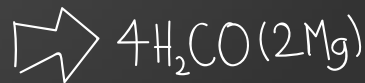
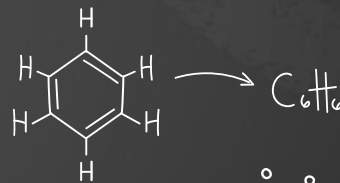
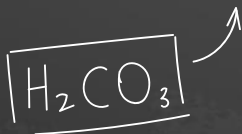
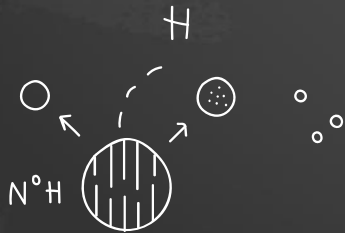
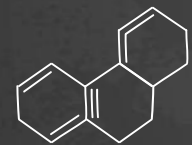
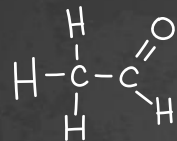
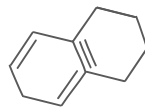




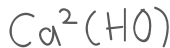
Chemistry - 101

Let's start the journey...





Introduction



Matter

Any material that makes up a physical body (something that have mass, volume, density, temperature, hardness, viscosity etc.). Pure matter is a **substance**.

Can we think why is it important to know what physical bodies are made off?

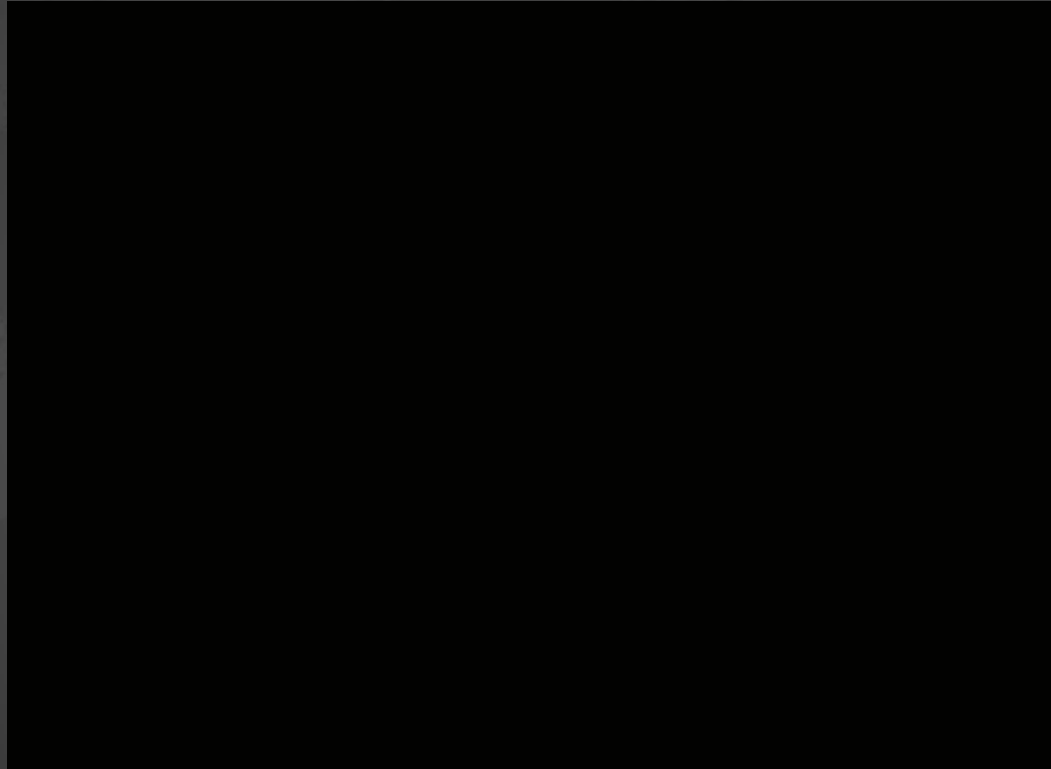
What changes/ transformations can substances undergo?



$$a_{n+1} - a_n = 0_n$$



Chemical transformations



What does chemistry study?

- In chemical transformations (called chemical reactions) substances change into different substances
- In physical transformations substances do not change into new ones

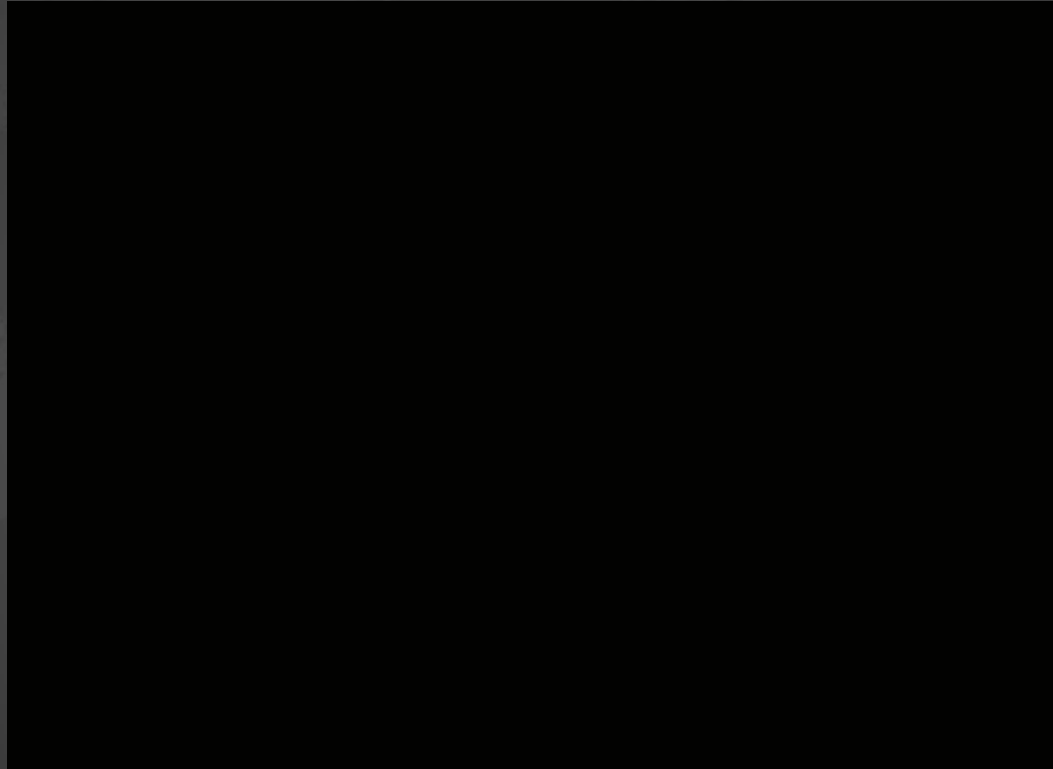
Sodium, metal (Na)



Sodium hydroxide
Na(OH)



Chemical vs. physical transformations



Can we think of other examples?

Chemistry

Chemistry is the **study** of matter and the **chemical** reactions between substances. **Chemistry** is also the **study** of matter's composition, structure, and properties.



Chemistry helps people to make new materials, optimize the use of resources and process waste products without destroying the Earth.

Chemistry

Chemistry helps to understand the world, to explain all sorts of different phenomena and make models of substance transformations



How does the Earth work? How does it keep the optimal temperature for many complex chemical reactions? Why the amount of oxygen in the Earth atmosphere did not change (constant within 1%) in the last half a billion years? What regulates it? Can humankind break it?

Chemistry and other subjects

Math



Logical ideas that may be independent of anything that you've ever observed or experienced – it could be a common language to communicate with species completely different from us...



Chemistry

We can use math and physics to think about how different building blocks can interact to explain all sorts of different phenomena and make models of substance transformations

Physics



How is our reality structured? What are the constituents of matter and what are mathematical properties that describe how they interact with each other?



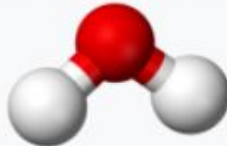
Biology

Builds up on math, physics and chemistry to explain phenomena connected to living organisms.

Atoms and molecules

Substances are made of atoms. Atoms get together to form molecules

Molecules are building blocks of substances controlling their properties



There are many more substances than atoms

You can think of letters and words – one can make many different words from the same letters putting them in different arrangements

Substance can be broken by breaking molecules, but atoms will not be broken.

Elements contains one type of atoms

Lead (Pb)

Basic unit of each
element

Gold (Au)



Carbon (C)



The most basic unit of each element is an atom, we cannot break the element any further and still call it this element

Definitions - no worries we will not stay here long...

Element

Contains just one type of atoms

Molecule

Can be built from the same or different atoms

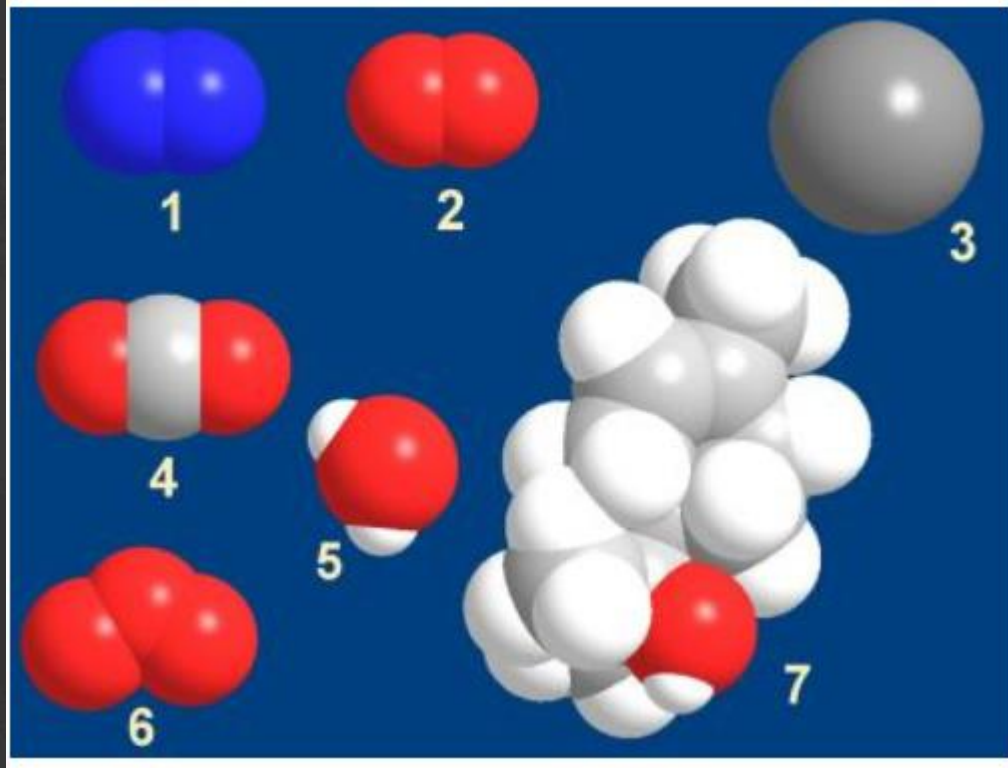
Compound

Is a chemical substance, which molecules are made of atoms from more than one element

A mixture

contains two or more different substances that are not joined together – pure substances can be separated from mixtures

Air - is an example of ...?



Molecules that make up air

1. Nitrogen N_2
2. Oxygen O_2
3. Argon Ar
4. Carbon dioxide CO_2
5. Water H_2O
6. Ozon O_3
7. Terpineol $\text{C}_{10}\text{H}_{18}\text{O}$

Oxygen in the air



Separation of mixtures



30 minutes later



To be continued...