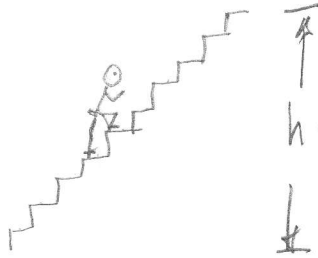


p. 349

# Ch. 16.3 Gravitational Potential Energy

Dr. Bob

1.



$$m = 60.0 \text{ kg}$$

$$g = 9.8 \text{ m/s}^2$$

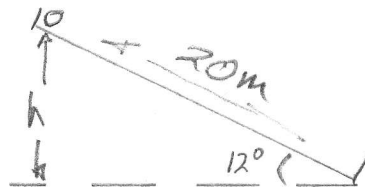
$$\Delta E_{pg} = mgh = (60 \text{ kg})(9.8 \text{ m/s}^2)(2.0 \text{ m})$$

$$\Delta E_{pg} = 1176 \text{ J}$$

$$\text{Units } \text{kg m}^2/\text{s}^2 = \text{J}$$

2.

$$m = 1.00 \text{ kg}$$



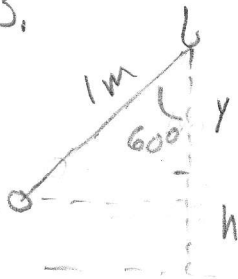
$$(20 \text{ m}) \sin 12^\circ = h$$

$$h = 4.16 \text{ m}$$

$$E_{pg} = mgh = (1.00 \text{ kg})(9.8 \text{ m/s}^2)(4.16 \text{ m})$$

$$E_{pg} = 40.8 \text{ J}$$

3.



$$m = 2.00 \text{ kg}$$

$$y = (1 \text{ m}) \cos 60^\circ = (1 \text{ m}) \sin 30^\circ = 0.5 \text{ m}$$

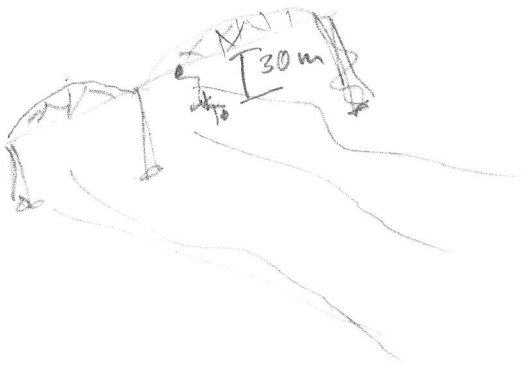
$$h = 1 \text{ m} - y = 1 \text{ m} - 0.5 \text{ m}$$

$$h = 0.5 \text{ m}$$

$$E_{pg} = mgh = (2.00 \text{ kg})(9.8 \text{ m/s}^2)(0.5 \text{ m})$$

$$E_{pg} = 9.8 \text{ J}$$

4.



$$m = 80 \text{ kg}$$

$$g = 9.8 \text{ m/s}^2$$

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

$$h_f = 0 \text{ m}$$

$$E_{pg} = mgh$$

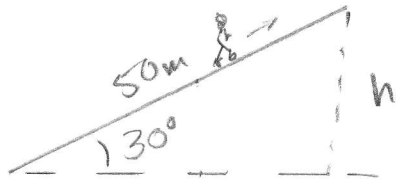
$$\text{Initial: } E_{pgi} = (80 \text{ kg})(9.8 \text{ m/s}^2)(30 \text{ m})$$

$$E_{pgi} = 23,520 \text{ J}$$

$$E_{pgf} = (80 \text{ kg})(9.8 \text{ m/s}^2)(0 \text{ m})$$

$$E_{pgf} = 0 \text{ J}$$

5.



$$h = (50 \text{ m}) \sin 30^\circ$$

$$h = 25 \text{ m}$$

$$E_{pgh} = 19,600 \text{ J}$$

$$E_{pg} = mgh$$

$$m = \frac{E_{pg}}{gh} = \frac{19,600 \text{ J}}{(25 \text{ m})(9.8 \text{ m/s}^2)}$$

$$m = 80 \text{ kg}$$

$$\begin{aligned} \text{Units} \\ \frac{\text{J}}{\text{m}(\text{m/s}^2)} &= \frac{\text{kg} \cdot \text{m}^2/\text{s}^2}{\text{m}^2/\text{s}^2} \\ &= \text{kg} \end{aligned}$$

6.



$$E_{pg} = 78.0 \times 10^9 \text{ J}$$

$$m = 1000 \text{ tonne} = 10^6 \text{ kg}$$

$$E_{pg} = mgh$$

$$h = \frac{E_{pg}}{mg} = \frac{78.0 \times 10^9 \text{ J}}{(10^6 \text{ kg})(9.8 \text{ m/s}^2)}$$

$$h_{\text{avg}} = 7,959 \text{ m}$$