

EXAM II – Oct. 7, 2019

Answers to Calculation-Based Problems

4. (27 pts)  $\alpha$ -Linolenic acid, ALA, is one of the omega-3 fatty acids found to benefit heart health. Its chemical formula is  $C_{18}H_{30}O_2$ , and it has the **Lewis structure** shown below.
- d. A teaspoon of flax seeds (which many people add to their breakfast cereal) contains 783 mg of ALA ( $C_{18}H_{30}O_2$ ). **How many molecules of ALA** are present?

**Answer:  $1.69 \times 10^{22}$  molecules**

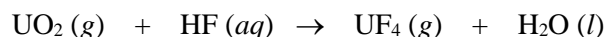
5. (12 pts) Hydrogen peroxide ( $H_2O_2$ ) is often sold by chemical suppliers as a concentrated solution that is 30.0 %  $H_2O_2$  by mass: this means that it contains 30.0 grams of  $H_2O_2$  per 100.0 grams of water.
- a. Suppose that 30.0 g of  $H_2O_2$  is combined with enough water to reach a total solution volume of 103.5 mL. What is the **molar concentration** of hydrogen peroxide in this solution?

**Answer: 8.52 mol/L (or 8.52 M)**

- b. Suppose that you wish to dilute 50.0 mL of the solution prepared in (a) to a final concentration of 0.425 M (a concentration similar to what is sold in the drugstore). **To what final volume must you dilute it** in order to reach this concentration? [Note: If you did not obtain an answer for (a), you may use 1.00 M.]

**Answer: 1.00 L**

6. (20 pts) Uranium must be refined and enriched in  $^{235}U$  before it can be used as a fuel in nuclear reactors. (We sometimes hear news reports about nations “enriching uranium” in efforts to produce nuclear weapons, too.) The first step in this process involves formation of  $UF_4$ , an **unbalanced** equation for which is shown below.



- c. What **mass of  $UF_4$  in kilograms** can be produced from the reaction of 10.00 kg of  $UO_2$  and 5.00 kg of  $HF$ ?

**Answer: 11.6 kg**

- d. Suppose that a scientist performs this reaction in the lab, obtaining 5.47 kg of  $UF_4$ . What is his/her **percent yield**?

**Answer: 47.0% yield**