HIGH SCHOOL CORE COURSES

INTEGRATED/COORDINATED SCIENCE 1 AB
Annual Course-Grades 9-12 Prerequisite: None
Prerequisite: Algebra 1AB or concurrent enrollment recommended

36-01-21 INT/COORD SCI 1A
36-01-22 INT/COORD SCI 1B

Type of Credential
Life Science, Physical Science, Science: Biological Science, Science: Chemistry, Science: Physics, Science: Geoscience. For further information please call Certificated Credentials and Contract Services Unit at 213-241-6520.

Course Description
This academic course provides students with an introduction to the earth sciences, physics, chemistry, and biology. This comprehensive view gives the students an understanding of the concepts and principles of science and provides opportunities to develop problem solving, and technological skills necessary to compete successfully in the 21st century. This course devotes at least 40 percent of the class time to student-centered laboratory activities and small group activities related to team projects and research. The Integrated/Coordinated Science curriculum is used at a variety of sites that vary in calendar configuration, student population, and teaching resources. The curriculum follows a spiral approach, connected by common concepts that are matched to the State Standards. After taking two years of Integrated/Coordinated Science, students may elect to take a third year of Integrated/Coordinated Science or any other advanced class offered by the science department to meet the second-year laboratory requirement for the University of California. Because each year of Integrated/Coordinated Science builds upon the previous year's instruction, all of the State Standards expected of all students are addressed within the three years of Integrated/Coordinated Science. This course, Integrated/Coordinated Science 1 AB lays a foundation for science education in High School. **Integrated/Coordinated 1AB meets one year of the University of California '*g*' requirement for an elective science class.**

COURSE SYLLABUS
Earth Science – Instructional Component 1 – Content Standards
Dynamic Earth Processes
Plate tectonics, operating over geologic time, has changed the patterns of land, sea, and mountains on Earth's surface. As the basis for understanding this concept:
3.a. *Students know* features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics.
3.b. *Students know* the principal structures that form at the three different kinds of plate boundaries.
3.c. *Students know* how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic
processes.
3.d. *Students know* why and how earthquakes occur and the scales used to measure their intensity and magnitude.
3.e. *Students know* there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows
producing gentle slopes.
3.f. **Students know* the explanation for the location and properties of volcanoes that are due to hot spots and the explanation of those that are due to

subduction.

ICS 1/Earth Science – Instructional Component 1 – Process Standards
Investigation and Experimentation
1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept 1and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:
1.a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data,
analyze relationships, and display data.
1.b. Identify and communicate sources of unavoidable experimental error.
1.c. Identify possible reasons for inconsistent results, such as sources of error and uncontrolled conditions.
1.d. Formulate explanations by using logic and evidence.
1.e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.
1.f. Distinguish between hypothesis and theory as scientific terms.
1.g. Recognize the usefulness and limitations of models and theories as scientific representations of reality.
1.h. Read and interpret topographic and geologic maps.
1i Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time,
and succession of species in an ecosystem).
1.j. Recognize the issues of statistical variability and the need for controlled tests.
1.k. Recognize the cumulative nature of scientific evidence.
1.l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
1.m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.
1.n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun,
Moon, and planets).

ICS 1/Physics – Instructional Component 2 – Content Standards
Heat and Thermodynamics
3. Energy cannot be created or destroyed, although in many processes energy is transferred to the environment as heat. As a basis for understanding
this concept:
3.f. **Students know* the statement "Entropy tends to increase" is a law of statistical probability that governs all closed systems (second law of thermodynamics).
Waves
4. Waves have characteristic properties that do not depend on the type of wave. As a basis for understanding this concept:
4.a. *Students know* waves carry energy from one place to another.
4.b. *Students know* how to identify transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves).
4.d. *Students know* sound is a longitudinal wave whose speed depends on the properties of the medium in

which it propagates.
4.e. *Students know* radio waves, light, and X-rays are different wavelength bands in the spectrum of electromagnetic waves whose speed in a vacuum is
approximately 3 x 108 m/s (186,000 miles/second).
4.f. *Students know* how to identify the characteristics properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.
Electric and Magnetic Phenomena
5. Electric and magnetic phenomena are related and have many practical applications. As a basis for understanding this concept:
5.d. *Students know* the properties of transistors and role of transistors in electric circuits.
5.e. *Students know* charged particles are sources of electric fields and are subject to the forces of the electric fields form the charges.
5.h. *Students know* changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.
5.i. *Students know* plasmas, the fourth state of matter, contain ions or free electrons or both and conduct electricity.
5.j. **Students know* electric and magnetic fields contain energy and act as vector force fields.
5m. **Students know* static electric fields have as their source some arrangement of electric charges.

ICS 1/Physics – Instructional Component 2 – Process Standards
Investigation and Experimentation
1. 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 four strands, students should develop their own questions and perform investigations. Students will:
1.a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data,
analyze relationships, and display data.
1.b. Identify and communicate sources of unavoidable experimental error.
1.c. Identify possible reasons for inconsistent results, such as sources of error and uncontrolled conditions.
1.d. Formulate explanations by using logic and evidence.
1.e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.
1.f. Distinguish between hypothesis and theory as scientific terms.
1.g. Recognize the usefulness and limitations of models and theories as scientific representations of reality.
1.h. Read and interpret topographic and geologic maps.
1.i. Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).
1.j. Recognize the issues of statistical variability and the need for controlled tests.
1.k. Recognize the cumulative nature of scientific evidence.
1.l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
1.m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.
1.n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and

planets).

ICS 1/Chemistry - Instructional Component 3 – Content Standards
Atomic and Molecular Structure
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:
1.a. *Students know* how to relate the position of an element in the periodic table to its atomic number and atomic mass.
1.b. *Students know* how to use the periodic table to identify metals, semimetals, non-metals, and halogens.
1.c. *Students know* 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.
1.d. *Students know* how to use the periodic table to determine the number of electrons available for bonding.
1.e. *Students know* the nucleus of the atom is much smaller that the atom yet contains most of its mass.
1.f. **Students know* 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
Chemical Bonds
2. Biological, chemical, and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons
and protons and between atoms and molecules. As a basis for understanding this concept:
2.a. *Students know* atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.
2.b. *Students know* chemical bonds between atoms in molecules such as H_2, CH_4, NH_3, H_2CCH_2, N_2, CI_2, and many large biological molecules are covalent.
2.c. *Students know* salt crystals, such as NaCI, are repeating patterns of positive and negative ions held together by electrostatic attraction.
Acids and Bases
5. Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept:
5.a. *Students know* the observable properties of acids, bases, and salt solutions.
5.c. *Students know* strong acids and bases fully dissociate and weak acids and bases partially dissociate.
Chemical Thermodynamics
7. Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept:
7.b. *Students know* chemical processes can either release (exothermic) or absorb (endothermic) thermal energy.
7.c. *Students know* energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts.

ICS1/Chemistry - Instructional Component 3 – Process Standards
Investigation and Experimentation
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1.a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and

graphing calculators) to perform tests, collect data, analyze
relationships, and display data.
1.b. Identify and communicate sources of unavoidable experimental error.
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1.e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.
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1.g. Recognize the usefulness and limitations of models and theories as scientific representations of reality.
1.h. Read and interpret topographic and geologic maps.
1.i. Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and
succession of species in an ecosystem).
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1.m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.
1.n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown
Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).

ICS 1/Biology - Instructional Component 4 – Content Standards
Ecology
6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:
6.a. *Students know* biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
6.b. *Students know* how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in
population size.
6.c. *Students know* how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
6.d. *Students know* how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through
photosynthesis and respiration.
6.e. *Students know* a vital part of an ecosystem is the stability of its producers and decomposers.
6.f. *Students know* at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.
6.g. **Students know* how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of
organisms through genetic change.
Biogeochemical Cycles

7. Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as
part of biogeochemical cycles. As a basis for understanding this concept:
7.a. *Students know* the carbon cycle of photosynthesis and respiration and the nitrogen cycle.
7.b. *Students know* the global carbon cycle: the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, fossil fuels, and the
movement of carbon among these reservoirs.
7.c. *Students know* the movement of matter among reservoirs is driven by Earth's internal and external sources of energy.
7.d. **Students know* the relative residence times and flow characteristics of carbon in and out of its different reservoirs.
Evolution
8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
8.a. *Students know* how natural selection determines the differential survival groups of organisms.
8.b. *Students know* a great diversity of species increases the chance that at least some organisms survive major changes in the environment.
8.e. *Students know* how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.
California Geology
9. The geology of California underlies the state's wealth of natural resources as well as its natural hazards. As a basis for understanding this
concept:
9.b. *Students know* the principal natural hazards in different California regions and the geologic basis of those hazards.
9.c. *Students know* the importance of water to society, the origins of California's fresh water, and the relationship between supply and need.
9.d. **Students know* how to analyze published geologic hazard maps of California and know how to use the map's information to identify evidence of geologic events of the past and predict geologic changes in the future.

ICS1/Biology – Instructional Component 4 – Process Standards
Investigation and Experimentation
1. 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 four strands, students should develop their own questions and perform investigations. Students will:
1.a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data,
analyze relationships, and display data.
1.b. Identify and communicate sources of unavoidable experimental error.
1c Identify possible reasons for inconsistent results, such as sources of error and uncontrolled conditions.
1.d. Formulate explanations by using logic and evidence.
1.e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.
1.f. Distinguish between hypothesis and theory as scientific terms.
1.g. Recognize the usefulness and limitations of models and theories as scientific representations of reality.
1.h. Read and interpret topographic and geologic maps.

1.i. Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).
1.j. Recognize the issues of statistical variability and the need for controlled tests.
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1.n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).

Representative Performance Outcomes and Skills
In accordance with their individual capacity, students will also grow in the ability to:

- Demonstrate process skills of scientific thinking: observing, communicating, comparing, ordering, categorizing, relating, inferring, and applying.
- Demonstrate skills in the areas of speaking, listening, writing, reading, graphing, mapping skills, and mathematics.
- Handle safely the equipment and materials common to chemistry laboratory.
- Evaluate the contributions of science and technology and their relevance to improving our daily lives in preparation for the future.
- Establish the relevance of science and its applications to careers and real-life situations.
- Investigate a societal issue by researching literature, analyzing data and communicating findings and discuss possible future outcomes.
- Demonstrate interconnections between the many disciplines of science.
- Demonstrate the interdisciplinary connections between science and other curricular fields.

Assessments
Instruction in our district is assessment-driven. The Framework states "that effective science programs include continual assessment of student's knowledge and understanding, with appropriate adjustments being made during the academic year (p.11)."[1] Assessments can be on demand or over a long period of time. The District Periodic Assessments and STAR State Testing play a significant role in Student Assessments.
The chart below, adapted from *A Guide for Teaching and Learning*, NRC (2000), gives some examples of on demand and over time assessment.

On Demand →			Over Time
answering questions multiple choice true false matching Periodic Assessments California Standards Tests	constructed response, essays	investigations, immersion projects research reports	portfolios, journals lab notebooks projects

Chart 1 - Assessment Examples

Texts/Materials

- District Guidelines for Instruction for ICS 1
- *Science Framework for California Public Schools*
- District Authorized Textbooks and ancillary materials:

  - Its About Time, *Integrated Coordinated Science for the 21st Century* Smith, et al. 2004
  - Its About Time, *Earth Comm*. American Geological Institute 2000
- *Science Safety Handbook for California Public Schools*
- Appropriate science laboratory materials