Name: Answer Key #: _____

Properties of Matter

STEMscopes: All matter has properties. Properties are the characteristics or traits that make a particular material unique from other materials. The physical properties of a material can be measured without changing the materials molecular form or structure.

Standards that will be addressed:

- **5-PS1.A.3**: Measurements of a variety of properties can be used to identify materials.
- **5-PS1.3**: Make observations and measurements to identify materials based on their properties.

Remember to look at the Science tab on our class website for additional resources, information, and updates.

Pages included in the packet:

1. STEMscopedia
2. Linking Literacy: Concept Definition Map
3. Communicate: Why do we chew gum?
4. Content Connections Video: Blacksmiths
5. Science Today: Property Scanner
6. Independent Practice
7. Concept Attainment Quiz

Optional Extension Activities:

- At Home Connection Piece (see class website)
- Web Surfing Science (see STEMscopes account)

Quiz date: ***tentatively December 15th***

- The quiz will be 5 Multiple Choice Questions

Reflect

What are the differences between solids, liquids, and gases?

Remember that everything you see around you (including yourself) is a form of matter. Does water have matter? You bet! Matter is anything that takes up space and has mass or weight.

Matter is made up of small particles. Matter is a solid, a liquid, or gas-based, depending on how fast these particles are moving around (how much energy they have).

- **Solid**: The particles that make up an object are so close together that they cannot move around and they are arranged in a regular pattern
- **Liquid**: The particles that make up an object are close together, but they can still move or slide around each other
- **Gas**: The particles that make up an object are completely separate so they can bounce around and off each other

When we think of water, we usually think of it as a liquid. However, water can also be a solid or a gas. When water is a solid, it is called *ice*. When water is a gas, it is called *water vapor*. The table below shows water in each state of matter.

Three States of Water		
Solid (Ice)	**Liquid**	**Gas (Water Vapor)**
		
Has its own shape and volume that does not change	Has its own volume but takes the shape of the part of the container it fills	Expands to fill the entire container (takes the container's volume and shape)
Does not move	Flows towards the bottom	Moves easily in all directions

Look Out!

Is sand a liquid? After all, we can pour sand from a bucket. We can fill a container with sand. In fact, sand is made up of thousands of solids. Each grain of sand is like a very small rock. It cannot be molded. It does not lose its shape.

What properties tell us if an object is a solid, liquid, or gas?

Each object has its own properties that do not change. Every substance will freeze and become solid at a certain temperature. For example, water freezes at 0 degrees Celsius (0°C). Every substance will melt and become a liquid or boil and become a gas at different temperatures. Water boils at 100 degrees Celsius (100°C). If you leave a chocolate bar in the back seat of a hot car, it will turn into a brown puddle of goo after a while. We can say, then, that temperature is a property of an object.

What Do You Think?

An object's temperature plays an important role in whether the object is a solid, liquid, or gas. Can you think of any other properties? Think about how you can tell that a table is a solid or that milk is a liquid. How can you tell that moving air or wind is a gas?

Reflect

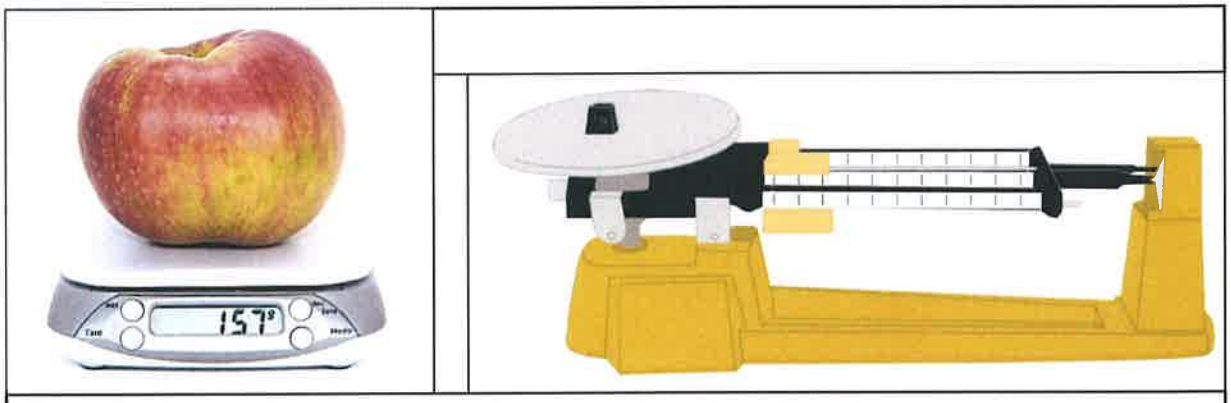
How can we measure, test, and record different properties of matter?

Have you ever been to an amusement park where someone offers to guess a person's weight? You probably tried to guess that person's weight too. Were you close?

Sometimes your eyes can trick you. A person may appear to weigh 90 pounds but really weigh 110 pounds. In science, that much difference could ruin an experiment. Instead, scientists rely on tools to measure an object's properties.

Reflect

- **Mass:** An object's *mass* is different than its weight. Mass is the amount of "stuff" or matter in an object. We use a balance scale to measure mass. Weight is a bit different. It refers to gravity's pull on an object. Think about astronauts jumping high on the Moon. They weigh less on the Moon than on Earth because the Moon has less gravity. However, they are still made up of the same "stuff," so they have the same mass.



Both of these instruments are balance scales. Even though both balances measure mass, they show mass in different ways. The scale on the left is digital. The scale on the right is a triple beam balance that you operate by hand.

- **Temperature:** Heating or cooling an object can change its state of matter. (You saw this with water.) *Temperature* is a physical property that shows how much energy an object has. Heating an object increases its energy. Cooling an object decreases its energy. Temperature of an object is measured with a thermometer.

- **Magnetism:** An object has *magnetism* if it contains certain metals such as iron. Magnets are attracted to magnetic objects. In other words, a magnet can pull a magnetic object closer. If an object is not attracted to a magnet, it is *non-magnetic*.

- **Density:** To figure out an object's *density* related to other objects, first figure out if the object floats or sinks in water. Objects with greater density than water will sink. Objects with less density than water will float.

Try Now

The type of ball you use in a sport determines the way the sport is played. You can see this by trying a simple experiment with relative density.

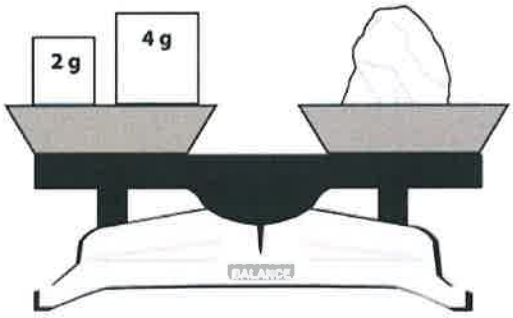
- First, collect these objects: table tennis (ping pong) ball, racquetball, golf ball, tennis ball, bouncy (rubber) ball, marble, and baseball. [Note: water could ruin your tennis ball or baseball, so either use an old ball you do not mind getting wet or wrap them tightly in cling-wrap (with no air bubbles) first.]
- Fill a clear container 2/3 full of water.
- Place each ball in the water to see if it floats or sinks. Record your results on a piece of paper.
- Which balls are less dense than water? Which balls are more dense than water?
- How does their relative density affect the way their games are played?

What Do You Think?

What Do You Know?

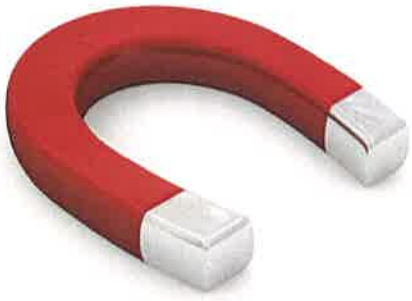
Which property of matter is being measured in each of these images?

1.

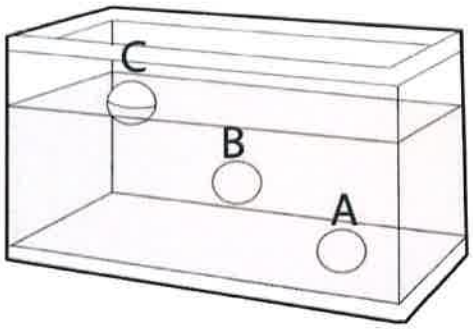


2.

3.



4.



Name: _____ Date: _____ Group: _____

Properties of Matter Concept Definition Map

What is it? (definition)

Anything that takes up space and has mass or weight.

Matter

What are some ways we measure, test, and record different properties of matter?

- Mass
- Temperature
- Magnetism
- Density

- Solid
- Liquid
- Gas

What are the three states matter is found in?

Explain: Communicate

Name: _____ Date: _____ Group: _____

Driving Question:

Why do we love to chew gum?

Discussion Goals:

- Have evidence to support your position statement
- Include information about:
  - Properties of chewing gum;
  - Ways to remove chewing gum from surfaces; and
  - Pros and cons of chewing gum.

Research:

Answers will vary

Notes From Discussion:

Content Connections Video

Name: _____ Date: _____ Group: _____

Blacksmiths

1. What do you think the blacksmith is making? (Pause 0:19)
   answers will vary

2. What does the blacksmith do to the metal to make something? (Pause 0:35)
   He puts it in the fire to heat it up and make it soft.
   Then he hammers it into the right shape.

3. What did the blacksmith make? (Pause 0:52)
   He made a spearhead.

Name: _____ Date: _____ Group: _____

Property Scanner

1. What information could the scanner provide about each food?

The scanner identified the food and listed the fat, carbs, calories, and other nutritional information.

2. Choose three other foods. List all the properties that would be necessary to identify that food item. Be sure to list properties you can observe as well as properties you can measure using tools.

1. Orange: tough outer skin; skin is orange and bumpy; round; has seeds inside; tastes sweet + juicy
2. Banana: tough, yellow outer skin; long and curved shape; about 13 cm long; tastes sweet
3. Chicken leg: bone inside; thin layer of skin on the outside; has more meat on one end; tastes salty

3. How will this device help the medical field?

The device could scan unknown medications and identify what drugs are in it.

Independent Practice

Name: Answer Key Date: _____ Group: _____

Part I: Word Scramble

1. properties
2. measurements
3. weight
4. evidence
5. temperature
6. volume
7. particle

Independent Practice

Name: Answer Key Date: _____ Group: _____

Part II: Word Search

E	M	E	V	I	D	E	N	C	E	S	W	P	Q
V	O	W	P	A	R	T	I	C	L	E	S	W	R
A	D	V	S	I	J	C	O	P	E	O	T	E	H
P	R	O	P	E	R	T	I	E	S	V	E	I	A
O	S	L	D	S	G	A	G	M	A	L	R	G	S
E	V	U	P	O	R	T	I	O	N	D	V	H	G
R	M	M	E	A	S	U	R	E	M	E	N	T	S
O	F	E	S	V	P	E	G	E	K	Y	P	O	C
P	A	G	T	E	M	P	E	R	A	T	U	R	E
M	I	C	R	O	S	C	O	P	E	L	R	V	E

1. temperature
2. properties
3. evidence
4. volume
5. particles
6. weight
7. Measurements
8. microscope

Concept Attainment Quiz

Name: ANSWER KEY Date: _____ Group: _____

I. Vocabulary Matching

C Used to observe and describe matter	A. Volume
D The amount or size of something that is determined by a tool	B. Weight
B How heavy an object is	C. Properties
A The amount of space that matter fills	D. Measurement

II. Identification

Use the word bank to fill in the blanks below.

properties	measureable	standard units	magnet	conductor

1. A material that allows energy to flow through it is called a(n) conductor, or said to have good conductivity.
2. A magnet is a metal that attracts other metals if they contain iron or cobalt.
3. Mass, state of matter, ability to attract iron, and insulation are all examples of properties of matter.
4. Physical properties are observable and measureable. Scientists measure properties using standard units.