REVIEW QUESTIONS
Chapter 1

1. Determine the number of significant digits in each of the following numbers:

   a) 503 **3** b) 63,000 **2**

   c) 0.0051 **2** d) 0.03002 **4**

   e) 4.100 **4** f) 0.0810 **3**

2. Round each of the following numbers to 2 significant figures:

   a) 93.643 **94** b) 0.02857 **0.029**

   c) 12153 **12000** d) 158.35 **160**

3. Perform the following operations with the correct number of significant digits:

   a) (0.0394)(12.85) = **0.506**

   b) $\frac{42.7853}{59.6}$ = **0.718**

   c) 12.62 + 1.5 + 0.25= **14.4**

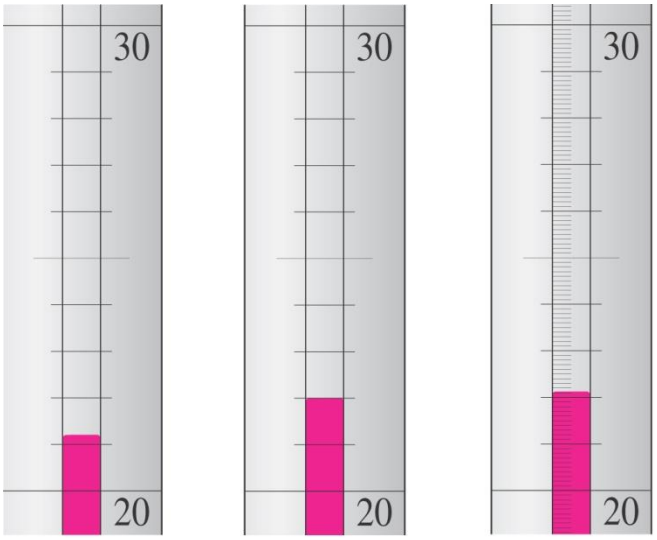
   d) $\frac{284 \times 0.293}{45}$ = **1.8**

4. Express each of the following numbers in scientific notation, with 3 significant figures:

   a) 2,900,000 **2.90×10^{6}** b) 0.005865 **5.87×10^{-3}**

   c) 0.000004563 **4.56×10^{-6}** d) 410870 **4.11×10^{5}**

5. Record each of the following measurements to the correct number of digits:



(a) (b) (c)

21.2 (1 decimal) **22.0 (1 decimal)** **22.11 (2 decimals)**

6. A mass of a sample of a powdered metal unknown was measured by four different students (I, II, III and IV). The result of their multiple trials is shown below. The true value for the sample is 6.72 g.

				Avg.	**Range**
I:	6.75 g	6.79 g	6.71 g	**6.75 g**	**0.08 g**
II:	6.56 g	6.74 g	6.82 g	**6.71 g**	**0.26 g**
III:	6.50 g	6.48 g	6.52 g	**6.50 g**	**0.04 g**
IV:	6.41 g	6.72 g	6.55 g	**6.56 g**	**0.31 g**

a) Which set of data above is the most precise?

Set III (smallest range of values)

b) Which set of data above is the most accurate?

Set II (average value closest to true value)

c) Which set of data has the best combination of accuracy and precision?

Set I (average close to true value and small range)

7. Convert each of the following units:

a) 1.78 kg to μg

$$\mathbf{1.78\ kg \times \frac{10^3\ g}{1\ kg} \times \frac{10^6\ \mu g}{1\ g} = 1.78 \times 10^9\ \mu g \qquad (3\ sig\ figs)}$$

b) 0.85 g to mg

$$\mathbf{0.85\ g \times \frac{10^3\ mg}{1\ g} = 850\ mg \qquad (2\ sig\ figs)}$$

c) 1.65 lbs to g (1 lb = 454 g)

$$\mathbf{1.65\ lb \times \frac{454\ g}{1\ lb} = 749\ g \qquad (3\ sig\ figs)}$$

d) 2.34 gal to mL (1 gal = 3.78 L)

$$\mathbf{2.34\ gal \times \frac{3.78\ L}{1\ gal} \times \frac{10^3\ mL}{1\ L} = 8850\ mL \qquad (3\ sig\ figs)}$$

e) 5780 mm^2 to m^2

$$\mathbf{5780\ mm^2 \times \left(\frac{1\ m}{10^3\ mm}\right)^2 = 5.78 \times 10^{-3}\ m^2}$$

8. The density of ether is 0.714 g/mL. What is the mass of 1.45 L of ether?

$$1.45\ \text{L} \times \frac{10^3\ \text{mL}}{1\ \text{L}} \times \frac{0.714\ \text{g}}{1\ \text{mL}} = 1040\ \text{g} \qquad \text{(3 sig figs)}$$

9. What is the capacity of a gasoline container (in gal) if it contains 117 lb of gasoline with a density of 0.60 g/mL? (1lb=454 g; 1 gal=3.78 L)

$$117\ \text{lb} \times \frac{454\ \text{g}}{1\ \text{lb}} \times \frac{1\ \text{mL}}{0.60\ \text{g}} \times \frac{1\ \text{L}}{10^3\ \text{mL}} \times \frac{1\ \text{gal}}{3.78\ \text{L}} = 23\ \text{gal} \qquad \text{(2 sig figs)}$$

10. A car travels at 55 miles per hour and gets 11 km/L of gasoline. How many gallons of gasoline are needed for a 3.0-hour trip? (1 mi=1.609 km; 1 gal=3.78 L)

$$3.0\ \text{h} \times \frac{55\ \text{mi}}{1\ \text{h}} \times \frac{1.609\ \text{km}}{1\ \text{mi}} \times \frac{1\ \text{L}}{11\ \text{km}} \times \frac{1\ \text{gal}}{3.78\ \text{L}} = 6.4\ \text{gal} \qquad \text{(2 sig figs)}$$

11. A small cube of aluminum measures 15.6 mm on a side and weighs 10.25 g. What is the density of aluminum in g/cm^3?

$$V = (15.6\ \text{mm})^3 = 3796\ \text{mm}^3$$

$$V = 3796\ \text{mm}^3 \times \left(\frac{1\ \text{cm}}{10\ \text{mm}}\right)^3 = 3.796\ \text{cm}^3$$

$$d = \frac{m}{V} = \frac{10.25\ \text{g}}{3.796\ \text{cm}^3} = 2.70\ \text{g/cm}^3$$

12. Sterling silver is 92.5% silver by mass with a density of 10.3 g/cm^3. If a cube of sterling silver has a volume of 27.0 cm^3, how many ounces of pure silver are present? (1 oz=28.4 g)

$$\mathbf{27.0\ cm^3\ sterling} \times \frac{\mathbf{10.3\ g}}{\mathbf{1\ cm^3}} \times \frac{\mathbf{92.5\ g\ silver}}{\mathbf{100\ g\ sterling}} \times \frac{\mathbf{1\ oz}}{\mathbf{28.4\ g}} = \mathbf{9.06\ oz} \quad \mathbf{(3\ sig\ figs)}$$

13. An empty vial weighs 31.45 g.

a) If the vial weighs 179.56 g when filled with liquid mercury (d=13.53 g/cm^3), what is its volume?

$$\mathbf{mass\ of\ mercury = 179.56\ g - 31.45\ g = 148.11\ g}$$

$$\mathbf{V = 148.11\ g} \times \frac{\mathbf{1\ cm^3}}{\mathbf{13.53\ g}} = \mathbf{10.95\ cm^3}$$

b) How much would the vial weigh if it was filled with water (d=0.997 g/cm^3 at 25°C)?

$$\mathbf{10.95\ cm^3} \times \frac{\mathbf{0.997\ g}}{\mathbf{1\ cm^3}} = \mathbf{10.9\ g}$$