



Marietta City Schools
2023–2024 District Unit Planner

Science Grade 8

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

GA DoE 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. Obtain, evaluate, and communicate information about the law of conservation of energy to develop arguments that energy can transform from one form to another within a system.

- 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
Change (MYP/CCC) 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.	Energy (MYP/CCC)	Scientific and technical innovation 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.
Statement of inquiry		
Scientific and technical innovations enable us to use thermal energy changes for practical applications.		
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 objectives 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: I. describe a problem or question to be answered by a scientific investigation	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.	<u>Formative Assessment(s):</u> Solid, Liquid, Gas CFA <u>Summative Assessment(s):</u> Thermal Energy & Phase Changes Unit Assessment Paper I and Paper II (Science A,D) Design an Insulating System to Demonstrate How the Transfer of Thermal Energy (CCR) Affects Particle Motion (Design: B-D)

<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, sufficient for peers to be able to follow to create the solution</p>		
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lii. follow the plan to create the solution, which functions as intended Design D: li. explain the success of the solution against the design specification		
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.		

<p style="text-align: center;"><u>Learning Experiences</u></p> <p style="text-align: center;">Add additional rows below as needed.</p>		
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"> Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners Next Generation Science Standards: “All Standards, All Students” Extensions – Enrichment Tasks/Projects <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"> Scaffolding Leveled Tasks Choice Board Mode/Method of Representation/Presentation (text, SIM, video, laboratory investigation) Type of Product/Design
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 (conduction), through space (radiation), or in currents in a liquid or gas (convection).	Heat Exploration Activity Heat Transfer Elaboration Lab Designing an Insulating Device	

Content Resources

Georgia Grade 8 Science: Interactions of Matter and Energy Instructional Segment

Georgia Grade 8 Science: Structure and Properties of Matter Instructional Segment: Dinner is Ready

PhET:

States of Matter: Basics

States of Matter: Phase Changes

Discovery Education Grade 8 Science Techbook

Unit 1: Matter

Concept 1.3: States of Matter

Unit 2: Types of Energy

Concept 2.3: Heat and Temperature

Mosa Mack:

States of Matter

Thermal Energy

Argument Driven Inquiry in Physical Science Lab 1: Thermal Energy and Matter: What Happens at the Molecular Level When Thermal Energy is Added to a Substance?