

AP CHEMISTRY SCHEDULE

Listed below is the unit schedule for AP Chemistry. It provides for approximately 3 weeks of review for the AP Chemistry test in early-May. Tests will typically cover multiple units. All assignments, quizzes, tests and lab days may change due to unforeseen circumstances, any and all changes will be announced prior to the assignment due date. Due to the pacing of this course, it is expected that all students complete the reading assignment prior to the start of the material.

Labs: Each unit will have labs specifically designed to reinforce the material being covered at that time.

Unit 1

Time: 3 weeks

Reading: Chapters 1-3 of Brown, LeMay, Bursten, and Murphy.

Topics: Welcome back to Chemistry (Atoms, Molecules, and Ions)

1. Atoms and the Periodic Table
2. Molecules and molecular compounds
3. Ions
4. Significant figures, dimensional analysis, units of measurement

UNIT 1 ASSIGNMENTS

- Matter and measurement Chpt 1 – 9, 13, 19, 25, 30
- **Lab Safety Video**
- **Lab Safety Quiz**
- Sig Fig and Problem Solving Chpt 1 – 35, 42, 43, 46, 69
- **Change You Can Believe In Activity**
- **Chromatography Labette**
- **Density Lab**
- Atom and Periodic Table Chpt 2 – 3, 14, 20, 25, 33, 42
- **POGIL Mass Spectroscopy**
- Naming Chpt 2 – 59, 63, 65, 70, 71
- **Periodic Table Simulation**
- Reactions and Mass Chpt 3 – 5, 13, 14, 21, 26
- **Hydrate Experiment**
- Stoichiometry Chpt 3 – 35, 38
- Empirical Formula Chpt 3 – 43, 46, 47, 54
- Chpt 3 – 59, 64, 74, 79
- **Unit 1 Test**

Unit 2

Time: 3 weeks

Reading: Chapters 4-5 of Brown, LeMay, Bursten, and Murphy.

Topics: Stoichiometry and Predicting Reactions Products

1. Chemical equations
2. Patterns of chemical reactivity
3. Formula weights

4. Avogadro's number and the mole
5. Empirical formulas from analysis
6. Quantitative information from balanced equations
7. Limiting reactants
8. Properties of aqueous solutions
9. Precipitation reactions
10. Acid-base reactions
11. Oxidation-reduction reactions
12. Concentrations of solutions
13. Solution stoichiometry and chemical analysis

Topic: Thermochemistry

1. What is energy?
2. First law of thermodynamics
3. Enthalpy and enthalpies of reactions
4. Calorimetry
5. Hess's Law
6. Enthalpies of formation

UNIT 2 ASSIGNMENTS

- Molarity and Electrolytes Chpt 4 – 62, 72, 16, 18
- Net Ionic Equations Chpt 4 – 21, 28
- **POGIL Net Ionic Equations**
- **Precipitate Lab**
- Redox and Activity Series Chpt 4 – 49, 52, 55, 57
- **POGIL RedOx Half Reactions**
- Solution Stoichiometry Chpt 4 – 79, 84, 87
- **RedOx Quiz**
- **Acid/Base Titration-Calculate M**
- Enthalpy Chpt 5 – 25, 33, 38, 40 (a & b only), 46
- Calorimetry Chpt 5 – 49, 52, 56, 57
- **Calorimetry Basics Lab**
- Hess's Law Chpt 5 – 63, 64
- **Heat of Reaction – Hess's Law Lab**
- Enthalpy Of Formation Chpt 5 – 67, 72, 77
- **POGIL Heats of Formation**
- **Unit 2 Test**

Unit 3

Time: 2 weeks

Reading: Chapters 6-7 of Brown, LeMay, Bursten, and Murphy.

Topics: The Electronic Structure of Atoms and Periodic Properties of the Elements

1. Wave nature of light
2. Quantized energy and photons
3. Bohr Model
4. Wave behavior of matter
5. Quantum mechanics and atomic orbitals
6. Many electron atoms
7. Electron configurations and the periodic table

8. History of the periodic table
9. Effective nuclear charge
10. Size of atoms and ions
11. Ionization Energy
12. Electron Affinities
13. Properties of metals, nonmetals, and metalloids
14. Trends for Groups 1A, 2A, 6A, 7A, and 8A

UNIT 3 ASSIGNMENTS

- **Determining Chemical Reaction Stoichiometry**
- Spectroscopes Chpt 6 – 14, 15
- **POGIL Electron Energy and Light**
- The Hydrogen Atom & Light
- Atomic History,
Quantum Numbers, Energy Chpt 6 – 21, 26, 30, 37
- **Flame Tests Lab**
- e- configuration, e- dot Chpt 6 – 68, 71, 74
- Zeff Chpt 7 – 11, 14
- Periodic Table & Properties Chpt 7 – 19, 23, 25, 33, 39, 42, 44, 49, 73, 108, 110
- **POGIL Advanced Periodic Trends**
- **Unit 3 Test**

Unit 4

Time: 2 weeks

Reading: Chapters 8-9 of Brown, LeMay, Bursten, and Murphy.

Topics: Chemical bonding and Predicting and Understanding Molecular Shapes

1. Chemical bonds
2. Lewis structures, and the octet rule
3. Ionic bonding
4. Covalent bonding
5. Bond polarity and electronegativity
6. Resonance structures
7. Exceptions to the octet rule
8. Strengths of covalent bonds
9. Molecular shapes
10. VSEPR model
11. Hybrid orbitals
12. Multiple bonds
13. Molecular orbitals and their application to diatomic and simple systems

UNIT 4 ASSIGNMENTS

- Ionic Bonding Chpt 8 – 15, 17, 21, 24, 28
- Covalent Bonding, Lewis Structures Chpt 8 – 3, 8, 12, 30, 34
- Bonds, Oxidation Numbers Chpt 8 – 38, 40, 44, 50, 52 (a,b), 69
- VSEPR Chpt 9 – 12, 15, 16, 21, 26
- **Molecular Model Activity**
- **VSEPR Model Activity**
- Dipole Moment Chpt 9 -31, 35, 38
- Hybridization Chpt 9 -41 (a,b,c), 43, 48, 51a/b, 56

- **Unit 4 Test**

Unit 5

Time: 2 ½ weeks

Reading: Chapters 10-11 of Brown, LeMay, Bursten, and Murphy.

Topics: Gasses, Liquids, and Solids

1. Pressure
2. Gas Laws (Boyle's Law; Charles's Law; Avogadro's Law)
3. Ideal Gas Equation
4. Molar Mass
5. Partial Pressure (Dalton's Law of Partial Pressures)
6. Kinetic-Molecular Theory
7. Effusion & Diffusion (Graham's Law)
8. Real Gases
9. Comparison of gases, liquids, and solids
10. Intermolecular forces & properties of liquids
11. Phase changes
12. Vapor Pressure
13. Phase diagrams
14. Structures and bonding of solids

UNIT 5 ASSIGNMENTS

- Gas Laws and KMT Chpt 10 – 13a, 14, 21, 24, 74, 76a
- **Pressure and Volume Lab**
- **Ideal Gas Law Lab**
- Ideal Deviations Chpt 10 – 30, 37, 82
Calculations... MW and Density
Effusion/diffusion, Grahams Law
- Partial Pressure and Gas Stoichiometry Chpt 10 – 58, 60, 64, 68
- **POGIL Partial Pressures of Gases**
- **Molar Volume Of Hydrogen Lab**
- Intermolecular Forces Chpt 11 – 14, 16, 20, 24
- Changes in State Chpt 11 – 36, 39, 40, 42, 46, 48
- **Heat of Fusion of Ice Lab**
- Phase Diagrams, Solids Chpt 11 – 53, 56, 59

Unit 6

Time: 3 weeks

Reading: Chapters 13-14 of Brown, LeMay, Bursten, and Murphy.

Topics: Properties of Solutions and Chemical Kinetics

1. The solution process
2. Saturated solutions and solubility
3. Factors affecting solubility
4. Expressing concentration
5. Description of reactions rates and factors affecting reaction rates
6. The rate law and impact of concentration

7. Change of concentration with time (1st and 2nd order reactions)
8. Temperature and rate
9. Reaction mechanisms
10. Catalysis

UNIT 6 ASSIGNMENTS

- Solutions/Concentration Chpt 13 – 13, 17, 18, 21, 27, 36, 42, 48
- Solubility
- **Rate of Decomposition of Calcium Carbonate**
- Kinetics Chpt 14 – 14, 16a, 18, 19
- Rate Laws and Equations Chpt 14 – 24, 27, 30, 32, 38, 43
- **POGIL Rate of Reaction**
- Mechanisms Chpt 14 – 62, 63, 66, 67
- Catalysis Chpt 14 – 71, 72
- **Unit 6 Test**

Unit 7

Time: 4 weeks

Reading: Chapters 15-16 of Brown, LeMay, Bursten, and Murphy.

Topics: Chemical Equilibrium and Acid-Base Equilibria

1. Concept of equilibrium and the equilibrium constant
2. Interpreting and working with equilibrium constants
3. Heterogeneous equilibria
4. Calculating equilibrium constants
5. Applications of equilibrium constants
6. Le Châtelier's Principle
7. Brønsted-Lowry acids and bases
8. Auto ionization of water
9. pH scale
10. Strong acids and bases
11. Weak acids and bases
12. Relationship between K_a and K_b
13. Acid-base properties of salt solutions
14. Acid-base behavior and chemical structure
15. Lewis acids and bases
16. Expressing concentrations

UNIT 7 ASSIGNMENTS

- Equilibrium Constant Chpt 15 – 10, 14, 19, 21a/b
- Calculation and LeChatelier Chpt 15 – 30, 34, 37, 41, 48, 52, 56
- Reaction Quotient Assumption
- **Application of LeChatelier's Principle Lab**
- **Chpt 15 Quiz**
- K_{sp} Chpt 16 – 47, 48
- Acid-Base, pH Chpt 16 – 16, 18, 22, 26, 38, 40, 42, 48
- Weak Acids, K_a Chpt 16 – 54, 58, 64, 70

- **Determination of K_a of Weak Acids**
- Lewis Theory
Weak Bases, K_b Chpt 16 – 72, 73, 74, 78
- Salts
Chemical Structure Chpt 16 – 81
- **Acid-Base Titrations Lab**
- **Unit 7 Test**

Unit 8

Time: 2 ½ weeks

Reading: Chapters 17 and 19 of Brown, LeMay, Bursten, and Murphy.

Topics: Aqueous Equilibria and Chemical Thermodynamics

1. The common ion effect
2. Buffered solutions, acid-base titrations
3. Solubility equilibria, K_{sp}
4. Factors affecting solubility
5. Precipitations and separation of ions
6. Qualitative analysis for metallic elements
7. Spontaneous processes
8. Entropy and the second law of thermodynamics
9. Molecular interpretation of entropy
10. Entropy changes in chemical reactions
11. Gibbs free energy
12. Free energy and the equilibrium constant

UNIT 8 ASSIGNMENTS

- Common Ion/Buffer Chpt 17 – 10, 13, 16, 18, 21, 26, 30
- **POGIL Common Ion Effect on Solubility**
- **POGIL Buffers**
- Strong/Strong Titrations Chpt 17 – 31, 34, 40, 42
- Strong vs. Weak
- Strong/Weak Titrations Chpt 17 – 36, 41, 44
- Enthalpy/Entropy Chpt 19 – 8, 11, 21, 26, 37, 40
- Gibbs Free Energy Chpt 19 – 50, 54, 60, 65, 69
- Free Energy and Equilibrium Chpt 19 – 71, 74, 78, 79
- **Properties of Buffer Solutions Lab**
- **Unit 8 Test**

Unit 9

Time: 3 weeks

Reading: Chapters 20, 21, and 25 of Brown, LeMay, Bursten, and Murphy.

Topics: Electrochemistry, Nuclear Chemistry, and Organic Chemistry

1. Oxidation states and oxidation-reduction reactions
2. Balancing oxidation-reduction equations
3. Voltaic cells
4. Cell EMF under STP

5. Free Energy and Redox reactions
6. Cell EMF under nonstandard conditions
7. Batteries and fuel cells
8. Corrosion
9. Electrolysis
10. Radioactivity
11. Patterns of Nuclear stability
12. Nuclear transmutation
13. Rates of radioactive decay
14. General characteristics of organic molecules
15. Hydrocarbons
16. Alkanes, alkenes, and alkynes (structures and reactions)
17. Organic functional groups
18. Chirality in organic chemistry

UNIT 9 ASSIGNMENTS

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| • Balancing Redox Equations | Chpt 20 – 18, 19 |
| • Voltaic Cells and EMF | Chpt 20 – 24 |
| • EMF and Nernst | Chpt 20 – 31, 34, 37, 47 |
| • Electrolysis | Chpt 20 – 85, 87, 90 |
| • Corrosion/Batteries | Chpt 20 – 69, 82 |
| • Nuclear Chemistry
Emission and Half Life | Chpt 21 – 37, 42 |
| • Fission and Fusion | |
| • Organic Chemistry | Chpt 25 – 22, 23, 24 |
| • Organic Chemistry 2 | Chpt 25 – 39, 43 |
| • Unit 9 Test | |

Additional Readings:

Kean, Sam (2010). "The Disappearing Spoon: And Other True Tales of Madness, Love and the History of the World from the Periodic Table of the Elements." New York City, NY: Back Bay Books.

Blum, Deborah (2010). "The Poisoner's Handbook: Murder and the Birth of Forensic Medicine in Jazz Age New York." Penguin Books.

FINAL EXAM