MIDDLE SCHOOL SCIENCE PACING GUIDES

Notes:

- Based on the California Science Standards
- Standards are sorted by marking periods, six a year
- Defines sequencing within each marking period

6TH GRADE – EARTH SCIENCE

Textbook: CPO Focus on Earth Science (CPO Science)

MP	California Science Standards/*Concepts*	Textbook Correlation/*Notes*
1	***Orientate Diverse Students to Science and Common Expectations*** ***Definition of Science*** **Investigation and Experimentation** (continues through out the year) 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: 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. 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. 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). 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).	**Unit One: The Scientific Process** Chapter 1: Science Is Everywhere Page 3 Chapter 2: The Science Toolbox Page 23 Chapter 3: Introducing Earth Page 53
2	**Heat (Thermal Energy) (Physical Sciences)** 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: a. *Students know* 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. b. *Students know* that when fuel is consumed, most of the energy released becomes heat energy.	**Unit Two: Energy in Earth's Systems** Chapter 4: Heat Page 75 Chapter 5: Density and Buoyancy Page 93 Chapter 6: Earth's Surface and Heat Page 113 Chapter 7: Heat Inside Earth Page 137

	c. *Students know* 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). d. *Students know* heat energy is also transferred between objects by radiation (radiation can travel through space). **Energy in the Earth System** 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: a. *Students know* the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle. b. *Students know* solar energy reaches Earth through radiation, mostly in the form of visible light. c. *Students know* heat from Earth's interior reaches the surface primarily through convection. d. *Students know* convection currents distribute heat in the atmosphere and oceans. e. *Students know* differences in pressure, heat, air movement, and humidity result in changes of weather.	
3	**Plate Tectonics and Earth's Structure** 1. Plate tectonics accounts for important features of Earth's surface and major geologic events. As a basis for understanding this concept: a. *Students know* 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. b. *Students know* Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core. c. *Students know* lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle. d. *Students know* that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface. e. *Students know* major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions. f. *Students know* how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics. g. *Students know* 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.	**Unit Three: Plate Tectonics and Earth's Structure** Chapter 8: Plate Tectonics Page 157 Chapter 9: Earthquakes Page 181 Chapter 10: Volcanoes Page 203
4	**Shaping Earth's Surface** 2. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. As a basis for understanding this concept: a. *Students know* water running downhill is the dominant process in shaping the landscape, including California's landscape. b. *Students know* rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns. c. *Students know* beaches are dynamic systems in which the sand is supplied by rivers and	**Unit Four: The Shape of Earth's Surface** Chapter 11: Water and Weathering Page 231 Chapter 12: Beaches Page 253 Chapter 13: Natural Hazards Page 269

	moved along the coast by the action of waves. d. *Students know* earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.	
5	**Ecology (Life Sciences)** 5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept: a. *Students know* energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs. b. *Students know* matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. c. *Students know* populations of organisms can be categorized by the functions they serve in an ecosystem. d. *Students know* different kinds of organisms may play similar ecological roles in similar biomes. e. *Students know* the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.	**Unit Five: Ecology** Chapter 14: Resources Page 293 Chapter 15 Ecosystems Page 315 Chapter 16: Biomes Page 337 *Earth Day* *Transition to 7th grade concepts*
6	**Resources** 6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept: a. *Students know* the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process. b. *Students know* different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable. c. *Students know* the natural origin of the materials used to make common objects.	

7TH GRADE –LIFE SCIENCE

Textbook: CPO Focus on Life Science (CPO Science)

MP	California Science Standards/*Concepts*	Textbook Correlation
1	***Definition of Life*** ***Living Systems*** **Investigation and Experimentation** (continues through out the year) 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: a. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data. b. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project. c. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence. d. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure). e. Communicate the steps and results from an investigation in written reports and oral presentations.	**Unit One: Living Systems** Chapter 1: Studying Life Page 3 Chapter 2: Living Things Page 27 Chapter 3: Interactions of Living Things Page 47 *Introduce microscope use*
2	**Cell Biology** 1. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept: a. *Students know* cells function similarly in all living organisms. b. *Students know* the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls. c. *Students know* the nucleus is the repository for genetic information in plant and animal cells. d. *Students know* that mitochondria liberate energy for the work that cells do and that chloroplasts capture sunlight energy for photosynthesis. e. *Students know* cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes. f. *Students know* that as multicellular organisms develop, their cells differentiate.	**Unit Two: Cell Biology** Chapter 4: Chemistry and Physics Connections Page 69 Chapter 5: Cell Structure and Function Page 91 Chapter 6: Cell Processes Page 111 Chapter 7: The Microscopic World Page 129
3	**Genetics** 2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept: a. *Students know* the differences between the life cycles and reproduction methods of sexual and asexual organisms.	**Unit Three: Genetics** Chapter 8: Reproduction Page 151 Chapter 9: Heredity Page 169 Chapter 10: The Code of Life Page 193

	b. *Students know* sexual reproduction produces offspring that inherit half their genes from each parent. c. *Students know* an inherited trait can be determined by one or more genes. d. *Students know* 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. e. *Students know* DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.	
4	**Evolution** 3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept: a. *Students know* both genetic variation and environmental factors are causes of evolution and diversity of organisms. b. *Students know* the reasoning used by Charles Darwin in reaching his conclusion that natural selection is the mechanism of evolution. c. *Students know* how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution. d. *Students know* 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. *Students know* that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival. **Earth and Life History (Earth Sciences)** 4. Evidence from rocks allows us to understand the evolution of life on Earth. As a basis for understanding this concept: a. *Students know* 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. *Students know* the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impacts of asteroids. c. *Students know* 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. *Students know* 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. *Students know* fossils provide evidence of how life and environmental conditions have changed. f. *Students know* 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. *Students know* how to explain significant developments and extinctions of plant and animal life on the geologic time scale.	**Unit Four: Evolution and Change** Chapter 11: Evolution Page 213 Chapter 12: Earth and Life History Page 237

5	**Structure and Function in Living Systems** 5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept: a. *Students know* plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism. b. *Students know* organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system. c. *Students know* how bones and muscles work together to provide a structural framework for movement. d. *Students know* how the reproductive organs of the human female and male generate eggs and sperm and how sexual activity may lead to fertilization and pregnancy. e. *Students know* the function of the umbilicus and placenta during pregnancy. f. *Students know* the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit. g. *Students know* how to relate the structures of the eye and ear to their functions.	**Unit Five: Structure and Function in Living Things** Chapter 13: The Diversity of Life Page 261 Chapter 14: Plants Page 277 Chapter 15: Animals Page 307
6	**Physical Principles in Living Systems (Physical Sciences)** 6. Physical principles underlie biological structures and functions. As a basis for understanding this concept: a. *Students know* visible light is a small band within a very broad electromagnetic spectrum. b. *Students know* that for an object to be seen, light emitted by or scattered from it must be detected by the eye. c. *Students know* light travels in straight lines if the medium it travels through does not change. d. *Students know* how simple lenses are used in a magnifying glass, the eye, a camera, a telescope, and a microscope. e. *Students know* that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths. f. *Students know* light can be reflected, refracted, transmitted, and absorbed by matter. g. *Students know* the angle of reflection of a light beam is equal to the angle of incidence. h. *Students know* 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* how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system. j. *Students know* that contractions of the heart generate blood pressure and that heart valves prevent backflow of blood in the circulatory system.	**Unit Six: The Human Body** Chapter 16: Human Body Systems Page 341 Chapter 17: Support and Movement Page 367 Chapter 18: Vision and Hearing Page 389 *(consider moving Human Reproduction here)*

8TH GRADE –PHYSICAL SCIENCE

Textbook: CPO Focus on Physical Science (CPO Science)

MP	California Science Standards/*Concepts*	Textbook Correlation
1	**Investigation and Experimentation** (continues through out the year) 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: a. Plan and conduct a scientific investigation to test a hypothesis. b. Evaluate the accuracy and reproducibility of data. c. Distinguish between variable and controlled parameters in a test. 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. e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables. 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 × area, volume = area × height). g. Distinguish between linear and nonlinear relationships on a graph of data.	**Unit One: Physical Science and You** Chapter 1: Studying Physics and Chemistry Chapter 2: Experiments and Variables Chapter 3: Key Concepts in Physical Science
2	**Density and Buoyancy** 8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept: a. *Students know* density is mass per unit volume. b. *Students know* how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume. c. *Students know* the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced. d. *Students know* how to predict whether an object will float or sink. a.	**Unit Two: Properties of Matter** Chapter 4: Density and Buoyancy Chapter 5: States of Matter
3	**Structure of Matter** 4. 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: a. *Students know* the structure of the atom and know it is composed of protons, neutrons, and electrons. b. *Students know* that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements. c. *Students know* atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.	**Unit Three: Atoms and the Periodic Table** Chapter 6: The Atom Chapter 7: Elements and the Periodic Table Chapter 8: Molecules and Compounds

	d. *Students know* the states of matter (solid, liquid, gas) depend on molecular motion. e. *Students know* 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. f. *Students know* how to use the periodic table to identify elements in simple compounds. **Periodic Table** 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: a. *Students know* how to identify regions corresponding to metals, nonmetals, and inert gases. b. *Students know* 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. c. *Students know* substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.	
4	**Reactions** 5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept: a. *Students know* reactant atoms and molecules interact to form products with different chemical properties. b. *Students know* 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. c. *Students know* chemical reactions usually liberate heat or absorb heat. d. *Students know* physical processes include freezing and boiling, in which a material changes form with no chemical reaction. e. *Students know* how to determine whether a solution is acidic, basic, or neutral. **Chemistry of Living Systems (Life Sciences)** 6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept: a. *Students know* 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. b. *Students know* that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur. c. *Students know* 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.	**Unit Four: Matter and Change** Chapter 9: Acids, Bases, and Solutions Chapter 10: Chemical Reactions Chapter 11: The Chemistry of Living Systems
5	**Motion** 1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept: a. *Students know* position is defined in relation to some choice of a standard reference point	**Unit Five: Motion and Force** Chapter 12: Distance, Time, and Speed Chapter 13: Forces Chapter 14: Force and Motion

	and a set of reference directions. b. *Students know* 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. c. *Students know* how to solve problems involving distance, time, and average speed. d. *Students know* the velocity of an object must be described by specifying both the direction and the speed of the object. e. *Students know* changes in velocity may be due to changes in speed, direction, or both. f. *Students know* how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction. **Forces** 2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept: a. *Students know* a force has both direction and magnitude. b. *Students know* when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces. c. *Students know* when the forces on an object are balanced, the motion of the object does not change. d. *Students know* 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. e. *Students know* 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). f. *Students know* the greater the mass of an object, the more force is needed to achieve the same rate of change in motion. g. *Students know* the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.	
6	**Earth in the Solar System (Earth Sciences)** 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: a. *Students know* galaxies are clusters of billions of stars and may have different shapes. b. *Students know* that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color. c. *Students know* how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth. d. *Students know* 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. e. *Students know* the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.	**Unit Six: Astronomy** Chapter 15: The Solar System Chapter 16: The Sun and Stars Chapter 17: Galaxies and the Universe