Science Activity Unit

Unit Introduction: This Unit is based on the FOSS Unit entitled Chemical Interactions. The basis of this unit is to introduce students to the basic concepts of chemistry through investigations. As part of this unit students will be observing the properties of matter and finding evidence of a chemical or physical change. Students will learn about the changes or transformations that take place when substances are combined. Learning about changes in substances is important because it gives students knowledge about how things go together and how they can be taken apart.

The lessons in this unit are part of a larger unit in our 8th grade curriculum on Chemistry.

Brief description of Group to be taught:

The students I will be teaching this unit to are an 8th grade class made up of a heterogeneous group of 24 students. This is part of an integrated science class which looks at chemistry, earth science, cells and heredity and force & motion during the year. This chemistry unit examines matter, the differences between an element and a compound, properties of a substance, and physical and chemical changes. Students have become familiar with parts of an atom (the smallest unit of an element). Students understand that a molecule is the smallest unit of a compound that maintains that compound's characteristics. Students have been introduced to the Periodic table of Elements and know atomic structure and how the periodic table is set up.

Science Activity Unit

Lesson: Matter

Relationship of this lesson to the unit: This lesson will be used as an introduction to the ways in which shape and particle motion are used in describing solids, liquids, and gases. Most students understand the concept of the different states of matter but may need review of how the molecules within a substance are actually moving. This will lead to further lessons in which they will learn about how matter is composed of elements and compounds and how those substances can be described (mixtures & pure substances).

Massachusetts Frameworks Strand and Learning Standard

Learning Standard 1: States of Matter- Compare and contrast solids, liquids, and gasses based on the basic properties of each of these states of matter

Concepts:

- Identify how matter can take shape
- Identify how matter can change form and what characteristics are evident when these changes occur

Processes:

- Observing and classifying

Science Habit of Mind:

- Asking Good Questions

Other Subject Area Objectives:

- Describing details of an object
- Forming operational definitions

Session length: 2 (45 minute) periods

Day 1

- ❖ How matter can take shape

Materials needed: Groups of 4

Each Station: ten objects such as pen, pencil, ruler, ball, clothespin, nut, bolt, screw, straw, antacid tablet, 1 liter bottle, balloon, water

Time	Procedure	Concept
Day 1	Prep	
10-15 min	**Introduction** 1. Place ten objects on each groups table. Begin by asking students at each table to examine ten objects and write a brief description of each in their science notebooks. 2. Ask students to write down any thing that will describe the object. 3. Ask the students "What is Matter? How can we describe it?" 4. Students will give various answers. Take all responses and write them on the board. 5. Ask students "What things are unique to each object? Write all answers on the board. 6. What things do some objects have in common?" Which objects appear to be made of a single substance?" What objects are made up of more than one thing?" Have students arrange the objects in groups that share one of the same characteristics.	Process skill: Class

	Activity Set Up: 1. Assign each student to a group table with a job. 2. Explain the responsibilities of each job IE: Getter, Timer, Recorder, Reporter. 3. Explain that the task will be to conduct an investigation with your group, make observations and report the results to the class	Roles and groups
20 min	**Activity:** Can matter come in different forms?" Students will usually answer solids, liquids, and gasses. Accept all answers Tell students that in science matter has a specific meaning. Matter is the stuff that everything in the universe is made of. Matter can appear in different forms. Water is an example that students are familiar with that occurs in different forms. Explain that today they will be using an antacid tablet (fizzing type), a balloon, a 1-liter plastic bottle and water to conduct an experiment and investigate the different forms of matter. 1. Explain that today you will use your investigation skills to observe and classify the different states of matter. 2. Let students know that they will be breaking an antacid tablet into three or four pieces and placing them inside a large, uninflated balloon. 3. They will fill a 1-liter plastic bottle about halfway with water and then stretch the mouth of the balloon over the top. (Take care to keep the pieces inside the balloon. 4. Jiggle the pieces inside the balloon so that they fall into the bottle. 5. Remove the balloon and examine its contents 6. Let them know that they have 15-20 minutes to conduct the activity. 7. Tell students to start the experiment. 8. The teacher will circulate around the room and check to see that the students are doing their assigned jobs, getter, recorder, timer, reporter.	Process Skill: Making Observatio
10 min	**Wrap Up:** 1. The last 5 min of class will have students return to seats. 2. Ask them to write down all observations in their science notebook. 3. HOMEWORK: Ask students to imagine the molecules in a solid, liquid, and a gas and draw each one on the worksheet (how those molecules would be arranged). Then have them describe the movement of the particles in each. 4. Remind them that we will continue the discussion of today's	

	investigation tomorrow.	

Day 2

Time	Procedure	Concept
5-10 minutes	**Introduction** 1. Have students get into their groups to discuss the findings from the previous day and to determine their final conclusions. 2. Assign a new role for each of the group members. (Getter, Timer, Recorder, Reporter.)	roles
	Pre Activity: 1. Post three large white sheets of paper on the side of the room each with a topic "Solids" "Liquids" "Gasses".	
15-20 min	**Discussion:** 1. Ask students to take out their observations from yesterday's experiment. Ask students "Using what we have found out, "What do you think are some characteristics of a Solid?" 2. Ask the reporters from each group to give one observation from yesterday's experiment. Record all observations on the board. 3. Have the reporter from each group respond as you go from group to group. Allow all groups to respond. Answers may be that matter is hard or soft, rough or smooth, round or square, and that it takes up space. Some students will answer that solids are dense. (This will be investigated in later experiments – examining the density of objects). 4. Write down the examples given by students on the poster at the side of the room. 5. Next ask "What do you think are some characteristics of a Liquid?" Allow the reporters from each group to respond. Answers may be that a liquid moves, it cannot stay still, it is able to mix things, it can be hot or cold. 6. Write down the examples given by students on the poster at the side of the room. Ask "Can you measure the space liquid takes up?" Allow students to think about this (wait time). Ask "Does a liquid keep a certain shape?" Guide students to conclude that it flows to take the shape of whatever it's in. 7. Ask "What do you think are some characteristics of a Gas?" Allow the reporters from each group to respond. 8. Write down the examples given by students on the poster at the side of the	Observing

	room. Answers may be that gas is invisible, it floats, it can make bubbles or that it smells. 9. Ask students "Does gas take up space?" "How can we tell if gas takes up a space?" Some students will say yes, it inflated the balloon in the experiment. Ask "Can we see a gas?" Explain to students that even though we cannot always see a gas we can measure the amount of a space gas takes up and determine its volume. Gas particles spread out and move around in all directions at faster speeds than liquids. 10. Discuss the Homework from last night. How are particles arranged in a solid, liquid and gas? Take answers and have students draw on the board. Are the particles moving? Clarify any misconceptions on particle movement.	
10-15 min	**Wrap Up:** 1. Ask students to write down a definition for each of the three terms based on the things that they learned from this investigation in their science journals. Homework: Have students read about boiling points and melting points of substances in Science text. Then complete the chart on the handout. Identify the physical state of matter (solid, liquid, gas) at room temperature for 5 substances in the table (see worksheets). Ask them to explain how they arrived at their conclusions.	

	Novice	Competent	Expert
Process Skills: Making clear observations, classifying	Observations are not clearly stated. Few or no details were provided for predicting particle movement	Some observations are clear and based on evidence. Some details are provided. Students understand particle movement in solids, liquids & gasses	Made accurate observations, clearly stated and details are provided. Students can identify and explain particle movement in solids, liquids, & gasses
Habits of Mind	Can not develop good questions to ask	Uses some questions to sort matter	Is able to question and use observations to develop concepts

Concepts ▪ Identify major forms of matter ▪ Particles are in motion within solids, liquids and gasses	Is unable to recognize that substances can come in different forms and does not realize particles within a substance move.	Is able to Identify that matter can come in different forms but does not understand particle motion.	Can explain matter comes in different forms and that within each form particle movement changes.

Worksheeets/Instruction Sheets

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What do the molecules in solids, liquids, and gases look like?

Activity

Make a Drawing of the molecules in each State	Describe whether the molecules are moving or not
solid	
liquid	

gas	

Day 1 Matter HOMEWORK

Look at the melting points and boiling points of the five substances listed in the table. Identify each substance's physical state at room temperature (approximately 20 degrees Celsius). Is it a gas, a liquid, or a solid? Explain how you arrived at your answer below.

Substance	Melting point (degrees C)	Boiling Point (degrees C)	State of Matter Solid, liquid or gas
Water	0	100	
Chloroform	-64	61	
Ethanol	-117	79	
Propane	-190	-42	
Table Salt	801	1,465	

Write your explanations here:

a. Water

b. Chloroform

c.

d.

e.

Day 3

Lesson: A Magnetic Personality

Relationship of this lesson to the Unit: This lesson explains how elements have certain characteristic properties which never change and can be used to identify a substance.

Massachusetts Frameworks Strand and Learning Standard: Physical Science # 8
Concepts:
Physical and chemical properties can be used to classify and describe matter

Processes:
Observing and Predicting

Science Habit of Mind:

Drawing sound conclusions based on evidence

Session Length: 2 (45 minute) periods

Materials Needed:
Magnifying glass, various mixtures of sand and iron filings, paper cups, magnet (for each pair of students)

Day 3

Time	Procedure	Concept
	Prep: Set up front desk with materials and directions.	
5 min	**Introduction:** 1. Explain to students that they will be working in pairs on this activity. 2. Explain to them that the task will be to conduct an investigation to determine one characteristic property. 3. Students will work in teams of two today.	Investigating
15-20min	Activity: Ask students "How can you separate the substances in a mixture?" Ask students about the difference between a mixture and a pure substance. Students will say a mixture is more than one thing. Ask if the substances changed when they were mixed? Take all answers. Guide students to think about a mixture as a substance that consists of two or more substances that are mixed together but not chemically combined.	Predicting

	1. First have students make a prediction about how a magnet can be used to separate the substances. 2. Have the students write their predictions in their science notebooks. 3. Have the getter from the group go to get materials at the front of the room. 4. Have students examine the mixtures and describe a way to see if one part of the substance had different properties from the other. 5. Students will say that they can use the magnet to test for reactions. 6. Predict what effect the magnet will have on the substances. Have students record their observations in science notebooks.Use the magnet to separate as much of the mixture as possible.	
10-15 min	**Wrap Up**: Collect and clean up: return materials, gather notebooks and prepare to leave. Instruct students that they will be discussing their results. Ask students to make sure they have recorded their observations in notebooks	
5 min	**Assign Homework:** Read in Science text about characteristic properties of matter and make up three questions about characteristic properties of matter. Write them in your science notebooks.	Asking good questions
	Visit the website http://serendip.brynmawr.edu/sci/chemsites.html#8	

Day 4

Time	Procedure	Concept
5 min	**Introduction:** **1.** Have students get into the same teams of two as yesterday **2.** Have students take out observations and notes from yesterday's activity **3.** Explain that today we will be discussing the results	Drawing conclusions
20-25 min	**Discussion**: Ask what do we know so far about characteristic properties? Students will answer that density, texture and shape are examples of characteristic properties of matter. They may also say temperature, flammability, size and color are all characteristics of matter.	

	Write these on the board. 1. Ask the students "Who can tell me their prediction from yesterday's activity with the sand/magnets?" 2. Students will respond with various answers. Have the recorder write a prediction on the board. 3. Ask the teams "Did your prediction match your conclusion?" Students will say that they were able to separate the pieces of matter into magnetic and nonmagnetic types. 4. "What can we infer from the results?" Students will answer that magnetic properties can separate one type of substance from another. 5. Next ask students to take out their Homework questions from last night. Have one person from each group present a question to the class. 6. Write it on the board and allow students to respond to the question. Guide students to think about what other characteristics which could be used to distinguish properties of matter. Explain that since characteristic properties for a given substance never change, they can be used to identify a substance**.**	
10-15 min	**Wrap up: Wrap up: Journal Writing- What have we learned about Characteristic properties of Matter?** What is one characteristic property of a substance that you discovered today? 1. Have students write down three things that they learned today about characteristic properties of matter in their science journals. 2. HOMEWORK: Assign students the reading on physical and chemical changes in the text.	

Rubric for Magnetic Personality

	Novice	Competent	Expert

Concept	Cannot understand that characteristic properties can be used to identify a substance	Can identify one characteristic property as a way to identify a substance	Can identify several characteristics of properties such as melting and boiling points and understands that these properties are unique to that substance.
Process Skills	Is unable to make a prediction base on a problem	Is able to make a prediction but cannot draw a conclusion from the results	Is able to make a prediction and draw a conclusion based on the data
Habits of Mind	Cannot draw conclusions based on evidence	Can draw some conclusions based on the evidence of the activity but can not give many details to support the conclusion	Can draw sound conclusions from the evidence and can give many details to support the conclusion

Day 5
Lesson: **Physical and Chemical Changes**

How Does a Burning candle Differ from Boiling Water?"

Relationship to lesson: This lesson will help students to understand the differences between a physical or chemical change and how to determine if a change has occurred.

Massachusetts State Standards and Frameworks: Learning Standard #10
Differentiate between physical changes and chemical changes

Concepts:

- Physical changes alter the form of the substance but not its identity
- In Chemical changes ,one or more substances combine or break apart to form new substances

Process Skills:
Inferring
Observing

Habits of mind:
Cooperating & collaborating

Length: 2 (45 minute) periods

Materials:
Each Group- Candle, matches, water, empty soda can, aluminum pie plate

Time	Procedure	Concept
5 min	Prep: Put a piece of toast, a shredded paper, and a burnt piece of wood on a table in the front of the room. Ask students to identify which represents evidence of a physical change and which represents evidence of a physical change on a scrap piece of paper. Ask students to tell why they said one or the other.	Inferring
10 min	**Activity Set Up**: Prepare instructions for each group and make copies. Instruct students to put on their goggles before they begin the investigation	
Time	**Procedure**	Concept
20 min	**Activity:** 1. Assign each student of the group a new job within the group. 2. Explain task will be to conduct an investigation at the station by following the detailed instruction at the station. Tell the students that they may begin working at the station 3. The teacher will circulate around the room to be sure that the students are doing their newly assigned jobs (getter, recorder, timer,) 4. Ask students to compare the substances that collected on the bottom of each soda can 5. Write their observations down in their science notebooks.	Cooperating Observing

Day 6

Time	Procedure	Concept

3-5 minutes	**Introduction:** 1. Ask students to get into the same groups as yesterday to discuss the results. **2.** Write the name of the web site on the board for students to visit as part of their next assignment: http://www.sciencespot.net./media/bnpromptt.pdf. Tell them to take the Brain POP Properties of Matter sheet and fill in the answers.	
20-30 min	**Discussion**: 1. Ask students "Can you identify any changes in matter that you observed? 2. Write down all answers on the board. 3. Ask "How did the substances which collected on the bottom of each soda can differ?" 4. Have the reporter describe for the group each observation. Allow each group to contribute one of their observations to the class discussion. Students may state that when the candle was used the can looked black on the bottom. 5. Ask what is the black substance on the bottom of the can? Take all answers. Students may say soot or smoke. Ask where did the black substance come from? Guide students to think about the source of the flame. (candle) 6. Ask "Why did it appear on the bottom of the can?" Ask "what caused this to occur?" Was a reaction taking place? 7. What kinds of things tell us a reaction took place? Guide students to changes in substances or changes in color etc. 8. Ask "What questions would you need to ask to determine whether a physical or chemical change occurred?" 9. Allow students time in each group to come up with some questions. Write questions that students create on the board. Ask "Can we use these questions as a basis for determining if a substance has undergone a physical or chemical change?"	Inferring
5 min	**Wrapup:** 1. What did you learn about matter from these experiments? 2. Ask them to write down three things that they learned about physical changes and three things that they learned about chemical changes in their science journals. 3. HOMEWORK: Physical vs. Chemical Changes Fun Sheet	

Rubric for Performance:

	Novice	Competent	Expert
Concept	Cannot differentiate between a physical change and a chemical change	Can differentiate between a physical and a chemical change	Can differentiate between chemical and physical changes and can explain that in Chemical changes elements and compounds rearrange to make new materials.
Process Skill	Cannot make inferences	Can make inferences based on observations	Makes inferences and can explain using detailed information
Habit of Mind	Does not cooperate and collaborate within group	Is able to cooperate and work within the group	Is able to cooperate and collaborate with team members and works well in the group setting

Worksheets/Instructions

How does a burning candle differ from boiling water?

Station Instructions:

1. Placing a small beaker half- filled with water on a hotplate.

2. Add half a cup of cold water to an empty soda can.

3. Use modeling clay to stand a candle in a small aluminum pie pan.

4. Light the candle.

5. Use tongs to hold the can about 3 cm (centimeters) over the candle for about a minute.

6. Move the soda can away from the candle. When the soda has cooled examine its bottom side.

7. Blow out the candle Repeat steps 3, 5, and 6 with a different soda can but hold the can over boiling water.

Record the results in your science notebooks.

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Day 7
Designing an Experiment

Lesson: Finding Evidence of a Chemical Reaction

Relationship to lesson: This lesson will help students to understand the differences between a physical or chemical change and how to determine if a change has occurred.

Massachusetts State Standards and Frameworks: Learning Standard #10
Differentiate between physical changes and chemical changes

Concepts:
- You can detect a chemical reaction by observing changes in properties of matter
- Production of a gas or a precipitate, changes in color or temperature, all indicate that a chemical reaction has taken place

Process Skills: Observing & Predicting

Habits of Mind: Designing an Experiment

Materials: per groups of four
1 liter plastic soda bottle, funnel, balloon, graduated cylinder, scale, safety goggles, Baking soda, vinegar, salt, sugar, water

2-3 class periods (45 min)

Time	Procedure	concept
5 min	**Intro:** Ask "What happens when we mix two substances together?" 1. Explain that today we will be investigating what happens when two substances are mixed together. **2.** Explain that safety goggles must be worn during the investigation and that all safety rules must be followed. (students have reviewed safety rules in previous classes)	
Time		Concept
5 -10 min	**Activity Set up:** 1. Explain to the students that they will be working in their groups on this activity. Remind them that the getter gets the materials, the recorder reminds the group to write down their data, the reporter shares the team's findings with the rest of the class, and the starter keeps the group on task. 2. Assign each student a group table for their investigation. Tell them	Designing A Experiment

	to note which number is at their seat. They can refer to the posted role chart to see what their role is for today.	
25 min	**Activity: Today you will be creating your own experiment to test two substances to see if a reaction has taken place.** 1. First have students choose two of the substances and make a prediction "What will happen if we mix these two substances?" **2.** Write your prediction in your science notebook **3.** Tell students that they will be creating their own experiment to see what will happen when we combine two substances. **4.** Ask them to form a plan as to how to conduct the experiment. Ask them to list the steps, keep track of what substances you chose to combine, materials and your procedure. **5.** Ask "How will you determine if a reaction has taken place?" after you have conducted your experiment. **6.** Have students write down their steps in order. **7.** Tell students to begin. Let them know that they have 15 minutes to work on the experiment. **8.** The teacher will move around the room to check on students' progress. .	Process Skil Predicting
5 min	**Wrap Up:** **1** Have each group write down observations before cleaning up. **2** Announce 5 minutes before end of class to clean up and collect materials. **3** Return materials to station neatly and record all results. Bring notebooks tomorrow for discussion of today's experiment	Observing
Day 8	**Assessment**: Informal whole group discussion to follow with written results from each group's experimental data. Oral presentation from each group can be presented and a final write up summarizing the experimental procedure. Have students include answers to the questions: What did you find most interesting? What would you change next time? Did your results support your hypothesis?	

Rubric for Performance:

	Novice	Competent	Expert
Process Skills Observing and predicting	Observations and predictions were not accurate based on data. Few or no details were provided	Made some accurate observations and predictions based on the data provided. Some details are provided.	Made accurate observations and predictions. Complete details are provided for each part of the experiment
Habits of Mind	Was unable to design and follow through experimental process	Was able to design own experiment with minimal help from teacher and follow throw with experimental process	Was able to design own experiment. Able to follow threw with experimental process. Shows clear step-by –step thinking
Concepts	Is unable to recognize the fact that a chemical change has taken place or that a physical change has taken place	Is able to Identify the fact that a chemical change has taken place by observing the results (production of a gas, change in color, temperature)	Can identify changes in properties and can explain that a chemical change has taken place as indicated by several factors one of which is the production of a gas