Answers: Practice Test (W, P, E) - 2013

1) A) B → vertical force, horizontal displacement
C → small Δd
D → no friction = very small force need

2) A) KE increases then decreases
KE as a function of position is linear

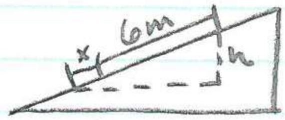
3) $F_{ap_x} = 2.0 \times 10^3\ N \times \cos 20°$
$= 1879\ N$

$W = F \cdot \Delta d$
$= (1879\ N)(50.0\ m)$
$= 93950\ J$

$P = \frac{W}{\Delta t}$
$= \frac{93950\ J}{5.0\ s}$
$= 1.9 \times 10^4\ W$

oops! 5) $PE_i - W_f = KE_f$
$KE_f = mgh - F \cdot \Delta d$
$= (1.0\ kg)(9.8\ m/s^2)(0.25\ m) - (1.325\ N)(0.75\ m)$
$= 1.456\ J$

$KE = \frac{1}{2} m v^2$
$v^2 = \frac{2KE}{m}$
$= \frac{2(1.456\ J)}{1.0\ kg}$
$v^2 = 2.912\ m^2/s^2$
$v = 1.7\ m/s$

oops! 6) 

$\sin 30^\circ = \frac{h}{6m + x} \rightarrow h = \sin 30^\circ (6m + x)$

$h = 3m + 0.5x$

$E_{p_i} = E_e$

$mgh = \frac{1}{2} k x^2$

$(20kg)(9.8\frac{m}{s^2})(3m + 0.5x) = \frac{1}{2}(200N/m)x^2$

$588J + 98x = 100x^2$ quadratic!

$0 = 100x^2 - 98x - 588J$

$x = \frac{98 \pm \sqrt{(98)^2 - 4(100)(-588)}}{2(100)}$

$x = \frac{98 \pm 495}{200} \rightarrow$ $\boxed{x = 2.97m}$ or ~~$x = -1.99m$~~

oops! 4) $W = \Delta KE$

$F\Delta d = KE_f^{\nearrow 0} - KE_i$

$F\Delta d = -\frac{1}{2} m v^2$

$F = -\frac{\frac{1}{2} m v^2}{\Delta d}$

$= -\frac{\frac{1}{2}(0.275kg)(25 m/s^2)^2}{0.30m}$

$= \underline{\underline{286N}}$

495

7) $PE_i = KE_f$

$mgh = \frac{1}{2} m v^2$

$v^2 = 2gh$

$= 2(9.8 m/s^2)(0.1m)$

$v^2 = 1.96 m^2/s^2$

$\underline{\underline{v = 1.4 m/s}}$

8) $PE_i - W \quad 0$ (use 5.0m as $PE = 0$)

$PE_i = W_f$

$mgh = F\Delta d$

$F = \frac{mgh}{\Delta d}$

$= \frac{(200kg)(9.8m/s^2)(5.0m)}{30.0m}$

$= \underline{\underline{327N}}$

9) $PE_i = E_s$

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

$k = \frac{2mgh}{x^2}$

$= \frac{2(0.75kg)(0.552m)}{(0.0264m)^2}$

$= \underline{\underline{1188N/m}}$

10) $W_{ap} = PE_f$

$F\Delta d = mgh$

$h = \frac{F\Delta d}{mg}$

$= \frac{(73.5N)(0.40m)}{(0.105kg)(9.8m/s^2)}$

$= \underline{\underline{28.6m}}$

↖ although the question does say "from starting position", the diagram does ask for h from the <u>top of the apparatus</u>.

11) $E_s - W_f = KE_f$

note: x of spring = Δd for friction

$$KE_f = E_s - W_f$$
$$= \frac{1}{2}kx^2 - F_f\Delta d$$
$$= \frac{1}{2}(50N/m)(0.10m)^2 - (1.225N)(0.10m)$$
$$= 0.1275J$$

$$F_f = \mu F_N \qquad F_N = F_g$$
$$= 0.25(4.9N)$$
$$= 1.225N$$

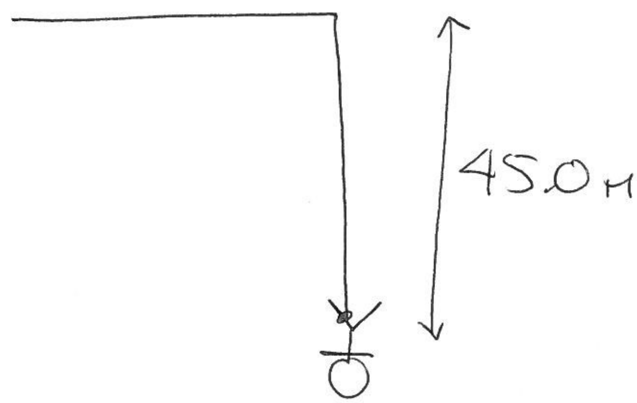
$$KE = \frac{1}{2}mv^2$$
$$v^2 = \frac{2KE}{m}$$
$$= \frac{2(0.1275J)}{0.5kg}$$
$$v^2 = 0.51 m^2/s^2$$
$$v = 0.71 m/s$$

12) From bridge to max speed

$$PE_i = KE_f$$
$$mgh = \frac{1}{2}mv^2$$
$$h = \frac{v^2}{2g}$$
$$= \frac{(24.2m/s)^2}{2(9.8m/s^2)}$$
$$= 29.9m$$

→

#13.



$X = 45.0m - 30.0m$
$= 15.0m$

① $E_{pi} = E_{kf} + E_e$

$E_{kf} = E_{pi} - E_e$
$= mgh - \frac{1}{2}kx^2$
$= (62kg)(9.8\frac{m}{s^2})(45.0m) - \frac{1}{2}(175N/m)(15.0m)^2$
$= 27\,342J - 19\,687.5J$
$= 7654.5J$

② $E_{kf} = \frac{1}{2}mv^2$

$v^2 = \frac{E_{kf}}{\frac{1}{2}m}$

$= \frac{7654.5J}{\frac{1}{2}(62kg)}$

$v^2 = 246.9 m^2/s^2$

$\boxed{v = 15.7m/s}$