ICSE 2026 EXAMINATION
Sample Question Paper - 5
Physics

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

General Instructions:

1. Answers to this Paper must be written on the paper provided separately.

2. You will not be allowed to write during first 15 minutes. This time is to be spent in reading the question paper.

3. The time given at the head of this Paper is the time allowed for writing the answers.

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

5. 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** **[15]**
   correct answers only.)

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

   a) 6 Nm   b) 2 Nm

   c) 1 Nm   d) 4 Nm

   (b) The band of seven colours formed, when white light passes through an equilateral prism is called: **[1]**

   a) dispersion   b) both dispersion and colour band

   c) colour band   d) spectrum

   (c) A scooter develops a power of 1 HP while running at 36 km hr^{-1}. Calculate the force generated by its **[1]**
        engine.

   a) 75.5 N   b) 80 N

   c) 60 N   d) 45 N

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

   a) β-particles   b) α-particles

   c) X-rays   d) γ-radiation

   (e) **Assertion (A):** The moment of force depends upon magnitude of the force applied and the   **[1]**
        perpendicular distance of the line of action of force from the axis of rotation.

   **Reason (R):** The opening and shutting of the door is possible due to the moment 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 true.

(f) When the object is at infinity, what is the nature of image formed by concave lens? **[1]**

    a) Virtual, erect, enlarged

    b) Real, inverted, enlarged

    c) Virtual, erect, diminished

    d) Real, inverted, same size

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

    a) frequency

    b) all of these

    c) speed

    d) loudness

(h) The practical application based on the reflection of sound is: **[1]**

    a) both megaphone and sounding board

    b) megaphone

    c) sonometer

    d) sounding board

(i) To determine the equivalent resistance of two resistors when connected in series, a student arranged the circuit components as shown in the diagram. But he did not succeed to achieve the objective. **[1]**
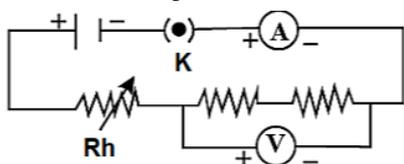
Which of the following mistakes has been committed by him in setting up the circuit?

    a) Terminals of voltmeter are wrongly connected

    b) Terminals of ammeter are wrongly connected

    c) Position of voltmeter is incorrect

    d) Position of ammeter is incorrect

(j) Step up transformers are used: **[1]**

    a) for saving sensitive appliances, such as T.V. and A.C.

    b) any of these

    c) for long distance transmission of power

    d) for distribution powr in localities

(k) A women draws water from a well using a fixed pulley. The mass of the bucket and water together is 6 kg. The force applied by the women is 70 N. The mechanical advantage is **[1]**

    a) 0.66

    b) 0.76

    c) 0.96

    d) 0.86

(l) A solid of mass 80 g and at 80°C melts completely to form liquid at 80°C by absorbing 640 J of heat energy. What is the sp. latent heat of fusion of solid? **[1]**

    a) 8 Jg^{-1}

    b) 4 Jg^{-1}

    c) 10 Jg^{-1}

    d) 2 Jg-1

(m) Land and sea breezes are formed in coastal regions because: **[1]**

    a) sea water cools the cooler regions.

    b) water has very high specific heat capacity than the land.

   c) all of these   d) land has very high specific heat

                                                                 capacity than the water.

(n)   The velocity of light in air is 3×10^8 ms^{-1} and in glass is 2×10^8 ms^{-1}. Find the refractive index of glass. **[1]**

      a) 1.5   b) 0.5

      c) 2.5   d) 3.5

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

      a) -2.5 D   b) +2.5 D

      c) +1.5 D   d) -1.5 D

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

(a)   i.   Why is a jack screw provided with a long arm? **[1]**

       ii.   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]**
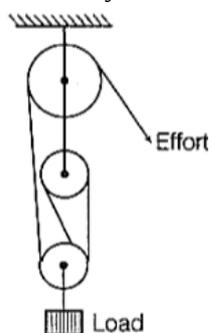
       iii. Considering that simple physical balance can work as an ideal lever, what can be said about its mechanical advantage? **[1]**

(b)   Where does the position of centre of gravity lie for **[2]**

    i. A circular lamina

   ii. A triangular lamina?

(c)   An effort is applied on the bigger wheel of a gear having 32 teeths. It is used to turn a wheel of 8 teeths. Where is it used? **[2]**

(d)   i. On what factor does the position of the centre of gravity of a body depend? **[2]**

    ii. What is the SI unit of the moment of force?

(e)   State the energy changes in the following devices while in use: **[2]**

    i. A loud speaker

   ii. A glowing electric bulb.

(f)   Calculate the equivalent resistance between P and Q from the following diagram. **[2]**
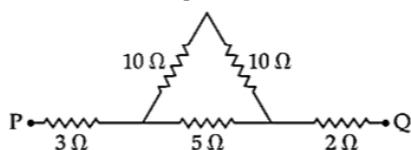
(g)   i. Sometimes when a vehicle is driven at a particular speed, a rattling sound is heard. Explain briefly, why this happens and give the name of the phenomenon taking place? **[2]**

    ii. Suggest one way by which the rattling sound could be stopped.

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) An electrical heater is rated 4 kW, 220 V. Find the cost of using this heater for 12 h, if one kWh of electrical energy cost ₹3.25. **[2]**

(c) A battery, having an emf of 6 V and internal resistance r, $\left(\frac{2}{3}\right)$ Ω, is connected to three resistors, arranged as shown. Calculate the total current drawn from the battery. **[2]**
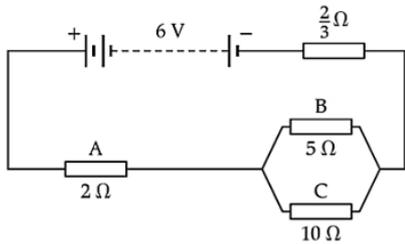

(d) Find the specific heat capacity of a body whose mass is 500 g and requires 2000 J of heat energy, so to raise its temperature from 35° to 45°. **[2]**

(e) What happens to the atomic number of an element, when it emits **[2]**

i. an α-particle and

ii. a β-particle?

Section B

Attempt any 4 questions

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

(a) It is seen that the white light splits into bands of seven colours when passed through the glass prism. With reference to this observation, answer the following questions. **[3]**

i. State the conclusion that you draw about the white light.

ii. Name the sequence of colours from the base of the prism.

iii. Do all the bands are of the same width? If not, then why?

(b) 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]**

(c) An object AB is placed between 2F and F on the principal axis of a convex lens as shown in the diagram. **[4]**

Copy the diagram and using these rays starting from point A, obtain the image of the object formed by the lens.
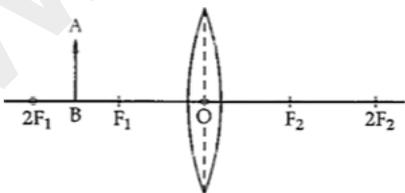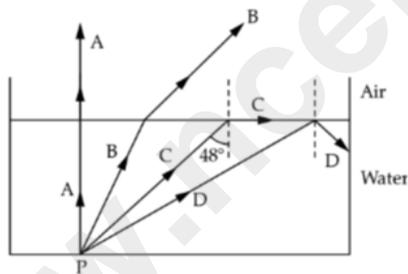

5. **Answer the following questions:** **[10]**

(a) The figure given below shows a ray directed towards a lens MN. **[3]**
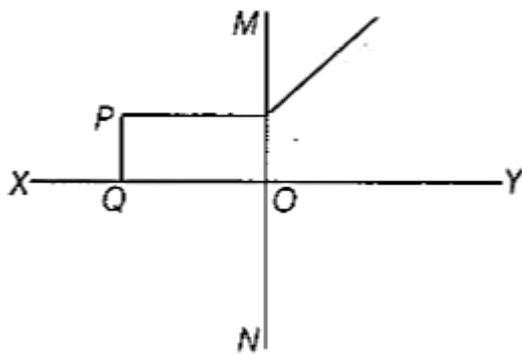
Study the above ray diagram and answer the following questions.

  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) A 5 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. **[3]** The distance of the object from lens is 30 cm. Determine the

  i. position

  ii. nature

  iii. size of image formed

(c) The diagram below shows a point source P inside a water container. Four rays A, B, C, D starting **[4]** from the source P are shown upto the water surface.

  i. Show in the diagram the path of these rays after striking the water surface. The Critical Angle for water air surface is 48°.

  ii. Name the phenomenon which the rays B and D exhibit.

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

(a) A pair of scissors and a pair of pliers belong to the same class of levers. **[3]**

  i. Which one has mechanical advantage less than 1?

  ii. State the usefulness of such a machine where mechanical advantage is less than 1.

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

  i. Draw a diagram of the arrangement.

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

(c) If a body of mass m is moving with velocity v, then derive an expression for its kinetic energy. **[4]**

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

(a) i. Name the waves used for echo depth sounding. **[3]**

  ii. Give one reason of their use for the above purpose.

  iii. Why are the waves mentioned by you not audible to us?

(b) The ore of Uranium found in nature contains $^{238}_{92}$U and $^{235}_{92}$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)   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) A 6 V, 12 W lamp is connected in series with a resistor R and a source of 12 supply. **[3]**

   a. What is the purpose of the resistor R?

   b. Calculate the value of the resistor R for the proper working of the lamp.

   c. What is the current flowing through the circuit?

(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) B_1, B_2 and B_3 are three identical bulbs connected as shown in the figure. Ammeters A_1, A_2 and A_3 are connected as shown in figure. When all the bulbs glow, then the current of 3 A is recorded by ammeter A. **[4]**
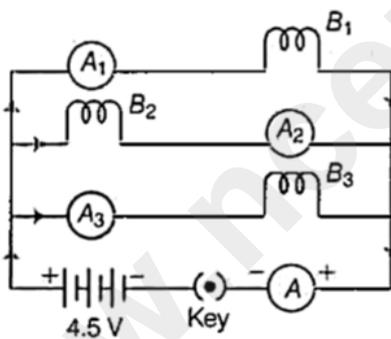
   i. What happens to the glow of the other two bulbs when bulb B_1 gets fused?

   ii. What happens to the reading of A_1, A_2, A_3 and A when the bulb B_2 gets fused?

   iii. How much power is dissipated in the circuit when all the three bulbs glow together?

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) Calculate the amount of heat given out while 400 g of water at 30°C is cooled and converted into ice at -2 °C. **[3]**

Specific heat capacity of water = 4200 J/kg K

Specific heat capacity of ice = 2100 J/kg K

Specific latent heat of fusion of ice = 336000 J/kg

(c)   Draw a representative diagram of a DC motor. Label the following in your diagram.   **[4]**

    i. The field magnet

   ii. The armature

  iii. Commutator

  iv. Wire brushes

What is the energy change in this case?

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) **(a)** 6 Nm

Explanation:

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

Couple arm = 1.2 m

∴ The moment of couple = F $\times$ ⊥ distance = 5 $\times$ 1.2 = 6 Nm

(ii) **(d)** spectrum

Explanation:

spectrum

(iii) **(a)** 75.5 N

Explanation:

Power P = $\frac{\text{work done}}{t}$ = F $\times$ $\frac{s}{t}$

P = F $\times$ v

1×750 w = F $\times$ $\frac{36000\ m}{(60 \times 60)s}$

F $\times$ 10 = 750

F = $\frac{750}{10}$ = $75\frac{1}{2}$ N

(iv) **(d)** γ-radiation

Explanation:

γ-radiation

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

Explanation:

The turning effect on the body about its axis is due to the moment of force or torque applied on the body. To open and shut the door the force is applied normally on the door at its handle which provided at the maximum distance from the hinges.

(vi) **(c)** Virtual, erect, diminished

Explanation:

When an object is at infinity, the nature of image formed by concave lens is virtual, erect and highly diminished.
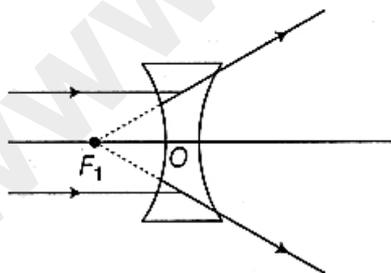
(vii) **(a)** frequency

Explanation:

frequency

(viii) **(a)** both megaphone and sounding board
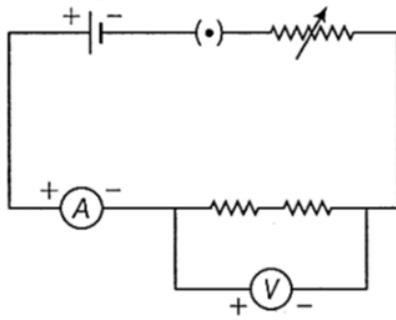
Explanation:

both megaphone and sounding board

(ix) **(b)** Terminals of ammeter are wrongly connected

Explanation:

According to the diagram, student has connected the apparatus, but terminals of the ammeter is wrongly connected because ammeter is in series. Hence, positive terminal of ammeters should be connected with positive terminal of

cell. Diagram is given below,

(x) **(b)** any of these

Explanation:

any of these

(xi) **(d)** 0.86

Explanation:

The mechanical advantage of a fixed pulley

$= \dfrac{\text{Load}(L)}{\text{Effort }(E)}$

Effort (force applied), E = 70 N

Weight of the bucket = mg

$= 6 \times 9.8 = 60$ N

Hence, mechanical advantage $= \dfrac{60}{70}$

Hence, mechanical advantage = 0.86

(xii) **(a)** 8 Jg^{-1}

Explanation:

Mass of solid m = 80 g at 80°C

on melting 80 g of liquid at 80°C

mL = 640

80 L = 640

Latent heat of solid = L $= \dfrac{640}{80} = 8$ Jg^{-1}

(xiii) **(b)** water has very high specific heat capacity than the land.

Explanation:

water has very high specific heat capacity than the land.

(xiv) **(a)** 1.5

Explanation:

R.I of glass $_{a}\mu_{g} = \dfrac{\text{velocity of light in air}}{\text{velocity of light in glass}}$

$_{a}\mu_{g} = \dfrac{3 \times 10^{8}}{2 \times 10^{8}} = 1.5$

(xv) **(b)** +2.5 D

Explanation:

Converging lens means convex lens has focal length +ve

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

$\therefore$ Power of lens $= \dfrac{1}{f}$ expressed in metres

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

2. Answer the following questions:

(i) i. Jack screw is provided with a long arm so that by applying less effort to this long arm, a heavy load can be lifted.

ii. Since, Mechanical Advantage,

MA $= \dfrac{\text{Load}}{\text{Effort}} = \text{VR} \times \eta = 3 \times \dfrac{80}{100} = 2.4$

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

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

Also, M.A. $= \dfrac{\text{Load}}{\text{Effort}}$

$= \dfrac{\text{Effort Arm}}{\text{Load Arm}}$

$= 1$

(ii) i. At the centre of circle.

    ii. At intersection point of medians i.e., centroid.

(iii) If an effort is applied on the bigger wheel of gear having 32 teeths to turn a wheel of 8 teeths, it acts as speed multiplier. And it is used in bicycles and car to gain speed.

(iv) i. The position of centre of gravity of a body depends upon the shape and size of the body.

    ii. The SI unit of moment of force or torque is N-m, i.e., newton-metre.

(v) i. Electrical energy to sound energy.

    ii. Electrical energy to heat energy and light energy.

(vi) The two resistances 10 Ω are in series

R = 10 + 10 = 20 Ω
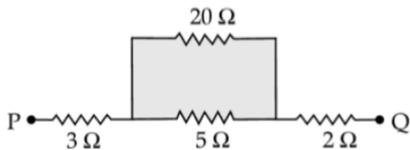
The resistances 5 Ω and 20 Ω are in parallel.

$\dfrac{1}{R_1} = \dfrac{1}{5} + \dfrac{1}{20} = \dfrac{4+1}{20} = \dfrac{5}{20} = \dfrac{1}{4}$

$\Rightarrow R_1 = 4\ \Omega$

The resistance 4 Ω, 3 Ω and 2 Ω are in series

$\therefore$ Equivalent resistance

$R_{eq} = 3 + 4 + 2 = 9\ \Omega$

(vii) i. Sometimes when a vehicle is driven at a particular speed, a rattling sound is heard, because the frequency of movement of piston in the engine becomes equal to the natural frequency of the part which is rattling. The phenomenon taking place is resonance.

    ii. The rattling sound can be stopped by changing the speed of the vehicle.

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. $\dfrac{1}{f} = \dfrac{100}{25}$

    P = +4 D

(ii) Given, P = 4 kW, V = 220 V, t = 12 h

E = P $\times$ t = 4 $\times$ 12 = 48 kWh

Cost of energy consumed

= 48 $\times$ 3.25 = ₹156

(iii) Let R be the equivalent resistance of the parallel combination of the resistors of 5 Ω and 10 Ω. Then,

$\dfrac{1}{R} = \dfrac{1}{5} + \dfrac{1}{10} = \dfrac{2+1}{10} = \dfrac{3}{10}$ or R = $\dfrac{10}{3}\Omega$

$\therefore$ Total resistance of the circuit = $\left(\dfrac{10}{3} + 2 + \dfrac{2}{3}\right)\Omega = 6\ \Omega$

$\therefore$ Total current drawn from the battery = $\dfrac{6\ \text{V}}{6\Omega}$ = 1 A.

(iv) Given, m = 500 g = 0.5 kg

Heat energy required, ΔQ = 2000 J

Rise in temperature, $\Delta T = (45^o - 35^o) = 10^oC = 10$ K

$\therefore$ Specific heat capacity,

c = $\dfrac{\Delta Q}{m \times \Delta T} = \dfrac{2000}{0.5 \times 10} = 400$ Jkg^{-1} K^{-1}

(v) i. When an α-particle is emitted, then atomic number decreases by 2 and mass number decreases by 4.

    ii. During (β-emission, atomic number increases by 1 as it consists of electrons.

Section B

4. Answer the following questions:

    (i)   i. After reading the given observation, it is concluded that white light is polychromatic due to which refraction and dispersion of white light takes place.

          ii. The sequence of colours from the base of prism is violet, indigo, blue, green, yellow, orange and red.

          iii. Bands of different colours will be of different width. As, their widths depends on the range of frequency or wavelength of a colour.

          As, the range of colour increases, its bandwidth also increases. So, red colour has maximum band size and yellow colour has minimum bandwidth.

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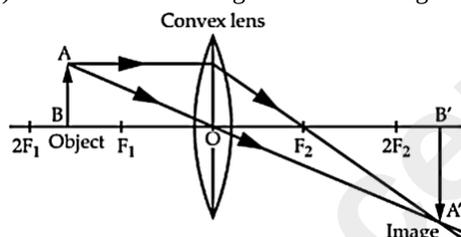
        $\therefore$ from eqns. (i) and (ii), we get

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

        $\Rightarrow 2S_P = S_Q$

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

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

    (iii) The formation of images is shown in fig.

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) Given, size of object, $h_0 = 5$ cm

        distance of object, u = -30 cm Focal length, f = + 20 cm

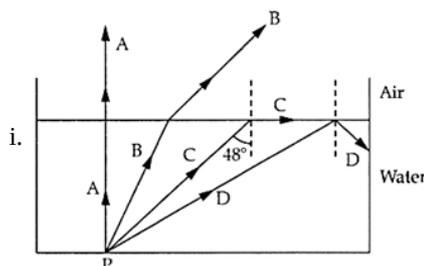   Using lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

        $\Rightarrow \frac{1}{v} = \frac{1}{u} + \frac{1}{f} \Rightarrow \frac{1}{v} = -\frac{1}{30} + \frac{1}{20} = \frac{1}{60} \Rightarrow v = 60$ cm

        Since, magnification, $m = \frac{h_i}{h_0} = \frac{v}{u}$

        $\Rightarrow m = \frac{h_i}{5} = \frac{60}{-30} \Rightarrow h_i = -10$

   Therefore, the image is real, inverted and magnified.

    (iii)

ii. Ray B exhibits refraction.

Ray D exhibits total internal reflection.

6. Answer the following questions:

(i)   i. A pair of scissors has mechanical advantage less than 1 because the blades are longer than the handles which is used to cut a paper.

ii. Usefulness of such a machine is to gain in speed i.e., blades move longer on paper or cloth when the handles are moved a little.

(ii)

i.
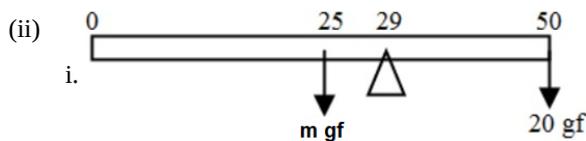
ii. Applying Principle of moments,

Anti-clockwise moment = Clockwise moment

m $\times$ (29 - 25) = 20 $\times$ (50 - 29)

or, m $\times$ 4 = 20 $\times$ 21

$\therefore$ m = $\frac{20 \times 21}{4}$

= 105 gf

(iii) Let a body of mass m is moving with velocity v. It is brought to rest by an opposing force F. Let it travels a distance s before stopping and a is the uniform retardation produced by the force. By the principle of conservation of energy, kinetic energy of the body = Work done by the retarding force to stop it.

Kinetic energy = force $\times$ displacement ...(i)

Retarding force, F = ma ...(ii)

Initial velocity, u = v, final velocity, v = 0

From the relation, $v^2 = u^2 + 2as$

$0 = v^2 - 2as$

$\therefore$ Displacement, s = $\frac{v^2}{2a}$ ...(iii)

Put the values of E and s from Eqs. (ii) and (iii) in Eq. (i), we get

Kinetic energy, K = F $\times$ s = $ma \times \frac{v^2}{2a} = \frac{1}{2}mv^2$

Kinetic energy = $\frac{1}{2} \times$ mass $\times$ (velocity $)^2$

7. Answer the following questions:

(i)   i. Ultrasonic.

ii. They can travel undeviated through long distance.

iii. Frequency of ultrasonic waves is above 20000 Hz and audible range of frequency is 20 Hz to 20000 Hz.

(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. 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)   a. The given lamp is meant to be used on 6 V supply since the source available is of 12 V, so a resistor R is used in series with the lamp to reduce the current to its safe value for the lamp.

b. Maximum current which the lamp rated 6 V, 12 W can withstand, is

I = $\frac{P}{V} = \frac{12}{6}$ = 2 A

Resistance of the filament of the lamp while in use

R = $\frac{V^2}{P} = \frac{(6)^2}{12}$ = 3 Ω

On connecting a resistor R in series with the lamp, the total resistance of circuit = (R + 3) Ω With 12 V supply, the current in the circuit should be equal to I = 2 A

By Ohm's law, V = IR

∴ 12 = 2(R + 3)
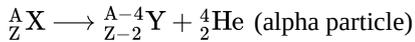
Or 12 = 2R + 6 or R = 3 Ω

   c. Current flowing through the circuit = 2 A

(ii) Radioactive nuclei can decay either

   i. by emitting an alpha particle $\left(^4_2He\right)$

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

$^A_Z X \longrightarrow ^{A-4}_{Z-2} Y + ^4_2 He$ (alpha particle)

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

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 $^0_{-1}e$ emission) or decreases by one unit (positron $\left(^0_{+1}e\right)$ 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) Equivalent resistance of three bulbs,

$R_{eq} = \frac{V}{I} = \frac{4.5}{3} = 1.5\ \Omega$

If R is the resistance of each wire, then using the formula

$\frac{1}{R_{eq}} = \frac{1}{R} + \frac{1}{R} + \frac{1}{R}$

or $\frac{1}{R_{eq}} = \frac{3}{R}$

or R = $3R_{eq}$ = 3 × 1.5 = 4.5 Ω

Current in each bulb is given as

$I = \frac{V}{R} = \frac{4.5\ V}{4.5\ \Omega} = 1\ A$

   i. When bulb B_1 gets fused, then the currents in B_2 and B_3 remain same $I_2 = I_3 = 1$ A, so their glow remains unaffected.

   ii. When bulb B_2 gets fused, then the current in B_2 becomes zero and currents in B_1 and B_3 remain 1 A.

∴ Total current, I = $I_1 + I_2 + I_3$

= 1 + 0 + 1 = 2 A

Current in ammeter A_1, $I_1 = 1$ A

Current in ammeter A_2, $I_2 = 0$

Current in ammeter A_3, $I_3 = 1$ A

Current in ammeter A, I = 2 A

   iii. When all the three bulbs are connected together, then power dissipated, $P = \frac{V^2}{R_{eq}} = \frac{(4.5)^2}{1.5} = 13.5$ W

9. Answer the following questions:

(i)   i. Q = mcΔt

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) The amount of heat given out on reducing the temperature of 400 g of water from 30°C to 0°C = mcΔt

= $\frac{400}{1000} \times 4200 \times 30$ = 50,400 J
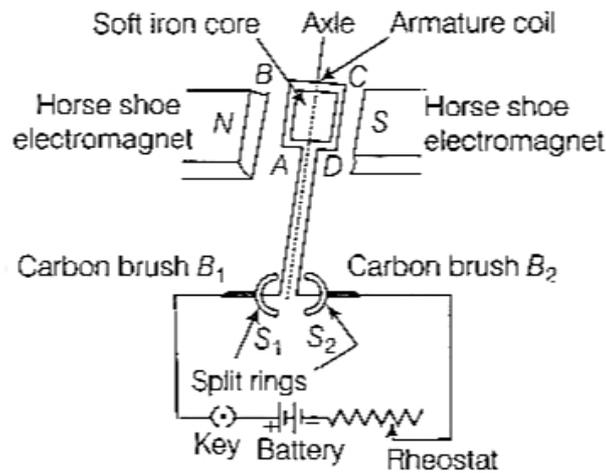
The amount of heat given out on converting water at 0°C to ice at 0°C = mL

= $\frac{400}{1000} \times 336000$ = 1,34,400 J

The amount of heat given out on reducing the temperature of ice at 0°C to - 2°C = mcΔt

$= \frac{400}{1000} \times 2100 \times 2 = 1{,}680$ J

Total heat given out in three stages = 50,400 + 1,34,400 + 1,680 = 1,86,480 J.

(iii) The labelled diagram of DC motor is as shown below

i. The magnetic field is labelled as N-S. It is an electromagnet with concave pole pieces and it provides radial magnetic field.

ii. The armature coil is mounted on an axle and is labelled as ABCD.

iii. The commutators are labelled as S_1, S_2.

iv. Wire brushes are labelled as B_1, B_2.

In an electric DC motor, the electrical energy is converted into mechanical energy.