

$$\Delta E_k + \Delta E_p + \Delta TE = 0$$

$$\Delta E_k + \Delta E_p = -\Delta TE$$

$$\frac{1}{2}m(v^2 - v_0^2) + mg\Delta h = F_{fr}d$$

$$\frac{1}{2}(1.83 \text{ kg})((1.30 \text{ m/s})^2 - 0)$$

$$+(1.83 \text{ kg})(9.81 \text{ m/s}^2)(-0.375 \text{ m}) = -(F_{fr})(-0.375 \text{ m})$$

$$1.55 \text{ J} - 6.73 \text{ J} = -(F_{fr})(0.750 \text{ m})$$

$$-5.18 \text{ J} = -(F_{fr})(0.750 \text{ m})$$

$$F_{fr} = 6.91 \text{ N}$$

7. Find Δh

$$\sin 40^\circ = \frac{\Delta h}{50.0 \text{ m}}$$

$$\Delta h = 32.1 \text{ m}$$

$$\Delta E_p = mgh$$

$$= (115 \text{ N})(32.1 \text{ m})$$

$$= 3.70 \times 10^3 \text{ J}$$

8. $\Delta E_k + \Delta E_p + \Delta TE = 0$

$$\Delta E_k + \Delta E_p = -\Delta TE$$

$$\frac{1}{2}m(v^2 - v_0^2) + mg\Delta h = F_{fr}d$$

$$\frac{1}{2}(45 \text{ kg})(v^2 - 0)$$

$$+(45 \text{ kg})(9.81 \text{ m/s}^2)(-5.00 \text{ m}) = -(55.0 \text{ N})(28.0 \text{ m})$$

$$(22.5 \text{ kg})(v^2) - 2207 \text{ J} = -1540 \text{ J}$$

$$v = \sqrt{\frac{-1540 \text{ J} + 2207 \text{ J}}{22.5 \text{ kg}}}$$

$$= 5.44 \text{ m/s}$$

9. a) $\Delta TE = F_{fr}d$

$$= (17.9 \text{ N})(8.0 \text{ m})$$

$$= 1.4 \times 10^2 \text{ J}$$

b) $\Delta E_k + \Delta E_p + \Delta TE = 0$

$$\Delta E_k + \Delta E_p = -\Delta TE$$

$$\frac{1}{2}m(v^2 - v_0^2) + mg\Delta h = F_{fr}d$$

$$\frac{1}{2}(75.0 \text{ kg})(v^2 - 0)$$

$$+(75.0 \text{ kg})(9.81 \text{ m/s}^2)(-5.0 \text{ m}) = -(17.9 \text{ N})(8.0 \text{ m})$$

$$(37.5 \text{ kg})(v^2) - 3679 \text{ J} = -143.2 \text{ J}$$

$$v = \sqrt{\frac{-143.2 \text{ J} + 3679 \text{ J}}{37.5 \text{ kg}}}$$

$$= 9.7 \text{ m/s}$$

Practice Test

1. $E_k = \frac{1}{2}mv^2$
 $\therefore E_k \propto v^2$

This mathematical expression tells us that if we double the speed, the kinetic energy will quadruple.

D is the answer.

2. $P = \frac{W}{t} = \frac{mgh}{t}$

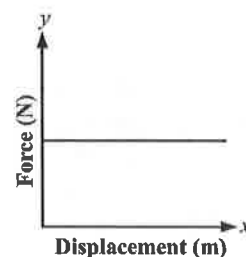
Units therefore are: $\frac{\text{kg} \cdot \frac{\text{m}}{\text{s}^2} \cdot \text{m}}{\text{s}} = \text{kg} \cdot \text{m}^2/\text{s}^3$

D is the answer.

3. When an object falls, it loses position and gains velocity. When it loses position, it loses potential energy. When it gains velocity, it gains kinetic energy.

A is the answer.

4.



Area under the graph = $l \times w$
 or $F \times d = Fd$

Work is defined as Fd

B is the answer.

5. $E_k = \frac{1}{2}mv^2$
 $E_k \propto m, E_k \propto v^2$

From this mathematical expression,

- if we double the mass, we double E_k .
- if we halve the speed, we "quarter" E_k .