

Subject Area Code (TSDL)

03 – Life and Physical Science

Course ID (TSDL)

105– Conceptual Chemistry

Certification of Teacher(s) assigned to course

DC, DI, DX, DP (Chemistry/Integrated Science/Science/Physical Science)

Local Course ID (TSDL)

LP - 105

Course Section ID (TSDL)

001

Course Type (TSDL)

01-Regular

Title of Course (TSDL)

Chemistry Concepts and Applications

Description of Course (must include major content and mode of delivery)

Conceptual Chemistry courses are practical, nonquantitative chemistry courses designed for students who desire an understanding of chemical concepts and applications. Through *Chemistry Concepts and Applications* students will develop an understanding of the substructure of atoms and to provide more mechanistic explanations of the properties of substances. Chemical reactions, including rates of reactions and energy changes, will be studied in terms of the collisions of molecules and the rearrangements of atoms. Students will be able to use the periodic table as a tool to explain and predict the properties of elements. Using this expanded knowledge of chemical reactions, students will be able to explain important biological and geophysical phenomena¹.

Length of Course (hours, days, weeks, semesters)

2 semesters

Credit

TSDL (Carnegie units):

1.0

MMC

1.0 science

¹ Excerpted from http://www.nextgenscience.org/sites/ngss/files/PS_High%20School_DCIs%20051413.pdf.

Standards Addressed:

Science:

Structure and Properties of Matter

HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS1-3 Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS1-8 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. *

Chemical Reactions

HS-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

HS-PS1-6 Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*

HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Matter and Energy in Organisms and Ecosystems

HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Space Systems

HS-ESS1-1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

HS-ESS1-3 Communicate scientific ideas about the way stars, over their life cycle, produce elements.

Earth's Systems

HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Engineering Design

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Mathematics:

MP.2 Reason abstractly and quantitatively. (HS-ESS1-1), (HS-ESS1-3),

MP.4 Model with mathematics. (HS-ESS1-1), (HS-ESS1-4), (HS-PS1-8)

N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS1-1), (HS-ESS1-2), (HS-ESS1-4), (HS-PS1-3), (HS-PS1-8), (HS-PS2-6)

N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS1-1), (HS-PS1-8), (HS-PS2-6)

N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS1-1), (HS-PS1-3), (HS-PS1-8), (HS-PS2-6)

ELA:

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. (HS-PS1-1)

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS1-1), (HS-PS1-3), (HS-PS2-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HSESS1-3), (HS-PS2-6)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS1-3)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-PS1-3)

SL.11-12.4 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. (HS-ESS1-3)

SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-5), (HS-LS1-7)