

Ex 9A $KE = \frac{1}{2}mv^2$ use kg, metres

① (i) $\frac{1}{2}(50)10^2 = 2500 \text{ J}$ and seconds!

(ii) $\frac{1}{2}(5000)4^2 = 40000 \text{ J}$

(iii) $\frac{1}{2}(7000000)40^2 = 5.6 \times 10^9 \text{ J}$

(iv) $\frac{1}{2}(7.4 \times 10^{22})1000^2 = 3.7 \times 10^{28} \text{ J}$

(v) $\frac{1}{2}(2 \times 10^{-19})(0.001)^2 = 1 \times 10^{-25} \text{ J}$

↑ must be kg ↑ must be ms^{-1}

② (i) work done = Fs

At start $KE = 0$ $PE = 0$

+ Wd by Man

- Wd by Resistance

$$KE = 0 + PE = 0$$

So $0 + Wd - 200 \times 5 = 0$ So $Wd = 1000 \text{ J}$

$$(2ii) \quad 0 + Wd - 1000 = \frac{1}{2}(35)^2$$

$$Wd = \underline{1070 \text{ J}}$$

$$(iii) \quad \frac{1}{2}(35)^2 + Wd - 1000 = 0$$

$$Wd = 930 \text{ J}$$

(iv) Nothing because he didn't move it.

$$(3) (i) \quad \begin{aligned} KE &= \frac{1}{2}mv^2 \\ &= \frac{1}{2} \times 60 \times 12^2 \\ &= 4320 \text{ J} \end{aligned}$$

$$(ii) \quad Wd = 4320 \text{ J}$$

$$(iii) \quad 4320 = F(30)$$

$$F = \underline{144 \text{ N}}$$

(iv)

$$F = ma$$

$$12^2 = 0^2 + 2a(30)$$

$$a = 15 \text{ ms}^{-2}$$

$$a = 2.4 \text{ ms}^{-2}$$

$$F = 60 \times 2.4 = 144 \text{ N}$$

As required

$$\begin{aligned} s &= 30 \\ u &= 0 \\ v &= 12 \\ a &=? \\ t & \end{aligned}$$

$$\textcircled{4} \textcircled{i} \quad Wd = \frac{1}{2} (1200) (30)^2 \\ = 540000 \text{ J}$$

$$\textcircled{ii} \quad Wd = Fs \\ 540000 = F (150)$$

$$F = 3600 \text{ N}$$

$$\textcircled{5} \textcircled{i} \text{ At start } \quad \overbrace{KE = \frac{1}{2} (1600) 25^2} \quad PE = 0 \\ - * \text{ Wd by resistance}$$

$$\text{At finish } \quad KE = 0 \quad PE = 0$$

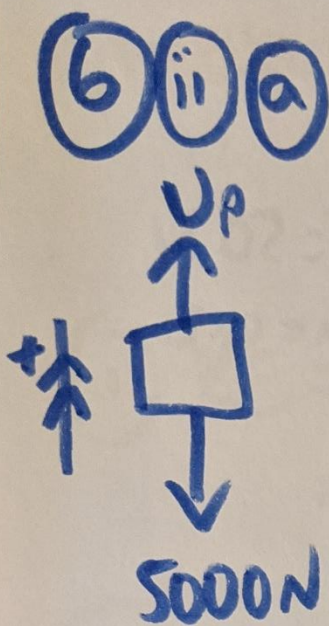
$$500000 - Wd = 0 \\ Wd = 500000 \text{ J}$$

$$\textcircled{ii} \quad Wd = Fs \\ 500000 = F (75)$$

$$F = \underline{6670 \text{ N}} \quad (3 \text{ SF})$$

$$\begin{aligned} \textcircled{6} \textcircled{i} \textcircled{a} \quad W_d &= \frac{1}{2} M v^2 - \frac{1}{2} M u^2 \\ &= 6250 - 10000 \\ &= \underline{5250 \text{ J}} \end{aligned}$$

$$\begin{aligned} \textcircled{b} \quad W_d &= 2250 - 16000 \\ &= \underline{-13750 \text{ J}} \end{aligned}$$



At start $KE = 1000$ $PE = 0$

+ Wd by up force

- Wd by resistance

At end $KE = 6250$

$$1000 + Wd_u - 5000(100) = 6250$$

$$Wd_u = 505250$$

(b) At start $KE = 16000$

+ Wd by up force

- Wd by resistance

At end $KE = 2250$

$$16000 + Wd_u - 500000 = 2250$$

$$Wd_u = 486250$$

⑦ mass = 0.02 kg
s = 0.16 m
u = 80 m s⁻¹

① KE = $\frac{1}{2} \times 0.02 \times 80^2$
= 64 J

② It got transferred to heat and noise.

③ At start KE = 64

- Wd by resistance

At End KE = 0

Wd by resistance = 64 J

④ F = $64 / 0.16 = 400 \text{ N}$

⑤ Wd = $400 \times 0.2 = 80$
 $80 = \frac{1}{2} (0.02) v^2$ so v = 89.4 m s⁻¹