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:



CONSERVATION OF MASS



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

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

Most importantly,

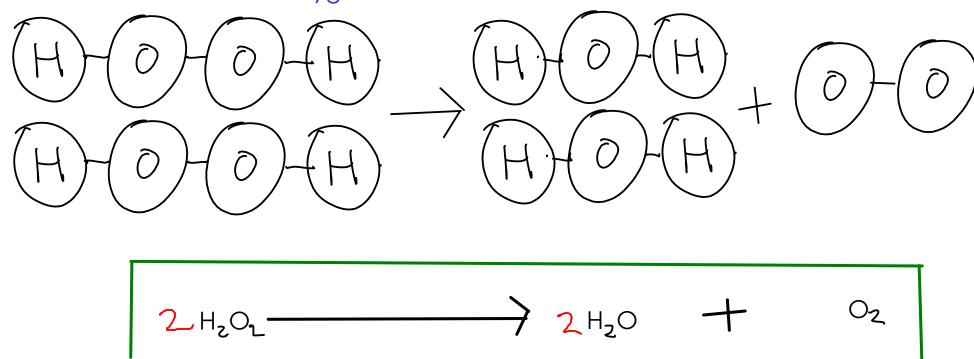
- CHEMICAL REACTIONS are REARRANGEMENTS of existing atoms to form new compounds.
 - Atoms are not gained or lost during a chemical reaction.
 - Atoms do not change their identity during a chemical reaction.
 - All the atoms that go into a chemical reaction must go out again!

You observed this reaction in the oxygen lab:

HYDROGEN
$$\longrightarrow$$
 WATER $+$ OXYGEN GAS

H₂O₁ \longrightarrow H₂O $+$ O₂

... 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:
 - Chemistry can't convert lead (an element) into gold (another element). Sorry, alchemists!
 - You can't have a compound form in a chemical reaction that contains an element that was not in your starting materials.
 - 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?

- 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 carres 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?