

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

$$F_{apx} = 2.0 \times 10^3 N \times \cos 20^\circ \\ = 1879 N$$

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

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

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

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

$$v^2 = \frac{m}{2KE}$$

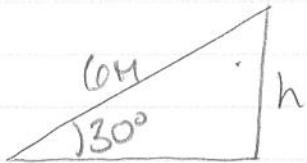
$$= \frac{m}{2(1.456 \text{ J})}$$

$$= \frac{1.0 \text{ kg}}{2.912 \text{ m}^2/\text{s}^2}$$

$$v = \underline{\underline{1.7 \text{ m/s}}}$$

oops!

(6)



$$\sin 30^\circ = \frac{h}{6\text{m}}$$

$$h = 6\text{m} \sin 30^\circ \\ = 3\text{m}$$

$$PE_i = E_s$$

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

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

$$= \frac{2(20\text{kg})(9.8\text{m/s}^2)(3\text{m})}{200\text{N/m}}$$

$$x^2 = 5.88\text{m}^2$$

$$x = 2.4\text{m}$$

oops!

(4)

$$W = \Delta KE$$

$$Fd = KE_f - KE_i$$

$$Fd = -\frac{1}{2}mv^2$$

$$F = -\frac{1}{2}mv^2$$

$$= -\frac{1}{2}(0.275\text{kg})(25\text{m/s}^2)^2$$
$$0.30\text{m}$$
$$= \underline{\underline{286\text{N}}}$$

$$(7) PE_i = KE_f$$

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

$$v^2 = 2gh$$

$$= 2(9.8\text{m/s}^2)(0.1\text{m})$$

$$v^2 = 1.96\text{m}^2/\text{s}^2$$

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

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

$$PE_i = W_f$$

$$mgh = F\Delta d$$

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

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

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

9) $PE_i = E_s$

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

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

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

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

10) $W_{ap} = PE_f$

$$F\Delta d = mgh$$

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

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

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

Although the question does say "from starting position", the diagram does ask for h from the top of the apparatus.

$$\begin{aligned}
 11) \quad E_s - W_f &= KE_f \\
 KE_f &= E_s - W_f \\
 &= \frac{1}{2} kx^2 - F_{\text{fr}}d \\
 &= \frac{1}{2} (50 \text{ N/m})(0.10 \text{ m})^2 - (1.225 \text{ N})(0.10 \text{ m}) \\
 &= 0.1275 \text{ J}
 \end{aligned}$$

note: x of spring
 $= \Delta d$ for friction

$$\begin{aligned}
 F_f &= \mu F_N \quad \uparrow \\
 &= 0.25 (4.9 \text{ N}) \\
 &= 1.225 \text{ N}
 \end{aligned}$$

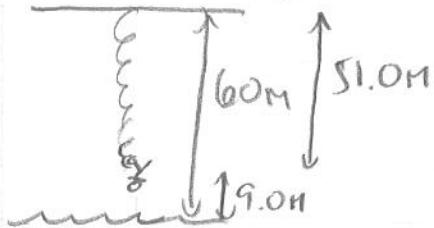
$$\begin{aligned}
 KE &= \frac{1}{2} mn v^2 \\
 v^2 &= \frac{2KE}{m} \\
 &= \frac{2(0.1275 \text{ J})}{0.5 \text{ kg}} \\
 v^2 &= 0.51 \text{ m}^2/\text{s}^2 \\
 v &= \underline{0.71 \text{ m/s}}
 \end{aligned}$$

12) From bridge to max speed

$$\begin{aligned}
 PE_i &= KE_f \\
 mgh &= \frac{1}{2} mn v^2 \\
 h &= \frac{v^2}{2g} \\
 &= \frac{(24.2 \text{ m/s})^2}{2(9.8 \text{ m/s}^2)} \\
 &= 29.9 \text{ m}
 \end{aligned}$$



From bridge to lowest point



$$\rightarrow x = 51.0\text{m} - 29.9\text{m} \\ = 21.1\text{m}$$

$$\begin{aligned} PE_i &= E_s \\ mgh &= \frac{1}{2} kx^2 \\ k &= 2mgh \\ &= 2(55\text{kg})(9.8\text{N/s}^2)(21.1\text{m}) \\ &= \underline{\underline{123\text{ N/m}}} \end{aligned}$$