Chem I and Chem I Honors Final Exam Study Guide

2014-2015, Pickett

Nature of Science (Ch. 1 and notes)

* Lab safety
* Lab tools and proper use
* Scientific methods/Experimental design – hypothesis, independent, dependent and controlled variables, controls, materials & procedure, data collection, analysis, conclusion
* Theory, law, hypothesis, and facts

Matter, Change and Energy (Ch. 2)

* Chemical and Physical properties and changes (signs of chemical change)
* Mixtures (homogenous vs. heterogeneous, solutions) and separating mixtures (filtration, chromatography, distillation)
* Elements, chemical symbols
* Ion formulas/charges (polyatomic ions and charges are on the reference sheet!)
* Conservation of energy and mass

Scientific Measurement (Ch. 3)

* Scientific notation
* Accuracy and Precision
* Error and percent error (formulas on reference sheet)
* Significant Figures
* Metric System (SI), incl. base units of measure, prefixes, temperature units and conversions (°C→ K, K → °C)
* Density (definition and equation)
* Dimensional analysis, Using proper units/labels

The Atom & Nuclear Chemistry (Ch. 4 & 25)

* Development of atomic theory and models – Dalton, Thomson, Rutherford, Bohr, Quantum Mechanical Model (Schrodinger)
* Atomic number, Mass number, Atomic mass/amu, Calculating number of neutrons, electrons, protons in an atom
* Isotopes
* Radioactive isotopes, alpha and beta particles, gamma rays, half life
* Honors – fission vs. fusion

Electrons in Atoms (Ch. 5)

* Quantum Mechanics (electrons moving between energy levels)
* Quantum numbers (principal energy levels)
* Electron configuration
* Orbital Notation
* Valence electrons and octet rule
* Elecromagnetic spectrum (parts of transverse wave, wavelength/frequency calculations)
* Atomic emission spectra (Bright Line Spectrum…where do the lines come from?)
* Photoelectric effect, energy of a photon calculation
* Ground states vs. excited states

The Periodic Table (Ch. 6)

* Development of the Periodic Table and Periodic Law
* Metals/Nonmetals/metalloids… Know where they are! Know their properties and characteristics!
* Electron configuration and the Periodic Table (know your blocks!)
* Groups/Periods of the Periodic Table (know names of groups and locations of representative elements, transition metals, inner transition metals)
* Periodic Table trends (atomic size, ionization energy, ionic size, electronegativity)

Bonding (Ch. 7-8)

* Ionic bonds
* Covalent bonds
* Polarity of Molecules and bonds
* Molecular shapes and VSEPR theory
* Intermolecular forces – van der Waals (dipole interactions and dispersion forces) and hydrogen bonds

Chemical Names/Formulas (Ch. 9)

* Naming and writing formulas for ionic compounds
* Naming and writing formulas for covalent compounds
* Naming and writing formulas for acids

The Mole (Ch. 10)

* Conversions between moles and mass, atoms/molecules (Avogadro’s number), volume (22.4L gas at STP)
* Calculating molar mass
* Standard Temperature and Pressure (STP), 0°C and 1 atm (101.3 kPa, 760 mmHg)
* Calculating percent composition

Chemical Reactions (Ch. 11)

* Writing Chemical Equations
* Balancing Chemical Equations
* Types of Chemical Reactions (Recognizing… Combination/Synthesis, Decomposition, Single Replacement, Double Replacement, Combustion, Oxidation-Reduction)
* Predicting products of each type of reaction
* Heat of reaction (exothermic, endothermic…)

Stoichiometry (Ch. 12)

* Mole ratios
* Gram to gram stoichiometry
* Reaction Stoichiometry (converting between mole/mass/volume/particles)
* Limiting Reagent Problems
* Percent Yield Problems

States of Matter (Ch. 13)

* Kinetic Molecular Theory and the Nature of Gases
* Pressure units and conversions (atm, kPa, torr, mmHg)
* Liquids – moderate kinetic energy, intermolecular forces hold molecules in contact
* Vapor pressure, boiling/condensation points, melting/freezing points
* Solids – low kinetic energy, strong intermolecular forces hold molecules in position
* Changes in state of matter
* Phase diagrams, triple point

The Behavior of Gases (Ch. 14)

* Compressability
* Gas Laws (Boyle’s, Charles; Gay-Lussac’s, Combined)
* Ideal vs. Real Gases, Ideal Gas Law (PV = nRT)

Water and Aqueous Solutions (Ch. 15-16)

* Solvation/ Solubility
* Solutions, Colloids, Suspensions
* Factors that effect solubility
* Concentration (molarity)
* Reading a solubility curve
* Dilution formula (M1V1 = M2V2)
* Colligative properties (freezing point depression, boiling point elevation)
* HONORS – Net ionic equations

Acids and Bases (Ch. 19)

* Definitions and Properties of Acids and Bases
* Strengths of acids and bases (Strong vs. Weak); Concentrated vs. Diluted
* Calculating pH, pOH, and concentration
* Titrations

Thermochemistry packet (Ch. 17)

* Energy transformations
* Specific heat

Reaction Rate and Equilibrium (Ch. 18)

* Collision theory and activation energy
* Factors affecting reaction rate – temperature, concentration, particle size, catalyst/inhibitor, (stirring)
* Equilibrium – rate of forward and reverse reactions

Redox Reactions (Ch. 20)

* Assigning oxidation numbers
* Identifying which species is reduced and which is oxidized