Quiz 1 – August 28, 2019

Useful Information: 1 metric ton = 1 × 10³ kg (exactly) $d = \dfrac{m}{V}$

1. (9 pts) A particular atom contains 72 protons and 108 neutrons.

    a. Please write the **complete chemical symbol** for this atom.

    $^{180}_{72}\text{Hf}$ or ^{180}Hf

    b. This element has several naturally occurring **isotopes**. In terms of the number and types of subatomic particles they contain, **how are the isotopes similar and how are they different?**

    - Same # of protons (72)
    - same # of electrons (72)
    - different #s of neutrons

2. (16 pts) News reports in 2011 revealed that Japan's crippled Fukushima nuclear plant experienced multiple leaks in storage tanks built to hold 3.000 × 10⁵ metric tons of radioactive water. Suppose that all the water in the tanks leaked into an area the size of Winthrop's campus, approximately 1.72 × 10⁶ m². Assuming that the water spread evenly over the entire area, how deep would it be? Express your answer in cm. (The density of water is 1.000 g/cm³.)

w   L   h = ?? cm

$m = 3.000 \times 10^5 \text{ metric tons}$ $d = 1.000 \text{ g/cm}^3$

$A = 1.72 \times 10^6 \text{ m}^2$ Find h in cm

$d = \dfrac{m}{V}$ $V = A \cdot h$

$h = \dfrac{V}{A}$

1) Convert m to grams

$3.000 \times 10^5 \text{ m.t.} \left(\dfrac{1 \times 10^3 \text{kg}}{1 \text{ n.t.}}\right)\left(\dfrac{1 \times 10^3 \text{g}}{1 \text{kg}}\right) = 3.000 \times 10^{11} \text{g}$

2) Find V in cm³

$V = \dfrac{m}{d} = \dfrac{3.000 \times 10^{11} \text{g}}{1.000 \text{ g/cm}^3} = 3.000 \times 10^{11} \text{cm}^3$

3) Convert A to cm²: $1.72 \times 10^6 \text{ m}^2 \left(\dfrac{100 \text{ cm}}{1 \text{ m}}\right)^2 = 1.72 \times 10^{10} \text{ cm}^2$

4) Solve for h in cm:

$h = \dfrac{V}{A} = \dfrac{3.000 \times 10^{11} \text{ cm}^3}{1.72 \times 10^{10} \text{ cm}^2} = \boxed{17.4 \text{ cm}}$ (3 sig figs)