

SPH3UC - kinetic energy hmw

1.)



$$m = 30 \text{ kg} + 2 \text{ kg} = 32 \text{ kg}$$

$$E_k = 1600 \text{ J} \quad v = ?$$

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

$$m v^2 = 2 E_k$$

$$v = \sqrt{\frac{2 E_k}{m}}$$

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

$$v = \sqrt{\frac{2(1600)}{32}} = \sqrt{100} = 10 \text{ m/s}$$

2.)

$$m = 30 \text{ kg}$$

$$v_1 = 0 \text{ m/s}$$

$$v_2 = 5 \text{ m/s}$$

$$\Delta d = 15 \text{ m}$$

$$a.) E_{k1} = \frac{1}{2} m v_1^2$$

$$= \frac{1}{2} (30) (0)^2 = 0 \text{ J}$$

$$b.) E_{k2} = \frac{1}{2} m v_2^2$$

$$= \frac{1}{2} (30) (5)^2 = 375 \text{ J}$$

$$c.) F_{\text{net}} = m \cdot a$$

$$a = \frac{v_2^2 - v_1^2}{2 \Delta d}$$

$$F_{\text{net}} = (30 \text{ kg}) \left(\frac{25}{30} \right) = \frac{5^2 - 0^2}{2(15)} = \frac{25}{30} \text{ m/s}^2$$
$$= 25 \text{ N}$$

$$d.) W = F \cdot \Delta d$$

$$= (25) (15) = 375 \text{ J}$$

3.) $m = 2 \text{ kg}$ $v_1 = 1.5 \text{ m/s}$ $W = 20 \text{ J}$
 $v_2 = ?$

$$W = \Delta E_k$$

$$\left(W = \frac{1}{2} m v_2^2 - \frac{1}{2} m v_1^2 \right) \times 2$$

$$\frac{2W = m v_2^2 - \cancel{\frac{1}{2}} m v_1^2}{m}$$

$$\frac{2W}{m} = v_2^2 - v_1^2$$

$$v_2^2 = \frac{2W}{m} + v_1^2$$

$$v_2 = \sqrt{\frac{2W}{m} + v_1^2}$$

$$v_2 = \sqrt{\frac{2(20)}{2 \text{ kg}} + (1.5)^2}$$

$$= 4.72 \text{ m/s}$$

4.) \rightarrow if you do positive work the speed of the object will increase [e.g. pushing an object]

\rightarrow if you do negative work the speed of the object will decrease [e.g. friction slows an object down]