Florida Department of Education

COURSE DESCRIPTION - GRADES 9-12, ADULT

Subject Area: Science
Course Number: 2003360
Course Title: Chemistry II
Credit: 1.0
Will meet graduation requirements for Science

A. Major Concepts/Content. The purpose of this course is to enable students to develop knowledge of chemistry by expanding and applying chemical concepts introduced in 2003340 - Chemistry I or 2003350 - Chemistry I Honors.

The content should include, but not be limited to, the following:

- implementation of scientific habits of mind
- application of scientific knowledge, methodology, and historical context to solve problems
- use of laboratory technologies
- terminology
- oxidation and reduction
- pH and ionic equilibria
- reaction mechanisms and rates
- nuclear chemistry
- organic chemistry applications and nomenclature
- biochemistry
- molecular geometry
- thermodynamics and equilibrium
- chemical analysis
- connections between chemistry, technology, society, and the environment

This course shall integrate the Goal 3 Student Performance Standards of the Florida System of School Improvement and Accountability as appropriate to the content and processes of the subject matter.

Course student performance standards must be adopted by the district, and they must reflect appropriate Sunshine State Standards benchmarks.

B. **Special Note.** Laboratory investigations of selected topics in the content, which also include use of the scientific method, measurement, laboratory apparatus, and safety procedures, are an integral part of this course. Inquiry into current technology and applications of chemical principles and their relationship to the environment is encouraged.

C. **Course Requirements.** These requirements include, but are not limited to, the benchmarks from the Sunshine State Standards that are most relevant to this course. Benchmarks correlated with a specific course requirement may also be addressed by other course requirements as appropriate. Some requirements in this course are not addressed in the Sunshine State Standards.

Benchmarks from Science, Strand H, should not be taught and assessed in isolation, but should be combined with other benchmarks identified in this course description.

After successfully completing this course, the student will:

1. Demonstrate effective implementation of scientific habits of mind.

2. Apply knowledge of the nature of science, scientific methodology, and historical context to solve problems, and employ safe and effective use of laboratory technologies.

SC.H.1.4.1 know that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories.

SC.H.1.4.2 know that from time to time, major shifts occur in the scientific view of how the world works, but that more often the changes that take place in the body of scientific knowledge are small modifications of prior knowledge.

SC.H.1.4.3	understand that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding of theories, new and old, never ends and leads to an increasingly better understanding of how things work in the world, but not to absolute truth.
SC.H.1.4.4	know that scientists in any one research group tend to see things alike and that therefore scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis.
SC.H.1.4.5	understand that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors.
SC.H.1.4.6	understand that, in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that, in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings.
SC.H.1.4.7	understand the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings.
SC.H.2.4.1	know that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex, but that scientists operate on the belief that the rules can be discovered by careful, systemic study.
SC.H.2.4.2	know that scientists control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural occurrences to discern patterns.

3. Demonstrate use of relevant terminology.

4. Analyze oxidation/reduction reactions and solve problems in electrochemistry.

5. Analyze and evaluate qualitative and quantitative problems in acid/base and ionic equilibria.

6. Analyze reaction mechanisms and rates of reactions.

SC.A.1.4.1 know that the electron configuration in atoms determines how a substance reacts and how much energy is involved in its reactions.

SC.A.1.4.4 experiment and determine that the rates of reaction among atoms and molecules depend on the concentration, pressure, and temperature of the reactants and the presence or absence of catalysts.

7. Demonstrate basic knowledge of nuclear chemistry and solve transmutation and decay problems.

SC.A.2.4.3 know that a number of elements have heavier, unstable nuclei that decay, spontaneously giving off smaller particles and waves that result in a small loss of mass and release a large amount of energy.

SC.A.2.4.4 know that nuclear energy is released when small, light atoms are fused into heavier ones.

SC.C.2.4.4 know that the forces that hold the nucleus of an atom together are much stronger than electromagnetic force and that this is the reason for the great amount of energy released from the nuclear reactions in the sun and other stars.

8. Demonstrate understanding of the applications of organic chemistry and its nomenclature (e.g., polymerization, hydrogenation, catalysis).

9. Demonstrate fundamental knowledge of biochemistry.

SC.B.1.4.1 understand how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth).

SC.F.1.4.1 know that the body processes involve specific biochemical reactions governed by biochemical principles.

SC.G.1.4.3 know that the chemical elements that make up the molecules of living things are combined and recombined in different ways.

10. Demonstrate understanding of the geometry of molecules and the implications of their structures.

SC.A.1.4.2 know that the vast diversity of the properties of materials is primarily due to variations in the forces that hold molecules together.

11. Analyze and evaluate problems in thermodynamics and equilibrium.

SC.A.1.4.3 know that a change from one phase of matter to another involves a gain or loss of energy.

SC.B.1.4.6 know that the first law of thermodynamics relates the transfer of energy to the work done and the heat transferred.

SC.B.1.4.7 know that the total amount of usable energy always decreases, even though the total amount of energy is conserved in any transfer.

12. Investigate various and common methods of qualitative and quantitative chemical analysis.

13. Demonstrate understanding of the connections of chemistry with technology, society, and the environment.

SC.B.1.4.5	know that each source of energy presents advantages and disadvantages to its use in society (e.g., political and economic implications may determine a society's selection of renewable or nonrenewable energy sources).
SC.G.2.4.6	know the ways in which humans today are placing their environmental support systems at risk (e.g., rapid human population growth, environmental degradation, and resource depletion).
SC.H.3.4.1	know that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure.
SC.H.3.4.2	know that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science.
SC.H.3.4.3	know that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events.
SC.H.3.4.4	know that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.
SC.H.3.4.5	know that the value of a technology may differ for different people and at different times.
SC.H.3.4.6	know that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.