current through XY respectively.



1. Name the **rule** that is used to predict the direction of deflection of the magnetic compass.
2. State the direction of current in the conductor (X to Y or Y to X) when the circuit is complete.
3. If resistance R is increased, then what will be the effect on the magnetic lines of force around the conductor?

ICSE 2023 – COMPARTMENT / IMPROVEMENT EXAMINATION

PHYSICS

(SCIENCE PAPER 1)

Maximum Marks: 80

Time allowed: Two hours

Answers to this Paper must be written on the paper provided separately.

You will not be allowed to write during first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section A** is compulsory. Attempt **any four** questions from **Section B**.*

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 answers only.)

(i) Two forces, equal in magnitude and opposite in directions are applied to both ends of a body that is pivoted at its center. The forces turn the body in:

(a) opposite direction

(b) same direction

(c) perpendicular direction.

(d) None of these

(ii) The energy conversion in a microphone is:

(a) Chemical energy to electrical energy

(b) Sound energy to electrical energy

(c) Heat energy to mechanical energy

(d) Electrical energy to sound energy

(iii) The work done by a force on a body will be positive if the:

(a) body does not get displaced.

(b) body is displaced along the direction of the applied force.

(c) body is displaced perpendicular to the direction of the applied force.

(d) body is displaced opposite to the direction of the applied force.

(iv) The radiations used in detecting fake currency in banks are _____.

(a) infra red

(b) gamma

(c) ultraviolet

(d) microwaves

(v) During β-emission an electron is ejected from the atom of a radioactive substance. The ejected electron is from:

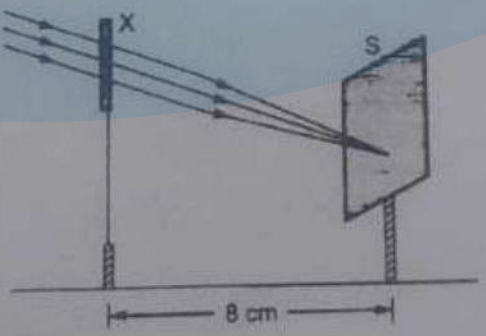
(a) outermost orbit of an atom

(b) innermost orbit of an atom

(c) nucleus of an atom

(d) None of these

(vi) A student used a device (X) to focus the image of a well illuminated distant building on a screen (S) as shown in the diagram. The device (X) is:



(a) a concave lens of focal length 8 cm.

(b) a convex mirror of focal length 8 cm.

(c) a convex lens of focal length 4 cm.

(d) a convex lens of focal length 8 cm.

(vii) If the loudness of a sound wave A is greater than sound wave B then:

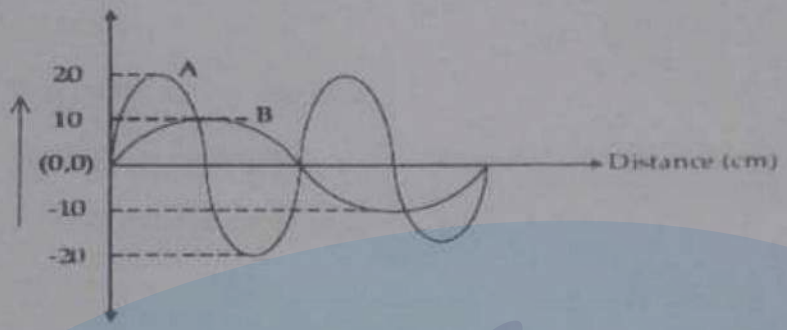
(a) The frequency of A is more than the frequency of B.

(b) The amplitude of wave B is more than the amplitude of wave A.

(c) The time period of wave A is less than the time period of wave B.

(d) The amplitude of wave A is more than the amplitude of wave B.

(viii) The figure below shows the displacement distance graph of two vibrating bodies A and B.



The ratio of amplitudes of A and B is:

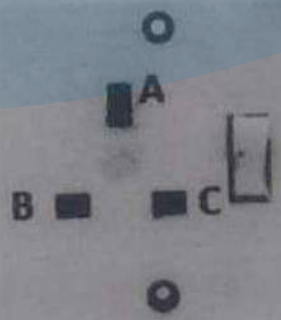
(a) 1:2

(b) 3:2

(c) 2:1

(d) 1:1

(ix) In the diagram of a socket below, A, B and C represent _____ wires respectively.



(a) live, neutral and earth

(b) earth, neutral and live

(c) neutral, earth and live

(d) earth, live and neutral

(x) A geyser is rated 1200 W, 250 V. The energy consumed by it in 12 hour is _____.

(a) 14.4 kWh

(b) 144 kWh

(c) 14400 kWh

(d) 144 Wh

(xi) Strength of a solenoid **does not** depend on:

(a) the number of turns in the coil.

(b) the colour of the wire.

(c) the current through the coil.

(d) the material of the core.

(xii) The SI unit of thermal capacity is:

(a) calorie $^{\circ}C^{-1}$

(b) $J\,K^{-1}$

(c) $J\,K$

(d) $J\,kg^{-1}\,K^{-1}$

(xiii) Substances A, B, C and D have specific heat capacities 400 $Jkg^{-1}k^{-1}$, 800 $Jkg^{-1}k^{-1}$, 1000 $Jkg^{-1}k^{-1}$ and 1200 $Jkg^{-1}k^{-1}$ respectively. If an equal amount of heat is supplied to equal masses of A, B, C & D at room temperature, which substance will attain the highest temperature?

(a) Substance A

(b) Substance B

(c) Substance C

(d) Substance D

(xiv) A ray of light passing from one transparent medium to another slows down. Then:

(a) The angle of incidence is equal to the angle of refraction.

(b) The angle of incidence is less than the angle of refraction.

(c) The angle of incidence is greater than the angle of refraction.

(d) The angle of incidence is less than or equal to the angle of refracti

(iv) What is the possible value of angle of incidence inside glass, when a ray of light incident on glass - air interface undergoes total internal reflection? Critical angle of glass air interface is 42°.

(a) 48°

(b) 40°

(c) 0°

(d) cannot be determined from the given information.

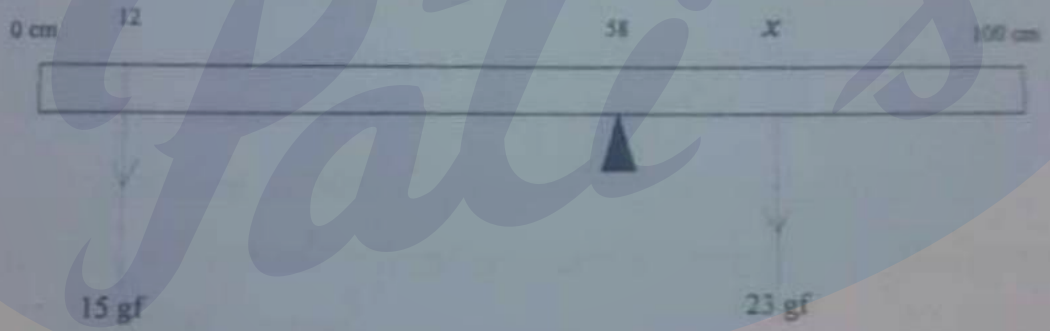
Question 2

(i) (a) How many pulleys are required in a block and tackle system with convenient direction to have V.R. = 4? [3]

(b) Which radiations can be stopped by human skin?

(c) Which type of nuclear radiation ensures the conservation of mass number in daughter nucleus?

(ii) A uniform metre ruler is balanced horizontally on a pivot, as shown below. [2]



Observe the arrangement above and calculate the value of 'x'. (Assume ruler is weightless)

(iii) Name the type of pulley that: [2]

(a) is used to change the direction of force applied.

(b) has ideal mechanical advantage equal to 2.

(iv) Give reason: In a cylinder centre of gravity lies at the midpoint of the axis, but in a cone it lies more closer to the base. [2]

(v) A truck weighing 5×10^3 kgf and a cart weighing 500 kgf are moving with the same speed. Compare their kinetic energies. [2]

Branch of a tree is pulled down and left. It starts vibrating. [2]

(a) Name the type of the vibrations.

(b) If the same branch is pulled down to a greater extent and left, how does the frequency compare to the previous case?

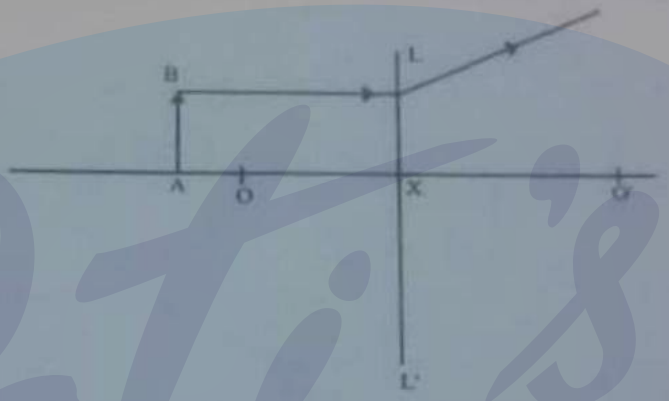
(vii) Two resistors have values 10 Ω and 20 Ω. How should they be connected so that the total resistance: [2]

(a) increases

(b) decreases

Question 3

(i) An object AB is kept in front of a lens as shown in the diagram below. Answer the questions that follow: [2]



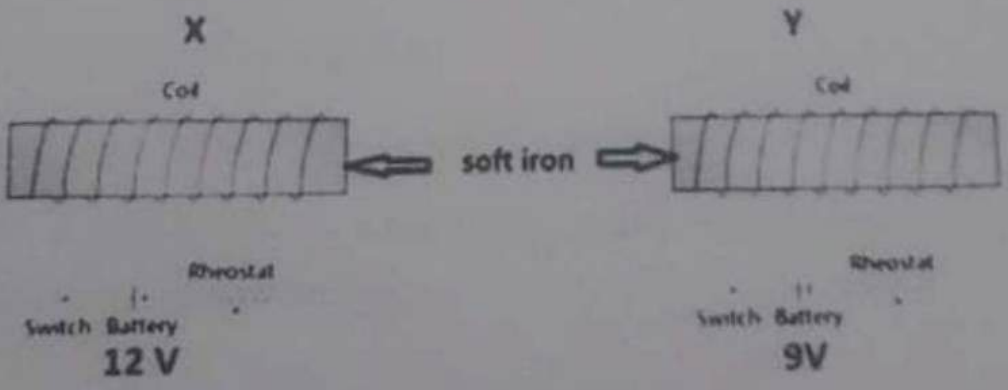
(a) Name the lens LL'.

(b) Can the image formed by the above lens LL' be caught on a screen?

(ii) (a) Why is Nichrome wire used as a heating element in appliances such as heater & toaster? [2]

(b) How does the specific resistance of a semi-conductor change with the increase in temperature?

(iii) [2]



(a) Between the two diagrams, which one will exhibit a stronger magnetic field?

(b) Give a reason for your answer.

(iv) What is the heat energy gained when 0.005 kg of water at 25°C is brought to its boiling point? Specific heat capacity of water = 4200 $J\,kg^{-1}\,°C^{-1}$ [2]

(v) Name the nuclear radiations which: [2]

(a) are used in the treatment of cancer.

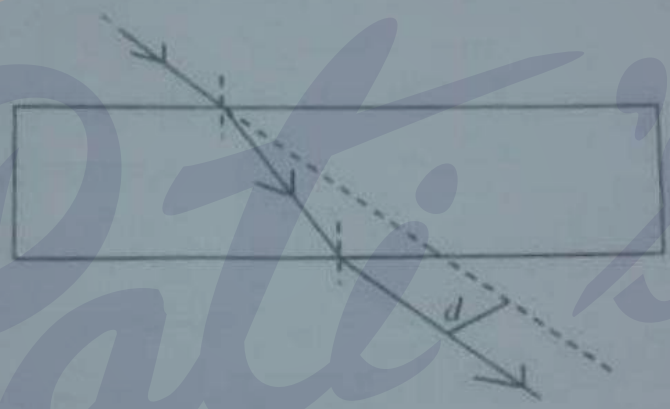
(b) are used in carbon dating.

SECTION B

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

Question 4

(i) A ray of light is incident on a glass slab as shown below: [3]



(a) What is represented by '*d*' shown in the diagram?

(b) Define '*d*'.

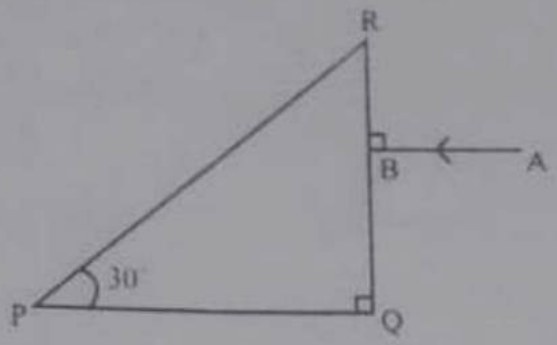
(c) How is '*d*' related to the refractive index of the medium?

(ii) (a) What is meant by critical angle?

(b) How is the critical angle related to the refractive index of the medium?

(c) What is the necessary condition for total internal reflection to occur, based on the critical angle of the medium?

(a) Copy the diagram and complete the path of the ray AB till it emerges out of the glass prism of critical angle 42° [4]



(b) Also name the phenomenon at the surface PQ.

Question 5

(i) A convex lens forms a virtual image at 60 cm from the lens which is four times the size of the object. Find the: [3]

(a) position of the object and

(b) focal length of the lens used.

(ii) Name the radiations: [3]

(a) Used for photography at night.

(b) Used for detection of fracture in bones.

(c) Whose wavelength range is from 100 Å to 4000 Å.

(iii) A slide projector is being used by your teacher for a presentation in class. [4]

(a) Name the type of lens used in a slide projector.

(b) Construct a ray diagram, to illustrate the formation of the image in a slide projector.

Question 6

(i) Draw a block and tackle system of pulley having velocity ratio 5, indicating load (L), effort (E) and tension (T) clearly in the diagram. [3]

(ii) (a) Define couple. [3]

(b) State its SI unit.

(c) Give one example of couple in everyday life.

(iv) The bob of a simple pendulum of mass 20g is imparted a velocity of 4 ms^{-1} at its mean position. Assuming that there is no energy lost in overcoming air friction, calculate: [4]

(a) the maximum vertical height up to which the bob will rise on reaching its extreme position.

(b) the total energy at any instant during the oscillation.

Question 7

(i) A man standing between two cliffs produces a sound and hears two successive echoes after 2s and 4s respectively. Calculate the distance between the cliffs. The speed of sound in air is 330 m/s. [3]

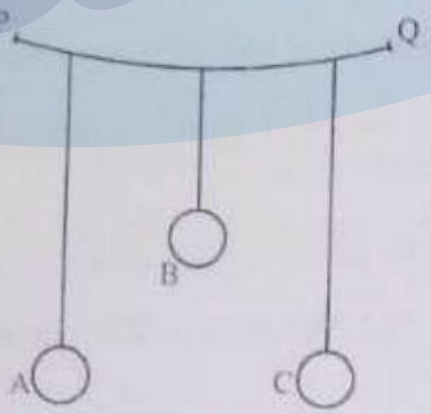
(ii) A mixture of radioactive substances gives out three types of radiations. [3]

(a) Name the radiation which travels with the speed of light.

(b) Name the radiation which has the highest ionizing power.

(c) When an alpha particle gains two electrons it becomes neutral and becomes a gas. Name the gas.

(iii) The diagram shows three pendulums A, B and C tied to a flexible string stretched between fixed points P and Q. Pendulum A and C are of equal length. [4]



(a) Name the vibrations produced in A and C when pendulum B is set into vibration.

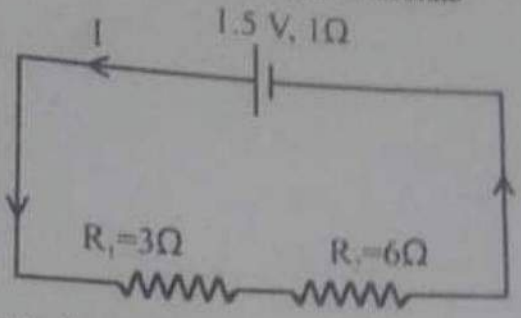
(b) Which pendulum has highest frequency of vibration?

(c) Name the vibrations produced in A if pendulum C is set into vibration.

(d) Define the phenomenon mentioned in (c)

ion 8

The circuit diagram shows two resistors, 3 ohms and 6 ohms connected to a battery of emf 1.5 V and internal resistance 1 ohm. Calculate [3]



(a) the current I in the circuit.

(b) The potential difference across R_2.

(c) The terminal voltage of the circuit.

(ii) Copy and complete the nuclear reactions: [3]

(a) ${}^{q}_{p}X \longrightarrow {}^{}_{}Y + {}^{0}_{-1}e$

(b) ${}^{}_{}X \longrightarrow {}^{q-5}_{p-2}Y + {}^{4}_{2}He$

(c) ${}^{q}_{p}X \longrightarrow \_\_\_\_ + \nu$

(iii) A power circuit uses a cable having three different wires. [4]

(a) Which wire in the power circuit poses a potential danger if touched?

(b) Between which of the two wires should the heating element of an electric geyser be connected?

(c) To which wire should the metallic case of the geyser be connected?

(d) To which wire should the switch and fuse be connected?

Question 9

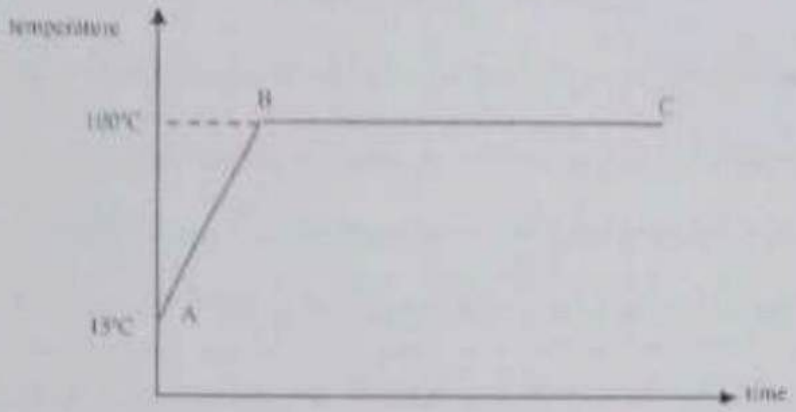
(i) A vessel of mass 195 g contains 200 g of water at 40°C. How much ice at 0°C is needed to cool it to 5°C? [3]

Take Specific heat capacity of material of vessel = 0.4 J $g^{-1}K^{-1}$

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

specific heat capacity of water=4.2 J $g^{-1}K^{-1}$

(ii) The temperature – time graph for water is shown below. Study the graph to answer the questions that follow: [3]

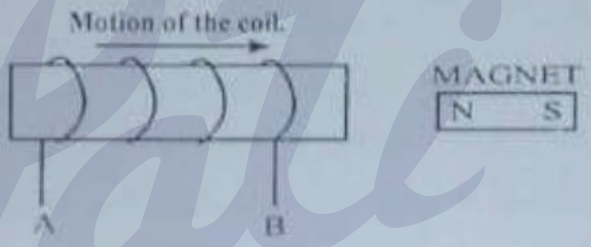


(a) What is the state of water indicated by the graph AB?

(b) Why is the part BC parallel to the time axis?

(c) At which point, A or B, the molecules possess more kinetic energy?

(iii) The diagram shows a copper coil near a magnet. The coil is moved towards the stationary magnet. [4]



(a) In which direction (A to B or B to A) does the induced current flow **in the coil** assuming that the circuit is complete?

(b) Name the law used to arrive at the conclusion in part (a).

(c) What is the magnitude of current when the coil remains stationary?

(d) If the number of turns in the coil is doubled, what happens to the induced current in the coil?

2023

PHYSICS

(SCIENCE PAPER 1)

Maximum Marks: 80

Time allowed: Two hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section A** is compulsory. Attempt **any four** questions from **Section B**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A (40 Marks)

*(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 answers only.)

(i) Clockwise moment produced by a force about a fulcrum is considered to be:

(a) Positive

(b) Negative

(c) Zero

(d) None of these

(ii) When the speed of a moving object is *doubled*, then its *kinetic energy*:

(a) remains the same

(b) decreases

(c) is doubled

(d) becomes four times

(iii) The energy conversion in a washing machine is from _____.

(a) magnetic to electrical

(b) electrical to mechanical

(c) electrical to magnetic

(d) magnetic to electrical

(iv) Which of the following radiations suffer maximum deflection in a magnetic field?

(a) Alpha radiations

(b) Beta radiations

(c) Gamma radiations

(d) X-radiations

(v) Speed of blue light in water is:

(a) more than green light

(b) more than orange light

(c) more than violet light

(d) more than red light

(vi) A concave lens produces only _____ image.

(a) real, enlarged

(b) virtual, enlarged

(c) virtual, diminished

(d) real, diminished

(vii) When a body vibrates under a periodic force, the vibrations of the body are always:

(a) natural vibrations

(b) damped vibrations

(c) forced vibrations

(d) resonant vibrations

(viii) Two notes are produced from two different musical instruments, such that they have same loudness and same pitch. The produced notes differ in their:

(a) Waveform

(b) Frequency

(c) Wavelength

(d) Speed

(ix) When a current I flows through a wire of resistance R for time t then the electrical energy produced is given by:

(a) I^2Rt

(b) IR^2t

(c) IRt

(d) IRt^2

(x) Choose the correct relation for e.m.f. (ε) and terminal voltage V:

(a) $\varepsilon = V$ (always)

(b) $V > \varepsilon$ [always]

(c) $V < \varepsilon$ [when the cell is in use]

(d) None of these

(xi) If the strength of the current flowing through a wire is increased, the strength of the magnetic field produced by it:

(a) decreases

(b) increases

(c) remains the same

(d) first increases then decreases

(xii) **Specific** latent heat of a substance:

(a) is directly proportional to the mass

(b) is directly proportional to the change in the temperature

(c) depends on the material

(d) is inversely proportional to the mass

(xiii) Specific heat capacity of a substance X is 1900 $Jkg^{-1}\ ^oC^{-1}$ means:

(a) Substance X absorbs 1900 J for 1°C rise in temperature

(b) 1 kg of substance X absorbs 1900 J heat for 1°C rise in temperature

(c) 1 kg of substance X absorbs 1900 J heat to increase the temperature

(d) 1 kg of substance X absorbs 1900 J heat to cool down by 1°C

(xiv) When a ray of light travels normal to the given surface, then the angle of refraction is:

(a) 180°

(b) 90°

(c) 0°

(d) 45°

(xv) Small air bubbles rising up a fish tank appear silvery when viewed from some particular angle is due to the:

(a) reflection

(b) refraction

(c) dispersion

(d) total internal reflection

Question 2

(i) (a) When does the nucleus of an atom tend to become radioactive? [3]

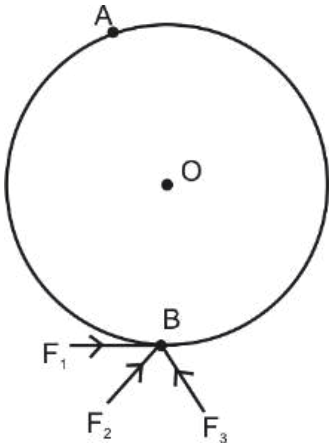
(b) Name a single pulley in which displacement of load and effort is not the same.

(c) State one advantage of this pulley.

(ii) (a) What is the position of centre of gravity of a triangular lamina? [2]

(b) When this triangular lamina is suspended freely from any one vertex, what is the moment of force produced by its own weight in its rest position?

(iii) The diagram shows wheel **O** pivoted at point **A**. Three equal forces **F**$_1$, **F**$_2$ and **F**$_3$ act at point **B** on the wheel. [2]



(a) Which force will produce maximum moment about **A**?

(b) Give a reason for your answer in (a).

(iv) (a) What should be the *angle* between the direction of force and the direction of displacement, for work to be negative? [2]

(b) Name the physical quantity obtained using the formula $\frac{U}{h}$, where U is the potential energy and h is the height.

(v) Calculate the power spent by a crane while lifting a load of mass 2000 kg, at velocity of 1.5 ms^{-1}. (g = 10 ms^{-2}) [2]

(vi) A metal foot ruler is held at the edge of a table. It is pressed at its free end and then released. It vibrates. [2]

(a) Name the vibrations produced.

(b) State *one* way to increase the frequency of these vibrations.

(vii) 'A geyser is rated 240 W – 220 V'. Explain the meaning of this statement. [2]

Question 3

(i) (a) Is it possible for a concave lens to form an image of size two times that of the object? Write *Yes* or *No*. [2]

(b) What will happen to the focal length of the lens if a part of the lens is covered with an opaque paper?

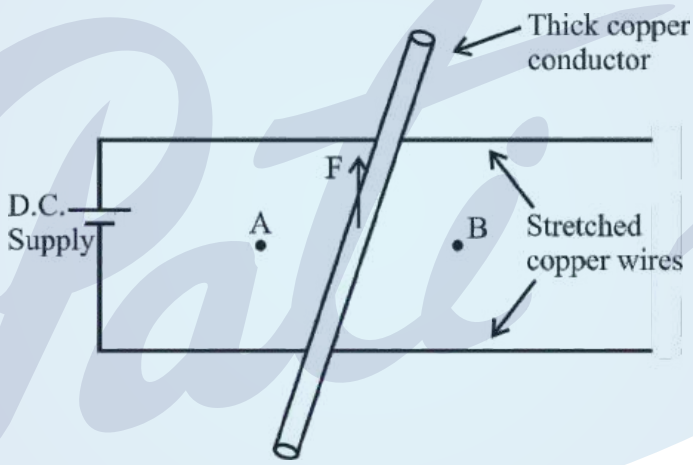
(ii) (a) Which electrical component protects the electric circuit in case of excess current and which can also be used as a switch? [2]

(b) Name the wire to which this electrical component is connected in an electric circuit.

(iii) A copper conductor is placed over two stretched copper wires whose ends are connected to a D.C. supply as shown in the diagram. [2]

(a) What should be the magnetic poles at the points**A** and **B** lying on either side of the conductor to experience the force in the upward direction?

(b) Name the law used to find these polarities.



(iv) Thermal capacities of substances **A** and **B** are same. If mass of **A** is more than mass of **B** then: [2]

(a) Which substance will have more specific heat capacity?

(b) Which substance will show greater rise in temperature ifthe same amount of heat is supplied to both?

(v) How is the *radioactivity* of a radio isotope affected if it undergoes a *chemical change*? Give a reason for your answer. [2]

SECTION B (40 Marks)

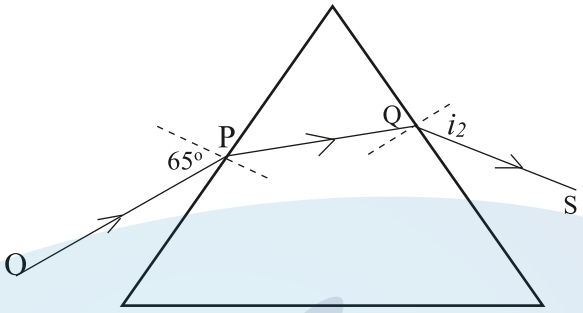
*(Attempt **any four** questions from this **Section**.)*

Question 4

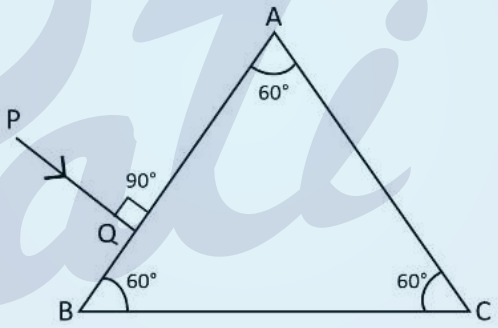
(i) The diagram below shows the ray **OP** travelling through an *equilateral* prism of a certain material. [3]

(a) Calculate the value of i_2, if the angle of deviation is 43°.

(b) What is the ray **QS** called?



(ii) Copy the diagram given below and complete the path of the light ray **PQ**, as it emerges out of the prism by marking necessary angles. The critical angle of glass is 42°. [3]

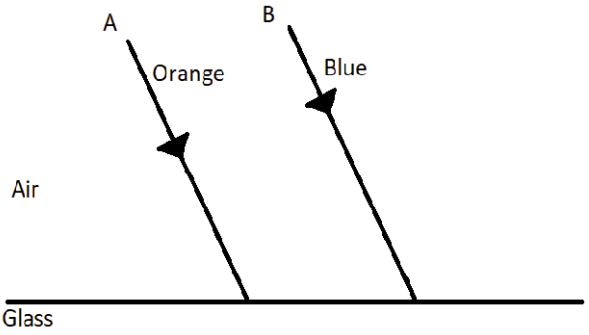


(iii) The diagram below shows two parallel rays **A** (Orange) & **B** (Blue) incident from air, on air-glass boundary. [4]

(a) Copy and complete the path of the rays **A** and **B**.

(b) How do the speeds of these rays differ in glass?

(c) Are the two refracted rays in glass parallel? Give a reason.



Question 5

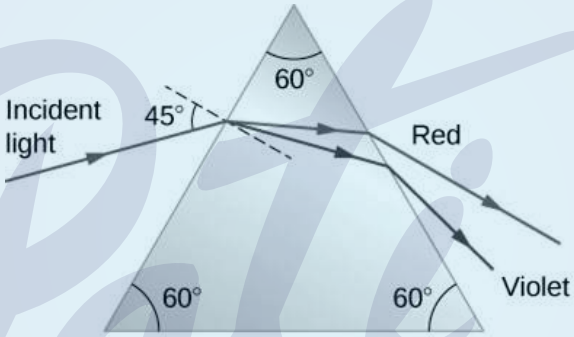
(i) A convex lens of focal length 10 cm is placed at a distance of 60 cm from a screen. How far from the lens should an object be placed so as to obtain a real image on the *screen*? [3]

(ii) (a) A coin kept inside water [μ=4/3] when viewed from air in a vertical direction appears to be raised by 3.0 mm. Find the depth of the coin in water. [3]

(b) How is the critical angle related to the refractive index of a medium?

(iii) (a) Infrared radiations are used in warfare. Explain with reason, why. [4]

(b) A ray of light is incident at 45° on an equilateral prism in the diagram below.



1. Name the phenomenon exhibited by the ray of light when it enters and emerges out of the prism.
2. State the cause of the above phenomenon mentioned by you.

Question 6

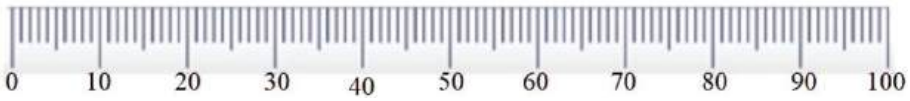
(i) A block and tackle system of pulleys has *velocity ratio* 4. [3]

(a) Draw a labelled diagram of the system indicating clearly, the direction of the load and the effort.

(b) What is the value of the mechanical advantage of the given pulley system if it is an ideal pulley system?

(ii) A **metre** scale of weight 50 gf can be balanced at 40 cm mark without any weight suspended on it. [3]

(a) If this ruler is cut at its centre then state which part [0 to 50 cm or 50 to 100 cm] of the ruler will weigh more than 25 gf.



(b) What minimum weight placed on this metre ruler can balance this ruler when it is pivoted at its centre?

(iii) A car of mass 120 kg is moving at a speed 18 **km/h** and it accelerates to attain a speed of 54 **km/h** in 5 seconds. Calculate: [4]

(a) the work done by the engine.

(b) the power of the engine.

Question 7

(i) (a) Which characteristic of sound is affected due to the larger surface of a school bell? [3]

(b) Calculate the distance covered by the Ultrasonic wave having a velocity of 1.5 **kms^{-1}** in 14 s, when it is received after reflection by the receiver of the SONAR.

(ii) (a) Complete the following nuclear changes: [3]

$$^{238}_{92}P \rightarrow \_\_Q + {}^{4}_{2}He \rightarrow \_\_R + {}^{0}_{-1}e$$

(b) Name the nuclear radiation which has the highest ionizing power.

(iii) We are able to see the T.V. channels clearly when we set T.V. on *auto-tuning*. [4]

(a) Which *phenomenon* led to the clear visibility of the channels, due to auto-tuning?

(b) Define the above phenomenon mentioned by you.

(c) Give *any one* more example of this phenomenon.

Question 8

(i) (a) Define specific resistance. [3]

(b) What happens to the specific resistance of a conductor if its length is doubled?

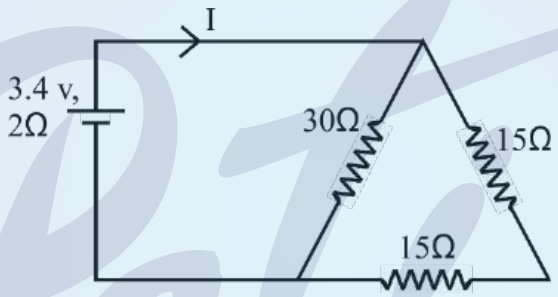
(c) Name a substance whose specific resistance remains almost unchanged with the increase in its temperature.

(ii) (a) Which nuclear radiation will travel undeviated in an electric field? [3]

(b) How can one stop the radiations escaping from a nuclear reactor in a nuclear power plant?

(c) Name *one* internal source of background radiations.

(iii) Find the value of current **I** drawn from the cell. [4]



(a) Calculate the current **I**.

(b) Calculate the terminal voltage.

Question 9

(i) Calculate the total amount of heat energy required to **melt** 200 g of ice at 0°C to water at 100°C. [3]

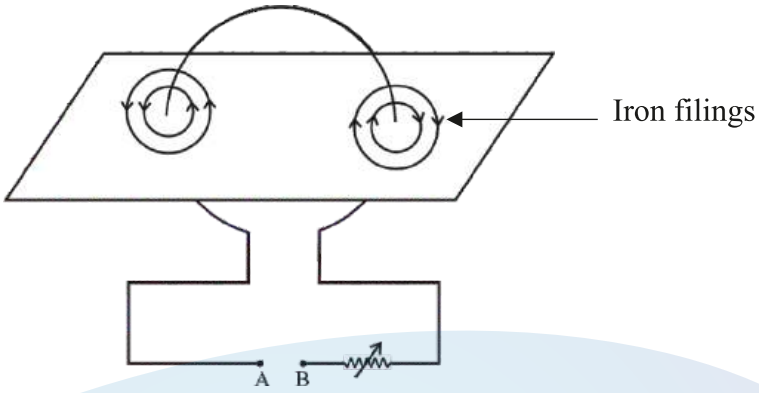
(Specific latent heat of ice = 336 J g^{-1}, specific heat capacity of water = 4.2 J g^{-1} $°C^{-1}$)

(ii) (a) State the principle of calorimetry. [3]

(b) Name the material used for making a calorimeter.

(c) Write *one* characteristic property of the material chosen for making a calorimeter.

(iii) The diagram below shows a cardboard on which iron filings are kept. A wire bent in the form of a loop is seen passing through the cardboard When current flows through it the iron filings arrange themselves as shown below. [4]



(a) State the polarities of the *battery* at **A** and **B**.

(b) State the effect on the magnetic field if an iron rod is held along the axis of the coil.

(c) State one way to:

1. Change the polarity of the *coil*.
2. *Decrease* the strength of the magnetic field around the coil.

PHYSICS

SCIENCE Paper – 1

(Two hours)

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during the first **15** minutes.*

This time is to be spent in reading the Question Paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section I** is compulsory. Attempt **any four** questions from **Section II**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 Marks)

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

Question 1

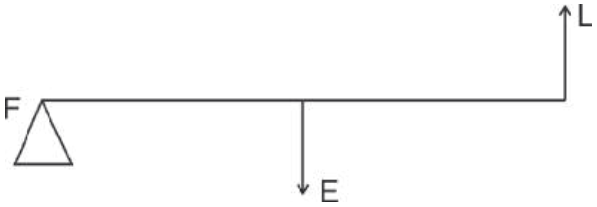
(a) (i) Define moment of force. [2]

(ii) Write the relationship between the SI and CGS unit of moment of force.

(b) Define a kilowatt hour. How is it related to joule? [2]

(c) A satellite revolves around a planet in a circular orbit. What is the work done by the satellite **at any instant**? Give a reason. [2]

(d) (i) Identify the class of the lever shown in the diagram below: [2]



(ii) How is it possible to increase the M.A. of the above lever without increasing its length?

(e) Give one example of each when: [2]

(i) Chemical energy changes into electrical energy.

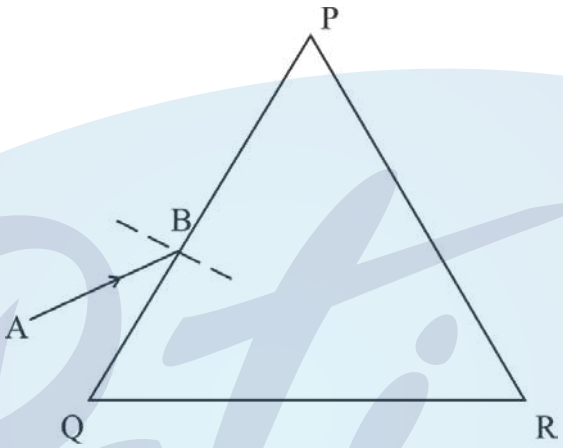
(ii) Electrical energy changes into sound energy.

Question 2

(a) A crane **'A'** lifts a heavy load in 5 seconds, whereas another crane **'B'** does the same work in 2 seconds. Compare the power of crane **'A'** to that of crane **'B'**. [2]

(b) A ray of light falls normally on a rectangular glass slab. [2]
Draw a ray diagram showing the path of the ray till it emerges out of the slab.

(c) Complete the path of the monochromatic light ray AB incident on the surface PQ of the equilateral glass prism PQR till it emerges out of the prism due to refraction. [2]



(d) Where should an object be placed in front of a convex lens in order to get: [2]

(i) an enlarged real image

(ii) enlarged virtual image?

(e) A pond appears to be 2.7 m deep. If the refractive index of water is $\frac{4}{3}$, find the actual depth of the pond. [2]

Question 3

(a) The wave lengths for the light of red and blue colours are nearly 7.8×10^{-7} m and 4.8×10^{-7} m respectively. [2]

(i) Which colour has the greater speed in a vacuum?

(ii) Which colour has a greater speed in glass?

(b) Draw a graph between displacement from mean position and time for a body executing free vibration in a vacuum. [2]

(c) A sound wave travelling in water has wavelength 0.4 m. [2]
Is this wave audible in air? (The speed of sound in water = 1400 ms^{-1})

(d) Why does stone lying in the sun get heated up much more than water lying for the same duration of time? [2]

(e) Why is it not advisable to use a piece of copper wire as fuse wire in an electric circuit? [2]

Question 4

(a) Calculate the total resistance across AB: [2]

(b) Two metallic blocks P and Q having masses in ratio 2:1 are supplied with the same amount of heat. If their temperatures rise by samedegree, compare their specific heat capacities. [2]

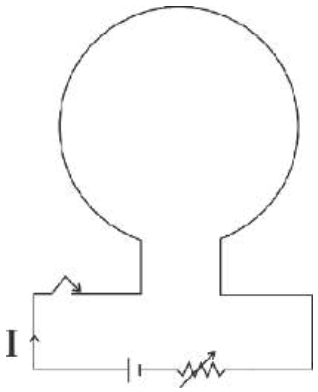
(c) When a current carrying conductor is placed in a magnetic field, it experiences a mechanical force. What should be the angle between the magnetic field and the length of the conductor so that the force experienced is: [2]

(i) Zero

(ii) Maximum?

(d) A nucleus ${}_{84}X^{202}$ of an element emits an alpha particle followed by a beta particle. The final nucleus is ${}_{a}Y^{b}$. Find a and b. [2]

(e) The diagram below shows a loop of wire carrying current I: [2]



(i) What is the magnetic polarity of the loop that faces us?

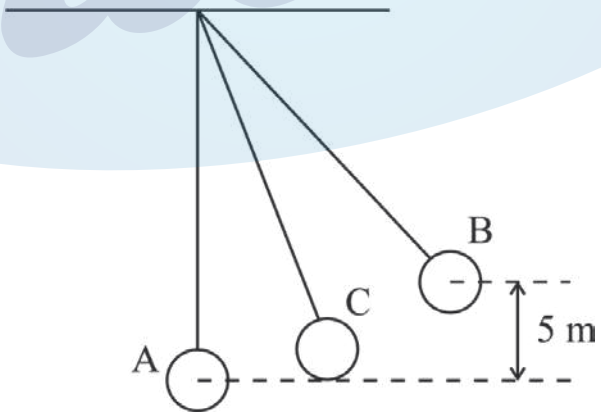
(ii) With respect to the diagram how can we increase the strength of the magnetic field produced by this loop?

SECTION II (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) The figure below 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 the position A is zero. At the position B the pendulum bob is raised by 5 m. [3]



(i) What is the potential energy of the pendulum at the position B?

(ii) What is the total mechanical energy at point C?

(iii) What is the speed of the bob at the position A when released from B?

(Take g = 10 ms^{-2} and there is no loss of energy.)

(b) (i) With reference to the direction of action, how does a centripetal force differ from a centrifugal force during uniform circular motion? [3]

(ii) Is centrifugal force the force of reaction of centripetal force?

(iii) Compare the magnitudes of centripetal and centrifugal force.

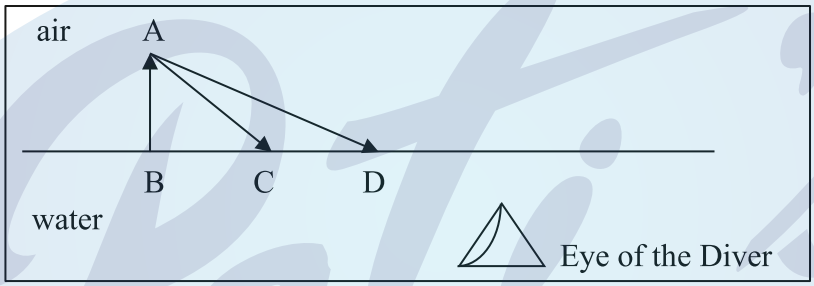
(c) A block and tackle system of pulleys has velocity ratio 4. [4]

(i) Draw a neat labelled diagram of the system indicating clearly the points of application and direction of load and effort.

(ii) What will be its V.R. if the weight of the movable block is doubled?

Question 6

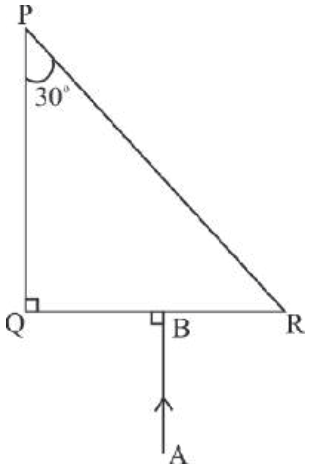
(a) A diver in water looks obliquely at an object AB in air. [3]



(i) Does the object appear taller, shorter or of the same size to the diver?

(ii) Show the path of two rays AC & AD starting from the tip of the object as it travels towards the diver in water and hence obtain the image of the object.

(b) Complete the path of the ray AB through the glass prism in PQR till it emerges out of the prism. Given the critical angle of the glass as 42°. [3]



(c) A lens of focal length 20 cm forms an inverted image at a distance 60 cm from the lens. [4]

(i) Identify the lens.

(ii) How far is the lens present in front of the object?

(iii) Calculate the magnification of the image.

Question 7

(a) Give reasons for the following: [3]

During the day:

(i) Clouds appear white.

(ii) Sky appears blue.

(b) (i) Name the system which enables us to locate underwater objects by transmitting ultrasonic waves and detecting the reflecting impulse. [3]

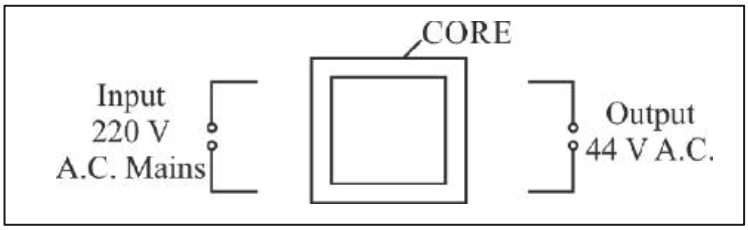
(ii) What are acoustically measurable quantities related to pitch and loudness?

(c) (i) When a tuning fork [vibrating] is held close to ear, one hears a faint hum. The same [vibrating tuning fork] is heldsuch that its stemis in contact with the table surface, then one hears a loud sound. Explain. [4]

(ii) A man standing in front of a vertical cliff fires a gun. He hears the echo after 3.5 seconds. On moving closer to the cliff by 84 m, he hears the echo after 3 seconds. Calculate the distance of the cliff from the initial position of the man.

Question 8

(a) The diagram below shows the core of a transformer and its input and output connections [3]



(i) State the material used for the core.

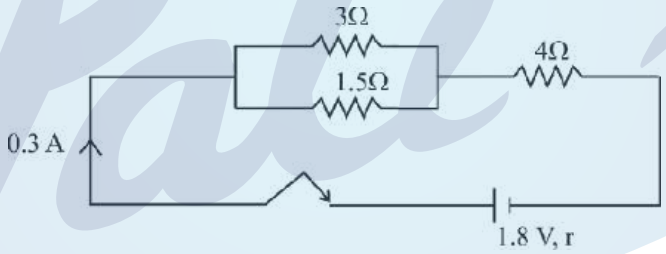
(ii) Copy and complete the diagram of the transformer by drawing input and output coils.

(b) (i) What are superconductors? [3]

(ii) Calculate the current drawn by an appliance rated 110 W, 220 V when connected across 220 V supply.

(iii) Name a substance whose resistance decreases with the increase in temperature.

(c) [4]



The diagram above shows three resistors connected across a cell of e.m.f. 1.8 V and internal resistance *r*. Calculate:

(i) Current through 3 Ω resistor.

(ii) The internal resistance *r*.

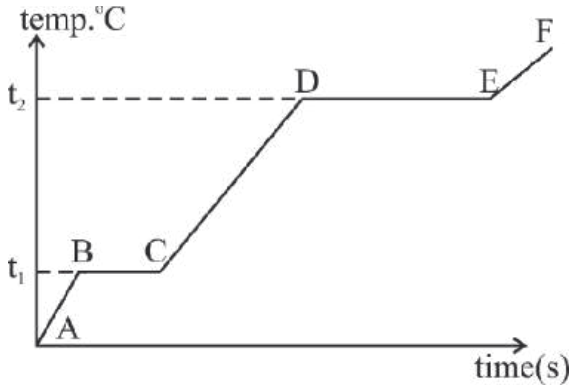
Question 9

(a) (i) Define heat capacity of a substance. [3]

(ii) Write the SI unit of heat capacity.

(iii) What is the relationship between heat capacity and specific heat capacity of a substance?

(b) The diagram below shows the change of phases of a substance on a temperature vs time graph on heating the substance at a constant rate. [3]



(i) Why is the slope of CD less than slope of AB?

(ii) What is the boiling and melting point of the substance?

(c) A piece of ice of mass 60 g is dropped into 140 g of water at 50°C. [4]
Calculate the final temperature of water when all the ice has melted.
(Assume no heat is lost to the surrounding)
Specific heat capacity of water = 4.2 $Jg^{-1}k^{-1}$
Specific latent heat of fusion of ice = 336 Jg^{-1}

Question 10

(a) (i) Draw a neat labeled diagram of a d.c. motor. [3]

(ii) Write any one use of a d.c. motor.

(b) (i) Differentiate between nuclear fusion and nuclear fission. [3]

(ii) State one safety precaution in the disposal of nuclear waste.

(c) 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**. [4]

(i) What is the composition of B?

(ii) The nucleus B emits a beta particle and is transformed into a nucleus C. What is the composition of C?

(iii) What is mass number of the nucleus A?

(iv) Does the composition of C change if it emits gamma radiations?

PHYSICS

SCIENCE Paper – 1

(Two hours)

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during the first **15** minutes.*

This time is to be spent in reading the Question Paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section I** is compulsory. Attempt **any four** questions from **Section II**.*

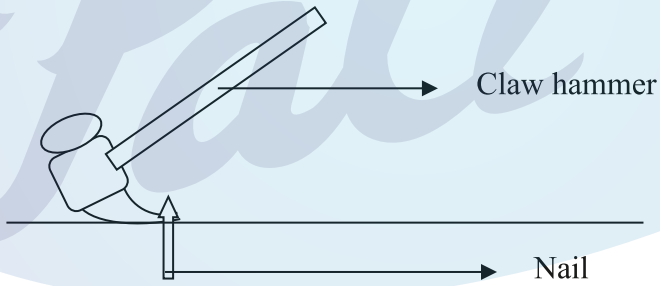
The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 Marks)

*Attempt **all** questions from this Section*

Question 1

(a) The diagram below shows a claw hammer used to remove a nail: [2]



(i) To which class of lever does it belong?

(ii) Give one more example of the **same class** of lever mentioned by you in (i) for which the **mechanical advantage is greater than one**.

(b) Two bodies A and B have masses in the ratio 5:1 and their kinetic energies are in the ratio 125:9. Find the ratio of their velocities. [2]

(c) (i) Name the physical quantity which is measured in calories. [2]

(ii) How is calorie related to the S.I unit of that quantity?

(d) (i) Define couple. [2]

(ii) State the S.I. unit of moment of couple.

(e) (i) Define critical angle. [2]

(ii) State one important factor which affects the critical angle of a given medium.

Question 2

(a) An electromagnetic radiation is used for photography in fog. [2]

(i) Identify the radiation.

(ii) Why is this radiation mentioned by you, ideal for this purpose?

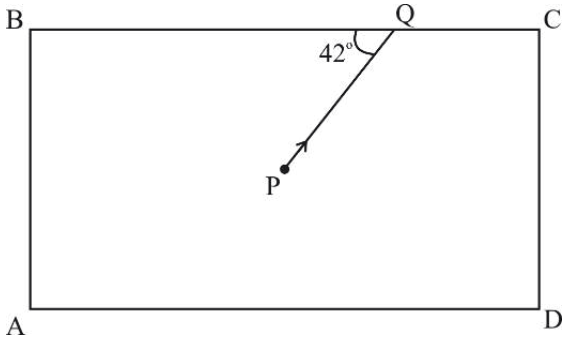
(b) (i) What is the relation between the refractive index of water with respect to air (${}_a\mu_w$) and the refractive index of air with respect to water (${}_w\mu_a$). [2]

(ii) If the refractive index of water with respect to air (${}_a\mu_w$) is $\frac{5}{3}$.
Calculate the refractive index of air with respect to water (${}_w\mu_a$).

(c) The specific heat capacity of a substance A is 3,800 $Jkg^{-1}K^{-1}$ and that of a substance B is 400 $Jkg^{-1}K^{-1}$. Which of the two substances is a good conductor of heat? Give a reason for your answer. [2]

(d) A man playing a flute is able to produce notes of different frequencies. If he closes the holes near his mouth, will the pitch of the note produced, increase or decrease? Give a reason. [2]

(e) The diagram below shows a light source P embedded in a rectangular glass block ABCD of critical angle 42°. Complete the path of the ray PQ till it emerges out of the block. [Write necessary angles.] [2]



Question 3

(a) (i) If the lens is placed in water instead of air, how does its focal length change? [2]

(ii) Which lens, thick or thin has greater focal length?

(b) Two waves of the same pitch have amplitudes in the ratio 1: 3. [2]
What will be the ratio of their:

(i) intensities and

(ii) frequencies?

(c) How does an increase in the temperature affect the specific resistance of a: [2]

(i) Metal and

(ii) Semiconductor?

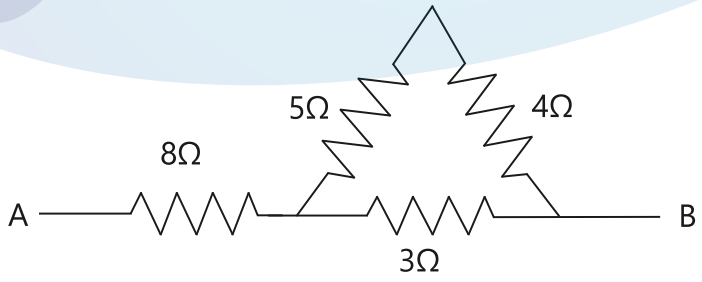
(d) (i) Define resonant vibrations. [2]

(ii) Which characteristic of sound, makes it possible to recognize a person by his voice without seeing him?

(e) Is it possible for a hydrogen ($^{1}_{1}H$) nucleus to emit an alpha particle? [2]
Give a reason for your answer.

Question 4

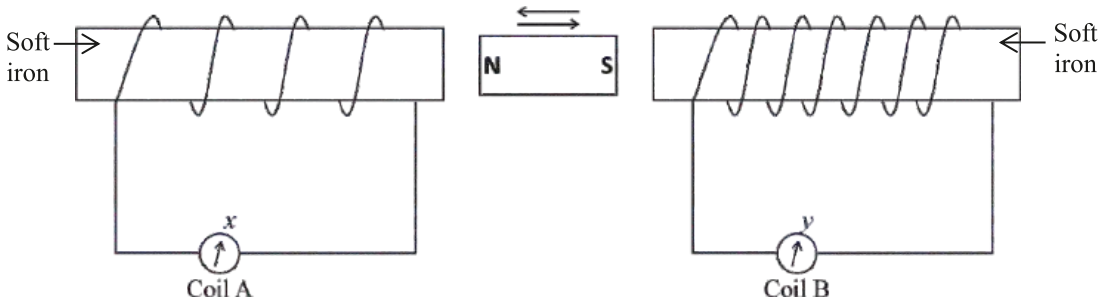
(a) Calculate the effective resistance across AB: [2]



(b) (i) State whether the specific heat capacity of a substance remains the same when its state changes from solid to liquid. [2]

(ii) Give one example to support your answer.

(c) A magnet kept at the centre of two coils A and B is moved to and fro as shown in the diagram. The two galvanometers show deflection. [2]



State with a **reason** whether:

$x > y$

or

$x < y$. [x and y are magnitudes of deflection.]

(d) (i) Why is a nuclear fusion reaction called a thermo nuclear reaction? [2]

(ii) Complete the reaction:

$$^{3}He_{2} + {}^{2}H_{1} \longrightarrow {}^{4}He_{2} + \ldots\ldots\ldots\ldots + \text{Energy}$$

(e) State two ways to increase the speed of rotation of a D.C. motor. [2]

SECTION II (40 Marks)

*Attempt any **four** questions from this Section*

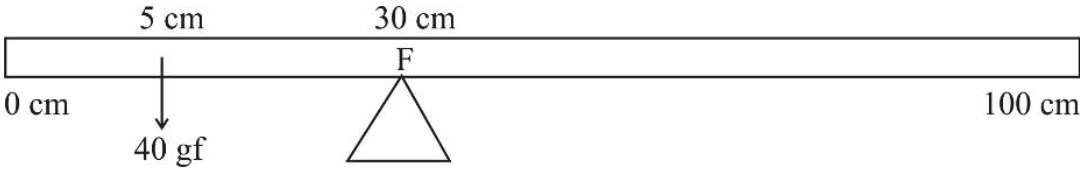
Question 5

(a) A body of mass 10 Kg is kept at a height of 5 m. It is allowed to fall and reach the ground. [3]

(i) What is the total mechanical energy possessed by the body at the height of 2 m assuming it is a frictionless medium?

(ii) What is the kinetic energy possessed by the body just before hitting the ground? Take g = 10 m / s^2.

(b) A uniform meter scale is in equilibrium as shown in the diagram: [3]



(i) Calculate the weight of the meter scale.

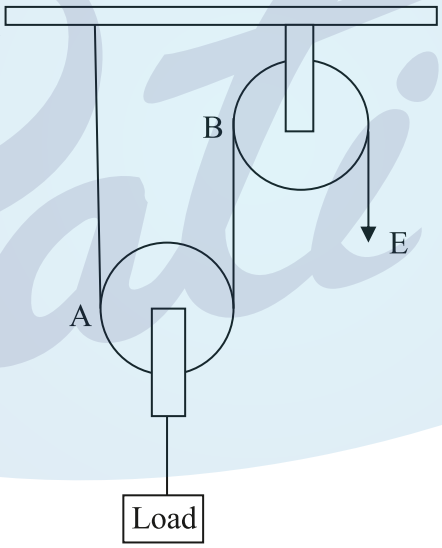
(ii) Which of the following options is correct to keep the ruler in equilibrium when 40 gf wt is shifted to 0 cm mark?

F is shifted towards 0 cm.

or

F is shifted towards 100 cm.

(c) The diagram below shows a pulley arrangement: [4]



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

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

(iii) If the tension acting on the string is T, then what is the relationship between T and effort E?

(iv) If the free end of the string moves through a distance x, find the distance by which the load is raised.

Question 6

(a) How does the angle of deviation formed by a prism change with the increase in the angle of incidence? [3]

Draw a graph showing the variation in the angle of deviation with the angle of incidence at a prism surface.

(b) A virtual, diminished image is formed when an object is placed between the optical centre and the principal focus of a lens. [3]

(i) Name the type of lens which forms the above image.

(ii) Draw a ray diagram to show the formation of the image with the above stated characteristics.

(c) An object is placed at a distance 24 cm in front of a convex lens of focal length 8 cm. [4]

(i) What is the nature of the image so formed?

(ii) Calculate the distance of the image from the lens.

(iii) Calculate the magnification of the image.

Question 7

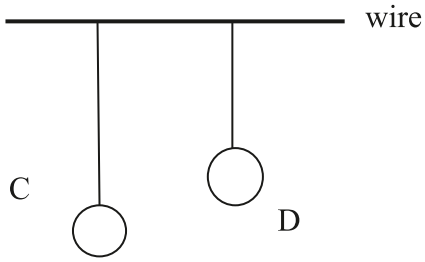
(a) It is observed that during march-past we hear a base drum distinctly from a distance compared to the side drums. [3]

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

(ii) Give a reason for the above observation.

(b) A pendulum has a frequency of 4 vibrations per second. An observer starts the pendulum and fires a gun simultaneously. He hears the echo from the cliff after 6 vibrations of the pendulum. If the velocity of sound in air is 340 m/s, find the distance between the cliff and the observer. [3]

(c) Two pendulums C and D are suspended from a wire as shown in the figure given below. Pendulum C is made to oscillate by displacing it from its mean position. It is seen that D also starts oscillating. [4]



(i) Name the type of oscillation, C will execute.

(ii) Name the type of oscillation, D will execute.

(iii) If the length of D is made equal to C then what difference will you notice in the oscillations of D?

(iv) What is the name of the phenomenon when the length of D is made equal to C?

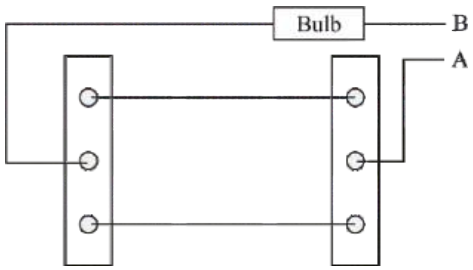
Question 8

(a) (i) Write one advantage of connecting electrical appliances in parallel combination. [3]

(ii) What characteristics should a fuse wire have?

(iii) Which wire in a power circuit is connected to the metallic body of the appliance?

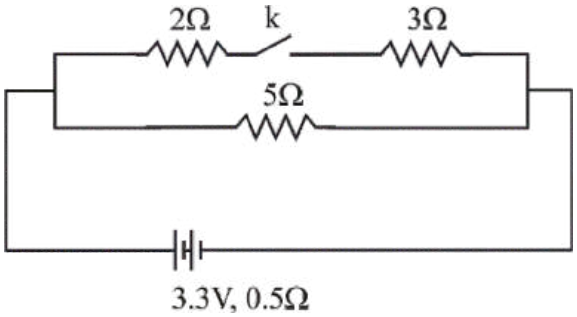
(b) The diagram below shows a dual control switch circuit connected to a bulb. [3]



(i) Copy the diagram and complete it so that the bulb is switched ON.

(ii) Out of A & B which one is the live wire and which one is the neutral wire?

(c) [4]



The diagram above shows a circuit with the key k open. Calculate:

(i) the resistance of the circuit when the key k is open.

(ii) the current drawn from the cell when the key k is open.

(iii) the resistance of the circuit when the key k is closed.

(iv) the current drawn from the cell when the key k is closed.

Question 9

(a) (i) Define Calorimetry. [3]

(ii) Name the material used for making a Calorimeter.

(iii) Why is a Calorimeter made up of thin sheets of the above material answered in (ii)?

(b) The melting point of naphthalene is 80°C and the room temperature is 30°C. A sample of liquid naphthalene at 100°C is cooled down to the room temperature. Draw a temperature time graph to represent this cooling. In the graph, mark the region which corresponds to the freezing process. [3]

(c) 104 g of water at 30°C is taken in a calorimeter made of copper of mass 42 g. When a certain mass of ice at 0°C is added to it, the final steady temperature of the mixture after the ice has melted, was found to be 10°C. Find the mass of ice added. [Specific heat capacity of water = 4.2 $Jg^{-1}°C^{-1}$; Specific latent heat of fusion of ice = 336 Jg^{-1}; Specific heat capacity of copper = 0.4 $Jg^{-1}°C^{-1}$] [4]

Question 10

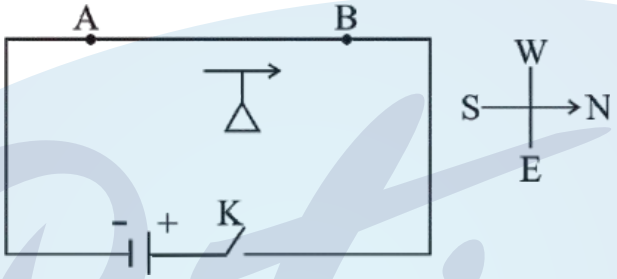
(a) Draw a neat labeled diagram of an A.C. generator. [3]

(b) (i) Define nuclear fission. [3]

(ii) Rewrite and complete the following nuclear reaction by filling in the atomic number of Ba and mass number of Kr:

$$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{144}_{\ldots\ldots}Ba + {}^{\ldots\ldots}_{36}Kr + 3\ {}^{1}_{0}n + Energy$$

(c) The diagram below shows a magnetic needle kept just below the conductor AB which is kept in North South direction. [4]



(i) In which direction will the needle deflect when the key is closed?

(ii) Why is the deflection produced?

(iii) What will be the change in the deflection if the magnetic needle is taken just above the conductor AB?

(iv) Name one device which works on this principle.

PHYSICS

SCIENCE Paper – 1

(Two hours)

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during the first **15** minutes.*

This time is to be spent in reading the Question Paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section I** is compulsory. Attempt **any four** questions from **Section II**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 Marks)

*Attempt **all** questions from this Section*

Question 1

(a) (i) State and define the S.I. unit of power. [2]

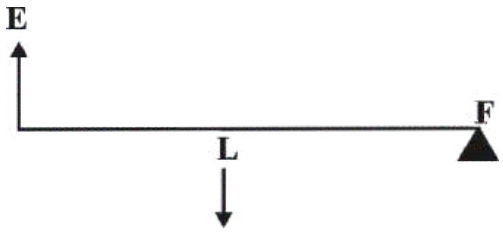
(ii) How is the unit horse power related to the S.I. unit of power?

(b) State the energy changes in the following cases while in use: [2]

(i) An electric iron.

(ii) A ceiling fan.

(c) The diagram below shows a lever in use: [2]



(i) To which class of levers does it belong?

(ii) Without changing the dimensions of the lever, if the load is shifted towards the fulcrum what happens to the mechanical advantage of the lever?

(d) (i) Why is the ratio of the velocities of light of wavelengths 4000Å and 8000Å in vacuum 1:1? [2]

(ii) Which of the above wavelengths has a higher frequency?

(e) (i) Why is the motion of a body moving with a constant speed around a circular path said to be accelerated? [2]

(ii) Name the unit of physical quantity obtained by the formula $\frac{2K}{V^2}$.

Where K: kinetic energy, V: Linear velocity.

Question 2

(a) The power of a lens is –5D. [2]

(i) Find its focal length.

(ii) Name the type of lens.

(b) State the position of the object in front of a converging lens if: [2]

(i) It produces a real and same size image of the object.

(ii) It is used as a magnifying lens.

(c) (i) State the relation between the critical angle and the absolute refractive index of a medium. [2]

(ii) Which colour of light has a higher critical angle? Red light or Green light.

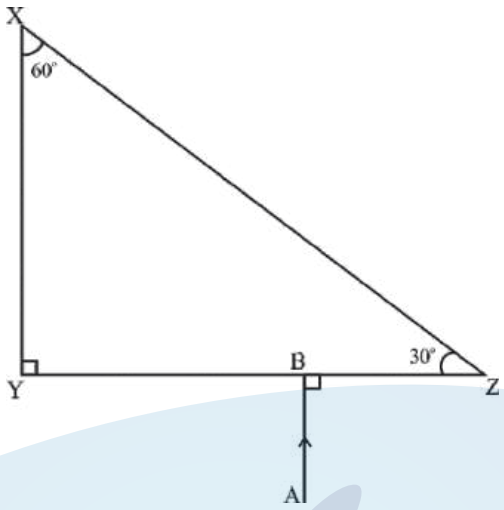
(d) (i) Define scattering. [2]

(ii) The smoke from a fire looks white.

Which of the following statements is true?

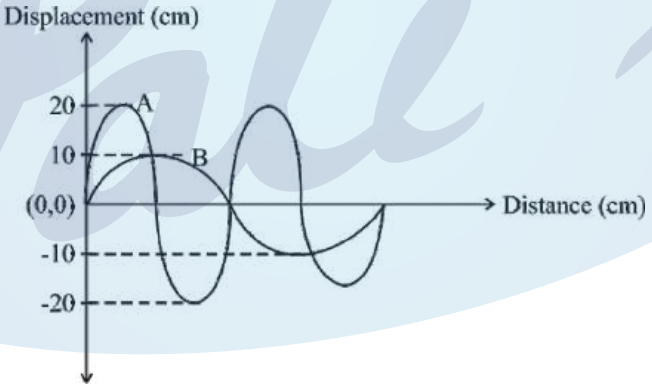
1. Molecules of the smoke are bigger than the wavelength of light.
2. Molecules of the smoke are smaller than the wavelength of light.

(e) The following diagram shows a 60°, 30°, 90° glass prism of critical angle 42°. [2]
Copy the diagram and complete the path of incident ray AB emerging out of the prism marking the angle of incidence on each surface.



Question 3

(a) Displacement distance graph of two sound waves A and B, travelling in a medium, are as shown in the diagram below. [2]



Study the two sound waves and compare their:

(i) Amplitudes

(ii) Wavelengths

(b) You have three resistors of values 2Ω, 3Ω and 5Ω. How will you join them so that the total resistance is more than 7Ω? [2]

(i) Draw a diagram for the arrangement.

(ii) Calculate the equivalent resistance.

(c) (i) What do you understand by the term nuclear fusion? [2]

(ii) Nuclear power plants use **nuclear fission** reaction to produce electricity. What is the advantage of producing electricity by **fusion** reaction?

(d) (i) What do you understand by free vibrations of a body? [2]

(ii) Why does the amplitude of a vibrating body continuously decrease during damped vibrations?

(e) (i) How is the e.m.f. across primary and secondary coils of a transformer related with the number of turns of coil in them? [2]

(ii) On which type of current do transformers work?

Question 4

(a) (i) How can a temperature in degree Celsius be converted into S.I. unit of temperature? [2]

(ii) A liquid **X** has the maximum specific heat capacity and is used as a coolant in Car radiators. Name the liquid **X**.

(b) A solid metal weighing 150 g melts at its melting point of 800 °C by providing heat at the rate of 100 W. The time taken for it to completely melt at the same temperature is 4 min. What is the specific latent heat of fusion of the metal? [2]

(c) Identify the following wires used in a household circuit: [2]

(i) The wire is also called as the phase wire.

(ii) The wire is connected to the top terminal of a three pin socket.

(d) (i) What are isobars? [2]

(ii) Give one example of isobars.

(e) State any two advantages of electromagnets over permanent magnets. [2]

SECTION II (40 Marks)

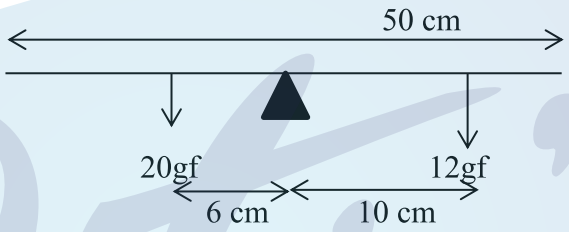
*Attempt any **four** questions from this Section*

Question 5

(a) (i) Derive a relationship between S.I. and C.G.S. unit of work. [3]

(ii) A force acts on a body and displaces it by a distance S in a direction at an angle θ with the direction of force. What should be the value of θ to get the maximum positive work?

(b) A half metre 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]



(i) Which of the two forces acting on the rigid rod causes clockwise moment?

(ii) Is the rod in equilibrium?

(iii) The direction of 20 gf force is reversed. What is the magnitude of the resultant moment of the forces on the rod?

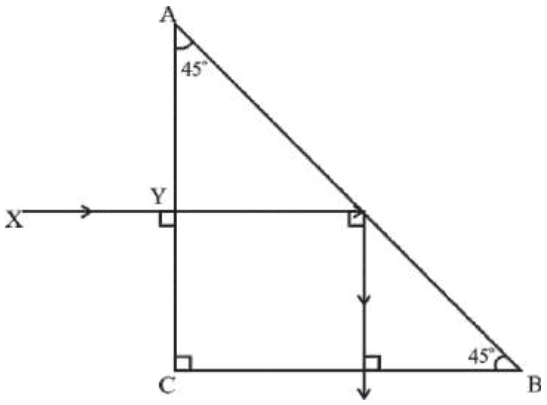
(c) (i) Draw a diagram to show a block and tackle pulley system having a velocity ratio of 3 marking the direction of load(L), effort(E) and tension(T). [4]

(ii) The pulley system drawn lifts a load of 150 N when an effort of 60 N is applied. Find its mechanical advantage.

(iii) Is the above pulley system an ideal machine or not?

Question 6

(a) A ray of light XY passes through a right angled isosceles prism as shown below. [3]

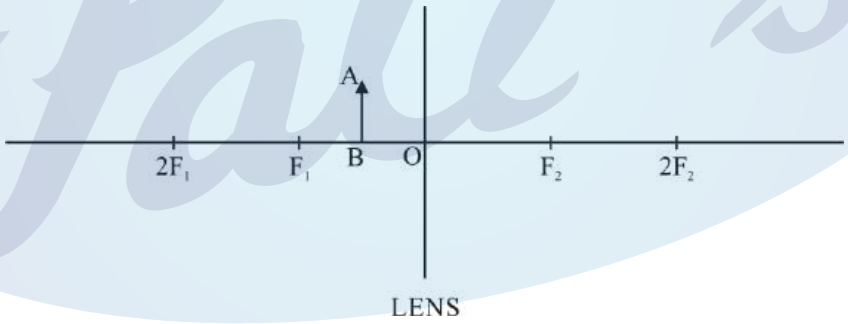


(i) What is the angle through which the incident ray deviates and emerges out of the prism?

(ii) Name the instrument where this action of prism is put into use.

(iii) Which prism surface will behave as a mirror?

(b) An object AB is placed between O and F_1 on the principal axis of a converging lens as shown in the diagram. [3]



Copy the diagram and by using three standard rays starting from point A, obtain an image of the object AB.

(c) An object is placed at a distance of 12 cm from a convex lens of focal length 8 cm. Find: [4]

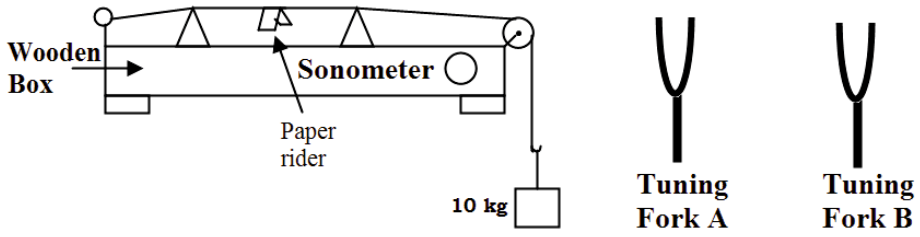
(i) the position of the image

(ii) nature of the image

Question 7

(a) Draw the diagram of a right angled isosceles prism which is used to make an inverted image erect. [3]

(b) [3]



The diagram above shows a wire stretched over a sonometer. Stems of two vibrating tuning forks A and B are touched to the wooden box of the sonometer. It is observed that the paper rider (a small piece of paper folded at the centre) present on the wire flies off when the stem of vibrating tuning fork B is touched to the wooden box but the paper just vibrates when the stem of vibrating tuning fork A is touched to the wooden box.

(i) Name the phenomenon when the paper rider just vibrates.

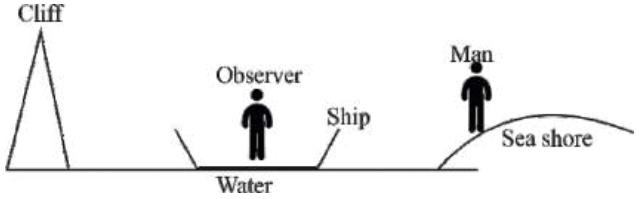
(ii) Name the phenomenon when the paper rider flies off.

(iii) Why does the paper rider fly off when the stem of tuning fork B is touched to the box?

(c) A person is standing at the sea shore. An observer on the ship which is anchored in between a vertical cliff and the person on the shore, fires a gun. The person on the shore hears two sounds, 2 seconds and 3 seconds after seeing the smoke of the fired gun. If the speed of sound in the air is 320 ms^{-1} then calculate: [4]

(i) the distance between the observer on the ship and the person on the shore.

(ii) the distance between the cliff and the observer on the ship.

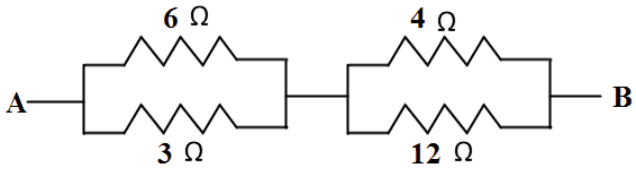


Question 8

(a) (i) A fuse is rated 8A. Can it be used with an electrical appliance rated 5 KW, 200 V? Give a reason. [3]

(ii) Name two safety devices which are connected to the live wire of a household electric circuit.

(b) (i) Find the equivalent resistance between A and B. [3]



(ii) State whether the resistivity of a wire changes with the change in the thickness of the wire.

(c) An electric iron is rated 220V, 2kW. [4]

(i) If the iron is used for 2h daily find the cost of running it for one week if it costs ₹ 4.25 per kWh.

(ii) Why is the fuse absolutely necessary in a power circuit?

Question 9

(a) (i) Heat supplied to a solid changes it into liquid. What is this change in phase called? [3]

(ii) During the phase change does the average kinetic energy of the molecules of the substance increase?

(iii) What is the energy absorbed during the phase change called?

(b) (i) State two differences between "Heat Capacity" and "Specific Heat Capacity". [3]

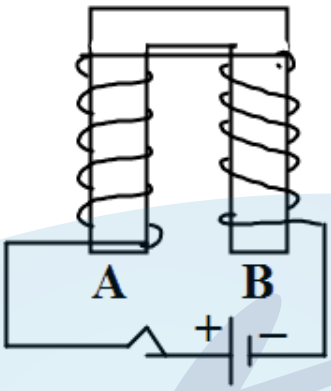
(ii) Give a mathematical relation between Heat Capacity and Specific Heat Capacity.

(c) The temperature of 170g of water at 50°C is lowered to 5°C by adding certain amount of ice to it. Find the mass of ice added. [4]

Given: Specific heat capacity of water = 4200 J kg^{-1} $^0C^{-1}$ and Specific latent heat of ice = 336000 J kg^{-1}

Question 10

(a) [3]



The diagram shows a coil wound around a U shape soft iron bar AB.

(i) What is the polarity induced at the ends A and B when the switch is pressed?

(ii) Suggest one way to strengthen the magnetic field in the electromagnet.

(iii) What will be the polarities at A & B if the direction of current is reversed in the circuit?

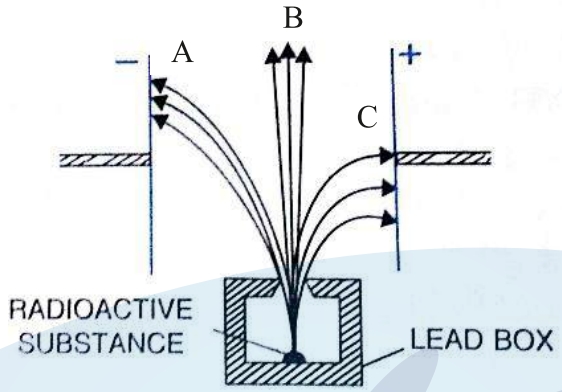
(b) The ore of Uranium found in nature contains $_{92}U^{238}$ and $_{92}U^{235}$. Although both the isotopes are fissionable, it is found out experimentally that one of the two isotopes is more easily fissionable. [3]

(i) Name the isotope of Uranium which is easily fissionable.

(ii) Give a reason for your answer.

(iii) Write a nuclear reaction when Uranium 238 emits an alpha particle to form a Thorium (Th) nucleus.

(c) 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. [4]



(i) Name the radiation B which is unaffected by the electrostatic field.

(ii) Why does the radiation C deflect more than A?

(iii) Which among the three causes the least biological damage externally?

(iv) Name the radiation which is used in carbon dating.

PHYSICS

SCIENCE Paper – 1

(Two hours)

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during the first **15** minutes.*

This time is to be spent in reading the Question Paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section I** is compulsory. Attempt **any four** questions from **Section II**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 Marks)

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

Question 1

(a) A brass ball is hanging from a stiff cotton thread. Draw a neat labelled diagram showing the forces acting on the brass ball and the cotton thread. [2]

(b) The distance between two bodies is doubled. How is the magnitude of gravitational force between them affected? [2]

(c) Why is a jack screw provided with a long arm? [2]

(d) If the power of a motor be 100 kW, at what speed can it raise a load of 50,000 N? [2]

(e) Which class of lever will always have MA > 1 and why? [2]

Question 2

(a) Define heat capacity and state its SI unit. [2]

(b) Why is the base of a cooking pan generally made thick? [2]

(c) A solid of mass 50 g at 150°C is placed in 100 g of water at 11°C, when the final temperature recorded is 20°C. Find the specific heat capacity of the solid. [2]

(Specific heat capacity of water = 4.2 J/g°C)

(d) How is the refractive index of a material related to: [2]

(i) real and apparent depth?

(ii) velocity of light in vacuum or air and the velocity of light in a given medium?

(e) State the conditions required for total internal reflection of light to take place. [2]

Question 3

(a) Draw a ray diagram to show the refraction of a monochromatic ray through a prism when it suffers minimum deviation. [2]

(b) The human ear can detect continuous sounds in the frequency range from 20 Hz to 20,000 Hz. Assuming that the speed of sound in air is 330 ms^{-1} for all frequencies, calculate the wavelengths corresponding to the given extreme frequencies of the audible range. [2]

(c) An enemy plane is at a distance of 300 km from a radar. In how much time the radar will be able to detect the plane? Take velocity of radiowaves as 3 x 10^8 ms^{-1}. [2]

(d) How is the frequency of a stretched string related to: [2]

(i) its length?

(ii) its tension?

(e) Define specific resistance and state its SI unit. [2]

Question 4

(a) An electric bulb of resistance 500Ω, draws a current of 0.4A. Calculate the power of the bulb and the potential difference at its end. [2]

(b) State two causes of energy loss in a transformer. [2]

(c) State two characteristics of a good thermion emitter. [2]

(d) State two factors upon which the rate of emission of thermions depends. [2]

(e) When does the nucleus of an atom tend to be radioactive? [2]

SECTION II (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) A uniform half metre rule balances horizontally on a knife edge at 29 cm mark when a weight of 20 gf is suspended from one end. [3]

(i) Draw a diagram of the arrangement.

(ii) What is the weight of the half metre rule?

(b) (i) A boy uses a single fixed pulley to lift a load of 50 Kgf to some height. Another boy uses a single movable pulley to lift the same load to the same height. Compare the effort applied by them. Give a reason to support your answer. [3]

(ii) How does uniform circular motion differ from uniform linear motion?

(iii) Name the process used for producing electricity using nuclear energy.

(c) A pulley system with VR = 4 is used to lift a load of 175 kgf through a vertical height of 15 m. The effort required is 50 kgf in the downward direction. [4]
($g = 10\ N\ kg^{-1}$)
Calculate:

(i) Distance moved by the effort.

(ii) Work done by the effort.

(iii) M.A. of the pulley system.

(iv) Efficiency of the pulley system.

Question 6

(a) (i) How is the transference of heat energy by radiation prevented in a calorimeter? [3]

(ii) You have a choice of three metals A, B and C, of specific heat capacities 900 $Jkg^{-1}{}^{o}C^{-1}$, 380 $Jkg^{-1}{}^{o}C^{-1}$ and 460 $Jkg^{-1}{}^{o}C^{-1}$ respectively, to make a calorimeter. Which material will you select? Justify your answer.

(b) Calculate the mass of ice needed to cool 150g of water contained in a calorimeter of mass 50g at 32ºC such that the final temperature is 5ºC. [3]

Specific heat capacity of calorimeter = 0.4 J/gºC

Specific heat capacity of water = 4.2 J/gºC

Latent heat capacity of ice = 330 J/g

(c) (i) Name the radiations which are absorbed by greenhouse gases in the earth's atmosphere. [4]

(ii) A radiation X is focused by a particular device on the bulb of a thermometer and mercury in the thermometer shows a rapid increase. Name the radiation X.

(iii) Name two factors on which the heat energy liberated by a body depends.

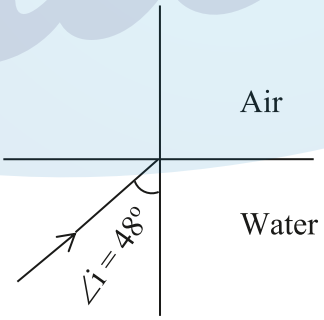
Question 7

(a) A Lens forms an upright and diminished image of an object when the object is placed at the focal point of the given lens. [3]

(i) Name the lens.

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

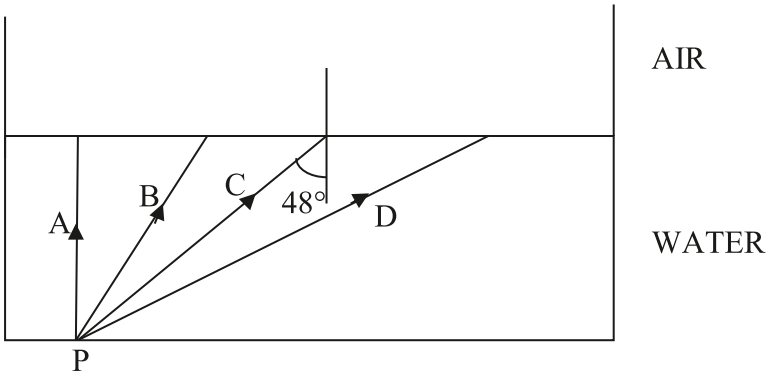
(b) A ray of light travels from water to air as shown in the diagram given below: [3]



(i) Copy the diagram and complete the path of the ray. Given the critical angle for water is 48°.

(ii) State the condition so that total internal reflection occurs in the above diagram.

(c) The diagram below shows a point source P inside a water container. Four rays A, B, C, D starting from the source P are shown upto the water surface. [4]



(i) Show in the diagram the path of these rays after striking the water surface. The Critical Angle for water air surface is 48°.

(ii) Name the phenomenon which the rays B and D exhibit.

Question 8

(a) Name the factor that determines: [3]

(i) Loudness of the sound heard.

(ii) Quality of the note.

(iii) Pitch of the note.

(b) (i) What are damped vibrations? [3]

(ii) Give one example of damped vibrations.

(iii) Name the phenomenon that causes a loud sound when the stem of a vibrating tuning fork is kept pressed on the surface of a table.

(c) (i) A wire of length 80 cm has a frequency of 256 Hz. Calculate the length of a similar wire under similar tension, which will have frequency 1024 Hz. [4]

(ii) A certain sound has a frequency of 256 hertz and a wavelength of 1.3 m.

1. Calculate the speed with which this sound travels.
2. What difference would be felt by a listener between the above sound and another sound travelling at the same speed, but of wavelength 2.6 m?

Question 9

(a) (i) Name the colour code of the wire which is connected to the metallic body of an appliance. [3]

(ii) Draw the diagram of a dual control switch when the appliance is switched 'ON'.

(b) (i) Which particles are responsible for current in conductors? [3]

(ii) To which wire of a cable in a power circuit should the metal case of a geyser be connected?

(iii) To which wire should the fuse be connected?

(c) (i) Explain the meaning of the statement 'current rating of a fuse is 5A'. [4]

(ii) In the transmission of power the voltage of power generated at the generating stations is stepped up from 11kV to 132kV before it is transmitted. Why?

Question 10

(a) Answer the following questions based on a hot cathode ray tube. [3]

(i) Name the charged particles.

(ii) State the approximate voltage used to heat the filament.

(iii) What will happen to the beam when it passes through the electric field?

(b) State three factors on which the rate of emission of electrons from a metal surface depends. [3]

(c) (i) What are free electrons? [4]

(ii) Why do they not leave the metal surface on their own?

(iii) How can they be made to leave the metal surface? (State any two ways)

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