Foundations of Science
Learner Outcomes

(Compiled by April Senger)

General

- Convert basic temperature readings between Fahrenheit, Celsius, and Kelvin
- Explain the laws of conservation of mass and conservation of energy, and explain how they apply to the changes of state
- Describe the main branches of natural science and relate them to each other
- Describe and apply the scientific method
- Identify what each common SI prefix represents, and convert measurements
- Understand the difference between precision & accuracy and apply this to significant figures
- Use scientific notation and significant figures in problem solving
- Distinguish among facts, theories, and laws.
- Perform calculations involving density
- Describe the relationship between science and technology
- Describe the relationship between density and convection currents

Chemistry

- Describe matter
- State the charge, mass and location of each part of an atom according to the modern model of the atom
- Determine how many protons, neutrons, and electrons an atom or isotope has, given its symbol, atomic number, and mass number
- Describe an atoms mass number
- Describe how the abundance of isotopes affects an element's average atomic mass
- Describe the differences between endothermic and exothermic reactions
- Describe a chemical bond
- Use the kinetic theory to describe the properties and structures of the different states of matter
- Describe energy transfers involved in changes of state
- Distinguish between chemical and physical properties of matter
- Explain why some atoms transfer their valance electrons to form ionic bonds, while other atoms share valance electrons to form covalent bonds
- Differentiate between ionic, covalent, and metallic bonds
- Demonstrate how to balance chemical equations
- Relate the pH of a solution to the concentration and strength of dissolved acid or base
- Relate the structure of water to its ability to dissolve many different substances
- Compare and contrast the properties of solutions, colloids, and suspensions
- Describe the energy transfers involved in changes of state
- Describe the laws of conservation of mass and conservation of energy, and explain how they apply to changes of state

Chemistry (continued)

- Compare and contrast Bohr's model with the modern model of the atom
- Interpret and write some common chemical formulas
- Explain why atoms sometimes join to form bonds
- Compare the properties of substances with different types of bonds
- Generalize among the five types of chemical reactions

Nuclear

- Describe the process of nuclear decay that make unstable isotopes stable
- Balance a equations for nuclear decay
- Calculate the half-life of a radioactive isotope
- Distinguish between fission and fusion, and provide examples of each

Physics

- Describe how weight is different then mass
- Calculate kinetic energy and gravitational potential energy
- Calculate the acceleration of an object
- Calculate the work done on an object and the rate at which work is done
- State Newton's three laws of motion, and apply them to physical situations
- Relate speed to distance and time
- Distinguish between speed and velocity
- Solve problems involving time, distance, velocity, and momentum

Earth

- Identify the Earth's different geologic layers
- Describe the movement of the Earth's lithosphere using the theory of plate tectonics
- Identify the three types of plate boundaries and the principal structures that form at each of these boundaries
- Identify the three types of rocks and how they change through out the rock cycle
- Identify the causes of earthquakes
- Distinguish between S waves, P waves, and surface waves in earthquakes
- Explain how the presence of magnetic bands on the ocean floor and continental coastlines support the theory of plate tectonics
- Identify the causes of rock shaping due to weathering and erosion
- Describe how a mineral is different from a rock

Astronomy

- Describe the role of distance and size on the gravity of two objects
- Describe the structure of the Milky Way galaxy, and include the location of our solar system
- Explain how the composition and surface temperatures of stars are measured

Astronomy (continued)

- Recognize that all normal stars are powered by fusion reactions that form elements
- State the main features of the big bang theory and evidence supporting the expansion of the universe
- Explain eclipses and the phases of the moon
- Describe Ptolemy, Copernicus, and Kepler's theories on our solar system

Light

- Investigate how energy is transferred by conduction, convection, and radiation
- Recognize that waves transfer energy
- Distinguish between mechanical waves and electromagnetic waves

Weather & Atmosphere

- Distinguish between climate and weather
- Investigate ice ages and their characteristics
- Identify the primary layers of the atmosphere

Natural Resources

- Identify different sources of energy used by living things, and trace each source back to the sun

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It is much better to understand the Universe as it really is than to persist in delusion…
…no matter how reassuring that delusion may feel to your soul!