ICSE 2025 EXAMINATION

Sample Question Paper - 1

Physics

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

General Instructions:

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.

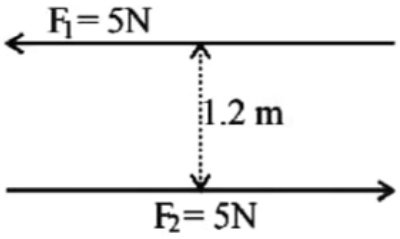
Section A is compulsory. Attempt any four questions from Section B.

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

Section A

1. **Choose the correct answers to the questions from the given options. (Do not copy the question, write the correct answers only.)** **[15]**

(a) Study the diagram alongside and calculate the moment of couple. **[1]**



a) 1 Nm b) 6 Nm

c) 2 Nm d) 4 Nm

(b) When white light is dispersed by a prism, compared with blue light, the red light is **[1]**

a) slowed down less and refracted less b) slowed down more and refracted less

c) slowed down more and refracted more d) slowed down less and refracted more

(c) A pendulum is oscillating freely. Its bob has: **[1]**

a) a constant energy which is the sum of potential and kinetic energy b) only kinetic energy

c) maximum kinetic energy at extreme position d) maximum potential energy at its mean position

(d) A radioactive substances emits: **[1]**

a) in the order of α, β and γ particles b) α-radiations or β-radiations

c) simultaneously α, β and γ radiations d) X-rays and γ-rays

(e) **Assertion (A):** When a force acts on a stationary rigid body which is free to move and if body starts moving in straight path in direction of applied force, then it is said to be linear motion. **[1]**

Reason (R): If free body is acted upon by two unequal forces in opposite direction, but not in one line, the effect is that the body will possess rotational motion only.

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

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

(f) The point on the principal axis of a convex lens, such that rays of light starting from it on passing through the lens, move parallel to the principal axis is called: **[1]**

a) first focal point

b) second focal point

c) aperture of lens

d) optical centre

(g) For hearing an echo, the minimum distance between the source of sound and reflecting body should be **[1]**

a) 24 m

b) 12 m

c) 17 m

d) 51 m

(h) The voice of women is shrill as compared to men because of the difference in their: **[1]**

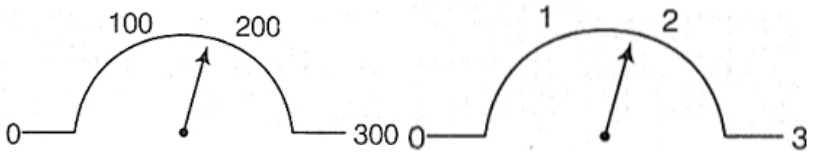
a) loudness

b) speed

c) all of these

d) frequency

(i) The current flowing through a resistor connected in an electric circuit and the potential difference applied across its ends are shown in figure below. The value of the resistance of the resistor is **[1]**



a) 10 Ω

b) 8 Ω

c) 5 Ω

d) 1 Ω

(j) By reversing the direction of current in an electromagnet, the magnetic field produced by it **[1]**

a) remains unchanged in strength and direction

b) gets reversed in direction

c) decreases in strength

d) increases in strength

(k) A nut can be opened by a lever of length 0.25 m by applying a force of 80 N. What should be the length of lever, if a force of 32 N is enough to open the nut? **[1]**

a) 0.18 m

b) 1.5 m

c) 3.0 m

d) 0.625 m

(l) The specific heat capacity of water in S.I. system is: **[1]**

a) $42\ JKg^{-1}\ K^{-1}$

b) $4200\ JKg^{-1}\ k^{-1}$

c) $4.2\ Jkg^{-1}\ K^{-1}$

d) $420\ JKg^{-1}\ K^{-1}$

(m) How many grams of ice at -14^oC are needed to cool 200 g of water from 25^oC to 10^oC? (Take, specific heat of ice = 0.5 cal $g^{-1}\ {}^oC^{-1}$ and latent heat of ice = 80 cal g^{-1}) **[1]**

a) 27 g b) 31 g

c) 20 g d) 30 g

(n) A coin is placed at a depth of 15 cm in a beaker containing water. The refractive index of water is $\frac{4}{3}$, calculate height through which the image of the coin is raised. **[1]**

a) 0.75 cm b) 1.75 cm

c) 3.75 cm d) 2.75 cm

(o) The critical angle for a material X is 45^o. The total internal reflection will take place, if the angle of incidence in the denser medium is: **[1]**

a) more than 45^o, but not 90^o b) 90^o

c) less than 45^o, but not zero degree d) less than 45^o

2. **Answer the following questions:** **[15]**

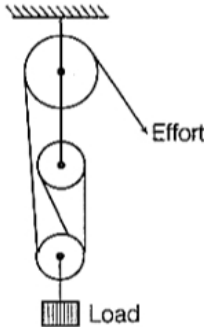
(a) i. Name a machine which can be used to **[1]**

i. Multiply force.

ii. Change the direction of force applied.

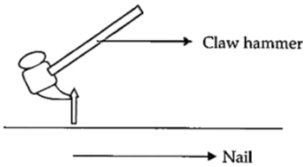
ii. If a machine is used to lift a load of 50 N such that resistance due to friction and movable part of machine is 15 N, then the total lifted load is 65 N, i.e., (50 + 15) N. If the displacement is caused through 2 m, then find actual and useful output. **[1]**

iii. Diagram given in below is representing a pulley system having a velocity ratio 3 and an efficiency of 80%. Calculate the mechanical advantage and efficiency. **[1]**



(b) Draw a neat labelled diagram for a particle moving in a circular path with a constant speed. In your diagram, show the direction of velocity at any instant. **[2]**

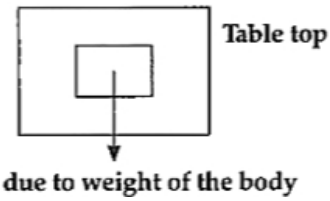
(c) The diagram below shows a claw hammer used to remove a nail: **[2]**



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 1.

(d) When a body is placed on a table top, it exerts a force equal to its weight downwards on the table top but does not move or fall. **[2]**



i. Name the force exerted by the table top.

ii. What is the direction of the force?

(e) Two bodies, A and B of equal mass are kept at heights 20 m and 30 m respectively. Calculate the ratio of their potential energies. **[2]**

(f) Calculate the work done in moving a charge of 4 C from a point at 220 V to a point at 230 V. **[2]**

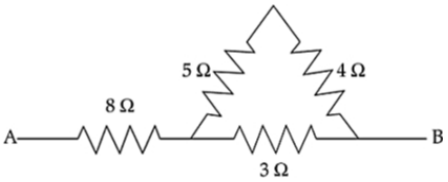
(g) State two differences between light waves and sound waves. **[2]**

3. **Answer the following questions;** **[10]**

(a) i. Define the power of a lens. **[2]**

ii. A lens has focal length 25 cm. Calculate the power of lens.

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



(c) How many protons will constitute a charge of 1 C? **[2]**

(d) i. Give one example, where high specific heat capacity of water is used as a heat reservoir. **[2]**

ii. Give one example, where high specific heat capacity of water is used for cooling purposes.

(e) Show by equations, the effect on the proton number Z and mass number A of the parent nucleus brought about by the two types of radioactive decay. **[2]**

Section B

Attempt any 4 questions

4. **Answer the following questions:** **[10]**

(a) Explain the meaning of reversibility of light. **[3]**

(b) 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)?

(c) If the speed of light in air is 3×10^8 ms^{-1}, determine the speed of light in glass. The refractive index of glass of 1.5. **[4]**

5. **Answer the following questions:** **[10]**

(a) A ray of monochromatic light is incident from air on a glass slab. **[3]**

i. Draw a labelled ray diagram showing the change in the path of the ray till it emerges from the glass slab.

ii. Name the two rays that are parallel to each other.

iii. Mark the lateral displacement in your diagram.

(b) i. If a monochromatic beam of light, undergoes minimum deviation through an equiangular prism, how does the beam pass through the prism, with respect to its base? **[3]**

ii. If white light is used in the same way as in (i) above, what change is expected in the emergent beam?

(c) Jatin puts a pencil into a glass container having water and is surprised to see the pencil in a different state. **[4]**

i. What change is observed in the appearance of the pencil?

ii. Name the phenomenon responsible for the change.

iii. Draw a ray diagram showing how the eyes sees the pencil.

6. **Answer the following questions:** **[10]**

(a) State the class of lever to which each one of the following items belongs. Also give the relative position of load (L), effort (E), and fulcrum (F) in each case **[3]**

i. Sea-saw

ii. Knife

iii. Nut cracker

(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) If a man raises a box of 50 kg mass to a height of 2 m, while the other man raises the same box to a same height in 5 min. Compare **[4]**

i. the work done.

ii. the power developed by them.

7. **Answer the following questions:** **[10]**

(a) A person standing between two vertical cliffs and 480 m from the nearest cliff shouts. He hears the first echo after 3 s and the second echo 2 s later. **[3]**

Calculate:

i. The speed of sound.

ii. The distance of the other cliff from the person.

(b) Arrange α, β and γ rays in ascending order with respect to their **[3]**

i. Penetrating power.

ii. Ionising power.

iii. Biological effect.

(c) i. Name the phenomenon involved in tuning a radio set to a particular station. **[4]**

ii. Define the phenomenon named by you in part (i) above.

iii. What do you understand by loudness of sound?

iv. In which units is the loudness of sound measured?

8. **Answer the following questions:** **[10]**

(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 ore of Uranium found in nature contains $^{238}_{92}\mathrm{U}$ and $^{235}_{92}\mathrm{U}$. 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) Two resistor of 4 Ω and 6 Ω are connected in parallel to a cell to draw 0.5 A current from the cell. **[4]**

i. Draw a labelled circuit diagram showing the above arrangement.

ii. Calculate the current in each resistor.

9. **Answer the following questions:** **[10]**

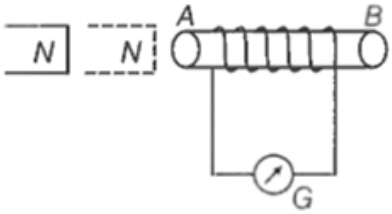
(a) i. Write an expression for the heat energy liberated by a hot body. **[3]**

ii. Some heat is provided to a body to raise its temperature by 25°C. What will be the corresponding rise in temperature of the body as shown on the Kelvin scale?

iii. What happens to the average kinetic energy of the molecules as ice melts at 0°C?

(b) Some ice is heated at a constant rate, and its temperature is recorded after every few seconds, till steam is formed at 100 °C. Draw a temperature time graph to represent the change. Label the two phase changes in your graph. **[3]**

(c) The diagram shows a coil connected to a centre zero galvanometer G. The galvanometer shows a deflection to the right, when the N-pole of a powerful magnet is moved to the right as shown in below figure. **[4]**



i. Explain, why the deflection occurs in the galvanometer?

ii. Does the direction of the current on the coil appear clockwise or anti-clockwise, when viewed from the end A?

iii. State the observation in G, when the coil is moved away from N.

iv. State the observation in G, when both the coil and the magnet are moved to the right at the same speed.

Solution

Section A

1. Choose the correct answers to the questions from the given options. (Do not copy the question, write the correct answers only.)

(i) **(b)** 6 Nm

Explanation: {

$F_1 = F_2 = F = 5$ N forces being equal opposite and parallel

Couple arm = 1.2 m

$\therefore$ The moment of couple = F $\times$ $\perp$ distance = 5 $\times$ 1.2 = 6 Nm

(ii) **(a)** slowed down less and refracted less

Explanation: {

As, $\lambda_{red} > \lambda_{blue}$

and $v = v\lambda$ (v is same for red and blue)

Then, $v_{red} > v_{blue}$, so red light is slowed down less and refracted less.

(iii) **(a)** a constant energy which is the sum of potential and kinetic energy

Explanation: {

a constant energy which is the sum of potential and kinetic energy

(iv) **(c)** simultaneously α, β and γ radiations

Explanation: {

simultaneously α, β and γ radiations

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

Explanation: {

Linear motion is also known as translational motion. When force acting on stationary object makes it to move in a straight path then the body is said to have translational or linear motion.

And when a free body is acted upon by two unequal forces in opposite direction, but not in one line, then the body possesses both rotational as well as translational motion.

(vi) **(a)** first focal point

Explanation: {

first focal point

(vii) **(c)** 17 m

Explanation: {

17 m

(viii) **(d)** frequency

Explanation: {

frequency

(ix) **(a)** 10 Ω

Explanation: {

Reading of ammeter in terms of amperes,

I = 180 mA = 0.18 A

Reading of voltmeter, V = 1.8 V

$\therefore$ Resistance of the resistor, R = $\frac{V}{I}$

$= \frac{1.8}{0.18} = \frac{180}{18}$ = 10 Ω

(x) **(b)** gets reversed in direction

Explanation: {

gets reversed in direction

(xi) **(d)** 0.625 m

Explanation: {

32 N × Force arm = 80 N × 0.25 m

Force arm = $\frac{80}{32} \times \frac{25}{100}$ = 0.625 m

(xii) **(b)** 4200 JKg^{-1} k^{-1}

Explanation: {

4200 JKg^{-1} k^{-1}

(xiii) **(a)** 27 g

Explanation: {

Heat gained by ice = Heat lost by water

Let m_1 = mass of ice

L_{ice} = 80 cal/g

c_{ice} = 0.5 cal/g/°C

Temperature of ice = -1.4° C

Heat gained by ice

$= m_1 L + m_1 c_{ice} \Delta t + m_1 c_{water} \Delta t$

$= m[L + c_{ice} \Delta t + c_{water} \Delta t]$

= m[80 + 0.5(0 + 14) + 1 × (0 + 25)]

= m[80 + 7 + 25]

= m × 112 ...(i)

Heat lost by water

= 200 × 1 × (25 - 10)

= 200 × 15 ...(ii)

From Eqs. (i) and (ii), we get

m × 112 = 200 × 15

$\Rightarrow$ m = $\frac{200 \times 15}{112}$ = 26.7 = 27 g

(xiv) **(c)** 3.75 cm

Explanation: {

Refractive index of water = $\frac{\text{Real depth}}{\text{Apparent depth}}$

$\frac{4}{3} = \frac{15 \text{ cm}}{x \text{ cm}}$

Apparent depth = x = $\frac{15 \times 3}{4}$ = 11.25 cm

$\therefore$ Height through which image is raised = 15 - 11.25 = 3.75 cm

(xv) **(a)** more than 45^o, but not 90^o

Explanation: {

more than 45^o, but not 90^o

2. Answer the following questions:

(i) i. i. Nut cracker.

ii. Handpump.

ii. Actual output = total load × distance

= 65 N × 2 m = 130 J

and useful output = useful work × distance

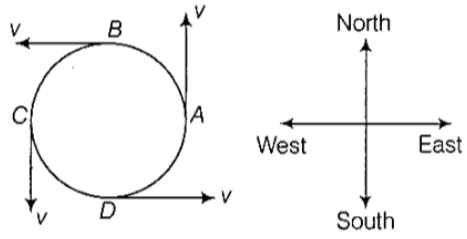
= 50 N × 2 m = 100 J

iii. Since, Mechanical Advantage,

MA = $\frac{\text{Load}}{\text{Effort}}$ = VR × η = 3 × $\frac{80}{100}$ = 2.4

or efficiency = $\frac{\text{load}}{2.4} = \frac{300}{2.4}$ = 125 N

(ii) The labelled diagram for a particle moving in a circular path is shown as below



Constant speed in circular path

(iii) i. Class I lever.

ii. Crow bar/pliers/any other correct example/diagram with name (only scissors not accepted), In these cases M. A. > 1.

(iv) i. Normal reaction force

ii. Vertically upwards

(v) Let mass of each body = m

$\therefore$ Potential energy of A, $P_A = mg\ (20)$

Similarly potential energy of B, $P_B = mg\ (30)$

$\therefore \frac{P_A}{P_B} = \frac{mg(20)}{mg(30)} = \frac{2}{3}$

(vi) Given, charge, q = 4 C

Potential at point A, $V_A = 220$ V

Potential at point B, $V_B = 230$ V

Work done, W = ?

$\therefore$ Potential difference, $\Delta V = V_B - V_A$

$= 230 - 220 = 10$ V

We know that, work done,

$W = \Delta V \times q = 10 \times 4 = 40$ J

(vii) The differences between sound waves and light waves are:

Sound waves	Light waves
Sound waves are mechanical waves.	Light waves are electromagnetic waves.
They are longitudinal in nature.	They are transverse in nature.
They require medium for its propagation.	They can travel in vacuum.
Speed of sound waves is 300 m/s in air.	Speed of light waves in air is 3×10^8 m/s.

3. Answer the following questions;

(i) i. It is the measure of deviation produced in the path of light when it passes through a lens.

ii. $\frac{1}{f} = \frac{100}{25}$

P = +4 D

(ii) 5 Ω and 4 Ω resistors are in series. So the equivalent resistance $R_1 = 9\ \Omega$.

R_1 and 3 Ω are in parallel. So equivalent resistance

$= R_2 = \frac{3 \times 9}{3+9} = 2.25\ \Omega$

R_2 and 8 Ω are in series. So, the effective resistance

$= R_{eff} = 10.25\ \Omega$

(iii) We know that

Q = ne

where, Q = 1 C

$e = 1.6 \times 10^{-19}$ (charge on proton)

$\Rightarrow n = \frac{Q}{e} = \frac{1}{1.6 \times 10^{-19}}$

$\Rightarrow n = 6.25 \times 10^{18}$ Protons

(iv) i. High specific heat capacity of water is used in hot water bottles for fermentation.

ii. High specific heat capacity of water is used for cooling radiators in cars.

(v) Two types of radioactive decay are

i. through the emission of α-ray

ii. through the emission of β-ray.

Equation of emission of α-ray

$${}^{A}_{Z}X \rightarrow {}^{A-4}_{Z-2}Y + {}^{4}_{2}He$$

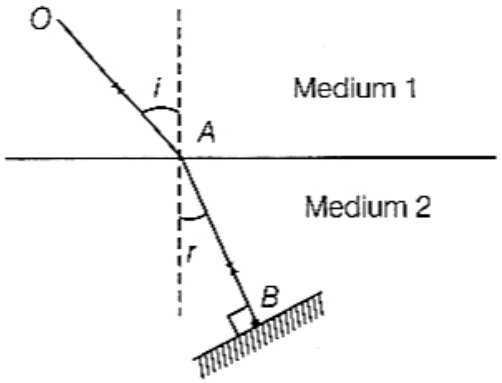
Equation of emission of β-ray

$${}^{A}_{Z}X \rightarrow {}^{A}_{Z+1}Y + {}^{0}_{-1}e$$

Section B

4. Answer the following questions:

(i) When a light ray after any number of reflections and refractions, travels back along its entire initial path. This is called principle of reversibility of light.



Reversibility of light

(ii) i. The measurenent of the quantity of heat is called calorimetry.

ii. Copper

iii. Specific heat capacity of copper is low and by making the vessel thin, its mass and heat capacity becomes low, therefore it takes a negligible amount of heat from the contents ta attain the temperature.

(iii) Given, speed of light, c = 3×10^8 ms^{-1}

Refractive index, μ = 1.5

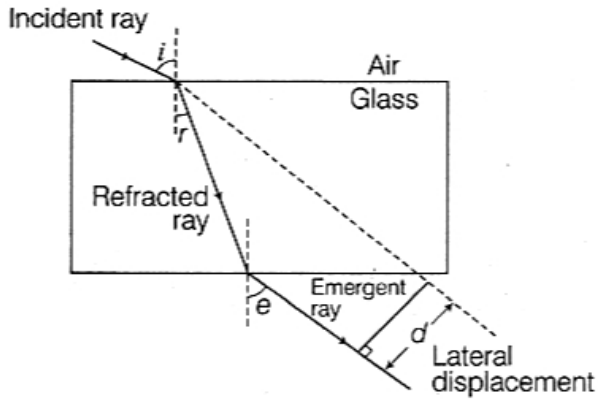
$\because \mu = \frac{c}{v} = \frac{\text{Velocity of light in air}}{\text{Velocity of light in a medium}}$

$\Rightarrow 1.5 = \frac{3\times10^8}{v} \Rightarrow v = \frac{3\times10^8}{1.5}$ solving this we get

$\Rightarrow$ velocity of light, v = 2×10^8 ms^{-1}

5. Answer the following questions:

(i) i. **Ray diagram**



ii. The rays parallel to each other are incident ray and emergent ray.

iii. The perpendicular distance between the incident ray and emergent ray is called the lateral displacement, which is marked as d in the above diagram.

(ii) i. If a monochromatic beam of light undergoes minimum deviation through an equiangular prism, then the angle of incidence i is equal to the angle of emergence e ($\angle i = \angle e$).

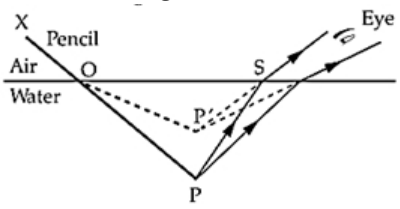
Hence, the refracted beam passes parallel to the base of the prism.

ii. If white light is used in the same way as in part (i), then dispersion of light takes place. We know that the angle of deviation depends on the wavelength of light.
The refractive index of a given transparent material decreases with the increase in a wavelength of light.
Consequently, the given prism deviates violet light more than the red light.

(iii) i. The pencil will be seen bent.

ii. Refraction of light.

iii.



6. Answer the following questions:

(i) i. Sea-saw is a lever of class I here F lies between L and E.

ii. Knife is a lever of class III. Here E lies between F and L.

iii. A nutcracker is a lever of class II here L lies in between F and E.

(ii) i. With reference to the direction of motion, both centrifugal force and centripetal force acts in opposite direction. Centripetal force acts towards the centre while centrifugal force acts radially outwards.

ii. No, the centrifugal force is not the force of reaction of centripetal force. It is because the action-reaction pair of forces acts on two bodies, but here it is acting on single body.

iii. The magnitudes of centripetal and centrifugal force are equal.

(iii) i. For the first man, mass m = 50 kg
Height from ground, h = 2 m
Time taken, t_1 = 2 min = 2×60 s = 120 s
For the second mass, m = 50 kg
Height, h = 2 m
Time, t = 5 min = 5 × 60 = 300 s
Let work done by the first man be W.
Since, W = mgh
Therefore, the work done by the second man is the same as mass and height are same.
$\therefore W_1 : W_2$ = 1 : 1

ii. Let power developed by the first man = P_1
$\because$ W = mgh = 50 × 10 × 2 = 1000 J
$P_1 = \frac{W}{t_1}$ = $\frac{1000}{120}$ W = $\frac{25}{3}$ W
Let P_2 be the power developed by the second man = P_2.
Therefore, power developed,
$P_2 = \frac{W}{t}$ = $\frac{1000}{300}$ W = $\frac{10}{3}$ W
$\therefore \frac{P_1}{P_2} = \frac{25}{3} : \frac{10}{3}$
$\therefore \frac{P_1}{P_2} = \frac{5}{2}$
$\Rightarrow$ $P_1 : P_2$ = 5 : 2 $\left(\because t_2 = 5 \text{ min}\right)$

7. Answer the following questions:

(i) i. $v = \frac{2\times \text{ distance}}{\text{time}}$
$= \frac{2\times 480}{3}$
= 320 m/s

ii. Speed of sound = 320 m/s
time = 5 s
$\therefore$ Distance of other cliff is given by
d = $\frac{v\times t}{2}$
$= \frac{320\times 5}{2}$ = 800 m

(ii) i. $\alpha < \beta < \gamma$

ii. $\gamma < \beta < \alpha$

iii. $\alpha < \beta < \gamma$

(iii) i. Resonance is used in tuning a radio set to a particular station.

ii. Resonance is the phenomenon in which vibration takes place under the influence of periodic force, when the frequency of the applied force becomes equal to the natural frequency of the vibrating body.

iii. Loudness is the sensation of sound generated in the ear that enables to distinguish between a loud and a faint sound.

iv. Loudness of sound is measured in the units called decibels (dB).

8. Answer the following questions:

(i) i. Each appliance will be working at the same potential; each appliance can operate independently.

ii. High resistivity and low melting point.

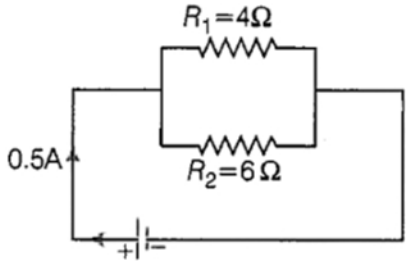
iii. Earth wire.

(ii) i. $_{92}U^{235}$

ii. Fission of $^{238}_{92}U$ is possible only by fast neutrons while the fission of $^{235}_{92}U$ can be even possible by the slow neutrons since it is less stable.

iii. $^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$

(iii) i. The circuit diagram is shown below



ii. Let the current flowing through resistance R_1, is I and current flowing through R_2 resistance is 0 5 - I.

∴ Current flowing through resistance R_1 = 4 Ω is 0.3 A and Current flowing through resistance R_2 = 6 Ω is

0.5 - 0.3 = 0.2 A

9. Answer the following questions:

(i) i. $Q = mc\Delta t$

where, m = mass of substance,

c = specific heat capacity of substance,

Δt = change in temperature,

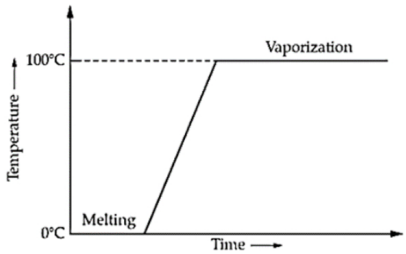
Q = heat given out

ii. Since, $\Delta Q \, \alpha \Delta t$

Hence the corresponding rise in temperature of the body in kelvin = 25 K.

iii. The average KE of the molecules remains same.

(ii)



(iii) i. When N-pole of the magnet is moved to the right, the current flows in the coil. Due to this, there is a change in the magnetic flux linked with the coil.

As according to Faraday's laws, an emf is induced across the ends of the coil which causes induced current to flow in the coil. Thus, the galvanometer shows deflection.

ii. Anti-clockwise.

iii. When the coil is moved away from N, the galvanometer needle deflects to the left side.

iv. When both the coil and the magnet are moved at the same speed there is no change in the magnetic flux linked with the coil. So, no induced emf gets produced and the galvanometer needle does not deflect.