



M/J Comprehensive Science 3, Advanced (#2002110)

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Course Number: 2002110

Course Path: **Section:** Grades PreK to 12 Education
Courses > **Grade Group:** Grades 6 to 8 Education
Courses > **Subject:** Science > **SubSubject:** General
Sciences >

Abbreviated Title: M/J COMP SCI 3 ADV

Course Length: Year (Y)

Course Attributes:

- Class Size Core Required

Course Level: 3

Course Status: Course Approved

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Additional content that may be included in the Grade 8 NAEP Science assessment includes:

- Rocks and rock formations bear evidence of the minerals, materials, temperature/pressure conditions, and forces that created them. (SC.4.E.6.1 and SC.4.E.6.2)
- Earth as a whole has a magnetic field that is detectable at the surface with a compass, with north and south poles and lines of force. (SC.912.P.10.16)
- The Sun is the major source of energy for phenomena on Earth's surface. (SC.3.L.17.2; SC.3.E.5.2; SC.3.E.6.1; SC.4.P.10.4; SC.4.L.17.2)
- Water, which covers the majority of Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle. (SC.5.E.7.1; SC.5.E.7.2; SC.5.E.7.6)
- A tiny fraction of the light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms. (SC.2.E.7.2; SC.3.E.6.1)
- Following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. (SC.912.L.16.13)
- Characteristics of organisms are influenced by heredity and environment. (SC.4.L.16.2 and SC.4.L.16.3)
- Nuclear reactions take place in the Sun. (SC.912.P.10.10; SC.912.P.10.11)

The NAEP frameworks for Science may be accessed at <http://www.nagb.org/publications/frameworks/science-09.pdf>

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a

relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Additional Instructional Resources:

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

Course Standards

Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Name	Description
SC.8.E.5.1:	Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.
SC.8.E.5.2:	Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.
SC.8.E.5.3:	Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.
SC.8.E.5.4:	Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.
SC.8.E.5.5:	Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness). Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.
SC.8.E.5.6:	Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics and MAFS.K12.MP.7: Look for and make use of structure.
SC.8.E.5.7:	Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions. Compare various historical models of the Solar System, including geocentric and heliocentric.
SC.8.E.5.8:	Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.
SC.8.E.5.9:	Explain the impact of objects in space on each other including: 1. the Sun on the Earth including seasons and gravitational attraction 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.
SC.8.E.5.10:	Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically; and, MAFS.K12.MP.6: Attend to precision.
SC.8.E.5.11:	Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.
SC.8.E.5.12:	Summarize the effects of space exploration on the economy and culture of Florida.
SC.8.L.18.1:	Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.
SC.8.L.18.2:	Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.
SC.8.L.18.3:	Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.
SC.8.L.18.4:	Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.
SC.8.N.1.1:	Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
SC.8.N.1.2:	Design and conduct a study using repeated trials and replication.
SC.8.N.1.3:	Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.
SC.8.N.1.4:	Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.
SC.8.N.1.5:	Analyze the methods used to develop a scientific explanation as seen in different fields of science.
SC.8.N.1.6:	Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence. Remarks/Examples:

	Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.
SC.8.N.2.1:	Distinguish between scientific and pseudoscientific ideas. Remarks/Examples: Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations (e.g. astrology is pseudoscience).
SC.8.N.2.2:	Discuss what characterizes science and its methods. Remarks/Examples: Science is the systematic, organized inquiry that is derived from <u>observations</u> and experimentation that can be verified through testing to explain natural phenomena.
SC.8.N.3.1:	Select models useful in relating the results of their own investigations. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.
SC.8.N.3.2:	Explain why theories may be modified but are rarely discarded.
SC.8.N.4.1:	Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.
SC.8.N.4.2:	Explain how political, social, and economic concerns can affect science, and vice versa.
SC.8.P.8.1:	Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases. Remarks/Examples: Recognize that <u>matter</u> is composed of discrete units called <u>atoms</u> and <u>atoms</u> are composed of sub-atomic particles called protons, <u>neutrons</u> , and <u>electrons</u> . Solid is the state in which intermolecular attractions keep the <u>molecules</u> in fixed spatial relationships. <u>Liquid</u> is the state in which intermolecular attractions keep <u>molecules</u> in proximity, but not in fixed relationships. <u>Gas</u> is the state in which <u>molecules</u> are comparatively separated and intermolecular attractions have relatively little effect on their respective motions. Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.
SC.8.P.8.2:	Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.
SC.8.P.8.3:	Explore and describe the densities of various materials through measurement of their masses and volumes. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.
SC.8.P.8.4:	Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample. Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.5: Use appropriate tools strategically and, MAFS.K12.MP.6: Attend to precision.
SC.8.P.8.5:	Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter. Remarks/Examples: Demonstrate with atomic <u>models</u> how <u>atoms</u> can combine in many ways. Explain why there are many, but limited, combinations. Use <u>models</u> to demonstrate the <u>conservation of mass</u> in modeled chemical reactions.
SC.8.P.8.6:	Recognize that elements are grouped in the periodic table according to similarities of their properties.
SC.8.P.8.7:	Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons). Remarks/Examples: Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.
SC.8.P.8.8:	Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.
SC.8.P.8.9:	Distinguish among mixtures (including solutions) and pure substances. Remarks/Examples: Pure substances include elements and <u>compounds</u> . Mixtures are classified as heterogeneous (mixtures) or homogeneous (solutions). Methods for separating mixtures include: distillation, chromatography, reverse osmosis, diffusion through semi-permeable <u>membranes</u> .
SC.8.P.9.1:	Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.
SC.8.P.9.2:	Differentiate between physical changes and chemical changes.
SC.8.P.9.3:	Investigate and describe how temperature influences chemical changes.
SC.912.E.5.4:	Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth. Remarks/Examples: Describe the physical properties of the Sun (sunspot cycles, solar flares, prominences, layers of the Sun, coronal <u>mass</u> ejections, and <u>nuclear reactions</u>) and the impact of the Sun as the main source of external <u>energy</u> for the Earth.
SC.912.L.18.7:	Identify the reactants, products, and basic functions of photosynthesis.
SC.912.L.18.8:	Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.
SC.912.L.18.9:	Explain the interrelated nature of photosynthesis and cellular respiration. Remarks/Examples: Annually assessed on Biology EOC. Also assesses SC.912.L.18.7 SC.912.L.18.8 SC.912.L.18.10 .
SC.912.P.8.1:	Differentiate among the four states of matter. Remarks/Examples: Differentiate among the four states of <u>matter</u> (solid, <u>liquid</u> , <u>gas</u> and plasma) in terms of <u>energy</u> , particle <u>motion</u> , and phase transitions. (Note: Currently five states of <u>matter</u> have been identified.)
	Differentiate between physical and chemical properties and physical and chemical changes of matter.

SC.912.P.8.2:	<p>Remarks/Examples: Discuss <u>volume</u>, compressibility, <u>density</u>, <u>conductivity</u>, malleability, reactivity, molecular composition, <u>freezing</u>, <u>melting</u> and <u>boiling</u> points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, <u>evaporation</u>).</p>
	Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.
SC.912.P.8.4:	<p>Remarks/Examples: Explain that <u>electrons</u>, protons and <u>neutrons</u> are parts of the <u>atom</u> and that the <u>nuclei</u> of <u>atoms</u> are composed of protons and <u>neutrons</u>, which experience <u>forces</u> of <u>attraction</u> and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.</p>
	Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.
SC.912.P.8.5:	<p>Remarks/Examples: Use the <u>periodic table</u> and <u>electron</u> configuration to determine an element's number of valence <u>electrons</u> and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer <u>electron</u> shell.</p>
	Interpret formula representations of molecules and compounds in terms of composition and structure.
SC.912.P.8.7:	<p>Remarks/Examples: Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ + NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.</p>
	Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.
SC.912.P.8.11:	<p>Remarks/Examples: Use experimental data to illustrate and explain the pH scale to characterize <u>acid</u> and <u>base</u> solutions. Compare and contrast the strengths of various common <u>acids</u> and <u>bases</u>.</p>
LAFS.68.RST.1.1:	Cite specific textual evidence to support analysis of science and technical texts.
LAFS.68.RST.1.2:	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LAFS.68.RST.1.3:	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LAFS.68.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
LAFS.68.RST.2.5:	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LAFS.68.RST.2.6:	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LAFS.68.RST.3.7:	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LAFS.68.RST.3.8:	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LAFS.68.RST.3.9:	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
LAFS.68.RST.4.10:	By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
	Write arguments focused on discipline-specific content.
LAFS.68.WHST.1.1:	<ol style="list-style-type: none"> Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. Establish and maintain a formal style. Provide a concluding statement or section that follows from and supports the argument presented.
	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
LAFS.68.WHST.1.2:	<ol style="list-style-type: none"> Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. Use precise language and domain-specific vocabulary to inform about or explain the topic. Establish and maintain a formal style and objective tone. Provide a concluding statement or section that follows from and supports the information or explanation presented.
LAFS.68.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.68.WHST.2.5:	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
LAFS.68.WHST.2.6:	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LAFS.68.WHST.3.7:	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LAFS.68.WHST.3.8:	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LAFS.68.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
LAFS.68.WHST.4.10:	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
	<ol style="list-style-type: none"> Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

LAFS.8.SL.1.1:	<p>b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.</p> <p>c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.</p> <p>d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.</p>
LAFS.8.SL.1.2:	Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
LAFS.8.SL.1.3:	Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.
LAFS.8.SL.2.4:	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
LAFS.8.SL.2.5:	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
MAFS.8.F.2.5:	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
	Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
MAFS.8.G.3.9:	<p>Remarks/Examples: Fluency Expectations or Examples of Culminating Standards</p> <p>When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous grade 7 work in angle measure, area, surface area and volume (7.G.2.4–2.6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.2.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers.</p>
MAFS.8.SP.1.4:	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?
ELD.K12.ELL.SC.1:	English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
ELD.K12.ELL.SI.1:	English language learners communicate for social and instructional purposes within the school setting.

Related Certifications

Science (Secondary Grades 7-12)
Middle Grades Integrated Curriculum (Middle Grades 5-9)
Physics (Grades 6-12)
Earth/Space Science (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)
Chemistry (Grades 6-12)
Biology (Grades 6-12)

There are more than 1068 related instructional/educational resources available for this on CPALMS. Click on the following link to access them: <http://www.cpalms.org/Public/PreviewCourse/Preview/13075>