

Answer on Question #43394 – Physics - Mechanics | Kinematics | Dynamics

An applied force of 875 N (up) acts on a 4.63 kg mass over a displacement of 4.80m (up). Assuming that no friction is involved in this movement, what is the change in kinetic energy of the mass?

Solution:

$F = 875\text{N}$ – applied force;

$m = 4.63\text{ kg}$ – mass of the object;

$s = 4.8\text{ m}$ – displacement of the mass;

ΔE_{KE} – change in kinetic energy of the mass;

ΔE_{PE} – change in potential energy of the mass;

The work done by applied force changes the total mechanical energy of the mass:

Work = Change in Total Mechanical Energy

$$W = \Delta E_{\text{KE}} + \Delta E_{\text{PE}} \quad (1)$$

$$\Delta E_{\text{PE}} = mg(h_2 - h_1) = mgs \quad (2)$$

$$W = F \cdot s \cdot \cos \theta = F \cdot s \cdot \cos 90^\circ = F \cdot s \quad (3)$$

(3)and(2)in(1):

$$F \cdot s = mgs + \Delta E_{\text{KE}}$$

$$\Delta E_{\text{KE}} = F \cdot s - mgs = 875\text{N} \cdot 4.8\text{m} - 4.63\text{kg} \cdot 9.8 \frac{\text{N}}{\text{kg}} \cdot 4.63\text{m} = 3990\text{ J}$$

Answer: change in kinetic energy of the mass is equal to 3990 J.