

Grade 8 Science-Technology/Engineering

Physical Science

Chemistry – Properties of Matter

Students will be able to:

- Define mass and weight.
- Describe the difference between mass and weight.
- Describe force due to gravity.
- Define mass, volume, and density.
- Apply the ratio of mass to volume in order to find an object's density.
- Determine an object's density by calculation and experimentation.
- Compare densities of substances.
- Compare the different units of measurement in the metric system.
- Demonstrate how to measure using standard metric units of distance, volume, mass, and temperature.
- Identify the common laboratory tools used to measure length, volume, mass, and temperature.
- Define and give an example of the law of conservation of mass.
- Demonstrate an understanding of conservation of mass by giving examples.
- Define element and Periodic Table of Elements.
- Describe the design of the modern Periodic Table.
- Discuss how groups or families contain elements with similar properties.
- Explain how properties of elements vary across a horizontal row or period.
- Gather information from the element key on the Period Table (# of protons, neutron, and electrons).
- Define atomic number and atomic mass.
- Distinguish between an atom and a molecule.
- Correlate the interaction of protons, neutrons, and electrons in an atom.
- Diagram the atom using information gathered from the Periodic Table (chemical families, metal, etc.).
- Compare and contrast elements and compounds.
- Name common elements and their chemical symbols.
- Explain why elements and compounds are pure substances.
- Write chemical formulas for common compounds.
- Classify substances through observation of characteristic properties that include density, boiling point, and solubility.
- Describe the concept of a molecule.
- Differentiate between physical and chemical changes.
- Correlate the interaction of protons, neutrons, and electrons in an atom.
- Explain conservation of mass.
- Differentiate between mixtures and chemical compounds.
- Define properly utilize the following terms in scientific discussions: solids, liquids,

gasses, density, temperature, absolute temperature, constant pressure, and volume.

- Explain elements, atoms, and the Periodic Table (chemical families, metal, etc.).
- Define relationship between atomic numbers, mass numbers, isotopes, and atomic mass.
- Differentiate between mixtures and chemical compounds.
- Describe the properties of mixtures.
- Distinguish between homogeneous and heterogeneous mixtures.
- Identify the phase changes in matter.
- Explain how adding or taking away energy will cause a phase change.
- Classify substances through observation of characteristic properties: density, boiling point, and solubility.
- Distinguish between physical and chemical properties of matter.
- Distinguish between a physical change and a chemical change.

Physics – Motion and Forces

Students will be able to:

- Define and give examples of speed, velocity, acceleration, and inertia.
- Explain the difference between speed and velocity. Discuss.
- Demonstrate an understanding of relationship of mass to motion, inertia, balanced and unbalanced forces.
- Using appropriate data, construct distance versus time graphs. Discuss.
- Compare and explain graphs illustrating constant and changing speed.

Physics – Energy

Students will be able to:

- Define and give examples of kinetic and potential energy.
- Define and give an example of the Law of Conservation of Energy.
- Discuss the factors that are involved in the determination of potential and kinetic energy.
- Explain and demonstrate where the transformation between potential and kinetic energy occurs, and visa versa. Explain the transformation as it relates to different forms of energy.
- Define and discuss heat as a type of energy.
- Explain the difference between heat and temperature.
- Discuss the different states of matter from the molecular approach.
- Identify, discuss, and explain the physical change process that occurs between the different phases of matter.
- Identify and define the temperatures at which the phase changes occur.
- Define and compare convection, conduction, and radiation.
- Discuss examples of heat movement in different materials and in the environment.

NOTE: The following topics are not in the State Frameworks, but are part of the WRSD Science Curriculum:

Students will be able to:

- Explain what a wave is in terms of energy.
- Classify waves that require a medium as transverse or longitudinal.
- Identify the crest and trough of a transverse wave and compressions and rarefactions in a

longitudinal wave.

- Define wavelength, frequency, and amplitude.
- Describe the properties of sound waves.
- Explain how frequency and pitch are related.
- Describe the Doppler Effect.
- Explain the relationship between light energy and the atom.
- Describe the properties of electromagnetic waves.
- Describe how light travels.
- Identify the parts of the EM spectrum.
- Explain the relationship between wavelength and frequency.
- Distinguish between the particle and wave properties of light.
- Describe the process of reflection and refraction of light.
- Distinguish materials that are translucent, transparent, or opaque.

Technology/Engineering

Engineering Design Process

Students will be able to:

- Identify, explain, and demonstrate the safe use of appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate.
- Identify, explain, and demonstrate the safe use of measuring tools, hand tools, and machines (band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) by constructing a prototype of an engineering design.
- Identify and explain the steps of the engineering design process: identify the need or problem; research the problem; develop possible solutions; select the best possible solution(s); construct a prototype; test and evaluate; communicate the solution(s); and redesign.
- Demonstrate methods of representing solutions to a design problem (sketches, orthographic projections, and multi-view drawings).
- Explain how design features such as size, shape, weight, function, and cost limitations (ergonomics) would affect the construction of a given prototype.
- Discuss the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback as it related to a given system.

Design World

Students will be able to:

- Explain and give examples of primary and secondary manufacturing systems.
- Describe and explain the manufacturing systems of custom and mass production.
- Explain and give examples of the impacts of interchangeable parts, components of mass-produced products, and the use of automation such as robotics.
- Organize and operate a manufacturing organization to produce a product (corporate structure, research and development, production, marketing, quality control, and distribution).
- Explain basic processes in manufacturing systems (cutting, shaping, assembling,

joining, finishing, quality control, and safety).

- Identify and explain the components of a communication system (source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination).
- Identify and explain the appropriate tools, machines and electronic devices (drawing tools, computer-aided design, and cameras) used to produce and/or reproduce design solutions (engineering drawings, prototypes, and reports).
- Identify and compare communication technologies and systems (audio, visual, printed, and mass communication).
- Identify and explain how symbols and icons (international symbols and graphics) are used to communicate a message.