

Unit 2: The Atom and Nuclear Chemistry

Summary

This unit will introduce you to atomic theory and discuss the transformations atomic nuclei undergo.

Textbook References

- Silberberg, Martin. Principles of General Chemistry, 2nd ed. New York, NY: The McGraw-Hill Companies, Inc., 2010 – Chapter 2.2-2.5; Chapter 23
- Wilbraham, Antony C., Dennis D. Staley, Michael S. Matta. Addison-Wesley Chemistry, 5th ed. Menlo Park, CA: Addison-Wesley Publishing Company, 2002. – Chapter 5.1-5.3; Chapter 28

Vocabulary

alpha emission	half-life	plum-pudding model of the atom
atom	law of conservation of mass	positron emission
atomic number	law of definite proportions	proton
beta emission	law of multiple proportions	quarks
binding energy	J.J. Thomson	radioactive nucleus
cathode ray	John Dalton	radioactive decay
core electron capture	mass defect	radioactivity
down quark	mass number	Robert Millikan
electron	mass-energy relationship	stable nucleus
electron cloud	neutron	transmutation reaction
Ernest Rutherford	nuclear decay series	transuranium elements
fission	nuclear force	up quark
fusion	nuclear model of the atom	
gamma emission	nucleus	

Calendar

If it ends in “gen” or “I...N...E”, then it bonds diatomically				
M 9/7	T 9/8	W 9/9	Th 9/10	F 9/11
NO SCHOOL	Today: - Return Tests Fundamental Laws POGIL & ActivInspire (Law of Conservation of Mass) HW: - Outline Ch 2 & 23 Watch Video 2.6	Today: - Diatomic ActivInspire - <i>if it ends in “gen” or “ine” it bonds diatomically</i> Fundamental Laws POGIL & ActivInspire (Law of Definite Proportions) Elements, Compounds, & Mixtures Video or POGIL activity HW: - Outline Ch 2 & 23 - Look over Patterns in IONS #1	Today: Fundamental Laws POGIL & ActivInspire (Law of Multiple Proportions) - Finish Fundamental Laws ActivInspire (CO & CO₂) CO Poisoning Austin, Texas - Start Analysis of Salt Solutions Lab HW: - Outline Ch 2 & 23	Today: - Finish Analysis of Salt Solutions Lab Density Challenge Video & Lab HW: - Outline Ch 2 & 23 Watch Video 2.3a and 2.3b

M 9/14	T 9/15	W 9/16	Th 9/17	F 9/18
Due Today: -Fill out the Iodine Link Google Form Today: - Unit 1 Retake Test ("2nd Olympics") - Watch Annenberg Chemistry Video - "Matter & Rise of Atomic Theory" (1:50-14:30min) - Discuss contents in Morton's Salt (Use Salinity of Calcium Silicate) <i>-explains cloudiness of bottle & contents settled on bottom of bottle</i> -Iodine Link -Goiter Link -Himalayan Pink Salt - Salt contents NOTES HW: - Outline Ch 2 & 23	Due Today: -Once you finish Online Hwk#30 Upload it Here Today: - Using Online Hwk#30 Examples and NOTES - Click here for Periodic Table - Complete Jaffe Online Hwk#11 OR Protons, Electrons and Neutrons Online Homework #30 (Do 10-15 probs on paper & upload) <i>*If the Online Hwk link isn't working, use this backup video link for Online Hwk#30</i> HW: - Outline Ch 2 & 23	Due Today: -Once you finish the Outline Ch 2 & 23 Upload it Here Today: - Watch Annenberg Chemistry Video - "Matter & Rise of Atomic Theory" (14:30-27:30min) Carlsbad Desalination Plant "Salinity Wrap-up after Articles" ActivInspire HW: - Finish Outline Ch 2 & 23 - Watch Video 2.4a and 2.4b	Due Today: - Once you finish the PhET Isotopes & Atomic Mass Guided WS Upload it Here Today: PhET Isotopes & Atomic Mass Guided WS Isotopes & Amu PhET - Isotope NOTES HW: - Read the article "How a Mass Spectrometer Works"	Today: - More Isotope NOTES - Isotope ActivInspire - Average atomic mass & Isotope abundance NOTES - If time....Isotope (Amu) Activity w/ Beans (Beanium WS & Picture) HW: - Work on Silberberg
M 9/21	T 9/22	W 9/23	Th 9/24	F 9/25
Today: PBS Nova or Alternative Video (13 min start @ 1:10min) - Determining if Isotopes are Radioactive NOTES "Island of Stability" aka <i>Island of Possibility</i> Island of Stability Questions WS Table of Isotopes - Band of stability / Alpha decay NOTES HW: - Silberberg	Today: Possibly half-way Unit Test Predicting Radioactive Isotopes (KEY) - Lecture: Nuclear Decay Types and Band of Stability Notes & KEY (alpha only today – Use Nuclear Decay ActivInspire) Radioactive Decay Simulation (AACT) Alpha Decay PhET - Smoke Detectors ActivInspire Types of Smoke Detectors (Ionization, Photoelectric, & Dual) HW: Self-Test - Silberberg	Due Today: -Fill out the Radon Gas Google Form Today: Predicting Radioactive Isotopes Part II (KEY) - Alpha & Beta Decay NOTES - US Rankings of Radon (or Here) Radon Gas CDC Radon Gas EPA - Smoke Detectors & Radon NOTES HW: Self-Test - Silberberg	Today: Radon Lung Cancer - How to fix Radon in Home - Radon - The Office Cloud Chamber Video #1 ~5 min - Lecture: Nuclear Decay Types - Beta Beta Decay PhET - U238 Decay Series (AP CD #21 – Media Gallery...Use debugger) OR Radioactive Decay Cards Video (go over U decay series & intro 1/2 life) HW: Self-Test - Silberberg	Due Today: -Fill out the Health Effects of Alpha, Beta, & Gamma Survey Today: - Lecture: Nuclear Decay Types - Gamma Health Effects of Alpha, Beta, & Gamma Particles - Half-Life & Gamma NOTES Cloud Chamber Video #2 ~2 min Cloud Chamber Video #3 (Watch 8:30-12:00 min) If time..... Critical Mass Article (read pg 1 and/or short video) HW: Self-Test - Silberberg

M 9/28	T 9/29	W 9/30	Th 10/1	F 10/2
Due Today: -Fill out the MRI, CT scan, and X-rays Google Form Today: • Radium Girls Discussion & Video • Radiation • MRI, CT scans, & X-rays -Site #1 -Site #2 (Video) -Site #3 -Site #4 -Site #5 (Video) If time..... • Critical Mass Article (read pg 2) HW: • Self-Test • Silberberg	Today: • Go over Silberberg #2.32 & 2.34 (ActivInspire) • Lecture: Nuclear Decay Types - Positron Emission • Watch Annenberg Video - "Kinetics & Nuclear Chemistry" (18:00-26:45min) <i>-The video covers how a PET scan works (Positron Emission) and Radioactivity Animation</i> • Estimate your Yearly dose of • Airport Screening CDC and EPA <i>**If time click on the CDC to look at radiation in cigarette smoking</i> HW: • Self-Test • Silberberg	Today: • Lecture: Nuclear Decay Types - Electron Capture (only for honors) • Spontaneous Fission • Start Half-Life Activity (Martin's Version) HW: • Self-Test • Silberberg	Today: • Finish Half-Life Activity • Make Graphs & Analyze Data • Half-Life Mini-Lecture (Use Alpha Decay PhET to assist in lecture) HW: • Self-Test • Silberberg	Due Today: -Once you finish Silberberg Upload it Here Today: • Nuclear Fission PhET • Half-Life/Mass-Defect WS (Here is the KEY) (the mass of the nucleus is a little less than the mass of the individual neutrons, protons, and electrons. This missing mass is known as the mass defect, and represents the binding energy of the nucleus.) • Unit 2 Check Point (and KEY) • Work on Silberberg HW: • Self-Test • Silberberg
M 10/5	T 10/6	W 10/7	Th 10/8	
Due Today: -Once you finish Self-Test Upload it Here (Here is the KEY) Today: • Study Guide • Unit 2 Practice Test (with KEY) • Separation α, β, γ (AP CD #21 – Media Gallery) • Work on Self-Test If time: Nuclear Decay Challenge (on overhead only) HW: • Self-Test • Study for Test	Today: • Unit 2 Test • Periodic Table HW: • Study for 2nd Olympics	Due Today: -Fill out the Chemotherapy vs Radiation Therapy Google Form Today: • Return tests • Chemotherapy vs Radiation Therapy (Proton Therapy is a type of radiation therapy) -Site #1 -Site #2 -Site #3 (with Proton Therapy Video) -Extra if necessary Site #4 • Proton Therapy Center Map (locally Scripps Proton Therapy Center in Mira Mesa) • RDR Ppt (Normal & Fast Versions) HW: • Study for 2nd Olympics	Today: • Nuclear Chemistry & Irradiated Food Articles (Read only) • RDR Ppt (Insane & Professional Version) • Start Unit 3 (if time remains) HW: • Study for 2nd Olympics	May add to calendar: 1. The Man Who Tried to Fake an Element (1 ½ hour long video about the Island of Stability) 2. PBS - Heavy Water - Day 1 -Read PBS Heavy Water Article #1 -PBS Heavy Water Article #2 -Start PBS Heavy Water Video & PBS Heavy Water WS - Day 2 -Finish Video & PBS Heavy Water WS 3. Salinity Article Assignment (Once you finish the Salinity Article Assignment Upload it Here) 4. Common Assessment - Atomic Structure (Periodic Table)

Silberberg Book

Chapter	Topic	Read	Outline	Recommended Book Problems
2.2-2.3	Laws / Dalton's Atomic Theory	√	√	#7
2.4	History of the Atom	√	√	-
2.5	Structure of the Atom	√	√	#23-35
23.1	Radioactive Decay	√	√	-
23.2	Half-Life	√	√	#2, 6-7, 8-13
23.3 & 23.5	Transmutation / Radioisotopes	√	√	#33-34
23.6	Fission, Fusion, Binding Energy	√	√	-