

Chapter 1 Problem 75 †

Given

$$P = 120 \pm 2 \text{ mm Hg}$$

Solution

a) Find the percentage uncertainty.

Percent uncertainty is the fraction of error times 100 percent.

$$\text{percent error} = \frac{\Delta P}{P} \times 100\%$$

$$\text{percent error} = \frac{2 \text{ mm Hg}}{120 \text{ mm Hg}} \times 100\% = 1.67 \%$$

Since the uncertainty is to one significant digit, the percent error is 2 %.

b) What is the error on a value of 80 mm Hg?

Modify the equation in part a) and solve for ΔP gives

$$\Delta P = P \left(\frac{\text{percent error}}{100 \%} \right)$$

$$\Delta P = (80 \text{ mm Hg}) \left(\frac{1.67 \%}{100 \%} \right) = 1.3 \text{ mm Hg}$$

Since this problem started with one significant digit of accuracy, the final answer should also be to one digit of accuracy. Notice the intermediate calculations maintained at least one additional digit of accuracy. The uncertainty in the 80 mm Hg measurement is 1 mm Hg.

†Problem from University Physics by Ling, Sanny and Moebs (OpenStax)