

## DALTON'S ATOMIC THEORY

- 1808: Publication of Dalton's "A New System of Chemical Philosophy", which contained the atomic theory

- Dalton's theory attempted to explain two things:

① CONSERVATION OF MASS

② LAW OF DEFINITE PROPORTIONS (also called the LAW OF CONSTANT COMPOSITION): All pure samples of a given compound contain the same proportion of elements by mass

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## The parts of Dalton's theory

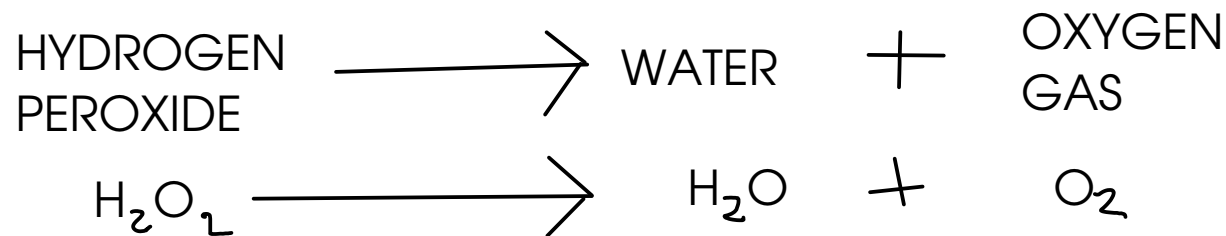
- ① Matter is composed of small, chemically indivisible ATOMS
- ② ELEMENTS are kinds of matter that contain only a single kind of atom. All the atoms of an element have identical chemical properties.
- ③ COMPOUNDS are kinds of matter that are composed of atoms of two or more ELEMENTS which are combined in simple, whole number ratios.  
*1:1 or 1:2 or 2:3, etc.*

Most importantly,

- ④ CHEMICAL REACTIONS are REARRANGEMENTS of existing atoms to form new compounds.
  - Atoms are not gained or lost during a chemical reaction.
  - Atoms do not change their identity during a chemical reaction.
  - All the atoms that go into a chemical reaction must go out again!

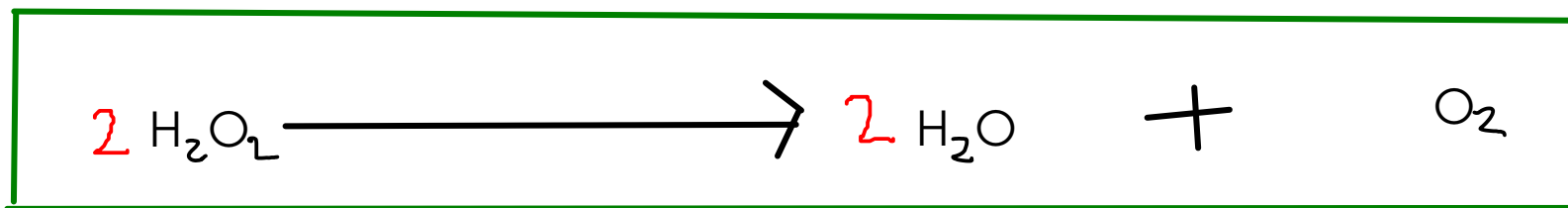
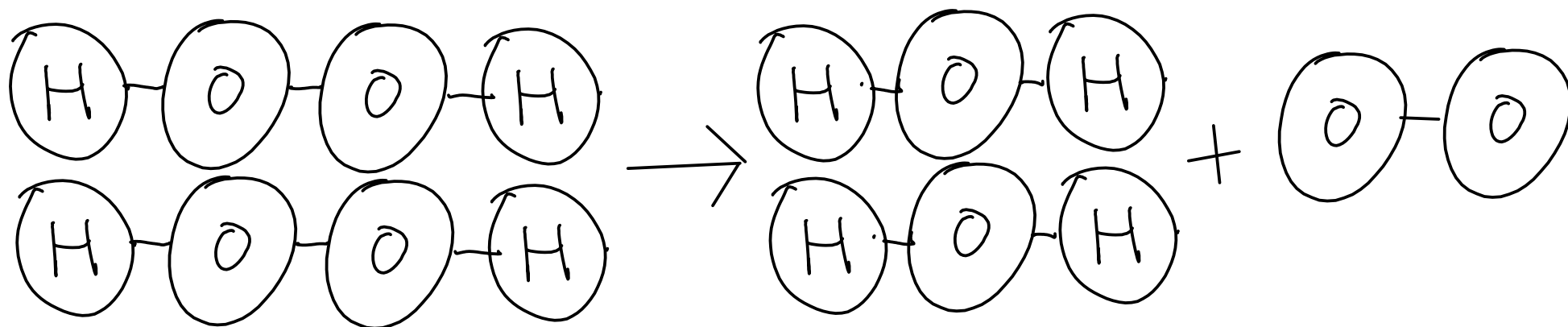
## Another look at chemical reactions

You observed this reaction in the oxygen lab:



... but wouldn't this mean that somehow an extra oxygen atom would form?

Not according to Dalton's theory. Dalton's theory would predict a different RATIO of water and oxygen would form:



- Dalton's theory sets LIMITS on what can be done with chemistry. For example:

- ① Chemistry can't convert lead (an element) into gold (another element). Sorry, alchemists!
- ② You can't have a compound form in a chemical reaction that contains an element that was not in your starting materials.
- ③ You can only make a certain amount of desired product from a fixed amount of starting material.

... but Dalton's theory said nothing about WHY atoms behave the way they do. What makes gold ... gold?

## Atomic structure

- Until the early 20th century, chemists considered atoms to be indivisible particles.
- The discovery of SUBATOMIC PARTICLES changed the way we view atoms!

### The subatomic particles

#### PROTON

- a small, but relatively massive particle that carries an overall unit POSITIVE CHARGE

#### NEUTRON

- a small, but relatively massive, particle that carries NO CHARGE
- slightly more massive than the proton

#### ELECTRON

- a small particle that carries an overall unit NEGATIVE CHARGE
- about 2000 times LESS massive than either protons or neutrons

... So these particles were all thought to be parts of the atom. But how were these parts put together?