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Work and Energy (Previous years NTSE Questions)

Homework

Sol 1. $K.E. = \frac{p^2}{2m} \Rightarrow p = \sqrt{2mK.E}$

$K.E.' = K.E. + \frac{300}{100} K.E. = 4K.E.$

$4K.E = 4\frac{p^2}{2m}$

$p' = \sqrt{2mK.E'}$

$\Rightarrow p' = \sqrt{2m \times 4K.E}$

$\Rightarrow p' = \sqrt{4p} \Rightarrow p' = 2\sqrt{p}$

$\Rightarrow p' = 2\sqrt{2mK.E} = 2p$

% increase in linear momentum

$= \frac{2p - p}{p} \times 100\% = \frac{p}{p} \times 100\% = 100\%$

Sol 2. $P = \frac{Work}{Time} \Rightarrow P = 1$

Sol 3. $K.E = W = F.S$

$K.E_{Lorry} = F \times S_{Lorry}$

$K.E_{Car} = F \times S_{Car}$

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$K.E_{lorry} = K.E_{car}$

$\Rightarrow F \times S_{lorry} = F \times S_{car}$

$\Rightarrow S_{lorry} = S_{car}$

∴ (B) Both come to rest in a same distance.

Sol^n 4. Power = $\frac{\text{work done}}{\text{Time taken}}$

Work done = mgh

$\Rightarrow W = 60 \times 10 \times (45 \times \frac{10}{100})$

$\Rightarrow W = 2700$ J

Time taken = 9 s

Power = $\frac{2700}{9} = 300$ W (a)

Sol^n 5. ~~100~~ $= K.E = \frac{p^2}{2m}$

$\Rightarrow 100 = \frac{p^2}{2m} \Rightarrow p = \sqrt{2m \times 100}$

~~$\Rightarrow p = 10$~~

$p' = 3p$

~~$p' = \sqrt{2mK.E'}$~~

$\Rightarrow K.E' = \frac{(p')^2}{2m} \Rightarrow K.E' = \frac{9p^2}{2m}$

$\Rightarrow K.E' = 9 \times 100 = 900\ J$

Increase in $K.E = 900J - 100J$

$= 800J$ (d)

Sol'n 6. $\text{Power} = \frac{mgh}{t}$

$\Rightarrow \text{Power} = \frac{1000 \times 10 \times 12^2}{60}$

$\Rightarrow \text{Power} = 2000\ W$

$1\ H.P = 746\ W$

$\Rightarrow 2000\ W = \frac{1}{746} \times 2000$

$\simeq 2.63\ H.P$ (c)