ICSE 2024 EXAMINATION

PHYSICS

SAMPLE PAPER - 6

Time Allowed : 2 hours ***Max. Marks : 80***

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]

(i) Mathematically, moment of couple is equal to:
(a) Product of one force and perpendicular distance between two forces
(b) Product of both the forces and perpendicular distance between them
(c) Product of one force and perpendicular distance between force and turning point
(d) None of these

(ii) The centre of gravity of a cricket ball is at:
(a) its bottom touching the ground
(b) its topmost point
(c) any point on its surface
(d) its geometric centre

(iii) The S.I unit of power is watt. It is expressed in terms of mass, length and time as:
(a) kgm^2s^{-3} (b) $kgms^{-1}$ (c) $kg^2m^2s^{-2}$ (d) kgm^2s^{-2}

(iv) A flying bird has:
(a) only kinetic energy
(b) only potential energy
(c) both kinetic and potential energy
(d) none of these

(v) A pendulum is oscillating freely. The bob of the pendulum has:
(a) only kinetic energy
(b) maximum kinetic energy at extreme position
(c) maximum potential energy at its mean position
(d) constant energy, which is sum total of potential and kinetic energy.

(vi) Which statement is not true for a machine?
(a) It can multiply effort
(b) It can increase speed
(c) It can change the direction of applied effort
(d) Its output is more than input

(vii) The actual mechanical advantage of a single movable pulley is:
(a) one
(b) two
(c) less than 2, but more than 1
(d) none of these

(viii) A ray of light on entering from medium '*a*' to medium '*b*' does not suffer refraction. The angle of incidence in medium '*a*' is:
(a) 90° (b) 45° (c) zero (d) 60°

(ix) A thermometer is placed in ice contained in beaker. The beaker is heated at low flame. The thermometer records temperature
(a) 0 °C when ice has just started melting
(b) 0 °C when half of ice melts
(c) 10 °C when half of ice melts
(d) both (a) and (b)

(x) When a beam of light strikes a glass slab a part of the light is:

(a) reflected (b) absorbed (c) transmitted (d) all of these

(xi) X-rays are produced by:

(a) oscillating circuits in special vacuum tubes

(b) excitation of outermost electronic shell of an atom

(c) excitation of inner electrons of an atom and sudden annihilation of high energy free electrons

(d) nucleus of an atom, by the destruction of high energy particle

(xii) The practical application based on the reflection of sound is:

(a) mega phone (b) sounding board (c) sonometer (d) both (a) & (b)

(xiii) Which of the following is an ohmic resistance?

(a) Diode valve (b) Electronic valves (c) Manganin wire (d) Carbon arc lamp

(xiv) The magnitude of induced current can be increased by:

(a) increasing number of turns in the secondary coil (b) decreasing number of turns in secondary coil

(c) By increasing current in primary coil (d) Both (b) and (c)

(xv) Which of the following radiation gets deflected most in electric or magnetic field?

(a) alpha particles (b) β-particles (c) X-rays (d) gamma rays

ANSWERS

(i) (a) **(ii)** (d) **(iii)** (a) **(iv)** (c) **(v)** (d) **(vi)** (d) **(vii)** (c) **(viii)** (c) **(ix)** (d) **(x)** (d)
(xi) (c) **(xii)** (d) **(xiii)** (c) **(xiv)** (d) **(xv)** (b)

Question 2 :

(i) (a) Define nuclear fusion. [3]

(b) Which of the two, fission or fusion is a nuclear chain reaction?

(c) Why can nuclear fusion not possible to generate electricity?

(ii) State two causes of energy loss in a transformer. [2]

(iii) Identify the following wires used in a household circuit. [2]

(a) The wire is also called phase wire.

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

(iv) A metal wire of resistance 6 Ω is stretched so that its length is increased twice to the original length. Calculate the new resistance of wire. [2]

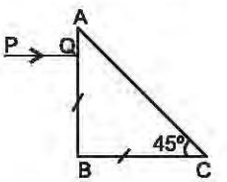
(v) (a) Define resonant vibrations. [2]

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

(vi) (a) What do you understand by the term free vibrations? [2]

(b) Why does amplitude of vibrating body decrease during damped vibrations?

(vii) Diagram alongside shows an isosceles glass prism, such that critical angle for glass is 42°. [2]

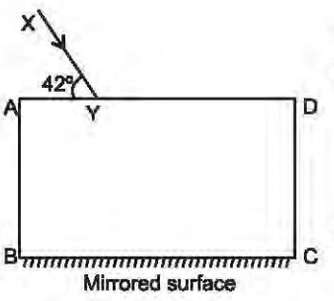


(a) Trace the course of ray, till it emerges out of the prism ABC.

(b) Why does this ray does not suffer refraction on face AB?

Question 3 :

(i) Copy the diagram and trace the course of rays XY, till it emerges out from face AD. [2]



(ii) Where is an object placed in front of convex lens when it forms: [2]

(a) Real and magnified image?

(b) Virtual and magnified image?

(iii) How much heat energy is released when 5 g of water at 20 °C changes to ice at 0°C? [2]

[Specific heat capacity of water $4.2 Jg^{-1} °C^{-1}$ and specific latent heat of fusion of ice is $336 Jg^{-1}$]

(iv) Which class of lever will always have M.A. > 1 and why? [2]

(v) State the energy changes in the following while in use. [2]

(a) Burning of candle

(b) A steam engine.

SECTION - B (40 Marks)

(Attempt *any four* questions from this Section)

Question 4

(i) (a) What do you understand by the term moment of force? [4]

(b) State two factors which determine the magnitude of moment of force.

(c) How does uniform circular motion differ from uniform linear motion?

(ii) A uniform wooden beam AB, 80 cm long and having weight of 250 gf is supported on a wedge, 10 cm from end A. Calculate the maximum weight that can be placed at A, without causing the beam to tilt. Draw the diagram of the arrangement. [4]

(iii) Why do truck drivers use long handle bars to unscrew the truck wheels? [2]

Question 5

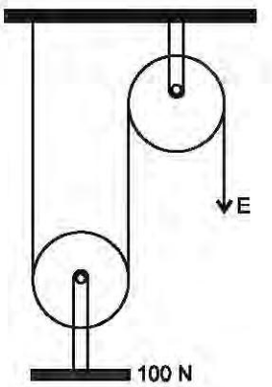
(i) A ball of 200 g is thrown vertically upward with initial velocity of 30 ms^{-1}, such that it attains maximum height in 3 seconds. [3]

(a) Draw the velocity-time graph.

(b) What will be the kinetic energy of the ball, when it returns to the starting point?

(c) What will be the potential energy of the ball at the highest point?

(ii) Diagram alongside shows a pulley arrangement: [7]



(a) Copy the diagram, and mark the direction of force due to tension acting on the movable pulley.

(b) What is the purpose of fixed pulley?

(c) If tension is T newtons deduce the relation between T and E

(d) Calculate the velocity ratio of arrangement.

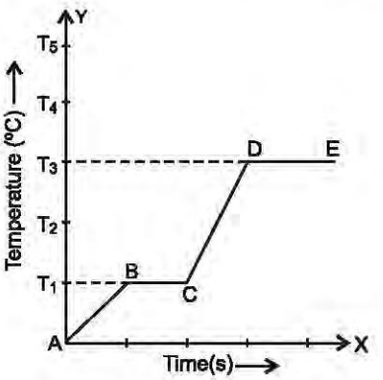
(e) Assuming the efficiency to be 100%, what is the mechanical advantage?

(f) Calculate the effort E.

(g) State the factors that reduce efficiency of the arrangement.

Question 6

(i) The graph alongside shows change of phases of a substance on temperature-time graph: [5]



(a) What do the following parts represent?

1. AB
2. BC
3. CD

(b) What is the melting point of substance?

(c) What is the boiling point of substance?

(ii) Find the result of mixing 10 g of ice at –10 °C with 10 g of water at 10°C. [Sp. heat capacity of ice is 2.1$Jg^{-1}K^{-1}$, sp. latent heat of ice = 336Jg^{-1} and sp. heat capacity of water is 4.2 $Jg^{-1}K^{-1}$] [5]

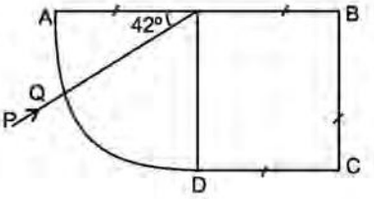
Question 7

(i) (a) Explain the terms: (1) total internal reflection (2) critical angle. [2]

(b) Write down the relation between refractive index and critical angle. [1]

(c) Under what conditions total internal reflection takes place? [2]

(ii) A ray of light enters glass slab ABCD as shown in diagram alongside. Copy the diagram and complete the path of ray, till it emerges out of glass slab. Mark the various angles where-ever necessary critical angle for glass is 42°. [3]



(iii) State the position of object, position of image and the nature of image, when a convex lens is used for observing biological specimens. [2]

Question 8

(i) (a) What is sonar? [3]

(b) State the principle on which it is based.

(c) What kind of waves are used in operating it?

(ii) A man stands between two cliffs, such that he is at a distance of 133.6 m from the nearer cliff. He fires a gun and hears first echo after 0.8 s and second echo after 1.8 s. Calculate [4]

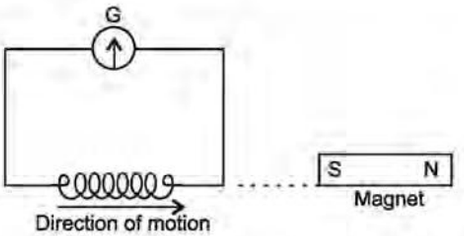
(a) speed of second

(b) distance between two cliffs

(iii) State three properties of alpha particles. [3]

Question 9

(i) The diagram shows a coil of several turns of copper wire, connected to a very sensitive galvanometer G near a bar magnet NS. The coil is free to move. [3]



(a) Describe the observation, if the coil is moved rapidly in the direction of arrow.

(b) How would the observation be altered if

(1) coil has twice as many turns

(2) coil is made to move three times faster.

(ii) A boy's is hostel has following appliances, when energy is supplied at 200 V and costs ₹5.50 per kilowatt hour. (1) 40 bulbs of 100 W each, working 8 hours a day (2) 20 fans each drawing a current of 0.8 A and working 15 hours a day. Calculate: [7]

(a) Power of 40 bulbs

(b) Energy consumed by 40 bulbs @ 8 hours a day

(c) Power of 20 fans

(d) Energy consumed by 20 fans @ 15 hours a day

(e) Total energy consumed by bulbs and fans in a day

(f) Total energy consumed by bulbs and fans in a month in k.W.h.

(g) Monthly bill of all appliances.

❖ ❖ ❖

SOLUTION

Time Allowed : 2 hours *Max. Marks* : **80**

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]

(i) Mathematically, moment of couple is equal to:
(a) Product of one force and perpendicular distance between two forces
(b) Product of both the forces and perpendicular distance between them
(c) Product of one force and perpendicular distance between force and turning point
(d) None of these

(ii) The centre of gravity of a cricket ball is at:
(a) its bottom touching the ground (b) its topmost point
(c) any point on its surface (d) its geometric centre

(iii) The S.I unit of power is watt. It is expressed in terms of mass, length and time as:
(a) kgm^2s^{-3} (b) $kgms^{-1}$ (c) $kg^2m^2s^{-2}$ (d) kgm^2s^{-2}

(iv) A flying bird has:
(a) only kinetic energy (b) only potential energy
(c) both kinetic and potential energy (d) none of these

(v) A pendulum is oscillating freely. The bob of the pendulum has:
(a) only kinetic energy
(b) maximum kinetic energy at extreme position
(c) maximum potential energy at its mean position
(d) constant energy, which is sum total of potential and kinetic energy.

(vi) Which statement is not true for a machine?
(a) It can multiply effort (b) It can increase speed
(c) It can change the direction of applied effort (d) Its output is more than input

(vii) The actual mechnical advantage of a single movable pulley is:
(a) one (b) two
(c) less than 2, but more than 1 (d) none of these

(viii) A ray of light on entering from medium '*a*' to medium '*b*' does not suffer refraction. The angle of incidence in medium '*a*' is:
(a) 90° (b) 45° (c) zero (d) 60°

(ix) A thermometer is placed in ice contained in beaker. The beaker is heated at low flame. The thermometer records temperature
(a) 0 °C when ice has just started melting (b) 0 °C when half of ice melts
(c) 10 °C when half of ice melts (d) both (a) and (b)

(x) When a beam of light strikes a glass slab a part of the light is:
(a) reflected (b) absorbed (c) transmitted (d) all of these

(xi) X-rays are produced by:
(a) oscillating circuits in special vacuum tubes
(b) excitation of outermost electronic shell of an atom
(c) excitation of inner electrons of an atom and sudden annihilation of high energy free electrons
(d) nucleus of an atom, by the destruction of high energy particle

(xii) The practical application based on the reflection of sound is:
(a) mega phone (b) sounding board (c) sonometer (d) both (a) & (b)

(xiii) Which of the following is an ohmic resistance?
(a) Diode valve (b) Electronic valves (c) Manganin wire (d) Carbon arc lamp

(xiv) The magnitude of induced current can be increased by:
(a) increasing number of turns in the secondary coil (b) decreasing number of turns in secondary coil
(c) By increasing current in primary coil (d) Both (b) and (c)

(xv) Which of the following radiation gets deflected most in electric or magnetic field?
(a) alpha particles (b) β-particles (c) X-rays (d) gamma rays

ANSWERS

(i) (a) **(ii)** (d) **(iii)** (a) **(iv)** (c) **(v)** (d) **(vi)** (d) **(vii)** (c) **(viii)** (c) **(ix)** (d) **(x)** (d)
(xi) (c) **(xii)** (d) **(xiii)** (c) **(xiv)** (d) **(xv)** (b)

Question 2 :

(i) (a) Define nuclear fusion. [3]
(b) Which of the two, fission or fusion is a nuclear chain reaction?
(c) Why can nuclear fusion not possible to generate electricity?

(ii) State two causes of energy loss in a transformer. [2]

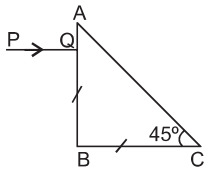
(iii) Identify the following wires used in a household circuit. [2]
(a) The wire is also called phase wire.
(b) The wire is connected to the top terminal of three pin socket.

(iv) A metal wire of resistance 6 Ω is stretched so that its length is increased twice to the original length. Calculate the new resistance of wire. [2]

(v) (a) Define resonant vibrations. [2]
(b) Which characteristic of sound makes it possible to recognize a person by his voice, without seeing him.

(vi) (a) What do you understand by the term free vibrations? [2]
(b) Why does amplitude of vibrating body decrease during damped vibrations?

(vii) Diagram alongside shows an isosceles glass prism, such that critical angle for glass is 42°. [2]
(a) Trace the course of ray, till it emerges out of the prism ABC.
(b) Why does this ray does not suffer refraction on face AB?



Solution :

(i) (a) The process of combining lighter nuclei (atomic number less then 10) into heavier nuclei under a pressure of millions of pascals and temperature over one million degree celsius with the release of enormous amount of heat energy is called nuclear fusion.
(b) Nuclear chain reaction can take place during nuclear fission.
(c) It is impossible to generate the temperature and pressure required for nuclear fusion. Further more there is no material available to withstand such a high pressure and temperature.

(ii) 1. A part of energy is lost due to resistance of primary and secondary coils.
2. A part of energy is lost due to the formation of eddy currents in the core of transformer.

(iii) (a) Live wire is called phase wire.
(b) Earth wire is connected to the top terminal of three pin socket.

(iv) **Case (i)** Let 'R' the resistance, '*l*' the length and '*a*' the area of cross-section.

$$\therefore R = \rho \frac{l}{a} \quad ...(i)$$

Case (ii) When the wire is stretched, its length becomes $2l$, area $\frac{a}{2}$ and resistance R_1

$$\therefore R_1 = \rho \frac{2l}{a/2} = 4 \times \frac{\rho l}{a} = 4R \text{ [From equation (i)]}$$
$$= 4 \times 6\ \Omega = 24\ \Omega$$

Thus new resistance of wire = 24 Ω

(v) (a) The vibrations produced by a body which has same frequency as in the frequency of impressed vibrations on it are called resonant vibrations.

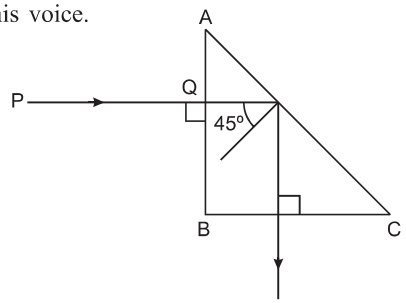
(b) It is the quality of sound which makes it possible to recognise a person by his voice.

(vi) (a) The periodic vibrations of a body of constant amplitude in the absence of any external force are called free vibrations.

(b) Damping i.e., decrease in amplitude occurs due to the frictional force, which the surrounding medium exerts on the vibrating body.

(vii) (a) Course of rays shown in diagram alongside.

(b) The angle of incidence on face AB is zero. So the angle of refraction is also zero. Hence the ray PQ, does not suffer any refraction on face AB.



Question 3 :

(i) Copy the diagram and trace the course of rays XY, till it emerges out from face AD. [2]

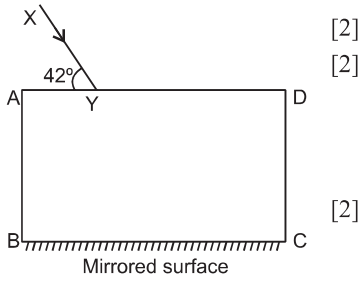
(ii) Where is an object placed in front of convex lens when it forms: [2]

(a) Real and magnified image?

(b) Virtual and magnified image?

(iii) How much heat energy is released when 5 g of water at 20 °C changes to ice at 0 °C? [2]

[Specific heat capacity of water $4.2 Jg^{-1} °C^{-1}$ and specific latent heat of fusion of ice is $336 Jg^{-1}$]



(iv) Which class of lever will always have M.A. > 1 and why? [2]

(v) State the energy changes in the following while in use. [2]

(a) Burning of candle

(b) A steam engine.

Solution :

(i) (a) Diagram showing the path of ray XY is shown alongside.

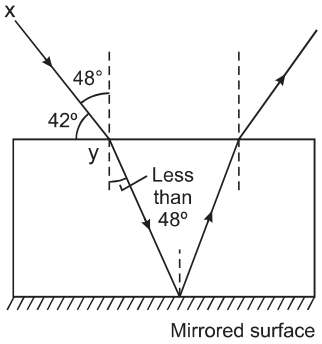
(ii) (a) The object is between $2F_1$ and F_1 of the convex lens.

(b) The object is between F_1 and O, the optical centre of convex lens.

(iii) Heat energy released when water cools from 20°C to 0 °C = $mc\theta_F$
$= 5g \times 4.2 Jg^{-1} °C^{-1} \times 20°C = 420\ J$

Heat energy released when water at 0°C freezes to form ice at 0°C = $m.L_{ice}$.
$= 5g \times 336\ Jg^{-1} = 1680\ J$

Total heat energy released = 1680 + 420 = **2100 J**



(iv) The lever of second order will always have mechanical advantage (M.A.) greater than 1.

Reason : Mechanical advantage is given by the expression, effort arm ÷ load arm.

As in the lever of second order, the effort arm is always longer than load arm, therefore its mechanical advantage is more than 1.

(v) (a) The chemical energy of the wax vapour first changer to heat energy and then to light energy.

(b) The chemical energy of the coal changes to heat energy. The heat energy changes to kinetic energy of steam. The kinetic energy of steam changes to mechanical energy of engine.

SECTION - B (40 Marks)

(Attempt *any four* questions from this Section)

Question 4

(i) (a) What do you understand by the term moment of force? [4]

(b) State two factors which determine the magnitude of moment of force.

(c) How does uniform circular motion differ from uniform linear motion?

(ii) A uniform wooden beam AB, 80 cm long and having weight of 250 gf is supported on a wedge, 10 cm from end A. Calculate the maximum weight that can be placed at A, without causing the beam to tilt. Draw the diagram of the arrangement. [4]

(iii) Why do truck drivers use long handle bars to unscrew the truck wheels? [2]

Solution :

(i) (a) The turning effect of force acting on a rigid body about a point or an axis is called moment of force.

(b) 1. The moment of force is directly proportional to the force applied on the rigid body.

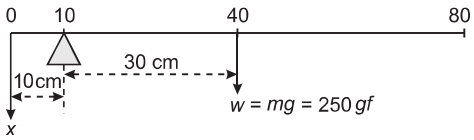
2. The moment of force is directly proportional to the perpendicular distance between the force acting on rigid body and the turning point.

(c) In uniform circular motion, an object covers equal distances in equal intervals of time, but the direction of object changes continuously. In uniform linear motion, an object covers equal distances in equal intervals of time, but the direction of motion does not change.

(ii) Let 'x' be the weight at zero end

$\Rightarrow x \times 10 \text{ cm} = 250 \text{ gf} \times 30 \text{ cm}$

$\therefore x =$ **750 gf.**



(iii) On using long handle bar the truck drivers increase the perpendicular distance between the point of action of force and the turning point. This in turn increases moment of force and hence it becomes easy for the truck drivers to unscrew the wheels.

Question 5

(i) A ball of 200 g is thrown vertically upward with initial velocity of 30 ms^{-1}, such that it attains maximum height in 3 seconds. [3]

(a) Draw the velocity-time graph.

(b) What will be the kinetic energy of the ball, when it returns to the starting point?

(c) What will be the potential energy of the ball at the highest point?

(ii) Diagram alongside shows a pulley arrangement: [7]

(a) Copy the diagram, and mark the direction of force due to tension acting on the movable pulley.

(b) What is the purpose of fixed pulley?

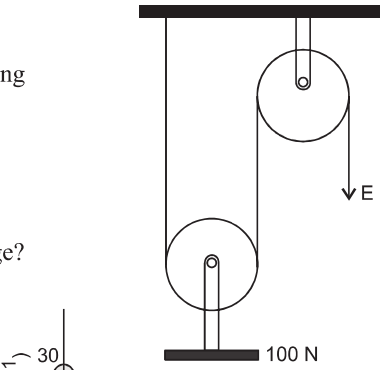
(c) If tension is T newtons deduce the relation between T and E

(d) Calculate the velocity ratio of arrangement.

(e) Assuming the efficiency to be 100%, what is the mechanical advantage?

(f) Calculate the effort E.

(g) State the factors that reduce efficiency of the arrangement.



Solution :

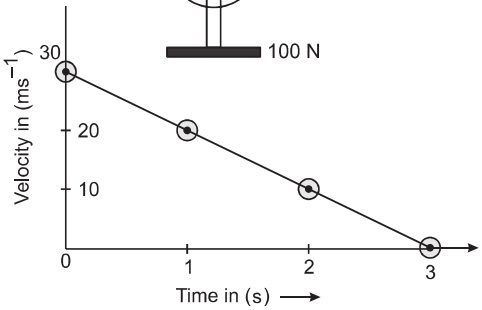
(i) (a) Velocity time graph show alongside

(b) K. E $= \frac{1}{2} m v^2$

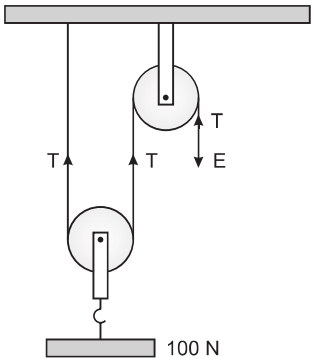
$= \frac{1}{2} \times \frac{200}{1000}$ kg $(30 \text{ ms}^{-1})^2$

$=$ **90 J**

(c) P.E = K.E = 90 J.



(ii) (a) The direction of force due to tension shown in diagram alongside.



(b) The fixed pulley changes the direction of effort from upward to downword.

(c) T = E

(d) Velocity ratio = $\frac{\text{distance through which effort acts}}{\text{distance through which load moves}}$

$= \frac{D}{\frac{D}{2}} = \mathbf{2}$

(e) MA = $\eta \times$ V.R

$= \frac{100}{100} \times 2 = \mathbf{2}$ $(\because \eta = 100\%)$

(f) MA = $\frac{l}{E}$

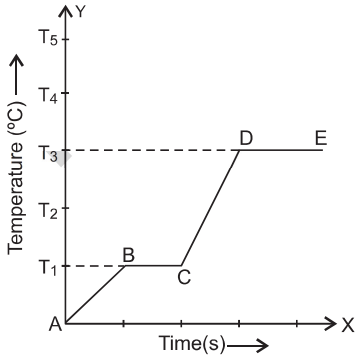
$\therefore E = \frac{l}{M.A} = \frac{100N}{2} = \mathbf{50N}$.

(g) 1. The friction at movable points reduce efficiency.

2. The weight of movable block reduces efficiency.

Question 6

(i) The graph alongside shows change of phases of a substance on temperature-time graph: [5]



(a) What do the following parts represent?

1. AB

2. BC

3. CD

(b) What is the melting point of substance?

(c) What is the boiling point of substance?

(ii) Find the result of mixing 10 g of ice at –10 ºC with 10 g of water at 10ºC. [Sp. heat capacity of ice is 2.1$Jg^{-1}K^{-1}$, sp. latent heat of ice = 336Jg^{-1} and sp. heat capacity of water is 4.2 $Jg^{-1}K^{-1}$] [5]

Solution :

(i) (a) 1. AB represents solid state of substance till it reaches at its melting point.

2. BC represents solid state of matter changing to liquid state without any rise in temperature.

3. CD represents liquid state of matter whose temperature rises uniformly.

(b) Melting point of solid is T_1 °C.

(c) Boiling point of liquid is T_3 °C.

(ii) Let the amount of ice which melts = x.

Heat energy gained by ice at –10°C to attain temp. of 0°C = $mc\theta_R$ = 10 × 2.1$Jg^{-1}°C^{-1}$ × 10°C = 210J

Heat energy gained by 'x' of ice in order to melt = $mL_{ice} = x \times 336Jg^{-1}$.

$\therefore$ Total heat gained by Ice = 336 x Jg^{-1} + 210J.

Heat energy lost by water at 10°C = $mc\theta_f$ = 10 g × 4.2 $Jg^{-1}°C^{-1}$ × 10°C = 420 J.

Now, Heat lost = Heat gained

420 J = 336 x Jg^{-1} + 210 J

$\therefore$ 336x Jg^{-1} = (420 – 210) J = 210 J

$\therefore x = \frac{210}{336}$ g = **0.625 g**

$\therefore$ Amount of ice left without melting = (10.0 – 0.625) g = **9.375 g**.

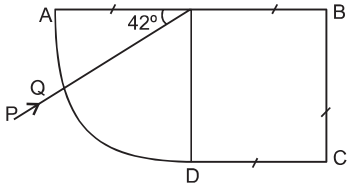
Question 7

(i) (a) Explain the terms: (1) total internal reflection (2) critical angle. [2]

(b) Write down the relation between refractive index and critical angle. [1]

(c) Under what conditions total internal reflection takes place? [2]

(ii) A ray of light enters glass slab ABCD as shown in diagram alongside. Copy the diagram and complete the path of ray, till it emerges out of glass slab. Mark the various angles where-ever necessary critical angle for glass is 42º. [3]



(iii) State the position of object, position of image and the nature of image, when a convex lens is used for observing biological specimens. [2]

Solution :

(i) (a) 1. The phenomenon due to which a ray of light while travelling from a denser medium to a rarer medium, gets reflected with dense medium at the interface of two media is called total internal reflection of light.

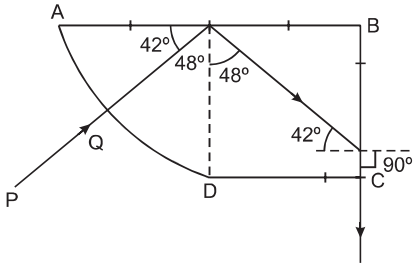
2. The angle of incidence in a denser medium for which the corresponding angle of refraction is 90° in rarer medium is called critical angle.

(b) Retraction index $(\mu) = \dfrac{1}{\sin C}$

(c) 1. The ray of light must travel from a denser medium to a rarer medium.

2. The angle of incidence in denser medium should always be greater than critical angle of the medium.

(ii) The path of ray PQ in glass slab is shown in diagram alongside.



(iii) 1. The object is placed between optical centre and F_1

2. The image is formed on the same side of object anywhere between $2F_1$ and infinity.

3. Image is virtual, erect and enlarged.

Question 8

(i) (a) What is sonar? [3]

(b) State the principle on which it is based.

(c) What kind of waves are used in operating it?

(ii) A man stands between two cliffs, such that he is at a distance of 133.6 m from the nearer cliff. He fires a gun and hears first echo after 0.8 s and second echo after 1.8 s. Calculate [4]

(a) speed of second

(b) distance between two cliffs

(iii) State three properties of alpha particles. [3]

Solution :

(i) (a) A device fitted on ships or war ships to find the depth of sea or to submarines in called sonar.

(b) It is based on the principle of reflection of sound i.e., if a sound strikes a distant hard object it reflected back, by producing an echo.

(c) Ultrasonic waves are used in operating sonar.

(ii) (a) Speed of Second $= \dfrac{2(\text{Distance of source of sound from nearer cliff})}{\text{Time for hearing echo}}$

$$= \frac{2 \times 133.6\text{m}}{0.8\text{s}} = \mathbf{334\ ms^{-1}}$$

(b) Distance of second cliff from source of sound $= \dfrac{v \times t}{2} = \dfrac{334\text{ms}^{-1} \times 1.8\text{s}}{2}$

$$= 300.6 \text{ m}$$

$\therefore$ Distance between two cliffs = (133.6 + 300.6) m = **434.2 m**

(iii) Properties of alpha particles :

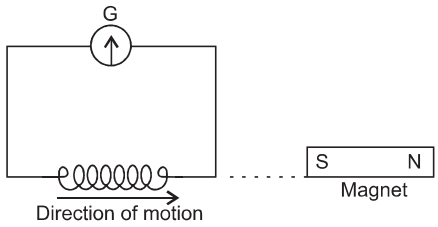
1. They are doubly ionised helium nuclei having 4 units of atomic mass and 2 units of positive charge.

2. They have the highest ionising power.

3. They have the least penetrating power.

Question 9

(i) The diagram shows a coil of several turns of copper wire, connected to a very sensitive galvanometer G near a bar magnet NS. The coil is free to move. [3]



(a) Describe the observation, if the coil is moved rapidly in the direction of arrow.

(b) How would the observation be altered if

(1) coil has twice as many turns

(2) coil is made to move three times faster.

(ii) A boy's is hostel has following appliances, when energy is supplied at 200 V and costs ₹5.50 per kilowatt hour. (1) 40 bulbs of 100 W each, working 8 hours a day (2) 20 fans each drawing a current of 0.8 A and working 15 hours a day. Calculate: [7]

(a) Power of 40 bulbs

(b) Energy consumed by 40 bulbs @ 8 hours a day

(c) Power of 20 fans

(d) Energy consumed by 20 fans @ 15 hours a day

(e) Total energy consumed by bulbs and fans in a day

(f) Total energy consumed by bulbs and fans in a month in k.W.h.

(g) Monthly bill of all appliances.

Solution :

(i) (a) The galvanometer needle shows a momentarily deflection and then comes back to centre zero position.

(b) 1. The galvanometer needle will show double deflection then in (i) (a).

2. The galvanometer needle will show three times deflection then in (i) (a).

(ii) (a) Power of 40 bulbs = 40 × 100 W = 4,000 W.

(b) Energy consumed by 40 bulbs @ 8 hours a day = 4,000 W × 8h = **32,000 Wh**.

(c) Power of 20 fans = 20 × I × V = 20 × 0.8A × 200V = **3200 W**

(d) Energy consumed by 20 fans @ 15 hours a day = 3200 W × 15h = **48,000 Wh**.

(e) Total energy consumed by bulbs and fans in a day = (32,000 + 48,000) Wh **= 80,000 Wh**

(f) Total energy consumed by bulbs and fans in a month = 30 × 80,000 Wh = 2,400,000 Wh **= 2400 kWh**

(g) Monthly bill of all appliances = 2400 kWh × ₹5.50 **= ₹13200**.

V V V