

Chapter 6 Problem 46 †

Given

$$W = 7.9 \times 10^{11} \text{ J}$$

$$m = 3.4 \times 10^6 \text{ kg}$$

$$\Delta x = 180 \text{ km} = 1.8 \times 10^5 \text{ m}$$

Solution

Find the average force as the locomotive pulls the train.

From the definition of work.

$$W = F\Delta x$$

Solving for the average force gives

$$F = \frac{W}{\Delta x} = \frac{7.9 \times 10^{11} \text{ J}}{1.8 \times 10^5 \text{ m}} = 4.39 \times 10^6 \text{ N}$$

$$F = 4.39 \text{ MN}$$

†Problem from Essential University Physics, Wolfson