

FINAL EXAM REVIEW

CHAPTER 10- Chemical Reactions

1. What information can be determined from a *balanced equation*
2. List the indicators that a chemical reaction has occurred
3. Define *spectator ions*
4. Identify synthesis, decomposition, single displacement, double displacement and combustion reactions
5. *Balance* chemical equations and predict their products
6. Write net ionic equations for single and double displacement reactions
7. Define "chemical reaction"
8. Determine oxidation and reduction in a single replacement reaction

CHAPTER 12- Stoichiometry

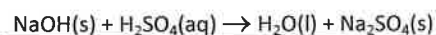
1. Define the *law of conservation of mass*
2. Define *Limiting* and *excess reagent*
3. Determine the limiting and excess reagents from given data
4. Define *Percent Yield* and calculate it from given data
5. a. What mass of iron must react with excess oxygen in order to form 4.81 moles of iron (III) oxide? b. What mass of iron is needed to react with 40.0 g of oxygen?
6. 6.00 moles of nitrogen gas react with 6.00 moles of hydrogen gas to produce ammonia.
 - a. what is the limiting reactant?
 - b. how many grams of ammonia are produced?

CHAPTER 15 – Solutions

1. Explain the effect of adding more solute to unsaturated, saturated and supersaturated solutions.
2. Explain how temperature and pressure affect solubility.
3. How many grams of AlCl_3 are required to make a 2.25M solution in 30.0 g of water?
4. What volume of 12M HCl is needed to prepare 250 mL of 0.20M HCl?
5. Which will have the greatest effect on ΔT_f at the same molality: $\text{C}_{12}\text{H}_{22}\text{O}_{11}$, MgBr_2 , AlCl_3 , or NH_4NO_3 ?

CHAPTER 16 B- Thermochemistry

1. For a reaction $\Delta H_{\text{rxn}} = -81 \text{ kJ}$ and $\Delta S_{\text{rxn}} = -215 \text{ J/K}$. Is it spontaneous at 50.0°C ?
2. Find ΔH : $2\text{B}(s) + 3\text{H}_2(\text{g}) \rightarrow \text{B}_2\text{H}_6(\text{g})$ Given:
 $2\text{B}(s) + 3/2 \text{O}_2(\text{g}) \rightarrow \text{B}_2\text{O}_3(\text{s}) \quad \Delta H = -1273 \text{ kJ}$
 $\text{B}_2\text{H}_6(\text{g}) + 3 \text{O}_2(\text{g}) \rightarrow \text{B}_2\text{O}_3(\text{s}) + 3 \text{H}_2\text{O}(\text{g}) \quad \Delta H = -2035 \text{ kJ}$
 $\text{H}_2(\text{g}) + 1/2 \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l}) \quad \Delta H = -286 \text{ kJ}$
 $\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{O}(\text{g}) \quad \Delta H = 44 \text{ kJ}$
3. Find the S° for the reaction:



Substance	$\Delta H^\circ(\text{kJ/mol})$	$\Delta G^\circ(\text{kJ/mol})$	$\Delta S^\circ(\text{J/molK})$
$\text{H}_2\text{O}(\text{l})$	-286	-237	70.
$\text{Na}_2\text{SO}_4(\text{s})$	-1387	-1270.	150.
$\text{NaOH}(\text{s})$	-426	-400.0	
$\text{H}_2\text{SO}_4(\text{aq})$	-909	-745	20.

VOCAB:

Reactant product coefficient solubility rules

Activity series , oxidation, reduction

- c. how many moles of the excess reactant remain?
 - d. if 30.0g of ammonia are produced, what is the percent error?
 - e. What is the percent yield?
 - f. how many liters of ammonia are produced at STP?
7. What volume of $\text{SO}_2(\text{g})$ is produced from 32.5 g of ZnS at 23°C and 103.3 kPa? $\text{ZnS} + \text{O}_2 \rightarrow \text{ZnO} + \text{SO}_2$

VOCAB:

Excess reactant limiting reactant
% error % yield

6. What is the molarity of a solution containing 26.5g of NaCl in enough water to make 275 mL of solution?

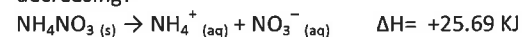
7. What volume of 12M HCl is needed to prepare 250 mL of 0.20M HCl?

8. Explain the effect of a solute on the boiling point, freezing point and vapor pressure of a solvent.

VOCAB: solvation solubility
Dissociation ionization
Like dissolves like

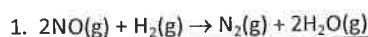
4. Determine the signs for ΔH , ΔS , ΔG when a sample of water condenses.

5. What is the sign of ΔS as the ammonium nitrate dissociate. Is the temperature of water increasing or decreasing?



VOCAB: endothermic exothermic
order disorder
Spontaneity specific heat
Heat capacity enthalpy
Entropy Gibbs free energy

CHAPTER 17 – Kinetics



Initial [NO] M	Initial [H ₂] M	Rate of Rxn M/s
4.0×10^{-3}	2.0×10^{-3}	1.2×10^{-5}
8.0×10^{-3}	2.0×10^{-3}	4.8×10^{-5}
4.0×10^{-3}	4.0×10^{-3}	2.4×10^{-5}

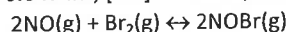
- Determine the rate law expression.
 - Calculate the rate law constant.
 - What would be the rate if $[\text{NO}] = [\text{H}_2] = 0.050\text{M}$?
 - What is the overall order of the reaction?
2. $\text{H}_2\text{O}_2 + \text{I}^- \rightarrow \text{H}_2\text{O} + \text{IO}^-$ (fast)
 $\text{H}_2\text{O}_2 + \text{IO}^- \rightarrow \text{H}_2\text{O} + \text{O}_2 + \text{I}^-$ (slow)
- What is the overall reaction?
 - Identify the catalyst.

- Identify the intermediate.
 - What is the rate law expression?
3. Given: $\text{rate} = k[\text{A}]^2[\text{B}]$ what would happen to the rate if:
- [A] is doubled?
 - [B] is halved?
 - [A] is doubled and [B] is tripled?

VOCAB: collision theory rate law
 Reaction order factors affecting rates
 Catalyst specific rate constant
 Activation energy reaction mechanism
 Activated complex rate determining step

CHAPTER 18- Equilibrium

1. Calculate K_{eq} given the equilibrium concentrations are:
 $[\text{NOBr}] = 0.0474\text{M}$, $[\text{NO}] = 0.312\text{M}$, and $[\text{Br}_2] = 0.259\text{M}$



2. How would equilibrium be affected for:
 $\text{PCl}_5(\text{g}) \leftrightarrow \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g}) + \text{heat}$
- Increase concentration of PCl_5
 - Decrease PCl_3 concentration
 - Increased the volume of the container

- Add a catalyst.
 - Cool the reaction vessel
3. Calculate the $[\text{F}^-]$ in a saturated solution of PbF_2 given the $K_{\text{sp}} = 3.3 \times 10^{-8}$.
4. Predict if a precipitate will form if 125 mL of 0.010M K_2SO_4 is mixed with 250 mL of 0.015M CaBr_2 . K_{sp} of $\text{CaSO}_4 = 4.9 \times 10^{-5}$

VOCAB: LeChatelier's Principle common ion effect

CHAPTER 19 – Acids and bases

State whether the following are acids or bases for 1-4

- Have a sour taste
 - React with metals
 - Feel slippery
 - Turn blue litmus paper red
5. Define acids and bases according to Arrhenius and Bronsted-Lowry.
6. Identify each substance as acid, base, conjugate acid or conjugate base: $\text{H}_2\text{S} + \text{H}_2\text{O} \rightarrow \text{HS}^- + \text{H}_3\text{O}^+$
7. Give the conjugate acids of: NH_3 and Br^- .
8. Give the conjugate bases of: H_3O^+ and HSO_4^- .
9. Find the pH of 0.75M HCl.
10. Find the molarity of a KOH solution with a pH of 9.5.
11. Is the solution in #27 acidic or basic?
12. If 43.5 mL of 0.15M HBr is required to neutralize 25.0 mL of $\text{Ca}(\text{OH})_2$, what is the molarity of $\text{Ca}(\text{OH})_2$?
13. What is the $[\text{H}_3\text{O}^+]$ in a 0.100M of HCN which has a $K_{\text{a}} = 6.17 \times 10^{-10}$?

14. Calculate K_{a} for a 0.100M of HClO that has a pH of 4.75.
15. Show how the addition of a strong acid or base does not significantly change the pH of a solution containing the $\text{HC}_2\text{H}_3\text{O}_2/\text{C}_2\text{H}_3\text{O}_2^-$ buffer.

VOCAB: hydronium ion neutralization reaction
 Amphoteric titration
 Strong/weak acid/base equivalence point
 buffer

First Half of the Year:

Significant figures
 Nomenclature (for stoichiometry)
 Equation writing (for stoichiometry)
 Periodic Table:
 Families
 Metals vs. nonmetals
 Valence electrons/charges of ions
 Bonding:
 Ionic – ions involved & properties
 Covalent- atoms involved & properties

Mole Concept
 Hydrogen bonding
 Vapor pressure and boiling point relationship