ICSE 2024 EXAMINATION

PHYSICS

SAMPLE PAPER - 1

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) When a candle is lighted then:
(a) Chemical energy of wax changes to heat energy only
(b) Chemical energy of wax changes to light energy only
(c) Chemical energy of wax, first changes to light energy and then to heat energy
(d) Chemical energy of wax, first changes to heat energy and then to light energy

(ii) Unit of power in terms of mass, length and time is:
(a) $kgms^{-1}$ (b) $kgms^{-2}$ (c) kgm^2s^{-2} (d) kgm^2s^{-3}

(iii) The energy of 8×10^{25} electron volts is equal to:
(a) $2.18 \times 10^6 J$ (b) $2.18 \times 10^7 J$ (c) $1.28 \times 10^7 J$ (d) $1.28 \times 10^6 J$

(iv) A lead pellet of mass 160 g leaves an air gun with a velocity of 40 ms^{-1}. The magnitude of K.E of the pellet is
(a) 8 J (b) 7.5 J (c) 16 J (d) 12 J

(v) Which statement is not true for an actual machine?
(a) It can multiply effort
(b) It can increase the speed
(c) It can change the direction of effort
(d) Its output can be greater than input.

(vi) A pulley system has three pulleys in all and the effort on the free end is applied in the upward direction. Its velocity ratio is:
(a) 3
(b) 4
(c) more than 3, but less than 4
(d) more than 4

(vii) A machine has a velocity ratio 6 and mechanical advantage 5. The percentage efficiency of machine is:
(a) 81.3% (b) 82.3% (c) 83.3% (d) 84.3%

(viii) Water is used as a coolant in desert coolers, because:
(a) water is very cheap
(b) water vapour does not cause respiratory problems
(c) water has highest sp. heat capacity
(d) none of these

(ix) Water is used for internal heating because:
(a) It is easily available and convenient to use
(b) It does not cause any fire hazards
(c) Its temperature does not rise above 100°C
(d) It has highest sp. heat capacity and hence can carry large amount of heat energy at bearable temperature

(x) 800 calories of heat energy is given out when 0.080 kg of a liquid cools from 100°C to 10°C. The sp. heat capacity of liquid is:

(a) 111.1 $calkg^{-1}{}^{o}C^{-1}$ (b) 101.1 $calkg^{-1}{}^{o}C^{-1}$ (c) 110.1 $calkg^{-1}{}^{o}C^{-1}$ (d) 121.1 $calkg^{-1}{}^{o}C^{-1}$

(xi) When a ray of light enters into another medium, while travelling from air, its wavelength and velocity decreases. The medium in which this change is maximum:

(a) alcohol (b) diamond (c) benzene (d) carbon disulphide

(xii) In step up transformer

(a) $N_S > N_P$ (b) $N_P > N_S$ (c) $N_P = N_S$ (d) any of these

(xiii) A lens forms an image of an object equal to its own size. The object is:

(a) in between infinity and $2F_1$ of the lens (b) at the $2F_1$ of the lens

(c) in between $2F_1$ and F_1 of the lens (d) in between F_1 and optical centre of lens.

(xiv) During sunset the colour which scatters closest to the eye of observer is:

(a) blue (b) green (c) red (d) orange

(xv) Which is not source of ultraviolet radiations?

(a) Sun (b) Electric heater (c) Stars (d) Arc lamp

ANSWERS

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

Question 2

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

(b) Rewrite and complete the following nuclear reaction by filling the atomic number of Ba and mass number of Kr.

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

(ii) An object is placed in front of a convex lens, such that the image formed has same size as object. Draw a diagram to illustrate it. [2]

(iii) A wire of a uniform thickness and resistance 36 Ω is cut into three equal pieces and the pieces are joined in parallel. Find the equivalent resistance of parallel combination. [2]

(iv) State the amount of work done by an object in a circular path for one complete rotation. Give a reason to justify your answer. [2]

(v) Calculate the amount of heat released when 5.0 g of water at 20°C freezes completely to form ice at 0°C. (Latent heat of fusion of ice = $336Jg^{-1}$] [2]

(vi) Calculate the height through a body of mass 0.5 kg is raised by a work of 1 J. [Take g = $10ms^{-2}$] [2]

(vii) Why does a crack in window pane appears silvery at some particular angle? [2]

Question 3

(i) (a) What do you understand by the term resonance? [2]

(b) What is the main difference between the resonance and forced vibrations?

(ii) A body of mass 4 kg is continuously acted upon by an acceleration of $5ms^{-2}$, such that body covers a distance of 200 m in the direction of applied force. Calculate: [2]

(a) force acting on body (b) work done by the body

(iii) Draw a neat diagram for the course of a ray of light through an equilateral glass prism and label clearly: [2]

(a) angle of emergence (b) angle of deviation

(iv) An electric heater of power 1600 W, has a resistance of 36 Ω. Calculate: [2]

(a) magnitude of current

(b) p.d at the ends of heater

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

(b) Complete the reaction:

$^{3}He_{2} + {}^{2}H_{1} \rightarrow {}^{4}He_{2} +$ _____ + energy

SECTION - B (40 Marks)

(Attempt *any four* questions from this Section)

Question 4

(i) The heat capacity of a substance of mass 50 g is $75\,J°C^{-1}$. What is the specific heat capacity of substance? [2]

(ii) A metal drill of power 500 W, drills a hole in a metal cube of mass 0.25 kg in 6.5 s. If the specific heat capacity of metal is $130\,Jkg^{-1}°C^{-1}$, calculate:

(a) Energy generated by drill in one second. [1]

(b) Energy generated by the drill in 6.5 seconds. [1]

(c) If t °C is the rise in temperature of metal, state the amount of heat energy absorbed by metal cube in terms of *t*. [1]

(d) From the above data, calculate the value of *t*. [1]

(iii) You are required to make a water bath of 40 kg at 40°C by mixing hot water at 100°C and cold water at 15°C. Calculate the ratio of hot and cold water, which should be mixed. [4]

Question 5

(i) (a) State the principle of moments. [3]

(b) A force of 5 N is applied at the edge of a door produces a moment of force of 4.5 Nm. What is the width of door?

(ii) A uniform metre-scale is balanced at 40 cm mark, when weights of 25gf and 10gf are suspended at 5 cm and 75 cm mark respectively. Calculate the weight of metre scale. [3]

(iii) (a) A pulley system has velocity ratio 3. Draw a labelled diagram of pulley system. [4]

(b) If a load of 750 gf is lifted by the movable block of weight 150 gf by the above pulley system, calculate the effort required to do so. [$g = 1000\,cms^{-2}$]

Question 6

(i) (a) What is an electrical fuse? [3]

(b) State two characteristics of an electrical fuse.

(ii) (a) What do you understand by the term internal resistance of cell? [3]

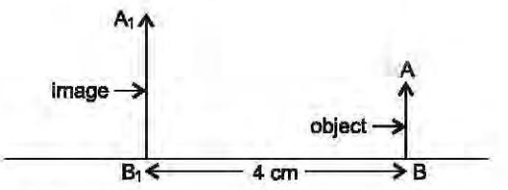
(b) State two factors on which internal resistance depends.

(iii) Study the diagram alongside carefully and answer the following questions; [4]

1. Total resistance of the circuit
2. Current flowing through circuit
3. Current in the 6 Ω resistor
4. Drop in potential across the terminals of cell

Question 7

(i) Diagram alongside shows an object AB placed in front of a lens, when an image A_1B_1 is formed on the same side of lens. Copy the diagram and answer the following questions: [4]



(a) What is the nature of lens?

(b) Show the position of lens in the diagram.

(c) Complete the diagram, showing two rays originating from the tip of object.

(ii) By drawing a diagram show why a stick held obliquely in water appears bent and short. [3]

(iii) (a) A postage stamp appears raised by 10 mm, when placed under a thick glass block of refractive index 1.45. What is the thickness of glass block? [3]

(b) Fill in the blank.

When a ray of light travelling from glass to air is reflected back into glass at the surface of separation the phenomenon is called_____.

Question 8

(i) A person walking past a railway line at the middle of night, hears a ringing sound along with the sound of his own feet.

Explain. [3]

(ii) By drawing separate diagrams, show the wave patterns produced by [3]

(a) simple musical note

(b) complex musical note

(c) noise

(iii) A man stands between two parallel cliffs 99 m apart. He fires a gun and hears two successive echoes after 0.2 s and 0.4 s. Calculate: [4]

(a) Distance of nearest cliff from the person.

(b) Speed of sound.

Question 9

(i) State three ways by which a nuclear reaction differs from chemical reaction. [3]

(ii) (a) What name is given to elements having same atomic number but different mass number? [3]

(b) When an alpha particle gains two electrons, it changes into neutral gas. Name the gas.

(c) How does the atomic number of an element change, if it emits beta particle?

(iii) (a) Is it possible for hydrogen $({}_{1}^{1}H)$ nucleus to emit an alpha particle. Give a reason for your answer. [4]

(b) The nucleus of ${}_{84}^{202}X$ emits alpha particle to form nucleus Y. Represent this change in the form of an equation.

(c) What change will take place in mass number and atomic number of the nucleus Y, if it emits gamma radiation?

SOLUTION

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(iii) A wire of a uniform thickness and resistance 36 Ω is cut into three equal pieces and the pieces are joined in parallel. Find the equivalent resistance of parallel combination. [2]

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(vi) Calculate the height through a body of mass 0.5 kg is raised by a work of 1 J. [Take g = $10\,ms^{-2}$] [2]

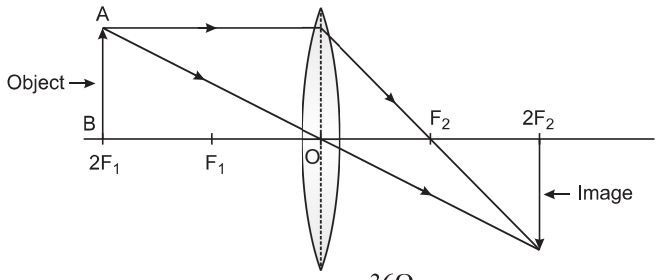
(vii) Why does a crack in window pane appears silvery at some particular angle? [2]

Solution :

(i) (a) **Nuclear fission:** The process by which a heavy radioactive nucleus is broken into lighter nuclei by the bombardment of slow neutron, so as to liberate energy and more neutrons than used for bombardment is called nuclear fission.

(b) $$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{144}_{56}Ba + {}^{89}_{36}Kr + 3\,{}^{1}_{0}n + Energy$$

(ii)



(iii) Resistance of each smaller wire = $\frac{36\Omega}{3}$ = 12 Ω

$\therefore$ Equivalent resistance of 3 smaller prices in parallel.

$$\frac{1}{R} = \frac{1}{12} + \frac{1}{12} + \frac{1}{12} = \frac{3}{12} = \frac{1}{4} \therefore R = \mathbf{4\ \Omega}$$

(iv) Zero work is done after one complete rotation.

It because the displacement of object after one complete rotation is zero. Now, as the work done is given by the expression, Force × displacement and the displacement is zero, so the work done is zero.

(v) Heat given out by water at 20°C to form water at 0°C = $mc\theta_f$ = 5 × 4·2 × 20 = 420 J

Heat given out by water at 0°C to form ice at 0°C = mL_{ice} = 5 × 336 = 1680 J

$\therefore$ Total heat energy given out = (420 + 1680) J = **2100 J**

(vi) W = P.E = mgh.

$\Rightarrow$ 1 J = 0·5 kg × 10 ms^{-2} × h

$$\therefore h = \frac{1}{0{\cdot}5 \times 10} = \mathbf{0{\cdot}2\ m}.$$

(vii) The crack in the window pane is filled with air, which acts as another medium between the pieces of glass. Now, if a ray travelling through glass strikes glass air surface at an angle greater than 42° (critical angle of glass), it gets totally reflected. When this reflected ray reaches the eye to the eye the crack appears silvery.

Question 3

(i) (a) What do you understand by the term resonance? [2]

(b) What is the main difference between the resonance and forced vibrations?

(ii) A body of mass 4 kg is continuously acted upon by an acceleration of 5 ms^{-2}, such that body covers a distance of 200 m in the direction of applied force. Calculate: [2]

(a) force acting on body (b) work done by the body

(iii) Draw a neat diagram for the course of a ray of light through an equilateral glass prism and label clearly: [2]

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(iv) An electric heater of power 1600 W, has a resistance of 36 Ω. Calculate: [2]

(a) magnitude of current

(b) p.d at the ends of heater

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

(b) Complete the reaction:

$^3He_2 + {}^2H_1 \rightarrow {}^4He_2 +$ _____ + energy

Solution :

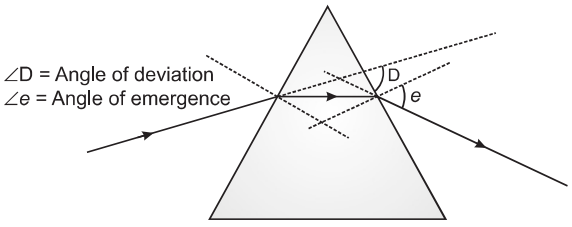
(i) (a) The phenomenon due to which the frequency of a given body corresponds to the frequency of another vibrating body, then both the bodies vibrate with large amplitude producing loud sound called resonance.

(b) In case of the forced vibrations the vibrations of the body may not correspond to the frequency of impressed force, thereby producing vibrations of smaller amplitude. However, in case of resonance both the given body and vibrating body, execute vibrations of same frequency with larger amplitude.

(ii) (a) F = $m.a$ = 4 kg × 5 ms^{-2} = 20 kg ms^{-2} = **20 N**.

(b) $W = \vec{F} \times \vec{S}$ = 20 N × 200 m = 4000 Nm = **4000 J**

(iii)



(iv) (a) $P = I^2 \times R$

$\Rightarrow 1600 = I^2 \times 36 \Rightarrow I^2 = \frac{1600}{36}$

$\therefore \quad I = \sqrt{\frac{1600}{36}} = \frac{40}{6} = \mathbf{6{\cdot}67\ A}.$

(b) $P = I \times V$

$\Rightarrow 1600 = \frac{40}{6} \times V \quad \Rightarrow \quad V = \frac{1600 \times 6}{40} = \mathbf{240\ V}$.

(v) (a) It is found that to fuse hydrogen atoms, the minimum temperature required 1000,000 °C. It is for this particular high temperature, the nuclear fusion reaction is called a thermonuclear reaction.

(b) $^3He_2 + {}^2H_1 \rightarrow {}^4He_2 + {}^1H_1 + \text{Energy}.$

SECTION - B (40 Marks)

(Attempt *any four* questions from this Section)

Question 4

(i) The heat capacity of a substance of mass 50 g is $75\,J°C^{-1}$. What is the specific heat capacity of substance? [2]

(ii) A metal drill of power 500 W, drills a hole in a metal cube of mass 0.25 kg in 6.5 s. If the specific heat capacity of metal is $130\,Jkg^{-1}°C^{-1}$, calculate:

(a) Energy generated by drill in one second. [1]

(b) Energy generated by the drill in 6.5 seconds. [1]

(c) If t °C is the rise in temperature of metal, state the amount of heat energy absorbed by metal cube in terms of *t*. [1]

(d) From the above data, calculate the value of *t*. [1]

(iii) You are required to make a water bath of 40 kg at 40°C by mixing hot water at 100°C and cold water at 15°C. Calculate the ratio of hot and cold water, which should be mixed. [4]

Solution :

(i) Specific heat capacity $= \frac{\text{Heat capacity}}{\text{Mass of substance}} = \frac{75\,J°C^{-1}}{50g} = \mathbf{1{\cdot}5\ J\ g^{-1}\ °C^{-1}}.$

(ii) (a) Energy generated by drill in $1s = 500\ W = 500\frac{J}{s} \times 1s = \mathbf{500\ J}.$

(b) Energy generated by drill in 6·5 s = 500 J × 6·5 s = **3250 J**

(c) Heat energy absorbed by metal $= mc\theta_R = 0{\cdot}25\ kg \times 130\ J\ kg^{-1}\ °C^{-1} \times t$

$= \mathbf{32{\cdot}5\ \textit{t}\ J\ °C^{-1}}$

(d) Heat absorbed = Heat given out

$\Rightarrow 32{\cdot}5\ t\ J°C^{-1} = \mathbf{3250\ J}$

$\therefore\ t = \frac{3250}{32{\cdot}5°C^{-1}} = \mathbf{100\ °C}.$

(iii) Let the mass of cold water $= x$

$\therefore$ Mass of hot water $= 40 - x$

Heat absorbed by cold water = Heat given by hot water

$\Rightarrow mc\theta_R = mc\theta_f$

$\Rightarrow x \times 4200 \times 25 = (40 - x) \times 4200 \times 60$

$\Rightarrow 25x = 60\ (40 - x)$

$\therefore$ or $\Rightarrow 5x = 12\ (40 - x)$

$\Rightarrow 5x + 12x = 480$

$\Rightarrow 17x = 480$

$\therefore \quad x = \frac{480}{17}$

Thus, mass of cold water $= \frac{480}{17}$ kg

$\therefore$ Mass of hot water = $40 - x = 40 - \frac{480}{17} = \frac{680-480}{17} = \frac{200}{17}$ kg

$\therefore$ Thus, ratio of hot and cold water = $\frac{200}{17}$ kg : $\frac{480}{17}$ kg = **5 : 12.**

Question 5

(i) (a) State the principle of moments. [3]

(b) A force of 5 N is applied at the edge of a door produces a moment of force of 4.5 Nm. What is the width of door?

(ii) A uniform metre-scale is balanced at 40 cm mark, when weights of 25gf and 10gf are suspended at 5 cm and 75 cm mark respectively. Calculate the weight of metre scale. [3]

(iii) (a) A pulley system has velocity ratio 3. Draw a labelled diagram of pulley system. [4]

(b) If a load of 750 gf is lifted by the movable block of weight 150 gf by the above pulley system, calculate the effort required to do so. [g = 1000 cms^{-2}]

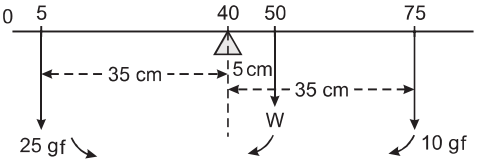
Solution :

(i) (a) It states when a body is in equilibrium under the influence of number of turning forces about a point, then sum total of clockwise moments is equal to sum total of anticlockwise moments.

(b) Moment of force = Force × width of door

$\therefore$ Width of door = $\frac{\text{Moment of force}}{\text{Force}} = \frac{4{\cdot}5 \text{ Nm}}{5 \text{ N}} = \mathbf{0{\cdot}9\ m}$.

(ii)



Moment due to 25 *gf* in A.C.W.D = 25 *gf* × 35 cm = 875 *gf* cm

Moments due is W in C.W.D. = W × 5 cm

Moments due to 10 *gf* in C.W.D. = 10 *gf* × 35 cm = 350 *gf* cm

$\therefore$ Total moments in clockwise direction = W × 5 cm + 350 *gf* cm

By the principle of moments,

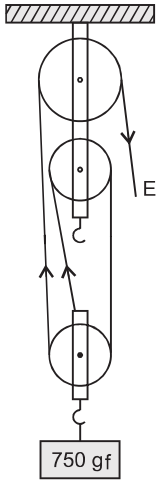
Moments in clockwise direction = Moments in, anticlockwise direction

$\Rightarrow$ W × 5 cm + 350 *gf* cm = 875 *gf* cm

$\Rightarrow$ W × 5 cm = (875 – 350) *gf* cm = 525 *gf* cm

$\therefore$ $W = \frac{525 \text{ gf cm}}{5 \text{ cm}} = \mathbf{105\ gf}$.

(iii) (a) Diagram shown alongside.



(b) Effort = $\frac{\text{Useful load + load of movable block}}{\text{Velocity ratio}}$

$= \frac{(750+150)\text{ g } f}{3} = \frac{900\text{ g } f}{3} = \mathbf{300\ gf = 300{\times}1000\ dyne = 3\ N}$ ($\because$ 1 dyne = 10^{-5}N)

Question 6

(i) (a) What is an electrical fuse? [3]

(b) State two characteristics of an electrical fuse.

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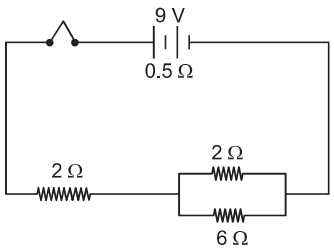


1. Total resistance of the circuit
2. Current flowing through circuit
3. Current in the 6 Ω resistor
4. Drop in potential across the terminals of cell

Solution :

(i) (a) Electrical fuse is the weakest point in an electrical circuit, if the circuit gets (1) overloaded (2) short circuited (3) or there is lot of fluctuation in the power supply, then it melts and breaks the circuit.

(b) 1. It is a very high electrical resistance.

2. It has a very low melting point, i.e., around 200 °C.

(ii) (a) The resistance offered by the electrolyte of a cell when the current is withdrawn from it is called internal resistance of the cell.

(b) 1. It is inversely proportional to the surface area of the electrodes in contact with the electrolyte.

2. It is directly proportional to the distance between the electrodes of the cell.

(iii) 1. Resistance of 2 Ω and 6 Ω in parallel

$$\frac{1}{R_p} = \frac{1}{2} + \frac{1}{6} = \frac{3+1}{6} = \frac{4}{6} = \frac{2}{3}.$$

$$\therefore \quad R_P = \frac{3}{2} = 1.5\ \Omega$$

Ext. resistance of circuit, $R_E = R_p + 2\ \Omega = 1{\cdot}5\ \Omega + 2\ \Omega = 3{\cdot}5\ \Omega$

Now total resistance of circuit = ext. resistance + int. resistance

$$= 3{\cdot}5\ \Omega + 0{\cdot}5\ \Omega = 4{\cdot}0\ \Omega$$

2. Current flowing through circuit, $I = \frac{E}{R+r} = \frac{9V}{4\Omega} =$ **2·25 A**

3. P.D. across parallel circuit, $V = I.R = 2{\cdot}25 \times 1{\cdot}5 = 3{\cdot}375$

$\therefore$ Current in 6 Ω resistor, $I = \frac{V}{R} = \frac{3{\cdot}375}{6}$ A

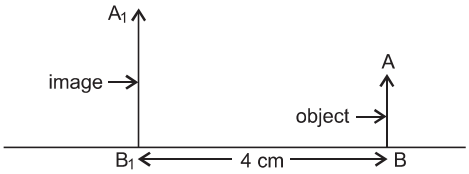
$$= \mathbf{0{\cdot}562\ A}$$

4. Drop in potential across the terminal of cell = I*r*

$$= 2{\cdot}25 \times 0{\cdot}5 = \mathbf{1{\cdot}125\ V}$$

Question 7

(i) Diagram alongside shows an object AB placed in front of a lens, when an image A_1B_1 is formed on the same side of lens. Copy the diagram and answer the following questions: [4]



(a) What is the nature of lens?

(b) Show the position of lens in the diagram.

(c) Complete the diagram, showing two rays originating from the tip of object.

(ii) By drawing a diagram show why a stick held obliquely in water appears bent and short. [3]

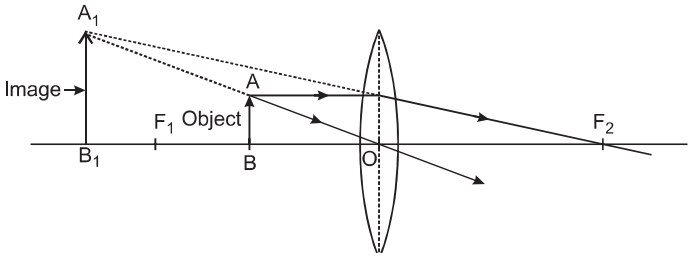
(iii) (a) A postage stamp appears raised by 10 mm, when placed under a thick glass block of refractive index 1.45. What is the thickness of glass block? [3]

(b) Fill in the blank.

When a ray of light travelling from glass to air is reflected back into glass at the surface of separation the phenomenon is called_____.

Solution :

(i)

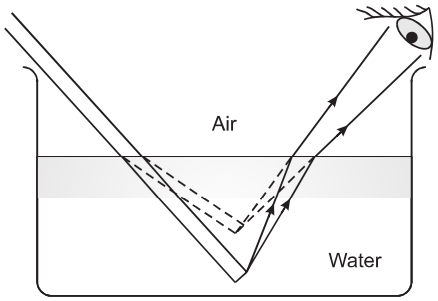


(a) Lens is a convex lens.

(b) Shown in diagram.

(c) Diagram completed.

(ii) Diagram shown alongside.



(iii) (a) Let the real thickness of glass block = x

$\therefore$ Apparent thickness of glass block = x – 10 m.m

$$\text{Now, } \mu = \frac{\text{Real depth}}{\text{App. depth}} \Rightarrow 1{\cdot}45 = \frac{x}{x - 10\,\text{m m}}$$

$$\Rightarrow 1{\cdot}45x - 14{\cdot}5 \text{ mm} = x$$

$$\Rightarrow 1{\cdot}45x - x = 14{\cdot}5 \text{ mm}$$

$$\Rightarrow 0{\cdot}45x = 14{\cdot}5\text{mm}$$

$$\therefore \text{Real thickness of glass block} = \frac{14{\cdot}5 \text{ mm}}{0{\cdot}45} = \mathbf{32{\cdot}22\ mm}$$

(b) Total internal reflection.

Question 8

(i) A person walking past a railway line at the middle of night, hears a ringing sound along with the sound of his own feet. Explain. [3]

(ii) By drawing separate diagrams, show the wave patterns produced by [3]

(a) simple musical note

(b) complex musical note

(c) noise

(iii) A man stands between two parallel cliffs 99 m apart. He fires a gun and hears two successive echoes after 0.2 s and 0.4 s. Calculate: [4]

(a) Distance of nearest cliff from the person.

(b) Speed of sound.

Solution :

(i) When vibrations produced by man due to walking are impressed on the railway line, they start vibrating with forced vibrations, there by producing a ringing sound.

(ii)

(a) Simple musical note (b) Complex musical note (c) Noise

(iii) (a) Let the distance of man from nearest cliff = x

$\therefore$ Distance of man from farthest cliff = 99 – x

Case (i) For nearer cliff, $v = \frac{2d}{t} = \frac{2x}{0{\cdot}2}$ or v = 10x ...(a)

Case (ii) For farther cliff, $v = \frac{2d}{t} = \frac{2(99 - x)}{0{\cdot}4}$ or v = 495 – 5x ...(b)

Comparing (a) and (b)

$10x = 495 - 5x \Rightarrow 15x = 495$

$\therefore$ Distance of man from nearest cliff (x) = $\frac{495}{15} = \mathbf{33\ m}$

(b) Putting value of x in (a).

Speed of sound = 10 × 33 = **330 ms^{-1}**.

Question 9

(i) State three ways by which a nuclear reaction differs from chemical reaction. [3]

(ii) (a) What name is given to elements having same atomic number but different mass number? [3]

(b) When an alpha particle gains two electrons, it changes into neutral gas. Name the gas.

(c) How does the atomic number of an element change, if it emits beta particle?

(iii) (a) Is it possible for hydrogen ($_{1}^{1}H$) nucleus to emit an alpha particle. Give a reason for your answer. [4]

(b) The nucleus of $_{84}^{202}X$ emits alpha particle to form nucleus Y. Represent this change in the form of an equation.

(c) What change will take place in mass number and atomic number of the nucleus Y, if it emits gamma radiation?

Solution :

(i)

S.No.	Nuclear Reaction	Chemical Reaction
1	It involves nucleus of an atom and is independent of electrons around nucleus.	It does not involves nucleus and is confirmed to valance electrons.
2	Energy released is enormous.	Energy released is very small.
3	New elements are formed.	No new elements are formed.

(ii) (a) Isotopes.

(b) Helium gas.

(c) Its atomic number increases by one.

(iii) (a) It is not possible. It is because a nucleus having only one proton can not eject of 2 protons and 2 neutrons.

(b) $_{84}^{202}X \xrightarrow{-\alpha} {}_{82}^{198}Y$.

(c) There is no change in mass number and atomic number.

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