**Unit Test Day**

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| **Course Name: Physical Science, Earth Science, Biology** |  |
| **Unit Title: Radiation in the Human Body** | **Day: 15/15** |
| **Relevant NC Standard Course of Study Goal(s):*** PSc.2.1.4 **Interpret the data presented in the Bohr model** diagrams and dot diagrams for **atoms and ions of elements 1 through 18.**
	+ Describe the charge, relative mass, and the location of protons, electrons, and neutrons within an atom.
	+ Calculate the number of protons, neutrons, electrons, and mass number in neutral atoms and ions.
	+ Explain how the different mass numbers of isotopes contributes to the average atomic mass for a given element (conceptual, no calculations).
	+ Explain Bohr’s model of the atom.
* PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay, and gamma decay; nuclear fusion and nuclear fission.
	+ Compare alpha, beta, and gamma decay processes –alpha decay reduces the mass of an atom by 4 and the atomic number by 2; beta decay increases the atomic number by 1 (a neutron decays into a proton and electron); gamma rays are electromagnetic waves released from the nucleus along with either an alpha or beta particle
	+ Compare the processes of fission (splitting of a very large atom) and fusion (joining of atoms) in terms of conditions required for occurrence, energy released, and the nature of products.
* PSc.2.3.2 Exemplify the radioactive decay of unstable nuclei using the concept of half-life.
	+ Conceptually explain half-life using models
	+ Perform simple half-life calculations based on an isotope’s half-life value, time of decay, and/or amount of substance.
* PSc.3.1.1 Explain thermal energy and its transfer.
	+ Compare thermal energy, heat, and temperature.
	+ Compare conduction, convection, and radiation as methods of energy transfer.
* Bio 1.1.3 Recall that chemical signals may be released by one cell to influence the development and activity of another cell.
* Biol 2.1.1 The input of radiant energy which is converted to chemical energy allows organisms to carry out life processes.
	+ Within ecosystems energy flows from the radiant energy of the sun through producers and consumers as chemical energy that is ultimately transformed into heat energy.
* Bio.2.2.1 Infer how human activities (ex. pollution) may impact the environment.
* Bio.2.2.1 Summarize how humans modify ecosystems through population growth, technology, **consumption of resources and production of waste**.
* Bio.3.1.3 Mutations can be random and spontaneous or caused by **radiation and/or chemical exposure**
* EEn.1.1.3 Explain how the sun produces energy which is **transferred to the Earth by radiation.**
	+ Compare combustion and nuclear reactions (fusion and fission) on a conceptual level. Identify fusion as the process that produces radiant energy of stars.
	+ Identify the forms of energy (electromagnetic waves) produced by the sun and how some are filtered by the atmosphere (X-rays, cosmic rays, etc.).
	+ Summarize how energy flows from the sun to the Earth through space
* EEn.2.2.1 Explain the consequences of human activities on the lithosphere past and present.
	+ Explain ways to mitigate detrimental human impacts on the lithosphere and maximize sustainable use of natural resources.
* EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood).
	+ Compare the methods of obtaining energy resources: harvesting (peat and wood), mining (coal and uranium/plutonium), drilling (oil and natural gas) and the effect of these activities on the environment.
* EEn.2.7.3 Explain how human activities impact the biosphere.
	+ Summarize ways to mitigate human impact on the biosphere.
* EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina
	+ Critique the benefits, costs and environmental impact of various alternative sources of energy for North Carolina (solar, wind, biofuels, **nuclear fusion**, fuel cells, wave power, geothermal).
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| **Specific Lesson Objectives** |
| **Students will understand:*** how energy is transferred from the Sun
* that energy can take different forms
* the scientific use of common words like heat, energy, and temperature
* how electron-electron repulsion and election-proton attraction contributes to the Bohr theory
* how charge is neutralized in an atom
* the relative locations of parts of an atom
* how elements are organized in the periodic table
* the general process of radioactive decay on the atomic level
* how fusion fuels the Sun
* how energy is released in fusion
* the complexity of how each nation uses and harvests energy
* how energy use by nation relates to their daily lives and has differential impacts on the environment
* how different nations’ energy use and North Carolina energy use is relative to their daily lives
* the complexity of energy use by region, and the complexity of attempts at mitigation of environmental damage due to harvesting of various types of energy especially at the local level
* the environmental impacts and consequences of different energy uses
* some of the evidence for the multi-faceted arguments against nuclear energy use because of disaster-driven data, and how this data is used by pro and anti-nuclear energy groups
* nuclear power is a highly efficient and “cleaner” energy source in that it does not produce carbon emissions, but there are many controversies over the long-term nuclear waste disposal from these power plants.
* the public perception of radiation on the human body and how the overall levels of radiation in everyday objects contributes to that level
* how radiation might affect the human body
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| **Students will know:*** what radiation means as a scientific process
* the structure of the atom in accordance with the Bohr theory
* the components of an element symbol
* the characteristics of metals and nonmetals
* what an isotope is and how it differs from an element
* the difference between fusion and fission
* the similarities and differences between alpha, beta, and gamma decay
* Vocabulary Part I (physical science portion)
* Different energy use data by nation and how these data change by global region/country/etc.
* the types of energy and how much that energy is used in North Carolina
* the environmental costs of different types of energy harvesting processes such as drilling, fracking, nuclear power, mining for coal and uranium, etc.
* the details of the nuclear disaster of the Chernobyl nuclear power plant in Pripyat, Ukraine
* an overview of how nuclear energy use functions and how uranium is mined to fuel plants
* the definitions of nuclear waste and the nature of the radioactivity of uranium
* the standard methods for containing and managing nuclear waste in the United States, which a regional example from North Carolina
* the various radiation levels of everyday objects
* sources of radiation
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| **Students will be able to:** * demonstrate their skills and understandings of unit material on the Unit Test
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| **Key Vocabulary/Formulae for this Lesson** |
| * all previous lesson vocabulary: energy, thermal energy, radiant energy, half-life, radiation, convection, conduction, nuclear fusion and fission, mutation, isotope, atom, Geiger counter, cancer, mutagenic, radioactivity, atomic number, proton, electron, nucleus, neutron, electromagnetic wave, chemical energy, radioactive decay, x-ray,
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| **Materials** |
| * printed unit tests (at least two versions to combat cheating)
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| **Technology Needs** |
| * laptop with displayed timer if desired
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| **LESSON ACTIVITIES** |
| **Opening (Hook, Warm-Up, Anticipatory Set, Review, etc.)** |
| *Describe activity to elicit active involvement of students or refer to previous learning:*Students will complete KWL (Know, Want to Know, Learn) chart on Radiation, filling out only the remaining final column - Learned. (10 min) |
| **Procedure: Include all sections that apply to this lesson; combine as necessary.** |
| **Section**  | **Time** | **What the Teacher will do:** | **What the Students will do:** |
| **Statement of Objective & Purpose** | 5 min | Explain the directions for completion of the Unit Test | listen |
| **Input,****Modeling, &****Check for****Understanding** | 10 min65 min | address last minute clarifying questions from students for a maximum of 10 minutescirculate to address questions and monitor behavior | independently review notes and ask clarifying questionscomplete the Unit Test |
| **Assessment of Student Learning** |
| *Comprehensive Unit Test* |