

Denair Charter Academy Course Outline

Course Title:	Physical Science
Grade Level:	9-12
Elective/Required:	Required
Length/Credits	One Year / 10 credits
Prerequisites:	None

I. Course Description

Earth Science plays a unique and essential role in today's rapidly changing world. A knowledge of the Earth Sciences is important because most human activities involve interaction with the structures, cycles and history of this planet. Students, who understand the processes that have created, changed and currently maintain systems of the Earth will be better able to make informed, responsible decisions concerning both their local environment and the global environment at large.

Earth Science is designed to be a first year course that introduces the student to the history and structure of the Earth. Described by NASA as "Earth System Science," this course will explore the Solid Earth (tectonics, magnetism, and geologic history), and the Fluid and Biologic Earth (water cycle and climate, radiation, ocean currents, biogeochemical cycles, and ecosystems/biomes). Throughout the course students will consider the unique qualities of planets of the solar system.

The observational aspects of science will be emphasized. Through laboratory investigations and activities students will understand how observed evidence develops into theoretical explanations.

II. Instructional Materials

Required Text:
Earth Science, Glencoe, 2002

Supplementary Text:
Physical Science, AGS, 2004

III. Course Outline

A. The Earth as a planet

1. Introduction
2. Biospherics
3. Biochemical cycles
4. Principles of energy flow

B. Astronomy

1. History of exploration
2. Theories of origin
3. The solar system

C. Minerals and Rocks

1. The periodic table
2. Mineral identification
3. Mineral resources
4. Rock identification
5. Volcanic activity

D. Tectonics and Earth History

1. Earthquakes
2. Plate tectonics/plate margin characteristics
3. Geologic time

E. California Geology

1. Geologic history
2. Earthquakes dangers
3. Soils and resources

F. Water Cycle and Oceanography

1. Water cycle
2. Ocean water characteristics
3. Ocean exploration
4. Weathering/erosion and landforms

G. Climatology

1. Structure of the atmosphere
2. Temperature and air pressure
3. Wind systems
4. Climate zones
5. Climate change

IV. Expectations for Student Learning

1. EARTH Introduction/Biospherics
(content standards 7 Biochemical Cycles a-c)

Each element on Earth moves among reservoirs in the solid Earth, oceans, atmosphere, and organisms as part of biogeochemical cycles.

- a. The short term carbon cycle of photosynthesis and respiration and the nitrogen cycle.
- b. The global carbon cycle in terms of the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, and fossil fuels and the movement of carbon among these reservoirs.
- c. Movement of matter between reservoirs is driven by the Earth's internal and external source of energy

(content standards 4 Energy in the Earth Systems a-d)

Energy enters the Earth system primarily as solar radiation and eventually escapes as heat

- a. The relative amount of incoming solar energy compared with Earth's internal energy and the energy used by society.
- b. The fate of incoming solar radiation in terms of reflection, absorption, and photosynthesis.
- c. The different atmospheric gases that absorb the Earth's thermal radiation and the mechanism and significance of the greenhouse effect.
- d. The different greenhouse conditions on Earth, Mars, and Venus, their origins and climatic consequences.

2. Astronomy

(content standard 1 Earth's place in the universe a-g)

Astronomy and planetary exploration reveal the structure, scale and change of the solar system over time.

- a. Differences and similarities among the sun, the terrestrial planets, and the gas planets and can relate those differences and similarities to the formation of the solar system
- b. Evidence from Earth and moon rocks that the sun, Earth, and rest of the solar system formed from a nebular cloud of dust and gas 4.6 billion years ago
- c. Evidence from geological studies of the Earth and other planets that the early Earth was very different from today
- d. Evidence that the planets are much closer than the stars
- e. The sun is a typical star and is powered by nuclear reactions, primarily the fusion of hydrogen to form helium
- f. Evidence that asteroid impacts have had dramatic effects in shaping the surface of planets and their moons and can cause mass extinctions of life on Earth
- g. Evidence that there are planets that orbit other stars

(content standard 2 Earth's place in the universe a-g)

Earth-based and space-based astronomy reveal the structure, scale, and change over time of stars, galaxies and the universe,

- a. The solar system is located in an outer edge of the disc-

- b. shaped Milky Way galaxy which spans 100,000 light years
- b. Galaxies are made of billions of stars and form most of the visible mass of the universe.
- c. Evidence that all elements larger than helium have been formed by nuclear fusion processes in stars
- d. Stars differ in their life cycles and visual, radio, and X-ray telescopes collect data that reveal these differences
- e. Accelerators give subatomic particles energies that simulate conditions, in the stars and in early history of the universe before stars formed.
- f. Evidence that stars are formed and are maintained by a balance between gravitational collapse and nuclear fusion. The mass of a star and the balance between collapse and fusion determine the color, brightness, lifetime and evolution of a star.
- g. How the red-shift from distant galaxies and the cosmic background radiation provide evidence for the big bang model that the universe has been expanding for 10 to 20 billion years.

3. Rock Cycle/Mineralogy

(content standard 3 Dynamic Earth Problem b-f)

Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on the Earth's surface.

- a. The principal structures that form at the three different kinds of plate boundaries
- b. How to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes
- c. Why and how earthquakes occur, and the scales used to measure their intensity
- d. Two kinds of volcanoes, one with violent eruptions producing gentle slopes and the other with voluminous lava flows providing gentle slopes
- e. Explanation for the location and properties of volcanoes that are due to hot spots and those that are due to subduction.

4. Tectonics/Geologic History

(content standard 3 Dynamic Earth Processes b-f)

Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on the Earth's surface.

- a. The principal structures that form at the three different kinds of plate boundaries
- b. How to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes
- c. Why and how earthquakes occur, and the scales used to measure their intensity

- d. Two kinds of volcanoes, one with violent eruptions producing steep slopes and the other with voluminous lava flows producing gentle slopes
- e. Explanation for the location and properties of volcanoes that are due to hot spots and those that are due to subduction

5. Landforms/CA Geology

(content standard 9 California Geology a-d)

The geology of California underlies the state's wealth of natural resources as well as its natural hazards

- a. The main economically important resources in California and their relation to California's geology
- b. The principal natural hazards associated with different California regions and the geological basis of those hazards
- c. The importance of water to society, the origins of California's fresh water, and the relationship between supply and need
- d. How to analyze published geologic hazard maps of California and use the map information to identify evidence of geological events of the past and predict geological changes in the future

6. Hydrology/Oceanography

(content standard 3 Dynamic Earth Processes a, f)

Plate tectonics operating over geologic time has changed the patterns of land, sea and mountains on Earth's surface.

- a. Features of the ocean floor (magnetic patterns, age, and sea floor topography) provide evidence for plate tectonics
- b. Explanation for the location and properties volcanoes that are due to hot spots and those that are due to subduction

7. Climatology

Structure and Composition of the Atmosphere

(content standard 8 a-c)

Life has changed Earth's atmosphere and changes in the atmosphere affect conditions for life.

- c. The thermal structure and chemical composition of the atmosphere
- d. How the composition of the Earth's atmosphere has evolved over geologic time including outgassing, the origin of the atmospheric oxygen and variations in carbon dioxide concentration
- e. The location of the ozone layer in the upper atmosphere, *its* role in absorbing ultraviolet radiation and how it varies, both naturally and in response to human activities

(content standard 5 a-g)

Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.

- a. Bow differential heating of the Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat
- b. The relationship between the rotation of the Earth and the circular motion of ocean currents and air in pressure centers
- c. The origin and effects of temperature inversions
- d. Properties of ocean water such as temperature and salinity can be used to explain the layered structure of the oceans, generation of horizontal and vertical ocean currents, and the geographic distribution of marine organisms
- e. The distribution of rain forests and deserts on Earth in bands at specific latitudes
- f. The interaction of wind patterns, ocean *currents*, and mountain ranges that results in the global pattern of latitudinal bands of rain forests and deserts
- g. Features of the ENSO cycle (El Nino) in terms of sea-surface and air temperature variations across the Pacific, and some climatic results of this cycle

(content standard 6 a-d)

Climate is the long term average of a region's weather and depends on many factors

- a. Weather (in the short run) and climate (in the long run) involve the transfer of energy in and out of the atmosphere
- b. Effects on climate of latitude, elevation, topography, as well as proximity to large bodies of water and cold or warm ocean currents
- c. How the Earth's climate has changed over time, corresponding to changes in the Earth's geography, atmospheric composition and/or other factors (solar radiation, plate movement, etc.)
- d. Use of computer models to predict the effects of increasing greenhouse gases on climate for the planet as a whole and for specific regions

V. Instructional Methods

- A. Discussion
- B. Model making
- C. Presentations
- D. Computer tutorials
- E. A current events newspaper/magazine collection will be made every four weeks

VI. Assessment and Evaluations

- Quizzes
- Tests

Current Events
Labs and Activities
Course notebook

VII. Grading Policy

100-90%	A
89- 80%	B
79-70%	C
69-60%	D
59%-0%	F