Domain-Based Unit Overview

Title of Domain: Investigating Matter

Big Idea

• This unit focuses on the scientific concept that matter is made up of tiny particles and that the arrangement and behavior of those particles account for matter's properties.

What Students Need to Learn

- Matter is all around us. The things we see—a tree, a window—and even things we can't see—air, the smell of a rose—are all made up of matter. We can describe and identify matter in terms of properties, such as color, hardness, and whether a material conducts electricity or responds to magnetism.
- Matter can exist in different states: as a solid (ice), a liquid (water), or a gas (water vapor). Matter can be mixed to form solutions, such as salt water, or mixtures, such as cement or granite.
- Students will model the concept that matter is made of particles too small to be seen. Later in the unit they will learn that atoms bond together in various ways to make more complex forms of matter.
- Matter undergoes physical changes when a characteristic of the matter changes but the chemical nature remains the same (for example, baking soda dissolved in water). Matter undergoes chemical changes when two types of matter interact to form a new substance (for example, when vinegar is poured into a cup of baking soda). Whether the change is physical or chemical, the amount of matter remains the same.

MN Academic Standards (2019)

- 5P.1.2.1.2
- 5P.1.2.1.3
- 5P.3.1.1.1

Pre-Assessment

1) What is matter?
2) What are the different states of matter and how to do molecules move in each state?
3) What are physical changes to matter?
4) What are chemical changes?
5) How does combining matter form new substances?

Domain Section 1	Properties of Matter (4 Days)
MN Academic Standards	
Objectives	✓*Describe properties that can be used to describe matter.* ✓*Explain what is matter and how you can use properties as evidence to identify matter.*
Vocabulary	Matter, property, design process and solution
Procedure	Lesson 1 1. Gather lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 12 of the teacher guide. Set up six stations around the classroom where students will make observations about matter. Directions for each station setup can be found on teacher guide pages 21 and 22. 2. Teacher: We will begin this unit traveling to different stations and observing familiar objects. While exploring the stations take time to record your observations of matter based on properties you can see, feel, smell, or measure. The goal is to write down as many observations as possible. 3. Students will use the remainder of class to visit each station to make their observations. 4. Exit ticket: a. What is matter? Lesson 2 1. Gather lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 12 of the teacher guide. 2. Review: What is matter? 3. As a large group create a list of properties students used in the activity yesterday to describe matter. Remind students that they are observing and describing physical properties. Physical properties can be measured using different kinds of equipment, such as scales and rulers. 4. Preview chapter 1 vocabulary and learning objectives. 5. Large group read and discuss: "Properties of Matter." 6. Class demonstration: Blow up a small balloon, and ask students to predict whether the balloon will sink or float in a container of water. Encourage students to cite evidence/patterns of past experience to support their answers. Repeat this, asking students

	to support their predictions about whether other objects, such as a rock, will sink or float, using evidence and patterns. Ask what students can observe in this demonstration. 7. Ask the class the following questions: a. What happens to the rock when it is placed in the water? b. What happens to the balloon when it is placed in the water c. Model for students the term buoyancy. For example, "Whether something sinks or floats in water is what is known as the property of buoyancy. A blown-up balloon is more buoyant than a rock." i. How can you tell whether an object is buoyant? d. What other objects do you know that float? That sink? 8. Exit Ticket: a. What properties can I use to describe matter? Lesson 3 *Day 1* 1. Grab lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 12 of the teacher guide. Setup for this lesson will require more time than in previous lessons. Materials for all 12 stations can be located on pages 38 within the teacher guide. 2. Introduce learning targets and vocabulary for lesson. 3. Large group read and discuss: "Applying Properties of Matter." 4. Have students work with a partner to complete each station. This activity will be completed next day. Review any safety concerns and goal of each station. 5. Exit Ticket: a. How can I use properties as evidence to identify matter? *Day 2* 1. Students will complete the activity from yesterday. 2. Large group discussion: a. How were the scratch marks different in the demonstration? b. What evidence does this provide about the materials? c. What happened at Station 1 when you placed the magnet over the different wires? d. What evidence does this provide about the materials? e. What happened at Station 2 when you placed the conductivity tester in the cup with Powder 2?

	f. What happened at Station 2 when you placed the conductivity tester in the cup with Powder 3? g. What evidence does this provide about the materials?
Poetry	*If Applicable*
Fiction	*If Applicable*
Saying and Phrases	*If Applicable*
Writing	*If Applicable*

Domain Section 2	Structure of Matter (3 Days)
MN Academic Standards	5P.3.1.1.1
Objectives	✓ Describe how models help to explain that matter is made of small particles. ✓ Explain how evidence suggests that matter is made of smaller particles.
Vocabulary	Evidence, models, particles, expand, dissolve, and evaporate
Procedure	Lesson 1 1. Grab lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 13 of the teacher guide. 2. We will open class by performing three demonstrations of changing of matter. Handout observation sheet (AP 4.1) located at the back of teacher guide. 3. Complete demonstration 1 and have student's complete observations. Have them back up their observations and the following discussion questions. a) Is this still sugar? How do you know? b) Is this sugar still made up of the same things as the cube? c) If someone didn't see me crush these cubes, how could you prove (or disprove) that this is still sugar? 4. Complete demonstration 2 and have student's complete observations and discussion questions. a) What happened to the sugar in the water? b) Is this the same as what happened to the sugar cube? Explain your thinking.

	c) Did the sugar disappear faster when it was in a cube or when it was crushed into granules? How could we investigate this to prove your idea? 5. Complete demonstration 3 and have student's complete observations and discussion questions. a) What happened to the ice cubes on the hot plate? b) What is different about the ice cubes after they have melted? c) Were the ice cubes water before they melted? How could you prove this to be true? 6. Exit Ticket: a) What evidence suggests that matter is made of smaller particles? Lesson 2 1. Grab lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 13 of the teacher guide. 2. Activity: Introduce the lesson through an engaging demonstration of matter. Put one end of the clear tubing in a bag. Press and seal the bag as close to the tube as you can, and then use the duct tape to seal. Tape the bag anywhere air could get out if the bag opens unexpectedly. Blow air into the bag through the tube to test if it is sealed. Leave that first bag as inflated as possible, and add the second bag at the other end, deflated, sealing the connection between the tube and bag with duct tape. 3. Review learning objectives and vocabulary for the lesson 4. Large group read and discuss: "Too Small to be Seen" 5. Exit Ticket: a) How do models help to explain that matter is made of small particles? Lesson 3 1. Activity: Distribute Balloon Model (AP 5.1) to students, and tell them that they will complete this page individually as they watch your demonstration. Explain that the diagram looks similar to a comic strip. Their role is to draw and fill in the diagram with evidence of particles. Let them know that you will tell them when it's time to work on the different parts of the diagram. Prepare for the teacher demonstration by setting out the balloon and pinwheel. 2. Complete the demonstration:

	a. 1. Barely blow into the balloon. The balloon should be droopy and stay relatively uninflated. b. Based on what students learned in the Student Reader, ask them to draw and describe a representation of the particles in the barely inflated balloon. Ask students to predict the amount of air in the balloon and what they think the particles in the balloon look like. c. Blow the balloon up so it is halfway inflated. d. Ask students to draw and describe the particles and the amount of air in the balloon now. e. Blow the balloon up so it is inflated fully. f. Prompt students to draw and describe the particles and the amount of air in the balloon now. g. Ask for a volunteer to hold the pinwheel. h. Aim the opening of the balloon at the pinwheel, and let all the air out of the balloon. The pinwheel will start to spin. i. Ask students to fill out the rest of their Balloon Model (AP 5.1) to answer the questions.
Poetry	*If Applicable*
Fiction	*If Applicable*
Music	*If Applicable*
Writing	*If Applicable*

Domain Section 3	Physical Changes in Matter (3 Days)
MN Academic Standards	5P.1.2.1.2 5P.1.2.1.3
Objectives	✓*Explain how matter changes.* ✓*Describe the amount of matter change during a physical change.*
Vocabulary	Physical change, states of matter, gas, liquid, solid, evaporation, condense, and conserve
Procedure	Lesson 1 *Day 1* 1. Grab lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 13 of the teacher guide. Before starting today's lesson make sure to review the student investigation guide, Ice and Water Investigation (Day 1) (AP 6.1 in teacher's guide).

	2. Ask the class "How can one type of matter change?" Accept all plausible examples. 3. Distribute Ice and Water Investigation (Day 1) which can be located in the back of the teacher's guide. Students will work in small groups and review safety lab practices before beginning lab. 4. Exit Ticket: a) What was the purpose of this investigation? b) What did you notice about changing ice into melted water? Day 2 1. Before starting today's lesson make sure to review the student investigation guide, Ice, and Water Investigation (Day 2) (AP 6.2 in teacher's guide). 2. Review with students what they observed and completed in the previous class session. 3. Distribute Ice and Water Investigation (Day 2) (AP 6.2). Review the pages with students, and model how to complete the investigation guide. 4. Exit Ticket: a. What happened to the water in terms of states of matter on Day 1? b. What happened to the weight of the water on Day 1? c. What happened to the matter on Day 2? d. What happened to the weight of the matter on Day 2? Lesson 2 1. Introduce learning targets and vocabulary for lesson. 2. Read and discuss: "How Matter Changes." 3. Exit Ticket: a) Does the amount of matter change during a physical change?
Poetry	*If Applicable*
Fiction	*If Applicable*
Saying and Phrases	*If Applicable*
Writing	*If Applicable*

Domain Section 4	Interactions of Matter (4 Days)
MN Academic Standards	5P.1.2.1.2
Objectives	✓*Describe how combining matter form a new substance.* ✓*Explain how interactions of matter result in a new substance.* ✓*Investigate if the amount of matter changes during a chemical stage.*
Vocabulary	Mixture, chemical, chemical changes, and precipitate

Procedure	Lesson 1 1. Grab lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 13 of the teacher guide. 2. Activity: In this activity, students will record their observations of new substances created as a result of chemical interactions. Distribute and review Chemical Changes Observation Sheet (AP 8.1 in teacher guide) to help students understand how to fill out the table as they observe your demonstrations and answer the related questions about cause and effect. They will complete these sheets independently at their desks. Make sure to leave time for students to fill out their Activity Page after each demonstration. 3. Choose at least four of the following activities to demonstrate to students. If time permits, perform all the demonstrations. Allow students time to record their observations in the corresponding space available on Chemical Changes Observation Sheet (AP 8.1). As you discuss each example, guide students to note the following: a. what changes occur b. what causes the changes c. what new matter results Lesson 2 1. Grab lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 13 of the teacher guide. 2. Activity: Distribute What Kind of Change Will Happen? (AP 9.1 in teacher guide). Split the steel wool in half, and have students write their observations of the steel wool. Place one half in the cup. Tell students that you will add acetic acid to the steel wool in the cup, and ask them to record their predictions of what will happen. Fill the cup with acetic acid, and let it sit for three to five minutes 3. Identify examples and guide discussion on Chemical Changes Finder (AP 9.2 in teacher's guide). Let students know that they will be thinking of chemical changes they encounter all the time. 4. Return to the steel wool, and have students compare their predictions against what they now see. Ask the following questions. a. How have the two pieces of steel wool changed? b. What type of change is this an example of? c. Was matter gained or lost in the chemical change? Lesson 3

	1. Introduce learning targets and vocabulary for the lesson. 2. Read and discuss: "Matter Can Change Chemically." 3. Exit Ticket: a. Why do some interactions of matter result in new substances? Lesson 4 1. Grab lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 14 of the teacher guide. 2. Introduce learning objectives for lesson. 3. Activity: Distribute Investigating Chemical Change (AP 10.1 in teacher's guide). Explain that students will be conducting an experiment that involves mixing vinegar and baking soda and recording their observations of what happens when these materials combine. 4. Exit Ticket a. Does the amount of matter change during a chemical change?
Poetry	*If Applicable*
Fiction	*If Applicable*
Saying and Phrases	*If Applicable*
Writing	*If Applicable*

Domain Section 5	Introduction to the Language of Chemistry (4 Days)
MN Academic Standards	5P.3.1.1.1
Objectives	✓*Explain what atoms, elements, and molecules are.* ✓*Describe how molecules of different matter are similar and different.*
Vocabulary	Chemistry, atom, element, bond, and molecule
Procedure	Lesson 1 1. Introduce learning objectives and vocabulary for lesson. 2. Read and discuss: "The Language of Chemistry." 3. Exit Ticket: a. What are atoms, elements, and molecules? Lesson 2 1. Grab lab materials needed for learning stations prior to start of the lesson. A material list can be located on page 13 of the teacher guide. 2. Activity: How are molecules of different matter similar and different? Tell students that they will conduct a hands-on activity

	in which they will build models of two types of molecules: ammonia and methane. Tell them that ammonia has one nitrogen atom bonded to three hydrogen atoms, NH_3 . Ammonia is a colorless gas with a very powerful smell. Ammonia gas occurs widely in living things, and it is used for many industrial purposes. Tell students that methane has one carbon atom bonded to four hydrogen atoms, CH_4 . Methane is a gas that is released into the air by bacteria. It is also found as "swamp gas" that bubbles up from bacterial action from the bottoms of lakes and ponds. Methane is the main component of natural gas, and it is used to heat homes. Prompt students to think about the question "How can I show that matter is made of tiny particles?" as they go through this lesson. Remind students that they learned about the terms atoms, elements, and molecules in the previous lesson 3. Distribute Comparing Molecules (AP 12.1 in teacher's guide). Explain that students will be making models of ammonia and methane molecules to compare and contrast them. Review the instructions with students, and model for them how to complete the different parts of the sheet. Show students the materials they will use to build their models. 4. Exit Ticket: a. How are molecules of different matter similar and different? Lesson 3 1. Student's will review for their test tomorrow on matter. Lesson 4 1. Student's will complete an assessment on matter.
Poetry	*If Applicable*
Fiction	*If Applicable*
Saying and Phrases	*If Applicable*
Writing	*If Applicable*