Look over the following quantitative Sample Problems. Notice h the four-step approach is used in each, and then apply the appro yourself in solving the practice problems that follow.

SAMPLE PROBLEM 2-6

Calculate the volume of a sample of aluminum that has a mass of 3.057 kg. The density o aluminum is 2.70 g/cm^3.

SOLUTION

ANALYZE

Given: mass = 3.057 kg, density = 2.70 g/cm^3
Unknown: volume of aluminum

PLAN

The density unit in the problem is g/cm^3, and the mass given in the problem is expressed kg. Therefore, in addition to using the density equation, you will need a conversion facto representing the relationship between grams and kilograms.

$$1000 \text{ g} = 1 \text{ kg}$$

Also, rearrange the density equation to solve for volume.

$$density = \frac{mass}{volume} \quad \text{or} \quad D = \frac{m}{V}$$

$$V = \frac{m}{D}$$

COMPUTE

$$V = \frac{3.057 \text{ kg}}{2.70 \text{ g/cm}^3} \times \frac{1000 \text{ g}}{\text{kg}} = 1132.222 \ldots \text{ cm}^3 \text{ (calculator answer)}$$

The answer should be rounded to three significant figures.

$$V = 1.13 \times 10^3 \text{ cm}^3$$

EVALUATE

The unit of volume, cm^3, is correct. An order-of-magnitude estimate would put the answ at over 1000 cm^3.

$$\frac{3}{2} \times 1000$$

The correct number of significant digits is three, to match the number of significant figu in 2.70 g/cm^3.

PRACTICE

1. What is the volume of a sample of helium that has a mass of 1.73×10^{-3} g, given that the density is 0.178 47 g/L?
   Answer 9.69 mL
2. What is the density of a piece of metal that has a mass of 6.25×10^5 g and is 92.5 cm × 47.3 cm × 85.4 cm?
   Answer 1.67 g/cm^3
3. How many millimeters are there in 5.12×10^5 kilometers?
   Answer 5.12×10^{11} m
4. A clock gains 0.020 second per minute. How many seconds will the clock gain in exactly six months, assuming exactly 30 days per month?
   Answer 5.2×10^3 s