

# AP Chemistry Unit 3

Content Area: **Science**  
Course(s): **Chemistry AP**  
Time Period: **OctNov**  
Length: **15 Days**  
Status: **Published**

## Title Section

## Department of Curriculum and Instruction



**Belleville Public Schools**

**Curriculum Guide**

**AP Chemistry 11,12**

**UNIT 2 - MOLECULAR AND IONIC COMPOUNDS**

**Belleville Board of Education**

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Board Approved:

## **Unit Overview**

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Topics include:

Intermolecular Forces

Properties of Solids

Solids, Liquids, and Gases

Ideal Gas Law

KInetic Molecular Theory

Deviation from Ideal Gas Law

Solution and Mixtures

Representation of Solutions

Separation of Solutions

Solubility

Beer Lambert Law

## **Enduring Understanding**

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### Enduring Understandings:

1. In these lessons students learn what the science of chemistry means and how will we approach learning chemistry through a combination of didactic and practical exercises. A learning schedule and procedures are imperative to create a safe, structured, and enthusiastic learning environment. In this first unit students will receive necessary information from instructor regarding applicable classroom and lab policies of the school.
2. All our surroundings and every object solid, liquid, and gas is matter. Matter can be classified and identified by their properties whether extensive properties or intensive properties. Extensive properties are dependent upon how much matter is present while intensive are dependent on type of material. We can classify matter by their physical properties and can then explore physical changes where matter changes phase although the chemical composition remains the same.

## **Essential Questions**

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### Essential Questions:

1. How do you describe the connection between particulate-level properties and macroscopic properties?
2. What is the relationship between pressure, volume, temperature and number of moles in an ideal gas?
3. How do you separate solid-liquid mixtures?
4. How do you separate liq-liq mixtures?

## **Exit Skills**

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## Skills Checklist:

- Explain the degree to which a model or representation describes the connection between particulate-level properties and macroscopic properties.
- Represent visually the relationship between the structures and interactions across multiple levels or scales (e.g., particulate to macroscopic).
- Explain the relationship between variables within an equation when one variable changes.
- Explain chemical properties or phenomena (e.g., of atoms or molecules) using given chemical theories, models, and representations.
- Calculate, estimate, or predict an unknown quantity from known quantities by selecting and following a logical computational pathway and attending to precision (e.g., performing dimensional analysis and attending to significant figures).
- Explain the degree to which a model or representation describes the connection between particulate-level properties and macroscopic properties.
- Identify or describe potential sources of experimental error.

## **New Jersey Student Learning Standards (NJSL-S)**

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### [NextGen Science Standards](#)

SCI.HS-PS1	Matter and Its Interactions
SCI.HS.PS2.B	Types of Interactions
SCI.HS.PS1.A	Structure and Properties of Matter
	Developing and Using Models
SCI.HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
SCI.HS.PS1.C	Nuclear Processes
SCI.HS.PS4.A	Wave Properties
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.

SCI.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
SCI.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
SCI.HS.ESS2.D	Weather and Climate
SCI.HS.ESS3.D	Global Climate Change
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS.ETS1.B	Developing Possible Solutions

## Interdisciplinary Connections

Please list all and any additional **Interdisciplinary Connections/Cross-Curricular** New Jersey Student Learning Standards that link to this unit, and which are not included in the NJSLs section above.

LA.RH.11-12	Reading History
MA.N-RN.A	Extend the properties of exponents to rational exponents.
MA.N-RN.B	Use properties of rational and irrational numbers.
MA.N-Q.A	Reason quantitatively and use units to solve problems.
LA.RST.11-12	Reading Science and Technical Subjects
LA.WHST.11-12	Writing History, Science and Technical Subjects

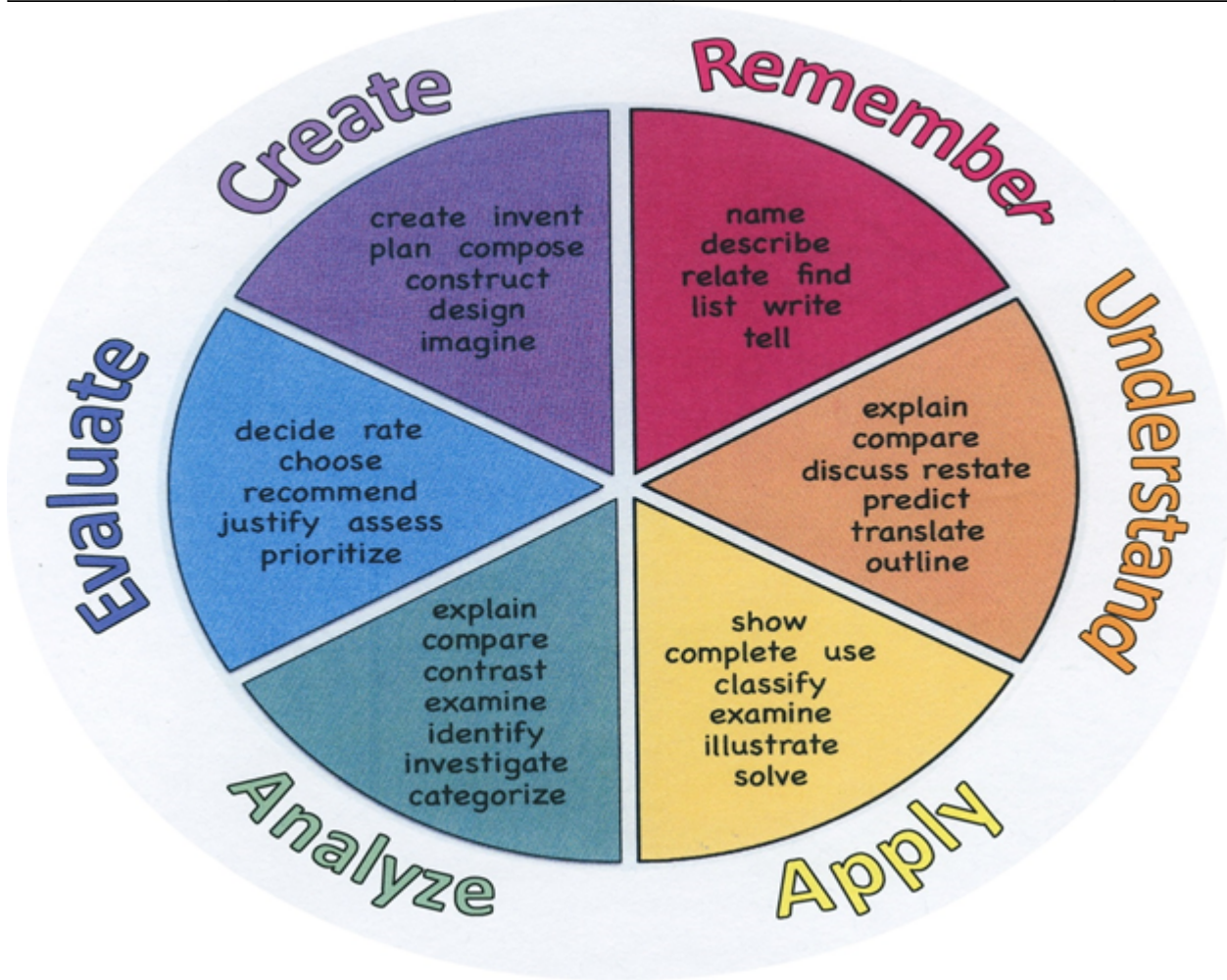
## Learning Objectives

1. Identify, the type and classify the strength of different intermolecular forces

**Action Verbs:** Below are examples of action verbs associated with each level of the Revised Bloom's Taxonomy.

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize

Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



## **Suggested Activities & Best Practices**

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- What situations in ordinary life could help to master this unit?

- Students create particle representations for samples of solid, liquid, and gaseous H<sub>2</sub>O. Each diagram should contain 10 molecules

- Students will show how the placement and motion of the particles varies in each phase.

- Investigating three different dyes using chromatography

- Student discuss evidence to understand of intermolecular forces.

- Atmospheric concentration of Carbon Dioxide (ppm) and consequences on climate change.

## **Assessment Evidence - Checking for Understanding (CFU)**

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Student must be able to graph fundamental gas properties. (Formative)

Students must be able to visualize solution at molecular level. (Formative)

Students must be able to convert different units of gas quantities. (Formative)

Unit Test/Quiz (Summative)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Anticipation Guide

- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

## **Primary Resources & Materials**

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Chemistry - The Central Science: AP Edition; 12th Edition.

Pearson: Brown, Lemay, Bursten, Murphy, and Woodward 2012

Albert.io

AP Collegeboard

### **Ancillary Resources**

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1. Teacher and Publisher supplied powerpoints, notes, laboratory guides, and worksheets
2. Textbooks
3. Resource Manuals
4. Internet Resources
5. Computer and smartboard Activities

### **Technology Infusion**

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Use a spectrophotometer to find unknown concentrations of solutions.

Use a spectrophotometer to find the wavelength of maximum absorption of solutions.

Use spectroscopy to read line spectra.

Albert.io

AP Collegeboard

What **Technology Infusion** and/or strategies are integrated into this unit to enhance learning? Please list all hardware, software and strategies. Please find a technology pedagogy wheel for assistance while completing this section.

# Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts  
 Photostory 3  
 Kid Story Builder  
 Music Maker Jam  
 Paint A Story  
 Office 365  
 MS PowerPoint  
 Stack 'Em Up  
 NqSquared Numbers  
 Physamajig  
 Xylophone 8

Wikipedia  
 Skydrive  
 Lync  
 SkyMap  
 Skype  
 Office 365  
 Puzzle Touch  
 Easy QR  
 Memorylage  
 Life Moments  
 Word Cloud Maker

Where's Waldo?  
 MS Excel  
 Flipboard  
 Office 365  
 Nova Mindmapping

Ted Talks  
 Record Voice Pen



Originally taken from <http://www.coetail.com/vzimmer/files/2013/02/1Padagogy-Wheel.001.jpg>  
 And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

## **Alignment to 21st Century Skills & Technology**

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Mastery and infusion of **21st Century Skills & Technology** and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CS.9-12.8.1.12.NI.3	Explain how the needs of users and the sensitivity of data determine the level of security implemented.
CS.9-12.8.1.12.NI.4	Explain how decisions on methods to protect data are influenced by whether the data is at rest, in transit, or in use.
CS.9-12.8.2.12.ITH.2	Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation.
WRK.9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
WRK.9.2.12.CAP.10	Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.DC.2	Compare and contrast international differences in copyright laws and ethics.

## **21st Century Skills/Interdisciplinary Themes**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list only the **21st Century/Interdisciplinary Themes** that will be incorporated into this unit.

- Communication and Collaboration
- Creativity and Innovation

- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

## **21st Century Skills**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list only the **21st Century Skills** that will be incorporated into this unit.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

## **Differentiation**

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Please remember: Effective educational **Differentiation** in a lesson lies within content, process, and/or product.

Please identify the ones that will be employed in this unit.

### **Differentiations:**

- Small group assignments (to prepare a unit 1 review of key concepts )
- Extra time to complete assignments (completed at home)
- Pairing oral instruction with visuals (College Board videos of Unit 1 Review)
- Repeat directions (Rephrase the problem on mixtures giving real-life examples)
- Use manipulatives (building atoms)
- Multisensory approaches (youtube videos on Unit 1)
- Preview content & concepts (percent composition of students in AP chem class)
- Student(s) work with an assigned partner (Complete a lab on flame test)

- Visual presentation (flame test lab video)

#### Hi-Prep Differentiations:

- Alternative formative and summative assessments (debating atomic trends exceptions)
- Leveled rubrics (writing rubric with siblings that took a science class in college)
- Project-based learning (propose a new project for low prep students)
- Problem-based learning (design solution for climate change)

#### Lo-Prep Differentiations

- Choice of books or activities (choose an article on Newsela on global warming)
- Cubing activities (apply the cubic method to atomic trends)
- Reading buddies (pair Lo-prep and Hi-prep students)
- Varied supplemental materials (Youtube videos on electron configuration)

## Special Education Learning (IEP's & 504's)

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Please identify the **Special Education Learning** adaptations that will be employed in the unit, using the ones identified below.

- visualize Water Structure.

- behavior management plan (Cubing activities (apply the cubic method to the periodic table)
- computer or electronic device utilizes (Varied supplemental materials (Youtube videos on climate change)
- modified assignment format (Reading buddies (pair Lo-prep and Hi-prep students)
- student working with an assigned partner (Students must be able to build atomic models)
- Use open book, study guides, test prototypes (choose an article on Newsela on global warming)

## English Language Learning (ELL)

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Please identify the **English Language Learning** adaptations that will be employed in the unit, using the ones identified below.

Students are provided with a glossary in their native language of climate change.

Spanish-speaking students may utilize the Spanish Edition of a Textbook to solve Unit 3 problems.

- visualize Sodium Chloride Solution Structure

- using videos, illustrations, pictures, and drawings to explain or clarify (Students are provided with videos in their native language on climate change.)
- allowing the use of note cards or open-book during testing (Students are provided with glossary in

their native language)

- providing study guides (Students are provided with a glossary in their native language on climate change)

## **At Risk**

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Please identify Intervention Strategies that will be employed in the unit, using the ones identified below.

- visualize water Structure.

- teaching key aspects of a topic. Eliminate nonessential information ((electron configuration exceptions are omitted))
- allowing the use of note cards or open-book during testing
- decreasing the amount of work presented or required (electron configuration exceptions are omitted)
- having peers take notes or providing a copy of the teacher's notes (videos from College Board provided)
- tutoring by peers (climate change discussed by peers)
- using videos, illustrations, pictures, and drawings to explain or clarify (Students provided access to virtual labs)

## **Talented and Gifted Learning (T&G)**

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Please identify the **Talented and Gifted** adaptations that will be employed in the unit, using the ones identified below.

- visualize Ammonium Nitrate solution Structure.

- Advanced problem-solving ( Students must be able to analyze Schrodinger Equation)
- Allow students to work at a faster pace (Princeton Review problems are solved)
- Cluster grouping (to propose original solutions of climate change)
- Complete activities aligned with above grade level text using Benchmark results ( Students must be able to analyze Schrodinger Equation)
- Higher order, critical & creative thinking skills, and discovery (exceptions of electron configuration are underlined and discussed)

- Using atomic models to identify the shape, the bond angle and the hybridization of molecules.

## Sample Lesson

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Unit Name: Intermolecular Forces

NJSLS: SCI.HS-PS1 &2 &3 & 4; SCI.HS.ESS3.D

Interdisciplinary Connection: Vocabulary and algebra contents

Statement of Objective: Students will demonstrate the ability to propose how to rank the boiling point of ten different substances with 90% accuracy.

Anticipatory Set/Do Now: What do you know about the molecular shape?

Learning Activity: Lecture - types o intermolecular forces.

Small groups activities: rank the boiling point of tenn different substances .

Final review: states of matter

Student Assessment/CFU's: Survey, written report, Exit ticket

Materials: Chromebook.

21st Century Themes and Skills: Critical thinking and Problem Solving

Differentiation/Modifications:

Students must be able to propose how to rank the boiling point of twelve different substances . (Gifted and Talented)

Students must be able to propose how to rank the boiling point of six different substances . (Special Ed)

Integration of Technology: Chromebook PowerPoint Presentation