

Date: 09/03/2026



Question Paper Code

**T26 521**

# Aakash

Medical | IIT-JEE | Foundations

Corporate Office : AESL, 3rd Floor, Incuspaze Campus-2, Plot-13, Sector-18, Udyog Vihar,  
Gurugram, Haryana-122015

Time: 2 Hrs.

## PHYSICS

Max. Marks: 80

### (Science Paper 1)

### ICSE Board Class X Exam (2026)

## Answers & Solutions

#### GENERAL INSTRUCTIONS

Read the following instructions very carefully and follow them:

- (i) Duration for the Test is 2 hours.
- (ii) Maximum Marks for Section-A and B is 40 each.
- (iii) The intended marks for questions or parts of questions are given in brackets [ ].
- (iv) **Section A** is compulsory. Attempt all questions from this section.
- (v) Attempt **any four** questions from **Section B**.
- (vi) Use of calculator is not permitted.
- (vii) It is mandatory to use Blue/Black ballpoint pen to write the answer.

**SECTION-A (40 Marks)**

(Attempt *all* questions from this **Section**.)

**Choose the correct answers to the questions from the given options.**

**[15×1=15]**

1. (i) For a body to be in **dynamic equilibrium**, its: **[1]**
- (a) momentum should be zero                      (b) acceleration should be zero  
(c) kinetic energy should be zero                (d) velocity should be zero

**Answer (b)**

**Sol.** Acceleration should be zero.

- (ii) The energy transformation taking place during **photosynthesis** in plants is: **[1]**
- (a) heat to chemical                                  (b) chemical to light  
(c) light to chemical                                 (d) chemical to heat

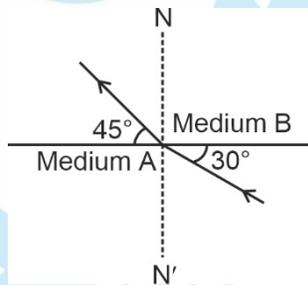
**Answer (c)**

- (iii) The **Velocity Ratio** (VR) of a block and tackle system of two pulleys with the **effort** in the **upward** direction is: **[1]**
- (a) 1    (b) 2  
(c) 3    (d) 4

**Answer (b)**

**Sol.** For a block and tackle system, the V.R. equals the number of rope segments supporting the moving block.

- (iv) From the figure given below, the refractive index of medium **B** with respect to medium **A** ( ${}^A\mu_B$ ) is: **[1]**



- (a)  $\frac{\sin 45^\circ}{\sin 30^\circ}$     (b)  $\frac{\sin 30^\circ}{\sin 45^\circ}$   
(c)  $\frac{\sin 45^\circ}{\sin 60^\circ}$     (d)  $\frac{\sin 60^\circ}{\sin 45^\circ}$

**Answer (d)**

**Sol.**  ${}^A\mu_B = \frac{\sin 60^\circ}{\sin 45^\circ}$

- (v) When a blackened bulb thermometer is moved beyond the red region of the visible spectrum, there is a rapid rise in the temperature. This is due to the presence of: **[1]**
- (a) Infrared radiations                                  (b) Ultraviolet radiations  
(c) X-rays    (d) Radio waves

**Answer (a)**

**Sol.** Beyond the red region of the visible spectrum, infrared radiation lies which carries strong heating effect.

- (vi) A fast-moving cyclist stops pedalling on reaching a hilly track. If he continues to move with the acquired energy, then assuming **no loss** of energy: [1]
- his kinetic energy remains constant at all times.
  - his potential energy remains constant at all times.
  - his total mechanical energy continuously increases.
  - his total mechanical energy remains constant.

**Answer (d)**

- (vii) The distance ( $V$ ) of a virtual image formed by a lens of focal length 15 cm never exceeds a certain **finite** value, then this value will be: [1]
- less than 15 cm
  - between 15 cm to 30 cm
  - less than or equal to 30 cm
  - less than or equal to 15 cm

**Answer (d)**

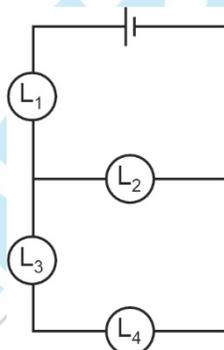
- (viii) **Assertion (A):** Tiny air molecules **scatter** blue light more than red light. [1]

**Reason (R):** The **refractive index** of a medium is greater for blue light than red light.

- (A) is true but (R) is false.
- (A) is false but (R) is true.
- Both (A) and (R) are true and (R) is the correct explanation of (A).
- Both (A) and (R) are true but (R) is not the correct explanation of (A).

**Answer (d)**

- (ix) In the circuit given below, identify the lamp ( $L_1$ ,  $L_2$ ,  $L_3$  or  $L_4$ ) whose failure **would not** interrupt the power supply to the other lamps. [1]



- $L_1$
- $L_2$
- $L_3$
- $L_4$

**Answer (b)**

- (x) **Equal** volumes of water are added to three cylindrical jars A, B and C of same height and radii  $r_A$ ,  $r_B$  and  $r_C$  respectively with  $r_B < r_A < r_C$ . If you blow air into the mouth of these jars, which tube will produce the shrillest note? [1]
- A
  - B
  - C
  - All will produce the notes of same shrillness

**Answer (b)**

**Sol.** Shorter air column  $\rightarrow$  High pitch (shrillest note)

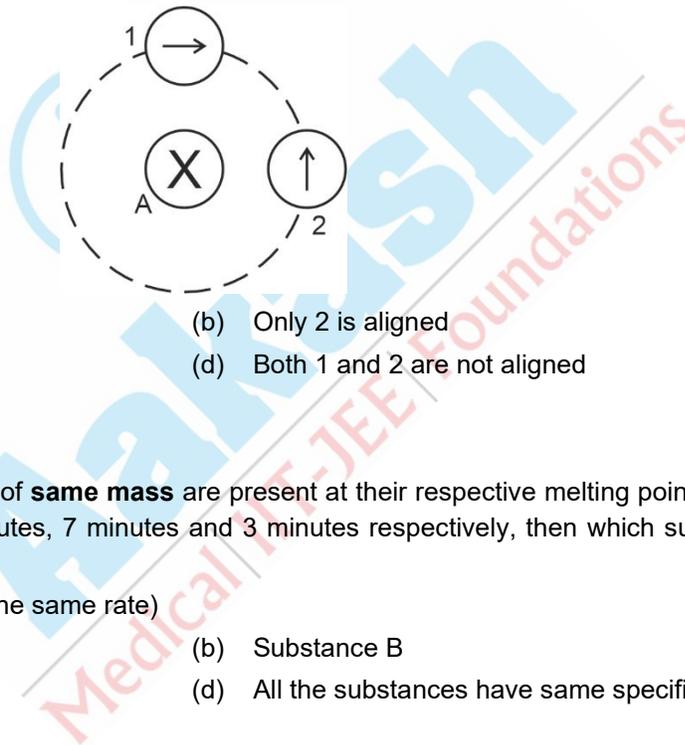
- (xi) A metallic wire is stretched in such a way that its new length becomes twice the original length. How does its **specific heat capacity** change? [1]
- (a) becomes double (b) becomes 4 times  
(c) becomes  $\frac{1}{4}$  (d) remains the same

**Answer (d)**

- (xii) The **correct formula** to calculate the equivalent resistance of two resistors  $R_1$  and  $R_2$  when connected in **parallel**, is: [1]
- (a)  $\frac{R_1 + R_2}{R_1 R_2}$  (b)  $\frac{R_1 R_2}{R_1 + R_2}$   
(c)  $\frac{R_1 - R_2}{R_1 R_2}$  (d)  $\frac{R_1 R_2}{R_1 - R_2}$

**Answer (b)**

- (xiii) The diagram below shows the top view of the Wire **A** shown by a cross (**X**), carrying current **into the plane** of the paper. Which of the compasses is **correctly** aligned with the magnetic field, produced by the current carrying wire? [1]



- (a) Only 1 is aligned (b) Only 2 is aligned  
(c) Both 1 and 2 are aligned (d) Both 1 and 2 are not aligned

**Answer (a)**

**Sol.** Using right hand thumb rule.

- (xiv) Three substances **A, B** and **C** of **same mass** are present at their respective melting points. On heating, they melt completely in 5 minutes, 7 minutes and 3 minutes respectively, then which substance has the highest specific latent heat? [1]

(Assume heat is absorbed at the same rate)

- (a) Substance A (b) Substance B  
(c) Substance C (d) All the substances have same specific latent heat

**Answer (b)**

**Sol.**  $Q = mL$

$Q \propto t$  (since heat is supplied at same rate)

$mL \propto t$

$L \propto t$  ( $\because$  mass is same)

- (xv) An atom of lithium contains 3 electrons, 3 protons and 4 neutrons. Its **mass number** is: [1]
- (a) 3 (b) 4  
(c) 7 (d) 10

**Answer (c)**

**Sol.** Mass number = Number of protons + Number of neutrons.

2. (i) Complete the following by choosing the correct answers from the bracket: [6]
- A car is moving in uniform circular motion. The direction of **friction** between the tyres and the path is \_\_\_\_\_ [*towards the centre / tangential to the path*].
  - When a ray of light passes from a **denser to a rarer** medium, its wavelength \_\_\_\_\_ [*decreases / increases*].
  - The **lid** of a calorimeter minimises heat loss by \_\_\_\_\_ [*convection / radiation*].
  - Quality** of sound depends on its \_\_\_\_\_ [*amplitude / waveform*].
  - A substance whose **resistance** becomes almost negligible at a temperature near **absolute zero** is called a \_\_\_\_\_ [*semiconductor / superconductor*].
  - \_\_\_\_\_ radiation deviates **minimum** in a magnetic field. [*Alpha / Beta*].

(ii) State two factors on which the position of **Center of Gravity** of a body depends. [2]

(iii) **Case 1:** Lata cuts a potato into two halves, using a cutter which belongs to a **Class II** lever. She needed effort  $E_1$ . [2]

**Case 2:** Then she cuts one half of this potato again, but this time she needed effort  $E_2$ . If  $E_1 > E_2$  then:

- In which case (1<sup>st</sup> or 2<sup>nd</sup>) was the potato closer to her hand applying the effort? (*Assume normal reaction of the surface of the potato is same in both cases*)
- Give a reason for your answer in (a) above.

- Sol.** (i) (a) Towards the centre [1]
- (b) Increases [1]
- (c) Convection [1]
- (d) Waveform [1]
- (e) Superconductor [1]
- (f) Alpha [1]

(ii) The position of the centre of gravity depends on:

- Shape of the body** - centre of gravity changes with the shape of a body. [1]
- Distribution of mass** - centre of gravity shifts towards the heavier part if mass is unevenly distributed. [1]

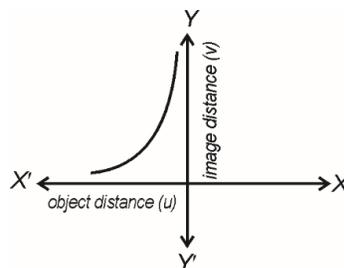
(iii) (a) 1<sup>st</sup> Case [1]

(b) As, effort  $\times$  effort arm = Load  $\times$  load arm  
The load and load arm is same in both the cases.

$$\therefore \text{Effort} \propto \frac{1}{\text{Effort arm}}$$

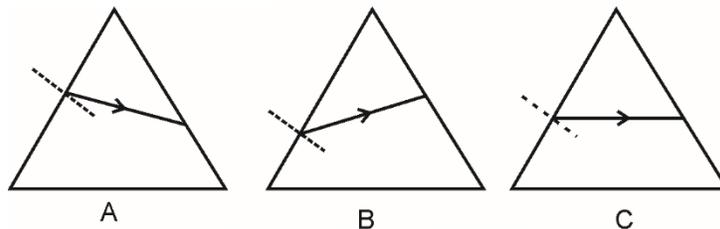
As  $E_1 < E_2$ . Hence effort arm will be shorter in 1<sup>st</sup> case and the potato will be closer to her hand in this case. [1]

3. (i) The graph below shows the variation of **image distance (v)** with the **object distance (u)** when an object is kept in front of a lens. [2]



- Identify the type of **lens** used.
- What would be the **magnification** (*more than 1 / less than 1 / equal to 1*) if the object is placed between  $F$  and  $2F$  of the above lens?

- (ii) A resistance  $R$  is connected across a cell with a switch and a rheostat in **series**. A voltmeter is connected parallel across the **cell**. Current in the circuit is increased using the rheostat. [2]
- (a) How will the voltmeter reading change? (*increase / decrease / remain the same*)
- (b) Justify your answer stated in (a) above.
- (iii) (a) Define *natural vibrations*. [2]
- (b) How is this vibration different from *damped vibrations* in terms of their amplitudes?
- (iv) A metal piece of **thermal capacity**  $40 \text{ JK}^{-1}$ , absorbs  $800 \text{ J}$  of heat. Calculate the rise in the temperature of this metal piece. [2]
- (v) In an **AC generator**, name the part which has the following functions: [2]
- (a) intensifies the magnetic field.
- (b) maintains electrical contact between the rotating parts and the external circuit.
- (vi) Give two differences between **nuclear fission** and **nuclear fusion**. [2]
- (vii) A monochromatic ray strikes the surface of identical prisms (**A**, **B** and **C**) at different angles of incidence. The diagram below shows their refracted rays. Study the path of these refracted rays and identify in which of the diagrams: [3]



- (a) the angle of incidence is maximum.
- (b) the angle of incidence is minimum.
- (c) the angle of incidence is equal to the angle of emergence.

- Sol.** (i) (a) Convex lens [1]
- (b) More than 1 [1]
- (ii) (a) Decreases [1]
- (b)  $V = \varepsilon - Ir$
- The current in the circuit increases by using the rheostat. Also, emf ( $\varepsilon$ ) and internal resistance ( $r$ ) are constant properties of the cell. So, the voltmeter reading ( $V$ ) must decrease. [1]
- (iii) (a) The periodic vibrations of a body of constant amplitude in the absence of any external force are called free or natural vibrations. [1]
- (b) The amplitude of natural vibrations remains constant and the vibrations continue forever while the amplitude of damped vibrations gradually decreases with time and ultimately the vibrations cease. [1]
- (iv)  $Q = C \times \Delta T$
- $\Rightarrow \Delta T = \frac{Q}{C} = \frac{800}{40}$  [1]
- $= 20 \text{ K}$  [1]
- (v) (a) Soft iron core [1]
- (b) Carbon brushes [1]

(vi)

**Differences between Nuclear Fusion and Nuclear Fission**

	<b>Nuclear Fusion</b>		<b>Nuclear Fission</b>
1.	In nuclear fusion, two light nuclei fuse to form a heavy nucleus.	1.	In nuclear fission, a heavy nucleus splits into two smaller nuclei.
2.	Nuclear fusion takes place at a very high temperature of 1,000,000°C or above.	2.	Nuclear fission is independent of temperature.
3.	The products of nuclear fusion are non radioactive and does not cause any disposal problems.	3.	The products of nuclear fission are radioactive and hence cause disposal problems.
4.	Nuclear fusion does not requires slow neutrons to initiate reaction.	4.	Nuclear fission requires slow neutrons to initiate reaction.
5.	Nuclear fusion is not a chain reaction.	5.	Nuclear fission is a chain reaction.
6.	Nuclear fusion cannot be controlled so as to generate electricity.	6.	Nuclear fission can be controlled so as to generate electricity.

(Any two) [2]

(vii) (a) Prism – B [1]

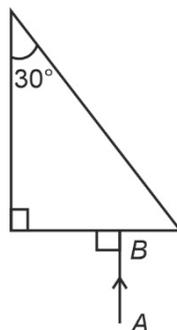
(b) Prism – A [1]

(c) Prism – C [1]

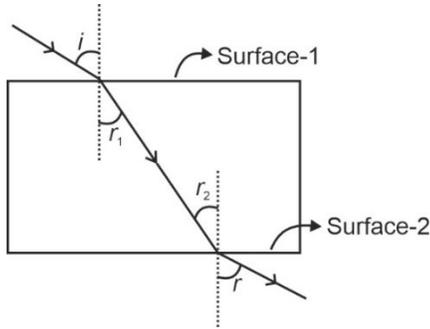
**SECTION-B (40 Marks)**

(Attempt any four questions from this Section.)

4. (i) A ray of light enters a glass block from air and comes out from the opposite surface. If the angle of refraction at the first surface is not the same as the angle of incidence at the second surface, then: [3]
- (a) What is the product of the ratio  $\frac{\sin i}{\sin r}$  at the first surface and at the second surface?
- (b) State whether the opposite surfaces are parallel or not parallel.
- (c) How did you reach the conclusion in (b) above?
- (ii) A type of glass block has a refractive index of 1.8, [3]
- (a) Calculate the speed of light in this glass.  
(Given speed of light in air  $3 \times 10^8 \text{ ms}^{-1}$ )
- (b) If the width of this block is **doubled**, then what will be the speed of light in the block?
- (iii) (a) Name the electromagnetic radiation used to detect fake currency. [4]
- (b) Redraw the diagram given below and complete the path of the light ray **AB** through the glass prism till it emerges out of the prism. Critical angle of the glass is  $42^\circ$ .



Sol. (i) (a)



At surface -1

By Snell's law

$$\sin i = \mu \sin r_1$$

$$\frac{\sin i}{\sin r_1} = \mu \quad \dots(i)$$

At surface -2

$$\mu \sin r_2 = \sin r$$

$$\frac{\sin r_2}{\sin r} = \frac{1}{\mu} \quad \dots(ii)$$

Product of ratio  $\frac{\sin i}{\sin r}$  at surface-1 and surface-2 is

$$\frac{\sin i}{\sin r_1} \times \frac{\sin r_2}{\sin r} = \mu \times \frac{1}{\mu} = 1 \quad [1]$$

(b) The opposite surface is not parallel. [1]

(c) If the surface were parallel the angle of refraction at the first surface would be equal to the angle of incidence at the second surface. Since it is given that they are not equal, the surface cannot be parallel. [1]

(ii) (a) Refractive index formula :

$$\mu = \frac{c}{v}$$

Where  $\mu$  = refractive index of the medium

$c$  = speed of light in air =  $3 \times 10^8$  m/s

$v$  = speed of light in glass

$$v = \frac{c}{\mu}$$

$$v = \frac{3 \times 10^8}{1.8}$$

$$v = 1.67 \times 10^8 \text{ m/s} \quad [2]$$

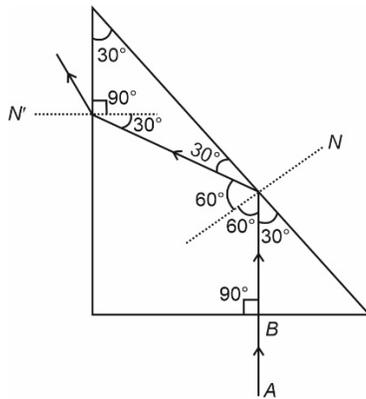
(b) The speed of light in a medium depends only on the refractive index and not on the thickness or width of the block. So even if the width is doubled, speed of light remains same. [1]

(iii) (a) Ultraviolet rays

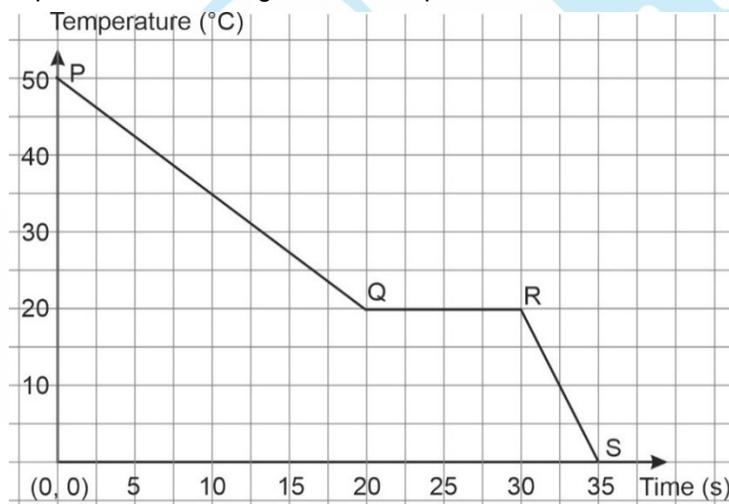
[1]

(b)

[3]



5. (i) An object placed in front of a convex lens, forms an image of same size on a screen. Moving the object 12 cm closer to the lens results in the formation of a real image which is three times the size of the object. Calculate the focal length of the lens. [3]
- (ii) (a) Atmospheric temperature after a hailstorm is greater than the temperature during the hailstorm. State True or False. [3]
- (b) Which thermal physical quantity of a frying pan changes by making its base heavier?
- (c) State the principle of Calorimetry.
- (iii) The given graph represents the cooling curve of a liquid. [4]



- (a) State the freezing temperature of the liquid.
- (b) Name the phase change happening at the region QR.
- (c) In which state (solid / liquid) does the above substance liberate heat at a faster rate? Justify.

Sol. (i) **Case-I**

$$\frac{v_1}{u_1} = -1$$

$$\Rightarrow v_1 = -u_1 \quad \dots(i)$$

Using lens formula

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

$$-\frac{1}{u_1} - \frac{1}{u_1} = \frac{1}{f} \quad \text{[Using (eq. (i))]} \quad [1]$$

$$\Rightarrow u_1 = -2f \quad \dots(ii)$$

**Case-II**

$$\frac{v_2}{u_2} = -3$$

$$v_2 = -3u_2 \quad \dots(\text{iii})$$

$$\text{Also, } u_2 = u_1 - 12 \quad \dots(\text{iv})$$

Using lens formula

$$\frac{1}{v_2} - \frac{1}{u_2} = \frac{1}{f} \Rightarrow -\frac{1}{3u_2} - \frac{1}{u_2} = \frac{1}{f} \quad [\text{using eq. (iii)}]$$

$$3u_2 = -4f \quad \dots(\text{v})$$

$$3u_1 - 36 = -4f \quad \dots(\text{v}) \quad [\text{using eq. (iv)}]$$

On solving eq.(ii) and (v) we get

$$-6f + 36 = -4f$$

$$-2f = -36$$

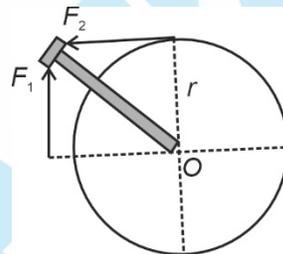
$$f = 18 \text{ cm}$$

[1]

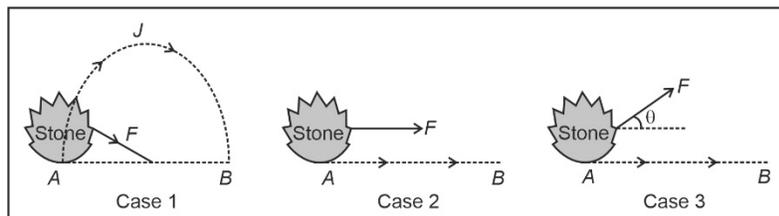
- (ii) (a) False [1]  
 (b) By making base of the cooking pan thick, its heat capacity becomes large. [1]  
 (c) When heat flow occurs between two bodies that are isolated from their surroundings, the amount of heat lost by one body must be equal to the amount of the heat gained by the other. [1]

- (iii) (a) 20°C [1]  
 (b) Freezing (liquid to solid). [1]  
 (c) The slope of the line PQ is lesser than line RS. Hence the substance liberate heat at a faster rate in liquid phase. [2]

6. (i) The diagram shows a wheel with a handle. Two forces,  $F_1$  and  $F_2$  of equal magnitudes are acting on the handle as shown in the diagram. [3]



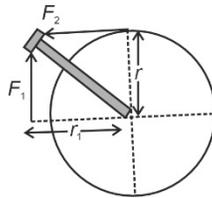
- (a) Which force produces negative moment?  
 (b) Is the wheel in equilibrium? (Yes or No)  
 (c) Justify your answer stated in (b).  
 (ii) (a) Name the unit of work done, used in subatomic scale. [3]  
 (b) To which class of lever does a pair of scissors belong?  
 (c) A stone is tied to a string and displaced from A to B by application of constant force  $F$  in three different ways as shown in the diagram below. Arrange the three cases in ascending order of the work done by the force. (Given  $AJB$  is a semi-circle,  $\theta < 90^\circ$  and  $AB = 20 \text{ m}$ )



- (iii) A ball of mass 20 g falls from a height of 45 m. It rebounds from the ground to a height of 40 m. Calculate:
- The initial potential energy of the ball.
  - The speed of the ball at which it hits the ground.
  - The loss in kinetic energy on striking the ground. [ $g = 10 \text{ m/s}^2$ ]

[4]

- Sol.** (i) (a)  $F_1$   
 (b) No  
 (c) Because  $r_1 > r$



[1]

[1]

[1]

- (ii) (a) Electron volt (eV)  
 (b) Class 1 Levers  
 (c) **Case-1**

[1]

[1]

$$W_1 = F \cdot s \cos 90^\circ$$

$$= 0$$

**Case-2**

$$W_2 = F \cdot s \cos 0^\circ$$

$$= Fs$$

**Case-3**

$$W_3 = F \cdot s \cos \theta, (\theta < 90^\circ)$$

$$\therefore W_1 < W_3 < W_2$$

[1]

- (iii) (a)  $PE_1 = KE_1 = mgh_1$  ( $\therefore$  of law of conservation of energy)

$$= \frac{20}{1000} \times 10 \times 45 = 9\text{J}$$

[1]

(b)  $v^2 = u^2 + 2gh$

$$v^2 = 2 \times 10 \times 45$$

$$\therefore v = 30 \text{ m/s}$$

[1]

- (c)  $PE_2 = KE_2$  ( $\therefore$  of law of conservation of energy)

$$PE_2 = KE_2 = mgh_2$$

$$= \frac{20}{1000} \times 10 \times 40 = 8\text{J}$$

[1]

$$\text{Loss in KE} = KE_1 - KE_2$$

$$= 9 - 8 = 1 \text{ J}$$

[1]

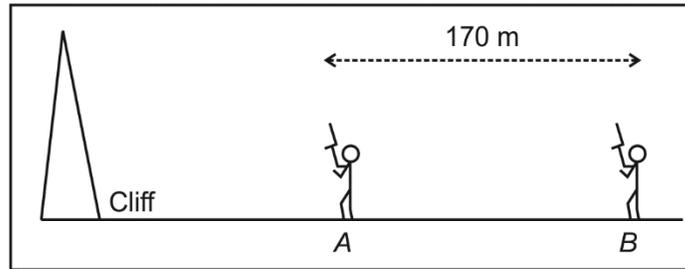
7. (i) To lift a load of 30 kgf, Suhas uses a single fixed pulley, while Radha uses a single movable pulley. The **displacement of efforts** in both the cases are **equal**.

[3]

In an **ideal situation** calculate the ratio of:

- the efforts in the two cases.
- the potential energy gained by the loads in the two cases.
- the efficiencies in the two cases.

- (ii) (a) One end of a plastic foot ruler is held tightly at the edge of a table and the other end is plucked. Name the vibrations produced in the ruler. **[3]**
- (b) Now the ruler is pushed inside partially and plucked again from its free end. State **with a reason** whether the frequency of vibration increases or decreases.
- (iii) Two persons **A** and **B** are standing in front of a cliff in the same line 170 m apart as shown in the diagram. Person **B** fires the gun and hears the echo in 3 s. Then the person **A** standing in front of the person **B** fires the gun. **[3]**
- (The speed of sound in air is 340 m/s.)



- (a) Calculate:
- the distance of the person **B** from the cliff.
  - the minimum time in which **B** hears the gunshot fired by **A**.
- (b) *Fill in the blank.* The echo is softer (less loud) than the original sound due to the **decrease** in \_\_\_\_ of the wave. (*amplitude / frequency*)

**Sol.** (i) (a) **Case-1:** Single fixed pulley ( $MA = 1$ )

$$E_1 = \frac{L}{MA} = \frac{30}{1} = 30 \text{ kgf}$$

**Case-2:** Single movable pulley ( $MA = 2$ )

$$E_2 = \frac{L}{MA} = \frac{30}{2} = 15 \text{ kgf}$$

$$\therefore \frac{E_1}{E_2} = \frac{30}{15} = 2 : 1$$

**[1]**

(b) Let effort displacement =  $d$

For single fixed pulley: [Load raised by  $d$ ]

$$PE_1 = l \times h = 30 \times d$$

For single movable pulley: [Load raised by  $d/2$ ]

$$PE_2 = L \times \frac{d}{2}$$

$$= 30 \times \frac{d}{2} = 15 \times d$$

$$\therefore PE_1 : PE_2 = 2 : 1$$

**[1]**

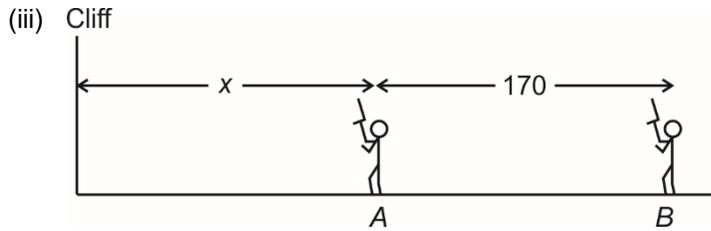
(c) For ideal machines:

$$\text{Efficiency } (\eta) = 100\%$$

$$\therefore \eta_1 : \eta_2 = 1 : 1$$

**[1]**

- (ii) (a) When one end of the ruler is held tightly at the edge of a table and the other end is plucked, the ruler vibrates at its natural frequency after being disturbed. These vibrations are called free vibrations. [1½]
- (b) When the ruler is pushed further inside the table, the free vibrating length decreases. The frequency increases because the effective vibrating length of the ruler becomes smaller. [1½]



For person B.

$$2x + (170 \times 2) = 340 \times 3$$

$$2x = 1020 - 340 = 680$$

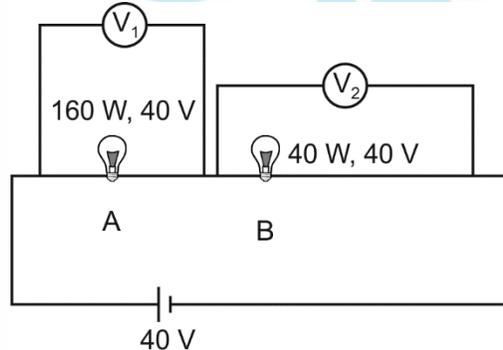
$$\Rightarrow x = 340 \text{ m}$$

- (a) 1. Distance of person B from the Cliff =  $x + 170$   
 $= 340 + 170 = 510 \text{ m}$  [2]

2.  $t_{\min} = \frac{170}{340} = 0.5 \text{ s}$  [1]

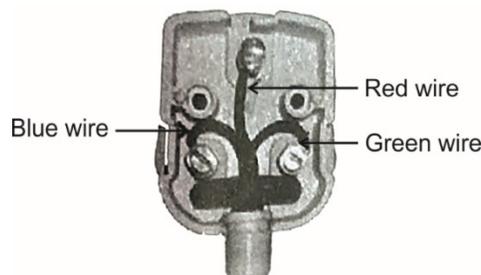
- (b) Amplitude [1]

8. (i) Bulb A rated 160 W, 40 V and Bulb B rated 40 W, 40 V are connected as shown in the diagram. [3]

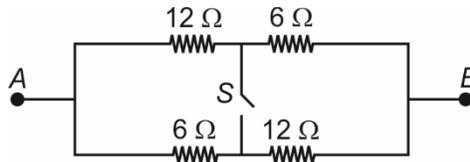


- (a) Calculate the ratio  $V_1 : V_2$ .
- (b) If the bulb A fuses, the current in the circuit remains the same. State True or False.  
 State **True** or **False**.

- (ii) The reverse side of a three-pin plug with **incorrect** connection of wires is shown in the diagram below in the diagram below. [3]



- (a) Identify the **fault** in the above *connection*.  
 (b) Mention a risk factor involved, if the user operates the appliance without correcting it.  
 (c) Will the appliance function in the present situation? (Yes or No)
- (iii) In the combinations of resistors shown below, calculate: [4]



- (a) the resistance across *AB* when the switch *S* is **open**.  
 (b) the resistance across *AB* when the switch *S* is **closed**.

**Sol.** (i) (a) Resistance of bulb *A*

$$R_A = \frac{V^2}{P} = \frac{40^2}{160} = 10 \Omega \quad \text{[1/2]}$$

Resistance of bulb *B*

$$R_B = \frac{40^2}{40} = 40 \Omega \quad \text{[1/2]}$$

Since the bulb are in series, the same current flows, so the voltage across each is proportional to its resistance

$$V_1 : V_2 = R_A : R_B$$

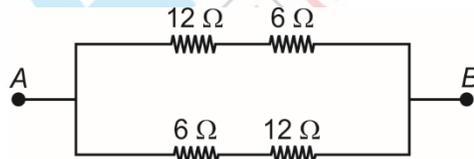
$$V_1 : V_2 = 10 : 40$$

$$= 1 : 4$$

[1]

- (b) If bulb *A* fuses, the series circuit breaks and current stops. The current does not remain the same. [1]
- (ii) (a) The live wire (red) is connected to the earth terminal instead of the live terminal. [1]  
 (b) The metal body of the appliance may become live, giving the user an electric shock. [1]  
 (c) No, because the live wire is wrongly connected, the appliance will not receive proper current. [1]

(iii) (a) When switch *S* is open



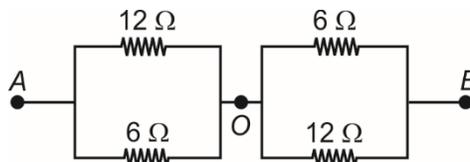
[1/2]

$$R_{AB} = \frac{(12+6) \times (12+6)}{(12+6) + (12+6)} \quad \text{[1/2]}$$

$$= \frac{324}{36} \quad \text{[1/2]}$$

$$= 9 \Omega \quad \text{[1/2]}$$

(b) Switch *S* is closed



$$R_{AC} = \frac{R_1 \times R_2}{R_1 + R_2}$$

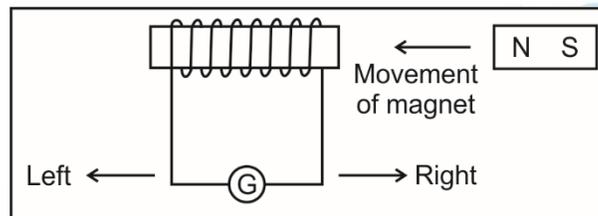
$$R_{AC} = \frac{12 \times 6}{12 + 6} = 4 \Omega \quad [1/2]$$

Similarly

$$R_{CB} = \frac{12 \times 6}{12 + 6} = 4 \Omega \quad [1/2]$$

$$R_{AB} = R_{AC} + R_{CB} = 4 + 4 = 8 \Omega \quad [1/2]$$

9. (i) An electric iron rated 1100 W, 220 V is operated for 5 hours. Calculate:
- (a) the **minimum** rating of the fuse required. [3]
- (b) the energy consumed in **kWh**.
- (c) the cost of the energy consumed, if the rate is ₹10 per unit.
- (ii) When the magnet as shown in the diagram, is moved towards the coil at a speed of  $5 \text{ ms}^{-1}$ , the galvanometer shows a certain deflection to the right. [4]



How will the **direction** and **magnitude of deflection** change when the **coil** also moves with a speed of  $5 \text{ ms}^{-1}$ :

- (a) in the direction of the motion of the magnet?
- (b) in the opposite direction of the motion of the magnet?
- (iii) (a) 1. Which **element** is used in the lining of the special aprons worn by workers in nuclear power plants? [4]
2. Why is this element preferred?
- (b)  ${}_{11}^{24}\text{Na}$  emits a nuclear radiation which **does not alter** the mass number but is **deflected** by a magnetic field.
1. Name the type of nuclear radiation emitted by  ${}_{11}^{24}\text{Na}$ .
2. Write the equation for this radioactive decay.

**Sol.** (i) (a)  $I = \frac{\text{Power}}{\text{Voltage}} = \frac{1100}{220} = 5 \text{ A}$

The minimum rating of the fuse is 5 A [1]

(b) Energy = Power  $\times$  Time

$$= 1100 \times 5$$

$$= 5500 \text{ Wh}$$

$$= 5.5 \text{ kWh} \quad [1]$$

(c) Cost of energy consumed

$$= 5.5 \times 10 = \text{Rs } 55 \quad [1]$$

- (ii) (a) When the coil also moves with a speed of 5 m/s in the direction of the motion of the magnet

$$V_{\text{rel}} = U_{\text{mag}} - V_{\text{coil}} = 5 - 5 = 0 \text{ m/s}$$

There will be no deflection in galvanometer.

[1½]

- (b) When the coil also moves with a speed of 5 m/s in the direction opposite of the motion of the magnet

$$V_{\text{rel}} = V_{\text{mag}} - V_{\text{coil}}$$

$$= 5 - (-5) = 10 \text{ m/s}$$

The deflection of galvanometer will be towards right and with a greater magnitude.

[1½]

- (iii) (a) 1. The workers of nuclear power plants put on special lead lined aprons and lead gloves.

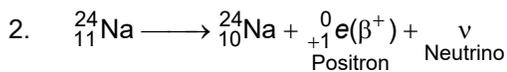
[1]

2. It block high energy  $\beta$  and  $\gamma$ -radiation from penetrating the aprons of the workers.

[1]

- (b) 1.  $\beta$ -radiation

[1]



[1]

