Science Teaching by Design

MIDDLE SCHOOL SCIENCE (TEKS BASED PROGRAM)

CATEGORY 1

8.5E

INVESTIGATE HOW EVIDENCE OF CHEMICAL REACTIONS INDICATES THAT NEW SUBSTANCES WITH DIFFERENT PROPERTIES ARE FORMED AND HOW THAT RELATES TO THE LAW OF CONSERVATION OF MASS

READINESS STANDARD 2 QUESTIONS

Day 1

8.5D INVESTIGATE EVIDENCE OF A CHEMICAL REACTION

8.2(C) COLLECT AND RECORD DATA USING THE INTERNATIONAL SYSTEM OF UNITS (SI) AND QUALITATIVE MEANS SUCH AS LABELED DRAWINGS, WRITING, AND GRAPHIC ORGANIZERS

8.2(E) ANALYZE DATA TO FORMULATE REASONABLE EXPLANATIONS, COMMUNICATE VALID CONCLUSIONS SUPPORTED BY THE DATA, AND PREDICT TRENDS.

8.3(A) ANALYZE, EVALUATE, AND CRITIQUE SCIENTIFIC EXPLANATIONS BY USING EMPIRICAL EVIDENCE, LOGICAL REASONING, AND EXPERIMENTAL AND OBSERVATIONAL TESTING, SO AS TO ENCOURAGE CRITICAL THINKING BY THE STUDENT;

8.3(B) USE MODELS TO REPRESENT ASPECTS OF THE NATURAL WORLD SUCH AS AN ATOM, A MOLECULE, SPACE, OR A GEOLOGIC FEATURE;

8.3(C) IDENTIFY ADVANTAGES AND LIMITATIONS OF MODELS SUCH AS SIZE, SCALE, PROPERTIES, AND MATERIALS;

Problem of the Day

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ELPS 3.E, 3.F, 3.G, 3.H, 3.J,

- Analyze the Chemical Equation example below.
- Identify the chemical formulas, coefficients, elements, subscripts, and atoms for the example

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2$$

Zinc Atoms	Hydrogen Atoms	Chlorine Atoms	Zinc Atoms	Chlorine Atoms	Hydrogen Atoms

Reactants:

Total # of Atoms = _____

Products:

Total # of Atoms = _____

Content Objective

- I WILL…INVESTIGATE when chemicals combine to create something new and evidences of a chemical reaction

3 minutes

Language Objective

3 minutes

Key Points to Learn

ELPS 2.G, 2.H, 2.I, 4.G, 4.H

- A chemical reaction occurs when 2 or more chemicals combine and create a new substance.
- The reactants and products are not the same in a chemical reaction
- Evidence of a chemical reaction includes: Release of Light, Release of Gas, Smoke, or Bubbles, and Change of Color

Anticipatory Set (Read/Listen) ELPS 2.E, 2.F, 2.G, 4E, 4F, 4G

Chemical Symbol	Chemical Formula
IRON **$Fe = Fe_1$** subscript A pure substance. Represents an Element Has 1 element. Has 1 subscript	IRON OXIDE **Fe_2O_3** subscript A pure substance/compound. Represents a Substance. Has more than 1 element. Has 2 subscripts

- Analyze the T-chart.
- Using a Venn-Diagram Compare and Contrast the characteristics of a Chemical Symbol to a Chemical Formula.

Anticipatory Set (Read/Listen) ELPS 2.E, 2.F, 2.G, 4E, 4F, 4G

Chemical Symbol	Chemical Formula
Carbon $C = C_1$ subscript A pure substance. Represents an Element Has 1 element. Has 1 subscripts	Glucose $C_6H_{12}O_6$ subscript A pure substance/compound. Represents a Substance. Has more than 1 element. Has 3 subscripts

- Analyze the T-chart.
- Using a Venn-Diagram Compare and Contrast the characteristics of a Chemical Symbol to a Chemical Formula.

Anticipatory Set (Listen) ELPS 2.E, 2.F, 2.G

- **Insert video on Chemical Formulas representing substances**

3-5 minutes

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Engage Activity (Interact)

ELPS 3.E, 3.F, 3.G, 3.H, 3.J,

- Analyze the Chemical Equation example below.
- Compare and Contrast the Reactants and Products.
- Identify the evidence of the chemical reaction in the equation

GAS

REACTANTS **PRODUCTS**

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

Carbon Dioxide + Water → Glucose + Oxygen

Reactants	Reactants	Products	Products	Evidence

Evidence of Chemical Reaction:

Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Formative Assessment

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- **Think-Pair-Share/ 1 minute Essay**
- Analyze the data table.
- Describe the observations of reactants and products in the chemical equation.
- Identify and describe the evidences of a chemical reaction.

2 minutes

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Guided Practice "I do We do"

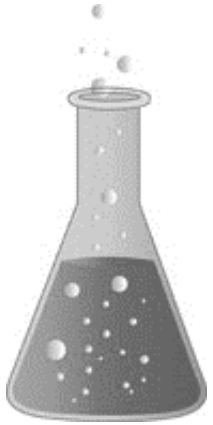
ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- **Analyze the science scenario example below.**
- **Identify the reactants, products, & evidence of the chemical reaction in the equation**

A student wanted to make a model of a volcano and mixed together 10g of Baking Soda into a 50mL beaker of Vinegar to test the reaction.

The product was Sodium Acetate, Carbon Dioxide, and Water

The student observed the following:



Starting Temp 20°C

Ending Temp 5°C

Evidence of Chemical Reaction:

Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Reactant	Reactant	Product	Product	Product	Evidences

Foundations in Teaching ®

Guided Practice "I do We do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- Analyze the Chemical Equation example below.
- Compare and Contrast the Reactants and Products.
- Identify the evidence of the chemical reaction in the equation

GAS

REACTANTS PRODUCTS

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

Carbon Dioxide — Water — Glucose — Oxygen

Reactants	Reactants	Products	Products	Evidence

Evidence of Chemical Reaction:

Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Guided Practice "I do We do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- Analyze the data table of observations below.
- A scientist conducted a lab investigation in which he added 4 different substance to different beakers of water
- Identify the evidences of the chemical reaction in data table

Substance	Observation
A	The substance sank to the bottom of the beaker
B	The substance dissolved in water
C	The substance caused smoke in water
D	The substance released fire in water

Evidence	Evidence

Evidence of Chemical Reaction:

Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Guided Practice "I do We do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- Analyze the data table of observations below.
- A scientist conducted a lab investigation in which he added 4 different substance to different beakers of water
- Identify the evidences of the chemical reaction in data table

Substance	Observation
A	The temperature increased then decreased
B	Bubbles formed and released smoke
C	There was a change in state of matter from solid to liquid
D	There was a change of color from clear to bright green

Evidence	Evidence	Evidence

Evidence of Chemical Reaction:

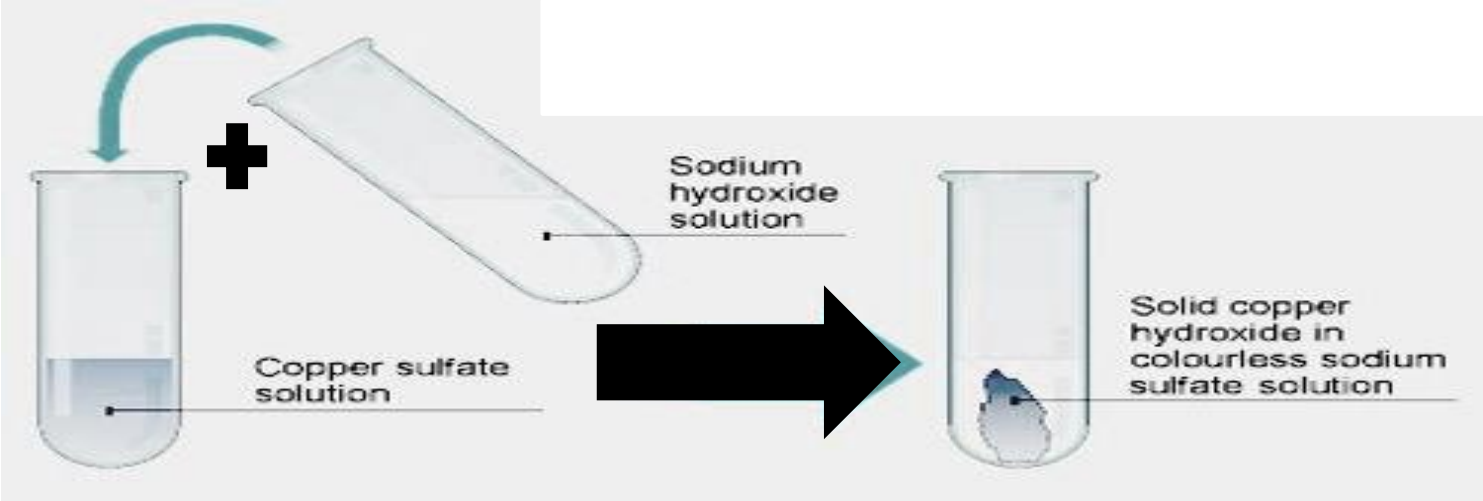
Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Guided Practice "I do We do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- Analyze the illustration example below.
- Compare and Contrast the Reactants and Products.
- Identify the evidence of the chemical reaction in the equation



Reactants	Reactants	Products	Products	Evidence
Sodium Hydroxide	Copper Sulfate	Copper Hydroxide	Sodium Sulfate	

Evidence of Chemical Reaction:

Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Independent Practice "You do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

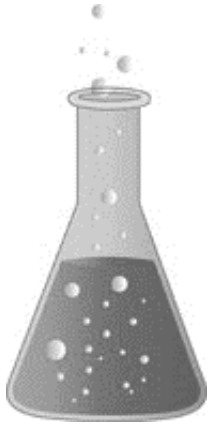
- **Analyze the science scenario example below.**
- **Identify the reactants, products, & evidence of the chemical reaction in the equation**

A student wanted to make a model of a volcano and mixed together

5g of Alka-Seltzer tablet into a 50mL beaker of Water to test the reaction.

The product was Sodium Citrate and Carbon Dioxide

The student observed the following:



Starting Temp 27°C

Ending Temp 7°C

Evidence of Chemical Reaction:

Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Reactant	Reactant	Product	Product	Evidences

Independent Practice "You do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- Analyze the Chemical Equation example below.
- Compare and Contrast the Reactants and Products.
- Identify the evidence of the chemical reaction in the equation

FIRE

REACTANTS → PRODUCTS

$2H_2 + O_2 \rightarrow 2H_2O$

Hydrogen + Oxygen → Water

Reactant	Reactant	Product	Evidence

Evidence of Chemical Reaction:

Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
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5. **Formation of Precipitate**

Independent Practice "You do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- Analyze the data table of observations below.
- A scientist conducted a lab investigation in which he added 4 different substance to different beakers of water
- Identify the evidences of the chemical reaction in data table

Substance	Observation
A	The substance changed from a solid to a gas
B	The substance sank to the bottom of the beaker
C	The substance changed color when it touched water
D	The substance released a spark when it touched water

Evidence	Evidence

Evidence of Chemical Reaction:

Products are not the same as Reactants

1. **Release of Gas**
2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Independent Practice "You do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

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Evidence	Evidence	Evidence

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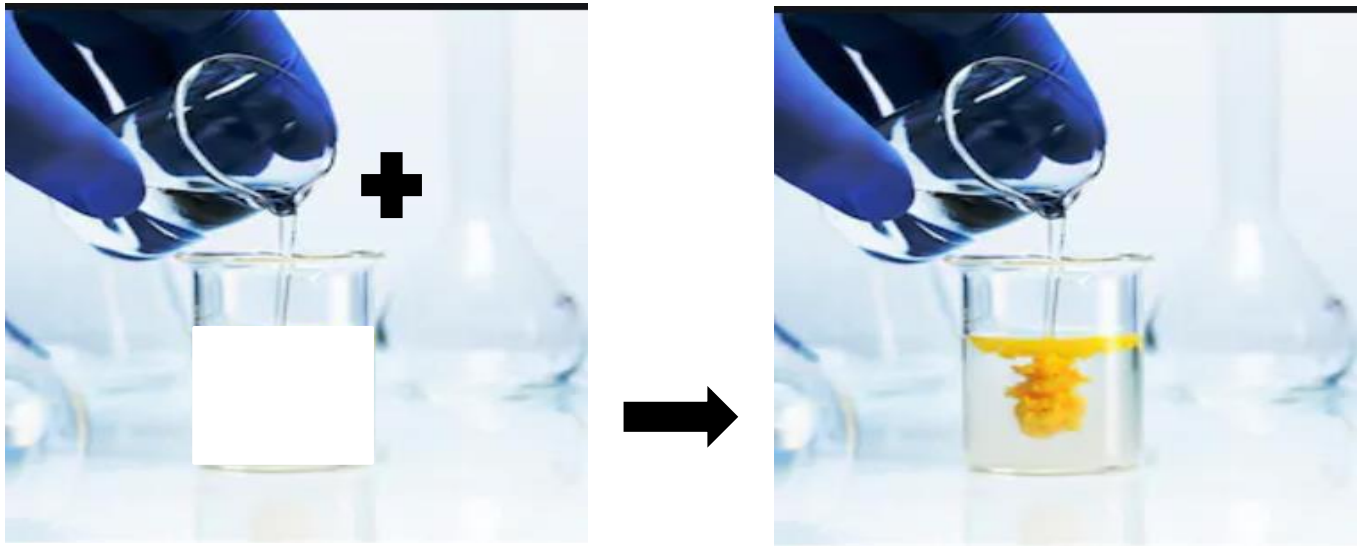
Independent Practice "You do"

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

- Analyze the illustration example below.
- Identify the evidence of the chemical reaction in the illustration



Evidence

Evidence of Chemical Reaction:

Products are not the same as Reactants

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2. **Release of Light**
3. **Change of Color**
4. **Change of Temperature**
5. **Formation of Precipitate**

Formative Assessment

ELPS 3.E, 3.F, 3.G, 3.H, 3.J, 5.F, 5.G

Analyze the data table.

- Describe the observations of reactants and products in the chemical equation.
- Identify and describe the evidences of a chemical reaction.

- **Summary Writing 3-4 complete sentences**
- What conclusion can be made about reactants and products in a chemical reaction?
- What evidences of a chemical reaction should you observe or look for when 2 or more chemicals combine?

5 minutes

Closure ELPS 2.G, 2.H, 2.I, 5.F, 5.G

- A chemical reaction occurs when 2 or more chemicals combine and create a new substance.
- The reactants and products are not the same in a chemical reaction
- Evidence of a chemical reaction includes: Release of Light, Release of Gas, Smoke, or Bubbles, and Change of Color

5 minutes

Testable Format based on Content Objective

A scientist spilled a few drops of dilute hydrochloric acid (HCl) on a lab table. For safety purposes, the scientist sprinkled some baking soda ($NaHCO_3$) onto the spill. Which observation would provide the best evidence that a chemical reaction occurred?

F The baking soda and hydrochloric acid combined, and bubbles formed.

G The baking soda absorbed the hydrochloric acid.

H Some of the baking soda dissolved in the hydrochloric acid.

J The hydrochloric acid evaporated, leaving only the baking soda.

Testable Format based on Content Objective

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During an investigation, a student combined the two clear, colorless solutions shown below.

Solution 1

Compound A dissolved in water at 25°C

Solution 2

Compound B dissolved in water at 25°C

The student observed that the temperature changed from 25°C to 23°C when the solutions were combined and that a white substance rapidly formed and settled to the bottom of the container. What most likely happened to produce these results?

F One of the original compounds came out of solution.

G The solutions reacted chemically.

H Some of the water froze into ice crystals.

J Rapid evaporation of water occurred, leaving a solid.

Testable Format based on Content Objective

Some students in a chemistry lab conducted an investigation in which they added four different solid substances to separate beakers of water. They stirred the mixtures for one minute and then recorded their observations in the table below.

Student Observations

Substance	Observation
1	The substance dissolved.
2	The substance caused bubbles to form.
3	The substance sank to the bottom.
4	The substance floated on top.

Which substance most likely caused a new substance to be formed when mixed with water?

F Substance 1

G Substance 2

H Substance 3

J Substance 4