Name. _____

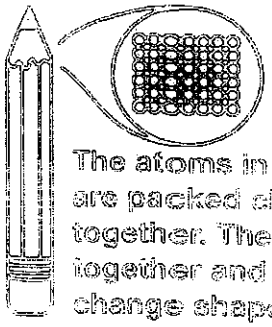
Why Does Matter Matter?

by Kelly Hashway

What do trees, air, and water have in common? They all have matter. That means they take up space. You might be wondering why these things look so different if they all have matter. Everything found on Earth can be grouped into one of three states of matter: solid, liquid, or gas. In order to figure out which state of matter an object fits in, we have to examine its properties. The properties we look at are shape, mass, and volume. Mass is the amount of matter an object has, and volume is the amount of space the matter takes up.

Solid

Solids are easy to recognize. They have definite shape, mass, and volume. Trees are solids. They are made up of tiny particles called atoms. These atoms are packed closely together, and they hold the solid in a definite shape that does not change. If you look around your house, you will see lots of solids. Televisions, beds, tables, chairs, and even the food you eat.

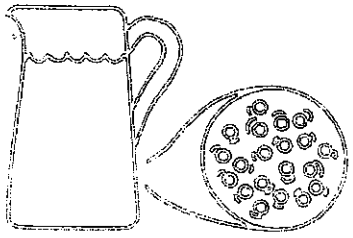


The atoms in a solid are packed closely together. They bond together and do not change shape.

Liquid

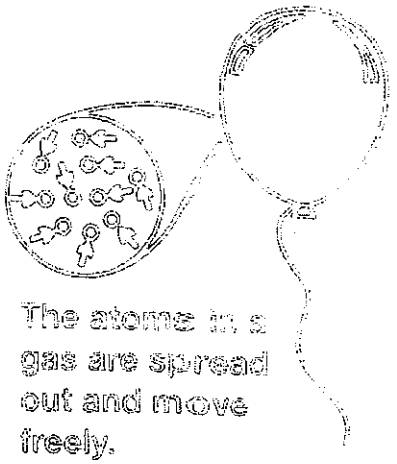
Liquids do not have definite shape, but they do have definite mass and volume. Liquids are similar to solids because their atoms are close together, but what makes a liquid different is that those atoms can move around. Liquids can change shape by flowing. If you've ever spilled a glass of milk, then you know it spreads out across the floor. It does this because the milk is taking the shape of the floor. Since liquids do not have a definite shape of their own, they will take the shape of their containers. This is why the same amount of milk can look different in a tall glass, a wide mug, or spread out on your kitchen floor.

The atoms in a liquid are close together. They slide around.



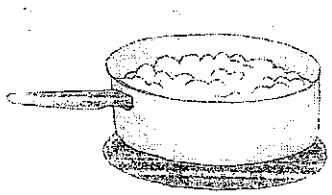
Gas

Gases do not have definite shape or volume. Like liquids, gasses will take the shape of their containers. If a gas is not in a container, it will spread out indefinitely. This is because the atoms in a gas are spaced farther apart than in a solid or a liquid. And being spread out like this allows them to move around freely. Think about the air you breathe everyday. That air is spread across the empty space around the earth. You've probably also noticed that you usually cannot see the air. This is another property of gases. Even though we cannot see them, you come in contact with them everyday. There's air in the tires of your family car and your bicycle. The sun is made up of gases, and the clouds in the sky are mostly made from water vapor.



The atoms in a gas are spread out and move freely.

When trying to remember the three states of matter, think about water. If it freezes into a solid, it becomes ice. Its atoms are packed together keeping its shape. Of course, we know water can also be a liquid. It flows in rivers or it can be poured from a glass. When water evaporates it becomes water vapor, a type of gas in the air. Try a little experiment of your own by placing an ice cube in a covered glass or container. You will be able to observe the ice first in its solid form and then watch as it melts into a liquid to become water. Eventually the water will turn to water vapor and your glass or container will be filled with this gas.



You can see three different states of matter in this picture. The pot is made of solid matter. The water inside the pot is liquid. When the liquid is heated it becomes water vapor, which is a gas.

Matter is everywhere! Can you find a solid, a liquid, and a gas around you right now?

Name: _____

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solids	volume	container	matter	ice	juice
gases	mass	atoms	chair	air	melting
liquids	shape	space	milk	clouds	

Choose a word from the box to complete each sentence.

1. The three basic properties of matter are _____,

   _____, and _____.

2. All matter is made up of tiny particles called _____.

3. Volume is the amount of _____ that matter takes up.

4. Mass is the amount of _____ an object has.

5. Liquids take the shape of their _____.

6. _____ do not have a definite shape or volume.

7. _____ do not have a definite shape, but they do have a definite volume.

8. _____ have a definite shape and volume.

9. A _____ and _____ are examples of solids.

10. _____ and _____ are examples of liquids.

11. _____ and _____ are examples of gas.

12. Solid ice is _____ when it is changing into a liquid.

Name(s):
Core:
Date:

Thermal Energy Meltdown

Directions: Please follow the Scientific Method procedures we learned to work through today's lab.

1. Question: Which substance butter, marshmallow, or chocolate melts the fastest?

2. Hypothesis: (I believe… because)

3. Procedure: Using the piece of Aluminum foil, create a flat bottom boat (bottom of a frying pan) for holding your substances over a flame. Each substance will be placed into this boat one at a time. You will record the time it takes to melt each substance from a solid to a liquid. The order in which to do this is: Butter, chocolate chip, and then the marshmallow.

List 2 Safety Precautions in this lab:

1.

2.

4. Results: Please place your results in the data table below.

Substances:	***Butter***	***Chocolate Chip***	***Marshmallow***
Time:			

5. Analysis: Explain your data in terms in terms of food consumption. What do you already know about these foods?

6. Conclusion: On the back of this sheet in your own words summarize this lab in 3 or more sentences.

7. Further Questions: On the back of this sheet explain: How would someone working in a bakery use this information?

In each of the following situations, identify the method of heat transfer taking place (conduction, convection, radiation). More than one process may be occurring.

1. Hot coffee is stirred with a spoon, the spoon gets hot due to _____.
2. A chair is placed several feet from a fire in a fireplace. The fireplace has a glass screen. The side of the chair facing the fireplace gets warm because of_____.
3. A certain type of decorative lamp contains colored liquids. These liquids form globs that break off and rise to the top of the liquid. The globs rise due to _____.
4. Near the ceiling of a room the air is warmer. The warm air rises because of _____.
5. A college student holds the back of his hand near an iron to see if it is hot. Heat is transferred to his hand by _____.
6. A heater is placed under one corner of a water bed mattress. Warm water moves throughout the mattress because of _____.
7. A certain type of stainless steel cookware has a layer of copper applied to the bottom to help it heat evenly. The copper transfers heat to the pan by _____.
8. In a swimming pool, the water near the surface is slightly warmer. The warm water rises because of _____.
9. One end of a copper rod is placed in a flame of a Bunsen burner. Small pieces of wax placed along the rod melt at progressively larger distance from the flame. Heat is transferred through the rod by _____.
10. A house burns down. On the house across the street, all of the vinyl siding is twisted and warped by the heat. The heat was transferred across the street by _____.
11. Warm air over the beach rises while cooler dense air from the ocean rushes in due to _____.
12. The metal skewer gets so hot that you drop your marshmallow in the campfire because of _____.
13. A huge rock at the state park gets so hot during the day that you can't sit on it from _____.
14. You lay on that same rock at night so that you can keep warm by _____.
15. A fireman feels a door and it is hot from the fire on the other side due to _____.
16. The cause of weather systems on earth is _____.
17. You are in the top bunk of a bunk bed and you want to turn the air conditioner on while your friend on the bottom bunk is fine is caused by _____.

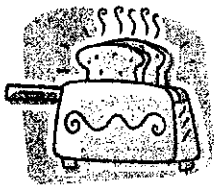
Worksheet: Methods of Heat Transfer
(conduction, convection, and radiation)

Define conduction:

Define convection:

Define radiation:

Identify the method of heat transfer that takes place in each illustration. Some illustrations may show more than one form of heat transfer.

1. 

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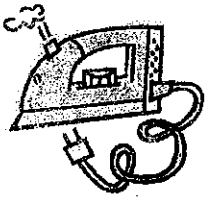
3. 

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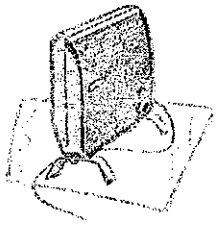
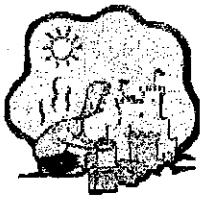
5. 

6. 

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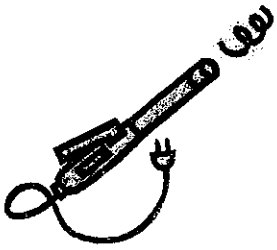
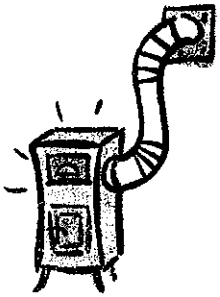
8. 

9. 

10. 

11. 

12. 

SPECIFIC HEAT ACTIVITY NAME:

Specific Heat of Common Materials

Substance	J/kg/°C or J/kg/K	cal/g/°C or cal/g/K
Water (0 °C to 100 °C)	4186	1.000
Methyl Alcohol	2549	0.609
Ice (-10 °C to 0 °C)	2093	0.500
Steam (100 °C)	2009	0.480
Benzene	1750	0.418
Wood (typical)	1674	0.400
Soil (typical)	1046	0.250
Air (50 °C)	1046	0.250
Aluminum	900	0.215
Marble	858	0.205
Glass (typical)	837	0.200
Iron/Steel	452	0.108
Copper	387	0.0924
Silver	236	0.0564
Mercury	138	0.0330
Gold	130	0.0310
Lead	128	0.0305

Directions: Using the data table and the information provided, answer the questions in complete sentences.

FACT: The specific heat of a material is the amount of energy required to raise the temperature of 1 kg of that material 1 degree K.

UNITS = Joules/ Kg . K

FACT: A material with a high specific heat can absorb a great deal of thermal energy before showing a great change in temperature.

QUESTIONS:

1. What material requires the least amount of energy to change its temperature according to the data table?

_____

2. Name 2 Elements often used in making jewelry?

_____ _____

Why would these be used?

_____.

3. What are the 3 forms of H2O and the specific heat of each?

_____ _____ _____

4. Which form of H2O has the highest specific heat and why?

5. Why does the air at the beach feel warmer then the water?

6. The specific heat of sand is 800 J/Kg • K. Draw a beach scene containing 5 objects that would normally be there. Then label each object, using the table, with their specific heats.

Name:
Date:

Thermal Energy

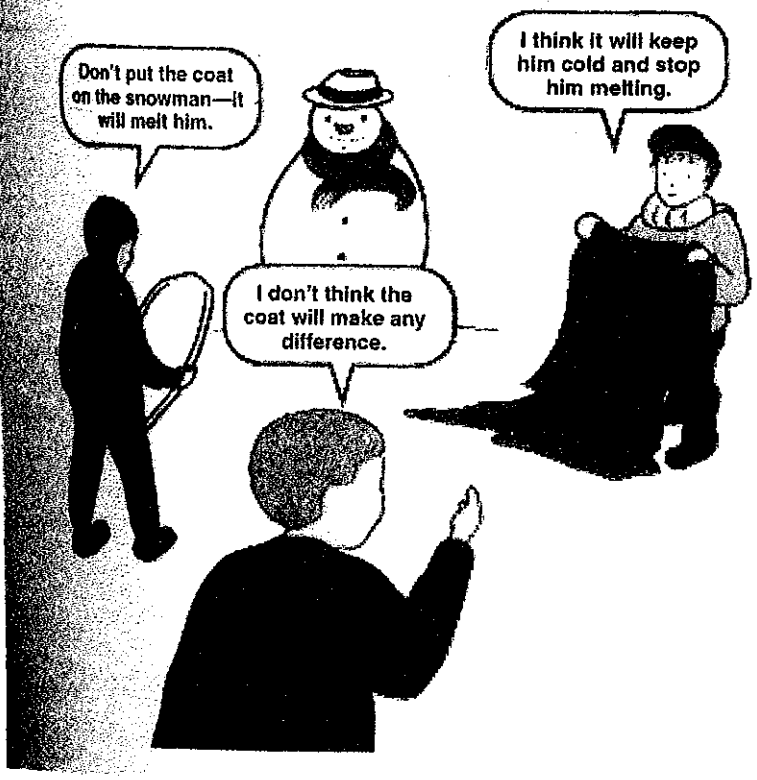
Directions: For numbers 1 and 2 read the fact sentence about thermal energy and then do your best to answer the question that follows. For number 3 read the cartoon and follow the directions. Answer every question; if you are unsure...write that you are unsure! ☺

1. Conduction, convection, and radiation are different ways that heat transfers. What are some examples that you can give for each? (Try to give at least 1 example for each type of heat transfer.)

2. Heat always flows from warmer objects to cooler objects. Why does ice melt in a glass of lemonade?

3. Examine the picture above. Decide which person you agree with most and explain why you agree with them.

Figure 4.6 The Snowman's Coat *Concept Cartoon*



Name _____

Heat

Write each term from the box in the correct blank to match it with its definition.

convection	**heat**	**radiation**
conduction	**Fahrenheit**	**molecules**
thermometer	**insulator**	**conductor**

1. _____ energy created by moving atoms and molecules
2. _____ a tool used to measure temperature
3. _____ a material that allows heat to pass through it easily
4. _____ a form of heating that transfers heat from molecule to molecule within a solid
5. _____ a form of heating that sends heat throughout a liquid or gas
6. _____ a temperature scale commonly used in the United States
7. _____ a material that does not allow heat to pass through it easily
8. _____ a form of heating that involves heat waves moving through space
9. _____ Movement of atoms and _____ causes a material to get hotter.

Write whether each situation below is an example of convection, conduction, or radiation.

10. _____ A swimmer notices that the water is warmer near the surface of a lake than in the deeper areas.
11. _____ A camper using a metal fork to roast marshmallows over a fire drops the fork because it gets too hot to hold.
12. _____ A woman reading next to a fire moves her chair away from the fireplace because the side of her nearest the fire gets too hot.
13. _____ The metal spoon a man is using to stir his hot coffee begins to feel hot.
14. _____ You warm an ice cream scoop in hot water to make it easier to scoop ice cream.

Write temperatures in the blanks to complete the chart below.

	Temperature Scale	Water Boils	Water Freezes
15.	Fahrenheit	_____	_____
16.	Celsius	_____	_____
17.	Kelvin	_____	_____