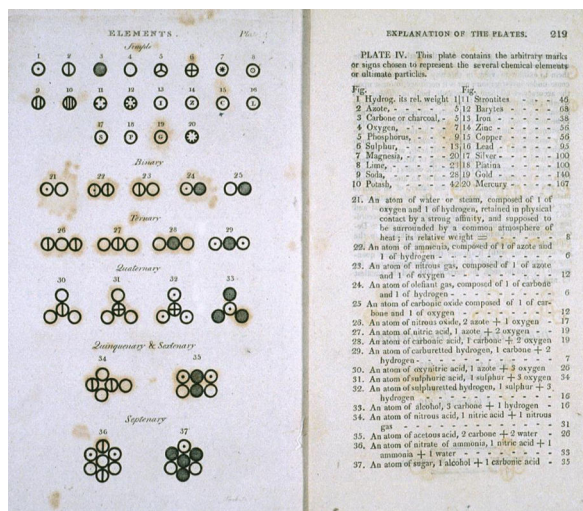


# Key terms

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- **atom** The smallest possible amount of matter that still retains its identity as a chemical element, now known to consist of a nucleus surrounded by electrons.
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- **atom** The smallest possible amount of matter that still retains its identity as a chemical element, now known to consist of a nucleus surrounded by electrons.
- **atomic mass unit** The standard unit that is used for indicating mass of an atom.
- **element** Any one of the simplest chemical substances that cannot be decomposed in a chemical reaction or by any chemical means, and are made up of atoms all having the same number of protons.
- **law of conservation of mass** A law that states that mass cannot be created or destroyed; it is merely rearranged.
- **law of definite composition** A law that states that chemical compounds are formed of constant and defined ratios of elements, as determined by mass.
- **law of multiple proportions** A law stating that if two elements form a compound, then the ratio of the mass of the second element and the mass of the first element will be small whole number ratios.
- **law of multiple proportions** The law stating that reactants will always combine in set whole number ratios.
- **product** A chemical substance formed as a result of a chemical reaction.
- **reactant** Any of the participants present at the start of a chemical reaction. Also, a molecule before it undergoes a chemical change.

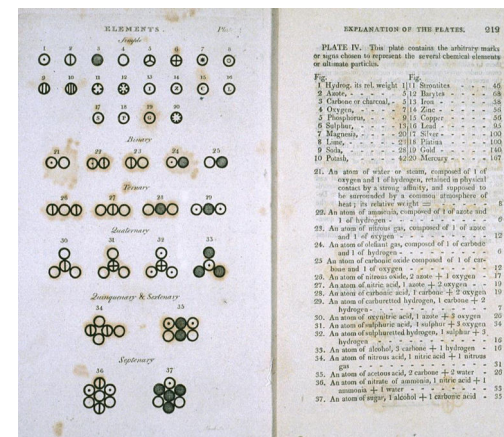
# History of Atomic Structure



- Early Ideas about Atoms
- The Law of Conservation of Mass
- The Law of Definite Composition
- The Law of Multiple Proportions
- John Dalton and Atomic Theory

# Early Ideas about Atoms

- The ancient Greek philosophers Democritus and Leucippus recorded the concept of the atomos, an indivisible building block of matter, as early as the 5th century BCE.
- The idea of an indivisible particle was further elaborated upon and explored by a number of scientists and philosophers, including Galileo, Newton, Boyle, Lavoisier, and Dalton.
- John Dalton, an English chemist and meteorologist, is credited with the first modern atomic theory based on his experiments with atmospheric gases.



John Dalton's A New System of Chemical Philosophy

# The Law of Conservation of Mass

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- The law of conservation of mass states that, in an isolated system, mass is neither created nor destroyed by chemical reactions or physical transformations.
- According to the law of conservation of mass, the mass of the products in a chemical reaction must equal the mass of the reactants.
- The law of conservation of mass is useful for a number of calculations and can be used to solve for unknown masses, such the amount of gas consumed or produced during a reaction.



Antoine Lavoisier

# The Law of Definite Composition

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- The law of definite composition was proposed by Joseph Proust based on his observations on the composition of chemical compounds.
- Proust proposed that a compound is always composed of the same proportions of elements by mass.
- Though initially controversial, the law of definite composition was supported by Dalton's atomic theory.



Joseph Proust

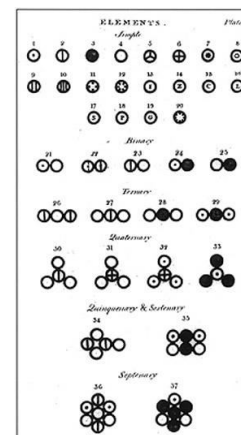
# The Law of Multiple Proportions

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- The law of multiple proportions is a rule of stoichiometry.
- John Dalton formulated the law of multiple proportions as part of his theory that atoms formed the basic indivisible building block of matter.
- The law of multiple proportions says that when elements form compounds, the proportions of the elements in those chemical compounds can be expressed in small whole number ratios.
- The law of multiple proportions is an extension of the law of definite composition, which states that compounds will consist of defined ratios of elements.

# John Dalton and Atomic Theory

- Dalton's atomic theory proposed that all matter was composed of atoms, indivisible and indestructible building blocks. While all atoms of an element were identical, different elements had atoms of differing size and mass.
- Dalton atomic theory also stated that all compounds were composed of combinations of these atoms in defined ratios.
- Dalton also postulated that chemical reactions resulted in the rearrangement of the reacting atoms.



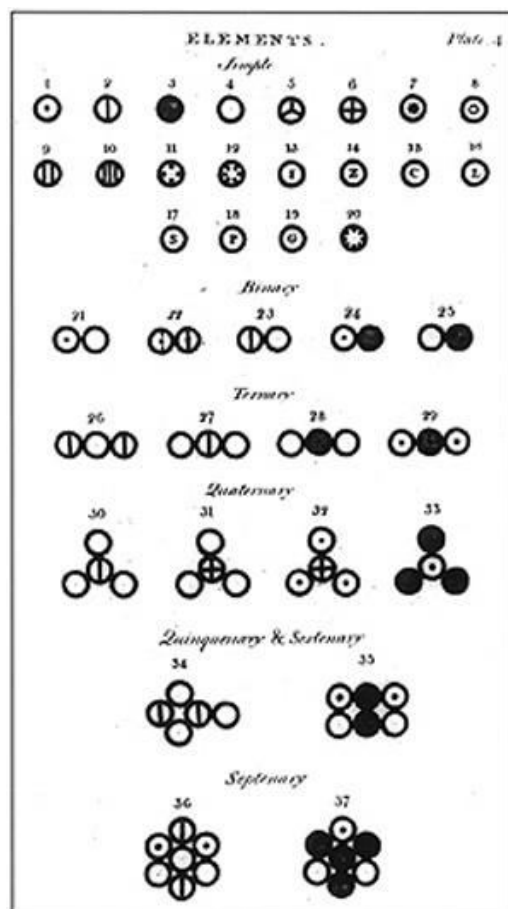
John Dalton's A New System of Chemical Philosophy



**Joseph Proust**

Portrait of Joseph Proust





## John Dalton's A New System of Chemical Philosophy

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