



Purpose

The resources provided in this document are not required to be used in preparation for your lab. They are simply resources that we thought might be helpful to you and engaging for your students in preparation for your lab. It is your choice to use them and you may pick as few or as many to implement as you like.

**If you are receiving a Title I scholarship for your lab, you are required to implement a vocabulary or journal activity prior to your lab visit.*

<p>Grade Level 2</p>	<p>Common Core Language Arts Standards <i>Speaking and Listening</i> Grade 2: 2.SL.1, 2.SL.3</p>	<p>Student Outcomes Students will:</p> <ul style="list-style-type: none"> • Identify the three phases of matter. • Demonstrate that matter is made up of many small particles that can be rearranged to form new products. • Observe physical characteristics of unidentified products.
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State and National Standards Connections

Next Generation Science Standards

	Physical Science	Disciplinary Core Ideas	Crosscutting Concepts	Science and Engineering Practices
<p>Grade 2</p>	<p>2-PS1-1 2-PS1-2 2-PS1-3</p>	<p>PS1.A</p>	<p>Cause and Effect Patterns Energy and Matter</p>	<p>1, 2, 3, 4, 6</p>

Preparing for the Lab Experience

There are many ways to help prepare your students before the lab and help them reinforce their knowledge after the lab, including the content you are covering in the classroom. Below you will find a chart of some materials we offer to help support your classroom.



	Description	Recommended	Time, Materials & Support Needed
Lab Journal	Includes: <ul style="list-style-type: none"> • Vocabulary • Pre- and Post-Journal • Venn Diagram • Lab Notes and questions 	<ul style="list-style-type: none"> • Pre- and post- lab activities • Vocabulary definitions and journal prompts provided in this resource guide* 	<ul style="list-style-type: none"> • Up to 60 minutes • Print and assemble the journals • Writing utensils
Lab Related Activities			
Matter Molecule Madness	Students will use their own bodies to experience and demonstrate how molecules are arranged and move within the three states of matter: solid, liquid, and gas.	<ul style="list-style-type: none"> • Pre- or post-lab activity 	<ul style="list-style-type: none"> • 20-30 minutes • Outdoor blacktop or grass access
Property Investigators	Students will learn how to investigate and analyze the properties of a set of materials to determine which materials are best suited for given tasks.	<ul style="list-style-type: none"> • Post-lab activity to reinforce how properties of matter determine an object's ability to function in particular tasks 	<ul style="list-style-type: none"> • 45-60 minutes • Specialized materials: <ul style="list-style-type: none"> • Metal washers • Dry spaghetti-type pasta
Changing Phases	Students will practice their observational skills by classifying different items by their phase of matter and determine what kind of changes may result from heating or cooling. <i>*This is a demonstration for students to observe.</i>	<ul style="list-style-type: none"> • Post-lab activity to reinforce that many phase changes occur due to temperature change and that some changes are permanent while others are not 	<ul style="list-style-type: none"> • 45-60 minutes activity time • Overnight prep time (freezing items) • Specialized materials <ul style="list-style-type: none"> • Freezer access • Hot plate or microwave • Ice tray

Related Links and Games

The following links and games provide additional information on chemical reactions, the periodic table and chemistry experiments that can be done from home or in the classroom. We are not endorsing the following organizations, but feel that the information provided by said organizations may be of benefit to your students and may help enhance the learning experience of the lab.

- **Study Jams by Scholastic:** This animated video by Scholastic reviews the three primary states of matter, as well as how matter can change from one state to another with temperature change. There is also a quick quiz mode available to check student learning as well as a song that can be sung as a class to reinforce the concepts of matter.

<http://studyjams.scholastic.com/studyjams/jams/science/matter/solids-liquids-gases.htm>



- **Study Jams by Scholastic:** This animated video by Scholastic reviews the chemical and physical changes of matter including reactions and temperature changes.
<http://studyjams.scholastic.com/studyjams/jams/science/matter/changes-of-matter.htm>
- **Turtle Diary:** This game shows learners how different changes in temperature can affect the physical and chemical properties of matter. <https://www.turtlediary.com/game/changes-in-states-of-matter.html>
- **Science 4 Us:** This site has several demos on matter, including materials and mixtures, observing matter, states of matter, and changes in matter. https://www.science4us.com/book_pages/physical-science/matter/

Related Texts

The following titles may provide students with a greater contextual understanding of the field of chemistry. Included in the list are narratives (fiction/nonfiction), referential texts and books that extend learning beyond the scope of the lab. We are not endorsing the following authors, but feel that the information they provide may be of benefit to your students and may help enhance the learning experience of the lab.

- “Matter: Physical Science for Kids.” By Andi Diehn.
 - Recommended for ages 4-8; Grades K-3.
 - Everything you can touch and hold is made up of matter! This book explores the definition of matter and the different states of matter, plus the things in our world that are not matter. Children are introduced to physical science through detailed illustrations and fun language to convey familiar examples of real-world science connections.
- “What is the world made of? All about solids, liquids, and gases.” By Kathleen Weidner Zoehfeld.
 - Recommended for ages 4-8; grades K-3.
 - This book is a fascinating exploration of the three states of matter, featuring rich vocabulary and simple, fun diagrams to explain the differences between solids, liquids, and gas.
- “What’s the Matter in Mr. Whisker’s Room?” By Michael Elsohn Ross.
 - Recommended for ages 6-9; grades 1-4.
 - Everyone is a scientist in Mr. Whisker’s class where hands-on mini-experiments lead to big ideas. This book even includes supplemental projects for young learners.
- “Change it! Solids, Liquids, Gases, and You.” By Adrienne Mason.
 - Recommended for ages 4-7; grades K-2.
 - This book is a tool to teach physical sciences to young children. It takes the physics of matter— solids, liquids, and gases — and transforms it to an easy to understand science book for little ones.
- “Super Science: Matter Matters!” By Tom Adams.
 - Recommended for ages 7-10; grades 2-5.
 - This book explores the elements of the science of matter in a fun, straightforward way. It includes comic-book style illustrations and explores atoms, molecules, reactions, elements, radioactivity and other aspects of chemistry.
- “Matter: See it, Touch it, Taste it, Smell it.” By Darlene R. Stille.
 - Recommended for ages 5-10; grades K-4.
 - In this book, the states of matter are explained and demonstrated. Includes an experiment for you to try at home.
- “Many Kinds of Matter: A Look at Solids, Liquids, and Gases.” By Jennifer Boothroyd
 - Recommended for ages 6-9; grades 1-3.
 - Solids, liquids, and gases are all around you. This book teaches all about the different states of matter and how to tell them apart!



- “The Solid Truth about States of Matter with Max Axiom, Super Scientist.” By Agnieszka Biskup.
 - Recommended for ages 8-14; grades 2-8.
 - This book features a superhero scientist and covers matter, atoms and molecules, solids, liquids, and gases, melting, boiling, and freezing, evaporation and condensation.
- “Touch it! Materials, matter, and you.” By Adrienne Mason.
 - Recommended for ages 4-7; grades TK-2.
 - This book teaches physical sciences to young children and is loaded with surprising facts, hands-on activities. It explores materials and their color, shape, texture, size, mass, magnetism, and more.
- “The Nature of Matter.” By Deborah J. Housel.
 - Recommended for ages 6-7; grades 1-2.
 - Anything that takes up space is matter. Learn about matter with this science reader that is easy to read, and even includes a fun and engaging science experiment.
- “Matter Comes in All Shapes.” By Amy S. Hansen.
 - Recommended for ages 6-7; grades 1-2.
 - In this book, early readers will investigate various types of matter that they see and experience in everyday life. Not only does it outline the states of matter, but it also shows how matter changes shape based on the container within which it is held. There are also components of the book that focus on irreversible changes.

Tech Interactive Gallery and Exhibit Connections

The Tech Studio (Lower Level): The Tech Studio is where students of all ages can design, build, tinker, and test with different materials to solve a given problem.

- Connection to the lab:
 - Students examine and explore different materials, using their powers of observation to determine which materials are the best fit for the challenge at hand. While this area is not directly tied to matter specifically, the principles of observation and properties of matter are present and used in a real-life practical application.
- Activities to complete at the exhibit:
 - Design, build, test, and iterate a device to complete the given challenge.
 - Students should use their knowledge of the properties of matter to determine which available materials are best for the task at hand.
- Questions to guide student learning:
 - What qualities do you think the materials need to have to be successful in the task?
 - Do you think some materials will do the job or task better than others? Why? What makes them better suited for the job?
 - How can you test the properties or qualities of the materials to make sure they are the right materials for the job?
 - Which materials do you think are best suited for the job? Why?



Design Challenge Learning Resources

Design Challenge Learning is a dynamic way for learners to become creative problem-solvers. The below link will take you to short guides created by educators at The Bowers Institute on facilitating design challenges, promoting engineering and fostering innovator mindsets.

<https://www.thetech.org/content/bowers-institute/resources>

Writing Prompts

The following writing prompts and questions are just a few examples of journal topics to incorporate writing into your students' lab experience. If you feel that one of the below prompts does not meet your needs, you are welcome to use your own, but please make sure it is related to the chosen lab experience. If you have a related writing prompt you would like to share with The Tech and other teachers, please let us know on our teacher survey that will be available in the lab.

Most of the writing topics could be used as either pre-lab or post-lab writing. You may choose the prompts that work best for your class and schedule.

Generic Writing Topics/Prompts

Pre-visit

- We will be attending the Make it Matter lab at The Tech Interactive; what do you think we will learn about in the lab? What do you want to know about this topic? What do you already know about this topic?
- We will be attending the Make it Matter lab at The Tech Interactive; what are you looking most forward to in this lab? Why?

Post-visit

- We learned a lot in our Make it Matter lab. What were your two favorite things you learned in the lab? Why?
- The principal is excited to hear all about your lab experience. Explain what you did and learned about in the lab since she or he was unable to attend the lab.

Specific to Make it Matter

- Describe the differences between the three phases of matter: liquid, solid, and gas. Draw an example of each.
- The root beer float is a yummy, magical drink that includes all three phases of matter. Tell a short story about drinking a root beer float, making sure to include all of the matter vocabulary (solid, liquid, and gas).
- Scientists use their senses to describe and investigate the properties of matter all the time. Pick one item in your classroom to investigate and use your senses to investigate the item and write a description of the item's properties in detail. (Use your senses of sight, smell, touch, and hearing — no tasting!).



Pre-Visit Vocabulary

These are words and concepts that we will discuss in the lab. Your students' experience will be enhanced if they are familiar with these terms prior to your visit. Below you will find several graphic organizers and games to aid in your vocabulary review.

Terms and Definitions

Gas	A state of matter that does not have its own defined shape, mass or volume. Examples: air, helium and oxygen.
Liquid	A state of matter that does not have its own shape but takes the shape of the container it is in. It has its own defined weight and volume. Examples: water, milk, and juice.
Matter	Everything around you that takes up space.
Observation	Something we can describe using our five senses.
Particles	Tiny parts that make up a larger item.
Properties	Physical characteristics of an object that can be observed using the five senses.
Solid	A state of matter that has its own defined shape, weight and volume. Examples: wood, metal and plastic.

Vocabulary Activities

Graphic Organizers

- *Framer Graphic Organizer*: The Frayer Graphic Organizer is a great tool for vocabulary development. It allows students to write their own definitions, define characteristics, and provide examples and non-examples. This tool will lead your students to a deeper understanding of the vocabulary and how it relates to their lives. On page 8 you will find a blank Frayer Graphic Organizer for your use in the classroom.
 - For more information on the Frayer Model and how to implement it, please visit the following link: <http://www.theteachertoolkit.com/index.php/tool/frayer-model>
- *Vocabulary Graphic Organizer*: This graphic organizer is a great tool for younger students as well as English Language Learners. Although very similar to the Frayer Model, this graphic organizer includes a drawing of the vocabulary term and its use in a sentence. On page 9 you will find a blank Vocabulary Graphic Organizer for your use in the classroom.
- *Circle Map*: This graphic organizer is a great tool for helping all students develop an overall sense of a topic. It is also very helpful for beginning and early intermediate English Language Learners. This graphic organizer lets students brainstorm what a term or concept means to them and provides a frame of reference for the term. On page 10 you will find a blank Circle Map for your use in the classroom.
 - For more information on the Circle Map and other Thinking Maps, please visit the following link: <http://thinkingmaps.com/why-thinking-maps-2/>

Vocabulary Review Games

- *Quiz, Quiz, Trade*: This is a fun cooperative game for students to review vocabulary terms. For more details and to see an example of Quiz, Quiz, Trade in action, please visit the following link: <http://www.theteachertoolkit.com/index.php/tool/quiz-quiz-trade>
 1. Create questions or vocabulary cards. On one side of an index card, write the question or vocabulary term; on the other, the answer or definition. Pass out the cards to students. If there are not enough terms for everyone to have a different card, try using different "back" sides to the same cards (e.g., instead of the definition again, have a drawing, a question about the term, characteristics of the term or an example of the term).
 2. Pair up. When all cards have been passed out, students find a partner to quiz with their card.
 3. Hands up. When both partners have completed the quizzes correctly, they put their hand up to show



other students that they are ready for a new partner to quiz.

- *Back-words*: This game is part Charades, part 20 Questions. In this review game, students have to guess the vocabulary term that is on their back by asking questions of a partner or having the partner act out the term.
 1. Write your vocabulary terms on index cards. If there aren't enough terms for each student to have a different one, you can make two sets and divide the class into two groups. You may also add in other related vocabulary terms that you have been studying in class.
 2. Tape one term onto the back of each student so that he or she cannot see the word.
 3. Have students pair up. Each partner should look at the word on their partner's back. Partners take turns asking questions or acting out or gesturing about the term that is on their back. (e.g., "Am I an element? Am I part of an atom? Do I make up all matter?") Partners must ask at least two questions before guessing their word.
 4. When both partners have correctly guessed their word, they put a hand up to signal that they are in need of a new partner. Continue game play until everyone has guessed their word.
- *\$10,000 Pyramid*: This review game is exactly like the classic game show. Students will work in pairs, taking turns to describe the words and to guess the words.
 1. Break up the terms into two groups. Each partner will take on one group of words.
 2. Have each partner fill out the worksheet on the next page with their group of words.
 3. For the first round, Partner A will be the one describing the term and Partner B will be the one guessing the term. Partner A will describe the term (starting with 1) using the words he or she wrote down on the worksheet. From the description, Partner B will guess what the term is.
 4. When Partner B guesses the word correctly, Partner A moves on to the next word.
 5. When Partner B correctly guesses all the words in Partner A's pyramid, they switch places and Partner B will describe the terms on his or her pyramid while Partner A guesses the terms.
 6. You can time this activity like on the quiz show, but it may intimidate some students



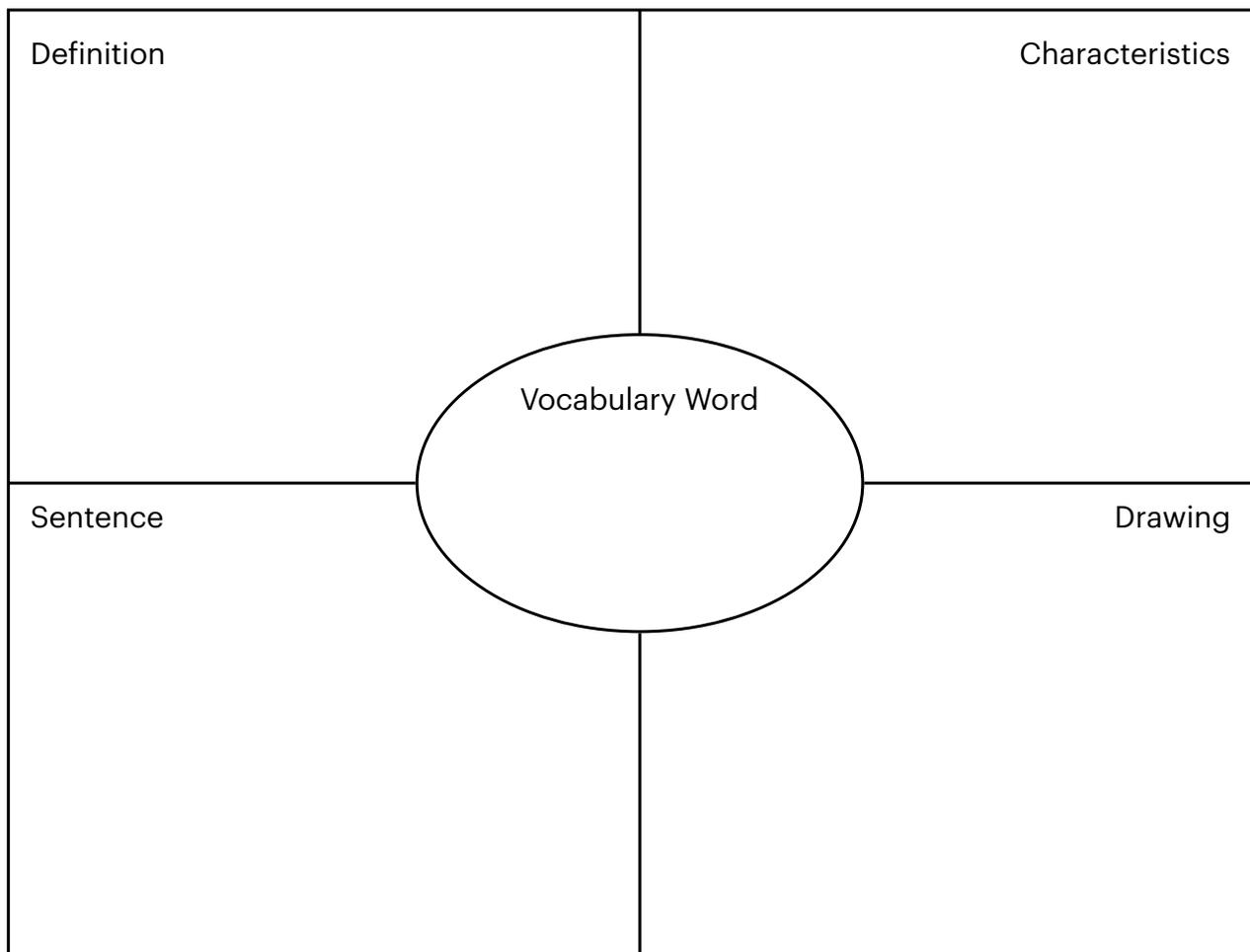
Fruyer Graphic Organizer

Definition	Characteristics
Examples	Non-Examples

Vocabulary Word



Vocabulary Graphic Organizer





Circle Map

