

SECTION B (40 Marks)

0705969563/
0752303928

- (01 mark)

A metal cube of side 2cm weighs 22.4N in air. Calculate the apparent weight of the cube when completely immersed in a liquid of density 800kgm^{-3}

(03 marks)


03

Define velocity ratio. Since metal circle is completely immersed, $V_f = V_{fl}$ (mark)

- (1 mark)

In a pulley system made of 5 wheels, an effort of 250N is used to move a load of 1000N. Calculate:

- (01 marks)



- (01 ½ marks)

$$\frac{11}{2} \times \frac{1}{2}$$

- (1/2 marks)

- any one correct way
award 1/2 mark.

- (01 mark)

- Any correct data

(01 mark)

- Array correct defn

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- (b) A wave source produces waves of frequency 500Hz and velocity 340ms^{-1} . Calculate:

(i) The wave length

(01 mark)

from $v = \lambda f$ $\lambda = \frac{v}{f} = \frac{340}{500} = 0.68\text{m}$ (01)

(ii) The periodic time

(01 mark)

From definition, $T = \frac{1}{f} = \frac{1}{500} = 0.002\text{s}$ (01)

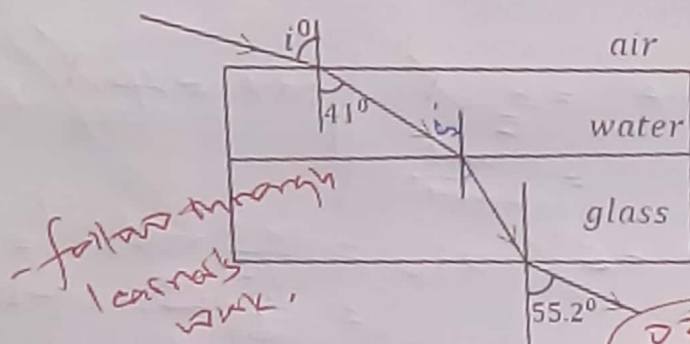
44. (a) What is meant by the term refractive index of a medium.

(01 mark)

Is a constant ratio of the sine of angle of incidence in one medium to the sine of angle of refraction in another medium.

- (b) A ray of light is incident from air to a layer of water placed on the surface of glass block of uniform thickness as shown in figure 8 below. Given that the refractive index of water is 1.33 and that for glass is 1.50 . calculate the angle of incidence i from air to water and angle of refraction for this ray travelling from water to glass

(03 marks)



$i_2 = i_1$ (Alternate angles)

Fig. 8 $i_2 = 41^\circ$

$n_{\text{air}} \sin i = n_{\text{water}} \sin r$

$1 \times \sin i = 1.33 \sin 41^\circ$

$i = 35.5^\circ$

Applying Snell's law at point of incidence.

$n_{\text{air}} \sin i = n_{\text{water}} \sin r$ $\sin i = \frac{1.33 \sin 41^\circ}{1}$

$i = \sin^{-1}(1.33 \sin 41^\circ)$

$i = \sin^{-1}(0.872)$

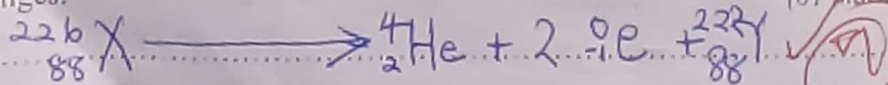
(01 mark)

45. (a) What is half-life of a radioactive nuclide?

Is the time taken for a radioactive nuclide to decay to half of its original mass (nuclide).

- (b) A radioactive nuclide ${}^{226}_{80}\text{X}$ changes to nuclide Y by emitting an alpha particle and two beta particles. Write a balanced equation to represent these changes.

(01 mark)



- (c) A Carbon atom initially contains 8×10^6 atoms. Calculate the time taken for 7.75×10^6 atoms to decay. (Half-life of carbon is 5,600 years) (02 marks)

For atoms remaining = $8 \times 10^6 - 7.75 \times 10^6$
 = 0.25×10^6
 Accept any method
 follow through
 learner's work = 2.5×10^6 atoms

mass remaining	half-life
8×10^6	0 02
4×10^6 ✓	5600
2×10^6	11200
1×10^6 (02 mark)	16800
	22400

- 46 (a) Distinguish between potential and kinetic energy.

Potential energy is the energy possessed by a body due to its position or state.
 Kinetic energy is the energy possessed by a body due to its motion.

- (b) A block of mass 2kg falls freely from rest through a height of 3.2m. Find the kinetic energy of the block before it hits the ground and hence its velocity at that point. (02 marks)

for
 thing
 learner's work

$$u = 0 \text{ m/s}$$

$$h = 3.2 \text{ m}$$

$$P.E = mgh$$

$$= 2 \times 10 \times 3.2$$

$$= 64 \text{ J}$$

$$P.E \text{ lost} = \text{gain in } K.E$$

$$K.E = 64 \text{ J}$$

$$= \frac{1}{2}mv^2$$

$$= \frac{1}{2} \times 2 \times v^2 = 8 \text{ m/s}$$

(01 mark)

- 47 (a) (i) State Ohm's law.

states that the potential difference between the ends of a conductor is directly proportional to the current flowing through it, provided temperature and other physical conditions remain constant.

- (ii) State one physical property that affects resistance of a solid conductor. (0.5 mark)

length, thickness, cross-sectional area
 - Avoid 2 from one physical property

(b)

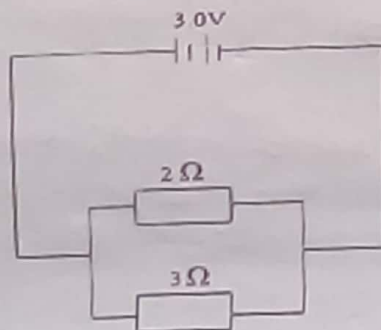


Fig. 9

Two cells each of E.M.F 1.5V and internal resistance of 0.15Ω are connected in series across two resistors of 2Ω and 3Ω respectively as shown in figure 9 above. Calculate the current that is passing through the 2Ω resistor. (02½ marks)

$$E = I(R+r)$$

$$3.0 = I \left(\frac{2 \times 3}{2+3} + 0.15 + 0.15 \right)$$

$$3.0 = I (1.2 + 0.3)$$

$$I = \frac{3.0}{1.5} = 2.0 \text{ A}$$

(01 mark)

- 48 (a) What is a step-down transformer?

Is a transformer with more turns in primary coils than secondary coils.

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