Course Name: Physical Science / Physical Science Honors

Course Number: 2003310 / 2003320

Total Number of Test Items: 50

SC.912.L.18.12	**Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.**

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
2	0	1	1

Focus/Benchmark Clarifications	• Students will be able to discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.
Content Limits	• Items will qualitatively assess water's relatively high specific heat as it relates to changes in temperature. • Items will qualitatively assess water's polarity.

SC.912.N.1.1	**Define a problem based on a specific body of knowledge. For example: biology, chemistry, physics, and earth/space science.**

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
4	0	3	1

Focus/Benchmark Clarifications	• Students will be able to define a problem based on a specific body of knowledge (e.g., biology, chemistry, physics, and earth/space science). • Students will be able to pose questions about the natural world using body of knowledge concepts. • Students will review and discuss what is known in light of empirical evidence.
Content Limits	• Items will assess content that is appropriate for grade level and rigor of course. • Items will require students to analyze data tables and/or graphs • Items will require students to interpret and evaluate experimental scenarios. • Items may require students to draw valid conclusions from sample data sets.

SC.912.P.8.2	Differentiate between physical and chemical properties and physical and chemical changes of matter.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
1	0	1	0

Focus/Benchmark Clarifications	• Students will be able to differentiate between physical and chemical properties and physical and chemical changes of matter.
Content Limits	• Items may qualitatively asses how certain physical characteristics can determine the identity of a pure sample of an unknown substance (e.g., by density, specific heat, etc.) • Items will not quantitatively assess chemical properties or changes. • Items will only assess chemical processes that fall under the reaction types delineated by SC.912.P.8.8

SC.912.P.8.4	Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
2	1	1	0

Focus/Benchmark Clarifications	• Students will be able to explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.
Content Limits	• Items may require students to qualitatively compare the masses and volumes occupied by subatomic particles. • Items will only address the following subatomic particles: protons, neutrons, electrons • Items may require knowledge and application of the periodic table

SC.912.P.8.5	Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
3	0	2	1

Focus/Benchmark Clarifications	• Students will identify that the group an atom is in on the periodic table corresponds to the number of valence electrons and orbital those valence electrons occupy. • Student will interpret that the atoms of a group on the periodic table have the same electron arrangements and therefore similar chemical and physical properties. • Items may assess the number of valence electrons of a given element using a periodic table • Items will neither assess the valence electrons of transition metals, nor Lanthanide/Actinide series metals. • Items may also assess placement of elements on the periodic table in terms of atomic number.
Content Limits	• Items will not require students to draw, recognize or interpret Lewis dot structures or complete an orbital diagram and/or an electron diagram for a particular atom. • Items may require that students know the chemical and physical properties of groups of elements on the periodic table. • Items will require knowledge and application of the periodic table

SC.912.P.8.7	Interpret formula representations of molecules and compounds in terms of composition and structure.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
1	0	1	0

Focus/Benchmark Clarifications	• Students will be able to interpret formula representations of molecules and compounds in terms of composition and structure.
Content Limits	• Items may address physical/chemical changes and properties of matter. • Items will not assess include VSEPR Theory. • Items may assess simple molecular structures (no more than five atoms) as a consequence of the types of bond that characterize the molecule (e.g., ionic, covalent, etc.)

SC.912.P.8.8	Characterize types of chemical reactions. For example: redox, acid-base, synthesis, and single and double replacement reactions.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
2	0	1	1

Focus/Benchmark Clarifications	• Students will be able to recognize and/or characterize the following types of chemical reactions: acid-base, synthesis, decomposition, combustion, single replacement and double replacement.
Content Limits	• Items will not require students to balance chemical equations. • Items will not require students to do stoichiometry. • Items may assess examples of types of reaction by written description or by representative chemical equations (e.g., stereotypical reactants/products).

SC.912.P.10.1	Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
2	0	2	0

Focus/Benchmark Clarifications	• Students will be able to differentiate among the various forms of energy and recognize that they can be transformed from one form to another.
Content Limits	• Items may include the kinetic theory of matter. • Items will only discuss the following energy types: thermal, electrical, mechanical, sound, light, gravitational potential, spring potential, elastic potential, and/or kinetic. • Items may include transfer of energy through friction. • Items may assess temperature changes and thermal equilibrium. • Items may assess the Law of Conservation of Energy. • Items will not assess efficiency.

SC.912.P.10.3	Compare and contrast work and power qualitatively and quantitatively.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
3	1	2	0

Focus/Benchmark Clarifications	• Students will be able to compare and contrast work and power qualitatively and quantitatively.
Content Limits	• Items will not assess efficiency. • All calculations will use SI units only. • Items may require quantitative calculations of work and/or power. • Items may include free body diagrams.

SC.912.P.10.4	Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
1	1	0	0

Focus/Benchmark Clarifications	• Students will be able to describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.
Content Limits	• Items will include examples of transfer of energy.

SC.912.P.10.5 Relate temperature to the average molecular kinetic energy.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
1	0	1	0

Focus/Benchmark Clarifications	• Students will be able to relate temperature to average molecular kinetic energy.
Content Limits	• Items may assess thermal energy. • Items may compare and contrast conventional states of matter (solid, liquid, gas) and the motion of their particles. • Items will not assess exotic states of matter (e.g., plasma). • Items will not assess the differences, or require conversions between Kelvin, Celsius and Fahrenheit scales.

SC.912.P.10.7 Distinguish between endothermic and exothermic chemical processes.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
1	1	0	0

Focus/Benchmark Clarifications	• Students will be able to qualitatively distinguish between endothermic and exothermic chemical processes.
Content Limits	• Items will not require quantitative analysis of heat energy or temperature. • Items will not assess the impact of catalysts in chemical reactions. • Items may assess phase changes in terms of endothermic and/or exothermic changes.

SC.912.P.10.10	Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
3	1	2	0

Focus/Benchmark Clarifications	• Students will be able to compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).
Content Limits	• Items may assess a comparison of the relative magnitude of the four fundamental forces. • Items will qualitatively describe the four fundamental forces • Items will assess the types of interactions each force is responsible for (e.g., gravity: attraction between massive objects, electromagnetism: attraction/repulsion between charged objects, strong nuclear force: attraction between nucleons, weak nuclear force: nucleon decay)

SC.912.P.10.11	Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
2	0	1	1

Focus/Benchmark Clarifications	• Students will be able to compare and contrast the nuclear reactions qualitatively.
Content Limits	• Items will not assess half-life or radioactive dating. • Items will not quantitatively assess nuclear reactions. • Items may require students to interpret charts or diagrams in order to identify nuclear reactions.

SC.912.P.10.14	Differentiate among conductors, semiconductors and insulators.		
Total Number of Items	**Number of Low Complexity Items**	**Number of Moderate Complexity Items**	**Number of High Complexity Items**
2	1	1	0
Focus/Benchmark Clarifications	• Students will be able to tell the difference between conductors, semiconductors, and insulators.		
Content Limits	• Items will not assess superconductors. • Items will not require quantitative analysis of materials. • Items may address energy transformations. • Items may require students to interpret and/or describe electron movement in materials.		

SC.912.P.10.15	Investigate and explain the relationships among current, voltage, resistance and power.		
Total Number of Items	**Number of Low Complexity Items**	**Number of Moderate Complexity Items**	**Number of High Complexity Items**
1	0	0	1
Focus/Benchmark Clarifications	• Students will be able to investigate and explain the relationships among current, voltage, resistance, and power.		
Content Limits	• Items may qualitatively and/or quantitatively assess calculations via Ohm's Law • Items may include prepared circuit diagrams. • Items will not require students to create circuit diagrams. • Items will not require students to find the total resistance of a parallel circuit.		

SC.912.P.10.18	**Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.**

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
4	0	4	1

Focus/Benchmark Clarifications	• Students will be able to explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.
Content Limits	• Items will not require students to calculate the energy of a wave. • Items may include qualitative analysis of absorption and/or reflection of a light wave that interacts with a given colored surface. • Items may qualitatively assess the relationship between wavelength, frequency and velocity. • Items will include effect of different mediums on speed of electromagnetic waves. • Items may assess the concept of refraction. • Items may require students to differentiate between transparent, translucent and opaque.

SC.912.P.10.21	**Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.**

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
1	0	1	0

Focus/Benchmark Clarifications	• Students will be able to qualitatively describe the shift in frequency in sound and/or electromagnetic waves due to the relative motion of a source and/or receiver.
Content Limits	• Items may address the general properties of sound. • Items will not require quantitative analysis of Doppler shift. • Items will not assess the speed of sound or mach numbers.

SC.912.12.2	Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
5	0	5	0

Focus/Benchmark Clarifications	• Students will be able to analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.
Content Limits	• Items may assess the effect of applied forces. • Items may use vectors in the analysis of a question (arrows and/or unit vector notation) • Items may assess scenarios using various graphs (distance-time, velocity-time and acceleration-time) • Items may assess scenarios using data tables and charts. • Items will not quantitatively assess 2-object 1-dimensional kinematics. • Items will not quantitatively assess 2-dimensional kinematics. • Items will not assess vector decomposition. • Items may assess vector addition and/or subtraction (arrows and/or unit vector notation).

SC.912.P.12.3	Interpret and apply Newton's three laws of motion.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
4	1	3	0

Focus/Benchmark Clarifications	• Students will be able to interpret and apply Newton's three laws of motion.
Content Limits	• Items may require quantitative analysis of Newton’s Second Law (f=ma) • Items will not require knowledge of, or use concepts related to momentum or impulse • Items may include free body diagrams • Items may qualitatively (but not quantitatively) assess Newton’s Law of Universal Gravitation. • Items will not assess mechanical advantage, torque, or simple machines.

SC.912.P.12.7	Recognize that nothing travels faster than the speed of light in a vacuum which is the same for all observers no matter how they or the light source are moving.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
1	0	1	0

Focus/Benchmark Clarifications	• Recognize that nothing travels faster than the speed of light in a vacuum which is the same for all observers no matter how they or the light source are moving.
Content Limits	• Items will not require students to have memorized the speed of light. • Items may compare and contrast the motion of light in mediums that are not vacuums to the motion of light in a vacuum. • Items may involve illustrations, charts or diagrams.

SC.912.P.12.10	Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Total Number of Items	Number of Low Complexity Items	Number of Moderate Complexity Items	Number of High Complexity Items
2	0	2	0

Focus/Benchmark Clarifications	• Students will be able to interpret the behavior of ideal gases in terms of kinetic molecular theory.
Content Limits	• Items will require qualitative understanding of Ideal Gas Law. • Items may address proportionality relationships between the variables of Ideal Gas Law • Items will not quantitatively assess Ideal Gas Law • Items will not qualitatively assess Charles', Boyle's or Gay-Lussac's Law.

SC.912.P.12.11	Describe phase transitions in terms of kinetic molecular theory.		
Total Number of Items	**Number of Low Complexity Items**	**Number of Moderate Complexity Items**	**Number of High Complexity Items**
2	0	1	1
Focus/Benchmark Clarifications	• Students will be able to describe phase transitions in terms of kinetic molecular theory. • Items will include phase change diagrams (temperature vs. total energy)		
Content Limits	• Items will only assess conventional states of matter (e.g., solid, liquid, gas) • Items will not assess exotic states of matter (e.g., plasma) • Items will not require quantitative analysis • Items will not include language regarding heat of fusion or heat of vaporization. • Items may assess temperature changes, thermal energy and/or thermal equilibrium		