

PRACTICE EXAM: FINAL

PAGE 1 of 6

Chem20, Elementary Chemistry

1.) Draw the Lewis structures for each of the following molecules, including all possible resonance structures. Give their expected **electronic** and **molecular** geometries and indicate whether they are polar or non-polar.

Element	B	F	O	Si	H	N
eN	2.0	4.0	3.5	1.9	2.1	3.1

a.) BF_3

POLAR/NONPOLAR: _____

ELECTRONIC: _____

MOLECULAR: _____

b.) O_3

POLAR/NONPOLAR: _____

ELECTRONIC: _____

MOLECULAR: _____

c.) SiH_4

POLAR/NONPOLAR: _____

ELECTRONIC: _____

MOLECULAR: _____

d.) NF_3

POLAR/NONPOLAR: _____

ELECTRONIC: _____

MOLECULAR: _____

2.) Round the following numbers to **FIVE** significant figures. Convert to appropriate scientific notation.

a.) 5002742.245 _____

b.) 0.0000611105 _____

c.) 0.9830001 _____

d.) 10.028421 _____

3.) An aqueous solution of 0.225 M silver(I) nitrate is added to an aqueous solution of 203 mL of 0.125 M magnesium chloride.

a.) Write the molecular, total ionic, and net ionic equations for the double displacement reaction.

MOLECULAR:

TOTAL IONIC:

NET IONIC:

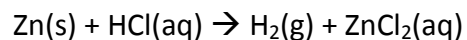
b.) How many mL of the 0.225 M silver nitrate solution need to be added to precipitate **all** the chloride ions? Assume a 100% yield.

3.) Convert the following measurements with appropriate significant figures.

a.) 1.52 kL = ? μL

b.) $942.5 \text{ cm}^2 = \underline{\hspace{1cm}} \text{ Dm}^2$

4.) When strong acids react with metals, it results in an aqueous salt and hydrogen gas, as shown in the following **UNBALANCED** chemical reaction. Answer the following questions regarding this reaction.



a.) Balance the above chemical equation. Classify the reaction in as many ways as possible.

b.) From a 6.2 M HCl(aq) solution, 25.1 mL are added to 20.3 g of Zn(s) and allowed to react. Determine the **limiting reactant** and **theoretical yield** of H₂(g), in mols.

c.) How many g of the **reactant in excess** are left over after the reaction is complete?

d.) The resulting H₂(g) was collected in a 0.255 L container at 1.00 atm and 273.15 K. What was the **actual yield** of H₂(g), in mols?

e.) What was the percent yield?

5.) How many grams of carbon tetrabromide would need to be added to 2.15 L of $\text{H}_2\text{O}(\text{l})$ to reduce the freezing point by 9.18°C ? (Assume the density of water is 1.00 g/mL , $K_f = 1.86^\circ\text{C/m}$)

6.) Write the electronic configurations for the following elements, with or without noble gas notation.

- a.) Zn _____
- b.) Cl _____
- c.) Ne _____

7.) Complete the following table.

Atomic Symbol	Number of Electrons	Number of Protons	Number of Neutrons	Atomic Number	Mass Number	Atomic Notation
Xe	54		77			
						${}_{13}^{27}\text{Al}^{+3}$
						${}_{42}^{96}\text{Mo}^{+2}$
	36			35	80	
	18	17			35	

8.) A sample of an unknown compound containing only carbon, hydrogen, and oxygen is found to contain 39.99% carbon, 6.693% hydrogen, and the rest oxygen by mass. The molecular weight of the compound is 180.18 g/mol. Determine the molecular formula.

9.) A sample of 0.52 mols of gas occupies 344 mL. If 0.83 mols of gas were added, calculate the new volume of the gas, in mL.

10.) If 672 mL of a 9.51 M solution of phosphoric acid is diluted to a total volume of 1.239 L, what is the new solution's concentration, in molarity (M)?

11.) A sample of water is measured to have $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-10} \text{ M}$.

a.) What is $[\text{OH}^-]$ in the sample?

b.) What is the pH of the sample?

c.) What is the pOH of the sample?

12.) Classify the following compounds as molecular or ionic. Name them appropriately.

a.) BaCl_2 _____

b.) $\text{Mn}(\text{NO}_3)_2$ _____

c.) PCl_5 _____

d.) $\text{HNO}_3(\text{aq})$ _____

13.) A line in the atomic spectrum of hydrogen has a wavelength (λ) of 486 nm. (**Possibly**

Useful: $c = 2.998 \times 10^8 \text{ m/s}$, $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$)

a.) Convert this wavelength into frequency (ν) in Hz.

b.) Convert this wavelength into energy (E) in J.