COOL CHEMISTRY
THIRD - FIFTH

Matter and Energy TEKS

Third Grade:	3.5A, 3.5B, 3.5C
Fourth Grade:	4.5A, 4.5B
Fifth Grade:	5.5A, 5.5D

Vocabulary

carbon dioxide, chemical change, conductor, deposition, endothermic, erosion, exothermic, gas, heat, insulator, liquid, magnetic, mass, milliliter, opaque, physical change, reactants, solid, temperature, texture, translucent, transparent, volume, weathering

Pre-Show Activity

Pre-Show Lesson: Physical and Chemical Changes

Post these questions on the board: "How do you know if matter has undergone a physical or a chemical change?" "What's the difference?"

Materials:

Per class:	needle, balloon, cellophane tape, electric teapot (optional), hot plate and pan, water
Per group:	balloon, baking soda, vinegar, water bottle
Per student:	copy of Appendix A-1 and A-2

Procedure:

1. Demonstrate how to put a needle through a balloon without popping it. Put a small piece of cellophane tape on the side of the balloon close to an end and press it down well. Now take the pin and press it through the tape and into the balloon. Ask: "Did the balloon

change? Why or why not?" Next, put the needle through the balloon with no tape and pop it. Did the balloon change? Why or why not? Make sure that students understand that this is a physical change. The balloon is still made of latex which comes from a rubber tree. The pin just put a hole in it and allowed the air to escape.

2. Ask students, "How many of you have ever been to the doctor for a physical?" "What does physical mean?" Ask: "What are some of the things the doctor checks when you get a physical?" If possible have a scale, thermometer, measuring tape, craft stick, and stethoscope.

    - Check in mouth - normally looks pink
    - Temperature
    - Weight
    - Height
    - Heart rate
    - Blood pressure
    - Check skin/body for irregularities.

Emphasize to students that the doctor is checking your physical properties. You may have changed your weight, height, etc., but you are still you. Just like the balloon changed, but it is still a balloon; it just popped.

3. Instruct students to stand up. Say: "Show me how you can physically change your body." Point out the differences – height, facial expressions, etc. Ask: "Are you still you?" "Did your heart, eyes, hair, etc. change into something else?"

4. Using an electric tea pot or hot plate, demonstrate how water boils and evaporates, changing into steam, or water vapor. Explain what is happening. Ask: "Is it still water?" "How could we turn it back into liquid water?" Emphasize that a change in state is still considered a physical change because nothing new was created. The starting and ending materials of a physical change are the same, even though they may look different. On chart paper create a web with the words with "physical changes" in the middle. Students should also create this chart in their science notebooks. Create a web using what we know about physical changes (include the definition of a physical change, characteristics - change in size, state, temperature, shape, etc, and examples of physical changes). See Appendix A-1.

5. Let's think about the Earth. What are some of the physical changes on earth and what causes them? Examples: seasons, caused by temperature changes; erosion, caused by wind movement; deposition, caused by placing sediment in a new location; weathering, caused by breaking down rocks. Add these ideas to your chart.

6. Demonstrate a chemical change. Crack a raw egg into a cup. Ask: "Would anyone want to eat this?" Now cook the egg on a pan on the hot plate. Ask: "Would anyone eat this now?" Why, what changed?" "Is the egg the same or has it changed into a new type of matter?" Answer: Yes, we still call it an egg, but it is not the same substance. It has chemically changed. Explain what a chemical change is to students. A chemical change creates a substance that wasn't there before; a new substance or type of matter is formed. There may be clues that a chemical reaction took place, such as light, heat, color change, gas production, odor, or sound.

7. Students will complete the following activity to experiment with a chemical change.

   Materials: (per partner) balloon, baking soda, vinegar, water bottle

   1. Place a tablespoon of baking soda inside an uninflated balloon. You may need a funnel to help you.

   2. Pour 100 ml of vinegar into the empty water bottle.

   3. Attach the balloon with baking soda to the top of the water bottle being careful not to allow any of the baking soda to spill into the water bottle.

   4. Students should draw and label the experiment set up in their science notebooks.

   5. Lift the balloon so that the baking soda falls from the balloon, into the water bottle, and mixes with the vinegar. Tell students to draw and record observations. They should feel the water bottle to notice a temperature change.

   6. Students should notice the presence of bubbles (carbon dioxide gas). The total volume has increased. Gas takes up more space than liquid or solid. They should notice that the liquid got colder. The reaction needs heat to make it happen so it takes heat, leaving the bottle feeling cold. A reaction that needs heat to make it happen is called endothermic. Your reaction stops when you run out of reactants. Our reactants were baking soda and vinegar.

   7. Students will create a web in their notebooks identifying characteristics of chemical changes (see Appendix A-2).

   8. Discuss the clues that a chemical reaction took place, such as light, heat, color change, gas production, odor, or sound. These should be added to the web.

   Some ideas to make this a true experiment for older students: you could have them vary the amount of vinegar or baking soda, try different liquids, see how the temperature of the vinegar affects the reaction.

Post-Show Enrichment Activities

Activity One: What's the Matter?

Materials: 6 x 6 colored construction paper, magazines.

Procedure:

1. Each student will be given two 6" x 6" pieces of colored construction paper.
2. Students will create a before and after picture involving a change in a type of matter on the colored construction paper. One paper is for the before and one is for the after. These can be cut out of magazines or drawn neatly on clean white paper and attached.
3. The teacher will use these to create a bulletin board. She will attach the after picture on top of the before picture. The after picture should be attached on the top so that it can be lifted to see the before picture that is underneath. Examples: apple sauce (on top) & apple (underneath), melted ice cream (on top) and frozen ice cream (underneath). Students will then try to identify these as chemical or physical changes.

Activity Two: Properties of Matter

Materials:

Per group: paperclip, glass test tube, wooden block, waxed paper, foil, penny, chart (see appendix), metric ruler, balance scale, magnet, battery, wire, bulb or Christmas tree light, and flashlight

Per student: copies of Appendix A-3

Procedure:

1. Students will observe matter (paperclip, glass test tube, wood block, waxed paper, foil and a penny) to observe properties (shape, texture, length, width, magnetism, conductivity, mass, transparency).
2. Each group of students will need a paperclip, glass test tube, wood block, waxed paper, piece of foil, a penny, a metric ruler, a balance scale, a magnet, a battery, wire and bulb (or Christmas tree light) and a flashlight (to test for transparency). They will record their observations in a chart (Appendix A-3).
3. Discuss results as a class.

Activity Three: Antacid Race

Materials:

Per student: antacid tablets, water, napkins, cups, spoons

Procedure:

Students will test to see if increasing the surface area of matter (an antacid tablet) speeds up a chemical reaction.

1. Students will work with a partner. They will crush one antacid tablet with a spoon or wooden block and leave the other whole.
2. Put 100 ml of water into each of two cups. Draw and label the experiment procedure in science notebooks. Predict the outcome.
3. At the same time, partner #1 puts the crushed tablet into cup A and the other partner puts the whole tablet into the cup B.
4. Students will observe to discover which dissolved first. They should note any signs for chemical change, and draw and label results. Students should record observations and inferences in their science notebook.
5. Debrief with students. Be sure to emphasize the states of matter throughout the activity and any signs of chemical or physical changes.

You can also use antacids in film canisters with water in them. Once the antacid begins to work and gives off gas, it will pop off the lid of the food canister. Students could test brands of antacids, amounts of water, crushed or whole antacids, etc.

Teacher Information:

How Do Antacids Work?

Your stomach normally produces acid to help with the digestion of food and to kill bacteria. This acid is corrosive so your body produces a natural mucus barrier which protects the lining of the stomach from being eroded.

In some people this barrier may have broken down allowing the acid to damage the stomach, causing an ulcer. In others there may be a problem with the muscular band at the top of the stomach (the sphincter) that keeps the stomach tightly closed. This may allow the acid to escape and irritate the esophagus (gullet). This is called acid reflux, which can cause heartburn and/or esophagitis.

Antacids work by neutralizing (counteracting) the acid in your stomach. They do this because the chemicals in antacids are bases (alkalis) which are the opposite of acids. A reaction between an acid and base is called neutralization. This neutralization makes the stomach contents less corrosive. This can help to relieve the pain associated with ulcers and the burning sensation in acid reflux.

When antacids work on stomach acid, they can produce gas which may cause flatulence (wind).

Information Source: http://www.patient.co.uk

Activity Four: Coins

Materials:

Per group: coins from different countries, including the United States, magnet, salt, vinegar, water, battery, Christmas lights or wire and bulb

Procedure:

You may want students to do some research on what coins are made of and how they got their names. http://www.usmint.gov/faqs/circulating_coins/

1. Gather a variety of coins from different countries. You will also want a penny, nickel, dime and quarter from the U.S. for each group. Using the battery and Christmas tree light, have students test the coins to see if they are conductors or insulators.

2. Students will also test the coins to see if they are magnetic. It is important for students to understand that although all metals are conductors, they are not all magnetic. The most common magnetic metals are iron and nickel.

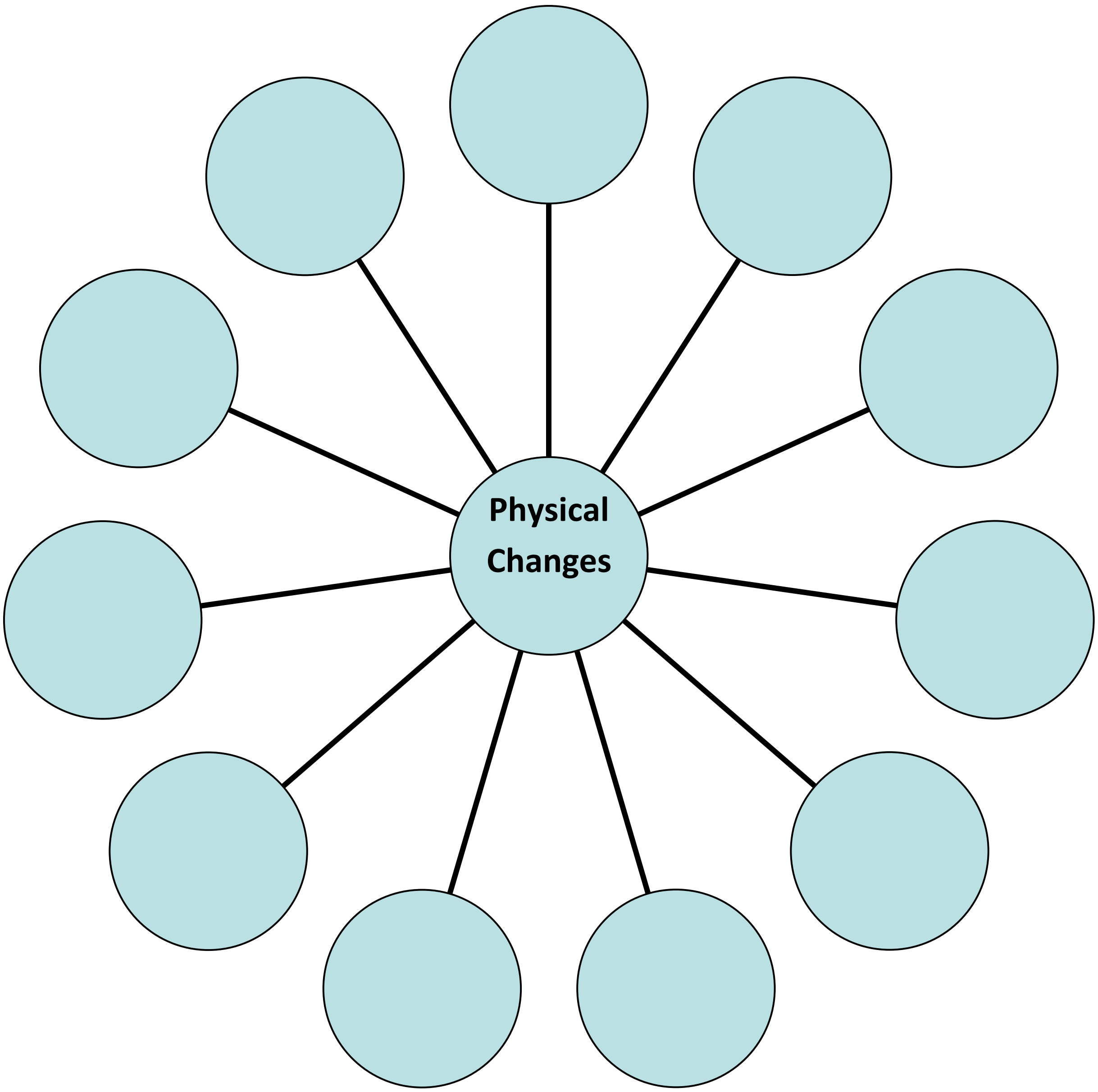
3. Have students place coins in salt and vinegar solution and observe physical and chemical changes.

Pennies get dull over time because oxygen in the air reacts with the copper. This produces a chemical change in the copper. The metal copper was bright and shiny, but the oxide is dull and greenish. The acetic acid from the vinegar dissolves the copper oxide. When this happens, a shiny, clean penny is left behind.

Appendix:

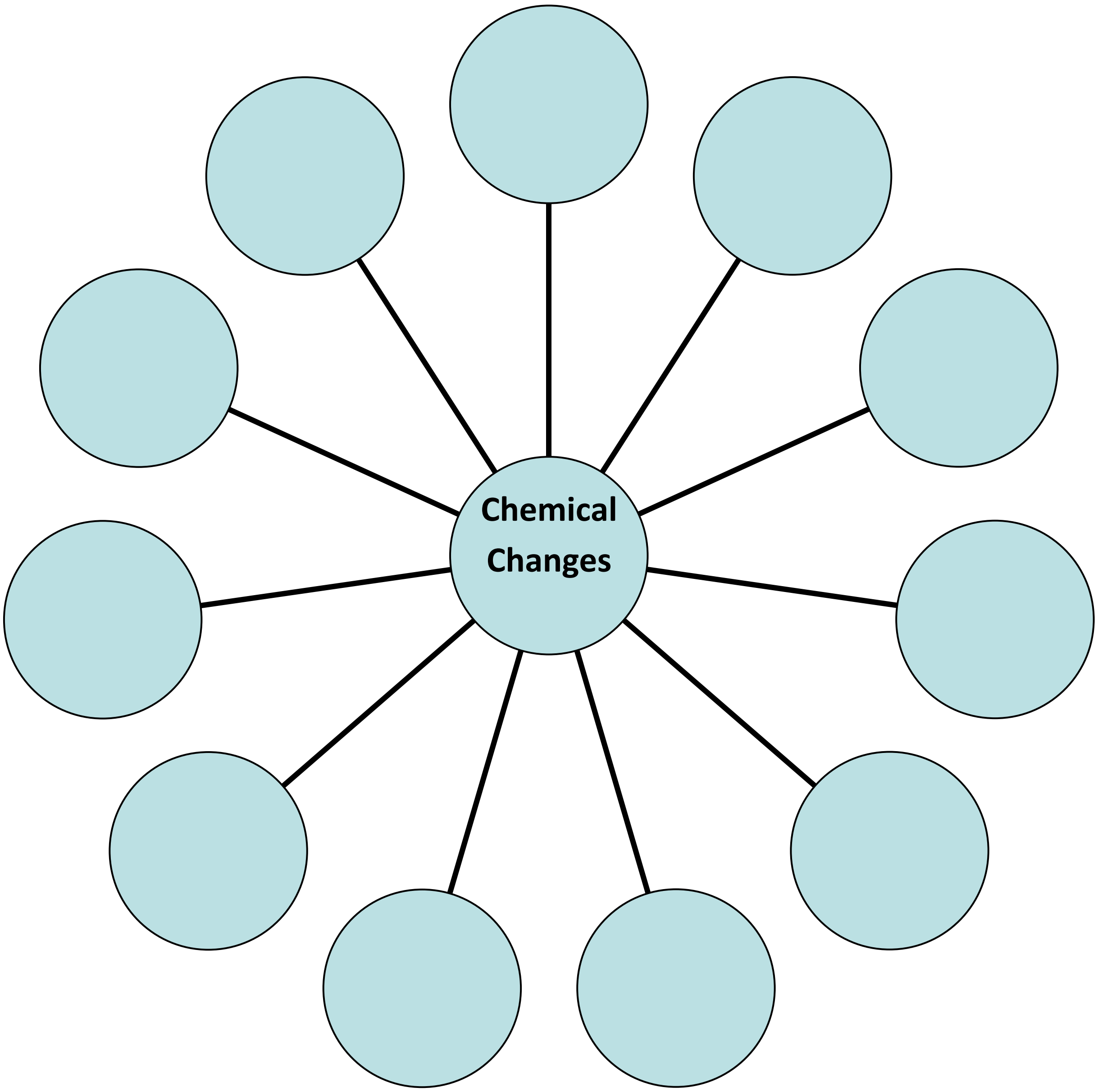
A-1

A Physical Change is-



A-2

A Chemical Change is-



A-3

Name ___________________________________ **Date** __________________

Properties of Matter

Properties	*Large Paperclip*	*Wax Paper*	*Foil*	*Wood Block*	*Glass Test Tube*	*Penny*
Shape						
Texture						
Magnetic						
length (cm)						
width (cm)						
mass						
transparent, translucent or opaque						
conductor or insulator						