ATOMIC THEORY

ONCE UPON A TIME…

- People have been fascinated with matter for a long time.
  - What is matter?
  - What is all this "stuff" around us made of?
  - Can it be broken down?
  - Are there different types of matter?

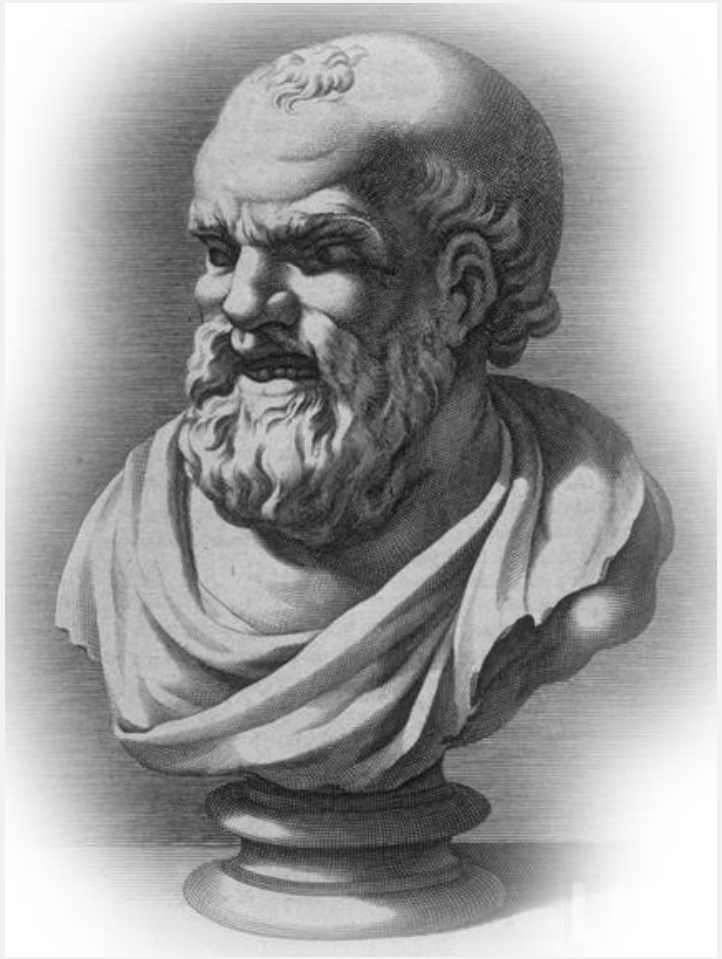
Time to develop a model…

ONCE UPON A TIME…

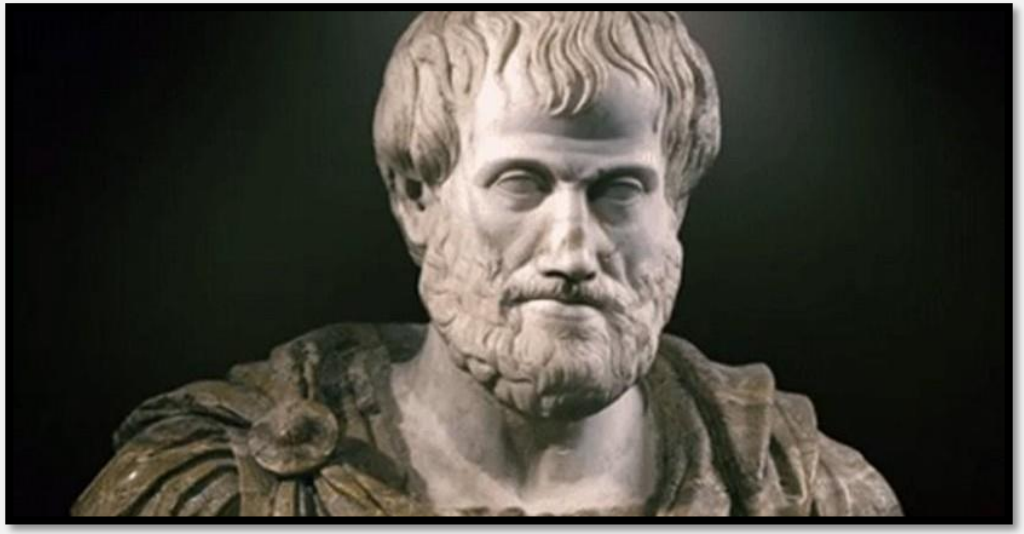
- **Democritus (~465BC)**
  - "The universe is composed of two elements: the atoms and the void in which they exist and move."

ONCE UPON A TIME…

- **Democritus (~465BC)**
  - Believed that the whole universe was made up of only 2 things:
    - **Tiny particles (atoms) and empty space**



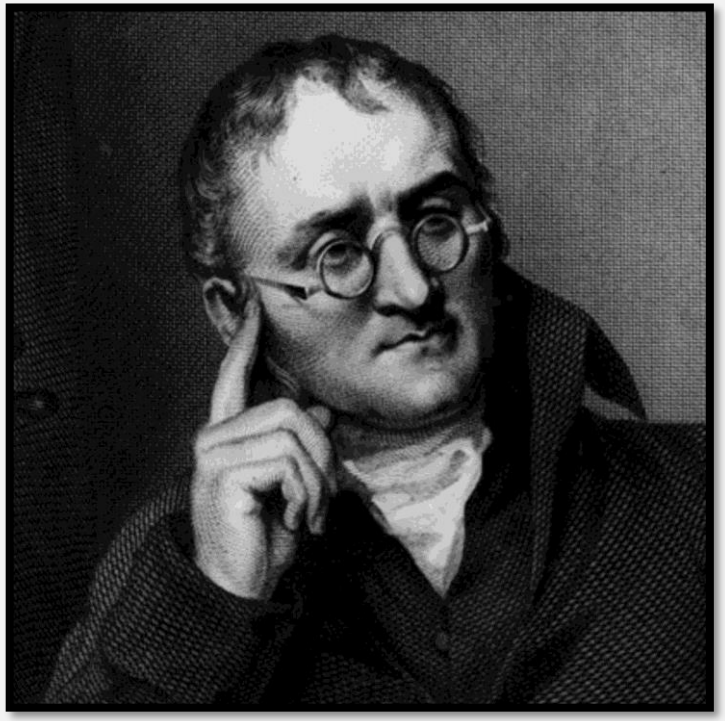
ONCE UPON A TIME…



- **Aristotle (~340BC)**
  - Did not agree with Democritus
    - Did not believe in atoms
  - He said all matter was composed of **5 elements**:
    - **Earth, Water, Air, Fire and Aether (divine element)**

FAST FORWARD THROUGH TIME…

ONCE UPON A TIME…



- **John Dalton (1808)**
- Since the time of Democritus and Aristotle a lot of advances had been made in Chemistry… and these generally involved the idea that matter was composed of particles

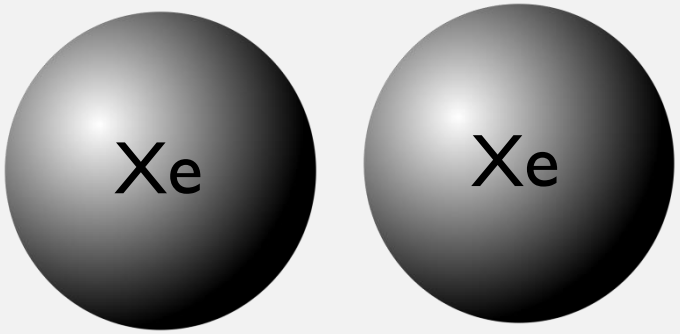
ONCE UPON A TIME…

- **Matter is composed of tiny indivisible particles called atoms**.
  - **Atoms are the smallest units of matter**; they cannot be broken up further

ONCE UPON A TIME…

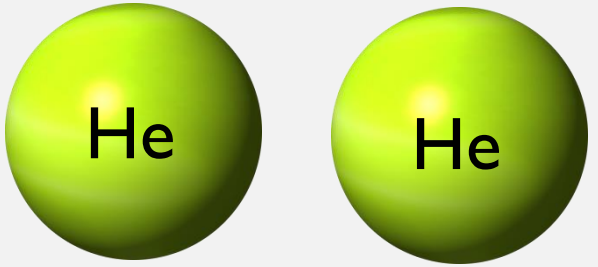
- **All atoms of a single element are identical**
  - All He atoms are identical; all Xe atoms are identical, etc
- **The atoms of different elements are different**
  - He atoms are different from Xe atoms

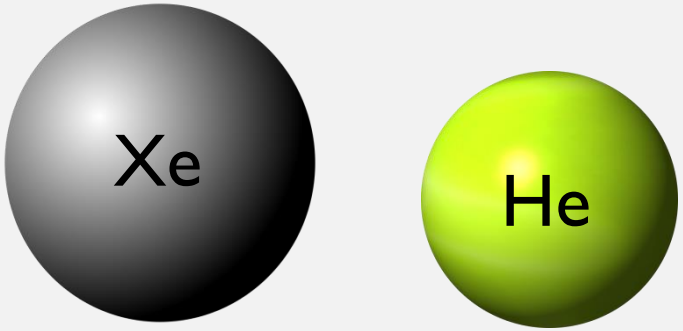
DALTON'S ATOMIC MODEL
1803



Identical

Identical

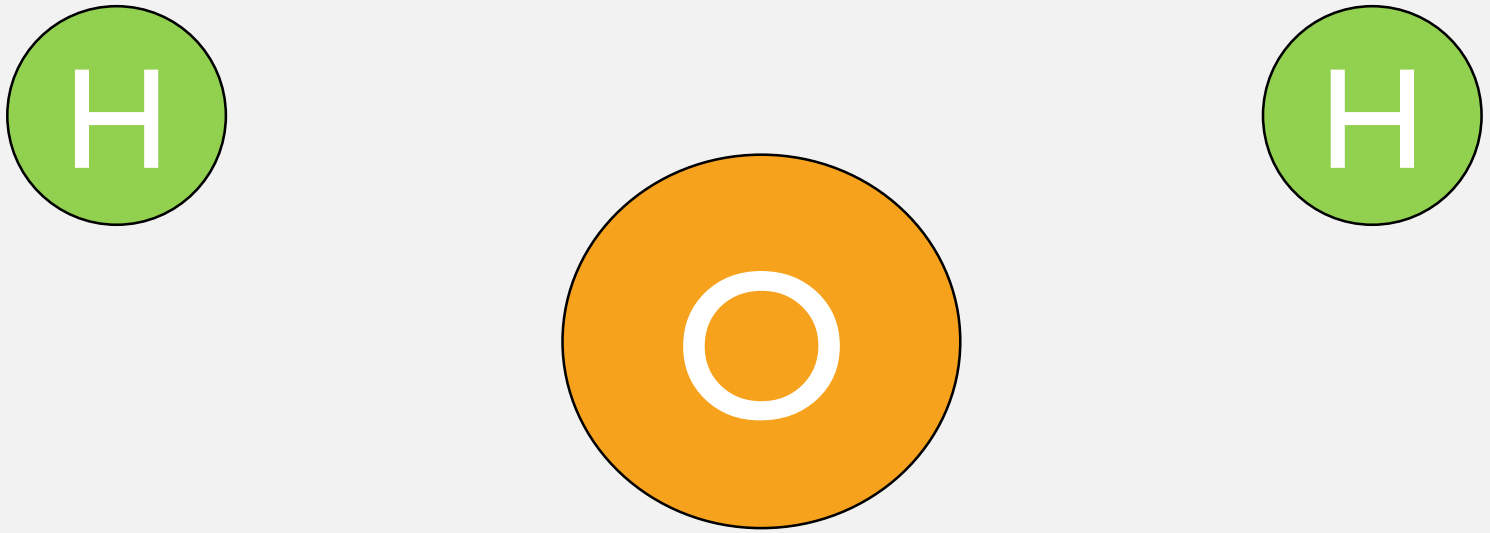




Different

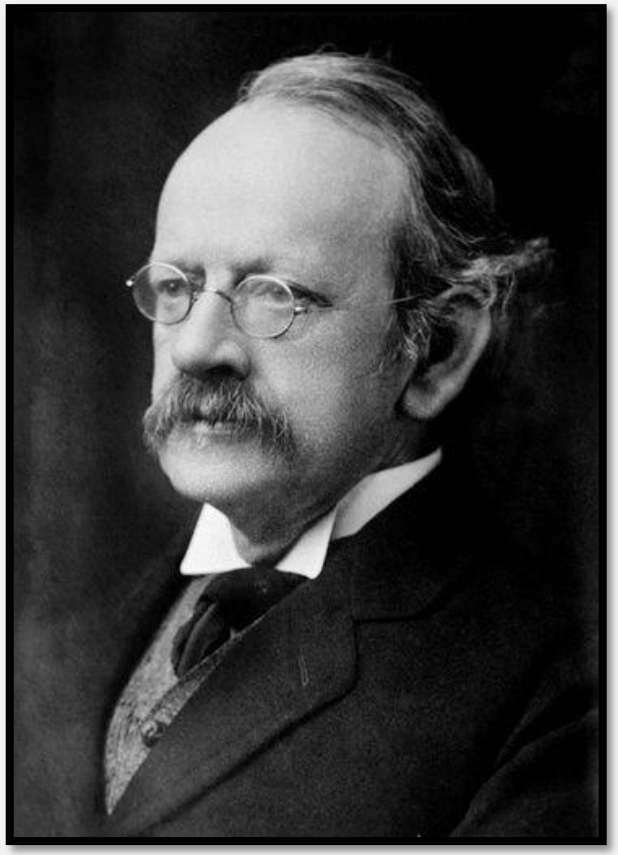
ONCE UPON A TIME…

- **Atoms of different elements could combine to form compounds**

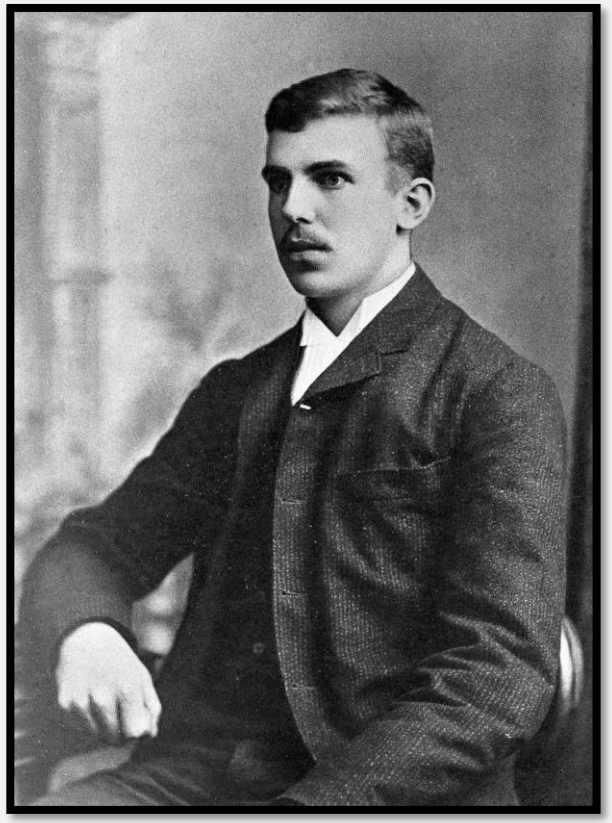


ONCE UPON A TIME…

- **J.J. Thomson (1897)**
  - Discover that there were particles that were smaller and lighter than the smallest atoms known (Hydrogen)
    - Therefore atoms had small building blocks that made them



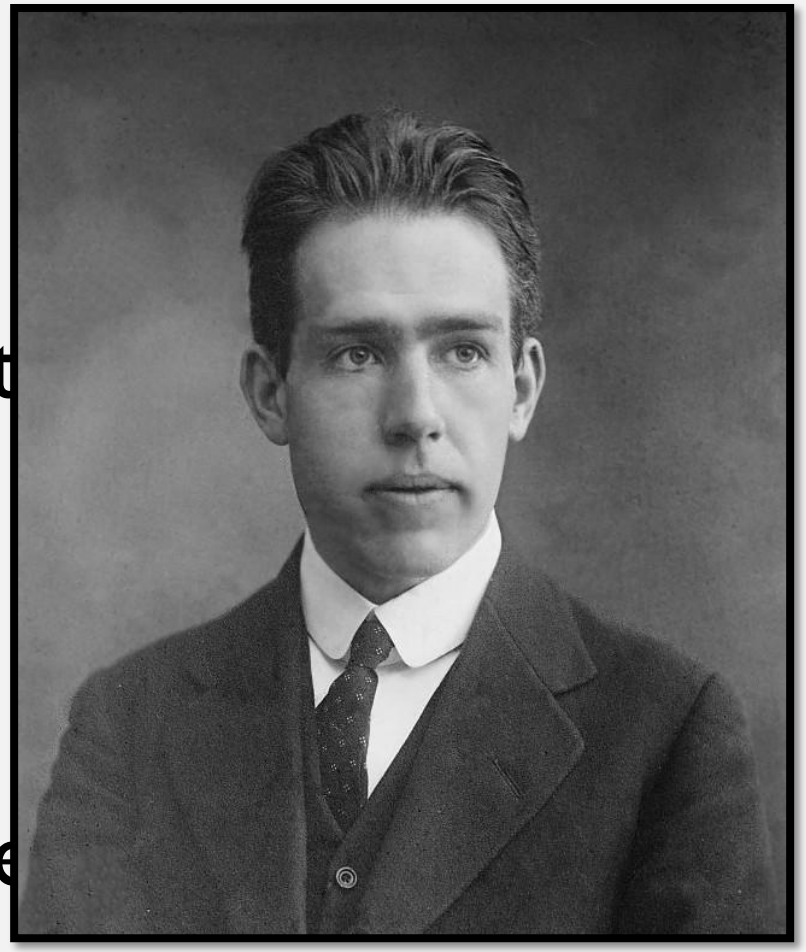
ONCE UPON A TIME…



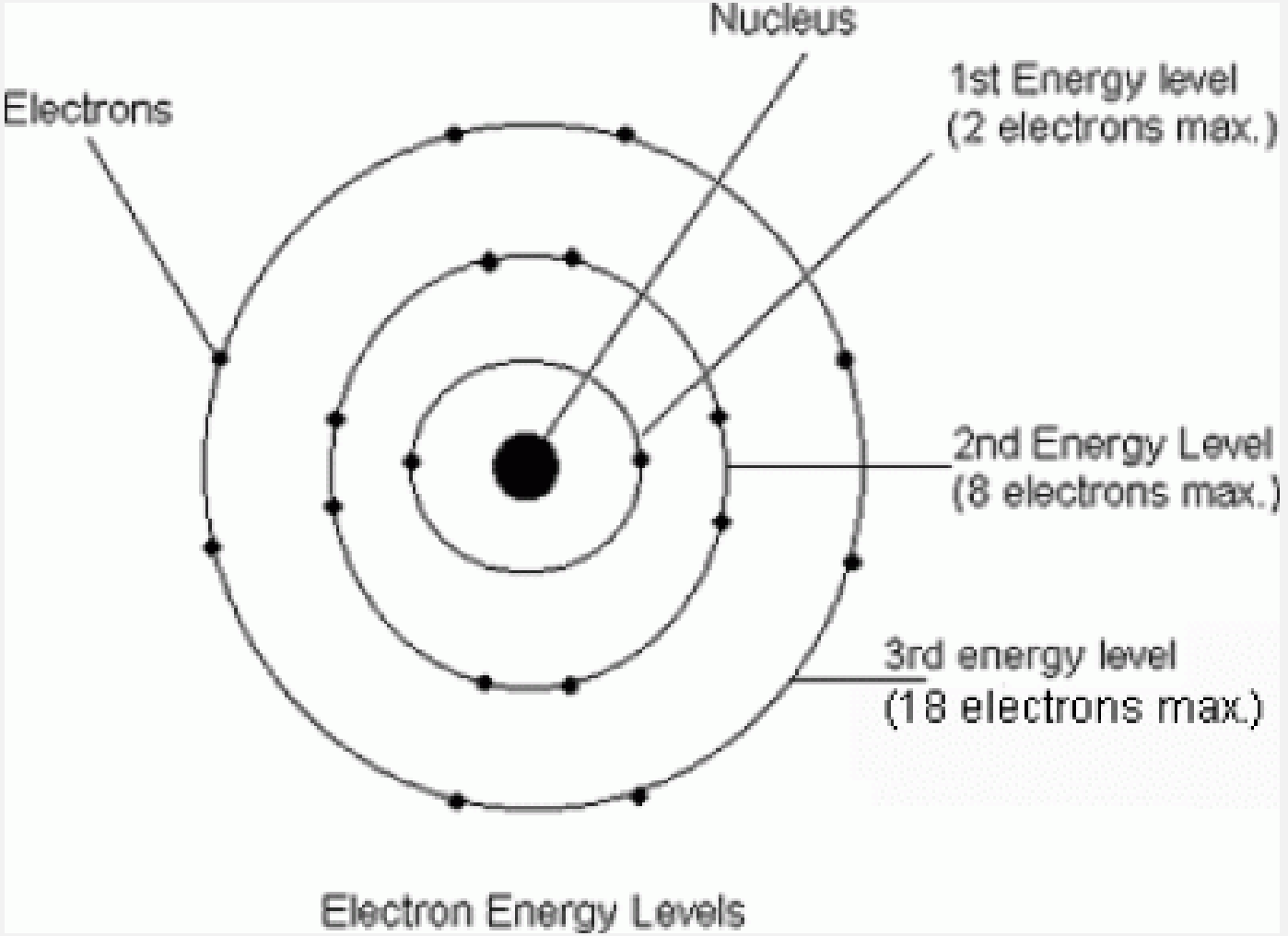
- **Ernest Rutherford (1911)**
- Discovered that the atom must be made up mostly of empty space, with small electrons floating around and a more massive central positive (+) nucleus

ONCE UPON A TIME…

- **Niels Bohr (1913)**
- Another one of Thomson's students
- Bohr hypothesized that electrons must be in specific orbitals around the nucleus
- Also determined that each orbital (energy level) could only accommodate a certain number of electrons



BOHR'S ATOMIC MODEL
1913



Electron Energy Levels

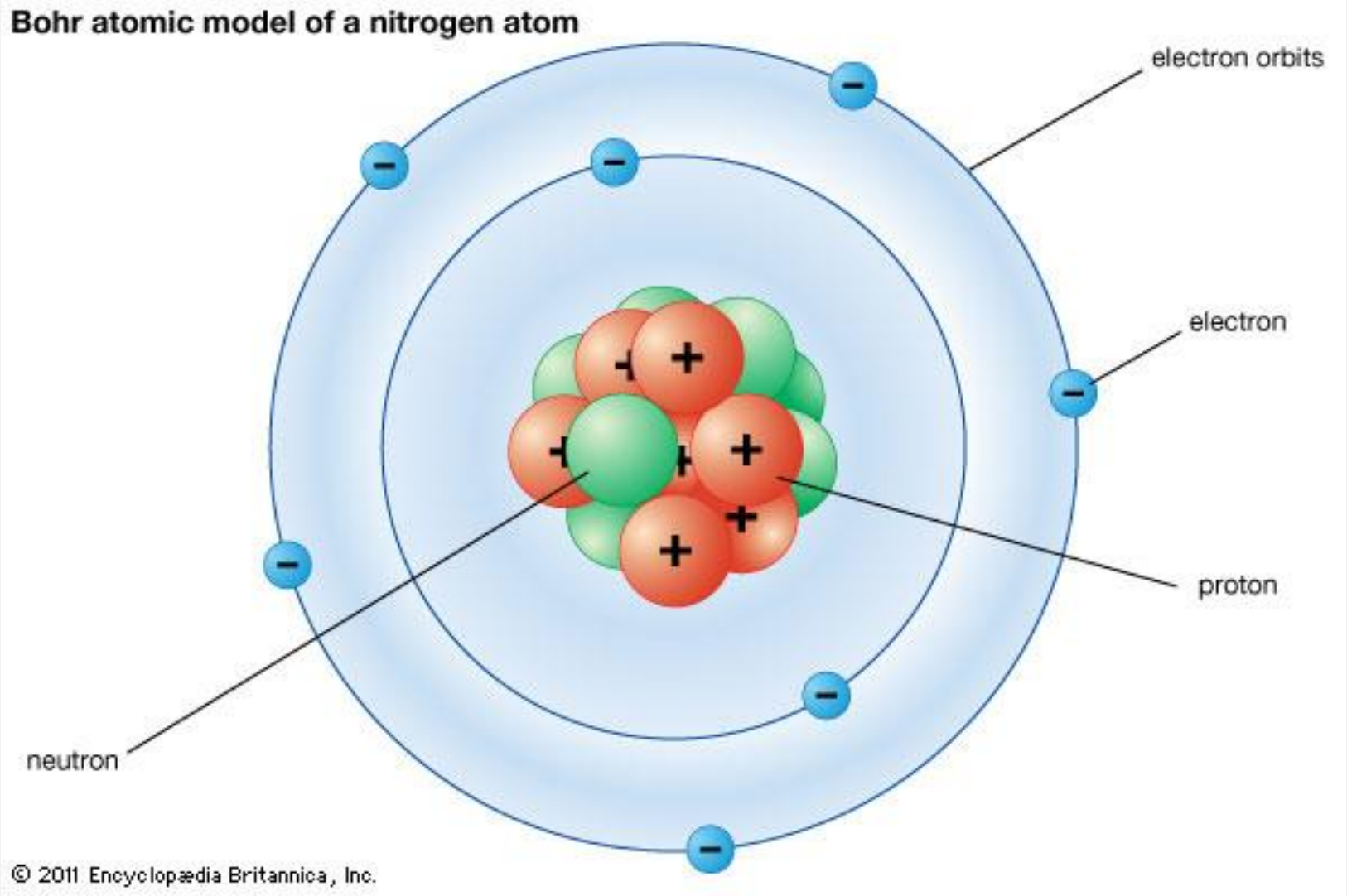
ONCE UPON A TIME…

- **Rutherford-Bohr Model**
- Rutherford later made the discovery of the proton
  - The nucleus is not just one large positive particle, but rather made up of several positive particles (protons) depending on the element

ONCE UPON A TIME…

- **Rutherford-Bohr Model**
  - It is this number of protons that determines the element!
  - Different elements have different numbers of protons
  - **Atoms have the same number of protons (+) as electrons (-) so that they are overall neutral (no charge)**

RUTHERFORD-BOHR MODEL



THE BOHR-RUTHERFORD MODEL

- **Protons → in the nucleus**
  - **Number of protons = atomic number** on Periodic Table
- **Electrons → in orbitals around the nucleus**
  - **Remember # electrons = # protons**
    - overall charge has to be neutral

WORKBOOK

- Reviewl p.6-9, p.12-13
- Do p.10-11, p.14-15