



Marietta City Schools

District Unit Planner

Everything on the unit planner must be included on the unit curriculum approval statement.

Science Grade 8

<b>Unit title</b>	<i>Thermal Energy and Phase Changes</i>	<b>MYP year</b>	3	<b>Unit duration (hrs)</b>	20 Hours
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**Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?***

### GSE Standards

#### Standards

#### **S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.**

- b. Develop and use models to describe the movement of particles in solids, liquids, gases, and plasma states when thermal energy is added or removed.
- c. Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling point) properties of matter.
- d. Construct an argument based on observational evidence to support the claim that when a change in a substance occurs, it can be classified as either chemical or physical. (Clarification statement: Evidence could include ability to separate mixtures, development of a gas, formation of a precipitate, change in energy, color, and/or form.)

#### **S8P2.**

- d. Plan and carry out investigations of the effects of heat transfer on molecular motion as it relates to the collision of atoms (conduction), through space (radiation), or in currents in a liquid or gas (convection).

#### **Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)**

##### **In fifth grade, students should have mastered:**

S5P1. Obtain, evaluate, and communicate information to explain the differences between a physical change and a chemical change.

- b. Construct an argument based on observations to support a claim that the physical changes in the state of water are due to temperature changes, which cause small particles that cannot be seen to move differently.

**Concepts/Skills to be Mastered by Students**

- Matter (structure, composition, properties)
- Thermal Energy
- States of Matter
- Chemical and Physical Properties and Changes

**Key Vocabulary: (KNOWLEDGE & SKILLS)**

molecule, atom, particle, state, solid, liquid, gas, plasma, physical property, melting point, boiling point, freezing point, physical change, chemical change, chemical reaction, precipitate, thermal energy, metal, non-metal, conduction, convection, radiation, heat, macro scale, molecular scale, temperature, kinetic energy, speed/velocity,

**Year-Long Anchoring Phenomena: (LEARNING PROCESS)**

Human Need for Energy

**Unit Phenomena (LEARNING PROCESS)**

The Science of Cooking and Eating

Which design is best for heating/insulating?

**Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)**

- Students have familiarity with the concept of solids, liquids, and gases. Even though students have studied the sun in 6th Grade Earth Science, the concept of plasma being the 4th state of matter may be new to them.
- Students often mistake phase changes for a chemical, rather than physical change.
- Students often confuse melting point and boiling point as chemical properties, rather than physical properties.

Key concept	Related concept(s)	Global context
<p style="text-align: center;"><b>Change (MYP/CCC)</b></p> <p>Change is a conversion, transformation or movement from one form, state, or value to another. Inquiry into the concept of change involves understanding and evaluating causes, processes and consequences.</p>	<p style="text-align: center;">Energy (MYP/CCC)</p>	<p style="text-align: center;"><b>Scientific and technical innovation</b></p> <p>Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.</p>
<b>Statement of inquiry</b>		
<p>Scientific and technical innovations enable us to use thermal energy changes for practical applications.</p>		

### Inquiry questions

#### Factual

- What are the similarities/differences between solids, liquids, gases, and plasma?
- What happens to the molecules of a substance when it changes phase?
- What causes changes in molecular motion?
- What are the methods of thermal energy transfer?

#### Conceptual

- Why can transferring energy into or out of a substance change molecular motion?
- How does the appearance of a substance change when it changes phase?
- How does the addition or removal of thermal energy impact the movement of particles in solids, liquids, and gases?
- How can I use what I know about thermal energy to design an insulating device?

#### Debatable

- What device design will be best for insulating a substance from temperature changes?

MYP Objectives	Assessment Tasks	
<i>What specific MYP <b>objectives</b> will be addressed during this unit?</i>	<i>Relationship between summative assessment task(s) and statement of inquiry:</i>	<i>List of common formative and summative assessments.</i>
Science A: Knowing and Understanding I. describe scientific knowledge li. apply scientific knowledge and understanding to solve problems Science B:	Scientists and technical innovations allow us to use thermal energy changes for practical applications. Throughout the unit, students are challenged to demonstrate their knowledge and conceptual understanding of how changes in matter occur at the atomic level when thermal energy is added or removed. The MYP Unit assessments require students to examine models of matter in different states and determine not only the state, but whether thermal energy was added or removed in order for the change to occur. Students are also required to predict and model how molecules will behave with the addition or removal of thermal energy. Ultimately, students are challenged with designing their own insulating system using the principles of thermal energy they have learned.	<b><u>Formative Assessment(s):</u></b> Solid, Liquid, Gas CFA <b><u>Summative Assessment(s):</u></b> Thermal Energy & Phase Changes Unit Assessment Paper I and Paper II (Science A,D)

<p>I. describe a problem or question to be answered by a scientific investigation</p> <p>Science C: Processing and Evaluating</p> <p>I. present collected and transformed data</p> <p>li. interpret data and describe results using scientific reasoning</p> <p>Science D: Reflecting on the Impact of Science</p> <p>I. describe the ways science is applied and used to address a specific problem or issue</p> <p>lii. apply scientific knowledge effectively</p> <p>Design A: Inquiring and Analyzing</p> <p>lii. analyze a group of similar products that inspire a solution to the problem</p> <p>Design B:</p> <p>lv. develop accurate planning drawings/diagrams and outline requirements for the creation of the chosen solution</p> <p>Design C:</p> <p>I. construct a logical plan, which outlines the efficient use of time and resources,</p>		<p>Design an Insulating System to Demonstrate How the Transfer of Thermal Energy (CCR) Affects Particle Motion (Design: B-D)</p>
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<p>sufficient for peers to be able to follow to create the solution</p> <p>lii. follow the plan to create the solution, which functions as intended</p> <p>Design D:</p> <p>li. explain the success of the solution against the design specification</p>		
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**Approaches to learning (ATL)**

**Category:** Communication

**Cluster:** Communication Skills: How can students demonstrate communication through language?

**Skill Indicator:** Read critically and for comprehension; Take effective notes in class.

**Learning Experiences**

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
S8P1.b. Develop and use models to describe the movement of particles in solids, liquids, gases, and plasma states when thermal energy is added or removed.	Boiling Ice Lab Boiling Ice Data Table States of Matter Choice Board Designing an Insulating Device	<ul style="list-style-type: none"> <li>● Discovery Education Science Techbook</li> <li>● NGSS Case Studies for Differentiated Learners</li> <li>● Next Generation Science Standards: “All Standards, All Students”</li> <li>● Extensions – Enrichment Tasks/Projects</li> </ul> <p>All information included by PLC in the differentiation box is the responsibility and ownership of the local school to review and approve per Board Policy IKB.</p> <p>Task-Specific Differentiation</p> <ul style="list-style-type: none"> <li>● Scaffolding</li> <li>● Leveled Tasks</li> <li>● Choice Board</li> <li>● Mode/Method of Representation/Presentation (text, SIM, video, laboratory investigation)</li> <li>● Type of Product/Design</li> </ul>
S8P1.c. Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling point) properties of matter.	Boiling Ice Lab	
S8P1.d. Construct an argument based on observational evidence to support the claim that when a change in a substance occurs, it can be classified as either chemical or physical.	Boiling Ice Lab	
S8P2.d. Plan and carry out investigations of the effects of heat transfer on molecular motion as it relates to the collision of atoms	Heat Exploration Activity Heat Transfer Elaboration Lab	

(conduction), through space (radiation), or in currents in a liquid or gas (convection).	Designing an Insulating Device	
<b>Content Resources</b>		
<p>Georgia Grade 8 Science: Interactions of Matter and Energy Instructional Segment</p> <p>Georgia Grade 8 Science: Structure and Properties of Matter Instructional Segment</p> <p>Discovery Education Grade 8 Science Techbook</p> <p>Mosa Mack: States of Matter</p> <p>Mosa Mack: Thermal Energy</p>		