

Density and Significant Figures

1. In the CHM 151 lab, you are given a metal object with a mass of 25.11 g. You are asked to determine its density. You decide to determine its volume by displacement of water. You fill a 50 mL graduated cylinder to a volume of 20.4 mL with water and then add the metal object to the cylinder. The volume of the water and cylinder is 29.7 mL.

- a) Calculate the density of this metal object.

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

The mass of the metal object is given. The volume of the metal is:

$$V_{\text{metal}} = 29.7 \text{ mL} - 20.4 \text{ mL} = 9.3 \text{ mL}$$

$$\text{density} = \frac{25.11 \text{ g}}{9.3 \text{ mL}} = \mathbf{2.7 \text{ g/mL}}$$

- b) To how many significant figures should your answer be expressed? Explain.

TWO. When calculating the volume of the metal, each number has 1 digit to the right of the decimal point. When adding or subtracting, the number with the least number of digits to the right of the decimal point determines the digits to the right of the decimal point in the answer. In this case, 1 digit is carried to the right of the decimal point giving the number 9.3, which has two significant figures. In the division that follows to calculate density, the number of significant figures in the answer is based on the number in the calculation with the fewest number of significant digits (in this case two).