AP CHEMISTRY

Course Content

Big Ideas

The big ideas serve as the foundation of the course and allow students to create meaningful connections among concepts. They are often abstract concepts or themes that become threads that run throughout the course. Revisiting the big ideas and applying them in a variety of contexts allows students to develop deeper conceptual understanding. Below are the big ideas of the course and a brief description of each.

BIG IDEA 1: SCALE, PROPORTION, AND QUANTITY (SPQ)

Quantities in chemistry are expressed at both the macroscopic and atomic scale. Explanations, predictions, and other forms of argumentation in chemistry require understanding the meaning of these quantities, and the relationship between quantities at the same scale and across scales.

BIG IDEA 2: STRUCTURE AND PROPERTIES (SAP)

Properties of substances observable at the macroscopic scale emerge from the structures of atoms and molecules and the interactions between them. Chemical reasoning moves in both directions across these scales. Properties are predicted from known aspects of the structures and interactions at the atomic scale. Observed properties are used to infer aspects of the structures and interactions.

BIG IDEA 3: TRANSFORMATIONS (TRA)

At its heart, chemistry is about the rearrangement of matter. Understanding the details of these transformations requires reasoning at many levels as one must quantify what is occurring both macroscopically and at the atomic level during the process. This reasoning can be as simple as monitoring amounts of products made or as complex as visualizing the intermolecular forces among the species in a mixture. The rate of a transformation is also of interest, as particles must move and collide to initiate reaction events.

BIG IDEA 4: ENERGY (ENE)

Energy has two important roles in characterizing and controlling chemical systems. The first is accounting for the distribution of energy among the components of a system and the ways that heat exchanges, chemical reactions, and phase transitions redistribute this energy. The second is in considering the enthalpic and entropic driving forces for a chemical process. These are closely related to the dynamic equilibrium present in many chemical systems and the ways in which changes in experimental conditions alter the positions of these equilibria.

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UNITS

The course content is organized into commonly taught units. The units have been arranged in a logical sequence frequently found in many college courses and textbooks.

The nine units in AP Chemistry, and their weighting on the multiple-choice section of the AP Exam, are listed below.

TOPICS

Each unit is broken down into teachable segments called topics. The topic pages contain the required content for each topic.

Units	Exam Weighting
Unit 1: Atomic Structure and Properties	7–9%
Unit 2: Molecular and Ionic Compound Structure and Properties	7–9%
Unit 3: Intermolecular Forces and Properties	18-22%
Unit 4: Chemical Reactions	7–9%
Unit 5: Kinetics	7–9%
Unit 6: Thermodynamics	7–9%
Unit 7: Equilibrium	7–9%
Unit 8: Acids and Bases	11–15%
Unit 9: Applications of Thermodynamics	7–9%

Spiraling the Big Ideas The following table shows how the big ideas spiral across units.

Big Ideas	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
	Atomic Structure and Properties	Molecular and Ionic Compound Structure and Properties	Intermolecular Chemical Forces and Reactions Properties	Chemical Reactions	Kinetics	Thermodynamics Equilibrium	Equilibrium	Acids and Bases	Applications of Thermodynamics
Scale, Proportion, and Quantity spo	•		5	5					•
Structure and Properties sap	>	5	•					\diamond	•
Transformations TRA				5	\bigcirc		\diamond		
Ene					•	5			•

Course at a Glance

Plan

The Course at a Glance provides a useful visual organization of the AP Chemistry curricular components, including:

- Sequence of units, along with approximate weighting and suggested pacing.
 Please note, pacing is based on 45-minute class periods, meeting five days each week for a full academic year.
- Progression of topics within each unit.
- Spiraling of the big ideas and science practices across units.

Teach

SCIENCE PRACTICES

Science practices spiral throughout the course.



Assess

Properties

Assign the Personal Progress Checks—either as homework or in class—for each unit. Each Personal Progress Check contains formative multiplechoice and free-response questions. The feedback from the Personal Progress Checks shows students the areas where they need to focus.



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-12	-13	Class Periods		Exam eighting
SAP 6	2.1	Type Bond	s of Chemica Is	al
SAP 3	2.2		molecular Fo Potential Ene	
SAP 4	2.3	Struc Solid	cture of Ionic s	2
SAP 4	2.4	Struc Alloy	cture of Meta 's	ls and
SAP 3	2.5	Lewi	s Diagrams	
SAP 6	2.6		nance and al Charge	
SAP 6	2.7		PR and Bond idization	

Personal Progress Check 1

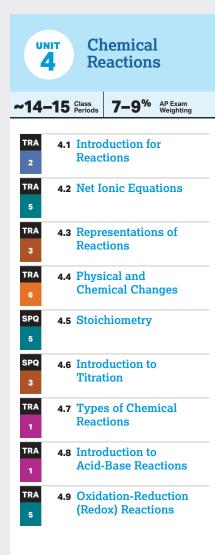
Multiple-choice: ~20 questions Free-response: 2 questions • Short-answer

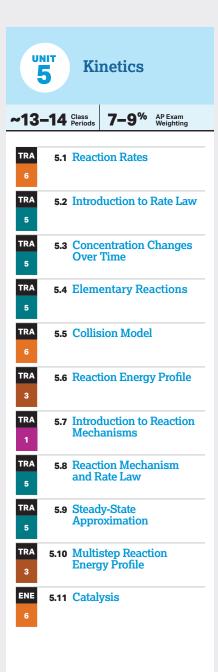
Short-answer

Personal Progress Check 2

Multiple-choice: ~15 questions Free-response: 1 question • Long-answer







Personal Progress Check 3

Multiple-choice: ~30 questions Free-response: 2 questions

- Short-answer
- Short-answer

Personal Progress Check 4

Multiple-choice: ~20 questions Free-response: 1 question • Long-answer

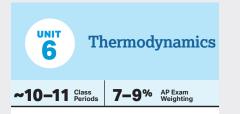
Personal Progress Check 5

Multiple-choice: ~25 questions Free-response: 2 questions • Short-answer

Long-answer

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ENE	6.1 Endothermic and Exothermic Processes
6	Exothermic Processes
ENE	6.2 Energy Diagrams
3	
ENE	6.3 Heat Transfer and
6	Thermal Equilibrium
ENE	6.4 Heat Capacity and
2	Calorimetry
ENE	6.5 Energy of Phase
1	Changes
ENE	6.6 Introduction to Enthalpy
4	of Reaction
ENE	6.7 Bond Enthalpies
5	
ENE	6.8 Enthalpy of Formation
5	
ENE	6.9 Hess's Law
5	

	чит 7	Eq	Juilibri	um
~14	-16	Class Periods	7–9%	AP Exam Weighting
TRA 6	7.1		duction to ibrium)
TRA 4	7.2	Direc Reac	tion of Re tions	versible
TRA 3	7.3		tion Quot ibrium Co	
TRA 5	7.4		ulating the ibrium Co	
TRA 6	7.5		nitude of t ibrium Co	
TRA 5	7.6		erties of tl ibrium Co	
TRA 3	7.7		ılating Equ entrations	
TRA 3	7.8		esentatior ibrium	ns of
TRA 6	7.9		duction to elier's Prim	
TRA 5	7.10		tion Quot nâtelier's l	
SPQ 5	7.11		duction to bility Equi	
SPQ 2	7.12	Com	mon-Ion E	Effect
SPQ 2	7.13	pH ai	nd Solubi	lity
SPQ 4	7.14		Energy of olution	

	B	Aci	ds an	d Base	S
~14 [.]	-15	Class Periods	11-1	5% AP Exar Weighti	n ing
SAP 5	8.1	Introdu and Ba	iction to ses	Acids	
SAP 5	8.2	pH and Acids a	l pOH of ind Base	Strong s	
SAP 5	8.3	Weak A Equilib	Acid and ria	Base	
SAP 5	8.4	Acid-B and Bu	ase Rea Iffers	ctions	
SAP 5	8.5	Acid-B	ase Titra	tions	
SAP 6	8.6		llar Struc and Base		
SAP 2	8.7	pH and	l pK _a		
SAP 6	8.8	Proper	ties of Bı	uffers	
SAP 5	8.9	Hender Equation		selbalch	
SAP 6	8.10	Buffer	Capacity	,	

Personal Progress Check 6

Multiple-choice: ~20 questions Free-response: 2 questions

- Short-answer
- Short-answer

Personal Progress Check 7

Multiple-choice: ~30 questions Free-response: 2 questions • Short-answer

Long-answer

Personal Progress Check 8

Multiple-choice: ~30 questions Free-response: 1 question • Long-answer

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9			oplicat nermo			
~10-	13	Class Periods	7–9 °	%	AP Exar Veighti	n ng
ENE 6	9.1	Intro	duction	to l	Entro	ору
ENE 5	9.2		lute Ent py Chai			ıd
ENE 6	9.3	Ther	s Free Er nodynar ability		jy ar	nd
ENE 6	9.4		modyna ic Conti		and	1
ENE 6	9.5		Energy a ibrium	and	l	
ENE 4	9.6	Coup	led Read	tio	ns	
ENE 2	9.7		anic (Vo rolytic C			nd
ENE 5	9.8	Cell I Energ	Potentia Jy	l ar	d Fi	ee
ENE 6	9.9	Unde	Potentia er Nonst litions	-	lard	
ENE 5	9.10		rolysis a lay's Lav			

Personal Progress Check 9

Multiple-choice: ~30 questions Free-response: 2 questions • Short-answer

- Long-answer