PHY 101
ENERGY HW SOLUTIONS

6. a) $PE = mgh = (2kg)(9.8 m/s^2)(1.2m) = 23.52 J$

b) $PE = mgh = (2kg)(9.8 m/s^2)(11.2m) = 219.52 J$

c) $PE = mgh = (2kg)(9.8 m/s^2)(-3.5m) = -68.6 J$

7. a) $KE = \frac{1}{2}mv^2 = \frac{1}{2}(0.015kg)(0)^2 = 0 J$

b) $KE = \frac{1}{2}mv^2 = \frac{1}{2}(0.015kg)(0.95 m/s)^2 = 0.0068 J$

c) $KE = \frac{1}{2}mv^2 = \frac{1}{2}(0.015kg)(0.32 m/s)^2 = 0.00077 J$

8. $PE_{ant} = mgh = (0.02kg)(9.8 m/s^2)(5m) = 0.98 J$

$PE_{person} = mgh = (85kg)(9.8 m/s^2)(5m) = 4165 J$

$PE_{elephant} = mgh = (1500kg)(9.8 m/s^2)(5m) = 73,500 J$

Elephant has largest PE and thus largest KE since $\Delta PE = -\Delta KE$. As the elephant falls, it loses PE and gains KE. Right before it hits, all its PE has been converted to KE.

9. a) $PE = mgh = mg(2m) = 2mg$, $KE = \frac{1}{2}mv^2 = 0$

b) $PE = 1.75mg$, $KE = .25mg$

c) $PE = mg$, $KE = mg$

d) $PE = 0$, $KE = 2mg$

10. See above

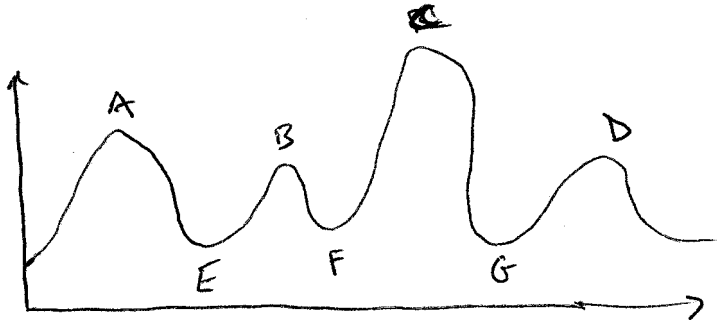
11. a) $v = 0$

b) $.25mg = \frac{1}{2}mv^2 \Rightarrow \frac{1}{2}g = v^2 \Rightarrow v = \sqrt{\frac{g}{m}(.5m)} = 2.2\,m/s$

c) $mg = \frac{1}{2}mv^2 \Rightarrow v^2 = 2g \Rightarrow v = \sqrt{g(2m)} = 4.43\,m/s$

d) $2mg = \frac{1}{2}mv^2 \Rightarrow v^2 = 4g \Rightarrow v = \sqrt{g(4m)} = 6.3\,m/s$

12. a)



b) The highest point will have the highest PE
The lowest point will have the lowest PE
The lowest points will have the highest KE and thus highest speed

c) see above.

13. $v = 5.7\,m/s \longrightarrow KE = \frac{1}{2}m(5.7\,m/s)^2 = (16.245)m$ (Joules)

at the very top, all KE has been converted to PE

$\Rightarrow \frac{1}{2}mv^2 = mgh \Rightarrow h = \frac{\frac{1}{2}(5.7\,m/s)^2}{g} = \frac{16.245}{9.8} = 1.66m$

14. a) $PE = mgh = 6.7m$

b) $6.7m = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{2 \times 6.7} = 3.66\,m/s$

c) $PE = mgh = 2.45m$

$\Delta PE + \Delta KE = 0$

$\Delta PE = (6.7m - 2.45m)$ $\Delta KE = KE_f - 0$

$\Rightarrow KE = 4.25m$

d) $4.25m = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{8.5} = 2.9\,m/s$