

Expert Pack: Solids, Liquids, Gases

Submitted by: Portland Public Schools (Portland, OR) & Tillamook SD #9 (Tillamook, OR)

Grades: 4-5

Date: January 2016

Topic/Subject
What is the world made of? Solids, Liquids and Gases
Texts/Resources
Books <ol style="list-style-type: none">1. A Matter of Survival2. States of Matter: A Question and Answer Book3. What is the World Made Of?: All About Solids, Liquids, and Gases
Articles <ol style="list-style-type: none">1. "Changing States of Matter Phase I and Phase II"2. "Does Matter really Matter?"3. "Is Fire a Solid, a Liquid, or a Gas?"4. "Lava Lake Explodes in Hawaii"
Videos <ol style="list-style-type: none">1. "Solids, Liquids, and Gases"2. "States of Matter"
Other Media <ol style="list-style-type: none">1. "States of Matter" [Infographic]
<p>Each expert pack contains a variety of selections grouped to create as coherent and gradual a learning process for students as possible, generally beginning with lower levels as measured by quantitative and qualitative measures, and moving to more complex levels in the latter selections. This gradated approach helps support students' ability to read the next selection and to become 'experts' on the topic they are reading about.</p> <p>Refer to annotated bibliography on the following pages for the suggested sequence of readings.</p>

Rationale and suggested sequence for reading:

This expert pack begins with two items meant to be used in tandem (the picture book, What is the World Made of? and the animated video, “Solids, Liquids, and Gases”). Both of these sources introduce students to the concepts of solids, liquids, and gases. The next resource, A Matter of Survival, introduces interesting concepts about the real life applications of the states of matter. Next, students will explore frequently asked questions about matter by reading the book States of Matter: A Question and Answer Book. Using the “States of Matter” infographic, students will reflect on and discuss what they have learned thus far. The next two articles (“Does Matter really Matter?” and “Changing States of Matter Phase I and Phase II”) make a bridge between states of matter and the changing states of matter. The expert pack culminates with two articles and a video (1: “Is Fire a Solid, a Liquid, or a Gas?” 2: “States of Matter”, and 3: “Lava Lake Explodes in Hawaii.”).

The Common Core Shifts for ELA/Literacy:

1. Regular practice with complex text and its academic language
2. Reading, writing and speaking grounded in evidence from text, both literary and informational
3. Building knowledge through content-rich nonfiction

Though use of these expert packs will enhance student proficiency with most or all of the Common Core Standards, they focus primarily on Shift 3, and the highlighted portions of the standards below.

College and Career Readiness Anchor Standards for Reading Literary and/or Informational Texts (the darkened sections of the standards are the focus of the Expert Pack learning for students):

1. **Read closely to determine what the text says explicitly and to make logical inferences from it;** cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
2. **Determine central ideas or themes of a text** and analyze their development; summarize the key supporting details and ideas.
10. **Read and comprehend complex literary and informational texts independently and proficiently**

Annotated Bibliography
and suggested sequence for reading

560L What is the World Made of?: All About Solids, Liquids, and Gases

Author: Kathleen Weldner Zoehfeld

Genre: Informational

Length: 32 pages

Synopsis: Using simple text and watercolor pictures the author describes the three states of matter. The author uses pictures and words to demonstrate how some objects change their state of matter whereas other objects stay in one state. This book is part of the read and find out series which includes activities at the end for readers to complete.

Citation: Zoehfeld, K. (1998). What is the World Made of? : All about Solids, Liquids, and Gases. New York: HarperCollins.

Cost/Access: \$1.92 for a paperback found on Amazon

Recommended Student Activities: A Picture of Knowledge

N/A “Solids, Liquids, and Gases”

Author: Unknown

Genre: Informational video

Length: Unknown

Synopsis: This video cartoon teaches that matter can exist in three forms: solids, liquids, and gases. The video highlights key vocabulary and includes a quiz at the end to test understanding of vocabulary words.

Citation: Solids, Liquids, and Gases [Video file]. (2015). Retrieved June 25, 2015, from:
<http://studyjams.scholastic.com/studyjams/jams/science/matter/solids-liquids-gases.htm>

Cost/Access: \$0.00 Scholastic.com

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

Recommended Student Activities: A Picture of Knowledge

546L A Matter of Survival

Author: Ann Weil

Genre: Informational

Length: 32 pages

Synopsis: Readers learn about the three states of matter through real life objects. There are clear section headings with a glossary and index to check for understanding. The book explains how to survive in the world using objects that are used in everyday life. Further, the book explains for every object how it would be classified according to the properties of matter.

Citation: Weil, A. (2006). A Matter of Survival: Properties of Matter. Chicago, Illinois: Raintree.

Cost/Access: \$1.99 for paperback from Amazon

Recommended Student Activities: A Picture of Knowledge

699L States of Matter: A Question and Answer Book

Author: Fiona Bayrock

Genre: Informational

Length: 32 pages

Synopsis: The book begins with a table of contents which lists different questions about the states of matter. As students read the book they will find the answers to the questions. The fact boxes give applied examples of the different states of matter.

Citation: Bayrock, F. (2006). States of Matter: a question and answer book. Mankato, Minneapolis: Capstone Press.

\$3.64 for a paperback from Amazon

Recommended Student Activities: Quiz Maker

N/A "States of Matter"

Author: Unknown

Genre: Informational diagram (infographic)

Length: N/A

Synopsis: This infographic provides a colorful diagram showing the different states of matter.

Citation: States of Matter. (2013, January 27th). Retrieved June 25,2015 from <http://www.kidsdiscover.com/infographics/infographic-states-of-matter-for-kids/>

Recommended Student Activities: Pop Quiz

740-1010L “Does Matter Really Matter?”

Author: Unknown

Genre: Informational

Length: 703 words

Synopsis: This article answers wonderings about differences between the states of matter and how they change from one state to another. This includes a list of “Wonder Words” which shows key vocabulary words as well as an activity for students to investigate at home.

Citation: Does Matter Really Matter? (2014-2015). Retrieved June 25, 2015, from <http://wonderopolis.org/wonder/does-matter-really-matter/>

Cost/Access: \$0.00 Wonderopolis.org <http://wonderopolis.org/wonder/does-matter-really-matter/>

Recommended Student Activities: Quiz Maker

N/A “Changing States of Matter phase I and II”

Author: Unknown

Genre: Informational

Length: 1150 words

Synopsis: This article allows students to further explore the changes in matter, but at the same time understand the different stages and processes. It covers new vocabulary while also providing reviews of words introduced earlier in this text set. It also provides colorful visuals in the changing states.

Citation: Changing states of Matter Phase I and II. (n.d.). Retrieved June 25, 2015, from http://www.chem4kids.com/files/matter_changes.html

Cost/Access: \$0.00 Chem4Kids.com http://www.chem4kids.com/files/matter_changes.html

Recommended Student Activities: Wonderings

N/A “Is Fire a Solid, a Liquid, or a Gas?”

Author: Ask Smithsonian

Genre: Informational

Length: 219 words

Synopsis: This article describes how fire is not a state of matter, but rather a process. It spurs thought about how fire is made and how it is extinguished. The article also includes a video which students will watch to reinforce the knowledge they learned from the article.

Citation: Ask Smithsonian. Is fire a solid, a liquid, or a gas? (2014, May 29). Retrieved June 25, 2015, from <http://tweentribune.com/tween56/fire-solid-liquid-or-gas>

Cost/Access: \$0.00 Smithsonian Tween Tribune <http://tweentribune.com/tween56/fire-solid-liquid-or-gas>

Recommended Student Activities: Wonderings

N/A "States of Matter"

Author: Columbus Art Museum

Genre: Informational video

Length: 4:38 minutes

Synopsis: Helps students understand the three states of matter by forming and shaping glass. The video includes high interest graphics to captivate students' interest.

Citation: Columbus Art Museum. States of Matter [Video file]. (2009, November 6). Retrieved from <https://www.youtube.com/watch?v=HAPc6JH85pM>

Cost/Access: \$0.00 Youtube.com <https://www.youtube.com/watch?v=HAPc6JH85pM>

Recommended Student Activities: A Picture of Knowledge

910 L "Lava Lake Explodes in Hawaii"

Author: Caleb Jones

Genre: Informational

Length: 507 words

Synopsis: This article explains a recent volcanic eruption in Hawaii. It describes how solid rocks fell into liquid lava which released trapped gas that resulted in an explosion. The volcano expert compares this event to cutting off the top of a champagne bottle.

Citation: Jones, Caleb. (2015, May 7). Lava Lake Explodes in Hawaii. Retrieved from <http://tweentribune.com/tween56/lava-lake-explodes-hawaii>

Cost/Access: \$0.00 Smithsonian Tween Tribune <http://tweentribune.com/tween56/lava-lake-explodes-hawaii>

Recommended Student Activities: Quiz Maker

Supports for Struggling Students

By design, the **gradation of complexity** within each Expert Pack is a technique that provides struggling readers the opportunity to read more complex texts. Listed below are other measures of support that can be used when necessary.

- Provide a brief **student-friendly glossary** of some of the academic vocabulary (tier 2) and domain vocabulary (tier 3) essential to understanding the text
- Download the Wordsmyth widget to classroom computers/tablets for students to access student-friendly definitions for unknown words. <http://www.wordsmyth.net/?mode=widget>
- Provide brief **student friendly explanations** of necessary background knowledge
- Include **pictures or videos** related to the topic within and in addition to the set of resources in the pack
- Select a small number of texts to **read aloud** with some discussion about vocabulary work and background knowledge
- Provide **audio recordings** of the texts being read by a strong reader (teacher, parent, etc.)
- **Chunk the text** and provide brief questions for each chunk of text to be answered before students go on to the next chunk of text
- Pre-reading activities that focus on the **structure and graphic elements** of the text
- Provide **volunteer helpers** from the school community during independent reading time.

Text Complexity Guide

“Changing States of Matter Phase I and II”

http://www.chem4kids.com/files/matter_changes.html

1. Quantitative Measure

Go to <http://www.lexile.com/> and enter the title of the text in the Quick Book Search in the upper right of home page. Most texts will have a Lexile measure in this database. You can also copy and paste a selection of text using the Lexile analyzer.

N/A

2-3 band	420 -820L
4-5 band	740 -1010L
6-8 band	925 - 1185L
9 -10 band	1050 – 1335L
11 – CCR	1185 - 1385

2. Qualitative Features

Consider the four dimensions of text complexity below. For each dimension*, note specific examples from the text that make it more or less complex.

Meaning/Purpose This article discusses how the four states of matter change; solid to liquid, solid to gas, liquid to gas, and plasma to gas. Within this discussion topics such as freezing point, melting point, pressure, and energy exchange are discussed as they are important parts of changing matter.	Structure The structure is supportive in that it is organized well with titles and subtitles. It also provides full color pictures and diagrams to assist with concepts that can be very abstract. In addition, there are hyperlinks to help with unfamiliar words and concepts.
Language Although written in a fun and personable way, being scientific in nature, some ideas are abstract and complex. The text includes some complex vocabulary words that are highly academic and can be difficult to determine meaning if read out of sequence. The sentence structure however is mostly simple and compound sentences, with some complex constructions.	Knowledge Demands The subject matter of this article is complex in nature. However, ideas such as sublimation, deposition, energy, molecules, and condensation have been introduced in previous readings in this expert pack. Overall, It contains a moderate levels of discipline-specific content knowledge; a range of recognizable ideas and some challenging abstract concepts.

3. Reader and Task Considerations

What will challenge students most in this text? What supports can be provided?

- Rereading, chunking, and discussion could support students with complex ideas and vocabulary.
- Stopping to think and diagrams could help support student's understanding.
- Making sketches along the way could also provide valuable aids to understanding.
- The biggest challenge in this text are the abstract concepts the students will encounter. Therefore providing additional videos and diagrams should assist in the understanding.
- Rolling Knowledge Journal with pictures and diagrams would also be helpful.
- Group/ partner discussion of previous text in the set may also help students have a more developed understanding of the more abstract concepts and thus aid in understanding in this text
- Highlighting or annotation of text, particularly in denser portions may allow students to think through more effectively.

Expert Pack: Solids, Liquids, Gases

Submitted by: Portland Public Schools (Portland, OR) & Tillamook SD #9 (Tillamook, OR)

Grades: 4-5

Date: January 2016

Learning Worth Remembering

Cumulative Activities – The following activities should be completed and updated after reading each resource in the set. The purpose of these activities is to capture knowledge building from one resource to the next, and to provide a holistic snapshot of central ideas of the content covered in the expert pack. *It is recommended that students are **required** to complete one of the Cumulative Activities (Rolling Knowledge Journal or Rolling Vocabulary) for this Expert Pack.*

1. Rolling Knowledge Journal

1. Read each selection in the set, one at a time.
2. After you read *each* resource, stop and think what the big learning was. What did you learn that was new *and important* about the topic from *this* resource? Write, draw, or list what you learned from the text about (topic).
3. Then write, draw, or list how this new resource added to what you learned from the last resource(s).

Sample Student Response

Title	Write, Draw, or List	
	New and important learning about the topic	How does this resource add to what I learned already?
1. <i>What is the World Made of? : Solids, Liquids, and Gases</i>	The world is made up of matter, which is displayed as a solid, liquid, or gas.	
2. "Solids, Liquids, and Gases"	Adding heat or taking it away can change matter from one state to another.	Solids, liquids and gases change forms when heat is added or taken away.
3. <i>A Matter of Survival</i>	A chemical change happens when changing matter into something that has totally new properties.	Solids, liquids and gases have different properties but they can also change properties. A solid like wood can change into a solid like ash by burning the wood

		and it will be completely different.
4. <i>States of Matter: A Question and Answer Book</i>	Provides answers to commonly asked questions like “Why do icebergs float?, What is Plasma? and how are weather and matter connected.”	This books gives visuals and understanding to the changing states of matter and how they affects our world’s environment.
5. “States of Matter” Infographic	Usually a solid turns to a liquid before it turns to a gas, but sometimes a solid can change right into a gas. That’s called sublimation.	The books and the articles talk about melting and freezing, but this picture shows the more uncommon words like condensation, sublimation and deposition.
6. “Does Matter Really Matter?”	In order for matter to change to another state the physical properties of the matter must change.	The wonder word challenge included words from previous articles and some new words from this article. Taking the challenge provided practice with the key vocabulary words.
7. “Changing States of Matter : Phase I and II”	Temperature and pressure effects how and when matter changes states. This also includes plasma!	Increases and decreases in pressure changes how matter changes because it affects the melting and freezing points. Also electrical charges help push energy into gases which makes plasma.
8. “Is Fire a Solid, a Liquid, or a Gas?”	Fire is not a solid, liquid or a gas...it’s a process!	This was a cool article because it showed me that although almost everything is a solid, liquid or a gas, there is at least one thing in the universe that isn’t exactly one of the three states of matter.
9. “States of Matter” (Video)	The states of matter are a part of everyday life (glassmaking).	The forms of matter move from one to another through changes in temperature and are common place.
10. “Lava Lake Explodes in Hawaii”	There’s a volcano in Hawaii that is filled with lava! Sometimes gas builds up under the volcano and shoots the lava 280 feet in the air!	I knew that volcanoes exploded because gas builds up underneath them. I didn’t know that some volcanoes just have lava sitting there inside them.

2. Rolling Vocabulary: “Sensational Six”

- Read each resource then determine the 6 words from each text that most exemplify the central idea of the text.
- Next use your 6 words to write about the most important idea of the text. You should have as many sentences as you do words.
- Continue this activity with EACH selection in the Expert Pack.
- After reading all the selections in the Expert Pack, go back and review your words.
- Now select the “Sensational Six” words from ALL the word lists.
- Use the “Sensational Six” words to summarize the most important learning from this Expert Pack.

Title	Six Vocabulary Words & Sentences
<i>What is the World Made of? : Solids, Liquids, and Gases</i>	<p>Words: solid, liquid, gas, matter, temperature, state</p> <p><u>Solids</u> are found all around us and they have their own shape.</p> <p><u>Liquids</u> take shape of their container and can be poured.</p> <p><u>Gas</u> has no definite shape and can be visible or invisible.</p> <p>Everything in our world is made up of <u>matter</u>.</p> <p>When we see how hot or cold something it is we are measuring its <u>temperature</u>.</p> <p>When matter changes from a liquid to a gas or a solid to a liquid, or even changes form, we call that changing state of matter.</p>
<i>“Solids, Liquids, and Gases”</i>	<p>Words: states of matter, molecules, heat, freezing point, melting point, boiling point.</p> <p>Materials can be classified as one of the <u>states of matter</u> - solid, liquid, or gas.</p> <p>Materials change their state of matter by how fast or slow <u>molecules</u> are moving.</p> <p><u>Heat</u> is used when a ice cube changes to water on the counter.</p> <p>Jimmy noticed that the liquid water in the ice trays turned into ice cubes when they reached the <u>freezing point</u>.</p> <p>Jimmy made sure the temperature was above 32° so that his ice cubes would melt and reach the <u>melting point</u>.</p> <p>Jimmy used heat to reach the <u>boiling point</u> for his pot of water.</p>

<i>A Matter of Survival</i>	<p>Words: density, mass, volume, matter, chemical change, physical change</p> <p>A rock has greater <u>density</u> than a coconut.</p> <p>There's more <u>mass</u> in a rock than a coconut because it has more matter in it.</p> <p>A coconut has more <u>volume</u> than a little rock because it takes up more space.</p> <p>The state of <u>matter</u> that has the least density is gas.</p> <p>It is a <u>chemical change</u> when you burn your marshmallow over the fire.</p> <p>It is a <u>physical change</u> when chocolate melts in your hand because it can turn back into solid chocolate by cooling down.</p>
<i>States of Matter: A Question and Answer Book</i>	<p>Words: plasma, energy, temperature, Fahrenheit, atom, molecule</p> <p><u>Plasma</u> is an electrically charged gas and is our fourth state of matter.</p> <p>When Matter changes from one state to another <u>energy</u> is added or taken away.</p> <p>When you increase the <u>temperature</u> of water it boils.</p> <p>At 212 degrees <u>Fahrenheit</u> water changes into a gas and boils.</p> <p>An <u>atom</u> is made up of protons, neutrons and electrons.</p> <p>A <u>molecule</u> of water is made up of two hydrogen atoms and one oxygen atom.</p>
<i>"States of Matter" Infographic</i>	<p>Words: condensation, evaporation, melting, solidification, sublimation, deposition</p> <p>I could see the <u>condensation</u> on the windows on the cold morning.</p> <p>It was so hot that the puddle <u>evaporated</u> in just a few minutes.</p> <p>To keep my ice cream from <u>melting</u> on my hands, I licked it like crazy.</p> <p>I checked the freezer to see if my soda pop had <u>solidified</u>.</p> <p>The <u>sublimation</u> from the dry ice at my friend's birthday party created massive amounts of smoke!</p> <p>On a freezing cold day, <u>deposition</u> caused water from the air to freeze onto our windshield.</p>
<i>"Does Matter Really Matter?"</i>	<p>Words: matter, atoms, solid, liquid, gaseous, physical properties</p> <p>If you look close enough in your kitchen, you will find many things that are considered a type of <u>matter</u>.</p>

	<p><u>Atoms</u> are the smallest elements that hold items together that you find in your kitchen.</p> <p>An ice cube found in your freezer is an example of a <u>solid</u>.</p> <p>When you pour a glass of water you are observing water as a <u>liquid</u> state.</p> <p>When you boil a pot of water on the stove you are observing water in a <u>gaseous</u> state.</p> <p>When you want to change an ice cube to liquid water you have to change the <u>physical properties</u> such as temperature to change the state of the matter.</p>
“Changing States of Matter : Phase I and II”	<p>Words: pressure, state, energy, transferred, plasma, electricity</p> <p><u>Pressure</u> changes the boiling point and freezing point of matter which changes how it changes states.</p> <p>The <u>state</u> of matter or it’s current form can also change with increases in energy.</p> <p>When the temperature changes, <u>energy</u> inside of the matter changes and causes the matter to change.</p> <p>One example is when energy inside steam is <u>transferred</u> or moved out of gas atoms when in a colder environment which causes it to change into a liquid, water.</p> <p><u>Plasma</u> is the fourth state of matter and is closely related to gas.</p> <p>Plasma start out as a gas but changes states when the atoms are energized with <u>electricity</u>.</p>
“Is Fire a Solid, a Liquid, or a Gas?”	<p>Words: elements, universe, substance, oxygen, ignition temperature, extinguish</p> <p>The three <u>elements</u> that you need to make fire are fuel, heat and oxygen.</p> <p>One of the few things in the <u>universe</u> that is not a solid, liquid or a gas is fire.</p> <p>Fire is not a <u>substance</u>...it is a process.</p> <p>You can’t make fire without <u>oxygen</u>.</p> <p>Wood’s <u>ignition temperature</u> is about 500 degrees.</p> <p>To <u>extinguish</u> a fire, you have to get rid of at least one of its elements.</p>
“States of Matter” (Video)	<p>Words: furnace, forms, materials, properly, solid, molecules</p> <p>The sculptors used the <u>furnace</u> to heat the glass and change it into a liquid.</p> <p>When the glass cools it changes <u>form</u>, it is not longer liquid but solid.</p>

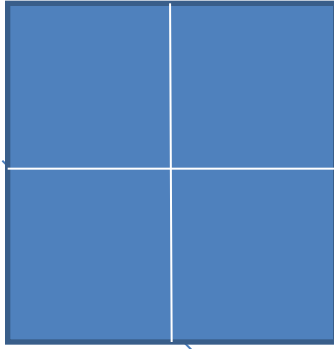
	<p>The artists use powder and other <u>materials</u> to make and shape the glass.</p> <p>The artists are careful to make the glass <u>properly</u> so that it is strong and will not break easily.</p> <p>Once the glass cools down and becomes <u>solid</u>, it can no longer be changed unless heated again.</p> <p>When the glass is heated up the <u>molecules</u> spread out and move easily in its liquid form but when it cools the molecules get closer and it becomes solid.</p>
"Lava Lake Explodes in Hawaii"	<p>Words: molten, altered, debris, collapse, geologist, fragments</p> <p>The <u>molten</u> lava flowed down the volcano.</p> <p>The explosion <u>altered</u> the shape of the volcano's crater.</p> <p><u>Debris</u> went flying through the air after the volcano exploded.</p> <p>When a gas bubbles pops under a volcano, it can cause the wall of the volcano to <u>collapse</u>.</p> <p>A <u>geologist</u> might like to study a volcano to determine when it will erupt again.</p> <p>People watched as <u>fragments</u> of rock exploded out of the volcano.</p>
Sensational Six	matter, states of matter, molecules, solid, gaseous, liquid
<p>Summary:</p> <p><u>Matter</u> is anything on Earth that takes up space. The three most common <u>states of matter</u> are solids, liquids, and gases. <u>Molecules</u> change the state of matter by speeding up or slowing down. Matter is in the <u>solid</u> state when it is hard and the molecules are not moving around. Matter is in a <u>gaseous</u> state when molecules are moving the fastest. Matter is in the <u>liquid</u> state when molecules are moving slower than gas.</p>	

Learning Worth Remembering

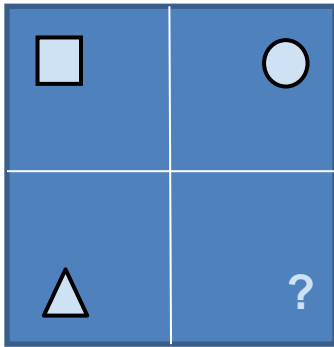
Singular Activities – the following activities can be assigned for each resource in the set. The purpose of these activities is to check for understanding, capture knowledge gained, and provide variety of ways for students to interact with each individual resource. Students may complete some or none of the suggested singular activities for each text. Singular activities should be assigned at the discretion of the teacher.

1. **A Picture of Knowledge** (Recommended for *What is the World Made of?: All about Solids, Liquids, and Gases*, "Solids, Liquids, and Gases", *A Matter of Survival*, and "States of Matter")

- Take a piece of paper and fold it two times: once across and once top to bottom so that it is divided into 4 quadrants.



- Draw these shapes in the corner of each quadrant.



1. Square
2. Triangle
3. Circle
4. Question Mark

- Write!

Square: What one thing did you read that was interesting to you?

Triangle: What one thing did you read that taught you something new?

Circle: What did you read that made you want to learn more?

Question Mark: What is still confusing to you? What do you still wonder about?

- Find at least one classmate who has read [selection] and talk to each other about what you put in each quadrant.

2. Quiz Maker (Recommended for *States of Matter: A Question and Answer Book*, “Does Matter Really Matter?”, and “Lava Lake Explodes in Hawaii”)

- Make a list of three or more questions that would make sure another student understood the information.
- Your classmates should be able to find the answer to the question from the resource.
- Include answers for each question.
- Include the where you can find the answer in the resource.

Question	Answer
1.	
2.	
3.	
4.	
5.	
6.	

3. Wonderings (Recommended for “Changing States of Matter phase I and II”, and “Is Fire a Solid, a Liquid, or a Gas?”)

On the left, track things you don’t understand from the article as you read.

On the right side, list some things you still wonder (or wonder now) about this *topic*.

I’m a little confused about:	This made me wonder:

4. Pop Quiz (Recommended for “States of Matter” Infographic)

Answer the following questions.

Question	Answer
1. Which state of matter has molecules most tightly together?	Solid
2. Which state of matter has molecules floating freely around?	Gas
3. Which state of matter has molecules that are close together but can move easily?	Liquid
4. _____ occurs when matter changes from a liquid to a solid.	Freezing
5. When a solid changes directly to a gas, it is called _____.	Sublimation

6. What causes evaporation?	Heat causes water to evaporate
-----------------------------	--------------------------------

Expert Pack: Solids, Liquids, Gases

Submitted by: Portland Public Schools (Portland, OR) & Tillamook SD #9 (Tillamook, OR)

Grades: 4-5

Date: January 2016

Expert Pack Glossary

What is the World Made of? : all about Solids, Liquids, and Gases

<i>Word</i>	<i>Student-Friendly Definition</i>
Assistant	A person who helps someone. Scientist have assistants who help get them materials to use in their experiments.
Concentrated	Gather together in a smallest possible bunch. i.e. removing or reducing a substance. When you buy frozen juices they are concentrated and all you do is add water to make it.
Container	An object that holds something. Billy put all of his cars into a container to hold them so he wouldn't loose them.
Gas	Gas is the state of matter when the molecules move the fastest and can be visible or invisible. The smoke from a fire or steam from the boiling water are examples of gas.
Gradually	Small amounts at a slower rate. When you gradually do something you do it slowly. For example Susie gradually pour the flour into the cookie batter.
Invisible	Unable to be seen, not visible to the eye. The oxygen we breathe we know it is there cause we are breathing, but we just don't see it
Liquid	Liquid is a state of matter where molecules move slower than gas and take shape of their container. When you drink something like soda, water or juice you are drinking a liquid.

Matter	Matter is anything that takes up space as a solid, liquid, or gas. Everything we see, touch, feel, taste, even smell is made of matter.
Solid	Solids are states of matter which are hard and don't change shape because their molecules don't move around. A wooden block, toy truck are examples of solids
Temperature	Is the degree of hotness or coldness of a body or environment. Sun makes the temperature get warmer and snow means the temperature is getting colder.
Water Vapor	Is water in a gaseous state instead of a liquid or solid. When water vapor gets cool we see it as water bubbles on the outside of a glass.

"Solids, Liquids, and Gases"

<i>Word</i>	<i>Student-Friendly Definition</i>
States of Matter	How fast molecules move determine their state of matter - solid, liquid, or gas. Jessica likes to watch water change from one state of matter to another.
Molecules	Molecules are very small particles that change the state of matter by speeding up or slowing down in a solid, liquid, or gas. Jimmy learned in school that a gas is when molecules moved the fastest.
Condensation	Condensation is when a gas turns to a liquid because the molecules are cold and move close together. Eric noticed on his ice water class the droplets of water on the outside of the glass which happened because of condensation.
Melting Point	Melting Point is when a solid is heated enough to become a liquid. Jennifer watched a stick of butter change from a solid to a liquid when it reached the melting point.
Boiling Point	Boiling Point is when a liquid is heated enough to become a gas. Sally was going to make spaghetti so she turned the heat up in order to allow the water to reach a boiling point.
Evaporation	Evaporation is the action of a liquid changing into a gas. Billy noticed that the puddle of water outside was no longer there because of evaporation.

A Matter of Survival

<i>Word</i>	<i>Student-Friendly Definition</i>
Buoyant	Something is buoyant if it can float in a liquid or a gas. A beach ball is buoyant because it floats in water. A heavy rock is NOT buoyant because it would NOT float in water.
Chemical change	A chemical change happens when one type of matter changes into a different kind of matter; this kind of change cannot be undone. It is a chemical change when you burn wood in a fire. It is also a chemical change if you burn your marshmallow over the fire and it turns black.
Density	Density is how heavy something is for its size. For example, a marble has a higher density than a Styrofoam ball because even if it is the same size, it is heavier. A gas has a lower density than a liquid or a solid because if you have a cup of gas, it will be much lighter than if you have a cup of water (liquid) or rocks (solid).
Dissolve	To dissolve something is to mix it into a liquid. For example, you can dissolve Kool-Aid into water. The water in the ocean tastes salty because salt has dissolved into the water.
Fuel	Fuel is anything that can be burned to make heat. Wood, coal and oil are types of fuel. You can burn wood, coal, oil and other things - such as paper, leaves or pine needles - to make heat.
Mass	Mass is how much matter is in an object. An elephant has a lot more mass than a mouse. There is more mass in a rock than a leaf, even if they are the same size.
Physical change	A physical change happens when matter changes in size or shape but its properties stay the same. For example, you can create a physical change in chocolate by melting it. As soon as it cools down it will be solid chocolate again.
Property	A property is a way to describe or measure matter. Some properties that you can use to describe matter are color, size, mass, volume and density.
Solution	A solution is a liquid that has solids mixed into it really well. For example, Kool-Aid and ocean water are both solutions. To make Kool-Aid, you mix solid powder into liquid water. Ocean water is a solution of salt and water.

Volume	The amount of space something takes up is its volume. A house has a large volume compared to a TV. Gases have a greater volume than liquids and solids. For example, steam has a lot more volume than ice.
--------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

States of Matter: A Question and Answer Book

<i>Word</i>	<i>Student-Friendly Definition</i>
Atom	An atom is an element in its simplest form. All the matter you see is made of atoms, but they are too small to see one at a time.
Boil	When water or another liquid is heated until it bubbles. Then the water/liquid changes from a liquid to a gas when it boils as well. For example when you put a pan of water on the stove and heat it up it will boil.
Elements	The parts you need to do or create something. Looking at a Periodic Table you will see all the elements like hydrogen, oxygen, iron etc that make up things in our world.
Energy	The ability to move things or do work. When a substance is heated up the energy move faster and when it is cooled the energy moves slower.
Fahrenheit	Fahrenheit is the measurement of temperature. A temperature scale that defines freezing point of water at 32° and boiling point of water at 212° .
Freeze	To change from a liquid to a solid; cooling temperatures cause water to freeze and become ice when temperature falls below 32 degrees Fahrenheit. An example of this is when water is put in the freezer and it becomes an ice cube.
Melt	To change from a solid to a liquid. Heat causes it to melt and become a liquid when temperature is above 32° . Leaving or eating a popsicle outside when it is warm causes it to melt because it starts to drip.
Plasma	Known as the “fourth state of matter” it is similar to gas but is ionized or charged. It has no definite shape unless in a container. A neon light glows when electricity changes gas into plasma inside the light’s glass tube. Stars are made of plasma.
Precipitation	Water that falls from clouds to the Earth’s surface. Types of precipitation could be rain, hail, sleet, or snow. Flowers, trees and plants need rain to

	help them grow.
Substances	The stuff that an object consist of (matter). Water is made of two hydrogen atoms and one oxygen atom.
Vapor	A gas made from something that is usually a liquid or solid at normal temperatures. On hot days water droplets will evaporate and become a gas known as water vapor.

“States of Matter” (Infographic)

<i>Word</i>	<i>Student-Friendly Definition</i>
Solidification	Solidification happens when you turn a liquid into a solid. You can make Popsicles by solidifying liquid juice in the freezer. If it is raining and it gets colder, you can get hail or snow.
Sublimation	Sublimation happens when a solid turns straight into a gas. If you have dry ice for a birthday party it sublimates from a solid block of ice directly to a steamy gas.
Deposition	Deposition happens when a gas turns directly into a solid. This can happen on a very cold day when the water vapor in the air inside your house freezes on your windows.

“Does Matter Really Matter?”

<i>Word</i>	<i>Student-Friendly Definition</i>
Physical Properties	Matter changes from one state to another when the physical properties of the matter change. For example, when you change the temperature, a physical property, of water it can change to a different state of matter.
Vaporize	When a liquid is heated to the point of becoming steam it vaporizes. Jimmy used his vaporizer to create steam to aid his breathing.

“Changing States of Matter Phase I and II”

<i>Word</i>	<i>Student-Friendly Definition</i>
State	The way something is now. The states of matter are solid, liquid, gas, and plasma. An ice cube is in a solid state but with heat it will soon be in a liquid state. State can also refer to a person’s physical or mental feelings, place they live, or the condition of something.
Extreme	More than, farther than, or in greater amounts. Something beyond what is considered normal. Some sports are considered extreme sports because they go beyond what was considered normal or safe.
Decrease	To make smaller in size, amount, or number. To make less. The pain decreased when the thorn was taken out of Juan’s foot.
Pressure	The weight or force or something pushing down or pressing on something else. Donald felt a lot of pressure on his chest when he was on the bottom of the pile of people. This can also refer to a feeling of being pushed into something. Jose felt a lot of pressure to do well on the test because he didn’t want to upset his parents.
Oxygen	An important gas that we breathe. When the man was having a hard time breathing, the doctor gave him oxygen. Water is made up of oxygen and hydrogen.
Solidify	When something becomes a solid. It changes into something with a definite shape and size. An example is water freezing. It goes from liquid that moves and can be changed easily to solid (ice).
Nitrogen	This is a colorless (no color), tasteless (no flavor) element that can be a gas and helps make up living things in the world.
Sealed	Closed up or shut in. A sandwich bag is sealed when you press the sides of the bag together and it stays shut.
Chamber	A smaller room, container, or section inside of something else. A smaller room inside of a room would be considered a chamber. There is a section inside of an engine that is called a chamber.
Phase	A step or part of something. The first phase of making a peanut butter and jelly sandwich is to get the bread out. The next phase is to spread the peanut butter or jelly. When a liquid becomes a solid it goes into a different

	phase.
Physical	Something that is real; it can be seen and or touched. In this reading “physical effects” are those real things that change something. An example is how pressure (physical effect) can change how something melts or freezes.
Dense	When parts of something are crammed/packed together closely. Fog is said to be dense when the particles are really close together. This makes it hard to see through. Traffic is dense when cars are close together and can’t move quickly or easily.
Specific	having a special or particular job or purpose. A hammer is a specific tool made just for hitting nails or other objects. It is not made for painting or mowing the lawn. A pen is used specifically for writing or drawing. It was not made to hold up your pants. It has a special job or purpose that it does.
Arrangement	How something is put together or organized.
Celsius	Is a unit for measurement of temperature. Water boils at 100° and freezes at 0° . Most people in the United States measure temperature using Fahrenheit but Celsius is used by many scientists.
Reverse	In this article it means the opposite of something. The reverse of warm would be cool. The reverse of up would be down. If a car is in “reverse” it means it is going to go backward instead of forward (the normal direction most cars move).
Atmospheric/ Atmosphere	Atmospheric as in “atmospheric pressures” has to do with the air or gases around the earth.
Vibrate	to move up and down or back and forth quickly. When someone is shaking or shivering they are vibrating.
Transferred	Moving from one place to another. Edgar didn’t want to move but the bus driver transferred him to a seat away from his friends.
Condensation Point	The temperature when something changes from a gas to a liquid. Water will condense on the outside of a cold glass on a warm day because it cools the air temperature around it and the water in the air collects on the outside of the glass.
Neon	It is an element (one of the things that makes up other things on the earth). It is a gas. Many people use neon in glass tubes and electrify them to make

	lights. These are called neon lights.
Electrons	Electrons are negatively charged parts of an atom. Electrons are one of the three parts that make up an atom. The other parts are Protons (they have a positive charge) and a neutron (no charge at all). Electrons moving from atom to atom create electricity
Ionize	To separate or change into ions. Ions are atoms that have more positive (+) or negative (-) charges.
Negative	As in “negative charge” is the opposite of a positive (+) charge. In drawings this is most often shown with a minus sign (-). Negative can also refer to something bad or not positive. John’s attitude was so negative that none of his friends wanted to be around him because he had nothing good to say.
Concentrations	When something is condensed or made into a smaller and denser or pure form. This happens when things that are not as necessary get removed from something. Orange juice that is concentrated is juice without as much water but the same amount of vitamins and flavor. The juice takes up less space than it normally would until you add back the water.
Electricity	When electrons move from one atom to another.

“Is Fire a Solid, a Liquid, or a Gas”

<i>Word</i>	<i>Student-Friendly Definition</i>
Contrary	The opposite of what you might expect. Contrary to what you might expect, the little boy said he did NOT like ice cream. Contrary to what the Greeks believed, fire is not an element.
Universe	All of space and everything in it. The Earth is just a little planet in a giant universe.
Oxygen	An important gas that we breathe. When the man was having a hard time breathing, the doctor gave him oxygen. Water is made up of oxygen and hydrogen.
Ignition Temperature	The temperature at which something catches on fire. The ignition temperature of wood is 500°. The ignition temperature of a metal chair is

	1600°!
Extinguish	To make something stop burning. If your clothes catch on fire, you can roll around on the floor to extinguish the fire. Scientists don't know exactly why, but sound can extinguish fires.

“States of Matter” (Video)

<i>Word</i>	<i>Student-Friendly Definition</i>
Forms	The word form has many meanings. In this video it is a type or kind of something. There are four forms of matter liquid, solid, gas, and plasma. There are also different forms of dance such as tap, hip-hop, ballroom, and break dancing.
Furnace	A furnace is a large appliance or machine for making heat by burning gas, oil, coal, or wood. In many places people use furnaces to heat their home.
Materials	Anything used for building or making new things. Wood, metal, paint, and paper are kinds of materials.
Broiler	In this video a broiler is a place or container where glass is heated. More commonly a broiler can be a pan, grill, or part of a stove used to boil (cook at high heat) food. My mom used the broiler in the oven to toast the garlic bread but we had to watch it to make sure it didn't burn because it heated it so quickly.
Annealer	A container used to slowly cool glass (or metal) so that it is stronger and less brittle (breakable). The glass sculpture was put into the annealer so that it could cool slowly and get stronger. If the glass sculpture wasn't cooled slowly in the annealer it would break easily.
Properly	Something done in the correct or right way. If you don't tie your shoes properly then you will trip over the laces or your shoes may fall off. If you don't listen properly then you may not really understand the directions your teacher gives you.
Sculpture	An object (thing) made by heating and shaping glass. You can also make a sculpture out of clay by moving it with your hands, out of rock (or wood) by using a hammer and chisel (big metal nail-like object), or metal by melting or shaping it with tools. People that make sculptures are called sculptors.

	Many famous sculptors make statues by chiseling or breaking off pieces of rock, metal, or wood so that it looks like a person or animal. These sculptures can be found in museums or art books.
Studio	A building or room in a building used for a special purpose, usually for art or creative things. A studio apartment is a big open space that sometimes doesn't even have another room for the toilet or shower. My uncle changed his garage into studio so that he had his own place to go to paint pictures.

"Lava Lake Explodes in Hawaii"

<i>Word</i>	<i>Student-Friendly Definition</i>
Molten	Molten is a melted liquid. If you heat a chocolate bar on the stove it will become molten. Molten rock filled up the volcano in Hawaii like a bathtub.
Collapse	Collapse means to fall or crumble, sometimes all of a sudden. When you are building a Jenga tower, it will eventually collapse. If the side of a volcano collapses, it can send hot lava flowing down the mountain.
Debris	Debris is bits of something lying around. After doing a lot of fireworks on the Fourth of July, there may be a lot of firework debris on the ground. An exploding volcano can send rock debris flying far away.
Geologist	A geologist is a scientist who studies the earth. Geologists dig up the earth to find out how long ago dinosaurs lived. Geologists also study volcanoes to try to figure out when they might explode.
Champagne	Champagne is a drink for adults with fizzy bubbles that pops when you open it. On New Year's Eve the people on TV popped open a bottle of champagne. A bottle of champagne and a volcano both pop because of the pressure that has built up inside them.
Fragments	Fragments are little pieces of something. After someone smashes a piñata, little fragments of the piñata fall to the ground. When a volcano explodes, fragments of rock fly through the air.
Altered	Changed. The girl altered her hair to look pretty for the wedding. The shape of a volcano is altered by an eruption.
Skyward	Toward the sky. The little girl let her balloon float skyward. Volcanoes

	shoot ash, gas and rocks skyward during an eruption.
Overlook	A place where you can look down onto something. There are many overlooks above the Grand Canyon for people to look down into the canyon from above. Some volcanoes have overlooks where tourists can look down into the crater of the volcano.
Fissure	A narrow break in something. As the temperature warms up, fissures start to happen on frozen lakes and rivers. Gas and lava can break through the ground near a volcano, creating a fissure.
Continuous	Something that is constantly happening. Some stores have continuous loud music playing. Some volcanoes erupt every 100 years, but others erupt continuously.
Diameter	How far it is across or through something. The diameter of a quarter is about one inch. The diameter of a volcano's crater can get a lot bigger during an eruption.
Magnitude	How large, strong or powerful something is. The magnitude of the earthquake was so strong that it shook all the pictures off the walls in our house. The magnitude of the explosion was so strong that almost the entire volcano exploded into the air.