

# INSTRUCTIONAL FOCUS DOCUMENT

## Grade 6/Science



**UNIT: 02      TITLE: Physical Properties of Matter**

**SUGGESTED DURATION: 17 days**

Exemplar Lesson 01: Classifying Metals, Nonmetals, and Metalloids  
 Exemplar Lesson 02: Physical Properties of Minerals



**State Resources:**

### **RATIONALE:**

This unit bundles SEs that address using physical properties, such as luster, conductivity, malleability, density, hardness, color and streak to classify matter.

Prior to this unit, students have had many opportunities to explore the concepts of identifying and classifying matter based upon physical properties in Grades 3-5. They have been introduced to the concept of relative density, but have not been introduced to calculating density. They will not be introduced to the concepts of elements or compounds until later in the year. During this unit, students learn to calculate density for regular and irregular objects. Students compare metals, nonmetals, and metalloids using physical properties. The concept of minerals is not addressed in the Earth Science units for this grade; therefore, the focus is on testing the physical properties for classification, not on the minerals themselves. After this unit, students will develop understandings of the concepts of elements and compounds.

Although the periodic table is not taught in Grade 6, this is an important foundation piece for students in Grade 8 to enable them to explain how elements are arranged by properties in the periodic table (metals, nonmetals and metalloids.) and builds content for Readiness Standard 8.5C. The concept of identifying matter by comparing metals, nonmetals and metalloids is tested as a STAAR Grade 8 Assessment Supporting Standard under Reporting Category 1: Matter and Energy. There are no TEKS to support this concept in Grade 7. The calculation of density can be used in the next grades, but it is explicitly taught only at Grade 6 and will be tested as a STAAR Grade 8 Assessment Supporting Standard under Reporting Category 1: Matter and Energy.

According to the American Association for the Advancement of Science (AAAS), in the *Benchmarks for Science Literacy (Project 2061)* [online version], “by the end of 8<sup>th</sup> grade, students should know that a substance has characteristic properties such as density, a boiling point, and solubility, all of which are independent of the amount of the substance and can be used to identify it.”

American Association for the Advancement of Science. (2009). *Benchmarks on-line*. Retrieved October 13, 2009, from <http://www.project2061.org/publications/bsl/online>



### **MISCONCEPTIONS/UNDERDEVELOPED CONCEPTS:**

#### **MISCONCEPTIONS:**

- Students may think that all metals are magnetic.
- Students may think that metals, nonmetals, and metalloids can only be solids.
- Students may think that any crystal that scratches glass is a diamond.
- Students may think that minerals “grow.”
- Students may think that testing for hardness is a good way to identify rocks.

PERFORMANCE INDICATORS	CONCEPTS	KEY UNDERSTANDINGS FOR LEARNERS
Compare a sample of a metal, a nonmetal, and a metalloid using physical properties including luster, conductivity,	Properties – Physical	Metals and nonmetals have specific properties, which can

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PERFORMANCE INDICATORS	CONCEPTS	KEY UNDERSTANDINGS FOR LEARNERS
malleability, magnetism, ductility, and state of matter. Calculate the density of each sample and explain in writing how the properties of each element relate to its classification. Display the results in a graphic organizer, such as a three-flap flip book. (6.2A; 6.6A, 6.6B) ELPs 5B, 5G	Constancy – Properties  Nature of Science – Critical Thinking	be used to determine their identity and classification.  Metalloids are substances that may exhibit some properties of both metals and nonmetals.  Density of an unknown substance can be calculated to determine the identity of an unknown substance.
Test the physical properties including hardness, color, luster, and streak, and calculate the density of an unknown mineral. Chose a graphic organizer to record the results. (6.2D; 6.6B, 6.6C) ELPs 1C, 1E	Properties – Physical  Constancy – Properties  Nature of Science	Minerals have characteristic properties, such as density, which are independent of the amount of the sample.

KEY ACADEMIC VOCABULARY SUPPORTING CONCEPTUAL DEVELOPMENT
<ul style="list-style-type: none"> <li>• <b>Metals</b> – substances that have the physical properties of luster, conductivity, malleability, ductility, and may appear in all three states of matter</li> <li>• <b>Nonmetals</b> – substances that have the physical properties of being dull, insulators, brittle, and may appear in all three states of matter</li> <li>• <b>Metalloids</b> – substances that exhibit some properties of metals and nonmetals</li> </ul>

TEKS# SE#	TEKS	SPECIFICITY
6.2	<i>Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and field investigations. The student is expected to:</i>	
6.2A	<b>Plan and implement comparative and descriptive investigations by making observations, asking well-defined questions, and using appropriate equipment and technology.</b>	Plan, Implement  COMPARATIVE INVESTIGATIONS  Including, but not limited to: <ul style="list-style-type: none"> <li>• Making observations</li> <li>• Asking well-defined questions</li> <li>• Using appropriate equipment and technology</li> </ul>
6.2C	<b>Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.</b>	Collect, Record  DATA  Including, but not limited to: <ul style="list-style-type: none"> <li>• Using the international system of units (SI)</li> <li>• Qualitative means</li> </ul>

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TEKS# SE#	TEKS	SPECIFICITY
		<ul style="list-style-type: none"> <li>• Writing</li> <li>• Graphic organizers</li> </ul>
6.2D	Construct tables and graphs, using repeated trials and means, to organize data and identify patterns.	Construct  TABLES AND GRAPHS  Including, but not limited to: <ul style="list-style-type: none"> <li>• Using repeated trials and means</li> <li>• Organize data</li> <li>• Identify patterns</li> </ul>
6.2E	Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.	Analyze  DATA  Including, but not limited to: <ul style="list-style-type: none"> <li>• Formulate reasonable explanations</li> <li>• Communicate valid conclusions</li> <li>• Predict trends</li> </ul> 2061 Note: By the end of the 8th grade, students should know that: <ul style="list-style-type: none"> <li>• Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as correct. 1A/M1b</li> </ul>
6.4	<i>Scientific investigation and reasoning. The student knows how to use a variety of tools and safety equipment to conduct science inquiry. The student is expected to:</i>	
6.4A	Use appropriate tools to collect, record, and analyze information, including journals/notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, triple beam balances, microscopes, thermometers, calculators, computers, timing devices, and other equipment as needed to teach the curriculum.	Use  APPROPRIATE TOOLS TO COLLECT, RECORD, AND ANALYZE INFORMATION  Including, but not limited to: <ul style="list-style-type: none"> <li>• Journals/notebooks</li> <li>• Graduated cylinders</li> <li>• Hot plates</li> <li>• Triple beam balances</li> <li>• Calculators</li> <li>• Other equipment as needed to teach the curriculum</li> </ul>
6.6	<i>Matter and energy. The student knows matter has physical properties that can be used for classification. The student is expected to:</i>	
6.6A	Compare metals, nonmetals, and metalloids using physical properties such as luster, conductivity or malleability.  <i>Supporting Standard</i>	Compare  METALS, NONMETALS, AND METALLOIDS USING PHYSICAL PROPERTIES  Including, but not limited to:

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TEKS# SE#	TEKS	SPECIFICITY
		<ul style="list-style-type: none"> <li>• Luster</li> <li>• Conductivity</li> <li>• Malleability</li> <li>• Magnetism</li> <li>• Ductility</li> <li>• State of matter</li> </ul>
6.6B	<b>Calculate density to identify an unknown substance.</b>  <i>Supporting Standard</i>	Calculate  DENSITY  Including, but not limited to: <ul style="list-style-type: none"> <li>• Using water displacement to determine the volume of an irregularly shaped object</li> <li>• Using l x w x h, measure and calculate the volume of a cube</li> <li>• Using <math>D = m/v</math>, calculate density of objects</li> </ul>
6.6C	<b>Test the physical properties of minerals, including hardness, color, luster, and streak.</b>	Test  PHYSICAL PROPERTIES OF MINERALS  Including, but not limited to: <ul style="list-style-type: none"> <li>• Hardness</li> <li>• Color</li> <li>• Luster</li> <li>• Streak</li> </ul>

TEKS# SE#	Scientific Process TEKS: Use appropriate Scientific processes to support instruction.
6.1	<b>Scientific investigation and reasoning. The student, for at least 40% of instructional time, conducts laboratory and field investigations following safety procedures and environmentally appropriate and ethical practices. The student is expected to:</b>
6.1A	<b>Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.</b>
6.1B	<b>Practice appropriate use and conservation of resources, including disposal, reuse, or recycling of materials.</b>
6.2	<b>Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and field investigations. The student is expected to:</b>
6.2A	<b>Plan and implement comparative and descriptive investigations by making observations, asking well-defined questions, and using appropriate equipment and technology.</b>
6.2B	<b>Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology.</b>
6.2C	<b>Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.</b>
6.2D	<b>Construct tables and graphs, using repeated trials and means, to organize data and identify patterns.</b>
6.2E	<b>Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.</b>
6.3	<b>Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions</b>

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TEKS# SE#	Scientific Process TEKS: Use appropriate Scientific processes to support instruction.
	<i>of relevant scientists. The student is expected to:</i>
6.3A	In all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student.
6.3B	Use models to represent aspects of the natural world such as a model of Earth's layers.
6.3C	Identify advantages and limitations of models such as size, scale, properties, and materials.
6.3D	Relate the impact of research on scientific thought and society, including the history of science and contributions of scientists as related to the content.
6.4	<i>Scientific investigation and reasoning. The student knows how to use a variety of tools and safety equipment to conduct science inquiry. The student is expected to:</i>
6.4A	Use appropriate tools to collect, record, and analyze information, including journals/notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, triple beam balances, microscopes, thermometers, calculators, computers, timing devices, and other equipment as needed to teach the curriculum.
6.4B	Use preventative safety equipment, including chemical splash goggles, aprons, and gloves, and be prepared to use emergency safety equipment, including an eyeface wash, a fire blanket, and a fire extinguisher.

<p>The <b>English Language Proficiency Standards (ELPS)</b>, as required by 19 Texas Administrative Code, Chapter 74, Subchapter A, §74.4, outline English language proficiency level descriptors and student expectations for English language learners (ELLs). School districts are required to implement ELPS as an integral part of each subject in the required curriculum.</p> <ul style="list-style-type: none"> <li>– School districts shall provide instruction in the knowledge and skills of the foundation and enrichment curriculum in a manner that is linguistically accommodated commensurate with the student's levels of English language proficiency to ensure that the student learns the knowledge and skills in the required curriculum.</li> <li>– School districts shall provide content-based instruction including the cross-curricular second language acquisition essential knowledge and skills in subsection (c) of the ELPS in a manner that is linguistically accommodated to help the student acquire English language proficiency.</li> </ul> <p><a href="http://ritter.tea.state.tx.us/rules/tac/chapter074/ch074a.html#74.4">http://ritter.tea.state.tx.us/rules/tac/chapter074/ch074a.html#74.4</a></p>	
ELPS#	Subsection C: Cross-curricular second language acquisition essential knowledge and skills.
C(1)	<i>Cross-curricular second language acquisition/learning strategies. The ELL uses language learning strategies to develop an awareness of his or her own learning processes in all content areas. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:</i>
1C	Use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary.
1E	Internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment.
C(5)	<i>Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:</i>
5B	Write using newly acquired basic vocabulary and content-based grade-level vocabulary.
5G	Narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired.