

From Alchemy to Reality: How Can We Create New Substances?

Name:

Teacher:

Class:

Physical Science
Unit 3
Lab Notebook

Lesson 1: Changes

Directions: Watch and observe the four scenarios to develop a method to identify physical versus chemical changes. Then use the cards to record examples of each change below.

Data:

Scenario	Observations — Consider the following: Properties of matter Signs of a chemical reaction Energy transformations	Physical or Chemical Change?
Melting Coins		
Fire Tornado		
Disappearing Can		
Old Faithful		

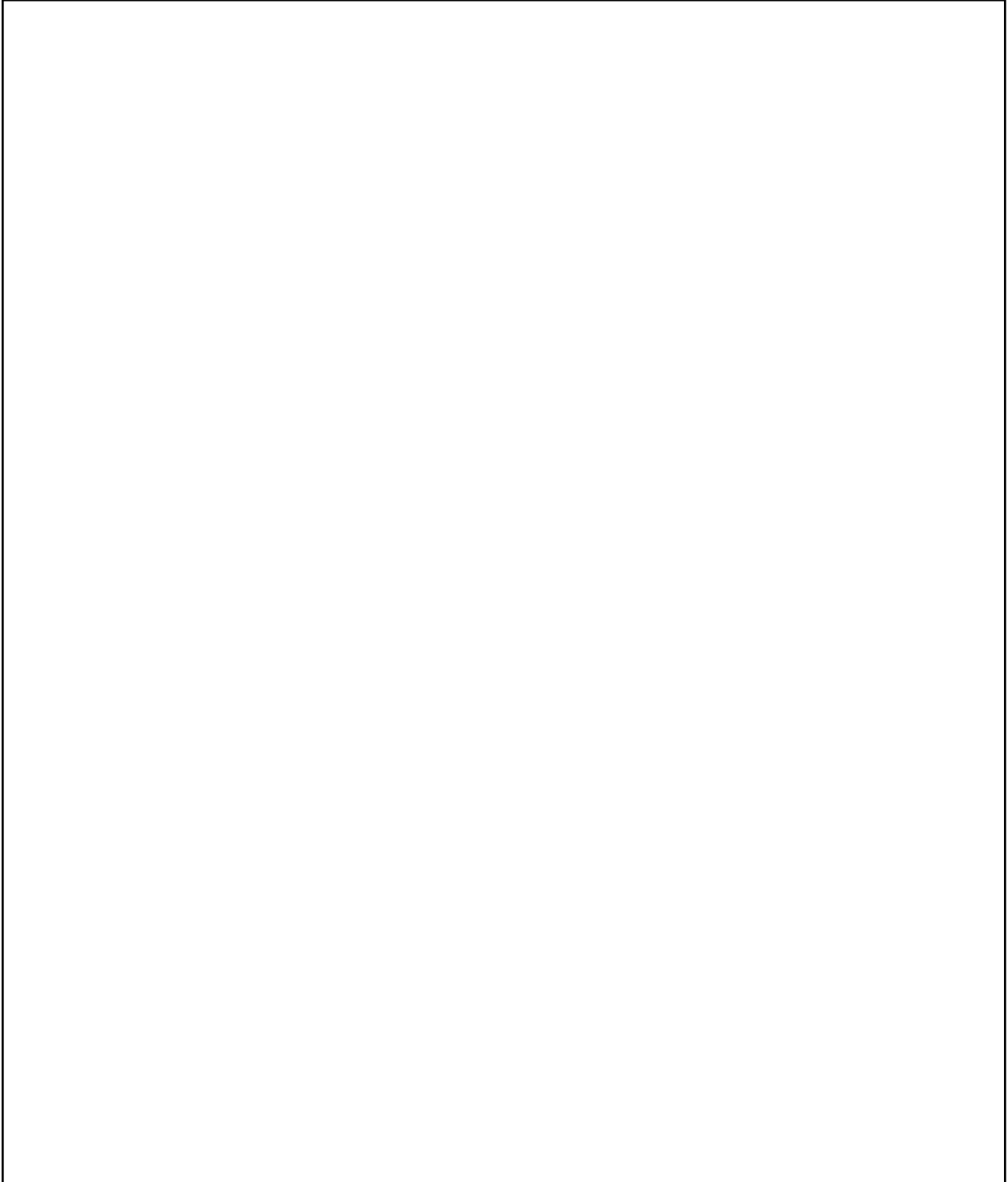
Lesson 1

Examples of Physical Changes	Examples of Chemical Changes
<ul style="list-style-type: none">• Ripping paper••••••••	<ul style="list-style-type: none">• Burning a match••••••••

Analysis Question: What is the big difference between a physical and chemical change?

Lesson 2

Data: Record notes and data from each trial below.

A large, empty rectangular box with a thin black border, intended for students to record their notes and data from each trial.

Lesson 3:

Chemical Equations Revealed

Directions: Follow the procedure below to make a model to track the path each atom takes in the chemical reaction between methane and oxygen. Write your final chemical formula below.

Procedure:

1. Prepare the atoms:
 - Lay out the molecules in your kit
 - Red represents oxygen
 - Gray represents carbon
 - White represents hydrogen
2. Build the reactant side of the equation:
 - Using the chemical bonds, attach the molecules to each other to form the reactants.
 - Place your model on a piece of blank paper.
 - Write the chemical formula under each molecule of the reactants. Also draw a plus sign between the reactants.
3. Build the products:
 - Using the chemical bonds, attach the molecules to each other to form the products.
 - Place your model on the same blank sheet of paper.
 - Write the chemical formula under each molecule of the products. Also draw a plus sign between the products.

Chemical Formula

Lesson 3

Additional Notes:

Lesson 4:

Forming a Precipitate

Directions: Follow the procedure below to see the formation of a precipitate.

Procedure:

1. Use masking tape and a permanent marker to label 2 plastic cups “baking soda” and “calcium chloride.”
2. Use a graduated cylinder to add 20 mL of water to each cup.
3. Add 2 g (about $\frac{1}{2}$ teaspoon) of calcium chloride to the water in its labeled cup. Swirl until as much of the calcium chloride dissolves as possible.
4. Add 2 g (about $\frac{1}{2}$ teaspoon) of baking soda to the water in its labeled cup. Swirl until as much of the baking soda dissolves as possible. There may be some undissolved baking soda remaining in the bottom of the cup.
5. Carefully pour the baking soda solution into the calcium chloride solution. Try not to pour in any undissolved baking soda. Observe.

Data:

Lesson 4

Conclusion: How do you know that a chemical reaction occurred?

Lesson 5:

The Law of Conservation of Mass

Directions: Develop and test a procedure to test whether the mass of reactants and products before and after a reaction follow a predictable “rule.”

Procedure:

Data:

Lesson 5

Conclusion: Do the mass of reactants and products before and after a reaction follow a predictable “rule”?

Additional Notes:

Lesson 6: Balancing Equations

Directions: Use the simulation site to develop a procedure to balance equations to support the law of conservation of mass.

Procedure:

Lesson 7:

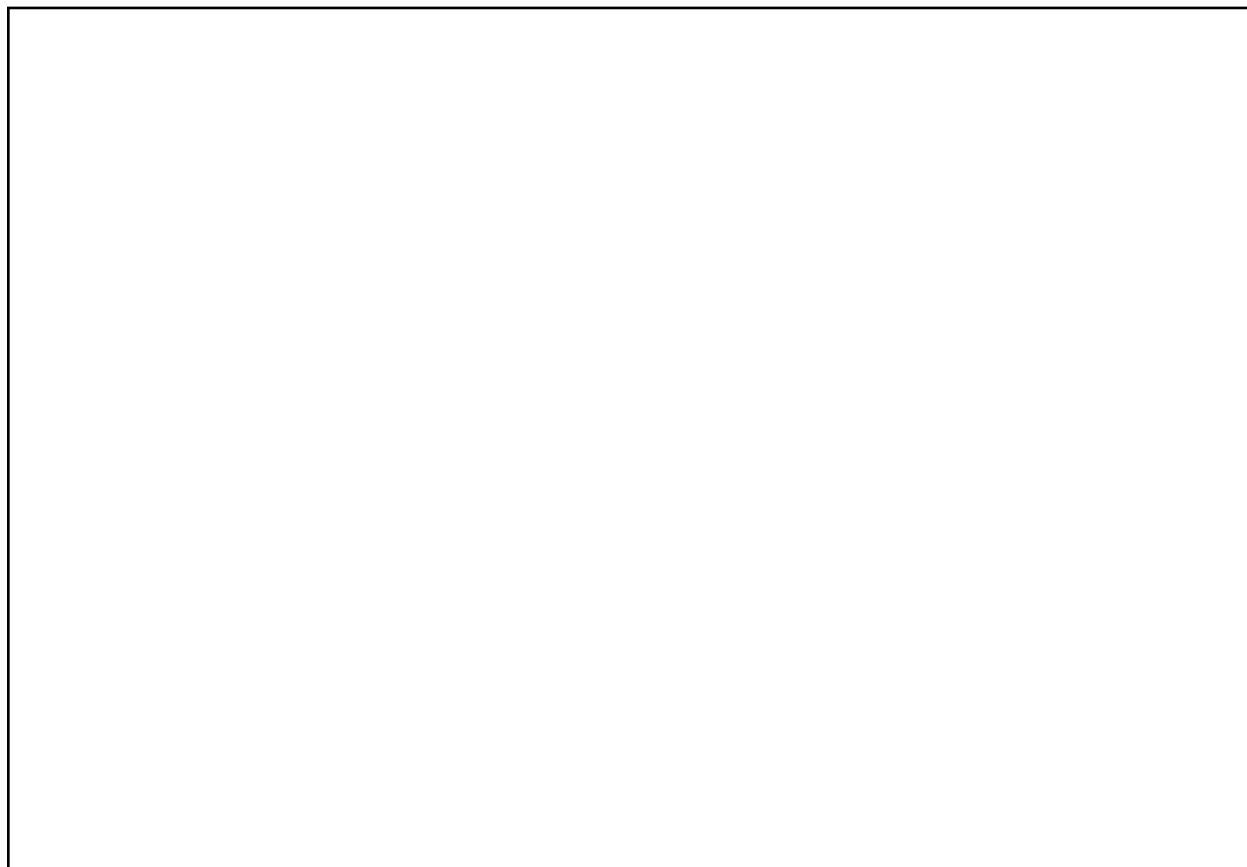
Mystery Powder

Directions: Follow the procedure below to identify the mystery powder.

Procedure:

1. Use a spoon to place four equal piles of baking soda on the testing chart in one column. You should not use all of the powder at this time. The remaining powder will be used later.
2. Add 5 drops of water to the first pile of baking soda. Record your observations below.
3. Continue testing each pile of baking soda with a different testing solution and recording your observations.
4. Test each of the powders with the test solutions the way you tested baking soda and record your observations.

Data:



Lesson 7

Conclusion: What is the identity of the unknown powder? How do you know?

Lesson 8:

Energy Changes in Chemical Reactions

Directions: Develop and implement a procedure to measure the change in temperature of a baking soda and vinegar reaction and a baking soda and calcium chloride reaction.

Procedure:

Data:

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Lesson 8

Conclusion: How does temperature change during chemical reactions? Why?

Lesson 9:

Types of Chemical Reactions

Directions: Research the four types of chemical reactions and model each reaction with the molecular modeling kit. After modeling, create an illustration and a one- to two-sentence description of each type of reaction. Include at least one real example of each reaction.

Synthesis Reaction

Replacement Reaction

Lesson 9

Decomposition Reaction

Combustion Reaction

Lesson 10: Natural Resources and Synthetic Materials

Directions: Choose a synthetic material to research and then find information for your presentation that answers the questions below.

Chosen Material:

	Notes
What natural resources are used to make the synthetic product?	
What chemical processes are used to make the synthetic product?	

Lesson 10

<p>What are the positive impacts to society of making and using the synthetic product?</p>	
<p>What are the negative impacts to society of making and using the synthetic product?</p>	
<p>Additional Notes</p>	

Lesson 11: Identifying and Describing Chemical Reactions

Directions: Choose any three of the provided videos to observe the chemical reactions. Record a description of the reaction, the balanced formula for the reaction, and the classification of the reaction below. Then rewatch the video from Lesson 1 and complete the same notes.

Data:

Reaction 1:	
Observations	
Evidence That a Chemical Reaction Occurred	
Balanced Chemical Equation	
Type of Reaction (classify in as many ways as possible!)	

Lesson 11

Reaction 2:	
Observations	
Evidence That a Chemical Reaction Occurred	
Balanced Chemical Equation	
Type of Reaction (classify in as many ways as possible!)	

Lesson 11

Reaction 3:	
Observations	
Evidence That a Chemical Reaction Occurred	
Balanced Chemical Equation	
Type of Reaction (classify in as many ways as possible!)	

Lesson 11

Reaction from Lesson 1: Iron and Sulfur	
Observations	
Evidence That a Chemical Reaction Occurred	
Balanced Chemical Equation	
Type of Reaction (classify in as many ways as possible!)	