

# Advanced Placement Chemistry Pacing Guide 2020-2021

## 1<sup>st</sup> 9 weeks:

### Unit 1: Chemistry Fundamentals

<u>Topics</u>	<u>Curriculum Framework</u>
1. scientific method	BI 1.D.1:a
2. classification of matter	1.A.1:b; 1.A.1:c; 1.A.1:d; 3.C.1:b; 3.C.1:c; 5.D:2
3. nomenclature and formulas of binary compound	1.E.2:b
4. polyatomic ions and other compounds	1.E.2:b
5. determination of atomic masses	1.A.1:a
6. mole concept	1.A.3:b; 1.A.3:c; 1.A.3:d; 1.E.2:b
7. percent composition	1.A.2:a
8. empirical and molecular formula	1.A.2:b

Lab Activity: Math and Measurement in Science

Guided Inquiry: Density of various objects

Guided Inquiry: Discovery of inquiry-based labs

### Unit 2: Reactions and Stoichiometry

<u>Topics</u>	<u>Curriculum Framework</u>
1. Writing chemical equations	1.E.1:a; 1.E.1:c; 3.C.1:a
2. Balancing chemical equations	1.A.3:a; 1.E.2:c; 1.E.2:d; 3.A.1:a
3. Applying mole concept to chemical equations	1.A.3:a; 1.E.1;b
4. Limiting reagent, theoretical and percent Yield	3.A.2:a

Lab Activity: Stoichiometry

Guided Inquiry: Types of chemical reactions

### Unit 3: Net Ionic Equations

<u>Topics</u>	<u>Curriculum Framework</u>
1. Precipitation reactions and solubility rules	6.C.3:d
2. Balancing redox	3.B.3:a; 3.B.3:b; 3.B.3:c; 3.B.3:d
3. Simple redox titrations	1.E.2:f
4. Redox and single replacement reactions	3.A.1; 3.B.3:e; 3.C.1:d
5. Double replacement reactions	3.A.1; 3.C.1:d
6. Combustion reactions	3.A.1; 3.B.3:e
7. Synthesis reactions	3.A.1; 3.B.1:a
8. Decomposition reactions	3.A.1; 3.B.1:a; 3.C.1:d

Guided Inquiry: Precipitation Reactions and net ionic equations

## 2nd 9 weeks:

### Unit 4: Electrochemistry

<u>Topics</u>	<u>Curriculum Framework</u>
1. Review redox equations	3.B.3:a; 3.B.3:b; 3.B.3:c; 3.B.3:d
2. Electrochemical cells and voltage	3.C.3:a; 3.C.3:b; 3.C.3:c; 5.E.4:a
3. Chemical applications	3.C.3:f

Lab activity: Redox reactions and making Christmas ornaments

### Unit 5: Gases/ Gas Laws

<u>Topics</u>	<u>Curriculum Framework</u>
1. Measurement of gases	2.A.2:a; 2.A.2:c
2. Boyles, Charles, Combined, Ideal Gas law	2.A.2:a; 2.A.2:c
3. Dalton's Law of partial pressure	2.A.2:b
4. Molar volume of gases and stoichiometry	3.A.2:b
5. Kinetic molecular theory	2.A.2:d; 5.A.1
6. Real gases	2.A.2:e; 2.A.2:f; 2.A.2:g; 2.B.2:c; 2.B.2:d

Lab Activity: Determining the molar volume of a gas

### Unit 6: Thermochemistry

<u>Topics</u>	<u>Curriculum Framework</u>
1. Law of conservation of energy, work, And internal energy	5.B.1; 5.E.2:a
2. Endothermic and exothermic reactions	3.C.2; 5.B.3:e; 5.B.3:f
3. Potential energy diagrams	3.C.2; 5.C.2:c; 5.C.2:d; 5.C.2:e
4. Calorimetry, heat capacity, and specific Heat	5.A.2; 5.B.2; 5.B.3:a; 5.B.3:b; 5.B.4
5. Hess's Law	5.B.3:a
6. Heat of formation/ combustion	5.C.2:g

Lab Activity: Hess's Law

Guided Inquiry: Calorimetry

### Unit 7: Thermodynamics

<u>Topics</u>	<u>Curriculum Framework</u>
1. Laws of thermodynamics	5.E.1
2. Spontaneous process and entropy	5.E.1
3. Spontaneity, enthalpy, and free energy	5.E.2:c; 5.E.3
4. Gibb's Free energy	5.E.2:d; 5.e.2:e; 5.E.2:f; 6.C.3:c; 6.D.1:a

### 3<sup>rd</sup> 9 weeks:

#### Unit 8: Chemical Kinetics

<u>Topics</u>	<u>Curriculum Framework</u>
1. Rates of reactions	4.A.1:a
2. Factors that effect rates of reactions/ Collision theory	4.A.1:b; 4.A.1:c; 4.D.1; 4.D.2
3. Reaction pathways	4.B.3:a; 4.B.3:b
4. Rate equation determination	4.A.2:a; 4.A.3; 4.B.1; 4.C.1; 4.C.2; 4.C.3; 4.A.2:b; 4.A.3:d
5. Activation energy	4.B.2; 4.B.3:c

Guided Inquiry: Determining the rate law of a crystal violet reaction

Activity: Using a web based simulation, students will study the elementary steps of a mechanism and how it relates to reaction rate and collision theory. [CR3d]

#### Unit 9: Equilibrium

<u>Topics</u>	<u>Curriculum Framework</u>
1. characteristics and conditions of Chemical equilibrium	6.A.1; 6.A.3:a; 6.A.3:f
2. equilibrium expression derived from Rates	6.A.3:b
3. factors that affect equilibrium	6.A.3:c
4. Le Chatlier's principle	6.A.3:b; 6.B.1; 6.B.2; 6.C.3:e; 6.C.3:f
5. equilibrium constant	6.A.3:d; 6.A.3:e; 6.A.4
6. solving equilibrium problems	6.A.2

Activity: In an online inquiry activity, students are able to manipulate the environment and produce stresses that verify the tendency of Le Chatelier's principle. [CR3f]

#### Unit 10: Acids and Bases

<u>Topics</u>	<u>Curriculum Framework</u>
1. Definition and nature of acids and Bases	3.B.2; 6.C.1:c; 6.C.1:d; 6.C.1:e; 6.C.1:f
2. Kw and the pH scale	6.C.1:a; 6.C.1:b; 6.C.1:g
3. pH of strong and weak acids and bases	6.C.1:h
4. polyprotic acids	6.C.1:n
5. buffers	6.C.2
6. titrations and pH curves	6.C.1:I; 6.C.1:j; 6.C.1:k; 6.C.1:l; 6.C.1:m
7. Ksp calculations and solubility product	6.C.3:a; 6.C.3:b

PBL Activity: Students will research acid rain and the effects of acid rain on their health and the environment. Students will construct a solution to the problems of acid rain. [CR4]

Lab Activity: pH titration

## Unit 11: Solutions and Intermolecular forces of liquids and solids

Topics	Curriculum Framework
1. Structure and bonding of metals, network,	2.A.1:a; 2.A.1:d; 2.C.3; 2.D.1:a; 2.D.2:a; 2.D.1:b; 2.D.3; 2.D.4
2. Structure and bonding of ionic, hydrogen, London, and van der Waals forces	2.A.1:b; 2.B.1:a; 2.B.1:b; 2.B.1:c; 2.B.2:a; 2.B.2:b; 2.B.2:c; 2.B.2:d; 2.B.3:a; 5.D:1
3. Heating and cooling curves	2.A.1:e; 5.B.3:c; 5.B.3:d
4. Composition of solutions	2.A.1:c; 2.A.3:b; 2.A.3:c; 2.B.3:b
5. Colloids and suspensions	2.A.3:a; 2.A.3:b; 2.A.3:g
6. Separation techniques	2.A.3:e; 2.A.3:f
7. Effect on biological systems	2.B.2:3; 2.D.3; 5.E.4:c

Lab Activity: Preparation of solutions

Lab Activity: Determining the freezing point of a liquid

## 4<sup>th</sup> 9 weeks:

### Unit 12: Atomic Structure of an Atom and Periodicity

Topics	Curriculum Framework
1. Electron configuration and Aufbau	1.B.2:a
2. Valence electrons and Lewis dot structures	1.B.2:c
3. Periodic trends	1.B.1:b; 1.B.1:c; 1.B.2:b; 1.B.2:d; 1.C.1:c; 1.D.1:b; 2.C.1:a; 2.C.1:b
4. Properties of light and waves	1.C.2:e; 1.D.3:a; 5.E.4:b
5. Quantum mechanical model	1.C.2:d
6. Quantum theory	1.C.2:c
7. Orbital shape and energies	1.C.2:b
8. Spectroscopy	1.D.2:a; 1.D.2:b; 1.D.2:c; 1.D.3:b

Student activity: Students graph values for atomic radius, electronegativity, and ionization energy to predict trends and explain the organization of the periodic table. [CR3a]

### Unit 13: Chemical Bonding and Molecular Geometry

Topics	Curriculum Framework
1. Lewis Dot structures	2.C.4:a
2. Resonance structures and formal charge	2.C.4:c; 2.C.4:d; 2.C.4:e
3. Bond polarity and dipole moments	2.C.1:c; 2.C.1:e; 2.C.1:f
4. VSEPR and molecular shape	2.C.4:b; 2.C.4:e; 2.C.4:f
5. Lattice energies	1.B.1:a; 1.C.2:a; 2.C.1:d; 2.C.2:a; 2.C.2:b; 2.D.1:b
6. Hybridization	2.C.4:g
7. Molecular orbitals	2.C.4:h; 2.C.4:i

Student Activity: Students make drawings on a series of molecules and from those drawings predict geometry, hybridization, and polarity [CR3b]