Chemistry

State Standard Number	State Standard Area/Description	Unit Name	Course Topic Description
1.9-12 SYS	Systems		
0	Predictability and Feedback		
1.9-12 SYSA	Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.	Feedback mechanisms covered in Biology	
1.9-12 SYSA.1	Give examples of a positive feedback system and explain its regulatory mechanism (e.g., global warming causes Earth's ice caps to melt, reflecting less energy to space, increasing temperatures).	Feedback mechanisms covered in Biology	
1.9-12 SYSA.2	Give examples of a negative feedback system and explain its regulatory mechanism (e.g., when a human body overheats, it produces sweat that cools the body by evaporation).	Feedback mechanisms covered in Biology	
1.9-12 SYSB	Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.	Chemical Thermodynamics	Students study heat and heat transfer in terms of systems. Students must define a system to establish the law of conservation of energy.
1.9-12 SYSB.1	Determine if a systems approach will be helpful in answering a question or solving a problem.	Chemical Thermodynamics	Students study heat and heat transfer in terms of systems. Students must define a system to establish the law of conservation of energy.
1.9-12 SYSB.2	Represent the system with a diagram specifying components, boundaries, flows, and feedbacks.	Chemical Thermodynamics	Students study heat and heat transfer in terms of systems. Students must define a system to establish the law of conservation of energy.
1.9-12 SYSB.3	Describe relevant subsystems and the larger system that contains the system being analyzed.	Systems are covered in Biology—body systems	

Chemistry

1.9-12 SYSB.4	Determine how the system functions with respect to other systems.	Systems are covered in Biology—body systems	
1.9-12 SYSC	In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.	Atomic Structure	Students see the development of the atomic model. The simplistic view of the model was re-done over and over again as predictions were not held true in further investigations.
1.9-12 SYSC.1	Create a simplified model of a complex system. Trace the possible consequences of a change in one part of the system and explain how the simplified model may not be adequate to reliably predict consequences.	Atomic Structure	Students are presented with an atomic model that represents the an atomic system. The model used commonly in science today does not accurately reflect current knowledge in science, but is a handy tool nonetheless.
1.9-12 SYSD	Systems can be changing or in equilibrium.	Gases, Liquids, and Solids	Students learn the concept of dynamic equilibrium and learn to distinguish if the state exists.
1.9-12 SYSD.1	Analyze whether or not a system (e.g., population) is changing or in equilibrium.	Gases, Liquids, and Solids	Students learn the concept of dynamic equilibrium and learn to distinguish if the state exists.
1.9-12 SYSD.2	Determine whether a state of equilibrium is static or dynamic (e.g., inflows equal outflows).	Gases, Liquids, and Solids	Students learn the concept of dynamic equilibrium and learn to distinguish if the state exists.

Chemistry

2.9-12 INQ	Inquiry		
0	Conducting Analyses and Thinking Logically		
2.9-12 INQA	Scientists generate and evaluate questions to investigate the natural world.	Pre-requisite unit	The content discusses "what is science?" as well as the nature of science being to understand the world around us.
2.9-12 INQA.1	Generate and evaluate a question that can be answered through a scientific investigation. Critique questions generated by others and explain whether or not the questions are scientific.	Pre-requisite unit	Discusses what types of questions are answerable by science.
2.9-12 INQB	Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.	Pre-requisite unit	Discusses the scientific method process as well as defines scientific inquiry. What are the pieces necessary for planning, putting together, performaing, and communicating about the process.
2.9-12 INQB.1	Plan and conduct a scientific investigation, choosing a method appropriate to the question being asked.	Introduction to Chemistry (and others)	Students perform a laboratory experiment on density. They choose the way they perform the experiment and explain in their report.
2.9-12 INQB.2	Collect, analyze, and display data using calculators, computers, or other technical devices when available.	Introduction to Chemistry (and others)	Students throughout their laboratory experience use technology (graphing etc) to show data and analysis.

Chemistry

2.9-12 INQC	Conclusions must be logical, based on evidence, and consistent with prior established knowledge.	Pre-requisite unit	Students study the concept of drawing conclusions
2.9-12 INQC.1	Draw conclusions supported by evidence from the investigation and consistent with established scientific knowledge.	Introduction to Chemistry (and others)	Students throughout their investigations in this course are drawing conclusions. There are different forms of laboratory investigations in this course: inquiry (they create models, explore) and traditional (they prove through labs scientific laws, theories, concepts presented to them).
2.9-12 INQC.2	Analyze alternative explanations and decide which best fits the data.	Atomic Structure	Students see the progression of the development of the atomic model. Seeing how the alternative explanations fit data better as more evidence becomes available.
2.9-12 INQD	The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.	Pre-requisite unit Introduction to Chemistry	Students see that communication is part of the scientific process. It leads to further investiations. Students discuss the code of ethics that scientists follow. Part of that code is commiunicating accurate results.
2.9-12 INQD.1	Write a detailed laboratory report that includes: the question that motivated the study, a justification for the kind of investigation chosen, hypotheses (if any), a description of what was done, a summary of data in tables and graphs, and a conclusion, based on the evidence, that responds to the question.	Introduction to Chemistry	Students write a thorough laboratory report on their investigation of density.

Chemistry

2.9-12 INQE	The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.	Pre-requisite unit	Discusses scientific theories, laws, and beliefs. Theories provide useful ways of prediciting what will happen in the future. They also see the different types of models used in science (conceptual, interactive, mathematical, statistical, and visualiations).
2.9-12 INQE.1	Formulate one or more hypotheses based on a model or theory of a causal relationship. Demonstrate creativity and critical thinking to formulate and evaluate the hypotheses.	Pre-requisite unit Introduction to Chemistry	Discusses how to form appropriate hypotheses, evaluate whether a hypothesis is good. Students perform a laboratory experiment where they have to formulate a hypothesis.
2.9-12 INQF	Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.	Pre-requisite unit	Discusses that scientific knowledge is durable, but tentative. If new evidence is found, theories can change.
2.9-12 INQF.1	Evaluate an investigation to determine if it was a valid means of answering the question, and whether or not the results were reliable.	Introduction to Chemistry	Students learn about ethics and skepticism. Learn to look critically at results to see if there is bias that would make the results bogus.
2.9-12 INQF.2	Describe the development of a scientific theory that illustrates logical reasoning, creativity, testing, revision, and replacement of prior ideas in light of new evidence.	Introduction to Chemistry	Students see that new scientific knowledge (i.e replacement of prior ideas in light of new evidence) leads to advances in science.
2.9-12 INQG	Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.	Pre-requisite unit Introduction to Chemistry	Students see that communication is part of the scientific process. It allows scientists to establish validity of their results. Students discuss the code of ethics that scientists follow. Part of that code is

Chemistry

			commiunicating accurate results and opening up their investigations to peer review.
2.9-12 INQG.1	Participate in a scientific discussion about their own investigations and those performed by others.	Atomic Structure	Students discuss the theory of atoms (investigations performed by others).
2.9-12 INQG.2	Respond to questions and criticisms, and if appropriate, revise explanations based on these discussions.	(Throughout)	Discussions are provided throughout the course so students can interact, state their opinions, and respond to others thoughts.
2.9-12 INQH	Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.	Introduction to Chemistry	Students discuss the code of ethics that scientists follow. Part of that code is citing sources of information as well as establishing reliability.
2.9-12 INQH.1	Provide appropriate citations for all ideas, findings, and information used in any and all written reports.	Getting Started/Integrity	Students are informed of their responsibilities to act with integrity. They are also informed of the definition of cheating and plagiarism.
2.9-12 INQH.2	Explain the consequences for failure to provide appropriate citations.	Getting Started/Integrity	Students are informed of their responsibilities to act with integrity. They are also informed of the definition of cheating and plagiarism. They are told of the consequences of these actions.
3.9-12 APP	Application		
0	Science, Technology, and Society		

Chemistry

3.9-12 APPA	Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded.	An Introduction to Chemistry	Students see the affects of scientific advancement on society. They even discuss whether they see some advancements as a help or a hindrance. There is also a journal assignment on funding research.
3.9-12 APPA.1	Describe ways that scientific ideas have influenced society or the development of differing cultures.	An Introduction to Chemistry	There is a thorough discssuion on certain scientific advancements and how they directly affect society today.
3.9-12 APPA.2	List questions that scientists investigate that are stimulated by the needs of society (e.g., medical research, global climate change).	An Introduction to Chemistry	One of the "scientific advancements" discussed is on global warming and how new evidences affect our understanding of these things.
3.9-12 APPB	The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.	This is covered really well in Physical Science—Inquiry Unit	
3.9-12 APPB.1	Work collaboratively with other students to generate ideas for solving a problem. Identify criteria and constraints, research the problem, and generate several possible solutions.	This is covered really well in Physical Science—Inquiry Unit	
3.9-12 APPC	Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a mode or other representation of the final design.	This is covered really well in Physical Science—Inquiry Unit	
3.9-12 APPC.1	Choose the best solution for a problem, create a model or drawing of the final design, and devise a way to test it. Redesign the solution, if necessary, then present it to peers.	This is covered really well in Physical Science—Inquiry Unit	
3.9-12 APPD	The ability to solve problems is greatly enhanced by use of mathematics and information technologies.	Pre-requisite Unit	Students see a discussion on the language of science which is mathematics.

Chemistry

3.9-12 APPD.1	Use proportional reasoning, functions, graphing, and estimation to solve problems.	(Throughout)	In almost every lab and every unit, the students are using functions, dimensional analysis, formulas, etc for solving problems.
3.9-12 APPD.2	Use computers, probes, and software when available to collect, display, and analyze data.	(Throughout)	Students are prompted during laboratory investigations to use their computer or calculator to analyze data.
3.9-12 APPE	Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.	This is covered really well in Physical Science—Inquiry Unit	
3.9-12 APPE.1	Analyze a societal issue that may be addressed through science and/or technology. Compare alternative solutions by considering trade-offs and unintended consequences (e.g., removing dams to increase salmon spawning).	Introduction to Chemistry	Students look at the cost versus benefit of several scientific endeavers.
3.9-12 APPF	It is important for all citizens to apply science and technology to critical issues that influence society.	Introduction to Chemistry	Students look at the cost versus benefit of several scientific endeavers. They see the importance of applying scientific knowledge.
3.9-12 APPF.1	Critically analyze scientific information in current events to make personal choices or to understand public-policy decisions.	Nuclear Chemistry	Students analyze the commercial use of nuclear processes, environmental issues regarding its use, and discuss these things.