SAUSALITO MARIN CITY SCHOOL DISTRICT
Science Standards – GRADE 7

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, students know:

a. cells function similarly in all living organisms.

b. the 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.

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, students know:

a. the differences between the life cycles and reproduction of sexual and asexual organisms.

b. sexual reproduction produces offspring that inherit half their genes from each parent.

c. an inherited trait can be determined by one or more genes.

d. 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. DNA 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, students know:

a. both genetic variation and environmental factors are causes of evolution and diversity of organisms.

b. the reasoning used by Darwin in making his conclusion that natural selection is the mechanism of evolution.

c. how independent lines of evidence from geology, fossils, and comparative anatomy provide a basis for the theory of evolution.

d. 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.

e. 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 Science)

4. Evidence from rocks allows us to understand the evolution of life on Earth. As the basis for understanding this concept, students know:

a. 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. the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impact of an asteroid.

c. the rock cycle includes the formation of new sediment and rocks. Rocks are often found in layers with the oldest generally on the bottom.

d. 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.

e. fossils provide evidence of how life and environmental conditions have changed.

f. 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.

g. 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, students know:

a. plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.

b. organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.

c. how bones and muscles work together to provide a structural framework for movement.

d. 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. the function of the umbilicus and placenta during pregnancy.

f. the structures and processes by which flowering plants generate pollen and ovules, seeds, and fruit.

g. how to relate the structures of the eye and ear to their functions.

Physical Principles in Living Systems (Physical Science)
6. Physical principles underlie biological structures and functions. As a basis for understanding this concept, students know:

a. visible light is a small band within a very broad electromagnetic spectrum.

b. for an object to be seen, light emitted by or scattered from it must enter the eye.

c. light travels in straight lines except when the medium it travels through changes.

d. how simple lenses are used in a magnifying glass, the eye, camera, telescope, and microscope.

e. white light is a mixture of many wavelengths (colors), and that retinal cells react differently with different wavelengths.

f. light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection).

g. the angle of reflection of a light beam is equal to the angle of incidence.

h. 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. how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system.

j. contractions of the heart generate blood pressure, and heart valves prevent backflow 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 to address the content 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. utilize a variety of print and electronic resources (including the World Wide Web) to collect information as evidence as part of a research project.

c. communicate the logical connection among hypothesis, 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 verbal presentations.