$$\Delta E_k + \Delta E_p + \Delta TE = 0$$
$$\Delta E_k + \Delta E_p = -\Delta TE$$
$$\frac{1}{2}m(v^2 - v_0^2) + mg\Delta h = F_{fr}d$$
$$\frac{1}{2}(1.83\text{ kg})\left((1.30\text{ m/s})^2 - 0\right)$$
$$+(1.83\text{ kg})(9.81\text{ m/s}^2)(-0.375\text{ m}) = -(F_{fr})(-0.375\text{ m})$$
$$1.55\text{ J} - 6.73\text{ J} = -(F_{fr})(0.750\text{ m})$$
$$-5.18\text{ J} = -(F_{fr})(0.750\text{ m})$$
$$F_{fr} = 6.91\text{ N}$$

7. Find Δh

$$\sin 40° = \frac{\Delta h}{50.0\text{ m}}$$
$$\Delta h = 32.1\text{ m}$$

$$\Delta E_p = mgh$$
$$= (115\text{ N})(32.1\text{ m})$$
$$= 3.70\times10^3\text{ J}$$

8.
$$\Delta E_k + \Delta E_p + \Delta TE = 0$$
$$\Delta E_k + \Delta E_p = -\Delta TE$$
$$\frac{1}{2}m(v^2 - v_0^2) + mg\Delta h = F_{fr}d$$
$$\frac{1}{2}(45\text{ kg})(v^2 - 0)$$
$$+(45\text{ kg})(9.81\text{ m/s}^2)(-5.00\text{ m}) = -(55.0\text{ N})(28.0\text{ m})$$
$$(22.5\text{ kg})(v^2) - 2\,207\text{ J} = -1\,540\text{ J}$$
$$v = \sqrt{\frac{-1\,540\text{ J} + 2\,207\text{ J}}{22.5\text{ kg}}}$$
$$= 5.44\text{ m/s}$$

9. a)
$$\Delta TE = F_{fr}d$$
$$= (17.9\text{ N})(8.0\text{ m})$$
$$= 1.4\times10^2\text{ J}$$

b)
$$\Delta E_k + \Delta E_p + \Delta TE = 0$$
$$\Delta E_k + \Delta E_p = -\Delta TE$$
$$\frac{1}{2}m(v^2 - v_0^2) + mg\Delta h = F_{fr}d$$
$$\frac{1}{2}(75.0\text{ kg})(v^2 - 0)$$
$$+(75.0\text{ kg})(9.81\text{ m/s}^2)(-5.0\text{ m}) = -(17.9\text{ N})(8.0\text{ m})$$
$$(37.5\text{ kg})(v^2) - 3\,679\text{ J} = -143.2\text{ J}$$
$$v = \sqrt{\frac{-143.2\text{ J} + 3679\text{ J}}{37.5\text{ kg}}}$$
$$= 9.7\text{ m/s}$$

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

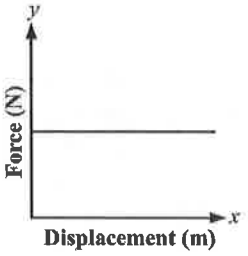
Units therefore are: $\dfrac{\text{kg}\cdot\frac{\text{m}}{\text{s}^2}\cdot\text{m}}{\text{s}} = \text{kg}\cdot\text{m}^2/\text{s}^3$

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.

