

## Tutorial 2 Problems

### Various problems

1. Perform the following mathematical operations and give the answer using the appropriate number of significant figures.

(a)  $(5.74)(38.27)/(0.001250)$     (b)  $1.000 + 10.2$     (c)  $(1.76 \times 10^4)/(0.12 \times 10^{-6})$

2. (FR 3.6) At 25°C, an aqueous solution containing 35.0 wt% H<sub>2</sub>SO<sub>4</sub> has a specific gravity of 1.2563. A quantity of the 35% solution is needed that contains 195.5 kg of H<sub>2</sub>SO<sub>4</sub>.

- Calculate the required volume (L) of the solution using the given specific gravity.
- Estimate the percentage error that would have resulted if pure-component specific gravities of H<sub>2</sub>SO<sub>4</sub> (SG = 1.8255) and water had been used for the calculation instead of the given specific gravity of the mixture.

3. (FR 3.7) A rectangular block of solid carbon (graphite,  $\rho = 2260 \text{ kg/m}^3$ ) floats at the interface of two immiscible liquids. The bottom liquid is a relatively heavy lubricating oil, and the top liquid is water. Of the total block volume, 54.2% is immersed in the oil and the balance is in the water. In a separate experiment, an empty flask is weighed, 35.3 cm<sup>3</sup> of the lubricating oil is poured into the flask, and the flask is reweighed. If the scale reading was 124.8 g in the first weighing, what would it be in the second weighing?

4. (FR 3.14) How many of the following are found in 15.0 kmol of benzene (C<sub>6</sub>H<sub>6</sub>)?

(a) kg C<sub>6</sub>H<sub>6</sub> ; (b) mol C<sub>6</sub>H<sub>6</sub> ; (c) lb-mole C<sub>6</sub>H<sub>6</sub> ; (d) mol C ; (e) mol H ; (f) g C ; (g) g H ; (h) molecules of C<sub>6</sub>H<sub>6</sub>.

5. (FR 3.3) The specific gravity of gasoline is approximately 0.70.

- Determine the mass (kg) of 50.0 liters of gasoline.
- The mass flow rate of gasoline exiting a refinery tank is 1150 kg/min. Estimate the volumetric flow rate in liters/s.
- For part (b), estimate the velocity in m/s if the exit tube has a diameter of 15 cm.

6. (FR 3.1) Perform the following estimations *without using a calculator*:

- Estimate the mass of water (kg) in an Olympic-size swimming pool.
- A drinking glass is being filled from a pitcher. Estimate the mass flow rate of the water (g/s).
- An oil pipeline across Alaska is 4.5 ft in diameter and 800 miles long. How many barrels of oil are required to fill the pipeline?
- Estimate the volume of your body.