

**Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study**

Department	Science			Course Title	Foundations of Scientific Inquiry 1AB			
Course Code	RY368		Grade Level	10-12		Course Length		1 year/2 semesters
Credits/Semester	10/year	Required for Graduation		no		Elective Credit		yes
Prerequisites	none							
Community College Articulation		no	Name of College					
UC/CSU Articulation		no	Name of University					
Meets UC/CSU “a-g” Requirement		Applied for	Meets NCAA Requirement			Honors Grading Differentiation		no

COURSE DESCRIPTION

Foundations of Scientific Inquiry (FSI) is a rigorous, hands-on, real world lab science course that provides for learning through various modalities including: experiments, research projects, quantitative data collection and analysis. Students will explore a variety of the scientific disciplines, with emphasis on investigation and experimentation, using advanced scientific equipment and methods. An emphasis is placed on the Scientific Method, as well as advanced critical thinking skills such as inductive reasoning. One year. 5 credits per semester. UC/CSU approval (section D lab science) pending. Sophomores must be concurrently enrolled in a core science course (ex. Biology, Chemistry).

GOALS: (Expected performance outcomes for students)

The focus of this course is mastery of the California Science Standards in the area of Investigation and Experimentation (9-12). These standards will be presented through the frameworks of Biology, Chemistry, Physics, Earth Science, and other specialized scientific disciplines. Upon successful completion students will demonstrate competence in the following areas:

- ☐ Experimental design, including proper use of controls, manipulation of variables, development of a research question, and analysis to propose further investigation
- ☐ Laboratory skills, including safe and effective use of pipettes, scales, hot plates, hot/cold baths, waste handling and disposal, and bacterial cultures
- ☐ Use of specialized equipment, including autoclaves, incubators, gel electrophoresis, multiparameter probes, and microscopes
- ☐ Critical thinking skills, including analysis of sources of error, implications of experimental design, and application of the scientific method

California Content Standards - Investigation and Experimentation, grades 9 - 12

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:

- 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.
- b. Identify and communicate sources of unavoidable experimental error.
- c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
- d. Formulate explanations by using logic and evidence.
- e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.
- f. Distinguish between hypothesis and theory as scientific terms.
- g. Recognize the usefulness and limitations of models and theories as scientific representations of reality.
- h. Read and interpret topographic and geologic maps.
- 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).
- j. Recognize the issues of statistical variability and the need for controlled tests.
- k. Recognize the cumulative nature of scientific evidence.
- l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
- 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.
- 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).

The following abbreviations are included to indicate the assessments used to measure a student's proficiency in each of the appropriate standards: California Standards Test (CST); California High School Exit Exam (CAHSEE); Practice Scholastic Aptitude Test/National Merit Scholarship Qualifying Test (PSAT/NMQST). Standards that are underlined and in bold are identified as high frequency standards on the CST. Standards that are in bold are identified as medium frequency standards on the CST.

Evaluation

Student achievement will be measured using multiple assessment tools, included but not limited to benchmark test results, final exams, end-of-unit tests, quizzes, homework, classwork, notebooks, portfolios, authentic performance assessments, laboratory experiments and lab reports, and written assessments using the district's rubric. Course progress will be assessed using the following chart:

Performance Standards - Benchmark Assessments				
Far Below Basic = F	Below Basic = D	Basic = C	Proficient = B	Advanced Proficient = A

Course Outline

Unit 1	Foundations of Scientific Inquiry					
	Key Terms	Standards*		Model Tasks**		Tools & Text
Laboratory Orientation (4 weeks) Subtopics: • Scientific Method • Observation & inference • Theories, facts, laws & hypotheses • Cause vs. correlation • Controlled experiments • Laboratory safety • Equipment and supplies • Weighing and measuring	Scientific Method observation inference theory fact law cause correlation measurement accuracy precision hypothesis experiment control variable metric system microscope solution	Investigation & Experimentation: 1a, 1b, 1c, 1d, 1f, 1g, 1n Biology: Physics: Chemistry: 1h, Earth Science:	H M L	Observation Journal, Plant Growth Experiment, Problem Solving Challenge, Weighing and Measuring Lab, Liquids	D C B A	Biology rulers scales microscopes soil seeds paper cups glassware internet Microsoft Word Microsoft Excel Microsoft Powerpoint
Differentiation	Support -- for students struggling with content	Content: The same as the general class Process: Extra time, scaffolding instruction, modified assignments, one-on-one help, partner work, Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.				
	Extension – for high achieving students. Required activities for all honors courses.	Content: Exploration of unit concepts in greater depth than is covered with the general class Process: Autonomous investigation, independent learning, modified assignments Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.				
Evaluation	Formative Assessments: Used to assess student understanding and determine whether to continue with the lesson or if re-teaching is required. Strategies may include, but are not limited to checks for understanding, quizzes, mind maps, and homework review. Benchmark tests are required for all state tested subjects. Summative Assessments: Typically used to assess student achievement at the end of units or end of course. Strategies may include, but are not limited to, chapter tests, research papers, lab reports, CST’s and					

final exams.

* Standards are to be identified by frequency on California Standards Tests. A high frequency standard will be labeled with an “H”, a medium frequency standard will be labeled “M”, and a low frequency standard will be labeled “L”.

Unit 2	Foundations of Scientific Inquiry					
	Key Terms	Standards*		Model Tasks**		Tools & Text
Experimental Design (6 weeks) Subtopics: • Developing a research question • Quantitative vs. qualitative • Controls and variables • Presenting and analyzing data • Sources of error	control variable experiment research question data line graph bar graph chart error quantitative qualitative cause correlation	Investigation & Experimentation: 1a, 1b, 1c, 1d, 1j, 1k, 1l, Biology: 1b, 1f, Physics: Chemistry: 2a, 2b, 2c, 5a, 5b, 6a, 6d, Earth Science:	H M L	Salinity Lab, Design-your-own Plant Experiment,	D C B A	Biology seeds paper cups soil salt cellophane glassware pH buffers internet Microsoft Word Microsoft Excel Microsoft Powerpoint
Differentiation	Support -- for students struggling with content	Content: The same as the general class Process: Extra time, scaffolding instruction, modified assignments, one-on-one help, partner work, Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.				
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Unit 3	Foundations of Scientific Inquiry					
	Key Terms	Standards*		Model Tasks**		Tools & Text
Topography (3 weeks) Subtopics: • Geologic vs. topographic vs. political • Symbols, scale, and orientation • Geographic information systems (GIS)	key scale GIS geologic topographic political elevation terrain	Investigation & Experimentation: 1a, 1b, 1c, 1d, 1h, 1i, Biology: Physics: Chemistry: Earth Science: 5e, 9d	H M L	Find it on a Map, Create Your Own Map, Using GIS, GPS scavenger hunt	D C B A	Biology GIS GPS maps rulers internet Microsoft Word Microsoft Excel Microsoft Powerpoint
Differentiation	Support -- for students struggling with content	Content: The same as the general class Process: Extra time, scaffolding instruction, modified assignments, one-on-one help, partner work, Product: See above, in "Model Tasks" section. Products include presentations, lab reports, graphs and charts, and projects.				
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**** Tasks are to be identified by the Application Taxonomy Quadrant designed by the International Center for Leadership in Education.**

Unit 4	Foundations of Scientific Inquiry				
	Key Terms	Standards*		Model Tasks**	Tools & Text
Microbiology (6 weeks) Subtopics: • Germ theory • Gram staining • Bacterial culture • Sterile technique • Cell theory • Microscopy • Inoculation	microbiology Germ Theory Gram staining culture prokaryote nucleus DNA protein plasmid microscope	Investigation & Experimentation: 1a, 1b, 1c, 1d, 1l Biology: 1a, 1c, 1d Physics: Chemistry: 10a, 10c Earth Science:	H M L	Intro to Bacterial Culture, Gram staining lab, Antibiotic Resistance Lab, Bacterial Transformation lab,	D C B A Biology E-Z Gene transformation lab micropipets microcentrifuge incubator gel electrophoresis glassware internet Microsoft Word Microsoft Excel Microsoft Powerpoint
Differentiation	Support -- for students struggling with content	Content: The same as the general class Process: Extra time, scaffolding instruction, modified assignments, one-on-one help, partner work, Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.			
	Extension – for high achieving students. Required activities for all honors courses.	Content: Exploration of unit concepts in greater depth than is covered with the general class Process: Autonomous investigation, independent learning, modified assignments Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.			
Evaluation	Formative Assessments: Used to assess student understanding and determine whether to continue with the lesson or if re-teaching is required. Strategies may include, but are not limited to checks for understanding, quizzes, mind maps, and homework review. Benchmark tests are required for all state tested subjects. Summative Assessments: Typically used to assess student achievement at the end of units or end of course. Strategies may include, but are not limited to, chapter tests, research papers, lab reports, CST’s and final exams.				

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Unit 6	Foundations of Scientific Inquiry					
	Key Terms	Standards*		Model Tasks**		Tools & Text
Populations, Science, and Society (6 weeks) Subtopics: • Sample size, reproducibility • Genetic drift • Exponential and logistic growth • Ecological footprint • Sustainability	sample size reproducibility exponential logistic carrying capacity J-curve S-curve ecological footprint sustainable	Investigation & Experimentation: 1a, 1b, 1c, 1d, 1e, 1l, 1m Biology: 6b, 6c, 7d, 8a, 8b, 8c, 8d Physics: Chemistry: Earth Science:	H M L	<i>Lemna minor</i> growth experiment, ecological footprint lab, Genetic drift simulation,	D C B A	Biology Lemna minor Petri dishes plant growth lights colored cellophane pH buffers salt thermometers glassware internet Microsoft Word Microsoft Excel Microsoft Powerpoint
Differentiation	Support -- for students struggling with content	Content: The same as the general class Process: Extra time, scaffolding instruction, modified assignments, one-on-one help, partner work, Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.				
	Extension – for high achieving students. Required activities for all honors courses.	Content: Exploration of unit concepts in greater depth than is covered with the general class Process: Autonomous investigation, independent learning, modified assignments Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.				
Evaluation	Formative Assessments: Used to assess student understanding and determine whether to continue with the lesson or if re-teaching is required. Strategies may include, but are not limited to checks for understanding, quizzes, mind maps, and homework review. Benchmark tests are required for all state tested subjects. Summative Assessments: Typically used to assess student achievement at the end of units or end of course.					

	Strategies may include, but are not limited to, chapter tests, research papers, lab reports, CST's and final exams.
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Unit 7	Foundations of Scientific Inquiry				
	Key Terms	Standards*		Model Tasks**	Tools & Text
Quantitative and Qualitative Chemistry (5 weeks) Subtopics: - Quantitative vs. qualitative - Titrations - Percent yield - Theoretical yield - Biological effects of chemicals	quantitative qualitative percent yield theoretical yield biomagnification bioaccumulation titration	Investigation & Experimentation: 1a, 1b, 1c, 1d, 1e, 1l, 1m Biology: 6b, Physics: Chemistry: 2b, 3a, 3d, 3e, 3f, 6a, 6d, 6f, Earth Science:	H M L	Calcium in Eggs Investigation, Is Organic Better? Investigation	D C B A Biology Organic eggs Grade AA eggs titration glassware beakers flasks chemical reagents hot plates internet Microsoft Word Microsoft Excel Microsoft Powerpoint
Differentiation	Support -- for students struggling with content	Content: The same as the general class Process: Extra time, scaffolding instruction, modified assignments, one-on-one help, partner work, Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.			
	Extension – for high achieving students. Required activities for all honors courses.	Content: Exploration of unit concepts in greater depth than is covered with the general class Process: Autonomous investigation, independent learning, modified assignments Product: See above, in “Model Tasks” section. Products include presentations, lab reports, graphs and charts, and projects.			
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