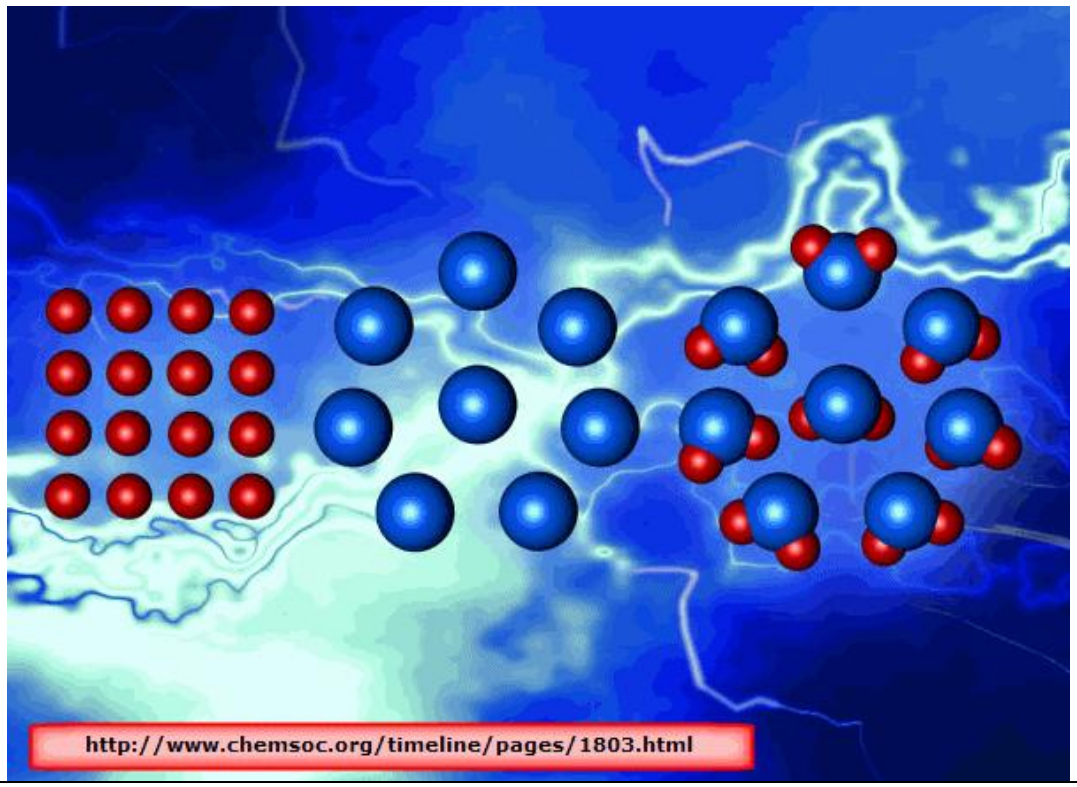
Topic:	CLASSIFICATION of MATTER

General topic	Objective ID	Objective
FK_B1_01 Dalton's atomic theory and classification of matter	FK_B1_01_01 Classification of matter	**Given** a picture depicting atomic and molecular structure **classify** that matter as • element • compound • homogeneous mixture • heterogeneous mixture and specify the state of each component as • solid (s), liquid (l), gas (g) **stating** the reasons for that classification
	FK_B1_01_02 Classification of changes	**Given** a picture depicting a process **classify** the change that happens as • physicsl change • chemical change (chemical reaction) **stating** the reasons for that classification

Dalton's atomic theory

Based on the law of conservation of matter, the law of constant composition, and the law of multiple prooprtions, Dalton formulated his atomic theory, which can be summarized in five short statements:

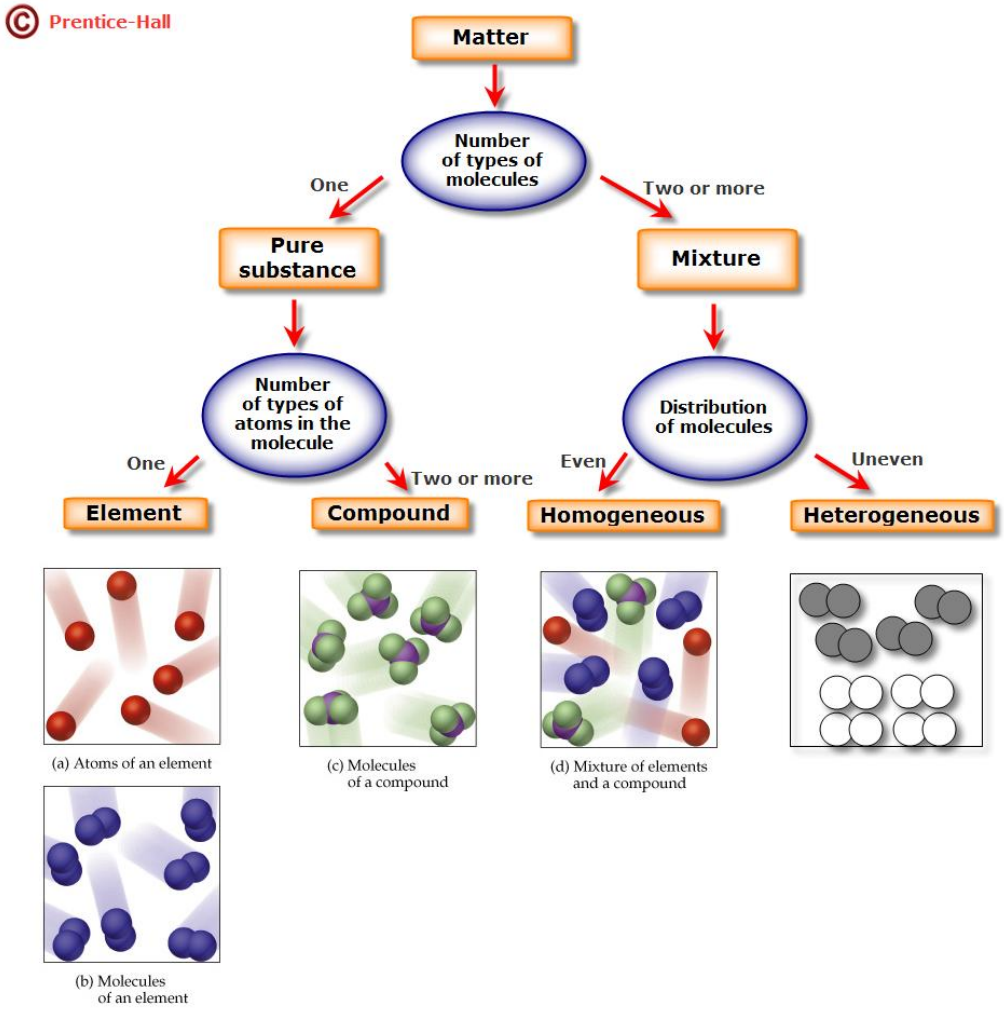
1 All matter is made up of atoms (small, indivisible)
2 Atoms can neither be created nor destroyed
3 Atoms of a particular element are alike (in size, mass, properties)
4 Atoms of different elements are different
5 A chemical change (reaction) involves the union or separation of individual atoms



Classification of matter

A **pure substance** is any sample of matter that contains only one type of molecules. A pure substance can be classified as:

- **element**, if those molecules have only one type of atoms
- **compound**, if the molecules have two or more type of atoms



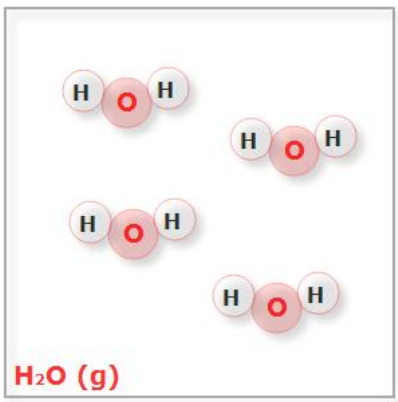
If a sample of matter contains more than one type of molecules, then is called **mixture**. A mixture is clasified as:

- **homogeneous mixture**, if the components of the mixture are evenly distributed in the vessel
- **heterogeneous mixture**, if the distribution is uneven.

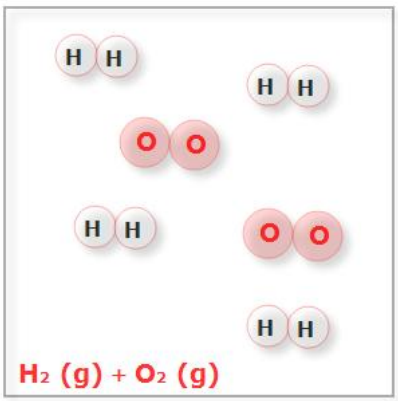
Difference between compounds and homogeneous mixtures

Bear in mind the difference between compounds and homogeneous mixture.
In both graphics there are 4 atoms of oxygen and 8 atoms of hydrogen, beut they are differently grouped in molecules.

The first graphic represents a compound (one type of molecule) and the second one represents a mixture (two types of molecules)



Pure substance, compound



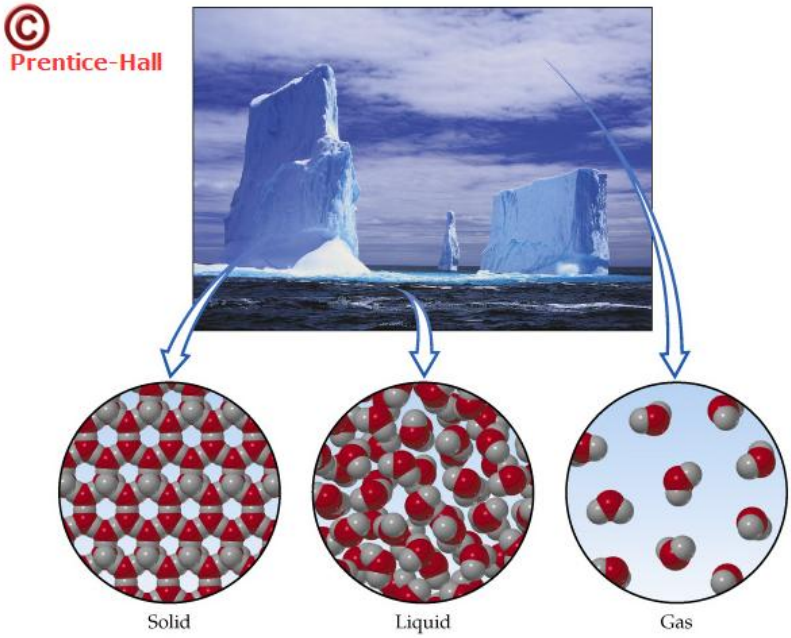
Homogeneous mixture

States of matter

We can find matter in three physical states: solid, liquid and gas.
As a solid, matter has a fixed volume and shape. The atoms or molecules are very closely packed.

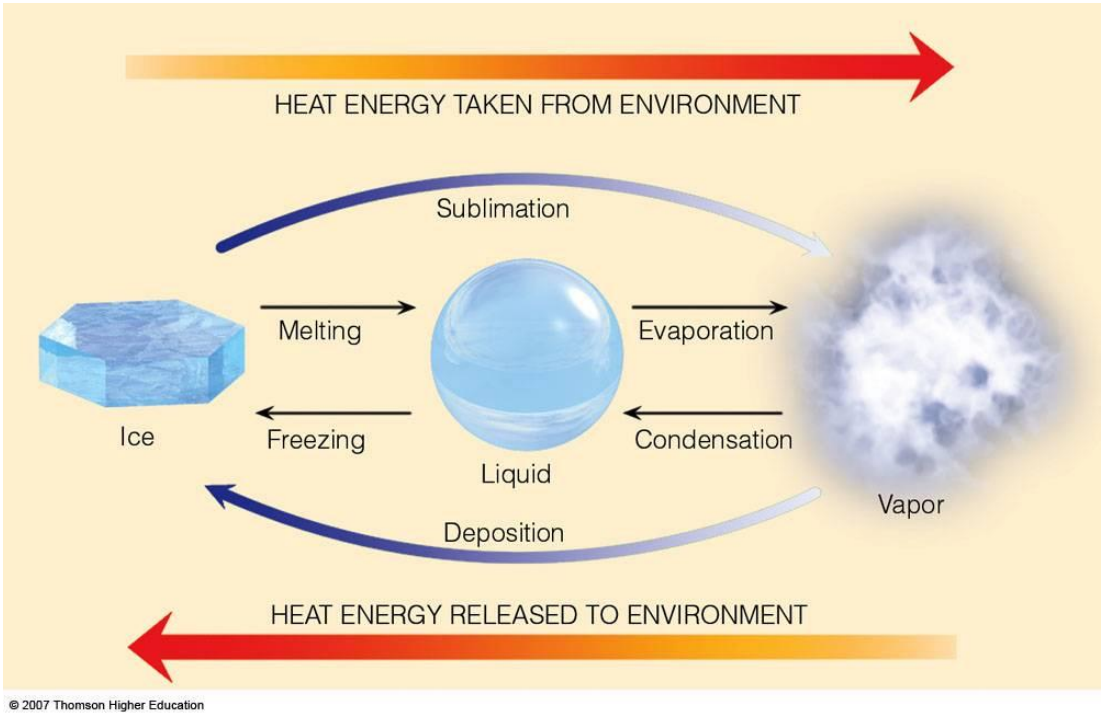
Liquids have a fixed volume (very small compressibility) but they don't have a definite shape.

Gases have not a fixed volume and the molecules are very far apart.

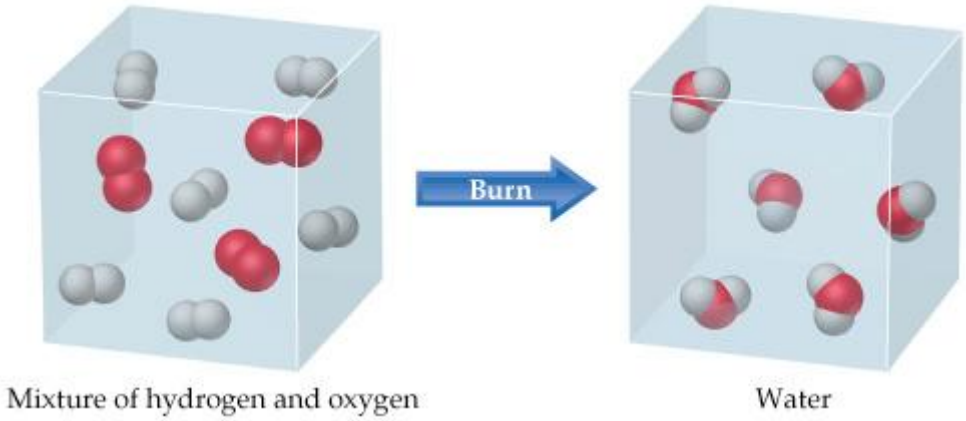


Physical and chemical transformations

A **physical transformation** (physical change) of the matter is the one that leaves it as the same substance but in a different physical state.



A **chemical transformation** occurs when new substances are formed.



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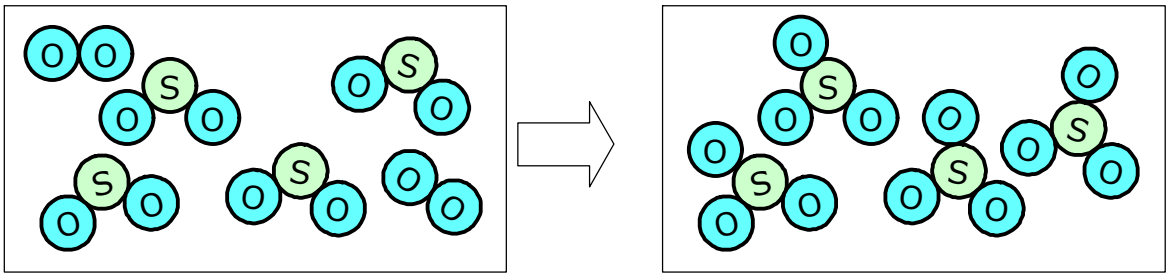
Sample exercise

Classify the samples that appear below (left and right), give their expressions and justify if the transformation is physical or chemical



Solution

ON THE LEFT SIDE:

Homogeneous mixture of a compound (SO_2) and an element (O_2)

SO_2 (g) + O_2 (g)

ON THE RIGHT SIDE:

Pure substance – Compound

SO_3 (g)

Chemical transformation: a new product appears

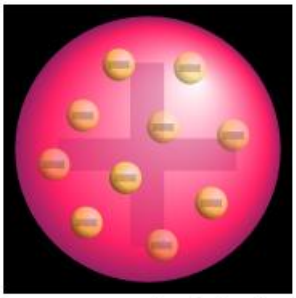
Thomson's atomic model

In 1897 J.J. Thomson discovered the first subatomic particle to be identified: the electron.

He proposed a new model of the atom. He knew two things:

- atoms contain small, negatively charged particles called electrons,
- the atoms of each element are electrically neutral.

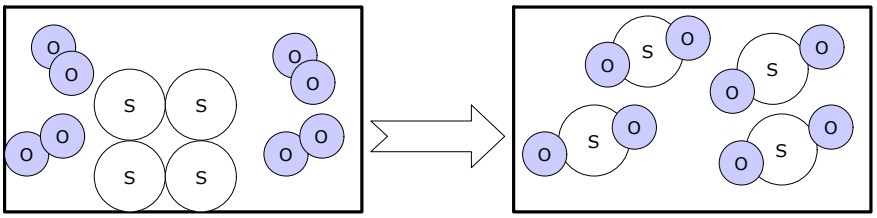
Thomson reasoned that there must be something in the atom that carries a positive charge to neutralize the electrons (protons had yet to be discovered). Thomson's model for the atom consisted of a "cloud of positive electricity" in which the negatively charged electrons were embedded.

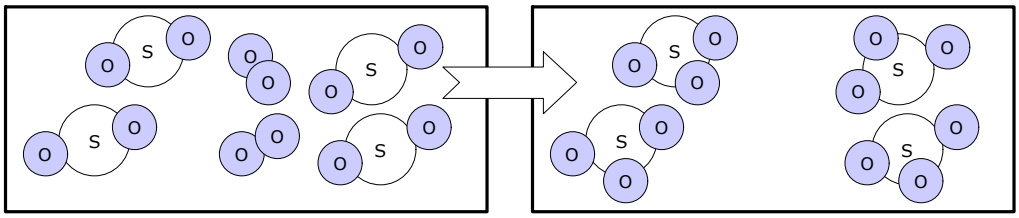


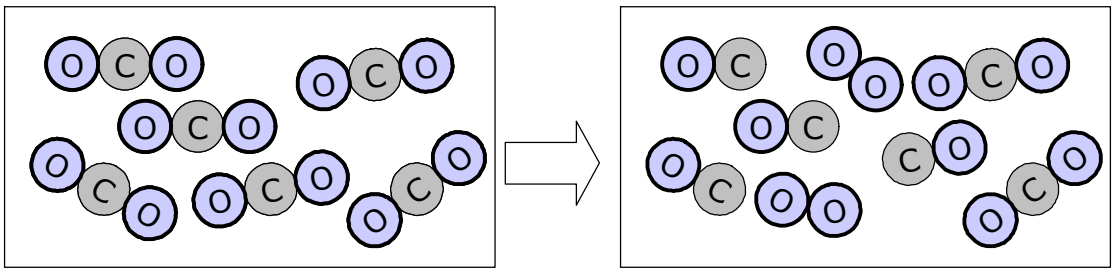
http://content.answers.com/main/content/wp/en-commons/thumb/4/47/180px-Plum_pudding_atom.svg.png

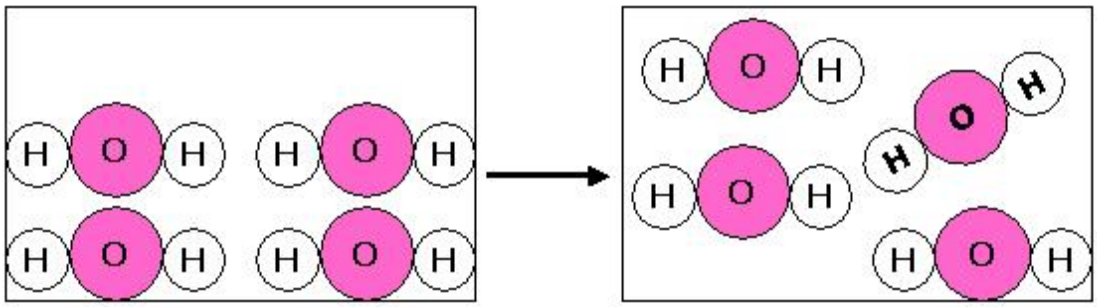
EXERCISES

Classify the samples that appear below (left and right), give their expressions and justify if the transformation is physical or chemical









No fixed shape