Problem Set Chapter 1 & 2

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August 27, 2020

1. Indicate the number of protons, electrons, and neutrons in the following:
   (a) Iron − 26 Protons, 26 Electrons, and 30 Neutrons
   (b) Tin − 50 Protons, 50 Electrons, and 69 Neutrons
   (c) Al^{+3} − 13 Protons, 10 Electrons, 14 Neutrons
2. Perform the conversions:
   (a) $6.23\ \text{g mL}^{-1} \rightarrow lb\,in^{-3}$

$$1[in^3] \rightarrow 16.387[\text{cm}^3]$$
$$1[lb] \rightarrow 453.592[\text{g}]$$
$$\frac{6.23[g]}{1[\cancel{\text{cm}^3}]} \cdot \frac{1[lb]}{453.592[\cancel{g}]} \cdot \frac{16.387[\cancel{\text{cm}^3}]}{1[in^3]} = .225 \left[\frac{lb}{in^3}\right]$$

   (b) $55\ mi/hr \rightarrow \text{m/s}$

$$1[\text{m}] \rightarrow 6.21 \cdot 10^{-4}[mi]$$
$$1[\text{s}] \rightarrow 2.78 \cdot 10^{-4}[hr]$$
$$\frac{55[\cancel{mi}]}{1[\cancel{hr}]} \cdot \frac{1[\text{m}]}{6.21 \cdot 10^{-4}[\cancel{mi}]} \cdot \frac{2.78 \cdot 10^{-4}[\cancel{hr}]}{1[\text{s}]} = 25 \left[\frac{\text{m}}{\text{s}}\right]$$

3. For the following pairs, write the formula for the compound that would form and name it:
   (a) S^{-2} and $Al^{+3} \rightarrow Al_2S_3 \rightarrow$ Aluminum Sulfide
   (b) Fe^{+2} and $I^{-1} \rightarrow FeI_2 \rightarrow$ Iron Iodide
   (c) SO_3^{-2} and $Ni^{+3} \rightarrow Ni_2(SO_3)_3 \rightarrow$ Nickel (III) Sulfite
   (d) O^{-2} and $Cu^{+4} \rightarrow CuO_2 \rightarrow$ Copper (IV) Oxide

(e) PO_4^{-3} and $NH_4^+ \rightarrow (NH_4)_3PO_4 \rightarrow$ Ammonium Phosphate

(f) HPO_4^{-2} and $Al^{+3} \rightarrow Al_2(HPO_4)_3 \rightarrow$ Aluminum Hydrogen Phosphate

(g) CO_3^{-2} and $NH_4^+ \rightarrow (NH_4)_2CO_3 \rightarrow$ Ammonium Carbonate

(h) PO_4^{-3} and $Hg^{+2} \rightarrow Hg_3(PO_4)_2 \rightarrow$ Mercury (II) Phosphate

(i) S^{-2} and $V^{+6} \rightarrow VS_3 \rightarrow$ Vanadium (VI) Sulfide

4. An empty 3.0[L] bottle weights 1.7[kg]. Filled with wine, the bottle weights 4.72[kg]. The wine contains 11% ethyl alcohol by mass. How many ounces of ethyl alcohol are present in 275[mL] of the wine?

   (a) $4.72[\text{kg}] - 1.7[\text{kg}] = 3.02[\text{kg}]$ of Wine

$$\frac{275[\cancel{\text{mL}}]}{3000[\cancel{\text{mL}}]} \cdot 106.527[oz] \cdot .11 = 1.1[oz]$$

5. A lab experiment requires 0.5[gram] of copper wire ($d = 8.94[\text{g mL}^{-1}]$). The diameter of the wire is $0.0179[in]$. Determine the length of the wire (in cm) to used for this experiment.Volume of cylinder $= \pi r^2 l$

   (a) $.0179[in] \rightarrow .0455[\text{cm}]\,, V = .00162l$

$$V = \frac{m}{\rho} \Rightarrow l = \frac{.5[\cancel{\text{g}}]}{.00162[\cancel{\text{m}^2}]8.94[\text{g mL}^{-1}]}$$

$$l = 35.24[\text{cm}]$$