5. $P = \frac{W}{t}$ $\quad 1\,hp = 746\,Watts \rightarrow 40\,hp = 29{,}840\,Watts$

$$29840\,W = \frac{2000\,J}{t}$$

$$\boxed{t = .067\,secs}$$

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6. car A

$KE_i = 0$

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

$= \frac{1}{2}(1200kg)(40m/s)^2$

$= 960{,}000\,J$

$W = \Delta KE \therefore W = 960{,}000J$

car B

$KE_i = 0$

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

$= \frac{1}{2}(2000kg)(40m/s)^2$

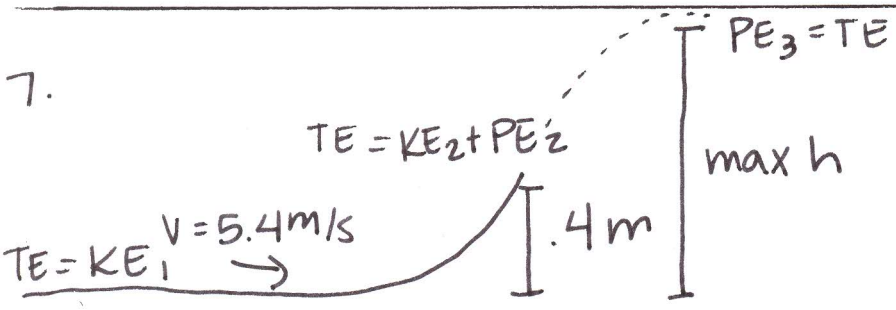
$= 1{,}600{,}000\,J$

$W = \Delta KE \therefore W = 1{,}600{,}000J$

car B requires $\boxed{640000\,J}$ more work

---

7.




Since energy is conserved $TE = TE$ at all pts!

a. $TE_1 = TE_2$

$KE_1 = KE_2 + PE_2$

$\frac{1}{2}mv_1^2 = \frac{1}{2}mv_2^2 + mgh_2$

$\frac{1}{2}(5.4m/s)^2 = \frac{1}{2}v_2^2 + (9.8m/s^2)(.4m)$

$$\boxed{v_2 = 4.617\,m/s}$$

b. $TE_1 = TE_3$

$KE_1 = PE_3$

$\frac{1}{2}mv_1^2 = mgh_3$ $\rightarrow$ $\frac{1}{2}(5.4m/s)^2 = (9.8m/s^2)h_3$

$$\boxed{h_3 = 1.488\,m}$$