*Unit 1. Introduction to Chemistry

Content Area: **Science**
Course(s):
Time Period: **September**
Length: **10 blocks**
Status: **Published**

Enduring Understandings

Chemistry explains the natural world.

Properties can be used to classify, identify and separate matter, explain structure and function.

Solving problems requires an appreciation of the big picture.

Dimensional Analysis is a useful tool.

The modern model of the atom has evolved over a long period of time through the work of many scientists

Scientists use a very precise means of measurement and the understanding of measurement and units is important to chemistry.

Essential Questions

Are all laboratory activities approached in the same matter?

Why is Chemistry important?

Why is it necessary to use a common set of measurement units?

How do scientists express the degree of uncertainty in their measurements?

To what extent is data reliable?

How is dimensional analysis used to solve problems in Chemistry?

How are scientific models developed and used to understand structure and properties of systems?

Is Chemistry present in everyday life? What are some representative examples?

What give matter its particular chemical and physical properties?

How does one characterize and classify substances as elements, compounds, and mixtures?

Student Learning Objectives (PE, SEP, DCI, CCC) & Aligned Standards

Performance Expectations:

HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

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.

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand

	how to bring innovation to an organization.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.

Concepts & Skills

Appropriately use measurement tools in the laboratory.

Record measurements to the correct number of sig figs, use rules for sig figs in calculations to correctly round off numbers.

Identify and use SI units in calculations.

Identify and describe physical properties.

Identify chemical properties.

Distinguish between mixtures, compounds, and pure elements.

Classify matter as homogeneous or heterogeneous.

List observations that suggest a chemical change.

Solve problems by Dimensional Analysis.

Use Conversion Factors to solve problems.

Compare protons, neutrons, and electrons with regard to mass, charge, and location in the atom.

Model the development of atomic theory.

Convert measurements to scientific notation.

Distinguish among accuracy, precision, and error.

Determine the number of significant figures in a measurement and in a calculation.

Construct conversion factors from equivalent measurements.

Apply the technique of dimensional analysis to a variety of conversion problems.

Solve problems by breaking the solution into steps.

Convert complex units using dimensional analysis.

Calculate the density from experimental data.

Describe how density varies with temperature using graphica representation.

Resources

Physical and Chemical Changes Lab Activity

Observing a Chemical Reaction

POGIL activities - law of conservation of mass, physical vs chemical changes, accuracy vs precision, Experiment by Design