Atomic Structure and Nuclear Reactions Unit Plan September, 2015 Honors Chemistry Dr. Rose Davidson	**Major Due Dates:** Day 12 Group Presentations of draft infographic Day 14 Final infographics are due to Dr. Davidson

Essential Questions:
What is the internal structure of the atom?
How do atoms differ from one another?
How can atoms change?
How have nuclear reactions impacted humans?

Day	Objectives	Activities	Homework
1	Students will be able to describe how the model of the atom has changed over time.	Video viewing of "The Atom"	Read and take notes on section in text.
2	Students will be able to describe how the model of the atom has changed over time.	Time line activity	Read, take notes on Section in text. Complete the model timeline.
3	Students will be able to describe the current model of the atom and be able to explain how isotope are used to calculate atomic mass.	Isotope Lab	Read, take notes on section in Text Lab Calculations due before leaving.
4	Students will be able to determine the number of protons, neutrons and electrons in isotopes.	Problem session	Practice problems due before leaving.
5	Students will be able to describe what happens to an atom when it radioactively decays.	Guided Discussion	Read, take notes on section in text.
6	Students will be able to graph parent and daughter isotope samples using the half-life.	Half Life Activity	Read and take notes on section in text.
7	Students will be able to describe the role which nuclear chemistry plays in modern life.	Infographic Activity	Deciding on a topic and locating data on nuclear topics
8	Students will be able to describe the role which nuclear chemistry plays in modern life.	Infographic Activity	Crafting graphs for the infographic from the data set.
9-10	Students will be able to describe the role which nuclear chemistry plays in modern life.	Infographic Activity	Adding information and images to the infographic
11	Students will be able to describe the role which nuclear chemistry plays in modern life.	Infographic Activity	Design principles and providing sources
12	Students will be able to clearly present the findings of their research to their peers.	Gallery Walk Activity	Infographics, revised and polished after peer feedback, are submitted to Dr. Davidson for feedback.

Academic Vocabulary:

Atom	Electron	Atomic Number	Nuclear Decay
Democritus	Electron Cloud	Mass Number	Radioactivity, Radiation
Dalton	Nucleus	Isotope	Half life
Thomson	Proton	Nuclear Symbol	Transmutation
Rutherford	Neutron	Atomic Mass	Nuclear Fission
Bohr	Scanning Electron Microscopes	Atomic Mass Unit	Nuclear Fusion

Assessment: This unit's summative assessments will be the Atomic Theory Time Line Activity and the Gallery Walk presentations and final infographic submitted on Nuclear Topics.

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Nuclear Reactions in Modern Life
Infographic Project
Dr. R. Davidson, Fall 2015

Objective:
Students will be able to describe the nuclear reactions which impact modern life using an infographic.

Student Directions:

1. Working with a partner, you will choose a topic related to nuclear reactions to research.
2. You will then locate a credible data source to provide statistics on your chosen topic.
3. The data source will be probed to determine mathematical relationship(s) in the data.
4. The relationship(s) in the data, along with textual explanations and images to illustrate will be assembled into an infographic.
5. Your research gathered and then assembled onto the infographic should address the following questions about the nuclear process chosen:
    a. What is the topic about? How are nuclear reactions involved with the topic?
    b. What do the statistics demonstrate in terms of the scale of involvement, the extent of use or problems with the use, concerns or benefits for citizens?
    c. What should citizens know about this topic in order to make informed decisions?
6. The infographic will be crafted using Venngage and Codap. The final infographic will be saved as a pdf and uploaded through Blackboard. The full sources of the information and pictures used are cited on a separate word document which is also uploaded through Blackboard.
7. The infographic will be presented visually and orally to the class for feedback.
8. The quality of the sources used for your information, the quality of the information presented, the quality of the infographic itself and the quality of your presentation to the class, are all features which will impact your grade on this project. Details can be found on the Specification Sheet.

Topic ideas:

A. Half-lives of radioactive elements most often used in our lives.	B. What are the radioactive elements and where are they found?
C. Radiation exposure levels of various activities such as airplane travel and x-rays	D. The production of energy on the Sun
E. The use of radiation to treat cancer	F. The use of radioactivity to diagnose cancer
G. Radon gas in our homes	H. The use of nuclear fission to produce electricity: pros and cons
I. Sources of uranium for nuclear power plants and weapons	J. Transportation of nuclear fuel and wastes
K. Security concerns with nuclear power	L. The Calloway County nuclear power plant: Nuclear energy in Missouri
M. The use of nuclear fission in making nuclear warheads or bombs	N. Decommissioning of nuclear warheads, weapons
O. The concerns about nuclear wastes	P. Locations of nuclear waste sites
Q. Radioactive hazardous waste sites	R. Nuclear catastrophes that have happened in the past: Fukushima
S. Nuclear catastrophes that have happened in the past: Chernobyl	T. Nuclear catastrophes that have happened in the past: Three Mile Island
U. How is nuclear power currently being used in the US?	V. What are the future plans for using nuclear fission to generate electricity in the US?

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NSF University of Colorado Boulder Saint Louis University TERC

Websites containing Data and Information on Nuclear Topics		
Source	**Type of data/info**	**Website**
NIST	Half-life data	http://www.nist.gov/pml/data/halflife.cfm
EPA	Radon data and info	http://www.epa.gov/radon/index.html
WNO	Sources of radioactive materials	http://www.world-nuclear.org/info/Safety-and-Security/Radiation-and-Health/Naturally-Occurring-Radioactive-Materials-NORM/ http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Uranium-Resources/Supply-of-Uranium/
NRC	Radioactive wastes	http://www.nrc.gov/waste.html http://www.nrc.gov/waste/llw-disposal/licensing/statistics.html
GAO	Radioactive Wastes	http://www.gao.gov/key_issues/disposal_of_highlevel_nuclear_waste/issue_summary
NIH	Radon and Cancer, Radiation levels, x-ray statistics	http://toxtown.nlm.nih.gov/text_version/chemicals.php?id=27 http://www.niehs.nih.gov/health/topics/agents/radon/
FAS	Status of world nuclear forces	http://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/
CDC	Number of x-ray visits	http://www.cdc.gov/nchs/data/public_health/SeriesB_38.pdf
ANS	Radiation dose chart	http://www.ans.org/pi/resources/dosechart/
NASA	Information about the sun's energy	http://helios.gsfc.nasa.gov/qa_sun.html
NRDC	Archive of Nuclear weapons data	http://www.nrdc.org/nuclear/nudb/datainx.asp http://www.nrdc.org/nuclear/
NRDC	Nuclear fallout regions for US plants	http://www.nrdc.org/nuclear/fallout/
Breast Cancer.org	Risk of developing breast cancer	http://www.breastcancer.org/symptoms/understand_bc/risk/understanding
ACS	Breast cancer facts and figures	http://www.cancer.org/acs/groups/content/@editorial/documents/document/acspc-044552.pdf
Cancer.org	Mammography statistics	http://www.cancer.org/research/infographicgallery/mammography-statistics
CDC	Fast stats mammography and breast cancer	http://www.cdc.gov/nchs/fastats/mammography.htm
NRC	High value data sets on nuclear reactors	http://www.nrc.gov/data/

WNO	Transportation of nuclear wastes	http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Transport/Transport-of-Radioactive-Materials/
NEI	Nuclear waste	http://www.nei.org/Knowledge-Center/Nuclear-Statistics/On-Site-Storage-of-Nuclear-Waste http://www.nei.org/Knowledge-Center/Nuclear-Statistics/On-Site-Storage-of-Nuclear-Waste/US-State-by-State-Used-Fuel-and-Payments-to-the-Nu
NRC NEI	Security and transportation of nuclear fuel	http://www.nrc.gov/waste/spent-fuel-transp.html http://www.nei.org/Issues-Policy/Nuclear-Waste-Management/Transportation
NEI	Nuclear Statistics	http://www.nei.org/Knowledge-Center/Nuclear-Statistics http://www.nei.org/Knowledge-Center/Nuclear-Statistics/World-Statistics
WNO	Information and statistics on nuclear power	http://www.world-nuclear.org/
ICAN	International campaign to abolish nuclear weapons	http://www.icanw.org/ Check "the Facts" tab
NRC	Decommissioning nuclear facilities	http://www.nrc.gov/waste/decommissioning.html
EIA	Nuclear power in Missouri	http://www.eia.gov/nuclear/state/2008/missouri/
NRC	Callaway County Reactor in MO	http://www.nrc.gov/info-finder/reactor/call.html
Nature	Fukushima radioactivity in food	http://www.nature.com/news/fukushima-data-show-rise-and-fall-in-food-radioactivity-1.17016
Fukushima Watch	Thyroid cancer and Fukushima	http://www.fukushimawatch.com/2015-07-29-second-post-as-test-by-moshin.html
WNN	The situation at Fukushima	http://www.world-nuclear-news.org/RS_Data_on_Fukushima_radiation_monitoring_1809121.html
WHO	Health effects of Chernobyl	http://www.who.int/ionizing_radiation/chernobyl/backgrounder/en/
NEI	Chernobyl disaster and its consequences	http://www.nei.org/master-document-folder/backgrounders/fact-sheets/chernobyl-accident-and-its-consequences
NRC	Background on Three Mile Island	http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html
SI	Exhibit about three mile island	http://americanhistory.si.edu/tmi/
3 mile island org	Health studies on what happened at 3 mile island	http://www.threemileisland.org/science/what_went_wrong/
NIH	A re-evaluation of the health effects from 3 mile island	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1469835/pdf/envhper00314-0052.pdf

Specifications for the Nuclear Infographics	
Content	**20 points = Outstanding coverage**
Summarize briefly the concept in your own words; how the process takes place or what the topic is about.	
Describe briefly the nuclear reaction involved with the process.	
Statistics provided in the form of a graph, pie chart, histogram, bubble chart.	
Relationship demonstrated by the statistics is clearly presented.	
Provide the information needed by citizens about this topic in order to make informed decisions.	
Infographic	**20 points = Outstanding visual presentation**
Limit descriptions to 25 words per text box.	
Pictures are either copyright free or student taken or created originals	
Pie charts, graphs, histograms, bubble charts are labeled appropriately and contain a sufficient number of data points.	
Design elements are used to provide cohesiveness and interest to the infographic.	
Oral Presentation	**5 points = Outstanding presentation**
The topic is presented clearly and succinctly	
Students do not present material in question answer format, nor do they simply follow the organization of the questions given.	
Both students participate equally	
Eye contact is maintained with the audience	
Presenters are dynamic and prepared	
Additional information and creative elements are included beyond those required.	
Sources used	**5 points = Perfectly attributed**
Four sources other than the textbook are used and cited on a work cited document.	
URL is provided for online sources.	
The sources used are credible and appropriate to the topic.	
All images are copyright free and the name of the source cited beneath the picture in tiny font.	
Original artwork, images should be cited with the student name beneath the image.	
Final copy uploaded as PDF on Blackboard	**Total = 50 points**

Examples of Student Work