Final Review

Unit 7 - Work, Energy, Power

(13) a) $W = F \cdot d = 300(12) = \boxed{3600\ J}$

b) $W_{friction} = \boxed{-3600\ J}$ (constant speed)

c) $P = \frac{W}{t} = \frac{3600}{10} = \boxed{360\ W}$

(14) a) $W = F \cdot d = 600(9.8)(50) = \boxed{294{,}000\ J}$

b) $P = W/t = 294{,}000/90 = \boxed{3{,}267\ W}$

(15) $W = Fd\cos\theta$

$15{,}000 = 200 \cdot d \cdot \cos 60^\circ \ (= 100d)$

$d = \boxed{150\ m}$

(16) Work-Energy Theorem: $W = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_0^2$

$W = \frac{1}{2}(12)25^2 - \frac{1}{2}(12)10^2 = \boxed{3150\ J}$

(17) F·d → $W = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_0^2$ (at rest before)

$75(0.5) = \frac{1}{2}(2.5)v_f^2 \rightarrow v_f = \boxed{5.5\ m/s}$

(18) $W = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_0^2$

$10{,}000 = \frac{1}{2}(7.5)(45^2) - \frac{1}{2}(7.5)v_0^2$ ← *unsolvable due to typo*

~~[illegible]~~

Change W to 5000 J and you should get an answer of $\boxed{25.3\ m/s}$

(19) a) $KE = \frac{1}{2}mv^2 = \frac{1}{2}(125)(5^2) = \boxed{1563\ J}$

b) $GPE = mgh = (125)(9.8)(15) = \boxed{18{,}375\ J}$

(20) a) ~~PE = mgh (150)(25)~~ $PE_{TOP} = KE_{BOTTOM}$

$PE = \boxed{3{,}375{,}000\ J}$

b) $PE = mgh$

$3{,}375{,}000 = 750(9.8)h \rightarrow h = \boxed{459\ m}$

c) $KE = \frac{1}{2}mv^2$

$3{,}375{,}000 = \frac{1}{2}(750)v^2 \rightarrow v = \boxed{95\ m/s}$

(21) a) $GPE = mgh = (80)(9.8)(3.5) = \boxed{2744\ J}$

b) $KE_{BOTTOM} = GPE_{TOP} = 2744$

$KE = \frac{1}{2}mv^2 \rightarrow 2744 = \frac{1}{2}(80)v^2 \rightarrow v = \boxed{8.3\ m/s}$

c) $GPE = mgh = 80(9.8)(1.5) = \boxed{1176\ J}$

$KE = 2744 - 1176 = \boxed{1568\ J}$

d) $KE = \frac{1}{2}mv^2 \rightarrow 1568 = \frac{1}{2}(80)v^2 \rightarrow v = \boxed{6.3\ m/s}$