

# Science – Technology/Engineering Curriculum Guide

## Preface

### Grade 8

Unifying Concepts and Processes	Content	Science Applications
<p><b>Systems, Order, &amp; Organization</b> Laws of force, motion, classification of organisms, planetary motion.</p> <p><b>Evidence, Models, Explanation</b> Prediction, probability, hypotheses, models, laws.</p> <p><b>Constancy, Change, Measurement</b> Rate, scale, patterns, trends, cycles.</p> <p><b>Evolution &amp; Equilibrium</b> Changes in environment, populations, ecosystems, conservation of energy, natural- and human- induced hazards.</p> <p><b>Form &amp; Function</b> Diversity and adaptation of organisms, interaction of energy and matter, behavior of organisms.</p>	<p><b><u>Physical Science:</u></b> <b><u>Chemistry – Properties of Matter</u></b></p> <ul style="list-style-type: none"> <li>• Define mass and weight.</li> <li>• Describe the difference between mass and weight.</li> <li>• Describe force due to gravity.</li> <li>• Define mass, volume, and density.</li> <li>• Apply the ratio of mass to volume in order to find an object’s density.</li> <li>• Determine an object’s density by calculation and experimentation.</li> <li>• Compare densities of substances.</li> <li>• Compare the different units of measurement in the metric system.</li> <li>• Demonstrate how to measure using standard metric units of distance, volume, mass, and temperature.</li> </ul>	<p>Identify a problem or design an opportunity.</p> <p>Propose designs and choose between alternative solutions.</p> <p>Implement a proposed solution.</p> <p>Evaluate the solution and its proposed consequences.</p> <p>Communicate the problem, process, and solution.</p> <p><b>Science: Personal &amp; Social Perspectives</b></p> <hr/> <p>Personal and community health.</p> <p>Population growth.</p> <p>Natural resources.</p> <p>Environmental quality.</p> <p>Natural- and Human-induced hazards.</p>

## Science as Inquiry

---

Identify questions and concepts that guide scientific investigation.

Design and conduct scientific investigation.

Use technology and mathematics to improve investigation and communication.

Formulate and revise scientific explanations and models using logic and evidence

- 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 Periodic Table (# of protons, neutrons, 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.

## History and Nature of Science

---

### Science as Human Endeavor

Requiring reasoning, insight, energy, skill, and creativity, as well as habits of mind, i.e., intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.

### Nature of Scientific Knowledge

Including evaluation of experiments, observations, theoretical models, proposed explanations, evidence, reasoning, and alternate conclusions.

### Historical Perspectives

Including the study of famous scientists and discoveries, i.e., Copernicus, Newton, Relativity, Geologic time, Plate Tectonics, Atomic Theory, Nuclear Physics, Biological Evolution, Germ Theory, Industrial Revolution, Molecular Biology, Information & Communication, Quantum Theory, Galactic Universe, Medical & Health Technology.

- 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 utilizing 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**

- 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**

- 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:***

- 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**

- Identify, explain, and demonstrate the safe use of appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate.

- |  |  |  |
|--|--|--|
|  | <ul style="list-style-type: none"><li>• 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.</li><li>• 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.</li><li>• Demonstrate methods of representing solutions to a design problem (sketches, orthographic projections, and multi-view drawings).</li><li>• Explain how design features such as size, shape, weight, function, and cost limitations (ergonomics) would affect the construction of a given prototype.</li><li>• Discuss the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback as it relates to a given system.</li></ul> |  |
|--|--|--|

### **Design World**

- 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).

- |  |   |  |
|--|---|--|
|  | <ul style="list-style-type: none"><li>• 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).</li><li>• Identify and compare communication technologies and systems (audio, visual, printed, and mass communication).</li><li>• Identify and explain how symbols and icons (international symbols and graphics) are used to communicate a message.</li></ul> |  |
|--|---|--|