Name: **Period:**   **Seat#:**

Directions: Any worksheet that is labeled with an * means it is suggested extra practice. We do not always have time to assign every possible worksheet that would be good practice for you to do. You can do this worksheet when you have extra time, when you finish something early, or to help you study for a quiz or a test. If and when you choose to do this Extra Practice worksheet, please do the work on binder paper. You will include this paper stapled into your Rainbow Packet when you turn it in, even if you didn't do any of this. We want to make sure we keep it where it belongs so you can do it later if you want to (or need to). If you did the work on binder paper you can include that in your Rainbow Packet after this worksheet. If we end up with extra class time then portions of this may turn into required work. If that happens you will be told which problems are turned into required. Remember there is tons of other extra practice on the class website…and the entire internet! See me if you need help finding practice on a topic you are struggling with.
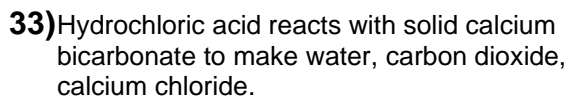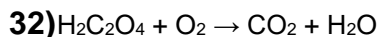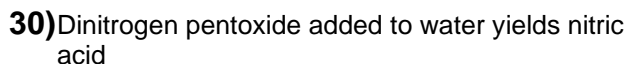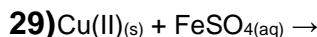
1) A solution of salt (molar mass 90 g/mol) in water has a density of 1.29 g/mL. The concentration of the salt is 35% by mass. Assume a 100 g sample.
     a. Calculate the molarity of the sol'n. *5.0 M*
     b. Calculate the total number of moles in the solution. *4.0 M*
     c. Calculate the mole fraction of the salt in the solution. *0.10*

2) Ethylene glycol ($C_2H_4(OH)_2$; 150g) is added to ethanol (C_2H_5OH; 250g)
     a. Calculate the mass % of ethylene glycol in the solution. *37.5%*
     b. Calculate the mole fraction of ethylene glycol in the solution. *0.31*

3) Concentrated sulfuric acid contains very little water, only 5% by mass. It has a density of 1.84 g/mL. What is the molarity of this acid? *17.8M*

4) The lattice energy of a salt is 350 kJ/mol and the solvation energies of its ions add up to 320 kJ/mol for the preparation of a 0.50 M solution. In the preparation of this solution would the solution get colder or water? What is the driving force for this solution process?

5) Addition of excess sodium nitrate to water to form a saturated solution results in the following equilibrium. The solution process is endothermic.
$NaNO_3(s) \leftrightarrow Na^+(aq) + NO_3^-(aq)$
Which of the following could increase the concentration of sodium nitrate in the solution? Circle choice. Then <u>explain</u> why or why not for each:
     a. Add more $NaNO_3(s)$
     b. Increase the pressure on the solution
     c. Increase the temperature
     d. Stir the solution more vigorously

6) A student dissolves 5.00 g of copper(II) nitrate trihydrate in water to make 100.0 mL solution. Calculate the concentration of the solution.

7) The lab technician dissolved 12.8g of naphthalene, $C_{10}H_8$, in ethanol to prepare 2.00 L of solution.
     a. What is the solute and what is the solvent in this solution?
     b. What is the solution's concentration?

8) What mass of $Mg(NO_3)_2$ is needed to prepare 250.0 mL of 0.120 M solution?

9) A chemist has pipetted 10.00 mL of 0.0500 M $CaCl_2$ into a test tube. How many moles of $CaCl_2$ is this?

10) A student used a graduated cylinder to obtain 25.0 mL of ethanol. She poured the ethanol into a 200.0 mL volumetric flask and added distilled water to prepare a solution. Pure ethanol (C_2H_5OH) has a density of 0.789 g/mL
     a. How many moles of ethanol were used?
     b. Calculate the molarity of the solution.
     c. How many molecules of ethanol are in the solution?

11) You need to prepare 500.0 mL of 40.0% (by volume) isopropyl alcohol in water. In a bullet list, with specific volumes, describe how to make the solution. Refer to two different types of appropriate lab glassware also.

12) A lab tech needs to prepare 500.0 mL of 0.0400 M ammonium sulfate.
     a. What mass of the salt should she use?
     b. List the steps to prepare the solution.

13) You pipette 25.00 mL of a 0.300 M NaCl solution into a petri dish and allow it to completely evaporate. What mass of salt will remain in the dish?

14) Explain what it means to dilute an aqueous solution. Mention both the <u>volume</u> and the <u>concentration</u> of the solution.

15) A student dilutes a 200.0 mL solution of 0.150 M sucrose solution to a new volume of 250.0 mL. Calculate the new concentration.

16) A student mixes 6.00 mL of distilled water with 4.00 mL of 0.400 M $CuSO_4$. What is the concentration after dilution?

17) You are given 20.0 mL of 0.500-M KOH and asked to use all of it to create a 0.200-M. What volume of water should you add to do this?

18) Solutions of nickel(II) sulfate were prepared. Violet colored light (410 nm) was passed through the solutions and the absorbance recorded. The Beer's Law plot was created.
   a. Estimate the concentration of a solution whose abs. is 0.30. Include units.
   b. 10.0 mL of a solution whose absorbance was 0.70 was diluted with the addition of 40.0 mL of water. What will be the absorbance for the new solution?
   c. You want to prepare 50.0 mL of a nickel(II) sulfate solution whose absorbance will be 0.50. What mass of the salt should you use?

Beer's Law Plot for Nickel Sulfate
Absorbances measured at 410 nm
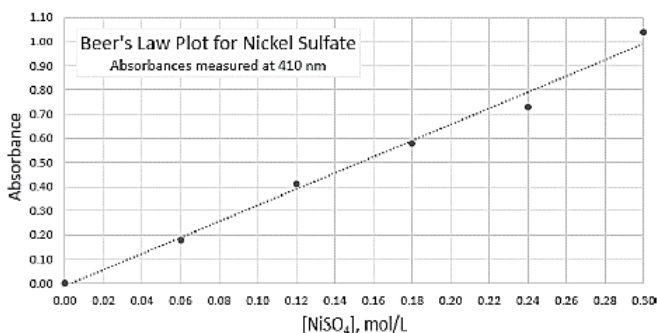
For the following, practice doing:
- *Write out the chemical equations.*
- *Identify type of reaction.*
- *For any single replacement – just assume the reaction takes place. We are not going to worry about the Activity Series.*
- *For any double replacement – use the Solubility Rules to identify if a precipitate forms.*
- *Identify any gases that form.*
- *For single replacement and double replacement reactions - practice writing overall balanced reaction, total ionic reaction, and net ionic reaction.*
- *These are copied and pasted, it is very likely there are duplicates. Oh well!*
- *You may need to look things up like the formulas for the acids in some problems.*

1) $Al_{(s)} + CuCl_{2(aq)} \rightarrow$

2) $Al_{(s)} + HCl_{(aq)} \rightarrow$

3) Aluminum hydroxide and sulfuric acid neutralize to make water and aluminum sulfate.

4) Aluminum hydroxide becomes Aluminum oxide and water

5) Aluminum sulfate and calcium hydroxide become aluminum hydroxide and calcium sulfate.

6) Ammonia plus water yields Ammonium hydroxide

7) Barium chloride reacts with sodium sulfate to produce barium sulfate and sodium chloride.

8) Barium hydroxide and sulfuric acid make water and barium sulfate.

9) Barium metal reacts with Iron (III) sulfate to produce barium sulfate and iron metal.

10) Barium oxide is added to carbon dioxide making Barium carbonate

11) Bismuth (III) oxide and zinc metal react to produce zinc oxide and bismuth metal.

12) $Br_{2(l)} + CaI_{2(aq)} \rightarrow$

13) $C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$

14) $C_6H_{12}O_6 + O_2 \rightarrow$

15) $C_7H_6O + O_2 \rightarrow CO_2 + H_2O$

16) Calcium carbonate will come apart when you heat it to leave calcium oxide and carbon dioxide.

17) Calcium fluoride and sulfuric acid make calcium sulfate and hydrogen fluoride (HF)

18) Calcium Hydroxide breaks into Calcium Oxide and water

19) Calcium metal reacts with phosphorus to produce calcium phosphide.

20) Calcium oxide and aluminum make aluminum oxide and calcium

21) Calcium phosphate and sulfuric acid make calcium sulfate and phosphoric acid (H_3PO_4).

22) Cesium Carbonate separates into Cesium Oxide and carbon dioxide

23) $CH_3COCH_3 + O_2 \rightarrow CO_2 + H_2O$

24) $CH_4 + O_2 \rightarrow CO_2 + H_2O$

25) Chlorine gas and sodium bromide yield sodium chloride and bromine

26) Copper metal and silver nitrate react to form silver metal and copper II nitrate.

27) Copper reacts with sulfuric acid and water to produce copper sulfate pentahydrate and sulfur dioxide

28) $Cr_2(SO_3)_{3(s)} + H_2SO_{4(aq)} \rightarrow$

29) $Cu(II)_{(s)} + FeSO_{4(aq)} \rightarrow$

30) Dinitrogen pentoxide added to water yields nitric acid

31) Electrolysis of water to individual elements

32) $H_2C_2O_4 + O_2 \rightarrow CO_2 + H_2O$

33) Hydrochloric acid reacts with solid calcium bicarbonate to make water, carbon dioxide, calcium chloride.

34) Hydrofluoric acid reacts with sodium hydroxide.

35) Iron (III) Hydroxide becomes Iron (III) oxide and water

36) $I_{2(g)} + MgCl_{2(aq)} \rightarrow$

37) Lead (II) nitrate and sodium iodide react to make lead iodide and sodium nitrate.

38) Lithium oxide and water make lithium hydroxide

39) Magnesium Chloride plus Oxygen yield Magnesium Chlorate

40) Magnesium Oxide is added to water make Magnesium Hydroxide

41) Magnesium solid added to Oxygen makes Magnesium Oxide

42) $Mg_{(s)} + HCl_{(aq)} \rightarrow$

43) Nickel (II) Chlorate $\rightarrow$ Nickle Chloride and Oxygen

44) Nitrogen plus Hydrogen make Ammonia gas

45) Nitrous Acid $\rightarrow$ Dinitrogen trioxide and water

46) Phosphoric acid (H_3PO_4) plus sodium hydroxide.

47) Potassium Chlorate becomes Potassium chloride and oxygen

48) Potassium nitrate decomposes to form potassium nitrite and oxygen

49) Propane (C_3H_8) burns (with oxygen)

50) $RaCl_2 \rightarrow Ra + Cl_2$

51) Rubidium Chlorate decomposes to Rubidium Chloride and Oxygen

52) Silver acetate plus potassium chromate $\rightarrow$

53) Sodium metal and chlorine react to make sodium chloride.

54) Solid Calcium Hydroxide plus a solution of phosphoric acid $\rightarrow$

55) Solid Sodium is added to Chlorine gas

56) Steam (add water vapor) to methane (CH_4) to get hydrogen and carbon dioxide

57) Sulfur burns in oxygen to make sulfur dioxide.

58) Sulfur trioxide and water combine to make sulfuric acid (H_2SO_4).

59) Sulfuric acid (H_2SO_4) reacts with zinc

60) Sulfuric Acid breaks into Sulfur trioxide and water

61) Table salt plus oxygen produces $\rightarrow$ Sodium chlorate

62) The combustion of $C_{23}H_{16}O_4$

63) Zinc and copper II sulfate yield zinc sulfate and copper metal

64) Zinc Carbonate becomes Zinc oxide and carbon dioxide

65) Zinc sulfide and oxygen become zinc oxide and sulfur.