

Hw
21/2/21

$$1) W = FS$$

$$F = ma$$

$$S = ut + \frac{1}{2}at^2$$

Since the body accelerated from rest

$$S = \frac{1}{2}at^2$$

$$W = FS = ma \times \frac{1}{2}at^2 \rightarrow \frac{1}{2}ma^2t^2$$

$$\rightarrow \frac{1}{2}m \left(\frac{v}{t} \right)^2 t^2 \quad \left(\text{From } a = \frac{v}{t} \right)$$

$$\rightarrow \frac{1}{2}m \frac{v^2}{t^2} t^2$$

$$2) a = \frac{F}{m}$$

$$v = u + at \rightarrow v = at \quad (\because \text{The particle move from rest})$$

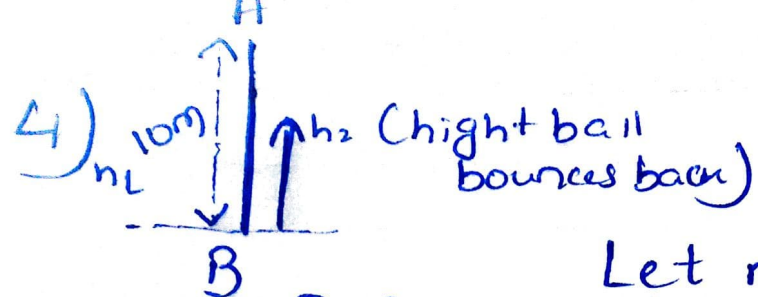
$$\rightarrow v = \frac{F}{m} \times 2 \quad (t = 2s \text{ given})$$

$$v = \frac{2F}{m}$$

$$\text{Power} = Fv \rightarrow F \times \frac{2F}{m} = \frac{2F^2}{m}$$

$$3) \text{Power} = Fv$$

$$\rightarrow 100 \text{ N} \times 20 \text{ m/s} = \cancel{2000} \text{ 2 kW}$$



Let mass be m
 $P.E = mgh_1 = 100 \text{ J}$

It loses 40% of its energy

$$100 \text{ J} - \frac{40}{100} \times 100 \text{ J} = 60 \text{ J}$$

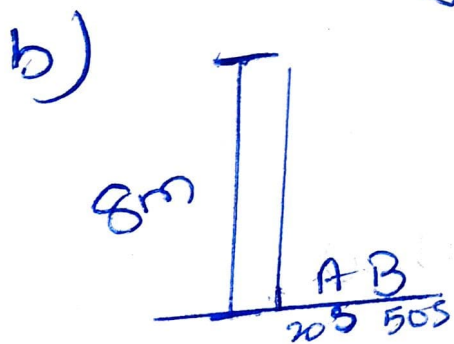
As it rebounds a height h_2

$$\Rightarrow mgh_2 = 60 \text{ J}$$

$$\Rightarrow m \times 10 \times h_2 = 60 \text{ J}$$

$$\Rightarrow h_2 = 6 \text{ m}$$

5) a) Law of Conservation of energy states that energy can neither be created nor destroyed. It can be transformed from one form to other. Ex - Solar Panel (converts Solar energy to electrical energy)



At each end weight 400N (force)

$$P = \frac{W}{t} = \frac{FS}{t}$$

$$(A) P_1 = \frac{FS}{t_1} = \frac{400 \times 8}{20} = 160 \text{ W}$$

$$(B) P_2 = \frac{FS}{t_2} = \frac{400 \times 8}{50} = 64 \text{ W}$$

c) $t = 10 \text{ hours}$

$\rightarrow 10 \times 3600 = 36000 \text{ s}$

Energy consumed by heater

$E = P \times t$

$E = 1500 \times 36000$

$E = 54000000$

$\rightarrow E = 5.4 \times 10^7 \text{ J}$

$E = 15 \text{ kWh} (\because 1 \text{ kWh} = 3.6 \times 10^6 \text{ J})$

6) a) $u = 36 \text{ km/h} \rightarrow \frac{36 \times 5}{18} = 10 \text{ m/s}$

$v = 72 \text{ km/h} \rightarrow \frac{72 \times 5}{18} = 20 \text{ m/s}$

$m = 1500 \text{ kg}$

$W = \frac{1}{2} m v^2 - \frac{1}{2} m u^2 \Rightarrow \frac{1}{2} m (v^2 - u^2)$

$\rightarrow \frac{1500}{2} \times 300^{150} = 225000$

The work done by force is positive

b) P.E is maximum at extreme point of the pendulum.

K.E is maximum at mean position.