Unit:

CHANGES

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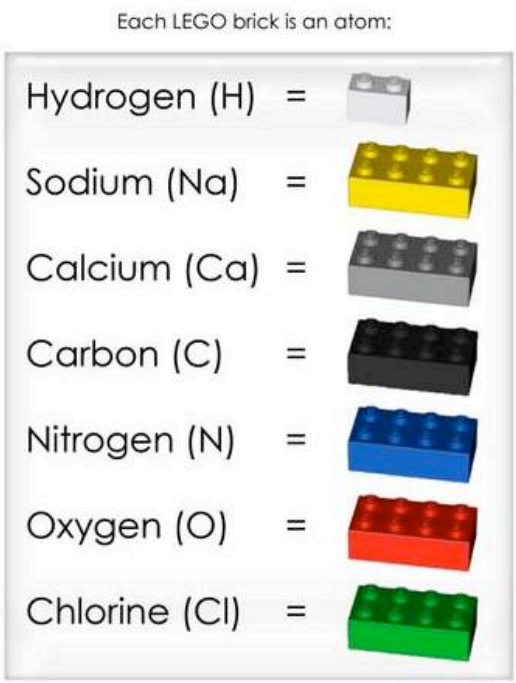
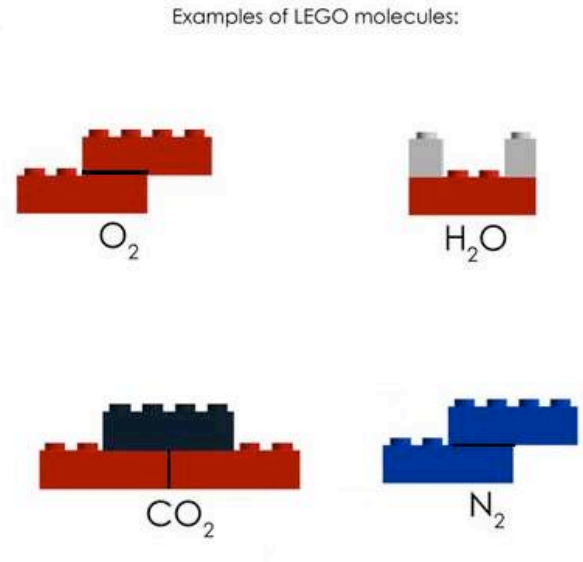
1. INTRODUCTION

As you know, matter is composed of particles (atoms and molecules). In fact, there is a huge amount of different atoms and plenty of combinations of atoms to form molecules or compounds.

Probably, you have always listened that "matter is not created or destroyed only transformed". The law implies that mass can neither be created nor destroyed, although it may be rearranged in space, so the amount of matter in our Universe is always the same. Imagine a cube with many lego bricks pieces Could you build only one structure or more than one?





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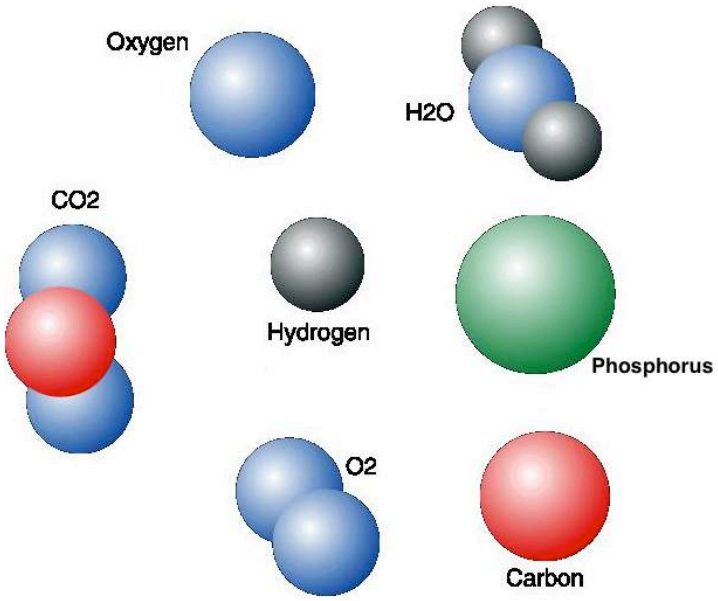
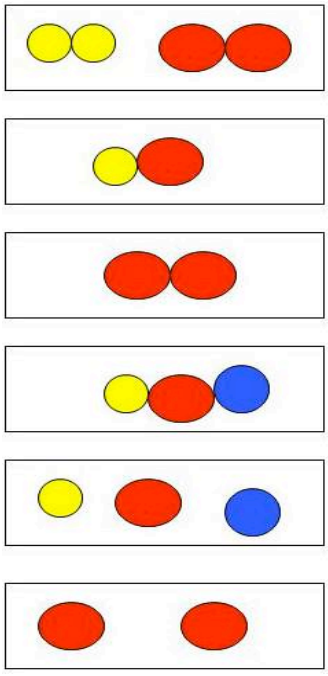
✓ *Activity **A1**. Remember what you have learned in the unit and give a little definition for **atom** and **molecule**. Furthermore, draw an example of each one.*

✓ *Activity **A2**. The images below are atoms or molecules?*



✓ *Activity **A3**. Copy in your notebook and match the picture to the descriptions*



Compound of 2 Elements

Mixture of Molecules

Element Molecule

Compound of 3 Elements

Element / Atoms

Mixture of Atoms

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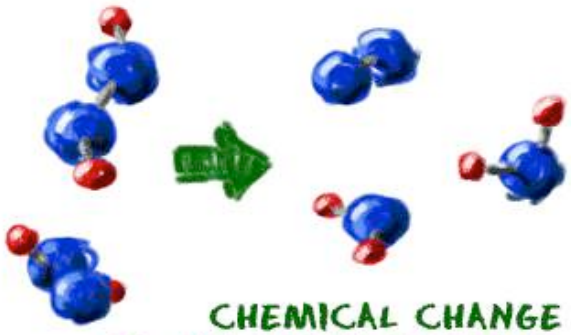
2. PHYSICAL CHANGES AND CHEMICAL CHANGES

It is important to understand the difference between **chemical** and **physical** changes. Some changes are obvious, but there are some basic ideas you should know.

- ✓ **Physical changes** are usually connected to physical states of matter. Physical change rearranges molecules but doesn't affect their internal structures neither substance nor composition.

- ✓ **Chemical changes** happen on a molecular level when you have two or more molecules interacting among them. Chemical changes happen when atomic bonds are broken or created during chemical reactions. A chemical change is any change that produces the formation of new chemical substances.

PHYSICAL CHANGE
OF WATER INTO ICE



CHEMICAL CHANGE
OF HYDROGEN PEROXIDE
INTO WATER

VIDEO

https://www.youtube.com/watch?v=M8tyjwB42X4

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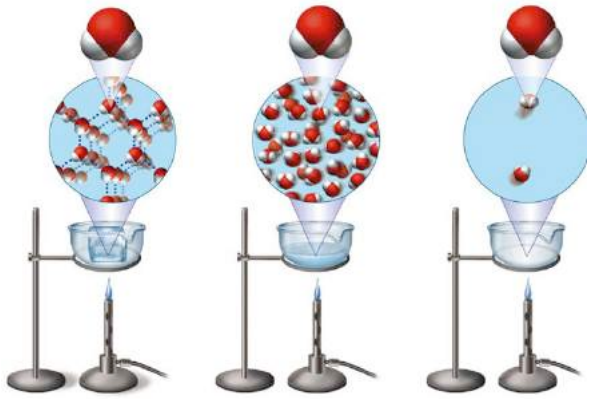
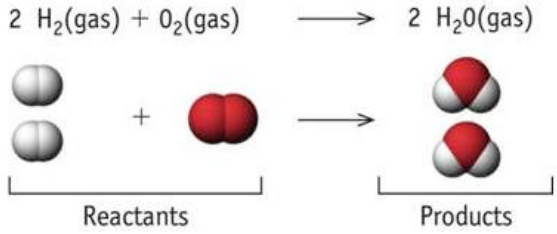
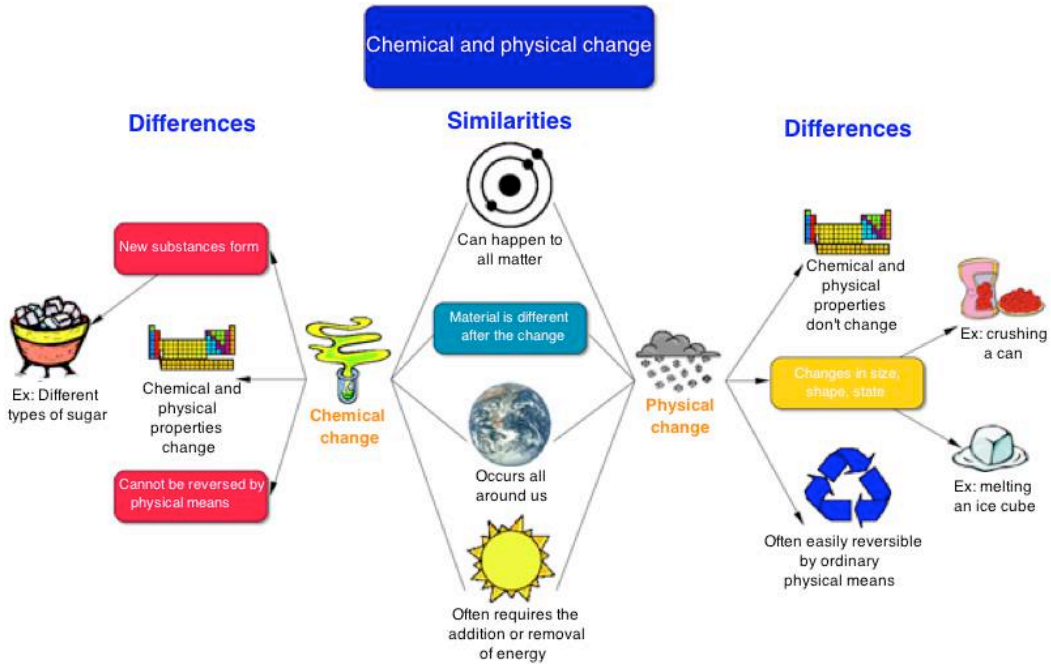
PHYSICAL VS. CHEMICAL CHANGES

PHYSICAL CHANGES	CHEMICAL CHANGES
Physical changes are simply change of state without changes of matter.	Chemical changes occur when new materials are formed by a change in the way atoms are bonded together. ⇨ **Colour change, gas created, smell change, new matter created, hot or light created…** are evidences or clues to identify a chemical change. ⇨ reactivity changes with the formation of new substances. ⇨ heat, light or electrical energy is often emitted or absorbed.
	



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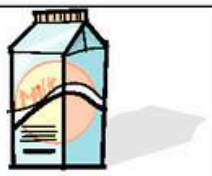
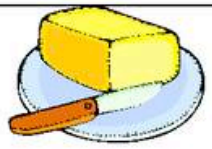
✓ *Activity **A4**. Choose the best option to answer the following questions:*

<table>
<tr>
<td> 
1. Soured milk smells badly because bacteria have formed new substances in the milk. This is an example of __.
a. physical change
b. chemical change</td>
<td> 
2. Sand flowing in an hour glass is an example of _____.
a. chemical change
b. physical change</td>
<td> 
3. The change of state from a gas to a liquid is an example of _____.
a. chemical change
b. physical change</td>
</tr>
<tr>
<td>  
  
4. Which is an example of a physical change?
_____</td>
<td> 
5. The melting of butter when is let out in a warm room is an example of _____.
a. chemical change
b. physical change</td>
<td> 
6. Which of the following is an example of physical change?
a. closing the door
b. cracking an egg
c. turning off the electric light
d. putting the milk back in the fridge</td>
</tr>
<tr>
<td> 
7. An ice cream cone melting on a hot day is an example of _____.
a. chemical change
b. physical change</td>
<td> 
8. Which of the following describes a chemical change?
a. water freezing
b. match burning
c. dew on grass
d. magnetizing a nail</td>
<td> 
9. Charcoal burning on the grill is an example of _____.
a. physical change
b. chemical change</td>
</tr>
</table>

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✓ *Activity **A5**. Draw a table in your notebook with two columns, one for physical changes and the other for chemical changes, and classify the different examples bellow correctly.*

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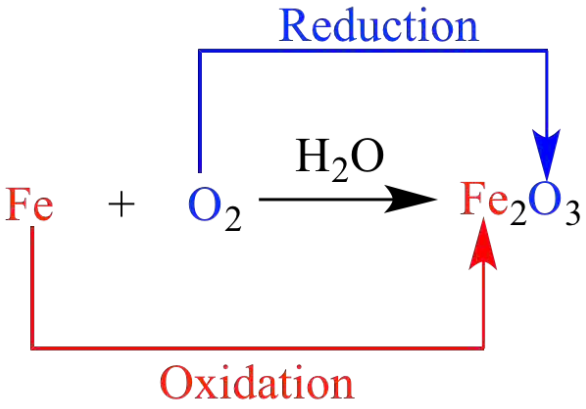
3. CHEMICAL REACTIONS

Let's start with the idea of a **chemical reaction**. Reactions occur when two or more molecules interact and the molecules change. Bonds between atoms are broken and created to form new molecules. That's it. What molecules are they? How do they interact? What happens? The possibilities are infinite.

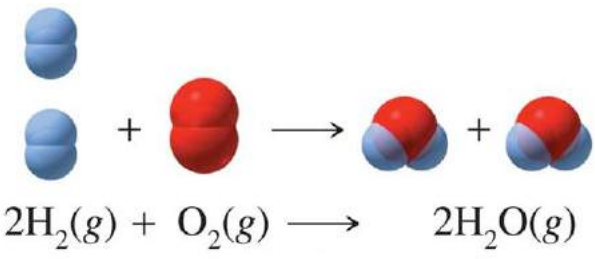
There are a few key points you should know about chemical reactions:

1. A chemical change must occur. You start with one molecule and turn it into another. Chemical bonds are made or broken in order to create a new molecule. One example of a chemical reaction is the rusting of a steel garbage can.



That rusting happens because the iron (Fe) in the metal is combined with oxygen (O_2) in the atmosphere. Chemical bonds are created and destroyed to finally make iron oxyde (Fe_2O_3).

2. A reaction could include atoms, compounds, or molecules of a single element. You need to remember that a chemical reaction can happen with anything, just as long as a chemical change occurs. If you put pure hydrogen gas (H_2) and pure oxygen gas in a room, they might be involved in a reaction to form water (H_2O). However, it will be in very very small amounts. If you add a spark, those gases would be involved in a violent chemical reaction that would result in a huge explosion (exothermic).



("the chemical reaction story")

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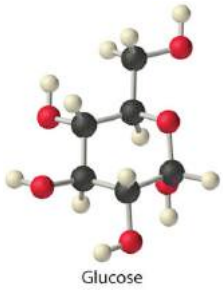
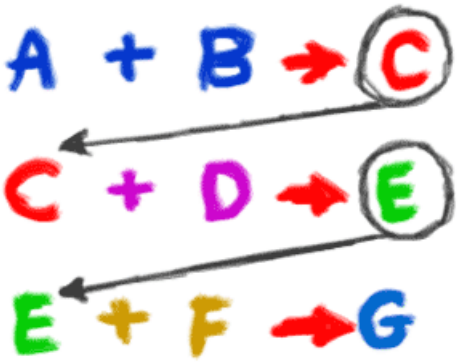
3. Single reactions often happen as a part o a larger series of reactions. When a plant makes sugars, there might be as many as a dozen reactions to get through the a cycle and eventually create (synthesize) glucose ($C_6H_{12}O_6$) molecules.

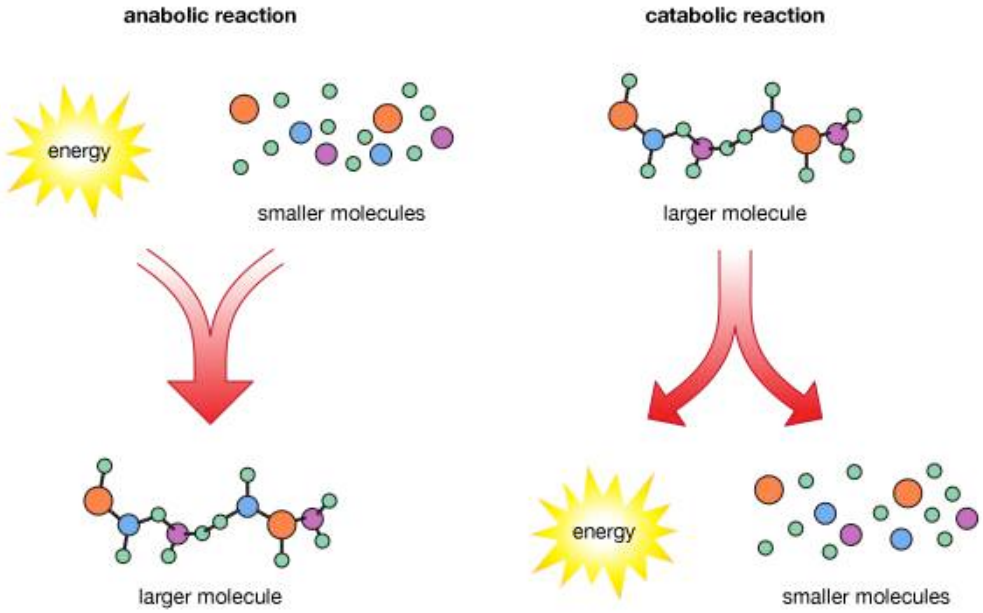

Glucose



The rusting example we used earlier only showed you the original reactants and final products of the chemical reaction. There were several intermediarte reactions where chemical bonds were created and destroyed.

✓ *Activity **A6**. **MAKING MOLECULES**. Click on this link and play making molecules the activity tels you.*
https://phet.colorado.edu/en/simulation/build-a-molecule

✓ *Activity **A7**. From the following picture try to give a correct definition to **catabolic** and **anabolic** chemical reactions, which happen in any living being.*



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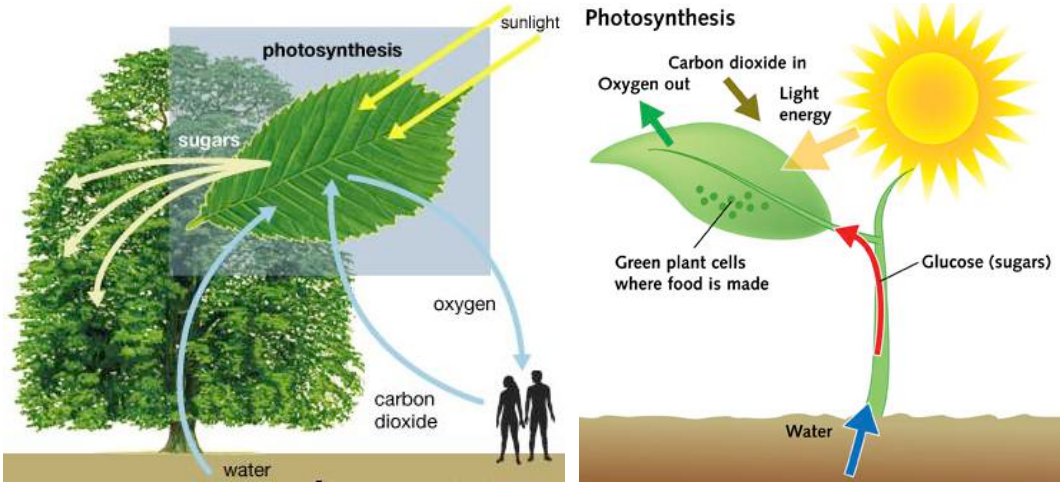
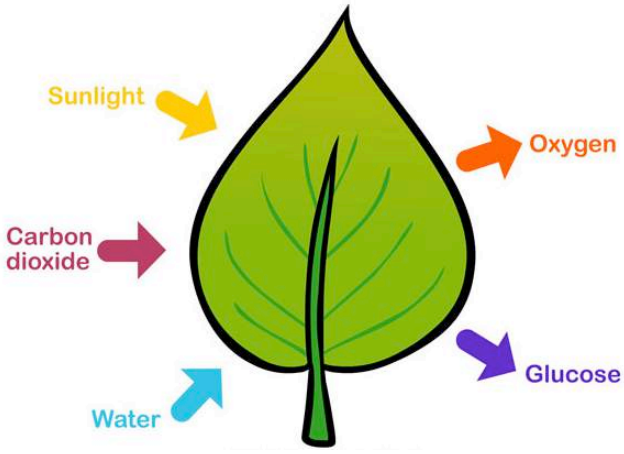
✓ *Activity **A8**. From the following pictures on photosyntesis identify what substances are reactants (ingredients) and what are final products. Finally give a brief description to explain photosynthesis process consists on.*





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Photosynthesis

When you get hungry, you might decide to raid the cookie jar or ask your mom to make you a sandwich. You do this because humans and animals get energy from the foods they eat.

Plants use light energy from the sun to produce the food they need to survive. This process is called photosynthesis.

INGREDIENTS

Light energy
Rays from the sun

Carbon dioxide
From the air

Water
Gathered by plant's roots in the soil

Chlorophyll
Present in cells of green plants

1 SUNLIGHT

Light shining down from the sun is absorbed by the plant's cells. These tiny cells are what make up the plant and its leaves.

Sunlight

Typical plant cell

Cell nucleus

Cell wall

Central vacule
Large fluid filled space

Chloroplasts
Contain the chemical chlorophyll

Oxygen

Carbon Dioxide

2 CHLOROPHYLL

Inside some of these cells is a special ingredient called chlorophyll. This is the compound that traps the sun's light to start the process of photosynthesis.

3 WATER

Water and carbon dioxide are two of the main ingredients needed for photosynthesis. These two substances are made of many smaller parts called molecules.

Water

Water molecules

Oxygen atom

Hydrogen atoms

Photosynthesis strips away the hydrogen atom leaving only oxygen.

OXYGEN!

Then, the hydrogen atoms are mixed together with the carbon dioxide to make a sugar the plant can use as its food.

4 END RESULT

The oxygen which is left from the transformation is released back into the air. The sugar created by photosynthesis is sent to the rest of the plant for food.

FOOD!

=

Carbon dioxide molecules

Carbon atom

Oxygen atoms

+

Hydrogen atoms

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4. UTILITY OF CHEMISTRY IN OUR SOCIETY

Have you ever Heard that chemistry is something dangerous? It is commonly held belief that people have a wrong image about chemistry. But to tell the truth chemistry is not bad or good, but it could be one thing or another.

In other words, people link chemistry with industries and high smokestacks smoking but chemistry also has the power to avoid pollution.

There are lots of examples of this so now it is your turn to do a little research about this topic.

✓ *Activity **A9**. Group Project. You are going to give a presentation to the class. Choose a topic (chemistry as something useful or harmful) and prepare your presentation. Use prezi, padlet, power point…*

✓ *Remember you and your classmates' level, 2nd ESO. Prepare something in a simple way, not complicated. Several topics that you can use are related to these fields:*

⇒ ***chemistry in food industry***

⇒ ***chemistry in drugs and treatments***

⇒ ***chemistry in cosmetics***

⇒ ***chemistry in transporting sector***

⇒ ***chemistry in sports***

⇒ ***chemistry in new materials***

⇒ ***pollutings origin***

⇒ ***chemistry at home***

⇒ ***… You're free!***

Try to link chemical industry with
the people's quality life and with environment.

Don't forget to include a page title, images, a short text (only key words or brief definitions), something to catch the attention of listeners…

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VOCABULARY

In the table below write down the keywords learned from the unit with their meaning.

key word	meaning	key word	meaning

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