

Unit 3: Electrons and the Periodic Table

Summary

This unit will advance your understanding of how electrons behave in atoms and how electronic structure relates to the construction of the periodic table.

Textbook References

- Wilbraham, Staley, Matta, & Waterman. Chemistry. Boston, Massachusetts: Pearson Prentice Hall, 2007.
- Wilbraham, Antony C., Dennis D. Staley, Michael S. Matta. Addison-Wesley Chemistry, 5th ed. Menlo Park, CA: Addison-Wesley Publishing Company, 2002.

Vocabulary

wavelength (λ)	orbital	lanthanides
frequency (ν)	probability	actinides
speed of light (c)	Aufbau principle	pnictogens
ground state	Pauli exclusion principle	chalcogens
excited state	Hund's rule	halogens
absorption	valence electrons	noble gases
emission	unpaired electrons	representative elements
spectrum	period	s-block
quantum	group/family	p-block
quantization	metal	d-block
photoelectric effect	nonmetal	f-block
wave-particle duality	metalloid	periodicity/periodic law
photon	alkali metals	activity series
Heisenberg's uncertainty principle	alkaline earth metals	atomic radius
energy level	transition metals	ionization energy
sublevel	inner-transition metals	

Calendar

Miscellaneous.....

- [Planck's Constant Video](#)
- [Heisenberg Principle](#)
- [Double Slit Expt](#)
- Hey there little Electron Article (Double Slit 1 min Youtube <https://www.youtube.com/watch?v=1LVkQfCptEs>)
- [Schrodinger's Experiment](#)
- [Spectra Tubes](#)
- [Flame Test Video #1](#)
- [Flame Test Video #2](#)
- [Atomic Spectra Tubes Explanation #1](#)
- [Atomic Spectra Tubes Explanation #2](#)
- Minutephysics ([How lasers work](#)) and [Example of laser at work](#)

Notes:

-Molecules & Light PHET

- ***Microwaves** - causes polar to rotate
- ***Infrared** - cause molecular vibrations except in small nonpolar like N₂ or O₂ (used to determine type of bond using IR spectroscopy)
- ***Visible** - causes electrons to jump to excited state
- ***UV** - can eject core electrons & even break some bonds (like UV)

M 10/13	T 10/14	W 10/15	Th 10/16	F 10/17
NO SCHOOL	Due Today: -Fill out the Nova Video Questions Here Today: - Watch Nova: Fabric of the Cosmos: Quantum Leap (Only watch 0-12 min today) *If the Nova link doesn't work try this link Quantum Mechanics Ppt NOTES Demo: -Demo quantized using 5-tone sound tube HW: - Outline Ch 5.1 & 5.3 - Watch Video 6.5a (Quantum Mechanics)	Due Today: -Once you finish the PhET Photoelectric Effect Guided Inquiry WS Upload it Here Today: Photoelectric Effect PHET and Guided Inquiry WS (w/ partner) UC Berkeley Photoelectric Effect Video Photoelectric Effect and laser demo NOTES Demo: -Red laser vs green laser shining on thumb Video & Explanation HW: - Outline Ch 5.1 & 5.3	*Great American Shakeout @10:16AM* Today: - Unit 2 Retake Test ("2nd Olympics") If not taking the retake: Quantum Mechanics. Light, Energy, & Spectroscopy Video (Visible) Quantum Mechanics. Light, Energy, & Spectroscopy Video (Microwave) Molecules & Light PHET -Focus on Microwaves & how they cause bent molecules to rotate Microwaves PHET -See note at the bottom of the calendar Demo: -ROYGBIV Video Demo: Blue Light Glasses/CellPhones/Laptops HW: - Outline Ch 5.1 & 5.3 Wavelength, Frequency, & Energy (Online Hwk#8) Video	Due Today: -Once you finish Online Hwk#8 Upload it Here (Complete at least 6 problems) Today: - Watch the Wavelength, Frequency, & Energy (Online Hwk#8) Video - Work on CSU Online Hwk#8 or Jaffe Online Hwk#43 or Online Homework #43 (Wavelength, Frequency, & Energy) **Make sure to convert cm to meters *If the Online Hwk link isn't working, use this backup video link for Online Hwk#8 Online Hwk#8 NOTES HW: - Outline Ch 5.2
M 10/20	T 10/21	W 10/22	Th 10/23	F 10/24
Today: "More than the eyes can see" Video clip (Infrared) AND... -Glass vs Plastic Cup Video -Infrared Video -Car Exterior Video -Car Interior Video Quantum Mechanics. Light, Energy, & Spectroscopy Video (Infrared) Greenhouse Gases PHET - Infrared (Use site#1 or site#2 for more info if necessary) - Electromagnetic Radiation & the Hydrogen Model Handout (from APbytheSea) -Optional: Deriving Bohr's Hydrogen Model Equation Video HW: - Outline Ch 5.2	Due Today: -Once you finish the Outline Ch 5.1, 5.2, & 5.3 Upload it Here Today: (Lab Attire) - Flame Test Lab (½ of the samples and fill in chart) - Annenberg Chemistry Video - "Atoms & Light" (0-14:50min covers flame tests) Flame Test Video #1 Flame Test Video #2 Chemistry of Flame Tests Article Chemistry of Fireworks Article Handout: - Flame Test Lab HW: - Outline Ch 6.1 - Watch Video 6.8a and 6.8b (Electron Configurations)	Today: Quantum Mechanics. Light, Energy, & Spectroscopy Video (Ultraviolet) UVA, UVB, UVC Lecture -Veritasium UV -Sunscreen in UV Mayoclinic UVA/B UV -Car Window Articles AND VIDEO - Spectra Tubes Demo OR Spectra Tubes Video Spectra Tubes PHET UV light & microwaves NOTES Demo: -Spectra Tubes HW: - Outline Ch 6.1 - Watch Video 6.5b and 6.5c	Today: - Flame Test Lab (½ of the samples and fill in chart) - Watch Nova: Fabric of the Cosmos: Quantum Leap (Only watch 13-25 min today) Atomic Orbitals Video (Original video clip ~2min) - Quantum Mechanics ActivInspire "Shell Game" (or use Alchemy Book p60) Flame test and Electron Configuration NOTES HW: - Outline Ch 6.2	*PEP Rally Day* Today: PES Graphs from (OK State Univ) Electron Configs, Orbital Diagrams, & PES (Online Hwk#34) Video AND Handout (Watch at 1.5x speed) - Work on CSU Online Hwk#34 on electron configurations -complete 2 neutral, 1 positive, & 1 negative -watch out for Cu and Cr *If the Online Hwk link isn't working, use this backup video link for Online Hwk#34 Energy/Orbital Diagram NOTES HW: - Outline Ch 6.2

M 10/27	T 10/28	W 10/29	Th 10/30	F 10/31
Due Today: -Once you finish the Outline Ch 6.1 & 6.2 Upload it Here Today: • Minutephysics – Magnetism & Electrons Video (6 mins) • Magnetism ActivInspire (goes along with the video) • Work on Electron Configuration Table • Noble Gas notation If time: Annenberg Chemistry Video - “Atoms & Light” (~14:50-26:50min) HW: • Outline Ch 6.2	Due Today: -Once you finish the Electron Config Table Upload it Here Today: • Valence/Core Notes (ActivInspire) • Half-way Point Non-graded Check (and KEY) • Work on Electron Configuration Table • Chemistry & The Color of Gold Article & ActivInspire • Silver/Gold and Valence Electrons NOTES HW: • Self-Test • Watch Video 7.3a, 7.3b, 7.3c (Atomic Radius, Ionic Radius, & Isoelectronic Species)	Today: • Create a Table Activity • Posters (Inv. II-5 - look at patterns) • Periodic Table Color Activity (Use the following short videos to help #1, #2) • Periodic Song • Sodium Disposal Video • Valence/Core Electrons & Periodic Table Patterns NOTES HW: • Self-Test • Watch Video 7.4a, 7.4b (Ionization Energy)	Today: • Valence, Shielding, & Radius ActivInspire • Periodic Trends Ppt (IE) • Trends ActivInspire -Pass out 1 pre-made “periodic table” with rubber pieces in well plates & 2 graphs labeled A & C per section • Work on Self-Test • Notes: Periodic Trends Powerpoint <i>If want more depth on Periodicity:</i> • Periodicity Video Optional (if time): ** Annenberg Chemistry Video - “Organizing Atoms & Electrons” (1:35-17:00min) HW: • Self-Test	Due Today: -Once you finish the Self-Test Upload it Here (and KEY) Today: • Work on Self-Test Study Guide On own to review if you want more practice: • Half-way Point Non-graded Check (and KEY) • “Quantum Review WS” ActivInspire (and KEY) -skip prob #13, #16, and #17 • “Review Questions of Unit 1 & 2” ActivInspire (and KEY) -skip prob #3 HW: • Study for the Unit 3 Test • Additional resources if necessary: 1) Quantum Mechanics Powerpoint 2) Periodic Trends Powerpoint
M 11/3				
Today: • Unit 3 Test				

Microwaves are absorbed by some of the chemicals in foods—most optimally water. This is because water molecules are polar, meaning that the distribution of charge within the molecule is not symmetrical; one side of the molecule is slightly positive, and the other is slightly negative. Thus, in the presence of the electric field component of a microwave, a force will be applied to both dipoles of the molecule which will cause it to rotate (Heckert 2007). In the figure to the right, two water molecules are shown in the positions where the force on their dipoles due to the electric field of a wave is at a minimum.

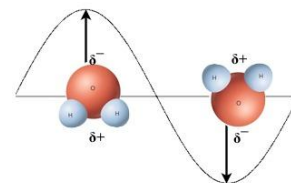


Figure 4: The rotation of water molecules under the influence of the electric field component in an electromagnetic wave. (Black arrows represent electric fields.) Because the electric field is continually oscillating, the water molecules continually rotate. (Ref. <http://tobyzerner.com/microwaves/>)