

Chapter 7 Problem 14 [†]

Given

$$m = 70 \text{ kg}$$

Solution

a) Find the potential energy at 1900 *m* above sea level.

Potential energy is the negative of the work done.

$$\Delta U = -W = - \int \vec{F}_g d\vec{r} = - \int_{y_0}^y -mg dy$$

Let $U = 0$ at y_0 which is sea level. Then

$$U = mgy = (70 \text{ kg})(9.8 \text{ m/s}^2)(1900 \text{ m}) = 1.3 \times 10^6 \text{ J}$$

$$U = 1.3 \text{ MJ}$$

b) Find the potential energy at 86 *m* below sea level.

From the equation derived above

$$U = mgy = (70 \text{ kg})(9.8 \text{ m/s}^2)(-86 \text{ m}) = -5.9 \times 10^4 \text{ J}$$

$$U = -59 \text{ kJ}$$

[†]Problem from Essential University Physics, Wolfson