

THE THINGS CHEMISTS USE IN CHEMICAL LABS 6TH GRAD Handbook

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Chemists, whether they are professionals or students learning about chemistry, rely on a variety of tools and equipment to carry out experiments safely and effectively. In a 6th-grade chemistry lab, the tools are designed to be simple, safe, and easy to handle, helping young learners understand basic scientific concepts while ensuring their safety. These tools allow chemists to observe, measure, and mix chemicals, helping them discover how things work at a tiny, molecular level. In this article, we will explore the essential tools and equipment that chemists use in a 6th-grade chemical lab, explaining what each one is used for and why it is important.

Basic Equipment in a 6th Grade Chemistry Lab

Measuring Instruments

In chemistry, accurate measurements are crucial. Chemists use several measuring tools to ensure they handle chemicals correctly.

- **Graduated Cylinders:** These tall, narrow containers are used to measure liquids precisely. They come in various sizes, such as 50 ml, 100 ml, or 250 ml.
- **Beakers:** Beakers are wide-mouthed containers used for mixing, stirring, and heating liquids. They are marked with measurement lines but are not as precise as graduated cylinders.
- **Test Tubes and Test Tube Racks:** Small, cylindrical tubes used to hold small amounts of liquids or solids during experiments. Test tube racks keep them upright and organized.

Handling and Heating Tools

Chemists need tools to handle chemicals safely and to heat substances when necessary.

- **Test Tube Holders and Clamps:** These help hold hot test tubes safely without burning fingers.
- **Bunsen Burners:** Small gas burners used to heat chemicals during experiments. They produce a controlled flame.
- **Tripods and Wire Gauze:** Tripods hold containers above the flame, and wire gauze spreads the heat evenly when heating liquids.

Safety Equipment

Safety is very important in any laboratory. Even in a 6th-grade lab, students should always use safety gear.

- **Safety Goggles:** Protect the eyes from splashes, fumes, or debris.
- **Lab Aprons:** Protect clothes and skin from spills and splashes.
- **Gloves:** Used to handle chemicals safely, especially when working with acids or other hazardous substances.

Common Tools and Materials Used in 6th Grade Chemistry Experiments

Chemicals and Substances

While 6th graders do not work with dangerous chemicals, they often use safe, household or school-approved substances to learn basic concepts.

- **Vinegar:** Used for acids and reactions with baking soda.
- **Baking Soda:** Used in reactions that produce carbon dioxide gas.
- **Food Coloring:** Added to liquids to observe mixing and color changes.
- **Salt and Sugar:** Used in solutions and to observe dissolving properties.

Other Laboratory Tools

Chemists also use various everyday tools adapted for science experiments.

- **Droppers or Pipettes:** Used to transfer small amounts of liquids accurately.
- **Stirring Rods:** Glass or plastic rods used to stir solutions or mix chemicals gently.
- **Magnifying Glass:** Helps observe small details in experiments or samples.

Understanding Safety and Proper Use of Lab Equipment

Why Safety Equipment is Important

Even in a 6th-grade lab, safety cannot be overlooked. Proper safety gear protects students from accidental splashes, burns, or inhalation of fumes. Always wearing safety goggles and aprons helps prevent injuries and keeps the learning environment safe.

Proper Handling of Tools and Chemicals

Using tools correctly is vital. For example:

- Always handle hot equipment with tongs or holders.
- Never taste or directly smell chemicals?use wafting techniques if needed.
- Follow instructions carefully when measuring or mixing chemicals.

Fun and Educational Experiments Using These Tools

Making a Volcano Eruption

Using baking soda, vinegar, and a container, students can observe a chemical reaction that simulates a volcanic eruption. They use measuring cups, droppers, and safety goggles for this experiment.

Color Mixing with Food Coloring

By mixing different colored liquids in beakers or test tubes, students learn about primary and secondary colors, observing how colors blend.

Growing Salt Crystals

Dissolving salt in water and allowing it to evaporate results in crystal formation. This experiment uses beakers, stirring rods, and patience.

Conclusion

Chemists, especially young students in 6th grade, rely on a variety of tools and equipment to explore the fascinating world of chemistry. From measuring instruments like graduated cylinders to safety gear like goggles and gloves, each item plays an important role in ensuring experiments are safe, accurate, and educational. Understanding the proper use of these tools helps foster curiosity, develop scientific skills, and build a foundation for future scientific learning. As students become familiar with these basic lab items, they gain confidence in conducting experiments and discovering the secrets of matter around them.

Chemists' Tools in the Laboratory: Exploring What Sixth Graders Need to Know

Understanding what chemists use in a chemical lab can seem like discovering a secret treasure chest filled with fascinating tools and equipment. For sixth graders, learning about these items is like

opening a window into the world of science, where each tool plays a vital role in helping chemists perform experiments, make discoveries, and understand the world around us. In this detailed guide, we will explore the essential equipment found in a chemical laboratory, explain their functions, and share interesting facts to help young learners appreciate the exciting work chemists do.

Introduction to Chemistry Labs

Chemistry is the science of matter, exploring what things are made of and how they interact. To do this safely and accurately, chemists use a variety of specialized tools and equipment. These tools help them measure, mix, observe, and analyze substances. For sixth graders, understanding these tools can inspire curiosity about the science they see in everyday life, from cooking to cleaning products.

Essential Laboratory Equipment for Chemists

Chemists rely on a broad range of equipment, each designed for specific tasks. Let's explore these tools in detail:

1. Glassware

Glassware is fundamental in any chemistry lab because it allows chemists to hold, measure, and heat chemicals safely. Here are some common types:

- Beakers:
 - Usually made of glass or plastic.
 - Used for mixing chemicals or holding liquids during experiments.
 - Come in various sizes, typically measured in milliliters (ml).
 - Have a spout for easy pouring.

- Test Tubes:
 - Small, cylindrical tubes with rounded bottoms.
 - Used to hold small amounts of liquids or solids for testing and observation.
 - Can be heated directly over a flame.

- Graduated Cylinders:
 - Tall, narrow containers with measurement markings.
 - Used for accurately measuring the volume of liquids.

- Flasks (Erlenmeyer Flasks):
 - Cone-shaped with a narrow neck.
 - Ideal for mixing chemicals because they can be swirled without spilling.
 - Often used in titrations (a method to determine the concentration of a solution).
- Droppers and Pipettes:
 - Used to transfer small amounts of liquids precisely.
 - Pipettes can be glass or plastic and often have measurement marks.

2. Measuring Instruments

Accurate measurements are crucial in chemistry, and chemists use specific tools to ensure precision:

- Balance Scales:
 - Used to measure the weight of substances.
 - Types include digital balances and triple-beam balances.
 - Important for recipes and reactions where exact amounts matter.
- Thermometers:
 - Measure temperature of chemicals and reactions.
 - Can be mercury, alcohol, or digital thermometers.
- pH Meters:
 - Measure the acidity or alkalinity of a solution.
 - Useful in experiments involving acids and bases.

3. Heating Equipment

Heating chemicals is common in chemistry experiments, and chemists use specialized devices:

- Bunsen Burners:
 - Small gas burners that produce a hot, adjustable flame.
 - Used for heating substances directly in test tubes or beakers.

- Hot Plates:
 - Electric devices that heat containers from below.
 - Safer and more controlled than open flames.
- Test Tube Holders and Clamps:
 - Hold test tubes securely while heating or handling.

4. Safety Equipment

Safety is paramount in any lab. Chemists wear and use various safety tools:

- Safety Goggles:
 - Protect the eyes from splashes, fumes, or flying objects.
- Lab Coats:
 - Cover clothing and skin to prevent chemical contact.
- Gloves:
 - Protect hands from harmful chemicals.
- Fire Extinguisher and First Aid Kit:
 - Essential safety gear in case of accidents.

5. Observation and Analysis Tools

Chemists need tools to observe and analyze their experiments:

- Magnifying Glasses:
 - Help see small details in samples.
- Spectrophotometers:
 - Measure how much light a substance absorbs, helping identify chemicals.

- Microscopes:
- Used in advanced labs to see tiny particles or microorganisms.

6. Miscellaneous Equipment

Other useful tools include:

- Stirring Rods:
- Glass or plastic rods used to mix chemicals gently.
- Crucibles and Tongs:
- Crucibles withstand high heat, and tongs help handle hot items.
- Wash Bottles:
- Plastic bottles used to rinse substances or add water to experiments.

Understanding Lab Safety and Proper Use of Equipment

For sixth graders, knowing how to handle lab tools responsibly is just as important as knowing what they are. Here are some safety tips:

- Always wear safety goggles and a lab coat when working with chemicals.
- Never touch chemicals with your bare hands unless instructed.
- Keep your workspace organized and clean.
- Follow instructions carefully to avoid accidents.
- Report any spills or broken equipment immediately to a teacher or supervisor.

The Role of Chemists and Their Tools in Scientific Discoveries

Chemists use their tools to explore the properties of materials, develop new medicines, improve cleaning products, and even understand environmental issues. Their equipment allows them to perform experiments that can lead to discoveries that benefit society.

For example:

- Developing Medicines:

Chemists analyze compounds to create effective and safe medicines.

- Environmental Protection:

They test water and soil samples using various instruments to detect pollutants.

- Material Science:

Inventing new materials like stronger plastics or better batteries.

Through their tools, chemists transform raw materials into useful products, solve mysteries about substances, and advance technology.

Fun Facts about Chemistry Lab Tools

- The Bunsen burner was invented by Robert Bunsen in 1855 and revolutionized heating in labs.
- The pH scale ranges from 0 to 14, with 7 being neutral?like pure water.
- Test tubes can be reused many times if cleaned properly.
- The balance scale has been used since ancient times, with early versions made of stones or wood.

Encouraging Young Chemists

For sixth graders interested in chemistry, understanding the tools is the first step toward becoming a young scientist. You can:

- Visit a science museum with a chemistry exhibit.
- Try simple experiments at home with adult supervision, like mixing baking soda and vinegar.
- Ask teachers or parents about how labs work and what equipment they use.
- Read books about famous chemists and their discoveries.

Conclusion

The equipment used by chemists in laboratories is a fascinating collection of tools designed to help explore the mysteries of matter safely and accurately. From glassware like beakers and test tubes to safety gear such as goggles and gloves, each item plays a crucial role in scientific experiments. Learning about these tools not only prepares sixth graders for potential future studies in science but

also helps them appreciate the careful work and precise methods chemists use every day. Whether it's heating substances with a Bunsen burner, measuring liquids with a graduated cylinder, or analyzing chemicals with a pH meter, each piece of equipment opens a new window into understanding our world.

So, next time you see a science experiment, remember the incredible tools behind the scenes that make discovery possible!

Question What are some common tools chemists use in a chemical lab? Chemists often use tools like beakers, test tubes, pipettes, and microscopes to carry out experiments and observe chemicals closely. **Answer** Why do chemists use safety goggles in the lab? Safety goggles protect their eyes from harmful chemicals, splashes, and accidental spills during experiments. What is a test tube used for? A test tube is used to hold, mix, and heat small amounts of chemicals during experiments. Why are gloves important in a chemical lab? Gloves protect chemists' skin from dangerous or irritating chemicals and prevent contamination of the experiments. What is a chemical dropper or pipette used for? A pipette helps chemists measure and transfer small amounts of liquids accurately. Why do chemists use a Bunsen burner? A Bunsen burner provides a controlled flame for heating chemicals safely during experiments.

Related keywords: laboratory equipment, test tubes, beakers, safety goggles, chemicals, microscopes, droppers, lab coats, glassware, chemical reactions

lab evidence for chemical change answ

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Understanding chemical changes is fundamental in the study of chemistry. Laboratory experiments provide concrete evidence to identify whether a chemical reaction has occurred. Recognizing lab evidence for chemical change helps students and scientists determine if a substance has undergone a transformation at the molecular level, rather than merely a physical alteration. This article explores the various types of lab evidence indicative of chemical changes, methods to observe these signs, and the significance of these observations in scientific investigations.

What Is a Chemical Change?

A chemical change, also known as a chemical reaction, involves the formation of new substances with different properties from the original materials. Unlike physical changes, which only alter the physical appearance or state of a substance without changing its chemical composition, chemical

changes result in new compounds.

Key characteristics of chemical changes include:

- Formation of precipitates
- Evolution of gases
- Color change
- Temperature change (exothermic or endothermic reactions)
- Emission of light
- Irreversibility in many cases

Recognizing these signs through laboratory experiments provides tangible evidence of chemical reactions.

Lab Evidence for Chemical Change

Laboratory investigations rely on observable phenomena and measurable changes that serve as evidence for chemical reactions. The primary lab evidence for chemical change includes:

1. Formation of a Precipitate

A precipitate is an insoluble solid formed when two solutions are mixed. Its formation indicates a chemical reaction has taken place.

Example:

- Mixing solutions of silver nitrate (AgNO_3) and sodium chloride (NaCl) results in the formation of silver chloride (AgCl), a white precipitate.

Procedure:

- Add AgNO_3 solution to NaCl solution.
- Observe the formation of a white solid settling at the bottom.

Significance:

The formation of a precipitate confirms a chemical change because the ions combine to form an insoluble compound.

2. Evolution of Gases

The production of gases during a reaction is a clear sign of a chemical change.

Common gases observed:

- Carbon dioxide (CO₂)
- Hydrogen (H₂)
- Oxygen (O₂)

Laboratory Tests:

- Bubbling or fizzing: When acids react with carbonates, bubbles of CO₂ are released.
- Test for hydrogen: Bring a lit splint to the gas; a popping sound indicates H₂.
- Test for oxygen: Relight a glowing splint; if it rekindles, O₂ is present.

Example:

- Reacting hydrochloric acid (HCl) with marble chips (calcium carbonate) produces CO₂ gas.

3. Color Change

A change in color during a reaction indicates the formation of new substances.

Examples:

- Iron rusting: Iron reacting with oxygen forms reddish iron oxide.
- Silver tarnishing: Silver reacting with sulfur compounds causes a color change.

Laboratory Observation:

- Monitoring solutions over time for color shifts can confirm chemical reactions.

4. Temperature Change

Chemical reactions often release or absorb heat, leading to temperature changes.

Types:

- Exothermic reactions: Release heat (e.g., combustion).
- Endothermic reactions: Absorb heat (e.g., photosynthesis).

Lab Evidence:

- Using a thermometer to record temperature before and after reaction.
- Noticing a rise or fall indicates energy exchange during chemical change.

5. Light Emission

Some chemical reactions produce light, which can be observed visually.

Examples:

- Combustion reactions.
- Certain chemiluminescent reactions.

Laboratory Observation:

- Reaction mixtures emitting glow or spark indicate chemical change involving light.

6. Irreversibility

Many chemical changes are difficult or impossible to revert to original substances, contrasting physical changes.

Lab Significance:

- If a process cannot be reversed by physical means, it suggests a chemical transformation has occurred.

Methods to Detect Lab Evidence of Chemical Change

Detecting chemical change requires specific techniques and observations during laboratory

experiments.

1. Visual Observation

- Monitoring color changes, precipitate formation, gas bubbles, and light emission.

2. Gas Tests

- Using test tubes and specialized equipment to capture and analyze gases.
- Applying chemical tests such as limewater for CO_2 (turns cloudy) or burning splints for H_2 .

3. Temperature Measurement

- Using thermometers or temperature probes to record heat absorption or release.

4. Precipitation Tests

- Filtering and observing solid formation.
- Using microscopes to examine precipitates.

5. pH Testing

- Changes in acidity or alkalinity can suggest chemical reactions, especially in acid-base reactions.

Examples of Laboratory Experiments Demonstrating Chemical Change

Practical experiments are essential for illustrating lab evidence of chemical change. Here are some common experiments:

1. Vinegar and Baking Soda Reaction

- Observation: Bubbles of CO_2 are produced, causing fizzing.
- Evidence: Gas evolution, temperature increase.

2. Silver Nitrate and Sodium Chloride Solution

- Observation: Formation of a white precipitate of silver chloride.
- Evidence: Precipitate formation indicates a chemical reaction.

3. Rusting of Iron

- Observation: Color change from metallic gray to reddish-brown.
- Evidence: Color change, formation of new compound.

4. Decomposition of Hydrogen Peroxide

- Reaction: $2H_2O_2 \rightarrow 2H_2O + O_2$
- Observation: Bubbles of oxygen are released.
- Evidence: Gas evolution, temperature change.

Importance of Lab Evidence in Chemistry

Lab evidence is crucial in confirming chemical reactions and understanding their mechanisms. It helps:

- Distinguish between physical and chemical changes.
- Identify reaction products.
- Study reaction conditions and kinetics.
- Validate theoretical predictions.

Accurate observation and interpretation of lab evidence are essential skills for chemists and students alike.

Conclusion

Recognizing lab evidence for chemical change is fundamental in chemistry. From precipitate formation and gas evolution to color and temperature changes, each sign provides insight into the transformative processes at the molecular level. Conducting controlled experiments and analyzing their outcomes enable scientists to confirm chemical reactions, understand reaction mechanisms, and develop new compounds. Mastery of observing and interpreting lab evidence is vital for advancing scientific knowledge and practical applications in fields such as medicine, manufacturing,

environmental science, and more.

Remember: Always follow safety protocols when performing laboratory experiments and interpret evidence accurately to draw valid conclusions about chemical changes.

Lab Evidence for Chemical Change

Understanding chemical change is fundamental to the study of chemistry, as it reveals how substances interact, transform, and give rise to new materials with distinct properties. Laboratory experiments serve as vital tools in providing tangible evidence of chemical changes, enabling scientists to observe phenomena that distinguish chemical reactions from physical processes. This article explores the various forms of lab evidence that confirm chemical change, detailing the methods, observations, and underlying principles that underpin these indicators.

Introduction to Chemical Change and Its Significance

A chemical change involves a process where substances undergo a transformation resulting in the formation of one or more new substances with different chemical compositions and properties. Unlike physical changes?such as melting, boiling, or dissolving?chemical changes are typically irreversible and involve breaking and forming chemical bonds.

Laboratory investigations into chemical change are crucial because they provide concrete evidence through observable phenomena. Recognizing these signs in experiments helps chemists verify reactions, understand reaction mechanisms, and develop new materials or processes.

Primary Lab Evidence for Chemical Change

Scientists rely on specific observable signs during experiments to determine whether a chemical change has occurred. These signs are typically categorized into physical and chemical indicators. While physical signs can sometimes be misleading, chemical signs are considered definitive evidence of a chemical reaction.

- Formation of a Precipitate

Definition: A precipitate is an insoluble solid that forms and separates from a solution during a chemical reaction.

Laboratory Example: When solutions of silver nitrate (AgNO_3) and sodium chloride (NaCl) are mixed, a white precipitate of silver chloride (AgCl) forms:



Significance: The formation of a precipitate indicates a chemical change because it results from the formation of an insoluble compound, not just a physical mixing.

- Gas Evolution and Bubbles

Definition: The generation of gas during a reaction is a strong sign of a chemical change.

Laboratory Example: When hydrochloric acid (HCl) reacts with calcium carbonate (CaCO₃), carbon dioxide gas (CO₂) is released:



Observation: Bubbles of CO₂ are observed, often tested with limewater (calcium hydroxide solution), which turns cloudy upon contact.

Significance: Gas evolution signifies a chemical transformation, especially when the gas has specific chemical properties and can be tested for.

- Color Change

Definition: A permanent change in the color of a substance is a common indicator.

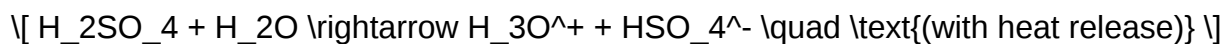
Laboratory Example: The oxidation of iodine (I₂) to iodine chloride (ICl) results in a color change from brown to colorless or vice versa. Similarly, the oxidation of potassium permanganate (KMnO₄) causes a transition from purple to colorless or brown.

Significance: Color changes reflect alterations in the chemical structure and oxidation states, confirming a chemical reaction has taken place.

- Temperature Change (Exothermic or Endothermic Reactions)

Definition: Chemical reactions often involve the absorption or release of heat.

Laboratory Example: Mixing acids and bases, such as sulfuric acid (H₂SO₄) with water, results in a noticeable temperature increase, indicating an exothermic reaction:



Observation: A thermometer shows a rise in temperature during the reaction.

Significance: Temperature change, especially when not attributable to physical mixing, provides evidence of chemical transformation.

- Permanent Changes in Physical Properties

Definition: Changes such as the formation of new substances with different melting points, boiling points, or densities suggest chemical change.

Laboratory Example: Heating sugar causes caramelization; the sugar melts and then turns brown, forming new compounds with different physical properties. However, physical change alone is insufficient; combined with other signs, it indicates chemical change.

Analytical Techniques as Evidence for Chemical Change

While visual signs are fundamental, advanced laboratory techniques provide more definitive evidence of chemical change by analyzing the composition and structure of substances.

- Spectroscopy

Infrared (IR) Spectroscopy: Detects changes in molecular bonds by observing absorption of IR radiation. New peaks or shifts indicate the formation of new chemical bonds.

UV-Visible Spectroscopy: Monitors changes in electronic transitions, useful for observing oxidation-reduction reactions or complex formation.

- Chromatography

Used to analyze reaction products by separating components based on their affinity to stationary and mobile phases. The appearance of new peaks or bands indicates new substances formed.

- Titration and Quantitative Analysis

Determining the amounts of reactants and products can confirm chemical transformations. For

example, a change in concentration of reactants over time indicates a chemical reaction.

- pH Measurements

Significant shifts in pH during reactions?such as neutralization reactions?are indicators of chemical change involving proton transfer.

- Mass Spectrometry

Provides molecular weight and structural information about reaction products, confirming the formation of new compounds.

Distinguishing Chemical from Physical Changes

While lab evidence can strongly suggest chemical change, scientists must differentiate between physical and chemical processes. Several criteria aid in this distinction:

- Reversibility: Physical changes are generally reversible; chemical changes are often irreversible.
- Energy Changes: Chemical reactions usually involve energy changes beyond simple physical processes.
- Formation of New Substances: The creation of new substances, as confirmed through analytical techniques, indicates a chemical change.
- Change in Composition: Chemical changes alter the elemental or molecular composition, detectable via chemical analysis.

Case Studies: Laboratory Evidence in Action

Case Study 1: Combustion of Hydrocarbon

Experiment: Burning methane (CH_4) in oxygen.

Observations:

- Bright flame (heat and light release)
- Formation of carbon dioxide and water (confirmed by gas tests)
- Temperature increase

Analysis: The formation of new substances (CO_2 and H_2O), energy release, and gas evolution evidence a chemical change.

Case Study 2: Rusting of Iron

Experiment: Exposing iron nail to moisture and oxygen over time.

Observations:

- Formation of reddish-brown rust (hydrated iron oxide)
- Change in physical appearance
- Irreversible alteration

Analysis: The rusting process involves oxidation, formation of new compounds, and structural change, confirmed through chemical analysis and physical observation.

Conclusion: The Central Role of Lab Evidence in Confirming Chemical Change

Laboratory experiments provide irrefutable evidence of chemical change through a variety of observable phenomena and sophisticated analytical techniques. The formation of precipitates, gas evolution, color changes, temperature shifts, and the creation of new substances are all hallmarks of chemical reactions. These signs, when corroborated by chemical analysis methods such as spectroscopy, chromatography, and titration, form a comprehensive framework for understanding and verifying chemical transformations.

Recognizing these indicators not only advances scientific knowledge but also underpins practical applications across industries—from manufacturing pharmaceuticals to developing new materials and understanding environmental processes. As chemistry continues to evolve, laboratory evidence remains the cornerstone of identifying and studying chemical changes, ensuring that our understanding of the material world is grounded in empirical, observable phenomena.

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Question What laboratory tests can confirm a chemical change has occurred? **Answer** Laboratory tests such as observing color changes, formation of a precipitate, gas evolution, temperature change, and pH shifts can indicate a chemical change. Specific tests like flame tests or chemical reagent reactions can also confirm new substances have formed. How does the formation of a precipitate serve as lab evidence for a chemical change? The formation of a precipitate indicates a new insoluble compound has formed from the reaction of soluble substances, which is a clear sign of a chemical change occurring in the lab. Can the release of gas in a lab test confirm a chemical change? Yes, the evolution of gas during a reaction, such as bubbling or fizzing, suggests a chemical change, especially when the gas is identified as a new substance, like carbon dioxide or oxygen. What role does temperature change play as lab evidence for chemical change? A temperature change, either exothermic or endothermic, observed during a reaction indicates that energy is being absorbed or released, which is characteristic of a chemical change. Why is observing color change in a lab important as evidence of a chemical change? Color change signifies that new substances with different properties have formed, providing visual evidence that a chemical transformation has taken place.

Related keywords: chemical change, lab experiments, evidence of chemical change, chemical reaction, indicators of chemical change, reaction observation, lab tests, chemical properties, evidence of chemical reaction, chemical transformation

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