

PHYSICS MARKING SCHEME

SECTION A (16 marks).

1.

i	ii	iii	iv	v	vi	vii	viii	ix	x
C	E	D	A	B	C	A	B	B	A

(10 marks)

2.

I	II	III	IV	V	VI
F	E	D	C	B	A

(06 marks)

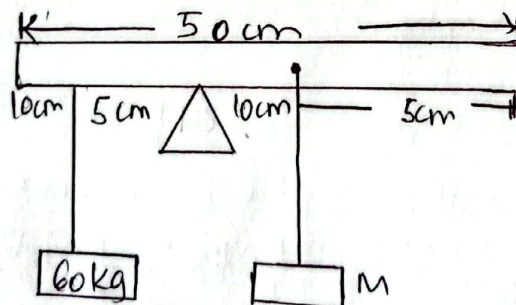
SECTION B (54 marks).

3. a). i). Centre of gravity is the point of which the whole weight of the body is likely to act. WHILE $0\frac{1}{2}$
Centre mass is the point of which the whole mass of the body is assumed to be concentrated: $0\frac{1}{2}$

ii) Racing car should have wide while tracks in order to increase stability by lowers centre of gravity 02

b) In order to increase turning force (moment of force) 02

ii).



$00\frac{1}{2}$

Sum of clockwise moment = Sum of anticlockwise moment $00\frac{1}{2}$

$$(60 \times 5) \text{ kgcm} = (10 \times M) \text{ cm}$$

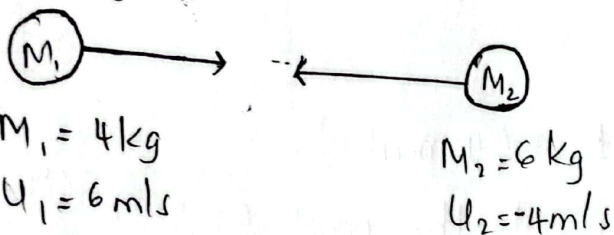
$$300 \text{ kgcm} = 10M \text{ cm}$$

$$M = 30 \text{ kg} \quad 01$$

∴ Mass of the metre rule (M) is 30 kg.

- 4 a). To ensure safety throughout the journey when a moving bus suddenly stops, the passengers feel a jerk in a forward direction. This is because the upper part of the body tends to remain in the forward motion while the lower part of the body suddenly comes at rest. (04 marks)

b). Diagram.



From.

Principle of momentum.

$$M_1 U_1 + M_2 U_2 = M_1 V_1 + M_2 V_2 \quad (00\frac{1}{2})$$

$$4 \text{ kg} \times 6 \text{ m/s} + 6 \text{ kg} \times -4 \text{ m/s} = 4 V_1 + 6 V_2$$

$$24 \text{ kg m/s} - 24 \text{ kg m/s} = 4 V_1 + 6 V_2$$

$$0 = 4 V_1 + 6 V_2$$

$$\therefore 4 V_1 = 6 V_2 = 0$$

$$V_1 = -\frac{6}{4} V_2$$

$$V_1 = -\frac{3}{2} V_2 \quad (01\frac{1}{2})$$

Perfect elastic collision KE is conserved

$$\frac{1}{2} M_1 U_1^2 + \frac{1}{2} M_2 U_2^2 = \frac{1}{2} M_1 V_1^2 + \frac{1}{2} M_2 V_2^2 \quad (01\frac{1}{2})$$

$$\frac{1}{2} \times 4 \times 6^2 + \frac{1}{2} \times 6 \times (4)^2 = \frac{1}{2} \times 4 V_1^2 + \frac{1}{2} \times 6 V_2^2$$

$$72 + 48 = 2 V_1^2 + 3 V_2^2$$

$$\text{but } V_1 = -\frac{3}{2} V_2$$

Then,

$$120 = 2 \left(-\frac{3}{2} V_2 \right)^2 + 3 V_2^2$$

$$120 = 2\left(\frac{9}{4}V_2^2\right) + 3V_2^2$$

$$120 = \frac{9}{2}V_2^2 + 3V_2^2$$

$$120 = 4.5V_2^2 + 3V_2^2$$

$$120 = 7.5V_2^2$$

$$V_2^2 = \frac{120}{7.5}$$

$$V_2^2 = 16$$

$$V_2 = \sqrt{16}$$

$$V_2 = 4 \text{ m/s.}$$

01½

From

$$V_1 = -\frac{3}{2}V_2$$

$$= -\frac{3}{2} \times 4 \text{ m/s}$$

$$= -6 \text{ m/s.}$$

∴ The velocities of the two balls are -6 m/s and 4 m/s respectively.

01 mark

5. a) i). The walls and floors of broadcasting studio and a theatre room are always covered with soft curtains and carpets so as to absorb echoes or reflected sound in the rooms.

02

ii). We can hear talking in the near places even without seeing them because of large diffraction of sound waves after passing through the wide-open space or wide gap.

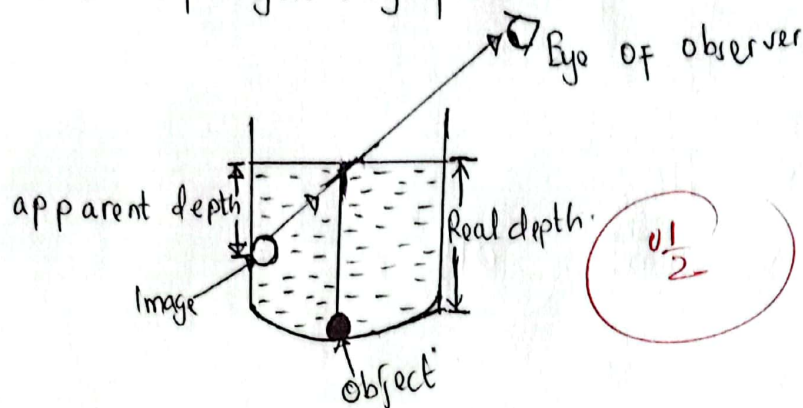
02

iii). An electric bell ringing inside a closed bottle does not produce sound because sound wave cannot travel in vacuum.

02

b). A dam or pond water is always constructed with thicker walls at its bottom than its top because the pressure in liquid (water) is greater at the bottom of the pond due to larger depth than at the top. (03)

6 a) i). A swimming pool (object) immersed in water) appears much shallower (closer) than its actual depth because of refraction of light ray from the bottom of water. (02)



ii). Data.

Apparent depth $h = 1.5$ m deep.

Refractive index of water $\eta = \frac{4}{3}$.

Since, Refractive index of water = $\frac{\text{Real depth}}{\text{Apparent depth}}$. (02)

$$\eta = \frac{H}{h}$$

$$H = \eta_w \times h$$

$$= \frac{4}{3} \times 1.5$$

$$= 2 \text{ m.}$$

\therefore Real depth = 2m (02)

b). The four sources from which water vapours are evaporated to the atmosphere are. @ 01 mark

- Rivers.
- Lakes
- Oceans or seas

= 04 marks

- Plant Leaves.
- Ponds or dams of water

7. a). An image is formed when regular reflection of light takes place. Due to the roughness of the surface of newspaper diffused reflections take place from it. For this reason, we do not see even a faint image in the newspaper. (05 marks)

b). Factors on which the angle of deviation produced by a prism depends: (a) 01 mark = (04 marks)

- Angle of prism.
- Refractive index of the prism.
- Wavelength of light used.
- Angle of incidence.

8. a). A force is anything that can set a stationary body in motion and can change the motion of a moving body, pressure is also the force acting normally per unit area hence related. A force is weight when is exerted by the earth on the body in the earth's gravitational field. (04)

b). Sound waves spreads in the room by diffraction in which the sound waves spreads around the house and through the openings of the window. (05)

SECTION C (30 marks).

9. a) i) - Uranium is the fuel most commonly used to produce energy (Nuclear energy) (01)

- Nuclear energy produces electricity that can be used to power homes, schools, businesses and hospitals. (01)

ii) Geiger-Muller counter registers pulse even though no radioactive substance is anywhere near the Geiger-muller tube due to background radiation. Background radiation are random radiation from cosmic rays which pass into G-M tube and produce ionization. (03)

b). Solution.

Difference isotopes will differ at least by 1 neutron. That is,

$$A_1 = 108, A_2 = 109, A_3 = 110 \dots A_n.$$

Since there are 25 isotopes, $n = 25$

From arithmetic progression,

$$A_n = A_1 + (n-1)d \quad (03)$$

In this case, $A_1 = 108, n = 25, d = 1$.

$$\therefore A_n = 108 + (25-1)1 = 132. \quad (03)$$

Denote the heaviest isotope by the symbol.



Hence, the heaviest isotope of tin will be ${}_{50}^{132}\text{Sn}$ (04)

10. a). i). Wave length - Is the distance between two successive crests or trough.
- Is the covered by wave to complete one cycle. (02)

Frequency - Is the number of oscillation per second
- Is the number of crests or trough that passes a given point per unit time.

ii). Given.

Wave Velocity (v) = 60 m/s

Frequency (f) = 4 Hz

Distance (wavelength) = λ = ?
From.

$$v = \frac{\lambda}{T}$$

$$\text{but } T = \frac{1}{f}$$

$$v = f\lambda$$

$$\lambda = \frac{v}{f}$$

$$\lambda = \frac{60 \text{ m/s}}{4 \text{ s}^{-1}} = 15 \text{ m}$$

\therefore Distance (wavelength) = 15 m. (03)

b). Given.

Distance (wavelength) = 200 mm.

1st and 5th Crest = 4 wavelength

Distance = 300 mm travelled in 1.5 s

1). Wave Length of the wave.

$$\text{For 1 wavelength} = \frac{200\text{mm}}{4} \\ = 50\text{mm}$$

$$\therefore \text{Wave Length } (\lambda) = 50\text{mm}$$

03

(ii). Frequency

$$\text{Time} \rightarrow 300\text{mm} \rightarrow 1.5\text{s} \\ 50\text{mm} \rightarrow ?\text{T}$$

Cross multiplying

$$300\text{mm} \times \text{T} = 50\text{mm} \times 1.5\text{s}$$

$$\text{T} = \frac{50 \times 1.5}{300}$$

$$= 0.25\text{sec}$$

$$\text{From } f = \frac{1}{\text{T}}$$

$$= \frac{50\text{mm}}{0.25\text{sec}}$$

$$= 0.2\text{Hz}$$

\therefore Frequency of wave is 0.2 Hz

05

11. a). The four (4) causes of power losses in a transformer are

- Eddy currents that rise on the soft iron core of a transformer. (03)

- Heating effect dissipated on the coils of a transformer. This is also known as copper losses as the coils are made of copper. (03)

- Leakage of magnetic flux linking the coils of a transformer. (03)

- Sound energy generated by vibrations in a transformer of simply due to friction. (03)

b). Data given.

Primary voltage $V_p = 240\text{V}$

Number of turns in primary coil, $N_p = 1000$ turns

Secondary voltage, $V_s = 12\text{V}$

Output power, $P_{out} = 24\text{W}$ (lamp).

Current in primary coil, $I_p = 0.125\text{A}$.

Efficiency of transformer = ?

But,

$$\text{efficiency} = \frac{\text{Output power}}{\text{Input power}} \times 100\%$$

(01)

$$= \frac{\text{Power in Secondary coil}}{\text{Power in Primary coil}} \times 100\%$$

$$= \frac{V_s I_s}{P_p I_p} \times 100\%$$

$$= \frac{24}{240 \times 0.125} \times 100\%$$

$$= 80\%$$

\therefore Efficiency of transformer = 80%.

(02)

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