

5. We use Eq. 7-12 for W_g and Eq. 8-9 for U .

(a) The displacement between the initial point and A is horizontal, so $\phi = 90.0^\circ$ and $W_g = 0$ (since $\cos 90.0^\circ = 0$).

(b) The displacement between the initial point and B has a vertical component of $h/2$ downward (same direction as \vec{F}_g), so we obtain

$$W_g = \vec{F}_g \cdot \vec{d} = \frac{1}{2} mgh = \frac{1}{2} (825 \text{ kg})(9.80 \text{ m/s}^2)(42.0 \text{ m}) = 1.70 \times 10^5 \text{ J}.$$

(c) The displacement between the initial point and C has a vertical component of h downward (same direction as \vec{F}_g), so we obtain

$$W_g = \vec{F}_g \cdot \vec{d} = mgh = (825 \text{ kg})(9.80 \text{ m/s}^2)(42.0 \text{ m}) = 3.40 \times 10^5 \text{ J}.$$

(d) With the reference position at C , we obtain

$$U_B = \frac{1}{2} mgh = \frac{1}{2} (825 \text{ kg})(9.80 \text{ m/s}^2)(42.0 \text{ m}) = 1.70 \times 10^5 \text{ J}$$

(e) Similarly, we find

$$U_A = mgh = (825 \text{ kg})(9.80 \text{ m/s}^2)(42.0 \text{ m}) = 3.40 \times 10^5 \text{ J}$$

(f) All the answers are proportional to the mass of the object. If the mass is doubled, all answers are doubled.