



OUSD Benchmark Assessments

Secondary Science

Science
December 2009

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Middle School 6-8,
High School Biology,
Chemistry, Physics

The OUSD Benchmark Assessments

The OUSD Benchmark Assessments are instructional tools designed to support student achievement of grade-level standards. Requested by the Secondary Schools Network and collaboratively designed by the Departments of Research and Assessment and Instructional Services, the assessments have been created using State testing blueprints and are aligned to content-based Pacing Guides. The purpose of these assessments is to provide timely and relevant information to teachers about student understanding. This information is to be used to enhance, revise, and strengthen instruction. *The assessments are not designed to be used for teacher evaluation.*

The Benchmark Assessments take place during the last two weeks of each semester only in Middle School grades 6-8, High School Biology, Chemistry, and Physics. All teachers of these courses are to administer the Fall and Spring Benchmark. The results for these assessments are then scanned into Edusoft.

Science Benchmark Assessments

The science assessments are aligned to each course's Pacing Guide. These guides are available on the [Science in Oakland](#) website. The guides are "living documents" that will be evaluated and revised each school year. Instructional Services hopes that the Benchmark Assessments will not only help teachers to create high-quality, standards-aligned curriculum and instruction, but will also foster discussion and debate about the Pacing Guides, the standards, and the assessments themselves.

If you have any suggestions or comments, visit the Benchmark Assessment page on the [Science in Oakland](#) website.

The purpose of these assessments is to provide timely and relevant information to teachers about student achievement.

Frequently Asked Questions

1. How should I prepare my students for the Science Benchmark Assessment?

All of the Benchmark Assessments have been aligned to the Pacing Guides which were distributed to school sites. The Pacing Guides are also available online at <http://science.ousd.k12.ca.us>. The Fall Benchmark Assessments will cover the standards in the first three marking periods. The Spring Benchmark Assessment will cover marking periods four through six. Teaching the standards and content in the Pacing Guides will prepare your students for the Benchmark Assessments.

2. How were the Benchmark Assessments developed?

Questions were created by teams of Oakland science teachers who are currently teaching the assessed subjects. The teachers wrote questions, selected and modified questions from the adopted textbook's test generator software, and/or selected CST release questions. All questions are aligned to the California Science Content Standards.

3. How many questions will be on the Benchmark Assessments?

6th Grade (~25 Questions)

7th Grade (~35 Questions)

8th Grade (~40 Questions)

High School Biology (~40 Questions)

High School Chemistry (~40 Questions)

High School Physics (~40 Questions)

All questions are in a multiple choice format.

4. Will every standard on the Pacing Guide for the Fall semester appear on the Benchmark Assessment?

No, but most of them will be included. The questions selected for each assessment represent core standards for each course. Each assessment is similar in format and difficulty to California Standards Test questions.

5. What do I do if I have not covered all the standards?

Have your students try their best on the assessments. The results of the assessment can be disaggregated by standard within Edusoft, allowing you to analyze the results by standard.

6. Are the Secondary Science Benchmarks Assessments required?

Yes, they are mandated by the District.

7. When will the Secondary Science Benchmark Assessments be distributed?

Copies of the assessments for students and teachers will be provided and delivered to school sites by the Research and Assessment department a week before the start of the test administration period.

8. Where do I go to get the answer documents?

Individual teachers or school sites need to print out answer sheets using the Edusoft website. Each answer sheet is custom coded for an individual class/teacher. Once you have printed one answer sheet for an individual class, you can duplicate a class set on your copier. To access Edusoft, please visit the OUSD Intranet site at <http://intranet.ousd.k12.ca.us> (click on the Edusoft box at the bottom of the page). Please note that you will need your OUSD login and password to access this site.

Analyzing the Results: PLC Talking Points

The results of the Science Benchmark Assessment will not only provide valuable information for an individual teacher about his or her students, but can also serve to focus discussions about teaching and learning within your Professional Learning Communities. You might choose to use one or more of the following questions as a starting point for PLC conversations:

- Analyze students' overall performance as well as how they performed on specific standards and questions. Which results of the Science Benchmark Assessment were expected and which were surprising? How might we account for either expected or surprising results?
- Compare/contrast the results of the Science Benchmark Assessment with the results of other assessments you have given during the year. What do the results of both assessments suggest about teaching and learning in your classroom? Pay special attention to standards students struggled to master. What changes or achievements are suggested by the results of the Benchmark?
- Compare/contrast the results found by different teachers within one grade level. Can you determine which teachers are "experts" at a particular standard or standards? How might you use your in-house expertise to raise student achievement and mastery of these particular standards? What structures need to be in place to best utilize these in-house resources?
- Compare/contrast the results across all grade levels. What do these results suggest about the skill levels of students within each grade? How might teachers reinforce skills across all grade levels to support school-wide student achievement?
- Share the results of the Benchmark Assessment with content teachers outside of Science. What do the results suggest about teaching and learning in other content areas?

Please contact us with comments and feedback

We're interested to learn more about your experience with the Science Pacing Guide and the Benchmark Assessments

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Please visit our website for more science related resources:

<http://science.ousd.k12.ca.us>

MIDDLE SCHOOL SCIENCE PACING GUIDES & BENCHMARK ASSESSMENT BLUEPRINTS

Benchmark assessment blueprints are noted in red next to each standard. The number indicates the number of questions that include that particular standard.

Notes:

- Based on the California Science Standards
- Standards are sorted by the six marking periods (MP)
- Defines sequencing within each marking period

6TH GRADE – EARTH SCIENCE

Textbook: CPO Focus on Earth Science (CPO Science)

MP	California Science Standards/ <i>Concepts</i>	Textbook Correlation/ <i>Notes</i>
1	<p><i>Orientate Diverse Students to Science and Common Expectations</i> <i>Definition of Science</i></p> <p>Investigation and Experimentation (continues through out the year)</p> <p>7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:</p> <ol style="list-style-type: none"> a. Develop a hypothesis. b. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data. (2) c. Construct appropriate graphs from data and develop qualitative statements about the relationships between variables. d. Communicate the steps and results from an investigation in written reports and oral presentations. e. Recognize whether evidence is consistent with a proposed explanation. (1) f. Read a topographic map and a geologic map for evidence provided on the maps and construct and interpret a simple scale map. g. Interpret events by sequence and time from natural phenomena (e.g., the relative ages of rocks and intrusions). (2) h. Identify changes in natural phenomena over time without manipulating the phenomena (e.g., a tree limb, a grove of trees, a stream, a hillslope). (1) 	<p>Unit One: The Scientific Process</p> <p>Chapter 1: Science Is Everywhere Page 3</p> <p>Chapter 2: The Science Toolbox Page 23</p> <p>Chapter 3: Introducing Earth Page 53</p>
2	<p>Heat (Thermal Energy) (Physical Sciences)</p> <p>3. Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature. As a basis for understanding this concept:</p>	<p>Unit Two: Energy in Earth's Systems</p> <p>Chapter 4: Heat Page 75</p> <p>Chapter 5: Density and Buoyancy Page 93</p>

	<ul style="list-style-type: none"> a. <i>Students know</i> energy can be carried from one place to another by heat flow or by waves, including water, light and sound waves, or by moving objects. (2) b. <i>Students know</i> that when fuel is consumed, most of the energy released becomes heat energy. (1) c. <i>Students know</i> heat flows in solids by conduction (which involves no flow of matter) and in fluids by conduction and by convection (which involves flow of matter). (4) d. <i>Students know</i> heat energy is also transferred between objects by radiation (radiation can travel through space). (2) <p>Energy in the Earth System</p> <p>4. Many phenomena on Earth's surface are affected by the transfer of energy through radiation and convection currents. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle. (2) b. <i>Students know</i> solar energy reaches Earth through radiation, mostly in the form of visible light. (1) c. <i>Students know</i> heat from Earth's interior reaches the surface primarily through convection. (1) d. <i>Students know</i> convection currents distribute heat in the atmosphere and oceans. (1) e. <i>Students know</i> differences in pressure, heat, air movement, and humidity result in changes of weather. (2) 	<p>Chapter 6: Earth's Surface and Heat Page 113 Chapter 7: Heat Inside Earth Page 137</p>
3	<p>Plate Tectonics and Earth's Structure</p> <p>1. Plate tectonics accounts for important features of Earth's surface and major geologic events. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> evidence of plate tectonics is derived from the fit of the continents; the location of earthquakes, volcanoes, and midocean ridges; and the distribution of fossils, rock types, and ancient climatic zones. (1) b. <i>Students know</i> Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core. (3) c. <i>Students know</i> lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle. (2) d. <i>Students know</i> that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface.(4) e. <i>Students know</i> major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions. (1) f. <i>Students know</i> how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics. (1) g. <i>Students know</i> how to determine the epicenter of an earthquake and know that the effects of an earthquake on any region vary, depending on the size of the earthquake, the distance of the region from the epicenter, the local geology, and the type of construction in the region. (1) 	<p>Unit Three: Plate Tectonics and Earth's Structure</p> <p>Chapter 8: Plate Tectonics Page 157 Chapter 9: Earthquakes Page 181 Chapter 10: Volcanoes Page 203</p>

	<ul style="list-style-type: none"> b. <i>Students know</i> sexual reproduction produces offspring that inherit half their genes from each parent. (1) c. <i>Students know</i> an inherited trait can be determined by one or more genes. (3) d. <i>Students know</i> plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive. (4) e. <i>Students know</i> DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell. (4) 	
4	<p>Evolution</p> <p>3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> both genetic variation and environmental factors are causes of evolution and diversity of organisms. b. <i>Students know</i> the reasoning used by Charles Darwin in reaching his conclusion that natural selection is the mechanism of evolution. c. <i>Students know</i> how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution. d. <i>Students know</i> how to construct a simple branching diagram to classify living groups of organisms by shared derived characteristics and how to expand the diagram to include fossil organisms. e. <i>Students know</i> that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival. <p>Earth and Life History (Earth Sciences)</p> <p>4. Evidence from rocks allows us to understand the evolution of life on Earth. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time. b. <i>Students know</i> the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impacts of asteroids. c. <i>Students know</i> that the rock cycle includes the formation of new sediment and rocks and that rocks are often found in layers, with the oldest generally on the bottom. d. <i>Students know</i> that evidence from geologic layers and radioactive dating indicates Earth is approximately 4.6 billion years old and that life on this planet has existed for more than 3 billion years. e. <i>Students know</i> fossils provide evidence of how life and environmental conditions have changed. f. <i>Students know</i> how movements of Earth's continental and oceanic plates through time, with associated changes in climate and geographic connections, have affected the past and present distribution of organisms. g. <i>Students know</i> how to explain significant developments and extinctions of plant and animal life on the geologic time scale. 	<p>Unit Four: Evolution and Change</p> <p>Chapter 11: Evolution Page 213</p> <p>Chapter 12: Earth and Life History Page 237</p>

5	<p>Structure and Function in Living Systems</p> <p>5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> <i>Students know</i> plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism. (3) <i>Students know</i> organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system. <i>Students know</i> how bones and muscles work together to provide a structural framework for movement. <i>Students know</i> how the reproductive organs of the human female and male generate eggs and sperm and how sexual activity may lead to fertilization and pregnancy. <i>Students know</i> the function of the umbilicus and placenta during pregnancy. <i>Students know</i> the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit. <i>Students know</i> how to relate the structures of the eye and ear to their functions. 	<p>Unit Five: Structure and Function in Living Things</p> <p>Chapter 13: The Diversity of Life Page 261 Chapter 14: Plants Page 277 Chapter 15: Animals Page 307</p>
6	<p>Physical Principles in Living Systems (Physical Sciences)</p> <p>6. Physical principles underlie biological structures and functions. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> <i>Students know</i> visible light is a small band within a very broad electromagnetic spectrum. <i>Students know</i> that for an object to be seen, light emitted by or scattered from it must be detected by the eye. <i>Students know</i> light travels in straight lines if the medium it travels through does not change. <i>Students know</i> how simple lenses are used in a magnifying glass, the eye, a camera, a telescope, and a microscope. <i>Students know</i> that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths. <i>Students know</i> light can be reflected, refracted, transmitted, and absorbed by matter. <i>Students know</i> the angle of reflection of a light beam is equal to the angle of incidence. <i>Students know</i> how to compare joints in the body (wrist, shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints). <i>Students know</i> how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system. <i>Students know</i> that contractions of the heart generate blood pressure and that heart valves prevent backflow of blood in the circulatory system. 	<p>Unit Six: The Human Body</p> <p>Chapter 16: Human Body Systems Page 341 Chapter 17: Support and Movement Page 367 Chapter 18: Vision and Hearing Page 389</p> <p><i>(consider moving Human Reproduction here)</i></p>

8TH GRADE –PHYSICAL SCIENCE

Textbook: CPO Focus on Physical Science (CPO Science)

MP	California Science Standards/ <i>Concepts</i>	Textbook Correlation
1	<p>Investigation and Experimentation (continues through out the year)</p> <p>9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:</p> <ul style="list-style-type: none"> a. Plan and conduct a scientific investigation to test a hypothesis. (4) b. Evaluate the accuracy and reproducibility of data. c. Distinguish between variable and controlled parameters in a test. (1) d. Recognize the slope of the linear graph as the constant in the relationship $y=kx$ and apply this principle in interpreting graphs constructed from data. (1) e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables. (1) f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height). (2) g. Distinguish between linear and nonlinear relationships on a graph of data. (1) 	<p>Unit One: Physical Science and You Chapter 1: Studying Physics and Chemistry Chapter 2: Experiments and Variables Chapter 3: Key Concepts in Physical Science</p>
2	<p>Density and Buoyancy</p> <p>8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> density is mass per unit volume. (2) b. <i>Students know</i> how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume. (3) c. <i>Students know</i> the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced. (1) d. <i>Students know</i> how to predict whether an object will float or sink. (2) 	<p>Unit Two: Properties of Matter Chapter 4: Density and Buoyancy Chapter 5: States of Matter</p>
3	<p>Structure of Matter</p> <p>3. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> the structure of the atom and know it is composed of protons, neutrons, and electrons. (6) b. <i>Students know</i> that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements. (3) c. <i>Students know</i> atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers. (1) d. <i>Students know</i> the states of matter (solid, liquid, gas) depend on molecular motion. (2) 	<p>Unit Three: Atoms and the Periodic Table Chapter 6: The Atom Chapter 7: Elements and the Periodic Table Chapter 8: Molecules and Compounds</p>

	<p>e. <i>Students know</i> that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently. (3)</p> <p>f. <i>Students know</i> how to use the periodic table to identify elements in simple compounds. (1)</p> <p>Periodic Table</p> <p>7. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept:</p> <p>a. <i>Students know</i> how to identify regions corresponding to metals, nonmetals, and inert gases. (6)</p> <p>b. <i>Students know</i> each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus. (3)</p> <p>c. <i>Students know</i> substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity. (7)</p>	
4	<p>Reactions</p> <p>5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:</p> <p>a. <i>Students know</i> reactant atoms and molecules interact to form products with different chemical properties. (4)</p> <p>b. <i>Students know</i> the idea of atoms explains the conservation of matter: In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same. (3)</p> <p>c. <i>Students know</i> chemical reactions usually liberate heat or absorb heat. (3)</p> <p>d. <i>Students know</i> physical processes include freezing and boiling, in which a material changes form with no chemical reaction. (3)</p> <p>e. <i>Students know</i> how to determine whether a solution is acidic, basic, or neutral. (2)</p> <p>Chemistry of Living Systems (Life Sciences)</p> <p>6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:</p> <p>a. <i>Students know</i> that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms. (2)</p> <p>b. <i>Students know</i> that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur. (2)</p> <p>c. <i>Students know</i> that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA. (2)</p>	<p>Unit Four: Matter and Change Chapter 9: Acids, Bases, and Solutions Chapter 10: Chemical Reactions Chapter 11: The Chemistry of Living Systems</p>

	<p>Motion</p> <p>1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> <i>Students know</i> position is defined in relation to some choice of a standard reference point and a set of reference directions. (2) <i>Students know</i> that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary. (3) <i>Students know</i> how to solve problems involving distance, time, and average speed. (4) <i>Students know</i> the velocity of an object must be described by specifying both the direction and the speed of the object. (3) <i>Students know</i> changes in velocity may be due to changes in speed, direction, or both. (2) <i>Students know</i> how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction. (3) <p>Forces</p> <p>5 2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> <i>Students know</i> a force has both direction and magnitude. (1) <i>Students know</i> when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces. (1) <i>Students know</i> when the forces on an object are balanced, the motion of the object does not change. (1) <i>Students know</i> how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction. (2) <i>Students know</i> that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction). (2) <i>Students know</i> the greater the mass of an object, the more force is needed to achieve the same rate of change in motion. (2) <i>Students know</i> the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system. (1) 	<p>Unit Five: Motion and Force Chapter 12: Distance, Time, and Speed Chapter 13: Forces Chapter 14: Force and Motion</p>
6	<p>Earth in the Solar System (Earth Sciences)</p> <p>4. The structure and composition of the universe can be learned from studying stars and galaxies and their evolution. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> <i>Students know</i> galaxies are clusters of billions of stars and may have different shapes. (1) <i>Students know</i> that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color. (2) <i>Students know</i> how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth. (2) <i>Students know</i> that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light. (1) <i>Students know</i> the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids. (2) 	<p>Unit Six: Astronomy Chapter 15: The Solar System Chapter 16: The Sun and Stars Chapter 17: Galaxies and the Universe</p>

HIGH SCHOOL SCIENCE PACING GUIDES & BENCHMARK ASSESSMENT BLUEPRINTS

Benchmark assessment blueprints are noted in red next to each standard. The number indicates the number of questions that include the standard. Only Biology, Chemistry, and Physics are being assessed on the Benchmark Assessments.

Notes:

- Based on the California Science Standards
- Standards are sorted by the six marking periods (MP)
- Defines sequencing within each marking period
- Investigation & Experimentation Standards are integrated throughout the year for all High School Science courses
- Standards that all students are expected to achieve in the course of their studies are unmarked
- Standards that all students should have the opportunity to learn are marked with an asterisk (*)

HIGH SCHOOL - BIOLOGY

Textbook: Biology CA Edition by Nowicki (McDougal Houghton Mifflin)

MP	California Science Standards/ <i>Concepts</i>	Textbook Correlation
	<p><i>Investigation & Experimentation Standards:</i> <i>1.d (2 questions)</i> <i>1.f (1 questions)</i> <i>1.j (1 question)</i></p>	
1	<p><i>Introduction to Biology</i></p> <p><i>Cell Biology</i></p> <p>1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> a. <i>Students know</i> cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings. [1] b. <i>Students know</i> enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings. [2] c. <i>Students know</i> how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure. [3] d. <i>Students know</i> the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm. [1] 	<p>Unit 1 Introducing Biology Page 1</p> <p>1 Biology in the 21st Century 2 Chemistry of Life</p> <p>Unit 2 Cells Page 67</p> <p>3 Cell Structure and Function 4 Cells and Energy 5 Cell Growth and Division</p>

	<ul style="list-style-type: none"> e. <i>Students know</i> the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins. [1] f. <i>Students know</i> usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide. [1] g. <i>Students know</i> the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide. [3] h. <i>Students know</i> most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors. [2] i. * <i>Students know</i> how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production. j. * <i>Students know</i> how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both. 	
2	<p>Genetics</p> <p>2. Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type. [2] b. <i>Students know</i> only certain cells in a multicellular organism undergo meiosis. [1] c. <i>Students know</i> how random chromosome segregation explains the probability that a particular allele will be in a gamete. [1] d. <i>Students know</i> new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization). [1] e. <i>Students know</i> why approximately half of an individual's DNA sequence comes from each parent. [2] f. <i>Students know</i> the role of chromosomes in determining an individual's sex. [1] g. <i>Students know</i> how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents. [2] <p>3. A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive). [2] b. <i>Students know</i> the genetic basis for Mendel's laws of segregation and independent assortment. [1] c. * <i>Students know</i> how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes. d. * <i>Students know</i> how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes. 	<p>Unit 3 Genetics Page 165</p> <p>6 Meiosis and Mendel 7 Extending Mendelian Genetics</p>
3	<p>Genetics</p> <p>4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify</p>	<p>Unit 3 Genetics</p> <p>8 From DNA to Proteins</p>

	<p>the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> a. <i>Students know</i> the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA. [2] b. <i>Students know</i> how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA. [2] c. <i>Students know</i> how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein. [2] d. <i>Students know</i> specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves. [1] e. <i>Students know</i> proteins can differ from one another in the number and sequence of amino acids. [1] f. * <i>Students know</i> why proteins having different amino acid sequences typically have different shapes and chemical properties. <p>5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> a. <i>Students know</i> the general structures and functions of DNA, RNA, and protein. [2] b. <i>Students know</i> how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA. [2] c. <i>Students know</i> how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products. d. * <i>Students know</i> how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules. e. * <i>Students know</i> how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products. 	<p>9 Frontiers of Biotechnology</p>
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HIGH SCHOOL - CHEMISTRY

TEXTBOOK: CHEMISTRY CALIFORNIA EDITION BY WILBRAHAM (PEARSON PRENTICE HALL)

MP	California Science Standards/ <i>Concepts</i>	Textbook Correlation
1	<p><i>Dimension Analysis</i> <i>Density</i> <i>Significant Figures</i> <i>Scientific Notation</i></p> <p>Atomic and Molecular Structure</p> <p>1. The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> a. <i>Students know</i> how to relate the position of an element in the periodic table to its atomic number and atomic mass. [4] b. <i>Students know</i> how to use the periodic table to identify metals, semimetals, nonmetals, and halogens. [2] 	<p>Chapter 1 Introduction to Chemistry 1.1 Chemistry 1.2 Chemistry Far and Wide 1.3 Problem Solving in Chemistry 1.4 Thinking Like a Scientist</p> <p>Chapter 2 Matter and Change 2.1 Matter 2.2 Mixtures 2.3 Elements and Compounds 2.4 Chemical Reactions</p> <p>Chapter 3 Scientific Measurement 3.1 Measurements and Their Uncertainty 3.2 International System of Units 3.3 Conversion Problems 3.4 Density 3.5 Temperature</p> <p>Chapter 4 Atomic Structure 4.1 Structure of the Atom 4.2 Distinguishing Between Atoms 4.3 Organizing the Elements</p> <p>Chapter 5 Electrons in Atoms 5.1 Models of the Atom 5.2 Electron Arrangement in Atoms 5.3 Physics and the Quantum Mechanical Model</p> <p>Chapter 6 The Periodic Table and Chemical Periodicity 6.1 Classification of the Elements 6.2 Periodic Trends</p> <p><i>Some concepts continued into 2nd marking period</i></p>

2	<p>Atomic and Molecular Structure (1)</p> <ul style="list-style-type: none"> c. <i>Students know</i> how to use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electronegativity, and the relative sizes of ions and atoms. [5] d. <i>Students know</i> how to use the periodic table to determine the number of electrons available for bonding. [6] e. <i>Students know</i> the nucleus of the atom is much smaller than the atom yet contains most of its mass. [2] f. * <i>Students know</i> how to use the periodic table to identify the lanthanide, actinide, and transactinide elements and know that the transuranium elements were synthesized and identified in laboratory experiments through the use of nuclear accelerators. g. * <i>Students know</i> how to relate the position of an element in the periodic table to its quantum electron configuration and to its reactivity with other elements in the table. h. * <i>Students know</i> the experimental basis for Thomson's discovery of the electron, Rutherford's nuclear atom, Millikan's oil drop experiment, and Einstein's explanation of the photoelectric effect. i. * <i>Students know</i> the experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom. j. * <i>Students know</i> that spectral lines are the result of transitions of electrons between energy levels and that these lines correspond to photons with a frequency related to the energy spacing between levels by using Planck's relationship ($E = hv$). <p>Nuclear Processes</p> <p>11. Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons. [1] b. <i>Students know</i> the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by $E = mc^2$) is small but significant in nuclear reactions. [1] c. <i>Students know</i> some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions. [1] d. <i>Students know</i> the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay. [2] e. <i>Students know</i> alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations. f. * <i>Students know</i> how to calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed. g. * <i>Students know</i> protons and neutrons have substructures and consist of particles called quarks. 	<p><i>Some concepts continued from 1st marking period</i></p> <p>Chapter 25 Nuclear Chemistry</p> <p>25.1 Nuclear Radiation 25.2 Nuclear Transformations 25.3 Fission and Fusion of Atomic Nuclei 25.4 Radiation in Your Life</p>
3	<p>Chemical Bonds</p> <p>2. Biological, chemical, and physical properties of matter result from the ability of atoms to form</p>	<p>Chapter 7 Chemical Composition and Ionic Bonding</p>

<p>bonds from electrostatic forces between electrons and protons and between atoms and molecules. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> <i>Students know</i> atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds. [5] <i>Students know</i> chemical bonds between atoms in molecules such as H₂, CH₄, NH₃, H₂CCH₂, N₂, Cl₂, and many large biological molecules are covalent. [4] <i>Students know</i> salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction. [1] <i>Students know</i> the atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a solid form. <i>Students know</i> how to draw Lewis dot structures. [4] * <i>Students know</i> how to predict the shape of simple molecules and their polarity from Lewis dot structures. * <i>Students know</i> how electronegativity and ionization energy relate to bond formation. * <i>Students know</i> how to identify solids and liquids held together by van der Waals forces or hydrogen bonding and relate these forces to volatility and boiling/ melting point temperatures. <p>Organic Chemistry and Biochemistry</p> <p>10. The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> <i>Students know</i> large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits. [3] <i>Students know</i> the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules. [1] <i>Students know</i> amino acids are the building blocks of proteins. [1] * <i>Students know</i> the system for naming the ten simplest linear hydrocarbons and isomers that contain single bonds, simple hydrocarbons with double and triple bonds, and simple molecules that contain a benzene ring. * <i>Students know</i> how to identify the functional groups that form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids. * <i>Students know</i> the R-group structure of amino acids and know how they combine to form the polypeptide backbone structure of proteins. 	<p>7.1 Electron Configuration in Ionic Bonding 7.2 Ionic Bonds 7.3 Bonding in Metals</p> <p>Chapter 8 Covalent Bonding 8.1 The Nature of Covalent Bonding 8.2 Bonding Theories 8.3 Polar Bonds and Molecules</p> <p>Chapter 9 Chemical Names and Formulas 9.1 Naming Ions 9.2 Naming Ionic Compounds 9.3 Naming Molecular Compounds 9.4 Naming Acids and Bases 9.5 Summary of Naming and Formula Writing</p> <p>Chapter 22 Hydrocarbon Compounds 22.1 Hydrocarbons 22.2 Unsaturated Hydrocarbons 22.3 Isomerism 22.4 Hydrocarbon Rings 22.5 Hydrocarbons from the Earth</p> <p>Chapter 23 Functional Groups and Organic Reactions 23.1 Introduction to Functional Groups 23.2 Alcohols and Ethers 23.3 Carbonyl Compounds 23.4 Polymerization</p> <p>Chapter 24 The Chemistry of Life 24.1 A Strategy for Life 24.2 Carbohydrates 24.3 Amino Acids and Their Polymers 24.4 Lipids 24.5 Nucleic Acids 24.6 Metabolism</p>
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HIGH SCHOOL - PHYSICS

Textbook: Conceptual Physics by Hewitt (Pearson Prentice Hall)

MP	California Science Standards	Textbook Correlation
1	<p>Motion and Forces Newton's laws predict the motion of most objects. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. <i>Students know</i> how to solve problems that involve constant speed and average speed. [4] b. <i>Students know</i> that when forces are balanced, no acceleration occurs; thus an object continues to move at a constant speed or stays at rest (Newton's first law). [5] c. <i>Students know</i> how to apply the law $F=ma$ to solve one-dimensional motion problems that involve constant forces (Newton's second law). [4] d. <i>Students know</i> that when one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction (Newton's third law). [3] 	1: About Science Unit I - Mechanics 2. Linear Motion 3. Projectile Motion 4. Newton's First Law of Motion-Inertia 5. Newton's Second Law of Motion-Force and Acceleration 6. Newton's Third Law of Physics-Action and Reaction
2	<p>Motion and Forces (1)</p> <ul style="list-style-type: none"> e. <i>Students know</i> the relationship between the universal law of gravitation and the effect of gravity on an object at the surface of Earth. [3] f. <i>Students know</i> applying a force to an object perpendicular to the direction of its motion causes the object to change direction but not speed (e.g., Earth's gravitational force causes a satellite in a circular orbit to change direction but not speed). [1] g. <i>Students know</i> circular motion requires the application of a constant force directed toward the center of the circle. [3] h. * <i>Students know</i> Newton's laws are not exact but provide very good approximations unless an object is moving close to the speed of light or is small enough that quantum effects are important. i. * <i>Students know</i> how to solve two-dimensional trajectory problems. j. * <i>Students know</i> how to resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components. k. * <i>Students know</i> how to solve two-dimensional problems involving balanced forces (statics). l. * <i>Students know</i> how to solve problems in circular motion by using the formula for centripetal acceleration in the following form: $a=v^2/r$. m. * <i>Students know</i> how to solve problems involving the forces between two electric charges at a distance (Coulomb's law) or the forces between two masses at a distance (universal gravitation). 	Unit I - Mechanics 9. Circular Motion 10. Center of Gravity 11. Rotational Mechanics 12. Universal Gravitation 13. Gravitational Interactions 14. Satellite Motion
3	<p>Conservation of Energy and Momentum</p> <p>2. The laws of conservation of energy and momentum provide a way to predict and describe the movement of objects. As a basis for understanding this concept:</p>	Unit I - Mechanics 7. Momentum 8. Energy

	<ul style="list-style-type: none"> a. <i>Students know</i> how to calculate kinetic energy by using the formula $E=(1/2)mv^2$. [4] b. <i>Students know</i> how to calculate changes in gravitational potential energy near Earth by using the formula (change in potential energy) =mgh (h is the change in the elevation). [3] c. <i>Students know</i> how to solve problems involving conservation of energy in simple systems, such as falling objects. [3] d. <i>Students know</i> how to calculate momentum as the product mv. [2] e. <i>Students know</i> momentum is a separately conserved quantity different from energy. [1] f. <i>Students know</i> an unbalanced force on an object produces a change in its momentum. [1] g. <i>Students know</i> how to solve problems involving elastic and inelastic collisions in one dimension by using the principles of conservation of momentum and energy. [3] h. * <i>Students know</i> how to solve problems involving conservation of energy in simple systems with various sources of potential energy, such as capacitors and springs. 	<p>15. Special Relativity-Space and Time *</p> <p>16. Special Relativity-Length, Momentum, and Energy *</p>
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