KINETIC ENERGY AND POTENTIAL ENERGY -SOLUTIONS

1. GIVEN:
$m = 60.0\ kg$
$v = 4.0\ \frac{m}{s}$

$E_k = \frac{1}{2}mv^2$
$= \frac{1}{2}(60.0)(4.0)^2$
$= 480\ J$

2. GIVEN:
$m = 7.26\ kg$
$h = 85\ cm = 0.85\ m$

$E_p = mgh$
$= (7.26)(9.8)(0.85)$
$= 61\ J$

3. a) GIVEN:
$m = 15\ g = 0.015\ kg$
$v = 24\ \frac{m}{s}$

$E_k = \frac{1}{2}mv^2$
$= \frac{1}{2}(0.015)(24)^2$
$= 4.3\ J$

b) GIVEN:
$m = 0.015\ kg$
$h = 40.\ m$

$E_p = mgh$
$= (0.015)(9.8)(40)$
$= 5.9\ J$

4. a) GIVEN:
$m = 1500\ kg$
$v_i = 0$
$v_f = 10\ \frac{m}{s}$

$\Delta E_k = E_{kf} - E_{ki}$
$= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$
$= \frac{1}{2}m(v_f^2 - v_i^2)$ ($v_i^2 \to 0$)
$= \frac{1}{2}(1500)(10^2)$
$= 75000\ J$

b) GIVEN:

$m = 1500\,kg$

$v_i = 10\,\frac{m}{s}$

$v_f = 20\,\frac{m}{s}$

$\Delta E_k = E_{kf} - E_{ki}$

$= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$

$= \frac{1}{2}m(v_f^2 - v_i^2)$

$= \frac{1}{2}(1500)(20^2 - 10^2)$

$= 225000\,J$

c) GIVEN:

$m = 1500\,kg$

$v_i = 20\,\frac{m}{s}$

$v_f = 30\,\frac{m}{s}$

$\Delta E_k = E_{kf} - E_{ki}$

$= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$

$= \frac{1}{2}m(v_f^2 - v_i^2)$

$= \frac{1}{2}(1500)(30^2 - 20^2)$

$= 375000\,J$

5 a) GIVEN:

$m_A = m$

$m_B = 4m$

$h_A = h_B = h$

$E_{P,A} = m_A g h_A$

$= mgh$

$E_{P,B} = m_B g h_B$

$= 4mgh$

$= 4E_{P,A}$

$E_P \propto m$

POTENTIAL ENERGY OF OBJECT B IS GREATER BY FACTOR of 4.

b) GIVEN:

$E_{PA} = E_{P,B}$

$m_A = m$

$E_{PA} = E_{PB}$

$m_A g h_A = m_B g h_B$

$m g h_A = (4m) g h_B$

$m_B = 4m$

$h_A = 4h_B$

OBJECT A MUST BE LIFTED TO A HEIGHT OF 4h (+3h COMPARED TO ITS INITIAL HEIGHT)

6. GIVEN:

$m_{RYAN} = m_{ALEX} = m$

$v_{ALEX} = v$

$v_{RYAN} = 2v_{ALEX} = 2v$

$$E_{k,ALEX} = \frac{1}{2} m_{ALEX} v_{ALEX}^2$$
$$= \frac{1}{2} m v^2$$

$$E_{k,RYAN} = \frac{1}{2} m_{RYAN} v_{RYAN}^2$$
$$= \frac{1}{2} m (2v)^2$$
$$= 4\left(\frac{1}{2} m v^2\right)$$
$$= 4 E_{k,ALEX}$$

RYAN'S KINETIC ENERGY IS GREATER BY A FACTOR OF 4.

7. a) GIVEN:

$m = 10.0\ kg$

$v_i = 7.0\ \frac{m}{s}$

$E_k = ?$

$$E_{k_i} = \frac{1}{2} m v_i^2$$
$$= \frac{1}{2} (10.0)(7.0)^2$$
$$= 245\ J$$

b) GIVEN:

$v_i = +7.0 \frac{m}{s}$

$v_f = 0$

$a = -9.8 \frac{m}{s^2}$

$d = ?$

$v_f^2 = v_i^2 + 2ad$

$0 = v_i^2 + 2ad$

$d = -\frac{v_i^2}{2a}$

$= -\frac{(7.0)^2}{2(-9.8)}$

$= 2.5\ m$

c) GIVEN:

$m = 10.0\ kg$

$h = 2.5\ kg$

$E_p = ?$

$E_p = mgh$

$= (10.0)(9.8)(2.5)$

$= 245\ J$

THE POTENTIAL ENERGY AT THE PEAK IS THE SAME AS THE INITIAL KINETIC ENERGY.