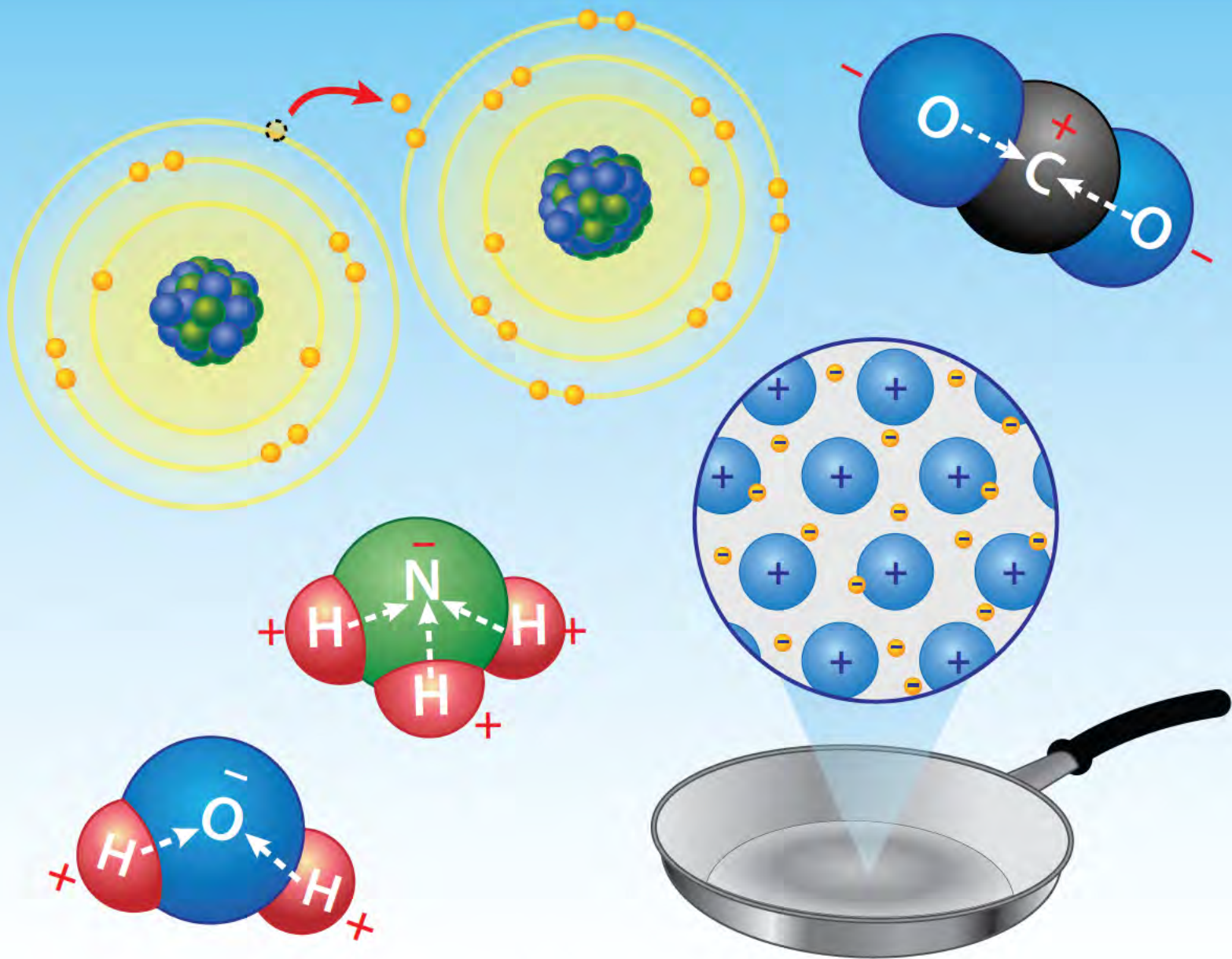


# Atoms & Chemical Bonding Learning Guide



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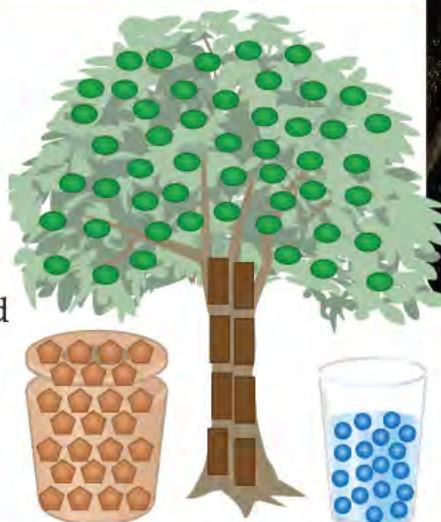
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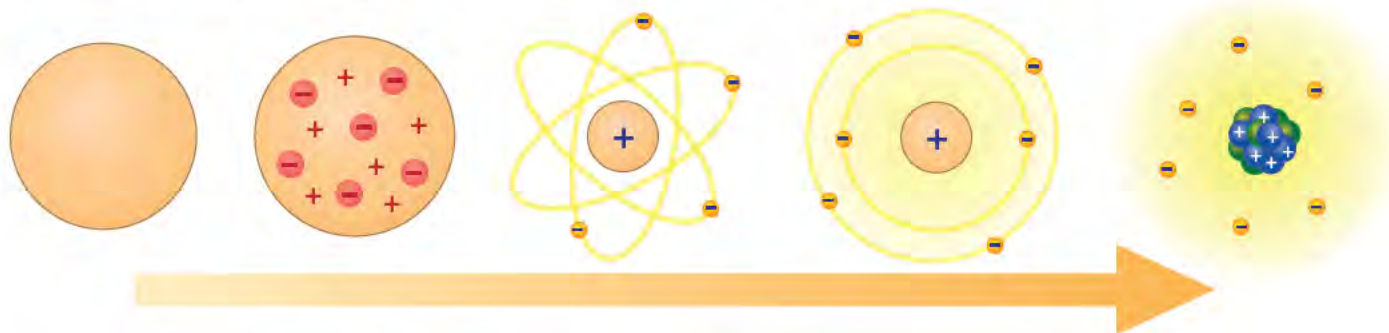
# MODELS OF THE ATOM

## Atomic Models

Scientists use models to explain things that cannot be seen directly. Since atoms are too small to be seen, scientists use models to describe their structure. The first model of the atom was proposed by the Greek philosopher, Democritus, who hypothesized that all matter was made of small particles, called atoms. He thought that different materials were made of atoms of different shapes and sizes. Over time, as new information has been discovered through experimentation, the model of the atom has changed to incorporate the new observations.



Democritus  
460-370 BCE

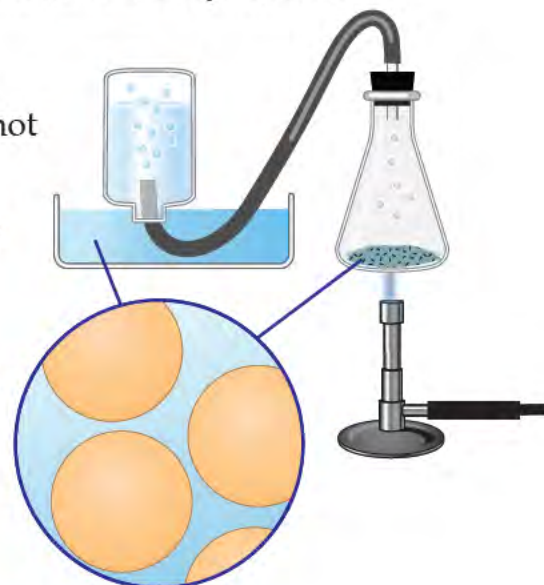


John Dalton  
1766-1844

## Dalton's Atomic Theory

John Dalton was an educator who was very interested in science. In the early 1800s, Dalton conducted experiments on gases. From his results he formed a model known as atomic theory. Dalton hypothesized the following:

- 1) All matter is made of atoms and atoms are small particles that cannot be created, divided or destroyed.
- 2) All atoms of the same element are identical and different elements have different types of atoms.
- 3) Atoms combine with other atoms to form new substances. Much of Dalton's atomic theory is still accepted today.

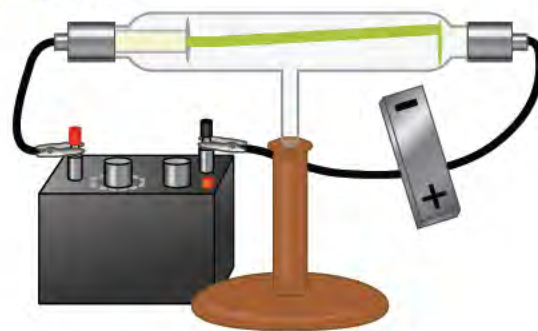




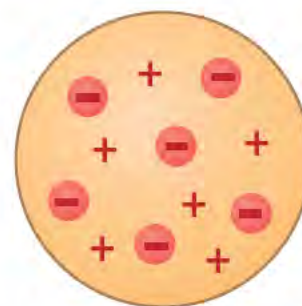
J.J. Thomson  
1856-1940

## Thomson's Model of the Atom

In 1897, J.J. Thomson performed experiments with currents of electricity inside empty glass tubes, which disproved Dalton's theory that atoms cannot be divided. He discovered that atoms have negatively charged subatomic particles, which he called "corpuscles." These particles are now called electrons.



Thomson assumed that atoms were neutral, so if an atom had negatively charged particles, they must have an equal number of positively charged particles. In 1904, Thomson proposed a model of the atom as a solid sphere with equal numbers of positive and negative charges spread throughout, much as raisins might be embedded in the surface of a pudding.



"plum pudding" model

## Rutherford's Experiment

In 1911, Ernest Rutherford and his students, conducted his "gold-foil" experiment to confirm Thomson's model of the atom. He fired positively charged alpha particles from a radioactive source at a piece of gold foil. Rutherford thought that if Thomson's model was correct, then the mass of the atom was spread out throughout the atom and there would be very little to deflect the alpha particles. As Rutherford expected, most alpha particles traveled right through the gold foil with little deviation, but to his surprise a few alpha particles deflected almost directly backwards.



Ernest Rutherford  
1871-1937

