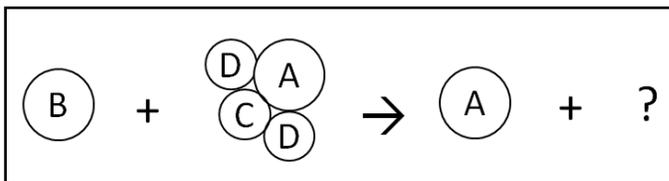


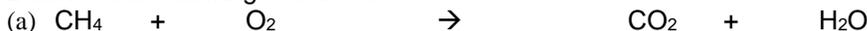
2nd Semester Study Guide 2016**Unit 6: Chemical Reactions and Balancing**

1. Draw the remaining product

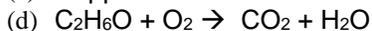


2. Write a balanced equation for the following reaction: The reaction between sodium metal and water yields aqueous sodium hydroxide and hydrogen gas.
3. If you leave your bike outside for an extended period of time and the bike rusts, would you expect your bike to weigh less, more or the same than it originally did?

4. Balance the following reactions:

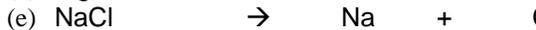


(b) Sodium carbonate reacts with hydrochloric acid to yield, sodium chloride, water, and carbon dioxide

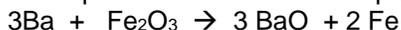
(c) Copper + silver nitrate \rightarrow silver + copper (II) nitrate

5. Interpret the following equation
- $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$
- in terms of atoms

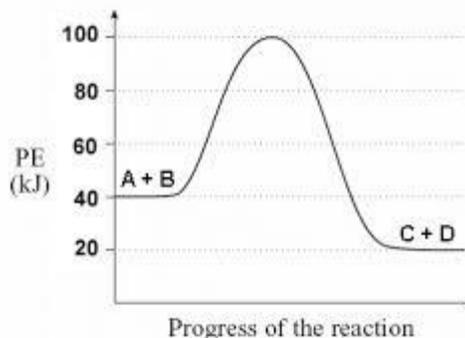
6. Balance,
- and**
- name the type of reaction for each of the following:



7. Use the equation below to answer questions A-E



- a. Which of the above substances are reactants?
- b. Which are products?
- c. What type of reaction is this?
8. How many molecules of Fe_2O_3 are represented in the above reaction?
9. How many Be atoms, and how many O atoms are in the formula: $2\text{Be}_3(\text{PO}_4)_2$?
10. Give the proper balanced equation from the following word equation:
Aluminum metal reacts with Sulfuric Acid (H_2SO_4) to produce Aluminum Sulfate and Hydrogen gas
11. Use the potential energy diagram to the right to answer the following questions.
- a. Is the reaction releasing energy or absorbing energy?
- b. How much energy is being absorbed or released?
- c. Is the reaction endothermic or exothermic?
- d. How much energy do the reactants need to gain in order for the reaction to occur?
- e. Write an equation for this reaction and include where heat would be placed in the equation.

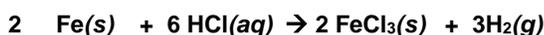


Unit 7- Moles, Molarity, and Dilutions

12. What is the molar mass for $\text{Ba}(\text{NO}_3)_2$?
13. How many atoms of oxygen are in $\text{Ba}(\text{NO}_3)_2$?
14. How many molecules are in 2 moles of NO_2 ?
15. A sample of C_8H_{18} (octanol) has a mass of 35 grams, how many moles does it contain?
16. What is Avogadro's number, and what is it used for?
17. How many moles are in 4.1×10^{24} molecules of KOH ?
18. How many grams are in 3.0 mol of $\text{Be}(\text{NO}_2)_2$?
19. If 25.1 grams of Na combines completely with 38.9 grams of Cl, what is the percent composition of the Na in the compound?
20. Find percent composition of carbon in Na_2CO_3 ? What about the percent of oxygen?
21. Explain the difference between a solute and a solvent.
22. Given 9.5g of KBr (molar mass is 119 g/mol) dissolved in water (molar mass is 18 g/mol) to make a 175mL solution, what would the molarity be?
23. In the previous question what is the solute? What is the solvent?
24. Calculate the moles and grams of solute in each solution
 - a. 1.5 L of 2.0 M KCl
 - b. 300 ml of a .30M NaCl
 - c. 500 ml of a 1.5M CaCl_2
25. Calculate the molarity of the following solutions
 - a. 2.0 mole KOH in 330 ml of solution
 - b. .75 mol BF_3 in a 3.2 L of solution
 - c. .22 mol of H_2O in 275 ml of solution
26. Calculate the following dilution problems:
 - a. How would you dilute a 3.0M solution of KNO_3 in order to get 240 ml of a .5M solution?
 - b. You are asked to make a 2.0L solution of .55M HCl by diluting the concentrated 16.0 M HCl . What volume of acid would be needed to make the dilution?
 - c. How would you dilute a 3.0 M solution of AgNO_3 in order to get 200 ml if a .60M solution?

Unit 8: Stoichiometry

** Use the following equation to solve questions 27-30:*

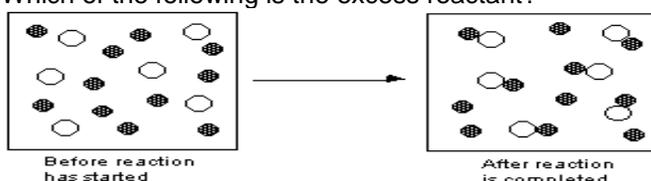


27. What is the mole ratio of Fe reacted to FeCl_3 produced?
28. How many moles of HCl are needed to react with 3.5 moles of Fe ?
29. Given 6.1 moles of HCl , how many grams of FeCl_3 are produced?
30. If 9g of Fe reacts with 14g of HCl , How many grams of H_2 will be produced? Which is the limiting reactant?

** Use the following equation to solve questions 31-32:*



31. Find the mass of Na needed to react with 1.36 mol of Na_2SiF_6 .
32. If 92.3 g of Na reacts, how many moles of NaF will be produced?
33. $2 \text{C}_2\text{H}_5 + 5 \text{O}_2 \rightarrow 4 \text{CO}_2 + 2 \text{H}_2\text{O}$
- (a) If 40 g of C_2H_5 reacts with 90 g of O_2 , What is the limiting reactant?
- (b) How many grams of CO_2 will be produced?
34. Determine the mass of water vapor you would expect to form (and the percent yield) in the reaction between 17 g of NH_3 and excess oxygen to produce water and nitrogen monoxide (NO). The mass of water actually formed is 23 g.
35. Which of the following is the excess reactant?



Unit 9: Acids and Bases

36. Describe the reactants and products of a neutralization reaction.
37. What is the concentration of HCl if 30 mL of acid is neutralized by 25 mL of .2 M NaOH?
38. How does each number change on the pH scale relate to its level of acidity?
39. In a solution, if the $[\text{H}^+] = 3.9 \times 10^{-4}$, then the $[\text{OH}^-]$ would equal what?
40. Give 3 properties of an acid.
41. Define an acid and define a base, and explain why water has a neutral pH?
42. If the pH of a substance is 9.5, what would the pOH be?
43. A solution has a concentration of H^+ ions of $1.0 \times 10^{-5} \text{ M}$, so the pH would be what?
44. Predict the products of the following neutralization reaction: $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow ?$
45. If the pH scale increases by increments of 10, how many times more acidic is a solution with a pH of 2 than a solution with pH of 4?
46. Which pH value is associated with the largest $[\text{H}^+]$, what about $[\text{OH}^-]$?
47. What is Bronsted/Lowry's acid base theory?
48. What is the Arrhenius acid/base theory?
49. What is the molarity of phosphoric acid if 15.0 ml of the solution is completely neutralized by 38.5mL of 0.150M NaOH?
50. How many milliliters of .50M hydrochloric acid must be added to 20mL of 0.90M potassium hydroxide to make a neutral solution?

51. Calculate the pH of the following and identify as an acid or base

- A) $\text{pOH} = 12$ B) $[\text{H}^+] = 2.2 \times 10^{-5}$ C) $[\text{OH}^-] = 1.0 \times 10^{-5}$

Unit 10: Energy

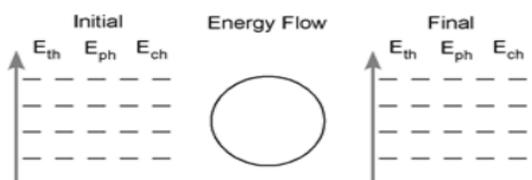
52. Describe the ways energy is stored in solids, liquids and gases:

Thermal energy –

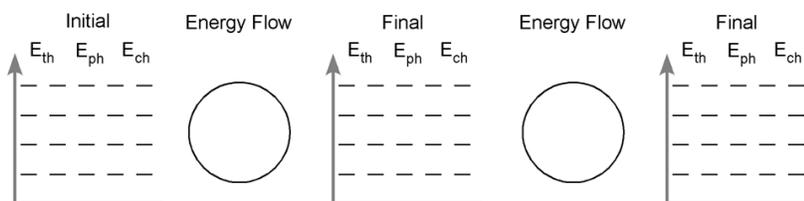
Phase energy –

53. Describe what happens (at the particle level) when a glass of cold water warms up to room temperature.

54. A cup of 70°C hot tea is left on the lab table for 15 minutes. Complete the bar chart that show this process.



55. A sample of water at 25°C is heated on a stove until it all becomes water vapor.

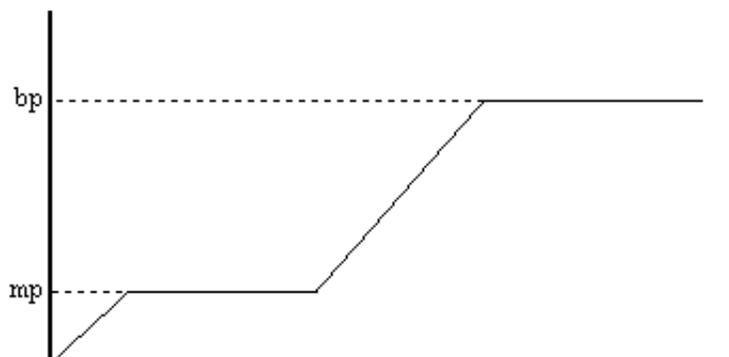


When energy is transferred to a sample of matter, either the particles speed up (temperature increases) or they get pulled apart (phase change), but not both at the same time. This helps account for the shape of the warming curve you got in the Icy Hot lab.

56. On the graph, label which phases are present in each portion of the curve.

57. On the graph, label the sections in which the thermal energy (E_{th}) of the sample is changing and where the phase energy (E_{ph}) is changing.

58. Describe the phase energy and thermal energy change of ice being heated from 0°C to 40°C . Be sure to include particle motion and arrangement for each change.



2.1 J/g°C **Specific Heat (C) of solid water**
4.18 J/g°C **Specific Heat (C) of liquid water**

For each of the situations below sketch a heating curve for water. Be sure to include beginning and ending temperatures as well as the temperature during any phase change. Label which phase(s) is (are) present in each portion of the curve.

59. A sample of ice at -5°C is heated until it becomes liquid water at 30°C .

60. A sample of liquid water at 30°C is heated until it all boils away.

61. If the specific heat of iron is $0.46 \text{ J/g} \times ^\circ\text{C}$, and silver is $0.24 \text{ J/g} \times ^\circ\text{C}$, then which would increase its temperature more quickly (assuming the same mass of each)?

62. Use the data table on the right from a calorimetry lab to calculate the heat absorbed by the water in the can.

mass of water heated	50.0 g
mass of ethanol burned	3.0 g
initial water temperature	35°C
final water temperature	60°C

63. A 55mL sample of water at 25°C is heated to 47.5°C . How much heat was absorbed?

Unit 11: Kinetics and Equilibrium

64. Give the two conditions that must be met for the collisions to be effective.

65. For the reaction, $6 \text{ HCl} + 2 \text{ Al} \rightarrow 2 \text{ AlCl}_3 + 3 \text{ H}_2$, aluminum foil reacts with hydrochloric acid.

- What happens to the speed of the reaction if more concentrated HCl is used? Explain why.
- What happens to the speed of the reaction if the aluminum foil is cut into small strips? Explain why.
- What happens to the speed of the reaction if the temperature is raised to 40°C ? Explain why.

66. For the reaction below, which change would cause the equilibrium to shift to the right?



- Decrease the concentration of dihydrogen sulfide.
- Increase the pressure on the system.
- Increase the temperature of the system.
- Increase the concentration of carbon disulfide.
- Decrease the concentration of methane.

67. What would happen to the position of the equilibrium (left, right, no shift) when the following changes are made to the equilibrium system below?



- Sulfur dioxide is added to the system.
- Sulfur trioxide is removed from the system.
- Oxygen is added to the system.
- Temperature decreases.
- Pressure is increased.