# AP Chemistry Unit 5: Quantum Mechanics

Content Area: **Science**
Course(s): **Sample Course**
Time Period: **December**
Length: **4 Weeks**
Status: **Published**

## Title Section

## Department of Curriculum and Instruction

**Belleville Public Schools**

Curriculum Guide

# AP Chemistry

# 11, 12

**Belleville Board of Education**

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## Unit Overview

Topics to include:

1. Electromagnetic spectrum
2. Energy, frequency, and wavelength of radiations
3. Bohr Model
4. Quantum Model
5. Quantum numbers
6. Electron configuration including noble gas and orbital notation
7. Ionization Energy
8. Electron Affinity
9. Atomic and ionic size
10. Ionic Bonding
11. Coulomb's law and lattice energy

## NJSLS

| | |
|---|---|
| MS-PS1-1 | Develop models to describe the atomic composition of simple molecules and extended structures. |

| | |
|---|---|
| MS-PS1-2 | Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. |
| MS-PS1-3 | Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. |
| MS-PS1-4 | Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. |
| MS-PS4-1 | Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. |
| MS-PS4-2 | Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. |

## Exit Skills

1. calculate the wavelength of radiations emitted by electrons
2. Determine electronic configuration
3. Apply the Quantum Mechanical Model and how to use this model create an orbital diagram
4. relate the position of an element in the periodic table to its atomic number and
5. atomic mass according to the periodic law
6. he periodic table to identify families/groups as well as trends
7. of electrons available for bonding.(Valence electrons)
8. relate the position of an element in the periodic table to its quantum electron
9. configuration and to its reactivity with other elements in the table
10. atoms combine to form molecules by sharing electrons to form covalent or metallic
11. bonds or by exchanging electrons to form ionic bonds
12. salt crystals are repeating patterns of positive and negative ions held together by electrostatic attraction
13. calculate lattice energy

## Enduring Understanding

1. The electromagnetic spectrum is a continuous spectrum that ranges from radiation with a long wavelength to radiation with a short wavelength.
2. There is relationship between the wavelength of radiation and the radiation's frequency and energy.
3. Light can be described as traveling as both a wave and a particle The production of light was used to develop the Bohr Model of that atom
4. The energy of a particular form a radiation is related to the location of the electron's initial, excited and final position.
5. The quantum model was developed as result of further experimentation on the electron location and movement.

## Essential Questions

1. Has the developments in atomic theory affected the view of the elements?

## Learning Objectives

1. differentiate Electromagnetic Radiation their applications, and the effect on the human body
2. differentiate the Bohr Model of the Atom and the Quantum Mechanical Model
3. relate the Quantum Mechanical Model to Electron Configuration
4. integrated Electron Configuration into the Modem Theory of the atom
5. Compare and contrast electron configuration to quantum numbers
6. deduce the electron configuration of an element from the periodic table
7. formulate the relationship between periodic properties and the periodic table
8. differentiate between atomic properties and ionic properties
9. justify that a bond is a force of attraction between charged particles
10. identify the relationship between cation and anions in a compound
11. calculate the lattice energy of an ionic compound
12. integrate Coulomb's law into chemical bonds properties

## Interdisciplinary Connections

Please list all and any cross-curricular content standards that link to this Unit.

## Alignment to 21st Century Skills & Technology

**Key SUBJECTS AND 21st CENTURY THEMES**

Mastery of key subjects and 21st century themes is essential for all students in the 21stcentury.

Key subjects include:

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

## 21st Century/Interdisciplinary Themes

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

## 21st Century Skills

- 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

## Technology Infusion

What technology can be used in this unit to enhance learning?




## Differentiation

As a Reminder:

The basis of good differentiation in a lesson lies in differentiating by content, process, and/or product.

Resources:

- NJDOE: Instructional Supports and Scaffolds for Success in Implementing the Common Core State Standards http://www.state.nj.us/education/modelcurriculum/success/math/k2/

## Special Education

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

## ELL

- teaching key aspects of a topic.  Eliminate nonessential information

- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

## Intervention Strategies

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic.  Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

## Evidence of Student Learning-CFU's

Please list ways educators may effectively check for understanding in this secion.

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit tests

## Primary Resources

Please list all resources available to you that are located either within the district or that can be obtained by district resources.

## Ancillary Resources

Please list ALL other resources available to strengthen your lesson.

## Sample Lesson

One Lesson per Curriculum must bein this lesson plan template.  I.e. one lesson in one unit

Unit Name:

NJSLS:

Interdisciplinary Connection:

Statement of Objective:

Anticipatory Set/Do Now:

Learning Activity:

Student Assessment/CFU's:

Materials:

21st Century Themes and Skills:

Differentiation/Modifications:

Integration of Technology: