

Chapter 2 Problem 24 †

Given

$$t = 8.5 \text{ min}$$

$$v = 7.6 \text{ km/s}$$

Solution

What is the average acceleration compared to gravity?

First convert the velocity into m/s .

$$v = 7.6 \text{ km/s} \left(\frac{1000 \text{ m}}{1 \text{ km}} \right) = 7600 \text{ m/s}$$

Also convert the time into seconds.

$$t = 8.5 \text{ min} \left(\frac{60 \text{ s}}{1 \text{ min}} \right) = 510 \text{ s}$$

From the definition of acceleration

$$\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i} = \frac{7600 \text{ m/s} - 0 \text{ m/s}}{510 \text{ s} - 0 \text{ s}} = 14.9 \text{ m/s}^2$$

Compared to gravity

$$14.9 \text{ m/s}^2 \left(\frac{1 \text{ g}}{9.8 \text{ m/s}^2} \right) = 1.52 \text{ g}$$

†Problem from Essential University Physics, Wolfson