

## Chem 1A - Review Problems for the Final Exam – Part 2

- A mixture of gases contains 0.350 mole nitrogen, 0.120 mole oxygen, and 0.225 mole carbon dioxide. If the total pressure is 875 torr and the total volume of the container is 15.0 L, what is the temperature of the mixture of gases?
- In a titration, the following molarities are obtained: 0.1082 M, 0.1087 M, and 0.1075 M. Calculate the percent difference between these molarities and round to the correct number of significant figures.
- 0.944 g of an unknown diprotic acid requires 24.88 mL of 0.4517 M KOH to reach the endpoint. What is the molar mass of the acid?
- What was Rutherford's experiment, and what did it imply about the structure of the atom?
- Draw diagrams indicating the arrangement of particles in a solid, a liquid, and a gas.
- Name:  

SCl <sub>2</sub>	Fe(OH) <sub>3</sub>
SnCl <sub>2</sub>	KSCN
NaMnO <sub>4</sub>	NaH <sub>2</sub> PO <sub>4</sub>
K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Cr(BrO <sub>3</sub> ) <sub>3</sub>
HNO <sub>2</sub>	HIO <sub>3</sub>
CuSO <sub>4</sub>	HI
Pb(NO <sub>3</sub> ) <sub>4</sub>	Cl <sub>4</sub>
- Write formulas for:  

copper (I) sulfite	ammonium bicarbonate
oxygen difluoride	zinc sulfide
silver nitrate	hydrosulfuric acid
perchloric acid	barium fluoride
magnesium nitride	hypobromous acid
cobalt (II) chloride	
- A piece of aluminum 3.20 in × 1.70 in reacts completely with 100.0 mL of 12.0 M HCl. The products of the reaction are aluminum chloride and hydrogen gas. The density of aluminum is 2.70 g/cm<sup>3</sup>.  
 a. What is the thickness of the aluminum, in mm?  
 b. What volume of hydrogen will it form at STP?
- For the reaction:  

$$\text{Ag} + \text{S}_8 \rightarrow \text{Ag}_2\text{S}$$
 If 3.0 g Ag and 2.0 g of S<sub>8</sub> are mixed, what mass of silver sulfide will be produced?  
 What mass of the excess reactant is left over after the reaction?
- Round to the correct number of significant figures: 120 + 180 =
- Draw three non-equivalent resonance structures for NNO. Decide which would be the best structure, based on formal charge.
- a. Write the reaction for the combustion of ethane (C<sub>2</sub>H<sub>6(g)</sub>). Make sure to use the lowest whole number coefficients.  
 b. Calculate ΔH<sub>rxn</sub>. Look up any necessary values from your textbook.  
 c. Estimate ΔH<sub>rxn</sub> using bond energies. (Look up values from textbook.)  
 d. If you mix 13.0 L oxygen gas and 1.50 L ethane at 25°C and 1.00 atm and allow them to react, how much heat will be evolved?



**Note: the following problems came from the review problems for Exam 3. You already have the answers to these problems.**

25. How many grams of ethylene glycol ( $\text{C}_2\text{H}_4(\text{OH})_2$ ) must be added to 400. g of water to bring the freezing point of the solution down to  $-15^\circ\text{C}$ ? (#1 on Ex3 Rev)
26. A solution is made by dissolving 50.0 g urea,  $\text{CO}(\text{NH}_2)_2$ , in 275 g of water.
  - a. Calculate the vapor pressure of this solution at  $45^\circ\text{C}$ .
  - b. Calculate the boiling point of the solution.
  - c. Calculate the freezing point of the solution.
 Look up any necessary information from your textbook. (#2 on Ex3 Rev)
27. A solution contains 3.75 g of a nonvolatile pure hydrocarbon in 95 g of acetone. The boiling points of pure acetone and the solution are  $55.95^\circ\text{C}$  and  $56.50^\circ\text{C}$ , respectively. The boiling-point constant of acetone is  $1.71^\circ\text{C/m}$ . What is the molar mass of the hydrocarbon? (#5 on Ex3 Rev)
28. The osmolarity of a solution is the concentration (in molarity) of solute particles in the solution. The osmolarity of blood is 0.308 M. If a solution of 0.115 M  $\text{CaCl}_2(\text{aq})$  was injected into the bloodstream, what would happen, if anything, to the red blood cells in the vicinity of the injection? Explain in detail. Assume the cell membrane is only permeable to water. Draw a diagram if you want. (#18 on Ex3 Rev)
29. Solution A contains 0.10 M sucrose. Solution B contains 0.070 M sodium chloride. Will solution B have a higher, lower, or equal osmotic pressure compared to solution A? Explain in one sentence. (#19 on Ex3 Rev)

### Some Answers:

- |  |                                   |
|--|-----------------------------------|
| 1. 303 K or $30.^\circ\text{C}$                          | 16. 6.941 amu                     |
| 2. 1.1 % diff  | 17a. 3p, 3e, 4n                   |
| 3. 168 g/mol   | 17b. 3p, 2e, 4n                   |
| 8a. 1.14 mm  | 22. $3.34 \times 10^{20}$ H atoms |
| 8b. 13.4 L   | 24. P doubles, V constant         |
| 9. 3.4 g $\text{Ag}_2\text{S}$ , 1.6 g $\text{S}_8$ left | 25. $2.0 \times 10^2$ g           |
| 10. $3.0 \times 10^2$                                    | 26a. 68.2 mmHg                    |
| 12b. -3119.6 kJ or -2855.6 kJ                            | 26b. $101.5^\circ\text{C}$        |
| 12c. -2831 kJ  | 26c. $-5.63^\circ\text{C}$        |
| 12d. -95.7 kJ  | 27. 120 g/mol                     |
| 13. 8.6 g  | 28. cells shrink                  |
| 14. -5730. kJ  | 29. B                             |
| 15. -55.2 kJ   |                                   |