ICSE 2024 EXAMINATION

PHYSICS

SAMPLE PAPER - 8

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) A sheaf pulley has:
(a) efficiency more than 100% (b) it multiplies speed
(c) it multiplies effort (d) both (a) and (b)

(ii) Which of the statement is not true for an actual machine?
(a) its mechanical advantage is always less than velocity ratio
(b) its efficiency is always less than 100%
(c) its mechanical advantage is greater than velocity ratio
(d) its output is always less than input.

(iii) A stone resting on a roof of a building has:
(a) kinetic energy (b) gravitational energy (c) potential energy (d) both (b) & (c)

(iv) A force of 525 N produces a torque of 420 Nm. The shortest distance between the turning point and point of application of force is:
(a) 0.75 m (b) 0.80 m (c) 0.70 m (d) 0.85 m

(v) A body is describing a uniform circular motion. Which of the following quantities is/are constant?
(a) speed (b) velocity (c) acceleration (d) both (a) and (c)

(vi) Which cools soft drink bottles best?
(a) A liquid of sp. heat capacity 0.70 $Jg^{-1}°C^{-1}$ and at –10°C
(b) Water at 0 °C (c) Crushed ice at 0°C
(d) An organic solid of sp. heat capacity 0.38$Jg^{-1}°C^{-1}$ and at –40 °C

(vii) A solid of mass 0.150 kg and of specific heat capacity 390 Jkg^{-1} $°C^{-1}$ is cooled from 90°C to 10°C. The heat given out of solid is
(a) 4680 J (b) 4650 J (c) 4860 J (d) 6480 J

(viii) Two media 'P' and 'Q' have same refractive index. A ray of light travelling from medium P to medium Q will suffer:
(a) refraction at the interface of PQ (b) partly suffer reflection at interface P & Q
(c) partly gets absorbed in medium Q (d) both (b) and (c)

(ix) Diamonds sparkle more than glass because they have:
(a) smaller critical angle than glass (b) larger critical angle than glass
(c) critical angle plays no role (d) none of these

(x) The most visible colour of visible spectrum is:
(a) red (b) violet (c) orange (d) green

(xi) To locate its prey in darkness the owl or bat emits:
(a) sonic-waves (b) infrared waves (c) ultrasonic waves (d) infrasonic waves

(xii) The amplitude of forced vibrations is generally _____ than the amplitude of applied external force.
(a) more (b) less (c) equal to (d) none of these

(xiii) When the amplitude of a pure note is reduced its:
(a) speed decreases (b) wavelength decreases (c) frequency decreases (d) loudness decreases

(xiv) A charge of 5000 C flows through a conductor for 8 min and 20 sec. The current flowing through conductor is:
(a) 8 A (b) 10 A (c) 9.5 A (d) 10.5 A

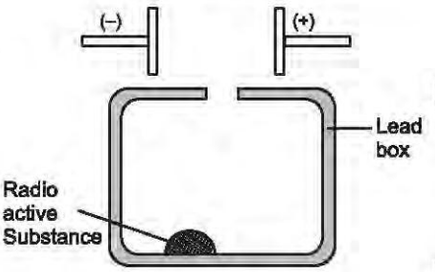
(xv) Which of the following is non-ohmic resistance?
(a) element of room heater (b) electronic valves
(c) connecting wire of copper (d) A thin strip of manganin alloy

ANSWERS

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

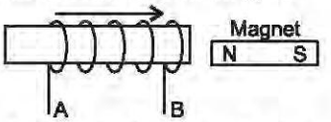
Question 2

(i) (a) Copy and complete diagram shown alongside by drawing deflection of radioactive radiation in the electric field. Label the radiations. [3]



(b) State one precaution in handling radioactive substances.

(ii) This diagram shows the direction of motion of coil towards magnet. [2]



(a) State the direction in which current flows, i.e.; A to B or B to A.
(b) Name the law used to come to the conclusion.

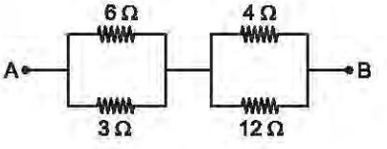
(iii) (a) What do you understand by the term nuclear fusion?
(b) Nuclear power plants use **nuclear fission** reaction to produce electricity. What is the advantage of producing electricity by **fusion** reaction? [2]

(iv) An electric bulb of resistance 500 Ω, draws a current of 0.4A. [2]
Calculate: (a) power of bulb (b) p.d at its ends.

(v) (a) At what voltage alternating current is supplied to homes? [2]
(b) How should electric appliances be connected in household circuit?

(vi) How does increase in temperature affect the specific resistance of [2]
(a) Metal
(b) Semiconductor?

(vii) Find the equivalent resistance between points A and B. [2]



Question 3

(i) (a) What do you understand by the term electric potential? [2]
(b) State and define practical unit of electric potential.

(ii) (a) What is a super conductor? [2]
(b) Name a material and the temperature at which it becomes super conductor.

(iii) (a) What are forced vibrations? [2]
(b) State two characteristics of forced vibrations.

(iv) (a) Define scattering. [2]
(b) 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.

(v) On what factors does the force experienced by a straight conductor placed in a magnetic field depends? [2]

SECTION - B (40 Marks)

(Attempt *any four* questions from this Section)

Question 4

(i) (a) The diagram below shows a lever in use : [4]

1. To which class of levers does it belong?
2. Without changing the dimensions of the lever, if the load is shifted towards the fulcrum what happens to the mechanical advantage of the lever?

(b) 1. Define power.
2. State a mathematical expression for power.

(ii) (a) What do you understand by the term equilibrium of a body? [3]
(b) State a condition when a body is in dynamic equilibrium.
(c) Give an example of a body is in dynamic equilibrium.

(iii) A uniform metre-scale balances horizontally on a knife edge placed at 55 cm mark, when the mass of 25 g is supported at its one end. Draw the diagram for arrangement and calculate the mass of scale. [3]

Question 5

(i) (a) How can a single pulley be used as single movable pulley? Show by drawing a diagram. [3]

(b) What is the velocity ratio of above pulley? Is its mechanical advantage is less or more than velocity ratio?

(ii) A pulley system has five pulleys in all, two in a movable block and three in a fixed block, such that effort applied in the UPWARD direction and a load of 120 kgf is attached to movable block. Answer the following questions: [4]

(a) What is the velocity ratio of system?

(b) Assuming pulley system an ideal one, what is its mechanical advantage?

(c) What is the magnitude of effort applied?

(d) If pulley system is not ideal and is 60% efficient, what is the effort required?

(iii) (a) Name and define unit of heat in old CGS system. [3]

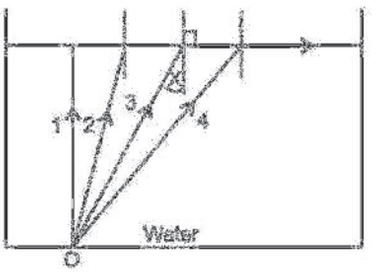
(b) Name the modern unit of heat energy. How this unit is related to old system of measuring heat energy?

(c) What is value of 2 kcal in new system of measurement of heat?

Question 6

(i) Diagram alongside shows a source of light 'O' placed in water tank and rays 1, 2, 3 and 4 originating from point.

The path of ray 3 is shown in diagram.



(a) Copy the diagram and trace the course of rays 1, 2 and 4. [2]

(b) Which ray does not suffer refraction and why? [1]

(c) Which ray suffers refraction and why? [1]

(d) Which ray suffers total internal reflection and why? [1]

(e) If critical angle for water is 48° which is the value of angle X? [1]

(ii) A object 1.5 cm high is placed at a distance of 16 cm from a convex lens of focal length 20 cm. Calculate (a) position of image; (b) size of image. State the characteristics of image formed. [4]

Question 7

(i) (a) Is the spectrum obtained by an equilateral prism pure or impure? Explain your answer. [4]

(b) What is ultraviolet spectrum? State its range in Å.

(ii) How do the following make use of echoes? [2]

(a) army (b) fishermen.

(iii) A man stands between two cliffs P and Q, such that he is at a distance of 132 m from nearer cliff P. When he blows a whistle he hears first echo after 0.8 s and the second echo after 2.4 s. Calculate [4]

(a) Speed of sound (b) Total distance between cliffs P and Q.

Question 8

(i) (a) Define electrical resistance. [1]

(b) State two laws of electric resistance. [2]

(c) 1. Name a substance whose resistance increases with the rise in temperature. [3]

2. Name a substance whose resistance practically does not change with rise in temperature.

3. Name a substance whose resistance decreases with temperature.

(d) A resistance wire is made from nichrome has a resistance of 9.50 Ω. Calculate the resistance of another nichrome wire, such that its length is 4 times and area of cross-section 1/3 times the dimensions of original wire. [4]

Question 9

(i) State three characteristics of a parallel electrical circuit. [3]

(ii) An electric motor is rated 1000 W and 250 V. [3]

(a) What does marking 1000 W and 250 V mean?

(b) What is current drawn by the motor?

(c) What is the electric resistance offered by motor?

(iii) A radioactive nucleus ${}_{84}X^{202}$ of an element emits a beta particle followed by 2 alpha particles such that final nucleus is ${}_{a}Y^{b}$. Find the value of 'a' and b. [4]

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SOLUTION

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

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(vii) A solid of mass 0.150 kg and of specific heat capacity $390\,Jkg^{-1}\,{}^{o}C^{-1}$ is cooled from 90°C to 10°C. The heat given out of solid is
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Question 2

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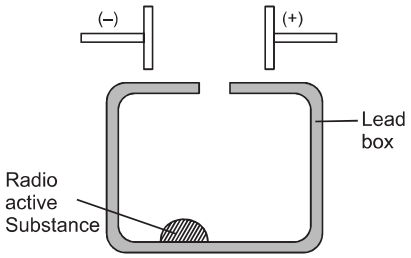
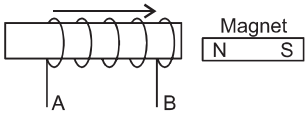


(b) State one precaution in handling radioactive substances.

(ii) This diagram shows the direction of motion of coil towards magnet. [2]



(a) State the direction in which current flows, i.e.; A to B or B to A.
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(b) Nuclear power plants use **nuclear fission** reaction to produce electricity. What is the advantage of producing electricity by **fusion** reaction? [2]

(iv) An electric bulb of resistance 500 Ω, draws a current of 0.4A. [2]
Calculate: (a) power of bulb (b) p.d at its ends.

(v) (a) At what voltage alternating current is supplied to homes? [2]
(b) How should electric appliances be connected in household circuit?

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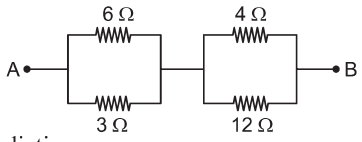
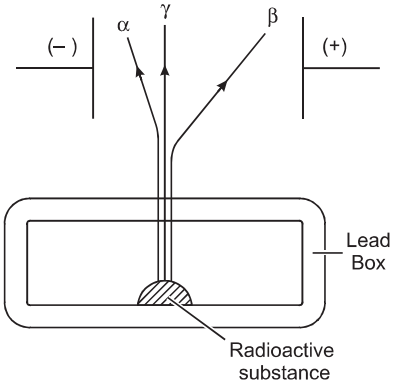


Solution :

(i) (a) Diagram alongside shows paths taken lay α, β and γ particles radiations.
(b) The radioactive material should be placed in thick lead containers with leak proof lead lids.



(ii) (a) Current flows from B to A, i.e.; in anticlockwise direction.
(b) Lenz's Law.

(iii) (a) The process of combining lighter nuclei (atomic weight less than 20) into heavier nuclei with the release of energy is called nuclear fusion.
(b) It is found that once fusion reaction starts it liberates 10 times or more heat energy than required to initiate it. Thus, it will not require any further heating and sustain itself. The products of this reaction are non-radioactive and does not cause any disposal problems. It does not require slow neutrons to initiate it.

(iv) (a) Power of bulb : $I^2 \times R = (0.4)^2 \times 500 =$ **80W**

(b) P.D at the ends of bulb, $V = I.R = 0.4 \times 500 =$ **200 V.**

(v) (a) Power to household consumer is suppled at 220V.

(b) Electric appliances in household circuit should be connected in parallel.

(vi) (a) Specific resistance of metal increases with the rise in temperature.

(b) Specific resistance of semi-conductors decreases with the rise in temperature.

(vii) Resistance of 6Ω and 3Ω in parallel $(R_1) = \frac{1}{R_1} = \frac{1}{3}+\frac{1}{6} = \frac{3}{6} = \frac{1}{2}$

$\therefore R_1 = 2\Omega$

Resistance of 4Ω and 12Ω in parallel $(R_2) = \frac{1}{R_2} = \frac{1}{4}+\frac{1}{12} = \frac{4}{12} = \frac{1}{3}$.

$\therefore R_2 = 3\Omega$

Resistance R_1 and R_2 in series = (2 + 3) = **5Ω**

Thus, equivalent resistance between points A and B = **5Ω**.

Question 3

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

(b) State and define practical unit of electric potential.

(ii) (a) What is a super conductor? [2]

(b) Name a material and the temperature at which it becomes super conductor.

(iii) (a) What are forced vibrations? [2]

(b) State two characteristics of forced vibrations.

(iv) (a) Define scattering. [2]

(b) 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.

(v) On what factors does the force experienced by a straight conductor placed in a magnetic field depends? [2]

Solution :

(i) (a) Electric potential is the amount of work done (energy spent) in moving a unit positive charge from infinity to a given point in an electric field.

(b) Practical unit of electric potential is volt, one coulomb charge is brought from infinity to a given point in an electric field, such that work done is one joule, then electric potential at that point is 1 volt.

(ii) (a) A material which does not offer resistance to the flowing of electric current is called super conductor.

(b) Mercury is a super conductor at 4.2 K.

(iii) (a) The vibrations produced by a body under the influence of an external periodic force are called forced vibrations.

(b) 1. The body vibrating with forced vibrations does not vibrate with its natural frequency, but acquires the frequency of external periodic force.

2. If the frequency of external force is much different than the natural frequency of the body, then the amplitude of forced vibrations is very small.

(iv) (a) The phenomenon in which an incident light strikes a particle which has a diameter greater than the wavelength of incident light, then the incident light is absorbed by the particle and transmitted in all possible directions, is called scattering.

(b) 1. Molecules of the smoke are bigger than the wavelength of light.

(v) (i) Force experienced by conductor is directly proportional to length of conductor in magnetic field.

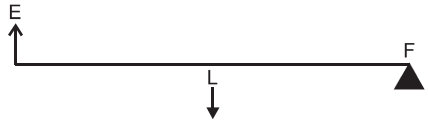
(ii) Force experienced by conductor is directly proportional to the magnitude of current in it.

SECTION - B (40 Marks)

(Attempt *any four* questions from this Section)

Question 4

(i) (a) The diagram below shows a lever in use : [4]



1. To which class of levers does it belong?
2. Without changing the dimensions of the lever, if the load is shifted towards the fulcrum what happens to the mechanical advantage of the lever?

(b) 1. Define power.
2. State a mathematical expression for power.

(ii) (a) What do you understand by the term equilibrium of a body? [3]
(b) State a condition when a body is in dynamic equilibrium.
(c) Give an example of a body is in dynamic equilibrium.

(iii) A uniform metre-scale balances horizontally on a knife edge placed at 55 cm mark, when the mass of 25 g is supported at its one end. Draw the diagram for arrangement and calculate the mass of scale. [3]

Solution :

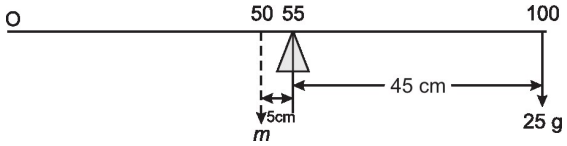
(i) (a) 1. Lever of second class.
2. If the load is shifted towards the fulcrum, then load arm will decrease, consequently, mechanical advantage of the lever will increase.

(b) 1. Rate doing work is called power.

2. Power $= \frac{\text{work}}{\text{times (in } s)} = \frac{W}{t}$.

(ii) (a) When number of forces (two or more) act on a rigid body, such that they do not change the state of rest or uniform motion of a body in a straight line then the rigid body is in the state of equilibrium.
(b) The body should not change its state of motion in any way when two or more external forces are applied.
(c) A train running at constant speed (say 72 km h^{-1}) in a particular direction is in dynamic equilibrium.

(iii) When the metre scale is in equilibrium,



Moments due to mass m about 55 cm mark

= Moments due to mass 25 g.

$\Rightarrow m \times 5 \text{ cm} = 25 \text{ g} \times 45 \text{ cm}$

$\therefore$ Mass of metre scale $(m) = \frac{25\,\text{g} \times 45\,\text{cm}}{5\,\text{cm}} =$ **225 g.**

Question 5

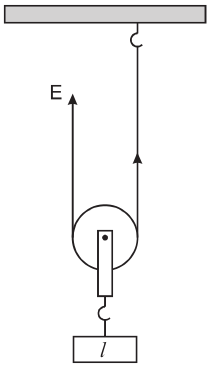
(i) (a) How can a single pulley be used as single movable pulley? Show by drawing a diagram. [3]
(b) What is the velocity ratio of above pulley? Is its mechanical advantage is less or more than velocity ratio?

(ii) A pulley system has five pulleys in all, two in a movable block and three in a fixed block, such that effort applied in the UPWARD direction and a load of 120 kgf is attached to movable block. Answer the following questions: [4]
(a) What is the velocity ratio of system?
(b) Assuming pulley system an ideal one, what is its mechanical advantage?
(c) What is the magnitude of effort applied?
(d) If pulley system is not ideal and is 60% efficient, what is the effort required?

(iii) (a) Name and define unit of heat in old CGS system. [3]
(b) Name the modern unit of heat energy. How this unit is related to old system of measuring heat energy?
(c) What is value of 2 kcal in new system of measurement of heat?

Solution :

(i) (a) A single fixed pulley can be converted with a single movable system by making the single pulley movable and applying effort in the upward direction as shown in diagram alongside.



(b) Velocity ratio of pulley system = No of supporting segment of rope = **2**

The mechanical advantage of this pulley is less than velocity ratio, because a part of effort is wasted in friction and overcoming the weight of movable block.

(ii) (a) Velocity ratio = No of supporting segments of rope = 6

(b) For ideal machine, MA = V.R = **6**

(c) $M.A = \frac{l}{E}$ $\quad\therefore\quad E = \frac{l}{M.A} = \frac{120 \text{ kgf}}{6} = \mathbf{20}$ kgf

(d) $\eta = \frac{M.A}{V.R}$ $\quad\therefore\quad M.A = \eta.\ V.R \Rightarrow \frac{l}{E} = \frac{60}{100} \times 6$

$\therefore E = \frac{100}{60 \times 6} \times l = \frac{100}{60 \times 6} \times 120 \text{ kgf} = \mathbf{33.33\ kgf}$.

(iii) (a) **Calorie :** It is the amount of heat energy required to raise the temperature of 1 gram of water through 1°C.

(b) Modern unit of heat energy is joule(J)

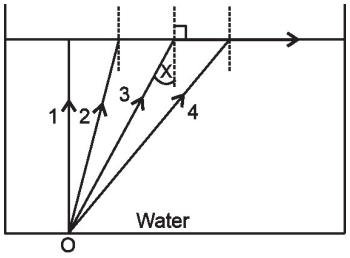
4.2 J = 1 calorie or $1J = \frac{1}{4.2}$ calorie.

(c) 2 *k* cal = 2000 cal = 2000 × 4.2 J = **8400J**.

Question 6

(i) Diagram alongside shows a source of light 'O' placed in water tank and rays 1, 2, 3 and 4 originating from point.

The path of ray 3 is shown in diagram.



(a) Copy the diagram and trace the course of rays 1, 2 and 4. [2]

(b) Which ray does not suffer refraction and why? [1]

(c) Which ray suffers refraction and why? [1]

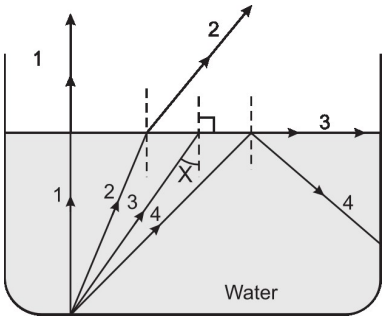
(d) Which ray suffers total internal reflection and why? [1]

(e) If critical angle for water is 48° which is the value of angle X? [1]

(ii) A object 1.5 cm high is placed at a distance of 16 cm from a convex lens of focal length 20 cm. Calculate (a) position of image; (b) size of image. State the characteristics of image formed. [4]

Solution :

(i) (a) Course of rays 1, 2 and 4 in shown in diagram alongside.



(b) Ray 1 does not suffer refraction because angle of incidence at interface of water and air in zero. So angle of refraction is zero.

(c) Ray 2 suffers refraction because the angle of incidence in rare medium is less than critical angle.

(d) Ray 4 suffers total internal reflection because angle of incidence is greater than critical angle.

(e) The value of angle X = critical angle of water = 48°.

(ii) Height of object (h_0) = 1.5 cm

Distance object from lens (u) = –16 cm

Focal length of lens (*f*) = + 20 cm

Distance of image from lens (*v*) to be calculated

(a) Applying, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{v} - \frac{1}{-16} = \frac{1}{20}$

$\Rightarrow \frac{1}{v} = \frac{1}{20} - \frac{1}{16} \Rightarrow \frac{1}{v} = \frac{4-5}{80}$

$\Rightarrow \frac{1}{v} = \frac{-1}{80} \Rightarrow v = -80$ cm

$\therefore$ Position of image at distance of **80 cm** from optical centre on the same side of object.

(b) Applying, $\frac{h_i}{h_0} = \frac{v}{u} \Rightarrow \frac{h_i}{1.5\,\text{cm}} = \frac{80}{16} \Rightarrow h_i = 5 \times 1.5$ cm $= 7.5$ cm

$\therefore$ Size of image = **7.5 cm.**

Characteristics of image :

Image is (1) virtual (2) erect (3) magnified and (4) formed on the same side of object.

Question 7

(i) (a) Is the spectrum obtained by an equilateral prism pure or impure? Explain your answer. [4]

(b) What is ultraviolet spectrum? State its range in Å.

(ii) How do the following make use of echoes? [2]

(a) army (b) fishermen.

(iii) A man stands between two cliffs P and Q, such that he is at a distance of 132 m from nearer cliff P. When he blows a whistle he hears first echo after 0.8 s and the second echo after 2.4 s. Calculate [4]

(a) Speed of sound (b) Total distance between cliffs P and Q.

Solution :

(i) (a) An equilateral prism always forms impure spectrum.

Reason : The ray striking on the dispersing face of the prism are not striking at the same angle of incidence. Thus, the dispersed colours mix to from impure spectrum.

(b) Invisible spectrum below the violet end of visible spectrum is called ultraviolet spectrum.

The range of ultraviolet spectrum is between 4000 Å to 100 Å.

(ii) (a) Army uses the echoes to locate enemy gun positions very accurately that time echoes produced by enemy gun fire and then applying trigonometric calculations can locate position of gun.

(b) Fishing boats are fitted with sonar which operates in the horizontal plane, rather than vertical plane. The fisherman send ultrasonic signals in the forward direction. If these signals strike fish shoals they are reflected back to the fishing boat. On the fishing boat they calculate the distance and direction of fish shoal. They move their boat in the calculated direction to net the fish.

(iii) **Case** (a) Speed of sound $= \frac{2d}{t} = \frac{2 \times 132\text{m}}{0.8\text{s}} =$ **330 ms^{-1}**.

Case (b) Distance of cliff Q $= \frac{v \times t}{2} = \frac{330\,\text{ms}^{-1} \times 2.4s}{2} =$ **396 m**.

$\therefore$ Distance between cliffs = (132 + 396) m = **528 m**.

Question 8

(i) (a) Define electrical resistance. [1]

(b) State two laws of electric resistance. [2]

(c) 1. Name a substance whose resistance increases with the rise in temperature. [3]

2. Name a substance whose resistance practically does not change with rise in temperature.

3. Name a substance whose resistance decreases with temperature.

(d) A resistance wire is made from nichrome has a resistance of 9.50 Ω. Calculate the resistance of another nichrome wire, such that its length is 4 times and area of cross-section 1/3 times the dimensions of original wire. [4]

Solution :

(i) (a) Friction or obstruction encountered by an electric current while passing through a conductor is called electrical resistance.

(b) 1. Temperature remaining constant the resistance passing of a conductor is directly proportional to the length of conductor.

2. Temperature remaining constant the resistance of a conductor is inversely proportional to the area of cross-section of conductor.

(c) 1. The resistance of wire of metal increases with rise in temperature.

2. The resistance of nichrome wire (alloy) practically does not increase with the rise in temperatures.

3. The resistance of carbon filament lamp decreases with the increase in temperature.

(ii) **Case** (i) $R = \rho \frac{l}{a}$ $\therefore 9.5 = \rho \frac{l}{a}$ ...(i)

Case (ii) $R_1 = \rho \frac{l_1}{a_1}$ $\therefore R_1 = \rho \frac{4l}{1/3a}$ $\Rightarrow R_1 = 12 \times \rho \frac{l}{a}$ ...(ii)

Substituting the value of (i) in (ii), we get

$R_1 = 12 \times 9.5 \quad \Rightarrow R_1 =$ **114.0** Ω

Question 9

(i) State three characteristics of a parallel electrical circuit. [3]

(ii) An electric motor is rated 1000 W and 250 V. [3]

(a) What does marking 1000 W and 250 V mean?

(b) What is current drawn by the motor?

(c) What is the electric resistance offered by motor?

(iii) A radioactive nucleus ${}_{84}X^{202}$ of an element emits a beta particle followed by 2 alpha particles such that final nucleus is ${}_{a}Y^{b}$. Find the value of '*a*' and *b*. [4]

Solution :

(i) Characteristic of parallel circuit.

1. Potential difference across resistors in parallel is a constant quantity.
2. The current divides in parallel circuit in the inverse ratio of the resistance of the resistor.
3. The total current entering or leaving parallel circuit is equal to the sum total of individual current flowing in the resistors in parallel circuit : *i.e*, $I = I_1 + I_2 + I_3 + ...$

(ii) (a) 1000 W means that electric motor consumed energy @ 1000 J/s. 250 V means that electric motor will operate most efficiently at 250 V.

(b) Current drawn by motor (I) $= \frac{P}{V} = \frac{1000}{250} =$ **4A**.

(c) Resistance offered by motor, $R = \frac{V}{I} = \frac{250}{4} =$ **62.5** Ω

(iii) ${}_{84}X^{202} \xrightarrow{-\beta} {}_{85}X_1^{202} \xrightarrow{-\alpha} {}_{83}X_2^{198} \xrightarrow{-\alpha} {}_{81}Y^{194}$

$\therefore$ In ${}_{a}Y^{b}$, ***a* = 81** and ***b* = 194**

V V V