Course No. S 100
(SDAIE) S 108
(Honors) S 109

Orange Unified School District

LIFE SCIENCE 7

Year Course

GRADE LEVEL: Required in Grade 7

PREREQUISITES: None for S100, S108
Honors: CST Math ≥ 400; ELA ≥ 394;
recommended GPA of 3.6 on last five grading periods.

INTRODUCTION TO THE SUBJECT:

Science 7 is the study of living things from the tiniest cell to the largest tree. In this course, students will discover:

- How to ask questions about the living world around them.
- The tools scientists use in their work.
- The similarities and differences of living things.

From the beginning of time, people have searched for answers about life. Science 7 will help students answer some of those questions.

ESSENTIAL LEARNINGS: Students will

- Use the scientific method to conduct investigations utilizing scientific tools appropriately.
- Discover that all living organisms are composed of cells.
- Explain that a typical cell contains genetic instructions that specify its traits.
- Explore the biological diversity of species.
- Investigate the complementary nature of structure and function in living things.
- Use evidence from geology to understand the history of life on earth.
- Analyze how physical principles relate to biological structures and functions.

COURSE OVERVIEW AND APPROXIMATE UNIT TIME ALLOTMENTS:

FIRST TRIMESTER

ASSESSMENT BLUEPRINT:

Trimester	Standard	# of Questions
1	7.1a Similarity of cell function	2
	7.1b Distinguishing characteristics—plant & animal cells	3
	7.1c Function of nucleus	2
	7.1d Mitochondria & chloroplasts	2
	7.1e Mitosis	1
	7.1f Differentiation	2
	7.7a Select appropriate tools & technology	3
	7.7c Connections among hypothesis, concepts, tests, conclusions	7
	7.7d Models, maps, labeled diagrams	3

WEEKS

I. Study Skills *(Chapter 1, sect 1, 2, 3 & 5, Chapt. lab p.24, Chapt. 2, sec. 1)* 3
   A. Problem solving - thinking like a scientist
   B. Scientific method and communication of lab results
   C. The tools of life scientists - microscopes, computers, balances, Internet, system of measurement
   D. System of measurement
   E. Recognize dependent and independent variables in an experiment
   F. Construct appropriate graphs, charts, and tables from data collected from investigations
   G. Apply simple mathematical relationships (utilize scientific formulas)
   H. Life cycles (sexual and asexual)

II. Cells: All living organisms are composed of cells, from one to many trillions, whose details usually are visible only through a microscope. 6
(*Chapter 4, sections 1,2,3; Chapter 5, section 1, 2)*
   A. Similarities of cell function in all living organisms
   B. Characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls
   C. The nucleus is the repository for genetic information in plant and animal cells
   D. Mitochondria liberate energy for the work that cells do, and chloroplasts capture sunlight energy for photosynthesis
   E. Cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes
   F. As multicellular organisms develop, their cells differentiate

III. Genetics: A typical cell of any organism contains genetic instructions that specify its traits. Those may be modified by environmental conditions. 5
*(Chapter 6, sections 1, 2, 3; Chapter 7, section 1, **section 2 Honors**)*
   A. Cells of any organism contain genetic instructions that specify its traits
   B. Influences on these traits:
      1. Life cycles (sexual and asexual)
      2. DNA - the genetic material of all living organisms
      3. Dominant and recessive genes

Total weeks: 14

Note: The LAST TWO WEEKS of *Genetics Unit* is completed in the first two weeks of Trimester 2. The entire unit is 5 weeks long

SECOND TRIMESTER

ASSESSMENT BLUEPRINT:

Trimester	Standard	# of Questions
2	7.2a Life cycles & reproduction of sexual & asexual organisms	3
	7.2b Inheritance of genes in sexual reproduction	2
	7.2c Inherited traits	1
	7.2d Dominant and recessive genes	4
	7.2e DNA	1
	7.3a Causes of evolution and diversity of organisms	1
	7.3b Reasoning of Darwin	1
	7.3c Theory of evolution	1
	7.3d Branching diagram	1
	7.3e Extinction of a species	2
	7.4b Major catastrophic events	1
	7.4c Rock cycle	3
	7.4e Fossils	1
	7.4f Movement of continental and oceanic plates	1
	7.4g Geologic time scale	2

I. Earth and Life History (*Chapt. 8, section 1, 2, 3; Chapt. 9, section 1, 2, 3*) 5
   A. Use evidence from geology to understand the history of life on earth
   B. Evidence from rocks allows us to understand the evolution of life on earth. As the basis for understanding this concept, students know:
      1. 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
      2. The history of life on earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impact of an asteroid
      3. The rock cycle includes the formation of new sediment and rocks. Rocks are often found in layers with the oldest generally on the bottom
      4. Evidence from geologic layers and radioactive dating indicate the earth is approximately 4.6 billion years old, and that life has existed for more than 3 billion years
      5. Fossils provide evidence of how life and environment conditions have changed
      6. How movements of the earth's continental and oceanic plates through time, with associated changes in climate and geographical connections, have affected the past and present distribution of organisms
      7. How to explain significant developments and extinctions of plant and animal life on the geologic time scale

II. Evolution: Biological evolution accounts for the diversity of species developed through gradual processes over many generations. (*Chapter 10, sections 1, 2, 3; Chap. 11, sec. 1*) 5
   A. Introduction to the biological diversity of species
   B. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept, students know:

1. Both genetic variation and environmental factors are causes of evolution and diversity of organisms
2. The reasoning used by Darwin in making his conclusion that natural selection is the mechanism of evolution
3. How independent lines of evidence from geology, fossils, and comparative anatomy provide a basis for the theory of evolution
4. How to construct a simple branching diagram to classify living groups of organisms by shared derived characteristics, and expand the diagram to include fossil organisms
5. Extinction of species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival

Total weeks: 10 Weeks

THIRD TRIMESTER

ASSESSMENT BLUEPRINT:

Trimester	Standard	# of Questions
3	7.5a Levels of organization in plants and animals	3
	7.5b Organ systems	2
	7.5c Bones and muscles / structural framework	2
	7.5d Reproductive organs; fertilization and pregnancy	2
	7.5e Umbilicus and placenta	1
	7.5f Plants: generation of pollen; ovules, seeds, fruit	2
	7.5g Structures of eye and ear	2
	7.6a Visible light	1
	7.6c Travel of light	1
	7.6e White light	2
	7.6f Transmission, absorption, scattering of light	2
	7.6h Compare body joints to machine structures	2
	7.6i Levers; application to musculoskeletal system	1
	7.6j Heart contractions/blood pressure; heart valves	2

I. Structure and Function of Living Systems: The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. 8

(*Chapter 15, sect 1, 2, 3; Chapt. 16, sect. 1,2; Chapt. 17, sect 2; Chapt. 18, sect. 1, 2; Chapt 12, section 4, Chapter Lab pg. 382)*

A. Students know plants and animals have levels of organization for structure and function, including cells, tissues, 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.
H. Physical principles relate to structures and functions. (*Ch. 15, sect. 2,3; Chapter 16, sect. 1,2)* Examples include:
    1. 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)
    2. How levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system
    3. Contractions of the heart generate blood pressure, and heart valves prevent back flow of blood in the circulatory system

II. Physical Principles (*Ch. 3, sect. 1, 2, 3)* 4
A. Physical principles relate to structures and functions. Examples include:
    1. Visible light is a small band within a very broad electromagnetic spectrum.
    2. For an object to be seen, light emitted by or scattered from it must enter the eye.
    3. Light travels in straight lines except when the medium it travels through changes.
    4. How simple lenses are used in a magnifying glass, the eye, camera, telescope, and microscope.
    5. White light is a mixture of many wavelengths (colors), and that retinal cells react differently with different wavelengths
    6. Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection)
    7. The angle of reflection of a light beam is equal to the angle of incidence

Total Weeks: 12

NOTE: Trimester 2 and 3 Honors Extension Activities

- Multi-media project (i.e., human body system)
- Three-dimensional visual (i.e., cell, fossil, lens)
- Field trip enrichment (i.e., fossil dig, science museum, arboretum)
- Research report (i.e., genetics, disease, scientist, animals, science, ethics)
- Collaborative projects (i.e., develop a geologic timeline, demonstration of continental drift, create a science website, complete a population study, show life cycle, write a dissection lab)
- Current event articles

DATE OF LAST CONTENT REVISION: August 2000

DATE OF CURRENT CONTENT REVISION: September 2010

DATE OF BOARD APPROVAL: September 2000

Addendum
GRADE 7 CALIFORNIA STATE SCIENCE CONTENT STANDARDS

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.

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.
    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.

Evolution

3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:
    1. Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms.
    2. Students know the reasoning used by Charles Darwin in reaching his conclusion that natural selection is the mechanism of evolution.
    3. Students know how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution.

4. 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.
5. 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.

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.

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 back flow of blood in the circulatory system.

Investigation and Experimentation

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.