MATTER

Physical Science 2nd Semester

NAME: _____

CLASS PERIOD: _____
TEACHER: _____

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Learning Targets: Matter

Answer the following questions to identify your level of understanding:
Refer to Chapters 2 and 3 in your textbook for assistance.

Learning Targets:	1 – Below Standard	2 – Approaching Standard	3 – At Standard	4 – Above Standard
A. I can explain the physical properties and changes of matter.	What are the 7 common physical properties of matter?	Explain 2 ways that physical properties are useful.	Give an example of a physical change, and explain how you know that it is a physical change.	Describe at least 5 physical & 5 chemical changes that occur as you get ready for school in the morning.
Growth Chart: 1st 2nd 3rd Lvl 4 Lvl 3 Lvl 2 Lvl 1				
B. I can explain the chemical properties and changes of matter.	What are the common chemical properties of matter?	What are the 3 common indicators that a chemical change has occurred?	Give an example of a chemical change, and explain how you know that it is a chemical change.	
Growth Chart: 1st 2nd 3rd Lvl 4 Lvl 3 Lvl 2 Lvl 1				
C. I can explain how matter is classified.	What is matter?	Explain the difference between a pure substance and a mixture.	Explain the difference between homogeneous and heterogeneous mixtures and give examples of each.	Explain the difference between solutions, suspensions, and colloids and give examples of each.
Growth Chart: 1st 2nd 3rd Lvl 4 Lvl 3 Lvl 2 Lvl 1				

Learning Targets:	1 – Below Standard	2 – Approaching Standard	3 – At Standard	4 – Above Standard
D. I can compare and contrast the different states of matter.	What are the 3 common states of matter? Sketch the particles of a substance in each of the 3 common states of matter.	Compare how the volume and shape of a substance change in each of the states of matter.	Explain the differences in the behavior of molecules in each state of matter.	Why does ice float in water while most other substances sink (in its own liquid form) when they freeze?
Growth Chart: 1st 2nd 3rd Lvl 4 Lvl 3 Lvl 2 Lvl 1				
E. I can explain and distinguish the different phase changes that matter undergoes.	What are the six common phase changes that matter can undergo and what phases does each include?	Define endothermic and exothermic and explain how they apply to the six types of phase change.	Explain what happens to the temperature of substance as it undergoes a phase change	During the phase change lab what is the energy used for during at least three parts of the experiment?
Growth Chart: 1st 2nd 3rd Lvl 4 Lvl 3 Lvl 2 Lvl 1				
F. I can explain how gasses are effected by various factors.	Define gas pressure and explain how it is caused by air inside a sealed container	What 3 main factors affect the pressure of a gas inside a sealed container?	How does each of the three factors affect gas pressure? (as _____ increases, pressure _____)	Explain the can crush in terms of the temperature and pressure of the gases inside the can before and after.
Growth Chart: 1st 2nd 3rd Lvl 4 Lvl 3 Lvl 2 Lvl 1				

Density Lab

Question:

Do two pieces of the same substance that are different sizes (volumes) have the same density?

Hypothesis:

_____

_____

_____.

Define:

Mass:

Volume:

Density:

Procedure:

1. Begin at your assigned station.
2. You have three minutes to measure the mass (to the nearest 0.1 gram) and volume of the object at that station. Record this information in your data table.
3. Move to the next station when instructed to do so, and repeat the procedure until you have data for all 5 stations.
4. Calculate the density for each object, and record it in the table. Be sure to show <u>all of your work</u> (the 4-step method) in the column provided!
5. Complete the conclusion questions.

Station 1: Identify the Material

- Use the table of common densities to find the identity of each material

Description of Material	Mass (g)	Volume (mL)	Density	Identity

Station 2: Density of Floating Objects

	Mass (g)	Volume (mL)	Density
Cork			

1. How did you find the volume of the cork?

2. Why couldn't you just let the cork sit on top of the water?

Station 3: Finding the Density of Water

Volume	Mass	Density
10 mL		
30 mL		
50 mL		

1. How did the densities of the various volumes of water compare? Explain.

Station 4: Density of Pennies

- Look at the dates carefully
- Place 5 pennies in the graduated cylinder at a time/weigh 5 at a time

Pennies	Mass (g)	Volume (mL)	Density
5 "old" pennies (1980 and older)			
5 "young" pennies (1983 and younger)			

1. Even though the pennies are the same shape and size they have different densities. Why do you think that is?

2. Using the Table of Common Densities find their components.
   Old Young

Station 5: Density of Wood Blocks

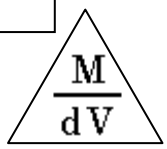
Block Number	Mass (g)	Volume (mL)	Density

1. Did changing the size/shape of the wood blocks change the Density? Why or why not?

Density Calculations Worksheet I

density = mass / volume

UNITS OF DENSITY
solids (g/cm^3) liquids (g/mL)



1. Find the unknown quantity:

a) d = 3 g/mL V = 100 mL M = ?	b) d = ? V = 950 mL M = 95 g	c) d = 0.5 g/cm^3 V = ? M = 20 g

2. Find the unknown quantity (CONVERT FIRST to g or mL)

a) d = 24 g/mL V = 1.2 L = _____ mL M = ?	b) d = ? V = 100 mL M = 1.5 kg = _____ g	c) d = V = 0.52 L = _____ mL M = 500 mg = _____ g

WORD PROBLEMS

1. A block of aluminum occupies a volume of 15.0 mL and weighs 40.5 g. What is its density?

2. Mercury metal is poured into a graduated cylinder that holds exactly 22.5 mL. The mercury used to fill the cylinder weighs 306.0 g. From this information, calculate the density of mercury.

3. What is the weight of the ethanol that exactly fills a 200.0 mL container?
The density of ethanol is 0.789 g/mL.

4. A rectangular block of copper metal weighs 1896 g. The dimensions of the block are 8.4 cm by 5.5 cm by 4.6 cm. From this data, what is the density of copper? (hint: find the volume of a block first)

5. What volume of silver metal will weigh exactly 2500.0 g. The density of silver is 10.5 g/cm^3.

6. Find the mass of 250.0 mL of benzene. The density of benzene is 0.8765 g/mL.

7. A block of lead has dimensions of 4.50 cm by 5.20 cm by 6.00 cm. The block weighs 1587 g. From this information, calculate the density of lead.

8. 28.5 g of iron shot is added to a graduated cylinder containing 45.50 mL of water. The water level rises to the 49.10 mL mark, From this information, calculate the density of iron.

Physical and Chemical Property Vocabulary/Notes

Physical	Chemical
What is a physical property? Physical properties are used to: 1. 2. 3.	What is a chemical property? When/how can chemical properties be observed?
Define each of the following physical properties: Viscosity Conductivity Malleability Melting Point Boiling Point Density	Define each of the following chemical properties: Flammability Reactivity Chemical Change? How will you recognize a chemical change: 3 Common Evidences 1. 2. 3. Precipitate:
Physical Change?	
How will you recognize a physical change?	
When matter undergoes a physical change the composition of the matter _____	When matter undergoes a chemical change the composition of the matter _____

Classifying Matter Concept Map

Matter

Definition:

Pure Substances

Definition:

Elements

Definition:

Example:

Picture:

Compounds

Definition:

Example:

Picture:

Mixtures

Definition:

Heterogeneous Mixture

Definition:

Homogeneous Mixture

Definition:

Solution	Suspension	Colloid
Definition:	A heterogeneous mixture that separates into layers over time	Contains some particles that are intermediate in size. They are held in place or do not separate.
Example:	Sand in water which is shook up – the particle float for a while	Milk or a marshmallow
Picture:		

Physical and Chemical Changes Lab

Substance	Observations	Chemical or Physical Change
Melting Candle Wax		
Burning Candle Wick		
Tearing Paper		
Burning Paper		
Dissolving NaCl (salt)		
Mixing NaCl and $AgNo_3$		
Cutting Magnesium Ribbon		
Adding Mg to HCl		
Heating $CuSo_4 * 5\ H_20$		
Mixing Fe and S		
Heating Fe and S		
Burning Mg strip		

1. Name 2 possible types of evidence that a chemical change has occurred (giving an example).

2. A change in color does not always indicate a chemical change. Explain why it could be a result of a physical change. Give one example.

3. Cooking involves both physical and chemical changes. Give 2 examples that support this statement. (2 for chemical and 2 for physical)

4. Complete the following table by describing the changes in properties that you might notice during each process, and state whether the changes are chemical or physical.

Event	Observable Changes	Type of Change
Freezing water		
Burning a log		
Milk turning sour		
Baking a cake		
Breaking a window		

Elements, Compounds & Mixtures

1. Label the following as either an element or a compound.

a. HCl _____ c. Na _____ e. Co_____

b. CO _____ d. H_2O _____ f. $CaCl_2$_____

2. Can two or more elements be chemically combined to make a new element? Explain your answer.

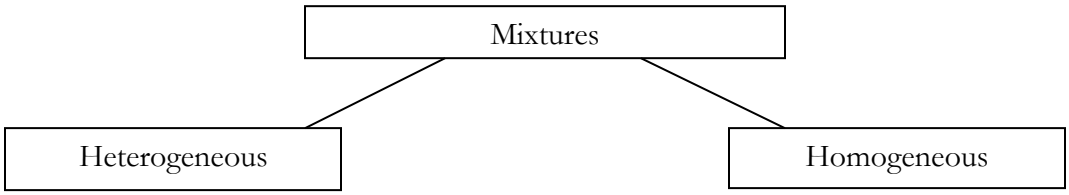
3. What is the difference between a mixture and a compound?

4. In the boxes below, draw a picture of a heterogeneous mixture and a homogeneous mixture. Use X's to represent one kind of molecule and O's to represent another kind.

Heterogeneous Mixture

Homogeneous Mixture

Place the examples given into the correct categories.



_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Lemonade (real lemons)	Brass	Suntan Lotion
Asphalt	Air	Fog
Saltwater	Smoke	Salt and Pepper
Pasta salad	Butter	Trail Mix

Concept Map Checklist:

Example

Molecular Drawing

Shape

Volume

Density

Energy Level

2 Interesting Facts

States of Matter Concept Map

Phase Change Notes

Phase Change	Energy	Molecular Speed	Structure	What do we call it?	Notes

Ice Cube Melting Contest

Everyone must answer questions 1-5 before the contest can begin!

1. What is responsible for phase changes?

2. Describe what is happening on the molecular level during the following phase changes. Your answer should discuss energy, molecular speed, and structure.

solid ⟶ liquid

liquid ⟶ gas

liquid ⟶ solid

3. What are the two types of vaporization and how do they differ?

ICE CUBE MELTING CONTEST

You and your partner will receive one ice cube sealed in a Ziploc bag. You will compete as a team to be the first to **completely** melt your ice cube.

RULES

1. The ice cube must stay in the bag.
2. You may not open the bag for any reason.
3. You must stay in your seats, and your seats must stay in their current location.
4. The ice cube must stay in one piece.

4. There will be a prize up for grabs so it is important that you devise a strategy before you begin. In complete sentences, describe the strategy that you and your partner will use to melt your ice cube.

5. How long do you predict it will take to completely melt your ice cube?

6. How long did it actually take to melt your ice cube?

7. Find a pair of classmates who melted their ice cube faster than you and ask them what their strategy was. Describe their strategy and explain why you think it worked better.

8. Are all solids frozen? Explain your answer.

Phase Changes Lab

Introduction:

A phase change occurs when a substance transforms from one state of matter to another. You witness these changes all the time in your everyday life. Every time the ice in your soda melts or the water vapor from you shower condenses on the mirror, you are observing these types of changes. During today's lab you and your partners will be observing the phase changes of water.

Objectives:

In this experiment you will…

- Observe the melting of ice and the boiling of water
- Analyze and graph the data you collect
- Use the graph you construct to make conclusions about phase changes

Learning Target:

I can label and describe the six phase changes by referring to energy levels, molecular arrangement, and temperature on a phase change diagram.

Question:

What happens to the temperature of water during a phase change?

Hypothesis: (If, then, because…) _____

_____

_____.

Define (in your own words):

Phase change:

Temperature:

Boiling point:

Melting point:

Materials:
Thermometer
250 mL beaker
Ring stand
Test tube clamp
Hot Plate
Ice

Procedure:

1. Put on goggles, an apron, and tie back your hair
2. Assemble the lab equipment as shown
3. Place 100 mL of cold water in your beaker.
4. Add approximately 100 mL of crushed ice. Record the temperature at time 0.
5. Use the thermometer to *gently* stir the ice mixture. Record the temp **every thirty seconds**. Be sure the thermometer is not touching the beaker when you read the temperature.
6. When the temperature does not change for 3 minutes, turn your hot plate on high and continue heating the mixture. You can use a test tube clamp to suspend the thermometer in the mixture.
7. Record the temperature readings **every thirty seconds** while heating on Date Table 1.
8. Continue to heat and record temperatures until the boiling water temperature does not change for 3 minutes.
   - Highlight the temperature on your data table at the point when the ice begins melting, and again when it reaches a rolling boil
9. Turn off your Hot Plate, clean up your station, and use a heat resistant glove to pour the water out. DO NOT set beakers in the sink as they may shatter due to the temperature change. Leave the beakers on the front counter.

Results:

Fill in the data table below.

Data Table 1:

Time (min)	Temp °C	Time (min)	Temp °C	Time (min)	Temp °C
0		14.0		28.0	
.5		14.5		28.5	
1		15.0		29.0	
1.5		15.5		29.5	
2.0		16.0		30.0	
2.5		16.5		30.5	
3.0		17.0		31.0	
3.5		17.5		31.5	
4.0		18.0		32.0	
4.5		18.5		32.5	
5.0		19.0		33.0	
5.5		19.5		33.5	
6.0		20.0		34.0	
6.5		20.5		34.5	
7.0		21.0		35.0	
7.5		21.5		35.5	
8.0		22.0		36.0	
8.5		22.5		36.5	
9.0		23.0		37.0	
9.5		23.5		37.5	
10.0		24.0		38.0	
10.5		24.5		38.5	
11.0		25.0		39.0	
11.5		25.5		39.5	
12.0		26.0		40.0	
12.5		26.5			
13.0		27.0			
13.5		27.5			

Data Analysis:

1. On the graph paper provided, graph the data from Table 1.

2. After the brief class discussion, make sure to add/include the following:

- TAIL
- Label the 3 states of matter, *each in a different color*
- Draw a picture of the molecular structure for each
- Add an arrow and label which direction kinetic energy is increasing
- Use arrows and labels to identify all 6 phase changes

Conclusion:

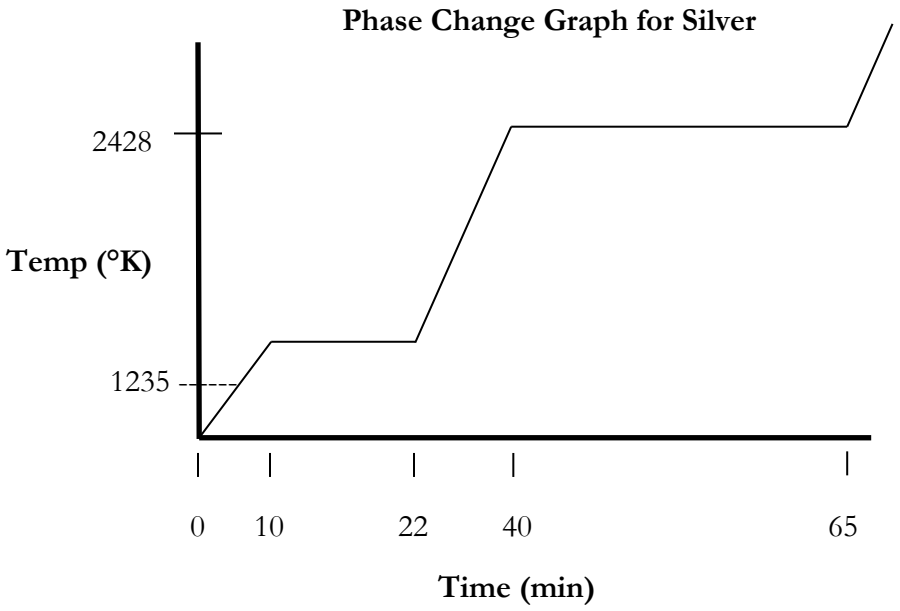
1. Looking at your graph, what trend in the temperatures do you see during the phase changes? Explain this trend using your knowledge of a phase change (or your book).

2. During which phase changes is energy being absorbed? During which phase changes is energy being released?

3. How does an endothermic phase change differ from an exothermic phase change?

4. Is there *always* a change in energy during a phase change? Explain.

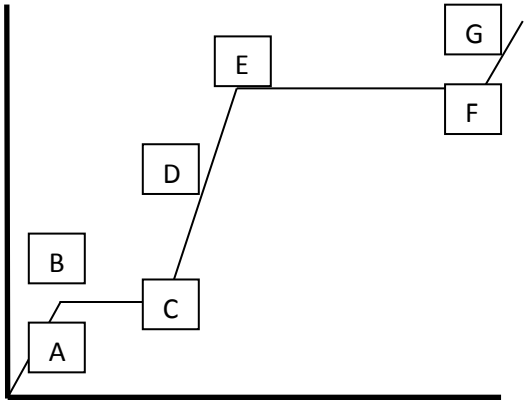
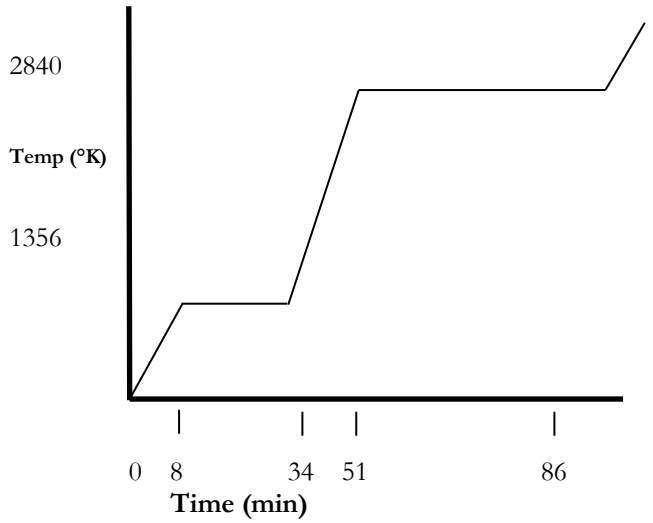
Use the phase change graph below and what you have learned about the phase changes of water to answer the questions that follow.

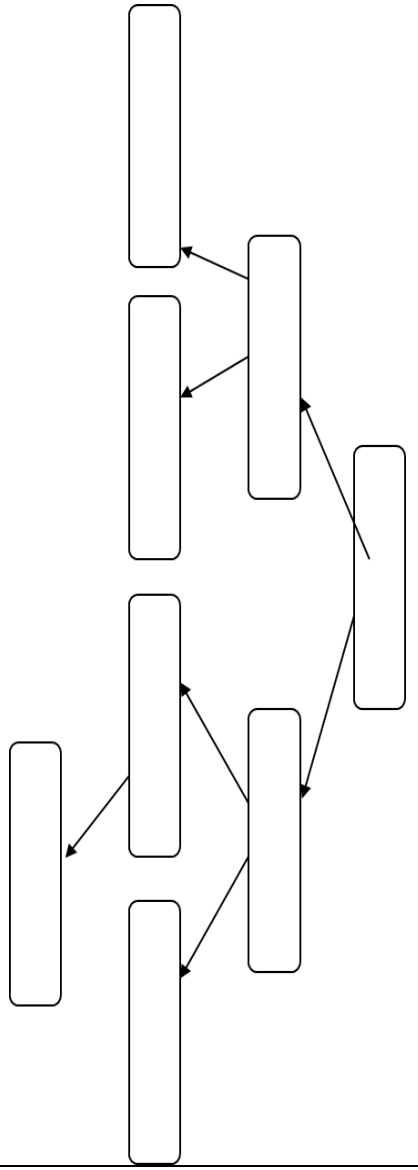


3. What is the melting point for silver? _____
4. What is the boiling point of silver? _____
5. At what temperature would silver freeze? _____
6. Between what *times* is the silver a solid *only*? _____
7. Between what *times* is the silver a solid and a liquid? _____
8. Between what *times* is the silver a liquid and a gas? _____

Hit the Target Review

States of Matter	Phase Change	Homogeneous vs. Heterogeneous
Identify the correct state of matter (solid, liquid, or gas) to match with each of the following statements. 1. _____ attraction between particles inhibits motion 2. _____ medium density 3. _____ has a definite shape and volume 4. _____ has the least kinetic energy 5. _____ has a definite volume but no definite shape 6. _____ particles have constant random motion 7. _____ attraction between particles can be ignored	Write the name of the phase change on the space provided. 1. Solid → Gas _____ 2. Solid → Liquid _____ 3. Liquid → Solid _____ 4. Liquid → Gas _____ 5. Gas → liquid _____ 6. Gas → Solid _____	Decide whether each mixture is homogeneous or heterogenerous. 1. Milk _____ 2. Sawdust and Sand _____ 3. Cereal and Raisins _____ 4. Sugar dissolved in water _____ 5. Sandy Water_____ 6. Lava Lamp _____ 7. Ice water _____
Target: _____ Correct: _____ Score: _____	Target: _____ Correct: _____ Score: _____	Target: _____ Correct: _____ Score: _____

Phase Change Diagram	Phase Change Diagram	Physical vs. Chemical Change
Label the following terms on the phase change graph.  1. Melting Point _____ 2. Gas _____ 3. Freezing Point _____ 4. Solid _____ 5. Boiling Point _____ 6. Liquid _____ 7. Condensation Point _____	**Phase Changes of Copper**  1. Melting point for Copper _____ 2. Condensation point for Copper _____ 3. Freezing point for Copper _____ 4. Between what times is Copper a solid ONLY _____ 5. Between what times is Copper both a solid and a liquid _____ 6. Between what time is Copper both a liquid and a gas _____ 7. What is happening during the horizontal/flat portions of the graph _____	Decide if each change listed is a physical or chemical change. 1. Iron nail rusting _____ 2. Water freezing _____ 3. Milk turning sour _____ 4. Chopping wood _____ 5. Burning wood _____ 6. Bread dough rising _____ 7. Boiling water _____
Target: _____ Correct: _____ Score: _____	Target: _____ Correct: _____ Score: _____	Target: _____ Correct: _____ Score: _____

Density	Classifying of Matter	Classifying Matter
1. What is the density equation? 2. What are the units of density? 3. What is the density of an object with a mass of 39 g and a volume of 13 cm^3? 4. How many cm^3 are in 125 mL? 5. A block of wood floats on water. What is true about its density? a. Its density is less than 1 g/cm^3. b. Its density is equal to 1 g/cm^3. c. Its density is more than 1 g/cm^3.	Use the choices below to answer the following questions. a. Compound b. Heterogeneous c. Solution d. Solute e. Solvent f. Element g. Homogeneous 1._____ The simplest pure substance 2._____ A mixture in which one substance is dissolved in another substance. 3._____ ALL mixtures that are the same throughout. 4._____ This is the substance that is dissolved. 5._____ Two or more elements that are chemical combined in a fixed proportion 6._____ This substance does the dissolving 7. _____ A type of mixture that is not the same throughout.	Use the following words to fill in the graphic (It might be easier to turn your paper) Compounds Matter Homogeneous Solutions Elements Pure Substances Heterogeneous Mixtures 
Target: _____ Correct: _____ Score: _____	Target: _____ Correct: _____ Score: _____	Target: _____ Correct: _____ Score: _____