Semester 2 Chemistry Final Exam – Review Notes

Chapter 7: The Mole and Chemical Composition

- Key Terms and Definitions
- Average Atomic Mass (Calculations)
- Calculating with Mass, Moles, Molar Mass, and Number of Particles (Atoms or Molecules) using Avogadro's Number
- Calculate % Compositions using Molar Mass or Total Mass and Molecular Formula
- Find Molecular Formula given Molar Mass and Empirical Formula and vice versa
- Determine Empirical Formula given % Compositions
- Determine Molecular Formula given % Compositions and Molar Mass

Chapter 8: Chemical Equations and Reactions

- Key Terms and Definitions
- Physical Change versus Chemical Change ; Physical Properties versus Chemical Properties
- Five Evidences of a Chemical Change
- Identify Five Types of Chemical Reactions
- Chemical Word Equation and Chemical Equation (Predicting Products and their states; Balancing Chemical Equations)
- Use Activity Series to Predict whether there will be a reaction (Single Replacement)
- Use Solubility Table to Predict Precipitation

Chapter 9: Stoichiometry

- Key Terms and Definitions
- Mole Ratios
- Gravimetric Stoichiometry Calculations
- % Yield and %Error
- Excess and Limiting Reactants and their Calculations

Chapter 10: Causes of Change

- Key Terms and Definitions
- Heat, Work, Energy and Enthalpy
- Heat Related to Physical Change (Kinetic - Temperature vs. Potential – Phase) and Calculations ($q = mc_P\Delta T$ and $q = nC\Delta T$)
- Specific Heat
- Enthalpy Related to Chemical Potential Change and Calculations ($\Delta H = n\Delta H_{f,\text{ comb, rxn}}$)
- Potential Energy Diagrams of Endothermic and Exothermic Change
- Molar Enthalpy of Reaction, Combustion and Formation
- Theoretical Calculation of Molar Enthalpy of Reaction (Hess's Law and $\Delta H_{rxn} = \Sigma H_{products} - \Sigma H_{reactants}$)
- Experimental Calculation of Molar Enthalpy of Reaction (Calorimetry – Heat Lost = Heat Gained)
- Law of Conservation of Energy

Chapter 11: States of Matter and Intermolecular Forces

- Key Terms and Definitions
- How Kinetic Molecular Theory Describes Three States of Matter
- Phase Changes
- Intermolecular Forces (Ion-Dipole, London Dispersion, Dipole-Dipole, and Hydrogen Bond)
- How Polarity of a Molecule affects Intermolecular Forces
- How Intermolecular Forces affect Physical Properties such as Boiling and Melting Points, Solubility
- Properties of Water (Surface Tension, Capillary Action, Ice Crystal Geometry, Density of Ice)
- Vapour Pressure and Temperature, Volatile Substance, Normal Melting and Boiling Point
- Interpreting Phase Diagram (plus Critical and Triple Point)

Chapter 12: Gases

- Key Terms and Definitions
- Properties of Gases and the Kinetic Molecular Model (Assumptions) of Gases
- Pressure and converting between its units (kPa, atm, mm Hg and torr)
- Gas Laws and calculations (Boyle, Guy-Lussac, Charles, Avogadro, and Combined Gas Law)
- Ideal Gas Law and calculation of mass and molar mass
- Ideal Gas versus Real Gas
- Dalton's Partial Pressure
- Graham's Law of Effusion and calculation
- Gas Stoichiometry

Chapter 13: Solutions

- Key Terms and Definitions
- Solution, Solute and Solvent of various Phases
- Suspensions, Colloid and Solution
- Precipitation and Crystallization, Filtration and Distillation
- Molarity Calculations, ppm Calculations, Preparing a Solution
- Solution Stoichiometry
- Dilution
- Dissociation of Ionic Solute vs. Hydration of Molecular Solute
- "Like Dissolves Like"
- Various Levels of Solubilities (Miscible, Partially Miscible, and Immiscible)
- Various Levels of Concentrations (Unsaturated, Saturated and Supersaturated Solutions)
- Solubility Table
- Calculating Solubility and using a Solubility Graph
- Factors affecting Solubility of Gas Solutes and Solid Solutes
- Conductivities in Solutions (Strong Electrolytes, Weak Electrolytes and Non-electrolytes)
- Colligative Properties (Boiling Point Elevation and Freezing Point Depression)
- Surfactant, Emulsion, Soap and Detergent

Chapter 15: Acids and Bases

- Key Terms and Definitions
- Physical and Chemical Properties of Acids and Bases
- Arrhenius Definitions of Acids and Bases
- Brønsted-Lowry Definitions of Acids and Bases
- Conjugate Acids and Conjugate Bases
- Strong and Weak Acids (Relative Strengths of Acids and Bases)
- Strong and Weak Bases
- Nomenclature of Acids and Bases
- Major Species of Strong and Weak Acids and Bases
- Monoprotic, Diprotic and Polyprotic Acids, Amphoteric Substances
- Acidity, Basicity, pH and pOH Calculations
- Autoionization of Water and Calculations ($K_w = [H_3O^+][OH^-]$)
- pH and pOH calculations of Strong Acids and Strong Bases)
- Acid and Base Indicators
- Acid and Base Neutralization, Stoichiometry of Acid and Base Neutralization
- Titration, Titration Procedure, pH Curve, Stoichiometric (Equivalence) Point and End Point

Things you can do to Review:

1. Look over your Quizzes. Note the type of questions you got wrong. Identify the type of mistakes. Did you not understand the concepts, or it was a silly calculation error? If you do not understand a concept, go to the notes and look over the examples.
2. Go through the multiple-choice questions at the end of each chapter. The answers to those are online. Do the practice chapter test I have been handing out at the end of each unit.
3. Do the following **Extra Review Questions** at the very back of the textbook.

   Moles and Chemical Composition (pg. 859−862 #1, 2, 8, 10, 14, 22, 28, 32, 35, 38, 48, 49, 54, 58, 70, 79, 81, 84, 87, 88)
   Stoichiometry (pg. 862−863 #1, 3 to 7)
   Causes of Change – Thermochemistry (pg. 863−864 #1 to 4, 7, 12)
   Gases (pg. 865 −870 #1 to 5, 8, 11, 23, 27, 30, 38, 41, 50, 52, 55, 74, 80, 82, 83, 90, 93, 104)
   Solutions (pg. 870−871 #1, 8 to 11, 17; redo **Dilution and Solubility Worksheet in Chapter 13 Notes**)

Answer to Extra Review Questions:

Moles and Chemical Composition (pg. 859−862)

1. 1300 g **2.** 4.0 mol **8.** 1.5×10^{23} molecules **10.** 1170 g **14.** 3.59×10^{22} molecules
22. 163.3 g **28.** 84.46 g/mol **32.** 85.00 g/mol **35.** 152.10 g/mol **38.** 158.18 g/mol
48. 52.55%Ba; 10.72%N; 36.73%O **49.** 43.85% H_2O **54. (a)** 41.8 g **(b)** 1.18 mol
70. $KClO_2$ **79.** $C_6H_8O_7$ **81.** NiO **84.** $O_3C_3N_3Cl_3$ **87.** $C_4H_8O_4$ **88.** C_3H_6

Stoichiometry (pg. 862−863)

2. 6.7 g **3. (a)** 2.38 g **(b)** 1.78 g **4. (a)** 2 mol **(b)** 1 mol **(c)** 0.125 mol
5. (a) 0.379 mol **(b)** 0.758 mol **(c)** 126 g **6.** 4.41 g **7. (a)** CO **(b)** 38 mL **(c)** 412 mL

Causes of Change − Thermochemistry (pg. 863−864)

1. −180 kJ **2.** 3600 J **3.** 570 K **4.** 890.2 kJ **7.** 66.4 kJ **12.** 0.14 kJ

Gases (pg. 865−870)

1. 177 kPa **2.** 1330 mmHg **3.** 0.75 atm **4.** 76 kPa **5.** 0.9813 atm **8.** 1.4999 atm
11. 1 L **23.** 40 kPa **27. (a)** 260 K **(b)** −11°C **30.** 6.9 L **38.** 36°C
41. 2.6 atm **50.** 32.0 g/mol **52.** 3.98 atm **55.** 105 L **74. (a)** 15 g **(b)** 2.22 g **(c)** 0.364 g
80. 162 g/mol **82.** 235 m/s **83.** 81 g/mol **90.** 2.24 L **93.** 18.0 g
104. (a) 0.50 mol **(b)** 0.75 mol **(c)** 17 L

Solutions (pg. 870−871)

1. 0.1249 mol/L **8.** 343 g **9.** 1140 g **10.** 0.143 mol **11. (a)** 132.2 g **(b)** 4.003 mol/L **17.** d,a,b,c

Acids and Bases (pg. 872−873)

1. acidic **2.** basic **3.** acidic **4.** basic **5.** 0.35 mol/L
6. (a) 1×10^{-8} mol/L **(b)** 1×10^{-6} mol/L **(c)** 5×10^{-7} M **8.** pH = 5 **10.** pH = 12
12. 1×10^{-4} mol/L **13.** 1×10^{-10} M **16.** 3×10^{-2} M **17.** 3.33×10^{-13} M
18. (a) 2×10^{-4} M **(b)** 5×10^{-11} M **20. (a)** 1×10^{-3} M **(b)** 5×10^{-4} M **21.** 0.0067 M