**Unit 1: Introduction to Chemistry

Content Area: **Science**
Course(s):
Time Period: **September**
Length: **8 Blocks**
Status: **Published**

Unit Summary

The world of chemistry can be divided into three areas: atomic (the world you cannot see), macroscopic (the world you can able to see,); and constructive (the symbolism used by chemists). Chemists acquire meaningful data through precise and meaningful measurements. Evaluating and analyzing the validity of acquired knowledge and experimental data are all important in scientific discovery. The acquisition of new scientific knowledge requires initiative, flexibility, and creativity.

Essential Questions

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?

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?

What is an atom?

How many types of atoms make up an element?

How many types of atoms make up a compound?

What are the three subatomic particles?

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-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.

Concepts & Formative Assessment

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. (Students will not have to memorize)

Identify and describe physical properties. (Students will not have to memorize each type but identify)

Identify chemical properties.(Students will not have to memorize each type but identify)

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. (With guidance, students will not have to memorize)

Use Conversion Factors to solve problems. (With guidance, students will not have to memorize)

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

Convert measurements to scientific notation. (Only 1x10^1, ^2, ^3, ^-1, ^-2,)

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

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

Solve problems by breaking the solution into steps.

Resources

POGIL activities - measurement, law of conservation of mass, physical vs chemical changes,

Lab activities - measurement, conversions, mass vs. matter, physical vs chemical changes,

Guided Notes

Observing a Chemical Reaction

Assessments

Assessments will be aligned to the Performance Expectations and will include a variety of assessment types such as labs, writing prompts, and projects.

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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.]

Connecting with English Language Arts Literacy and Mathematics

Connections to English Language Arts/Literacy-

Translate information from the periodic table about the patterns of electrons in the outermost energy level of

atoms into words that describe the relative properties of elements.

Write 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 of elements using well-chosen, relevant, and sufficient facts; extended definitions; and concrete details from students' own investigations, models, theories, simulations, and peer review.

Develop and strengthen explanations for the outcome of a simple chemical reaction by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties of elements.

Draw evidence from informational texts about the outermost electron states of atoms, trends in the periodic table, and patterns of chemical properties of elements to construct a rigorous explanation of the outcome of a simple chemical reaction.

Cite specific textual evidence comparing the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

Conduct short as well as more sustained research projects to compare the structure of substances at the bulk scale and use this research to infer the strength of electrical forces between particles.

Gather applicable information from multiple reliable sources to support the claim that electrical forces between particles can be used to explain the structure of substances at the bulk scale.

Develop evidence comparing the structure of substances at the bulk scale and the strength of electrical forces between particles.

Connections to Mathematics-

Determine a level of accuracy appropriate to limitations on measurement when reporting quantities representing periodic trends for main group elements based on patterns of electrons in the outermost energy level of atoms.

Considering the outermost energy level of atoms, define appropriate quantities for descriptive modeling of periodic trends for main group elements based on patterns of electrons in outermost energy levels.

Use units as a way to understand the outcome of a simple chemical reaction involving main group elements based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. Choose and interpret units consistently in chemical reactions.

Determine and interpret the scale and origin in graphs and data displays representing patterns of chemical properties, outer electron states of atoms, trends in the periodic table, and patterns of chemical properties.

Determine a level of accuracy appropriate to limitations on measurement when reporting quantities of simple chemical reactions.

Use units as a simple way to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. Choose and interpret units comparing the structure of substances at the bulk scale to infer the strength of electrical forces between particles. Choose and interpret the scale and origin in graphs and data displays comparing the structure of substances and the bulk scale and electrical forces

between particles.

Determine a level of accuracy appropriate to limitations on measurements of the strength of electrical forces between particles.

Modifications

Teacher Note: Teachers identify the modifications that they will use in the unit. The unneeded modifications can then be deleted from the list.

Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via

Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

Use project-based science learning to connect science with observable phenomena.

Structure the learning around explaining or solving a social or community-based issue.

Provide ELL students with multiple literacy strategies.

Collaborate with after-school programs or clubs to extend learning opportunities.

Prior Learning

By the end of Grade 8, students know that:

Physical science-

Substances are made from different types of atoms, which combine with one another in various ways.

Atoms form molecules that range in size from two atoms to thousands of atoms.

Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.

Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.

In a liquid, the molecules are constantly in contact with others.

In a gas, they are widely spaced except when they happen to collide.

In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.

Solids may be formed from molecules or they may be extended structures with repeating subunits (e.g., crystals).

The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.

Substances react chemically in characteristic ways.

In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.

The total number of each type of atom is conserved, and thus the mass does not change.

Some chemical reactions release energy, others store energy.

The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics.

These physical and chemical properties include water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting point of rocks.