Exercises for CHM1033 Test 2 (Modules 4-6) **3** Extra Credit Points Name Key

1. What is the weight for each of the following? Please indicate if these are molecular weights (MW), formula weights (FW) or atomic weights (AW). Also please show appropriate units:

	Weight	Type
a. $(NH_4)_2CO_3$	96.11	FW
b. H_3PO_4	82.00	MW
c. Ag	107.87	AW

2. How many atoms of carbon are there in 1 mole of carbon? 6.02×10^{23} atoms
3. What is the name for the answer to question 2? Avogadro's Number
4. Convert each of the following. Please show all conversion factors and units.

a. .08769 moles of Na_2CO_3 to grams 92.9 g

$$.8769 mol \times \frac{105.99 g\ Na_2CO_3}{1 mol\ Na_2CO_3} = 92.9 g\ Na_2CO_3$$

b. 67865 grams of chlorine (Cl_2) to moles 957 moles

$$67865 g\ Cl_2 \times \frac{1 mol\ Cl_2}{70.90 g\ Cl_2} = 957 moles\ Cl_2$$

5. What is the molar mass of NaCl with the appropriate units? 58.44 g

6. Balance the following chemical equations. Leave the space blank if the coefficient is 1.

a. $C_7H_{16} + 11\ O_2 \longrightarrow 7\ CO_2 + 8\ H_2O$

b. $\left(C_9H_{18}O_2 + \frac{25}{2} O_2 \longrightarrow 9\ CO_2 + 9\ H_2O\right) \times 2 = 2\ C_9H_{18}O_2 + 25\ O_2 \rightarrow 18\ CO_2 + 18\ H_2O$

c. $3\ (NH_4)_2CO_3 + 2\ AlPO_4 \longrightarrow Al_2(CO_3)_3 + 2\ (NH_4)_3PO_4$

d. $Ca + 2\ H_2O \longrightarrow Ca(OH)_2 + H_2$

e. $H_2SO_4 + 2\ KOH \longrightarrow K_2SO_4 + 2\ H_2O$

f. $P_4 + 5\ Cl_2 \longrightarrow 4\ PCl_5$

g. $2\ H_3PO_4 \longrightarrow P_2O_5 + 3\ H_2O$

7. For each of the reactions in question 6 give the type of reaction:

a. Combustion b. Combustion c. double replacement

d. single replacement e. neutralization f. combination

g. decomposition

8. Indicate whether you expect each of the following covalent compounds to be polar **(P)** or nonpolar **(NP)**. If ionic **(I)**, please indicate so:
a. H_2O P b. CCl_4 NP c. SiF_4 NP d. NH_3 P e. KCl I f. $(NH_4)_2SO_4$ I

9. Predict whether each of the following substances identified as polar, nonpolar or ionic are expected to dissolve to any great extent in one another (**S** for soluble or **I** for insoluble):
a. H_2O and KCl S b. CCl_4 and H_2O I c. $(NH_4)_2SO_4$ and CCl_4 I d. CCl_4 and SiF_4 S
e. H_2O and NH_3 S

10. Identify each of the following substances as weak acids **(WA)**, strong acids **(SA)**, weak bases **(WB)**, strong bases **(SB)**, salts **(S)**, or covalent compounds **(C)**:
a. $HC_2H_3O_2$ WA b. PCl_3 C c. $CaCO_3$ S d. H_2SO_4 SA e. RbOH SB f. NH_3 WB

11. Identify each of the substances in question 10 as weak electrolytes (**WE**), strong electrolytes (**SE**), or nonelectrolytes (**NE**):
a. WE b. NE c. SE d. SE e. SE f. WE

12. For the following problems pleas show all formulas, conversion factors and units:

a. What is the concentration in units of %w/v for a solution that contains 68.0 grams of NaCl in 2.0 liters?

$$\frac{68.0\text{ g NaCl}}{2.0\text{ L}} = 34.0\%\ w/v$$

b. What is the volume in mL of a solution of glucose if it has a concentration of 34.7 %w/v and it contains 89 grams of glucose?

$$89\text{ g glucose} \times \frac{100\text{ mL solution}}{34.7\text{ g glucose}} = 256\text{ mL solution}$$

c. What is the volume in mL of acetic acid in 1.50 L of a 5.5% v/v aqueous solution of acetic acid?

$$1.50\text{ L solution} \times \frac{5.5\text{ L acetic acid}}{100\text{ L solution}} = .0825\text{ L acetic acid}$$

$$.0825\text{ L} \times \frac{1000\text{ mL}}{1\text{ L}} = 82.5\text{ mL acetic acid}$$

d. What is the molarity of a glucose solution if 50.0 g of glucose are dissolved in 900. mL of solution? Note that the molar mass of glucose is 180.18 g/mol.

$$M = \frac{\text{mols glucose}}{\text{L solution}} = \frac{50.0\text{ g glucose} \times \frac{1\text{ mol glucose}}{180.18\text{ g glucose}}}{900\text{ mL} \times \frac{1\text{ L}}{1000\text{ mL}}} = .308\text{ M}$$

e. How many liters of a 6.0 M HCl solution will contain 8.0 moles of HCl?

$$8.0\text{ mol HCl} \times \frac{1\text{ L solution}}{6.0\text{ mol HCl}} = 1.33\text{ L solution}$$

f. How many mL of a 0.358 M sucrose solution can be obtained from 100. mL of a 5.50 M solution?

$(100mL)(5.50M) = (V_2)(.358M)$

$V_2 = 1536\ mL$

13. If a 7.5 M glucose solution (left compartment) is separated from a 2.5 M glucose solution (right compartment) with a semipermeable membrane, water will flow from the 2.5M compartment to the 7.5M compartment. This process is called osmosis.

14. If an aqueous solution of sodium chloride, glucose and starch is immersed inside of a pouch that has a semipermeable membrane in a container with pure water. After a couple of hours the water in the container is tested for the presence of each of the following substances. Please indicate if the test will be positive **(+)** or negative **(-)** for each. The name of the process that occurs is dialysis.

a. Cl^- (+) b. starch (−) c. glucose (+)

15. Identify how a cell membrane compares to each of the following solutions (isotonic **(ISO)**, hypertonic **(HYPER)** or hypotonic **(HYPO)**, and what the name of the process that occurs is:

	ISO, HYPER, or HYPO	Name of Process
a. 0.4 % NaCl and 1% glucose	hypotonic	hemolysis
b. 0.9 % NaCl and 10% glucose	hypertonic	crenation
c. .9% NaCl and 5% glucose	isotonic	no change

16. Give the pH for each of the solutions for which the following $[H^+]$ are given:

a. 1×10^{-9} M 9 b. 1×10^{-2} M 2 c. 1×10^{-7} M 7

17. Identify whether each of the solutions in question 16 is acidic **(A)**, basic **(B)** or neutral **(N)**:

a. B b. A c. N

18. Give the pOH for each of the solutions in question 16.

a. 4 b. 12 c. 7

19. What is the $[OH^-]$ for each of the solutions in question 16?

a. 10^{-9} b. 10^{-12} c. 10^{-7}

20. Identify which of the following is a buffer as yes or no:

a. NaCl and HCl NO b. $(NH_4)_2Br$ and NH_3 YES c. HCN and NH_4CN YES

d. LiOH and $LiNO_3$ NO

21. Complete each of the following reactions or processes:

a. $HBr \xrightarrow{H_2O} H^+ + Br^-$

b. $NH_3 \xrightarrow{H_2O} NH_4^+ + OH^-$

c. $CsOH \xrightarrow{H_2O} Cs^+ + OH^-$

22. A buffer consists of $HC_2H_3O_2$ and $CsC_2H_3O_2$. If NaOH is added to this buffer, would you expect it to react with the $HC_2H_3O_2$ or the $CsC_2H_3O_2$ component of the buffer? $HC_2H_3O_2$

Why? Acid reacts with base