

①

Given weight $mg = 600 \text{ N}$ height $h = 10 \text{ m}$; time $t = 12 \text{ s}$

$$\text{Power} = \frac{W}{t} = \frac{mgh}{t}$$

$$P = \frac{600 \times 10}{12} = 500 \text{ W} \rightarrow B$$

②

 $m_{\text{water}} = 200 \text{ kg}$; time $t = 5 \text{ min} = 5 \times 60 \text{ s}$ depth $h = 120 \text{ m}$

$$\text{Power} = \frac{W}{t} = \frac{mgh}{t} = \frac{200 \times 10 \times 120}{5 \times 60}$$

$$= 800 \text{ W (or) } 784 \text{ W (if } g = 9.8 \text{ m/s}^2) \rightarrow A$$

③

Given $m = 50 \text{ kg}$; height $h = 40 \text{ m}$; $t = 25 \text{ s}$ $P = 1568 \text{ W}$ let mass of man = M Total mass = $(M + 50)$

$$\therefore \text{Power} = \frac{W}{t} = \frac{(M + 50)gh}{t}$$

$$1568 = \frac{(M + 50) \times 9.8 \times 40}{25}$$

$$\Rightarrow (M + 50) = \frac{1568 \times 25}{9.8 \times 40} = 100$$

$$\Rightarrow M = 50 \text{ kg} \rightarrow B$$

(4)

Given power $P = 3 \text{ kW}$ height $h = 10 \text{ m}$; $t = 60 \text{ sec}$

$$P = \frac{mgh}{t}$$

$$\Rightarrow 3 \times 10^3 = \frac{m \times 10 \times 10}{60}$$

$$\Rightarrow 18000 = m \rightarrow D$$

(5)

$m_{\text{air}} = 2 \text{ gm} = 2 \times 10^{-3} \text{ kg}$; $t = 1 \text{ sec}$; speed $= 150 \text{ m/s}$

$$\text{lung's Power} = \frac{W}{t} = \frac{\frac{1}{2} m v^2}{t}$$

$$P = \frac{1}{2} \times 2 \times 10^{-3} \times (150)^2$$

$$P = 22500 \times 10^{-3} = 22.5 \text{ W} \rightarrow B$$

(6)

Given $\frac{n}{t} = 240/60 \text{ bullets/sec}$

$m_{\text{bullet}} = 10 \text{ gm} = 10 \times 10^{-3} \text{ kg}$; power $= 7.2 \times 10^3 \text{ W}$

$$\text{Power} = \frac{W}{t} = \frac{n}{t} \times \frac{1}{2} m v^2$$

$$\Rightarrow 7.2 \times 10^3 = \frac{240}{60} \times \frac{1}{2} \times 10^{-2} \times v^2$$

$$\Rightarrow \frac{7200}{36} = v^2 \times 10^{-2}$$

$$\Rightarrow v^2 = 100 \times 3600$$

$$\Rightarrow v = 600 \text{ m/s} \rightarrow B$$

(7)

$$m_2 = 2m_1 \quad v_2 = \frac{1}{2} v_1$$

we know Power = $\frac{W}{t} = \frac{n \times \frac{1}{2} m v^2}{t}$

$$P \propto m v^2$$

$$\Rightarrow \frac{P_1}{P_2} = \frac{m_1}{m_2} \left(\frac{v_1}{v_2} \right)^2$$

$$\Rightarrow \frac{P_1}{P_2} = \frac{m_1}{2m_1} \times \left(\frac{v_1}{\frac{1}{2} v_1} \right)^2$$

$$\Rightarrow \frac{P_1}{P_2} = \frac{1}{2} \times 2^2 = \frac{2}{1} \rightarrow D.$$

(8)

No. of bullets per sec = $\frac{420}{60}$

Velocity $v = 300 \text{ m/s}$; $m_{\text{bullet}} = 19 \text{ g} = 10^{-3} \text{ kg}$.

Power = $\frac{W}{t} = \frac{n \times \frac{1}{2} m v^2}{t}$

$$= \frac{420}{60} \times \frac{1}{2} \times 10^{-3} \times (300)^2$$

$$= 7 \times \frac{1}{2} \times 10^{-3} \times 90 \times 10^3$$

$$\Rightarrow 315 \text{ W} \rightarrow A$$

(9)

velocity $v = 3 \text{ m/s}$; Force $F = 5 \text{ N}$.

Power = $F \cdot v$

$$= 3 \times 5$$

$$= 15 \text{ W} \rightarrow A$$

Given $F = 10\text{ N}$; Power = 100 W .

We know Power = $F \cdot v$

$$= 100 = 10 \cdot v$$

$$\Rightarrow v = 10\text{ m/s} \rightarrow B$$

Advanced

(2)

Total mass = $50 + 30 = 80\text{ kg}$; height $h = 20\text{ m}$; $t = 40\text{ s}$.

$$\text{work done} = mgh = 80 \times 20 \times 10 = 16000\text{ J}.$$

$$\text{Power} = \frac{W}{t} = \frac{16000}{40} = 400\text{ W} \rightarrow A$$

(5)

$$[\text{work}] = \text{ML}^2\text{T}^{-2}; [\text{linear momentum}] = \text{MLT}^{-1}$$

$$[\text{Power}] = \text{ML}^2\text{T}^{-3}; [\eta] = \frac{[P_{\text{out}}]}{[P_{\text{in}}]} = \frac{\text{ML}^2\text{T}^{-3}}{\text{ML}^2\text{T}^{-3}} = \text{M}^0\text{L}^0\text{T}^0$$

(6), (7), (8)

$$T.E = P.E + K.E = mgh.$$

at height = $\frac{3h}{4}$ $P.E = mgh = mg\left(\frac{3h}{4}\right) = \frac{3}{4}mgh$

$$\text{kinetic energy} = T.E - P.E = mgh - \frac{3}{4}mgh = \frac{1}{4}mgh$$

$$\therefore \frac{K.E}{P.E} = \frac{\frac{1}{4}mgh}{\frac{3}{4}mgh} = \frac{1}{3}$$

~~Exo~~ LTASK

COQA

(2)

let mass = m : velocity = v .

$$\text{weight} = mg = F.$$

$$\therefore \text{Power} = \text{Force} \times \text{velocity} \\ = mgv$$

(4)

weight to be lifted = Mg : height = h .

$$\therefore \text{Power} = \frac{W}{t} = \frac{mgh}{t} = mgv$$

here 'h' is displacement of the body $\therefore v = \frac{h}{t}$

(5)

we know $\text{Power} = \frac{W}{t} = \frac{F \times \text{displacement}}{\text{time}}$

$$\text{Power} = \text{kg m/s}^2 \times \frac{\text{m}}{\text{s}}$$

$$= \text{kg m}^2/\text{s}^3 = \text{kg m}^2 \text{s}^{-3} \rightarrow \text{C}$$

(6)

we know that $\text{Power} = F \cdot v = Fv \cos \theta$.

when force and velocity are perpendicular $\theta = 90^\circ$

$$P = Fv \cos 90^\circ = 0.$$

(8)

Given $\text{Power} = 0.392 \text{ kW} = 392 \text{ W}$: $h = 10 \text{ m}$; $t = 60 \text{ s}$.

$$\text{Power} = \frac{W}{t} = \frac{mgh}{t}$$

$$\Rightarrow m = 4 \times 60$$

$$= 240 \text{ kg} \rightarrow A$$

$$\Rightarrow 392 = m \times \frac{9.8 \times 10}{60}$$

$$\Rightarrow m = \frac{392 \times 60}{9.8}$$



(1)

$$\text{weight} = mg = 300 \text{ N}$$

$$\text{height} = h = 10 \text{ m} ; t = 10 \text{ sec}$$

$$\text{Power} = \frac{mgh}{t}$$

$$P = \frac{300 \times 10}{10} = 300 \text{ W}$$

(2)

$$\text{Given mass} = 100 \text{ kg} ; \text{time} = 2 \times 60 \text{ sec} ; \text{depth } h = 120 \text{ m}$$

$$\text{Power} = \frac{\text{work}}{\text{time}} = \frac{mgh}{t}$$

$$= \frac{100 \times 10 \times 120}{2 \times 60}$$

$$= 1000 \text{ W} \rightarrow A.$$

(3)

$$m = 20 \text{ kg} ; \text{height} = 20 \text{ m} ; \text{time} = 25 \text{ sec.}$$

$$\text{Power} = 200 \text{ W}$$

$$\text{Mass of man} = M.$$

$$\text{Total mass} = M + 20$$

$$\therefore \text{Power} = \frac{mgh}{t} = \frac{(M+20) \times 10 \times 20}{25}$$

$$= 200 = \frac{(M+20) \times 200}{25}$$

$$\Rightarrow M + 20 = 25 \Rightarrow M = 5 \text{ kg} \rightarrow B$$

(4)

$$\text{Power} = 6 \text{ kW} = 6 \times 10^3 \text{ W} ; \text{height } h = 20 \text{ m}$$

$$\text{time} = 60 \text{ sec}$$

$$\text{Power} = \frac{mgh}{t}$$

$$\Rightarrow 6 \times 10^3 = \frac{m \times 10 \times 20}{60}$$

$$\Rightarrow m = \frac{6 \times 6 \times 10^3}{20} = 6 \times 3 \times 10^2 = 1800 \text{ kg} \rightarrow D$$

(5)

Given

$$m_{\text{air}} = 3 \text{ gm} = 3 \times 10^{-3} \text{ kg}$$

$$v = 200 \text{ m/s} ; \text{ time } t = 1 \text{ sec}$$

$$\text{Power} = \frac{W}{t} = \frac{\frac{1}{2} m v^2}{t}$$

$$P = \frac{1}{2} \times 3 \times 10^{-3} \times (200)^2$$

$$P = \frac{1}{2} \times 3 \times 10^{-3} \times 4 \times 10^4$$

$$P = 60 \text{ W} \rightarrow B$$

(6)

$$\text{No. of bullets per sec} = \frac{120}{60}$$

$$m_{\text{air}} = 10 \text{ gm} = 10 \times 10^{-3} \text{ kg} = 10^{-2} \text{ kg}$$

$$\text{Power} = 3.6 \text{ kW} = 3.6 \times 10^3 \text{ W}$$

$$\text{Power} = \frac{W}{t} = n \frac{\frac{1}{2} m v^2}{t}$$

$$\Rightarrow 3600 = \frac{120}{60} \times \frac{1}{2} \times 10^{-2} \times v^2$$

$$\Rightarrow 3600 \times 10^2 = v^2 \Rightarrow v = \sqrt{3600 \times 10^2} \Rightarrow v = 600 \text{ m/s} \rightarrow B$$

(7)

Given

$$m_2 = 2m_1 ; v_2 = \frac{1}{4} v_1$$

$$\therefore \text{Power} = \frac{W}{t} = n \frac{\frac{1}{2} m v^2}{t}$$

$$P \propto m v^2$$

$$\Rightarrow \frac{P_1}{P_2} = \left(\frac{m_1}{m_2} \right) \left(\frac{v_1}{v_2} \right)^2 = \left(\frac{m_1}{2m_1} \right) \left(\frac{v_1}{\frac{1}{4}v_1} \right)^2$$

$$\Rightarrow \frac{P_1}{P_2} = \frac{1}{2} \times 16 = \frac{8}{1} \rightarrow D$$

⑧

No. of bullets Per sec $\frac{n}{t} = \frac{120}{60} = 2$

velocity $v = 100 \text{ m/s}$

mass $m = 2 \text{ gm} = 2 \times 10^{-3} \text{ kg}$

Power = $\frac{W}{t} = \frac{n}{t} \frac{1}{2} m v^2$

$P = 2 \times \frac{1}{2} \times 2 \times 10^{-3} \times (100)^2$

$= 2 \times 10^{-3} \times 10^4$

$= 20 \text{ W} \rightarrow \text{A}$

⑨

Given velocity $v = 6 \text{ m/s}$

force = 10 N

Power = $F v = 10 \times 6 = 60 \text{ W} \rightarrow \text{A}$

⑩

Given Force = 20 N ; Power = 200 W

Power = $F v$

$= 200 = 20 v$

$\Rightarrow v = 10 \text{ m/s} \rightarrow \text{B}$

Advanced

①

we know that Power = $\frac{W}{t}$

Power $\propto \frac{1}{t_{\text{time}}}$

less in the time, more is Power.

⑤

④, ⑤, ⑥

Given $m = 4 \text{ kg}$; Velocity $= 5 \text{ m/s}$; height $h = 10 \text{ m}$

kinetic energy $K.E = \frac{1}{2} m v^2$
 $= \frac{1}{2} \times 4 \times 5^2$
 $= 2 \times 25$
 $= 50 \text{ J}$

P.E $= m g h$
 $= 4 \times 10 \times 10$
 $= 400 \text{ J} \rightarrow D$

Total Energy $= K.E + P.E$
 $= 50 + 400$
 $= 450 \text{ J}$