

Answer of T.B ch8

1- KE = $\frac{1}{2}mv^2 = \frac{1}{2}(0.4)(16)^2 = 51 \text{ J}$

2- PE = mgh = $0.4 * 9.8 * 0.22 = 86 \text{ J}$

3- ME = KE + PE = $51 + 86 = 137 \text{ J}$

4- Drop due to gravity its mean free fall (acceleration is constant) then we use 5 equation to find final velocity just before hits the ground (Vf)

$$V_o = 16 \quad a = -9.8 \quad \Delta y = -22 \quad V_f = ????$$

$$V_f^2 = V_i^2 + 2a\Delta y$$

$$V_f^2 = (16)^2 + 2(-9.8)(-22) = 687.2 \left(\frac{m}{s}\right)^2$$

$$V_f = 26.2 \frac{m}{s}$$

$$KE = \frac{1}{2}mv_f^2 = \frac{1}{2}(0.4)(26.2)^2 = 137$$

5- $V_o = 16 \quad a = -9.8 \quad \Delta y = -22 \quad V_f = ????$

$$V_f^2 = V_i^2 + 2a\Delta y$$

$$V_f^2 = (16)^2 + 2(-9.8)(-22) = 687.2 \left(\frac{m}{s}\right)^2$$

$$V_f = 26.2 \frac{m}{s}$$

6- ME = KE + PE = $137 + 0 = 137 \text{ J}$

7- $PE = -W = -\left(-\frac{1}{2}k\Delta x^2\right) = \frac{1}{2}k(x_f^2 - x_i^2)$

$$PE = \frac{1}{2}(10)(0.25^2 - 0.2^2) = 0.1 \text{ J}$$

8- ANS1

$$PE_1 = -W = -\left(-\frac{1}{2}k \Delta x_1^2\right)$$

$$4 = \frac{1}{2} k (2 * 10^{-3})^2$$

$$K = 2 * 10^6 \frac{N}{m}$$

$$PE_2 = -W = -\left(-\frac{1}{2}k \Delta x_2^2\right) = \frac{1}{2} (2 * 10^6)(10 * 10^{-3})^2 = 100 J$$

ANS2

$$\frac{PE_1}{PE_2} = \frac{\frac{1}{2}k \Delta x_1^2}{\frac{1}{2}k \Delta x_2^2} = \frac{\Delta x_1^2}{\Delta x_2^2}$$

$$\frac{4}{PE_2} = \frac{(2 * 10^{-3})^2}{(10 * 10^{-3})^2} = 100J$$

9-

$$\frac{PE_1}{PE_2} = \frac{\frac{1}{2}k \Delta x_1^2}{\frac{1}{2}k \Delta x_2^2} = \frac{\Delta x_1^2}{\Delta x_2^2}$$

$$\frac{100}{PE_2} = \frac{(2 * 10^{-2})^2}{(10 * 10^{-2})^2} = 400J$$

the stored potential energy will be changed by $400 - 100 = 300J$ **10-** $PE = mgh = 580 (9.8) (14) = 79576 J \approx 80000 J = 80 KJ$ **11-** $ME_{at\ 38m} = ME_{at\ 14m}$

$$(PE + ME)_{at\ 38m} = (PE + ME)_{at\ 14m}$$

$$(1/2 m V^2 + mgh)_{at\ 38m} = (1/2 m V^2 + mgh)_{at\ 14m}$$

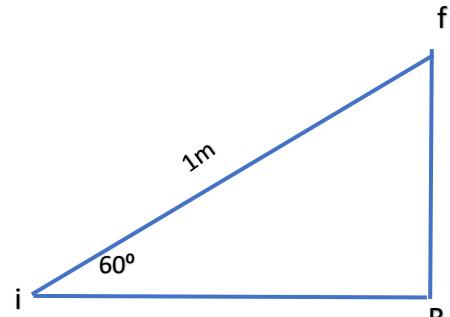
$$(0 + 580 * 9.8 * 38) = (KE + 80000)$$

$$KE = 135992 \approx 1360000 = 136 KJ$$

12- $ME \text{ at } 14m = (PE + ME) \text{ at } 14m = 80 + 136 = 216 \text{ KJ}$

13- $h_{\text{at point i}} = 0$ $h_{\text{at point f}} = Bf = 1 \sin 60^\circ = 0.866 \text{ m}$
the change in its potential energy as it moves from point (i) to point (f)

$$\begin{aligned}\Delta PE &= PE \text{ at point f} - PE \text{ at point i} \\ &= (mg h_{\text{at point f}} - mg h_{\text{at point i}}) \\ &= mg (h_{\text{at point f}} - h_{\text{at point i}}) \\ &= 15 * 9.8 * (0.86 - 0) = 128 \text{ J}\end{aligned}$$



14- $ME_i = ME_f$

$$\begin{aligned}(PE + ME)_i &= (PE + ME)_f \\ (1/2 m V^2 + mgh)_i &= (1/2 m V^2 + mgh)_f \\ (0 + mgh_i) &= (1/2 m V^2 + 0) \\ gh_i &= 1/2 m V^2\end{aligned}$$

$$\begin{aligned}V_{f(\text{pendulum})} &= \sqrt{2gh_i} \\ V_f &= \sqrt{2(9.8)(0.2)} = 2 \text{ m/s}\end{aligned}$$

15- $W = -\Delta PE = -(PE_f - PE_i) = -(1.2 - 2.5) = -(-1.3) = 1.3 \text{ J}$

16- $ME_i = ME_f$

$$\begin{aligned}(PE + ME)_i &= (PE + ME)_f \\ (3 + 2.5)_i &= (1.5 + 1/2 m V^2)_f \\ 5.5 - 1.5 &= \frac{1}{2} (1 V^2) \quad V = 2.8 \text{ m/s}\end{aligned}$$

17- $PE = -W = -\left(-\frac{1}{2} k \Delta x^2\right)$
 $0.65 = \frac{1}{2} k (0.1)^2$
 $K = 130 \text{ N/m}$

18- $PE = -W = -\left(-\frac{1}{2} k \Delta x^2\right)$

$$7 = \frac{1}{2} (500) \Delta x^2$$

$$\Delta x = 0.16 \text{ m}$$

19- Hight decreases, PE decreases

