ICSE 2025 EXAMINATION

Sample Question Paper - 4

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) A uniform metre scale balances horizontally on a knife edge placed at 55 cm mark, when a mass of 25 g is supported from one end. Draw the diagram of the arrangement. Calculate mass of the scale. **[1]**

a) 100 g b) 225 g

c) 400 g d) 275 g

(b) A converging lens has a focal length 40 cm. Calculate its power. **[1]**

a) -1.5 D b) -2.5 D

c) +2.5 D d) +1.5 D

(c) An electric pump is 60% efficient and is rated 2 HP. Calculate the maximum amount of water it can lift through a height of 5 m in 40 s. [Take g = 10 ms^{-2} and 1 HP = 750 W] **[1]**

a) 280 kg b) 38 kg

c) 125 kg d) 720 kg

(d) Which of the following radiation is most penetrating? **[1]**

a) α-particles b) β-particles

c) X-rays d) γ-radiation

(e) **Assertion (A):** The moment of force for force 10 N applied at a distance of 20cm from the pivot will be 0.02 Nm. **[1]**

Reason (R): The moment of force is ratio of perpendicular distance of the line of action of the force for axis of rotation and magnitude of force.

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) Both A and R are false.

(f) A convex lens forms a real image 4 times magnified when placed at a distance of 6 cm from the lens. Calculate the focal length of the lens. **[1]**

a) 8.8 cm b) 6.8 cm

c) 2.8 cm d) 4.8 cm

(g) To locate its prey in the darkness the owl or the bat emits: **[1]**

a) infrasonic waves b) sonic waves

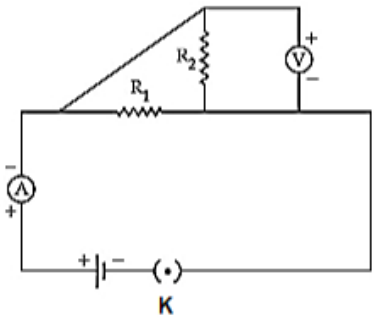
c) infrared waves d) ultrasonic waves

(h) Which of the following does not produce a sound wave? **[1]**

a) A bell ringing under water b) A hammer hitting a block of rubber

c) A gun fired in a room with no echoes d) An explosion in outer space

(i) For the given circuit, name the components which are connected in parallel. **[1]**



a) Both R_1 and V b) Both R_2 and V

c) Both R_1 and R_2 d) R_1, R_2 and V

(j) Which is not the use of an electromagnet? **[1]**

a) Used for magnetising steel bars. b) Used for making sensitive magnetic compass.

c) Used in separating iron particles from a scrap of iron and other metals. d) Used in electric appliances such as electric bell and electric fans.

(k) The correct relationship between the effort (E) load (L) and mechanical advantage (M.A.) is: **[1]**

a) M.A. = L $\times$ E b) M.A. + E = L

c) M.A. $\times$ L = E d) M.A. $\times$ E = L

(l) A heater, rated 1000 W, is used to heat 1.5 kg of water at 40^oC to its boiling point. Calculate the time in which the water starts to boil. Specific heat capacity of water is 4200 J $kg^{-1}{}^oC^{-1}$. **[1]**

a) 680 seconds b) 480 seconds

c) 378 seconds d) 225 seconds

(m) A copper vessel contains 200 g of water at 24^oC. When 112 g of water at 42^oC is added, the resultant temperature of water is 30^oC. Calculate the thermal capacity of the calorimeter. **[1]**

a) 1000.8 J^oC^{-1} b) 1.8 J^oC^{-1}

c) $10.8\ J^oC^{-1}$ d) $100.8\ J^oC^{-1}$

(n) When a ray of light travelling in an optically denser medium, emerges into an optically less denser medium it: **[1]**

a) deviates away from normal b) gets reflected

c) deviates towards the normal d) does not deviate

(o) During the Sunset the colour which scatters closest to the eye of observer is: **[1]**

a) red b) yellow

c) violet d) blue

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

(a) i. Which class of levers has a mechanical advantage always greater than 1? **[1]**

ii. A crow-bar of length 150 cm has its fulcrum situated at a distance of 50 cm from the load. Calculate the mechanical advantage of crow-bar **[1]**

iii. State the class of levers and the relative positions of load (L), effort (E) and fulcrum (F) in a bottle opener **[1]**

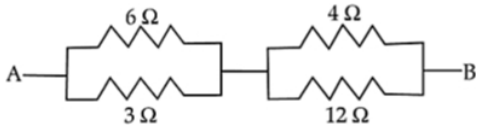
(b) Explain the fictitious force and also explain how does it play an important role in a uniform circular motion? **[2]**

(c) A pulley system has a velocity ratio 4 and an efficiency of 70%. Draw a labelled diagram of this pulley system. Calculate the mechanical advantage of the system and the value of the effort required to raise a load of 400 N. **[2]**

(d) The moment of a force of 10 N about a point X is 4 N-m. Find the distance of point of application of the force from the point X. **[2]**

(e) A car of mass 2000 kg is lifted up a distance of 30 m by a crane in 1 min. A second crane does the same job in 2 min. Do the cranes consume the same or different amounts of fuel? What is the power supplied by each crane? Neglect power dissipation against friction. **[2]**

(f) i. Find the equivalent resistance between A and B. **[2]**



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

(g) i. State the safe limit of sound level in terms of decibel for human hearing. **[2]**

ii. Name the characteristic of sound in relation to its waveform.

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

(a) i. Why is the ratio of the velocities of light of wavelengths 4000 $\mathring{A}$ and 8000 $\mathring{A}$ in vacuum 1 : 1? **[2]**

ii. Which of the above wavelengths has a higher frequency?

(b) 200 J of heat is produced 10 s in a 5 Ω resistance. Find the potential difference across the resistor. **[2]**

(c) In a three-pin plug, why is the earth pin made longer and thicker than other two pins? **[2]**

(d) Explain, why water is used in hot water bottles for fermentation and also as a universal coolant? **[2]**

(e) Complete the following nuclear changes. **[2]**

i. $_{11}Na^{24} \longrightarrow {}_{...}Mg^{...} + {}_{-1}\beta^0$

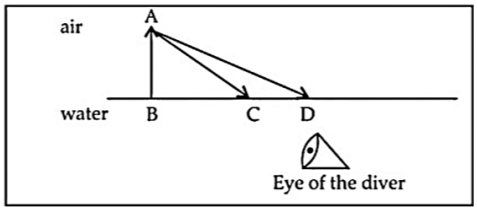
ii. $_{92}U^{238} \longrightarrow {}_{90}Th^{234}$ + ... + Energy

Section B

Attempt any 4 questions

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

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



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

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

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

ii. Write the SI unit of heat capacity.

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

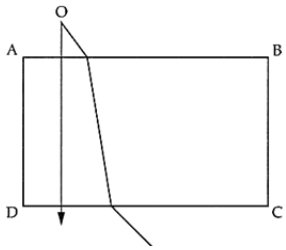
(c) A monochromatic point source of light O is seen through a rectangular glass block ABCD. Paths of two rays, in and outside the block, are shown in the figure below. **[4]**

i. Does the source at point O appear to be nearer or farther with respect to the surface AB?

ii. How does the shift depend on the thickness (AD or BC) of the block?

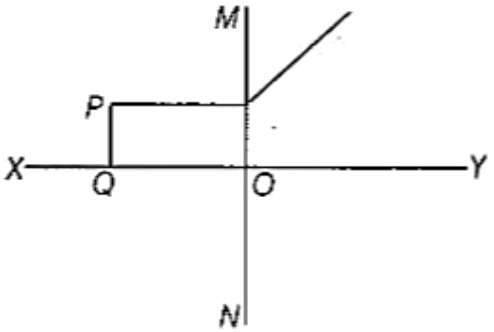
iii. Justify your answer with the help of an appropriate ray diagram as shown in figure.

iv. For the same rectangular glass block, which colour from the visible spectra will produce the maximum shift?



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

(a) The figure given below shows a ray directed towards a lens MN. **[3]**



Study the above ray diagram and answer the following questions.

i. Name the lens.

ii. What is line XY called?

iii. The image of the object PQ is formed between which points.

iv. Write the nature of the image.

(b) Which type of rays exist beyond visible red end of the electromagnetic spectrum? State one property and one use of these rays. **[3]**

(c) An object is placed 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find position and nature of image formed. **[4]**

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

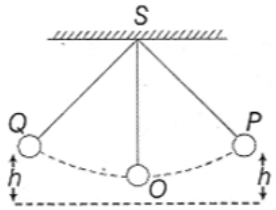
(a) A force of 10 kgf is required to cut a metal sheet. A shear used for cutting a metal sheet has its blades 10 cm long, while its handle is 20 cm long. What effort is needed to cut a sheet? **[3]**

(b) A uniform half metre rule balances horizontally on a knife edge at 29 cm mark when a weight of 20 gf is suspended from one end. **[3]**

i. Draw a diagram of the arrangement.

ii. What is the weight of the half metre rule?

(c) Illustrate the law of conservation of energy by discussing the energy changes which occur when we draw a pendulum bob to one side and allow it to oscillate. Why does the bob eventually come to rest? What happens to its energy eventually? Is it a violation of the law of conservation of energy? **[4]**



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

(a) Distinguish between the terms **[3]**

i. music and noise

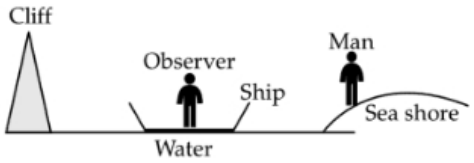
ii. tone and note.

(b) Radioactive nuclei can decay in two different ways, each of these brings about a change in the mass number A and the proton number Z of the decaying parent nucleus. Write appropriate equation to show the effect of each type of decay on both A and Z. **[3]**

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

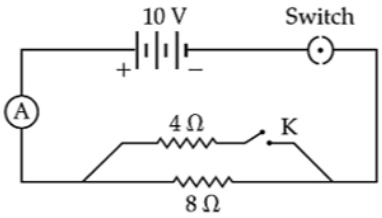
i. the distance between the observer on the ship and the person on the shore.

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



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

(a) Calculate the reading of A when **[3]**



i. K is closed.

ii. K is open.

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

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

(c) A battery is designed by connecting four cells, each of emf 1.5 V and internal resistance 2.0 ohm in parallel. If this battery is now connected to an resistance of 2.5 ohm, find **[4]**

i. the total resistance of the circuit,

ii. the current flowing in the external circuit and

iii. the potential drop across the terminal of the battery.

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

(a) Two metallic blocks P and Q having masses in ratio 2 : 1 are supplied with the same amount of heat. If their temperatures rise by same degree, compare their specific heat capacities. **[3]**

(b) i. Name the liquid which has the highest specific heat capacity. **[3]**

ii. Name two factors on which the heat absorbed or given out by a body depends.

iii. An equal quantity of heat is supplied to two substances A and B. The substance A shows a greater rise in temperature. What can you say about the heat capacity of A as compared to that of B?

(c) Describe an experiment to show that a current is set up in a closed loop when an external magnetic field passing through the loop increases or decreases. **[4]**

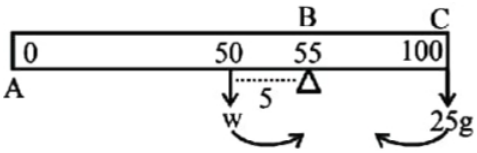
Solution

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)** 225 g

Explanation: {



As the metre scale is balanced at 55 cm mark i.e. large arm is balanced by arm BC and 25 g is suspended at one end i.e. at 100 cm mark

∴ Anticlockwise moment = clockwise moment

$W \times (55 - 50) = 25 \times (100 - 55)$

$5W = 25 \times 45$

$W = \frac{25 \times 45}{5} = 225$ g

(ii) **(c)** +2.5 D

Explanation: {

Converging lens means convex lens has focal length +ve

f = 40 cm = $\frac{40}{100}$m

∴ Power of lens = $\frac{1}{f}$ expressed in metres

P = $\frac{100}{40}$ = +2.5 D

(iii) **(d)** 720 kg

Explanation: {

Power of lift pump = 2 HP

$= (2 \times 750) \times \frac{60}{100} = 15 \times 60$ w

p × t = work done

$15 \times 60 \times 40 = (mg) \times$ displacement

$15 \times 2400 = (m \times 10) \times 5$

Mass of water = m = $\frac{15 \times 2400}{50}$ = 720 kg

(iv) **(d)** γ-radiation

Explanation: {

γ-radiation

(v) **(d)** Both A and R are false.

Explanation: {

The moment of force is the product of perpendicular distance of the line of action of the force for axis of rotation and magnitude of force.

F = 10N, r = 20cm = 0.2m

F = F × r = 10 × 0.2 = 2Nm

Thus, both assertion and reason are false.

(vi) **(d)** 4.8 cm

Explanation: {

m = 4

u = 6 cm

v = ?

$m = \frac{v}{u}$

$\Rightarrow u = \frac{v}{6}$ ∴ v = 4 × 6 = 24 cm

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\Rightarrow \frac{1}{f} = \frac{1}{24} - \left(\frac{1}{-6}\right) = \frac{1}{24} + \frac{1}{6} = \frac{1+4}{24}$

$\Rightarrow \frac{1}{f} = \frac{5}{24} \therefore f = \frac{24}{5} = 4.8$ cm

(vii) **(d)** ultrasonic waves

Explanation: {

ultrasonic waves

(viii) **(d)** An explosion in outer space

Explanation: {

An explosion in outer space because sound needs a medium to travel. As in outer space, there is no atmosphere, sound of explosion will not be heard.

(ix) **(d)** R_1, R_2 and V

Explanation: {

For the given circuit diagram, the components R_1, R_2 and V are connected in parallel combination. Because terminals of the resistance and voltmeter are connected together.

(x) **(b)** Used for making sensitive magnetic compass.

Explanation: {

Used for making sensitive magnetic compass.

(xi) **(d)** M.A. $\times$ E = L

Explanation: {

M.A. $\times$ E = L

(xii) **(c)** 378 seconds

Explanation: {

Let t be the time in seconds

$\therefore$ Heat supplied H = P $\times$ t = (1000 $\times$ t) J

m = 1.5 kg Rise in temp. Δt = (100 - 40) = 60^oC

C = 4200 $Jkg^{-1}\ {}^oC^{-1}$

H = mc Δt

1000 t = $\frac{15}{10} \times 60 \times 4200$

t = $\frac{90 \times 4200}{1000}$ = 378 seconds

(xiii) **(d)** 100.8 J^oC^{-1}

Explanation: {

Let mc = x be the thermal capacity of calorimeter

final temp. of mixture 30^oC

$\therefore$ Heat gained by cold water + calorimeter = [x + $m_1 \times 4.2$] rise in temp.

= [x + (200 $\times$ 4.2) $\times$ (30 - 24)]

= (x + 840) $\times$ 6

Heat lost by (hot water)

[112 $\times$ 4.2] fall in temp.

(470.4) (42 - 30)

(470.4) 12

Heat lost = Heat gained

(12 $\times$ 470.4) = 6(C + 840)

(C + 840) = 2 $\times$ 470.4

heat capacity of cal. mc = 940.8 - 840 = 100.8 J^oC^{-1}

(xiv) **(a)** deviates away from normal

Explanation: {

deviates away from normal

(xv) **(a)** red

Explanation: {

red

2. Answer the following questions:

(i) i. Class II levers have mechanical advantage always greater than 1

ii. For a simple physical balance, the two arms are equal in length.

Also, M.A. = Length of effort arm from fulcrum/Length of the load arm from fulcrum

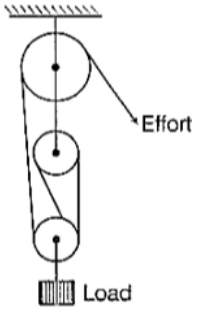
=(150-50)/50= 2

iii. A bottle opener: II class of lever, here the load L is in between the effort E and the fulcrum F.

(ii) A force which is not real is called fictitious force.

Centrifugal force is a fictitious force. It is the apparent force that draws a rotating body away from the centre of rotation.

(iii) Labelled diagram of the pulley system is shown in figure. Given, velocity Ratio (VR) = 4, efficiency, η = 70%, load, L = 300 N



Mechanical Advantage (MA) = ? and effort, E = ?

$MA = \frac{\text{Load}}{\text{Effort}} = VR \times \eta$

$= 4 \times \frac{70}{100} = 2.8$

and effort = $\frac{\text{load}}{2.8} = \frac{500}{2.8} = 178.57$

(iv) Given, moment of force = 4 N-m, F = 10 N

If the distance of point of application of force from the point X is d metre, then

moment of force = force $\times$ distance

$4 = 10d \Rightarrow d = \frac{4}{10} = \frac{2}{5} = 0.4m$

(v) Here, m = 2000 kg, s = 30 m

t_1 = 1 min = 60s, t_2 = 2 min = 120s

Work done by each crane,

W = Fs = mgs ($\because$ F = mg)

$= 2000 \times 9.8 \times 30 = 5.88 \times 10^5$ J

As, both the cranes do same amount of work, so both consume same amount of fuel. Power supplied by first crane,

$P_1 = \frac{W}{t_1} = \frac{5.88 \times 10^5}{60} = 9800$ W

Power supplied by second crane,

$P_2 = \frac{W}{t_2} = \frac{5.88 \times 10^5}{120} = 4900$ W

(vi) i. $R_1 = \frac{(6 \times 3)}{(6+3)} = 2\ \Omega$ Or $R_2 = \frac{4 \times 12}{4+12} = 3\ \Omega$

R = 2 + 3 = 5 Ω

ii. No, it does not change.

(vii) i. Safe limit of sound level - upto 120 dB.

ii. Quality of sound waves.

3. Answer the following questions;

(i) i. The velocity of light is independent of frequency (or wavelength). It depends on the medium in which light travels. As the medium is vacuum which remains the same, and the velocity of light of any wavelength in a vacuum is 3×10^8 m/s, therefore the ratio is 1 : 1.

ii. Frequency of light is inversely proportional to its wavelength. So, the light of wavelength 4000 $\mathring{A}$ has a higher frequency.

(ii) Given, heat, H = 200 J, resistance, R = 5 Ω,

time, t = 10 s, potential difference, V = ?

We know that,

heat, $H = I^2Rt \Rightarrow I = \sqrt{\frac{H}{Rt}} = \sqrt{\frac{200}{5 \times 10}}$ = 2 A

So, the potential difference across the resistor is

V = IR (by Ohm's law)

= 2 × 5 = 10 V

(iii) The earth pin is made longer and thicker, because of the following:

i. It must make contact with the circuit before live wire or neutral.

ii. It might not get inserted accidentally to live wire.

(iv) Since water has large specific heat capacity, it does not cool down quickly. That's why it is used in hot water bottles for fermentation.

Water is used as a universal coolant, because of its large specific heat capacity. Therefore it can absorb a large amount of heat.

(v) i. $_{11}Na^{24} \longrightarrow {}_{12}Mg^{24} + {}_{-1}\beta^0$

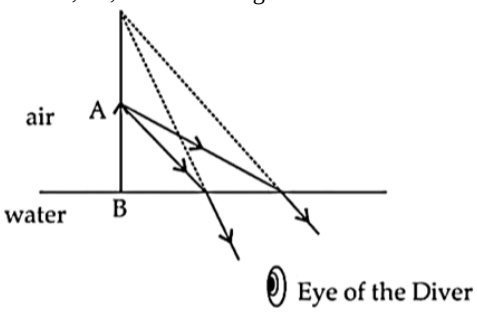
ii. $_{92}U^{238} \longrightarrow {}_{90}Th^{234} + {}_{2}He^{4}$ (α - particle) + Energy

Section B

4. Answer the following questions:

(i) i. The object appears taller.

ii. As we know that when a ray of light enters from air water, i.e., from rarer to denser medium, it bends toward the normal, So, the above diagram will be as follows:



Hence the object will appear taller.

(ii) i. The amount of heat which is to be supplied to a given mass of a material to produce a unit change in its temperature, is known as heat capacity.

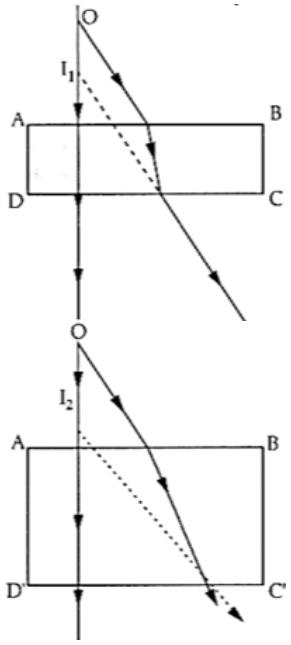
ii. The SI unit of heat capacity is joule per kelvin.

iii. Heat capacity = mass × specific heat capacity.

(iii) i. The sources O appears to be nearer w.r.t the surface AB.

ii. The shift is directly proportional to the thickness of glass slab, so the shift decreases with decrease in the thickness of glass slab.

iii.



For thickness AD, image forms at I_1

For thickness AD', image forms at I_2

AD < AD', $OI_1 < OI_2$

So, as the thickness increases, shift increases.

As thickness decreases shift decreases.

iv. The refractive index of glass is minimum for red light and maximum for violet light i.e., $\mu_v > \mu_r$, Therefore, for the same rectangular glass block, violet colour in the visible spectra will produce maximum shift.

5. Answer the following questions:

(i) i. The lens is concave lens.

ii. The line XY is named as principal axis.

iii. The image of the object PQ is formed between points Q and O

iv. The image will be virtual and erect.

(ii) Infrared rays exist beyond the visible red end of the electromagnetic spectrum. They have a frequency less than and wavelength greater than that of red light.

Property: They are hot and can be detected by their heating property.

Use: They are used in photography at night and also in mist and fog conditions. They have a frequency less than and wavelength greater than that of red light.

Property: They are detected by their heating property.

Use: They are used in photography at night and also in mist and fog.

(iii) Object distance, u = - 25 cm

Image distance, v = ?

Focal length, f = 10 cm

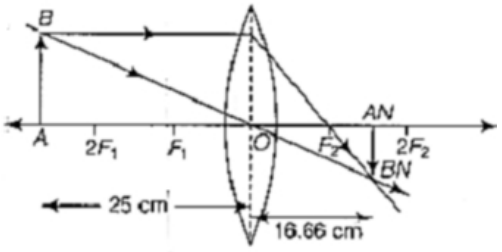
Using lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ or $\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$

$= \frac{1}{10} + \frac{1}{(-25)} = \frac{3}{50}$

or v = $\frac{50}{3}$ =16.66 cm

so the distance of image from the lens is 16.66 cm.

Ray diagram



The image is real, diminished and inverted.

6. Answer the following questions:

(i) Length of blades = Load arm =10 cm = $\frac{10}{100}$m

Load, L = 10 kgf, effort needed, E = ?

Length of handle = Effort arm = 20 cm = $\frac{20}{100}$m

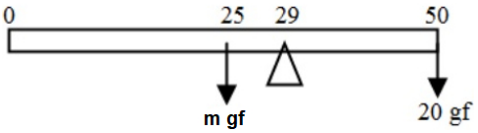
using the effort and load relation

E × effort arm = L × load arm

$\Rightarrow$ E × $\frac{20}{100}$ = 10 × $\frac{10}{100}$

$\Rightarrow$ E = $\frac{100}{20}$ = 5 kgf

(ii) i.



ii. Applying Principle of moments,

Anti-clockwise moment = Clockwise moment

m × (29 - 25) = 20 × (50 - 29)

or, m × 4 = 20 × 21

$\therefore$ m = $\frac{20\times21}{4}$

= 105 gf

(iii) Let OS be the equilibrium position of the pendulum and it is displaced to a position P, where it is at rest. At extreme position P, the pendulum has potential energy (mgh). When the pendulum is released from position P, it begins to move towards position O.

The speed of the pendulum goes on increasing and its height decreases that means the potential energy is converting into kinetic energy.

At position O, whole of the potential energy of the pendulum gets converted into its kinetic energy.

Then, the pendulum swings to other side due to inertia of motion.

As the pendulum begins to move towards position Q, the speed of pendulum decreases and height increases which means kinetic energy gets converted back into potential energy. At point Q, whole of the kinetic energy is converted into potential energy.

Although the potential energy is converted into kinetic energy and vice-versa during the motion of the pendulum. But the total energy remains constant. When the pendulum oscillates in air, the air friction opposes its motion.

So, some part of kinetic energy of the pendulum is used to overcome this friction.

With the passage of time, energy of the pendulum goes on decreasing and finally becomes zero. The energy of the pendulum is transferred to the molecules of atmosphere. So, energy is converted from one form to another. So, no violation of law of conservation of energy takes place.

7. Answer the following questions:

(i) i. Music: The sound which is pleasant to the ears, is called music. It is produced by regular periodic vibrations of sound. There is no sudden change in its amplitude. e.g., Sound produced from a tabla.

Noise: The sound which feels unpleasant to the ears is called noise. It is produced at irregular intervals of time. There is a sudden change in its amplitude, e.g., Sound produced in a market place and the sound produced by an explosion.

ii. Tone: The sound of a single frequency is called a tone.

(ii) Radioactive nuclei can decay either

i. by emitting an alpha particle $\left({}_{2}^{4}\mathrm{He}\right)$

When a radioactive nucleus decays by emitting an alpha particle, its mass number (A) decreases by 4 units. While its proton number (Z) decreases by 2 units. The appropriate equation is

${}_{Z}^{A}\mathrm{X} \longrightarrow {}_{Z-2}^{A-4}\mathrm{Y} + {}_{2}^{4}\mathrm{He}$ (alpha particle)

ii. by emitting a beta particle ${}_{-1}^{0}e$ (or ${}_{+1}^{0}e$)

When a radioactive nucleus decays by emitting a beta particle, there is no change in its mass number (A) but its proton number increases by one unit (electron ${}_{-1}^{0}e$ emission) or decreases by one unit (positron $\left({}_{+1}^{0}e\right)$ emission).

The appropriate equations are:

$^{A}_{Z}P \rightarrow {}^{A}_{Z+1}Q + {}^{0}_{-1}e$ (electron)

$^{A}_{Z}R \rightarrow {}^{A}_{Z+1}S + {}^{0}_{+1}e$ (positron)

(iii) i. The first sound which the person on the shore hears is after 2 sec of firing the gun which comes directly from the observer in ship.

So, the distance between person on shore and observer on ship is,

$d = v \times t = 320 \times 2$ m

$= 640$ m

ii. The second sound which the person on shore hears after 3 sec is the sound coming after reflection from the cliff.

Time required for the reflected sound to be heard by observer in ship = 3 - 2 = 1s

Here, the sound wave travels 2d distance (in going to cliff and coming back to observer in ship.)

So, distance between cliff and observer on ship is,

$d = \frac{v \times t}{2} = \frac{320 \times 1}{2}$ m

$d = 160$ m.

8. Answer the following questions:

(i) i. When is R closed, 4 Ω and 8 Ω are in parallel.

Let the resistance of 4 Ω and 8 Ω in parallel be R

$\therefore \frac{1}{R} = \frac{1}{4} + \frac{1}{8}$

$\Rightarrow \frac{1}{R} = \frac{2+1}{8}$

$\Rightarrow \frac{1}{R} = \frac{3}{8}$

$\Rightarrow R = \frac{8}{3}\Omega$

Given V = 10 V

$\therefore I = \frac{V}{R} = 10 \times \frac{3}{8}$

$= \frac{30}{8} = \frac{15}{4}$ Amp

ii. When K is open R' = 8 Ω

$\therefore I = \frac{10}{8} = \frac{5}{4}$ Amp

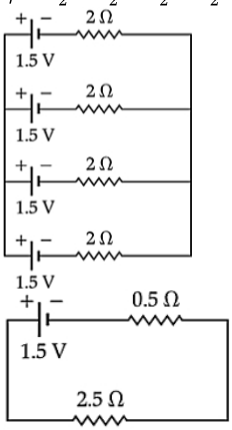
(ii) i.

Nuclear fusion	Nuclear fission
1. In this, smaller nuclei combines to form a larger one.	In this, a heavier nuclei breaks into the smaller nuclei.
2. Very high amount of temperature.	Low temperature in comparison to that in nuclear fusion.

ii. The solid radioactive waste should be sealed in a thick lead bag and must be buried in specially constructed deep underground store away from populated area.

(iii) The battery has a net emf of 1.5 V only and its net internal resistance is

$\frac{1}{r} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{4}{2}$ = 2 or r = 0.5 ohm



When this battery is connected to an external resistance of 2.5 Ω, the

i. total resistance (R) of the circuit is given by

$R = 0.5\ \Omega + 2.5\ \Omega = 3.0\ \Omega$

ii. current flowing in the external circuit is

$I = \frac{1.5}{R} = \frac{1.5}{3.0} = 0.5$ A

iii. for finding the p.d. across the terminals of the battery, we notice that this will equal the p.d. across the external resistance connected to the battery.

Hence, (observed) p.d. across the battery

$= 0.5\ A \times 2.5\ \Omega = 1.25\ V$

9. Answer the following questions:

(i) Consider a metallic block having mass 'm', specific heat capacity 'S', gains heat energy 'Q', after rising the temperature 'ΔT', then the relation among them is given by,

$\because Q = mS\Delta T$ ...(i)

For block P, Mass = 2m,

Specific heat capacity = S_p

Temperature = ΔT

For block Q, Mass = m

Specific heat capacity = S_Q

Temperature = ΔT

As per question, $Q_P = Q_Q$ ...(ii)

$\therefore$ from eqns. (i) and (ii), we get

$2m\ S_P\ \Delta T = m\ S_Q\ \Delta T$

$\Rightarrow 2S_P = S_Q$

$\Rightarrow S_P = \frac{1}{2} S_Q$

It means that specific heat capacity of block P is half of the capacity of block Q.

(ii) i. Water has the highest specific heat capacity.

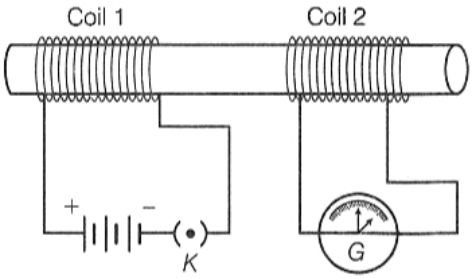
ii. Factors on which heat given out or absorbed depends upon are:

a. Temperature of the body with respect to the surroundings.

b. Specific heat capacity of the body.

iii. As substance A has a greater rise in temperature, so specific heat capacity of A is less than the heat capacity of B.

(iii) In the given figure there are two different coils of copper wire, namely coil 1 and coil 2, having large number of turns are arranged as per the circuit (as shown in figure).



The coil 1, having larger number of turns, is connected in series with a battery and a plug key, whereas the other coil 2 is connected with a galvanometer.

Case I When key K is closed, the galvanometer shows a deflection, its needle instantly jumps to one side and just as quickly returns to zero, indicating a momentary current in coil 2. This happens due to an external magnetic field as well as magnetic flux passing through the loop increases.

Case II When key K is open, the coil 1 is disconnected from the battery. The needle momentarily moves in the opposite direction. It means that now the current flows in the opposite direction in coil 2. This happens due to an external magnetic field passing through the loop decreases and magnetic flux also decreases..