



TEACHER GUIDE

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STUDENT HANDOUTS

• Reading Comprehension

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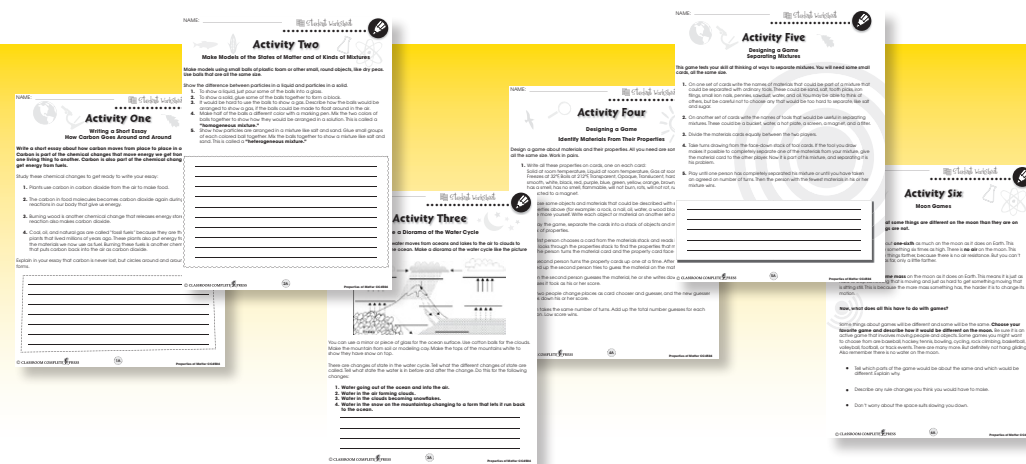
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- Go to our website:
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- Click on item CC4504 – Properties of Matter
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Three States of Matter

1. Materials can be solids, liquids, or gases. Write **S** after each material that is a solid. Write **L** after each material that is a liquid. Write **G** after each material that is a gas.

- a) water _____
- b) air _____
- c) sand _____
- d) cooking oil _____
- e) candle wax _____
- f) steam _____
- g) ice _____

2. Fill in each blank with a word from the list.

solid

liquid

gas

- a) When something **melts**, it goes from a _____ to a _____.
- b) When something **boils**, it goes from a _____ to a _____.
- c) When something **freezes**, it goes from a _____ to a _____.



Three States of Matter

You may know that most materials can take three different forms called **solid**, **liquid**, and **gas**. These forms are known as the three **states of matter**. We are most familiar with the three states of water. Solid water is ice; we drink liquid water; and water as a gas is called steam or water vapor. Some people think fog and clouds are gas, but they are actually very small drops of liquid water.



Each state of matter has its own **properties**:

Solids have a fixed **shape** and a fixed **volume**. This means that a solid's shape and volume always stay the same.

Liquids do not have a fixed shape; they take the shape of their container. Liquids do have a fixed volume.

Gases take the shape of their container, *and* they completely fill their container. So gases do not have a fixed shape or a fixed volume.

Show the properties of the three states of matter by writing YES or NO in each box of the table below.

State of Matter	Does it have a fixed shape?	Does it have a fixed volume?
Solid		
Liquid		
Gas		

But why *are* there different states of matter? What makes a material change from one state to another? We can answer these questions by looking at the behavior of the **particles** in each state. Remember that all matter is made up of very small particles called atoms and molecules.



Three States of Matter

1. Circle **T** if the statement is True or **F** if it is False.

- T F a) Particles in a solid cannot move.
- T F b) Particles in a gas are much farther apart than particles in a liquid.
- T F c) Liquids have fixed shape that cannot change.
- T F d) Materials lose mass when they go from liquid to gas.
- T F e) When particles of a material move faster, the temperature of the material goes up.

2. Use the words in the list to answer each question. Two words will be used more than once.

boiling

condensing

evaporating

freezing

melting

- a) Which is a change from liquid to solid?

- b) Which is a change from gas to liquid?

- c) Which can happen when heat is added to a solid?

- d) Which **two** things can happen when heat is added to a liquid?

- e) What happens when particles break free from their fixed positions?

- f) What change is happening when clouds form in the sky, dew forms on grass, or water droplets form on a bathroom mirror?



Three States of Matter

3. Why can't solid things change their shape? Use the word "particles" in your explanation.

4. The temperature of a bowl of hot soup goes down after the soup is poured into a bowl. What is happening to the motion of the particles in the soup as it cools?

5. Gases have very low densities. What does this show about the distance between gas particles?

Extensions & Applications

6. a) Use the graphic organizer on the next page to organize what you have learned about states of matter. The arrows show the **direction of change** from one state to another. Write the name of each change. Tell whether the change is caused by adding heat or removing heat. Tell whether the change makes the particles move faster or slower. Some of the answers have been done for you.

b) We can understand how particles move in the three states by thinking of something we can see that moves the same way. For example, particles in a solid move like people riding in a bus on a bumpy road.

The people in the bus are always in motion because the bus is in motion. Yet, they never change position because they don't change seats. The speed of the bus is like temperature. The greater the bus speed, the faster the people bounce around.

Now do the same for the other two states of matter.

Think of a type of motion you can see that is like the **motion of particles in a liquid**. You may write a complete description of the motion, or draw a detailed picture of the motion.

Think of a type of motion you can see that is like the **motion of particles in a gas**. You may write a complete description of the motion, or draw a detailed picture of the motion.



Chemical Changes and Conservation of Mass

CONSERVATION OF MASS is one of the laws of science. "Conserved" means something stays the same. So this law says that no mass is lost or gained during a chemical change. This is also true of physical changes. You can do experiments to show that this is true.

Experiment 1

For the first experiment you will need a piece of fresh bread, a tablespoon of water and a container. You must be able to see through the container and be able to seal it very tightly. You will also need a scale or balance that can tell very small differences in weight. Ask your teacher if there is an "analytical balance" in your school. Ask if someone could weigh some things on for you.

Steps:

1. Put the bread and water in the container and seal it tightly.
2. Weigh the container with the bread and water in it.
3. Put the container in a sunny window or other warm place.
4. Wait until the bread is covered with mold. (Getting moldy is a chemical reaction.)
5. Weigh the container again.

Experiment 2

For the second experiment you will need a few small iron nails or some iron filings. The nails should be plain iron and not coated with anything. Iron filings will work better.

Steps:

1. Weigh the iron nails or filings carefully.
2. Put the nails or filings outside in a place where they will get sunlight and where dew and rain can get on them.
3. Wait until the iron is covered with rust. (Remember rusting is a chemical reaction.)
4. Bring the nails or filings inside. When you are sure they are dry, weight them again.

- A. Did the weight change in the first experiment?
- B. Did the weight change in the second experiment?
- C. If the results were different in the two experiments, explain the difference.
- D. Do you think mass was conserved in both experiments? Explain your answer.



Word Search

Find all of the words in the Word Search. Words are written horizontally, vertically, diagonally, and some are even written backwards.

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

atom

boil

chemical

dissolve

force

freeze

gas

mass

gravity

liquid

matter

melt

mixture

opaque

oxide

volume

physical

property

pure

rot

rust

shape

solids

weight



Comprehension Quiz

Answer each question in complete sentences.

1. Describe the **motion** of particles in each state of matter. 3

2. Using the words "mass," "space," and "atoms," tell **three** things that are true of all matter. 3

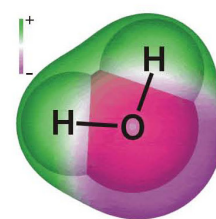
3. What does the **density** of a material tell about the way particles are packed in a material? Name the **two** things you need to know to find the density of a material. 3

4. What is a **physical change**? Give an example of a physical change. What is a **chemical change**? Give an example of a chemical change. 4

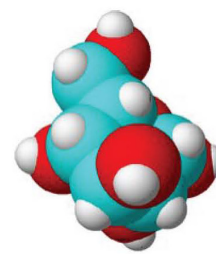
5. Explain how a mixture of salt and water is different from a mixture of pebbles and water. 3

Particles In Two Kinds of Mixtures

Sugar particles in solution



Water molecule



Sugar molecule



water particles
sugar particles



Sand grain



Sugar grain



Three States of Matter

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You may write a complete description of the motion, or draw a detailed picture of the motion.



3. Particles of a solid can't change their positions.

Answers will vary

13

4. The particles are slowing down.

5. Gas particles are far apart.

6. Answers will vary

11

- A. condensation
- B. removed
- C. slower
- D. freezing
- F. slower
- G. melting
- H. added
- K. added
- L. faster

12

A. No

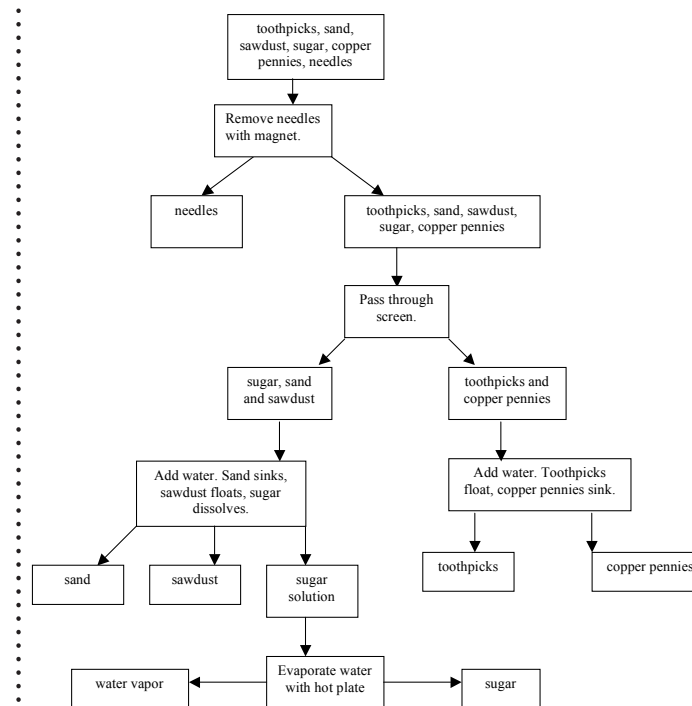
B. Yes

C. No matter could enter or leave in the first experiment. In the second experiment, no iron left, but oxygen from the air combined with the iron and added to the mass.

D. Yes, because the mass gained by the rusting iron equaled the mass lost by the air.

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15



EASY MARKING ANSWER KEY