

AIM | What are the differences 15 | between a physical change and a chemical change?

There are different ways you can change things. For example, you can tear up a piece of paper into small pieces. What remains is still paper. You have changed the way the paper looks. But you have not made any new substance. You have made a *physical change*.

If, instead, you burned the paper, what would be left? What is left is no longer paper. In this case the substance has been changed. This is a *chemical change*.

Physical Change

A physical change does not change the way the atoms are linked up. The substance may look different. But no new substance has been formed. The chemical properties are not changed.

In a physical change, no energy is taken in or given off unless there is a change of state.

Chemical Change

In a chemical change, the atoms change the way they link up. New substances are formed. The new substances have different chemical properties from the old substance. When atoms change the way they link up, we say a *chemical reaction* has taken place.

Energy is always part of a chemical reaction. In a chemical reaction, energy is either taken in or given off.

STUDYING SOME CHEMICAL CHANGES

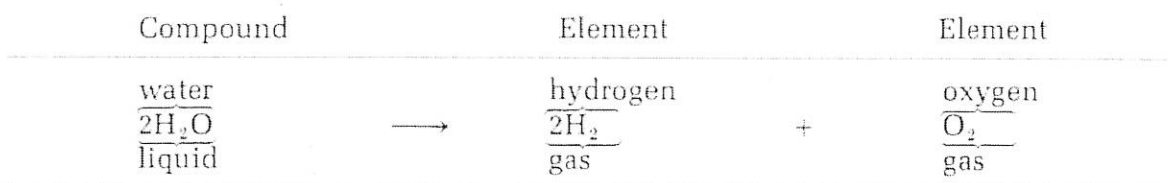
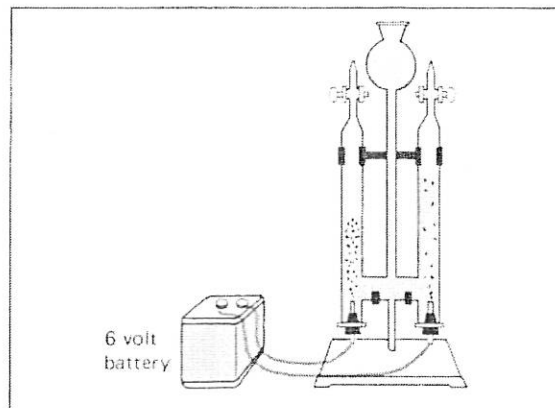
1. A *chemical equation* tells the story of a chemical reaction.

A chemical equation tells which substances we start out with.

A chemical equation also tells us which new substances are formed.

In a chemical reaction, there is never a change in the number of elements. No elements are lost. No new elements are added. They just link up in different ways.

Here is an example of a chemical equation. This equation tells the story of electrolysis.



The elements we start out with are on the left side of the arrow.

The elements we end up with are on the right side of the arrow.

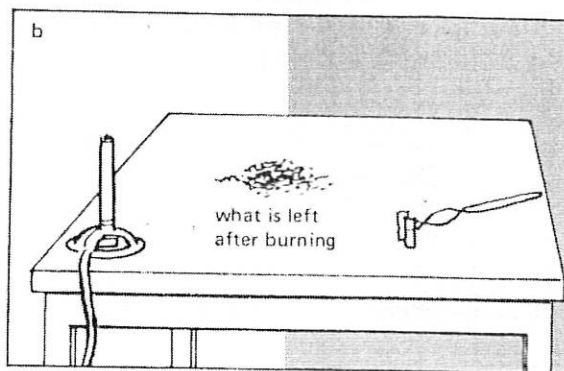
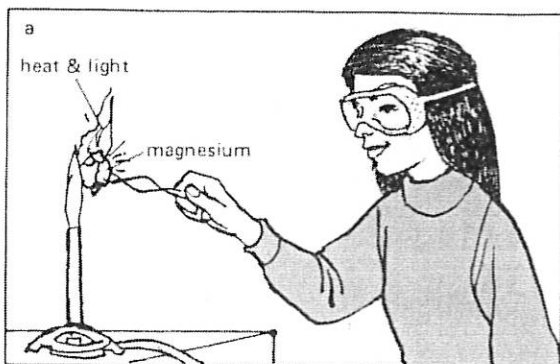
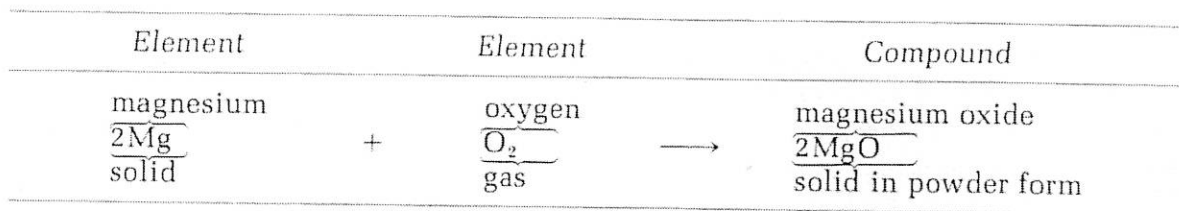
Try to answer these questions by using the chemical equation above.

1. Name the elements we started with. _____
2. Name the elements we ended with. _____
3. Did the elements change the way they link up? _____
4. Were new products formed? _____
5. Did the properties change? _____
6. Were any new elements added? _____
7. Were any elements lost? _____

8. What kind of energy was used? _____
9. The energy was _____
taken in, given off
10. Electrolysis causes a _____
physical change, chemical change

II. THE BURNING OF MAGNESIUM

This equation tells how magnesium joins with oxygen. Study it and then answer the questions below.



- Name the elements we started with. _____
- Name the elements we ended with. _____
- Did the elements stay separate? _____
- Was a new product formed? _____
- Did the properties change? _____
- Were any new elements added? _____
- Were any elements lost? _____
- a) In this reaction, energy was _____
taken in, given off
- b) Name the kinds of energy. _____
- The burning of magnesium causes a _____
physical change, chemical change

EXAMPLES OF PHYSICAL CHANGE

In a physical change, the atoms do not change the way they are linked up. No new products are formed.

Look closely at each of the following examples of physical change. Then answer the questions about each change.

I. TEARING PAPER



1. The tearing of paper is an example of a physical change. Does the paper look different after being torn? _____
2. Is the paper still paper? _____
3. Are the atoms taking in energy? _____
4. Are the atoms giving off energy? _____
5. In a physical change, the atoms _____ change the way they link up.
do, do not
6. The chemical properties of the paper _____ changed.
are, are not
7. A chemical equation _____ be written to show a physical change.
can, cannot
8. A chemical equation shows only a _____ change.
chemical, physical

II. MELTING ICE



1. Does the ice look different after it is melted? _____
2. The formula for water is H_2O .
The formula for ice is *also* H_2O .
 - a) When ice changes to water, the link-up of the atoms _____ change.
does, does not
 - b) When water changes to ice, the link-up of the atoms _____ change.
does, does not
3. A chemical equation _____ be written to tell the story of the melting of ice.
can, cannot
4. The melting of ice is an example of a _____ change.
physical, chemical
5. Think carefully about this one before answering.
When ice changes to a liquid, the ice _____ take in energy.
does, does not
6. Usually, energy _____ part of a physical change.
is, is not
7. Energy is part of a physical change only when there is _____
electrolysis, a change of state

III. CHOPPING WOOD



1. Does the wood look different after being chopped? _____
2. Is the wood still wood? _____
3. Are the atoms changing the way they are linked up? _____
4. Are any elements being added? _____
5. Are any elements being lost? _____
6. Are any new products being formed? _____
7. Is the wood taking in energy? _____
8. Is the wood giving off energy? _____
9. The chopping of wood is an example of a _____ change.
physical, chemical
10. A chemical equation _____ be written to show how wood changes when it is chopped.
can, cannot

MATCHING Match the two lists. Write the correct letter on the line next to each number.

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- | | | |
|----------|-----------------|--|
| 1. _____ | chemical change | a) may be taken in or given off during a chemical reaction |
| 2. _____ | equation | b) new products always formed |
| 3. _____ | properties | c) always change in a chemical reaction |
| 4. _____ | physical change | d) tells the story of a chemical change |
| 5. _____ | energy | e) no new products formed |

TRUE OR FALSE Write T on the line next to the number if the sentence is true. Write F if the sentence is false.

1. _____ A chemical reaction causes a chemical change.
2. _____ A chemical change makes new products.
3. _____ Elements can be lost or gained in a chemical reaction.
4. _____ Energy can only be taken in during a chemical reaction.
5. _____ The substances that take part in a chemical reaction keep their properties.
6. _____ The new substances made in a chemical reaction have new properties.
7. _____ A physical change makes new products.
8. _____ The boiling of water is an example of a chemical change.
9. _____ An equation tells the story of a physical change.
10. _____ An American scientist cannot understand an equation written by a Chinese scientist.

PHYSICAL CHANGE OR CHEMICAL CHANGE?

Tell whether each of the following is a chemical change or a physical change.

1. mixing salt and pepper _____
2. evaporation of water _____
3. electrolysis of water _____
4. cutting a marshmallow _____
5. toasting a marshmallow _____
6. burning magnesium _____
7. adding chocolate syrup to milk _____
8. the rusting of iron _____
9. melting of sugar _____
10. making iron into a magnet _____

