🔬 Lesson Plan: Chemical and Physical Changes of Matter

Grade Level: 5
Subject: Physical Science
Duration: 45–60
NGSS 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

🎯 Learning Objectives

By the end of this lesson, students will be able to:

- **Distinguish** between chemical and physical changes of matter based on observable evidence.
- **Identify** examples of chemical and physical changes in everyday life.

- **Reactant:** A substance used in a chemical reaction. Reactants are the starting materials that undergo change.
- **Product:** A substance produced during a chemical reaction. Products are the new materials formed after the reaction.
- **Combustion Reaction:** A reaction that occurs when substances in a compound are combined with oxygen, which then produces heat and light. The products are always carbon dioxide and water.
- **Decomposition Reaction:** A chemical reaction in which a compound breaks down into individual elements or simpler substances.

- **Synthesis Reaction:** A type of chemical reaction in which two or more simple substances combine to form a more complex one.

💼 Materials Needed: (all links are included in this PDF)

- Printed copies of the Study Guide (https://newpathworksheets.com/api/guide/study-guide-science-grade-5-chemical-and-physical-changes-of-matter.pdf)
- Worksheet 0 (multiple-choice assessment) (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-chemical-and-physical-changes-of-matter-0.pdf)
- Worksheet 1 (physical vs. chemical changes) (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-chemical-and-physical-changes-of-matter-1.pdf)
- Worksheet 2 (chemical reactions)

- Begin by asking students: 'If you tear a piece of paper in half, is it still paper? What if you burn the paper—is it still paper?' Use their responses to introduce the difference between physical and chemical changes.
- Show an ice cube in a sealed bag and ask students to predict what will happen as it melts. Discuss whether the water is still the same substance as the ice.
- Explain that today's lesson will help them identify and distinguish between chemical and physical changes in matter.

Step 2: Direct Instruction (15 minutes)

- Use the Study Guide to define physical change: a change in size, shape, or state that does not alter the substance's chemical makeup. Emphasize that physical changes are often reversible. (https://newpathworksheets.com/api/guide/study-guide-science-grade-5-chemical-and-physical-changes-of-matter.pdf)
- Define chemical change: a change in which one substance is transformed into a different substance with different properties. Chemical changes are usually irreversible. (https://newpathworksheets.com/api/guide/study-guide-science-grade-5-chemical-and-physical-changes-of-matter.pdf)
- Demonstrate a simple chemical reaction by combining baking soda and vinegar in a clear container. Point out observable signs: gas production (bubbles), temperature change, and formation of a new substance (carbon dioxide).
- Review the signs of chemical change from the Study Guide: color change, temperature change, light emission, gas production, smell change. Contrast these with signs of physical change: shape, state, or size change without new substance formation.

Step 3: Guided Practice (15 minutes)

- Have students complete the vocabulary matching worksheet independently, matching terms like reactant, product, combustion reaction, and decomposition reaction to their definitions. (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-chemical-and-physical-changes-of-matter-1.pdf)
- Encourage students to create a two-column chart listing three physical changes and three chemical changes they observe in their daily lives.

Step 5: Assessment (10 minutes)

- Administer Worksheet 0 as a formative assessment, which contains multiple-choice questions covering key concepts of chemical and physical changes. (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-chemical-and-physical-changes-of-matter-0.pdf)
- Review student responses to the independent practice worksheets, checking for accurate classification and use of vocabulary terms.
- Ask students to classify the following as chemical or physical: ice melting, wood burning, paper tearing, iron rusting, and sugar dissolving in water. Have them explain one classification in detail.

Differentiation Strategies

For advanced learners:

- Challenge advanced learners to research and present on a specific type of chemical reaction

example.

- Create a class demonstration station where students rotate through observing different changes (melting ice, rusting nail in water, paper burning safely in a metal container) and record observations using scientific vocabulary.
- Challenge students to write and illustrate a comic strip showing a substance undergoing both a physical change and a chemical change, labeling reactants, products, and observable signs.

Complete List of Available Resources:

- NewPathWorksheets: Chemical and Physical Changes of Matter (https://newpathworksheets.com/science/grade-5/chemical-and-physical-changes-of-matter)
- Study Guide: Chemical and Physical Changes of Matter (https://newpathworksheets.com/api/guide/study-guide-science-grade-5-chemical-and-physical-changes-of-matter.pdf)
- Worksheet 0: Multiple-Choice Assessment (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-chemical-and-physical-changes-of-matter-0.pdf)
- Worksheet 1: Physical vs. Chemical Changes (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-chemical-and-physical-changes-of-matter-1.pdf)
- Worksheet 2: Chemical Reactions (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-chemical-and-

CHEMICAL AND PHYSICAL CHANGES OF MATTER

Chemical Changes

A **chemical change** is a change in which one kind of substance is changed into a different kind of substance. Chemical changes produce substances that were not there when you started. You can't reverse or undo a chemical change. For example, burning a log is an example of a chemical change: once you burn a log, you can't "unburn" it or reconstruct it from its ashes.

Examples of chemical changes include:
1. rusting metal

- a change in the substance's temperature
- light is given off
- a gas is produced
- a change in smell
- a change in taste (*Warning: do not taste anything during a science experiment.*)

Lesson Checkpoint: What is a chemical change? Give one example of a chemical change.

Physical Changes

A **physical change** is when matter undergoes a change that does not affect its physical make up. Physical changes involve an object's physical properties such as size, shape, color, and weight. The substance or object involved is the same before and after the change (unlike a chemical change). The change is not permanent and can be undone.

Examples of physical changes:

1. an ice cube melting
2. a piece of paper cut into two pieces
3. a crushed can

Lesson Checkpoint: What is a physical change? Give one example of a physical change.

Physical VS Chemical Changes: Which Is Which?

Physical Changes	Chemical Changes
A paper towel is ripped in half.	Milk goes sour.
A ball of clay is molded into a square.	A silver ring tarnishes.
A stick is snapped in half.	Bread is toasted.
Stirring cake batter.	Dead leaves and grass clippings turn into compost.

Chemical Reactions

Keep in mind: all matter is made of atoms, which may combine to form molecules.

Lesson Checkpoint: What is a chemical reaction?

Types of Chemical Reactions:

1. **Decomposition reaction** is the process of a complex substance being split up into simpler substances.

General formula to explain a decomposition reaction: AB → A + B

2. **Synthesis reaction** is the process of two or more simple substances combining to form a more complex one.

General formula for a synthesis reaction: A + B = AB

☞ Decomposition and synthesis reactions are opposites.

3. **Combustion reaction** is when all substances in a compound are

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Name_____ Class_____ Date_____

1 A **chemical change** is a change in which one kind of substance is _____.

A sometimes changed
B not changed at all
C changed into a different kind of substance
D kept separate from other substances

2 Which is true of the substance produced as the **product** during a **chemical change**?

A It increased in mass.
B It decreased in mass.
C The exact same substance was present before the change.
D It is a unique new substance with different properties.

3 Unlike a physical change, a **chemical change** cannot be _____.

A reversed
B proven
C done

4 Which of the following is an example of a **chemical change**?

A moving a can
B crushing a can
C the rusting of a

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B nitrogen
C rust
D dirt

B It gives off oxygen.
C It gives off energy in the form of heat.
D It breaks up into little pieces.

9 Which of the following is an example of a **chemical change**?

A cracking an egg
B cooking a raw egg
C a chicken laying an egg
D dropping an egg onto the floor

10 These are all possible **signs** that _____.

- a change in color
- a change smell
- light is given off
- a gas is produced

A no change has occurred
B a physical change has occurred
C a chemical change has occurred
D a reversible change has occurred

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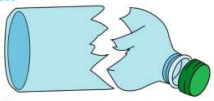
1 A(n) _____ is when matter undergoes a change that **does not** result in the formation of a **completely new substance** with different properties.

A physical change
B chemical change
C permanent change
D irreversible change

2 What does a **physical change** involve?



A an object's chemical properties
B an object's size, shape, or its state
C no properties of the object
D the elements the object is made of

3 After a **physical change**, the substance or object involved _____.

A is the same shape
B is chemically different, but looks the same
C looks different, but is

4 **Cutting paper** is a physical change because the paper _____.

A can never be paper again
B has changed it's

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C burning leaves
D all of the above

D irreversible

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9 Which of the following is an example of a **physical change**?

A steel swing set rusting
B a log burning
C butter being melted
D waffle burning in a toaster

10 These are possible **signs** that _____.

- change of shape
- change of state (solid, liquid, or gas)
- change in size

A no change has occurred
B an irreversible has occurred
C a chemical change has occurred
D a physical change has occurred

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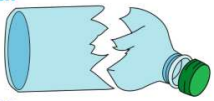

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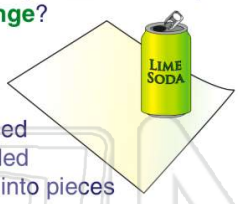

A silver necklace tarnishing
B can being crushed
C paper being folded
D string being cut into pieces

2 A _____ is when one or more substances change into different substances that have **different chemical and physical properties**.

A physical change
B physical reaction
C chemical reaction
D chemical property

3 A **chemical reaction** that results in the formation of a new compound by **uniting** elements or compounds is known as a _____.

A combustion reaction
B combination reaction

4 This reaction **produces a gas** and can be used to make a volcano model.

vinegar + baking soda = _____

A nitrogen
B water

PREVIEW

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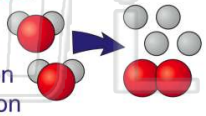
D reactant – product = product

magnesium and oxygen
C magnesium oxide reacted with oxygen
D magnesium oxide reacted with magnesium

9 A _____ is the process of a **complex** substance being **split up** into **simpler** substances.



A synthesis reaction
B combustion reaction
C combination reaction
D decomposition reaction

10 What **kind of reaction** occurs in the equation below when zinc (Zn) **replaces** the copper (Cu) in the compound?

$Zn + CuCl_2 \rightarrow ZnCl_2 + Cu$

A replacement reaction
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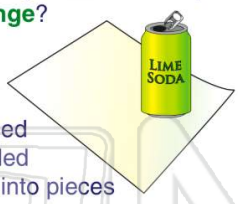

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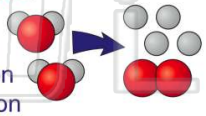

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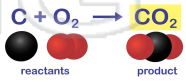
Name_____ Class_____ Date_____

Match each of the following terms to its definition:

Product	Chemical reaction	Physical change	Chemical change
Decomposition reaction	Reactant	Synthesis reaction	Combustion reaction

1. - a change in the actual chemical makeup when one kind of substance is changed into a different kind of substance

2. - when one or more substances change into different substances that have different chemical and physical properties



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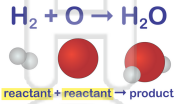
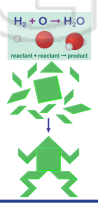
7. - a substance used in a chemical reaction



8. - a type of chemical reaction in which elements are put together; the process of two or more simple substances combining to form a more complex one



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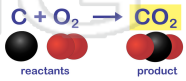
2. chemical reaction - when one or more substances change into different substances that have different chemical and physical properties



3. con
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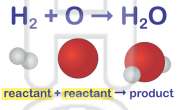

8. synthesis reaction - a type of chemical reaction in which elements are put together; the process of two or more simple substances combining to form a more complex one