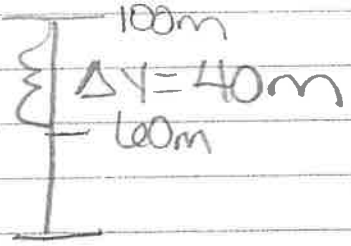
Work & Energy 2019 Review

① 

$\Delta Y = 40m$

$U_g = mg\Delta Y$

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

$U_g = K$

$mg\Delta Y = \frac{1}{2}mv^2$

$v = \sqrt{2g\Delta Y} = \sqrt{2(9.8 m/s^2)(40m)}$

$\boxed{v = 28m}$

② $m = 4Kg$

$v_i = 12 m/s$

$a = 3 m/s^2$

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

$W = \Delta K$

$K = \frac{1}{2}(4Kg)(12 m/s)^2$

$\boxed{W = \Delta K = -288J}$

③ $m = 105Kg$

$\Delta Y = 15m$

$v_i = 4 m/s$

$v_f = 0 m/s$

$F = (105Kg)(9.8 m/s^2)$

$= 1029N$

$W = Fd$

$= (1029N)(15m)$

$= 15435J$

$* K_i + U_{gi} + W = K_f + U_f$

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

$= \frac{1}{2}(105Kg)(4)^2$

$= 840$

$W = 15435J - 840J$

$\boxed{W = 14595J}$

(4) $P = \frac{W}{t} = \frac{Fd^*}{t} = \boxed{\frac{mgd}{t}}$ $\quad d^* = H$

(5) $\Delta y = 70\,m$
$m = 1\,kg$
$v_i = 10\,m/s$
$v_f = 30\,m/s$

$K_i = \frac{1}{2}mv^2 = 50J$
$\frac{1}{2}(1kg)(10m/s)^2 = 50J$

$K_f = \frac{1}{2}mv^2$
$\frac{1}{2}(1kg)(30m/s)^2$
$= 450J$

$\Delta K = 400J$

$U_g = mg\Delta y$
$= (1kg)(9.8m/s^2)(70m)$
$= 686J$

$K_i + U_g + W = K_f + U_{gf}$
$= \Delta K + \Delta U_g$
$= (450J - 50J) + (0 - 686J)$
$= -286J$

$\boxed{-E = 300J}$

(6) $k = 60\,N/m$
$\Delta x = 0.50\,m$

$U_s = \frac{1}{2}kx^2$

$U_s = \frac{1}{2}(60N/m)(0.5m)^2$

$\boxed{U_s = 7.50J}$

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

(8) $m = 1000\,kg$ $\quad K = \frac{1}{2}mv^2$

$\Delta y = 8\,m$

$F_{Ten} = 11{,}000\,N$ $\quad U_{gi} = mg\Delta y$

$= 78{,}400\,J$

$v_i = \sqrt{2g\Delta y}$ $\quad mg\Delta y = \frac{1}{2}mv^2$

$v_i = \sqrt{2.98\,m/s^2 \cdot 1m}$

(9) $\Delta y = 0.2m$ $\quad F = kx$

$F = 20N$

$m = 0.4kg$ $\quad k = F/x$

$20N/.2m$

$U_S = \frac{1}{2}kx^2$

$\frac{1}{2}(100N/m)(.2m)^2 = 2J$

$U_{Si} = K_f = \frac{1}{2}mv^2$

$v = \sqrt{\frac{2U_{Si}}{m}} = \frac{2(2J)}{.4kg} = 3.16$

$\boxed{v = 3.20\,m/s}$

(10) fall accelerate at same rate from 40m height

(11) Wall is stationary
$W = Fd\cos\theta \quad d = \emptyset$

(12) Depends on direction object moves

(13) Returned to original position
$W = Fd\cos\theta \quad d = \emptyset$

(14) $K = \frac{1}{2}mv^2$

$K_1 = \frac{1}{2}(500kg)(0m/s)^2$
$= 4.0 \times 10^5 J$

$K_2 = \frac{1}{2}(1000kg)(20m/s)^2$
$= 2.0 \times 10^5 J$

15) $m_T = 4m_c$
$V_T = 2V_c$

$K_c = \frac{1}{2}mv^2$
$K_t = \frac{1}{2}(4m_c)(2V)^2$

$\boxed{K_t = 16K_c}$

16) $W = Fd\cos\theta$
$m = 12\,kg$
$d = 4.3\,m$
$F = 22\,N$

$W = (22N)(4.3m)\cos\emptyset$
$= 94.6\,J$
$W = \boxed{95\,J}$

17) $W = 555\,J$
$\theta = 36°$
$d = 15\,m$
$F_{ten} = ?$

$W = Fd\cos\theta$

$F = \frac{W}{d\cos\theta} = \frac{555\,J}{(15m\cos 36°)} = 45.7\,N$

$\boxed{F = 46\,N}$

18)* need circumference

$C = 2\pi r$

$= 2(3.14)(1.82m)$

$= 11.4m$

$W = F_f d \cos\theta$

$F_f = \mu mg$

$(.25)(65N) = 16.25N$

$W = (16.25)(11.4m)$

$= 185.8J$

$\boxed{W = 190J}$

19) $F = kx$ $\quad m = 10kg$, $x = 2cm$

$k = F/x$

$98N/2cm$

$F = (10kg)(9.8m/s^2)$

$= 98N$

$\boxed{k = 49N/m}$

20) $v_0 = 29.1m/s$

$\Delta y = 1.5m$

$H = ?$

$U_g = K_e$

$mg\Delta y = \frac{1}{2}mv^2$

$\Delta y = \frac{v^2}{2g} = \frac{(29.1m/s)^2}{2(9.8)}$

$= 43.2m$

Add 1.50m

$\Delta y = 43.2m$

$+ 1.50m$

$\boxed{\Delta y = 44.7m}$