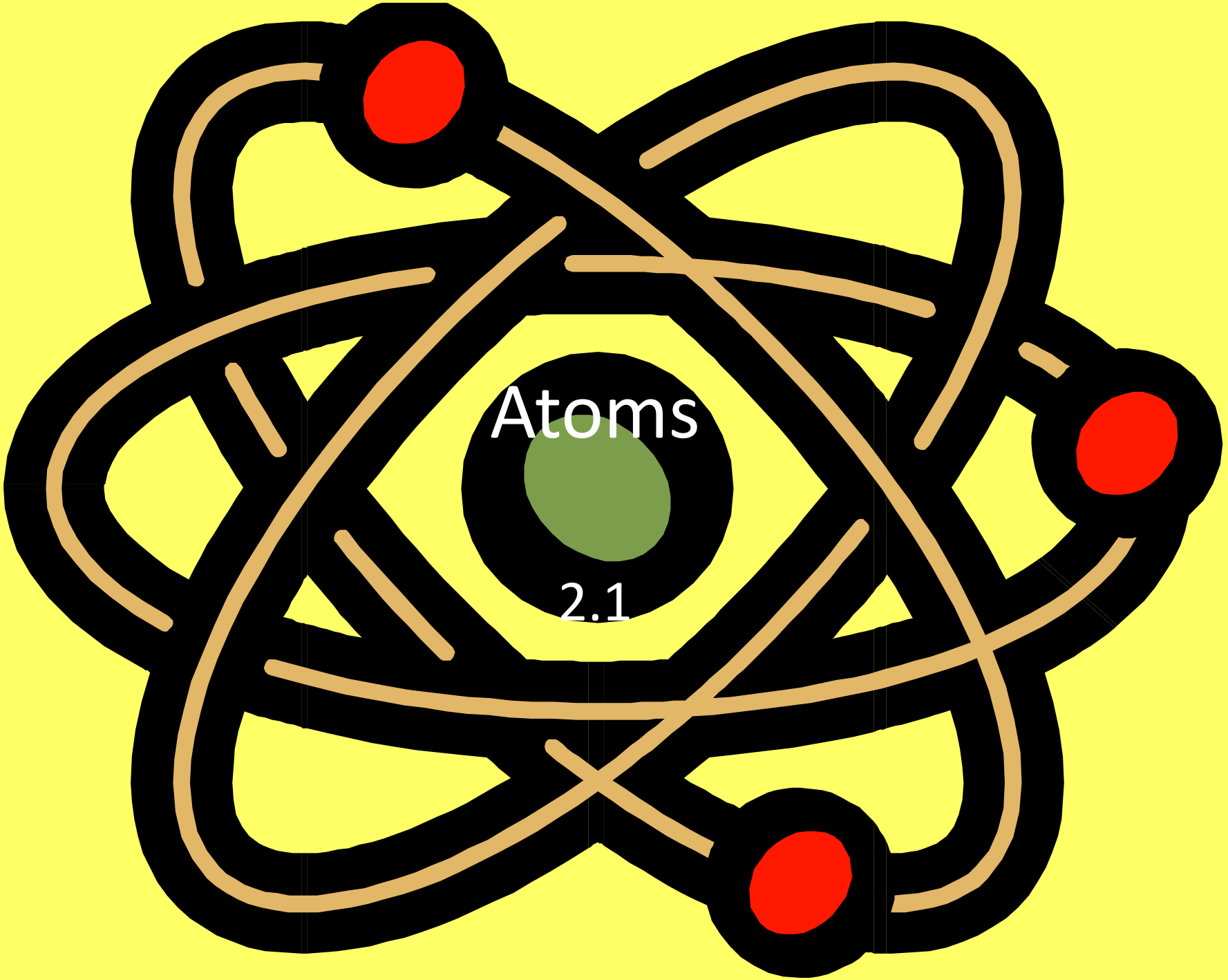

Atoms
2.1

I. The Building blocks of Matter

- *Matter* is anything that takes up space and has mass

- *Atoms* are tiny particles that make up matter

A. Atoms

a. All matter is composed of “building blocks”

b. The structure of these building blocks determine the structure of the matter you observe

c. The building blocks of matter are atoms
   - The arrangement and type of atoms give matter its properties

B. Elements

a. Atoms combine – like Lego's snapping together, to form many different types of matter

b. <u>Elements</u> are a form of matter that contains only one kind of atom

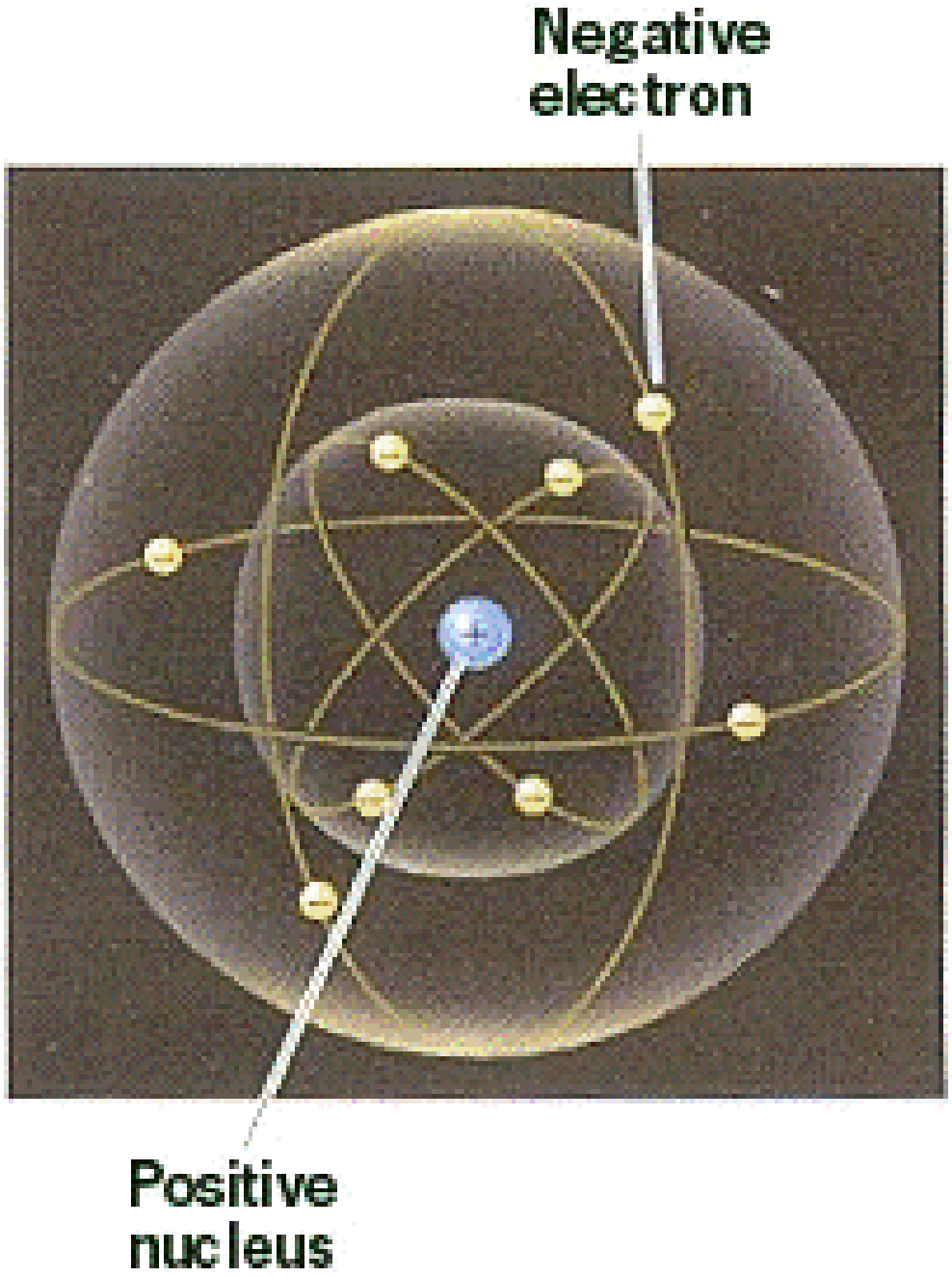
- It can NOT be broken down into a simpler form

II. Modeling the Atom

- When structures are too small or too large to handle then models are often used to take their place

  – Models are based on information we've gathered by observing the ways atoms react when in contact with other atoms or with light

The Atom



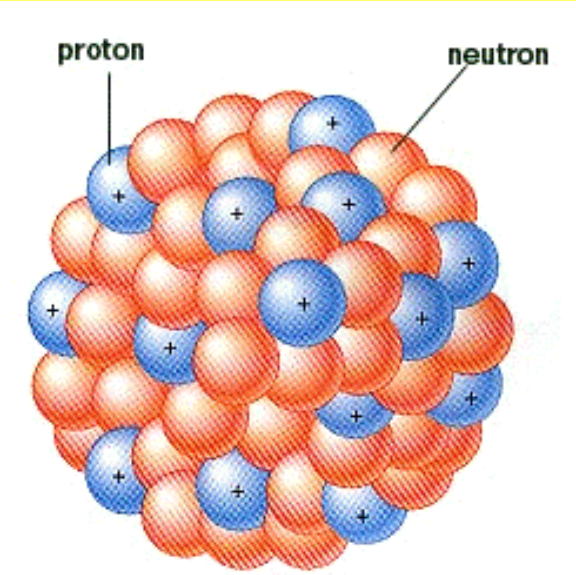
A. Protons and Neutrons

a. Three basic particles make up the structure of an atom – Proton, Neutron and an Electron

b. Protons and Neutrons are located in the center of the atom and make up the nucleus which has a positive charge

c. *Protons* are particles that have a positive electrical charge

d. *Neutron* are particles that have no electrical charge



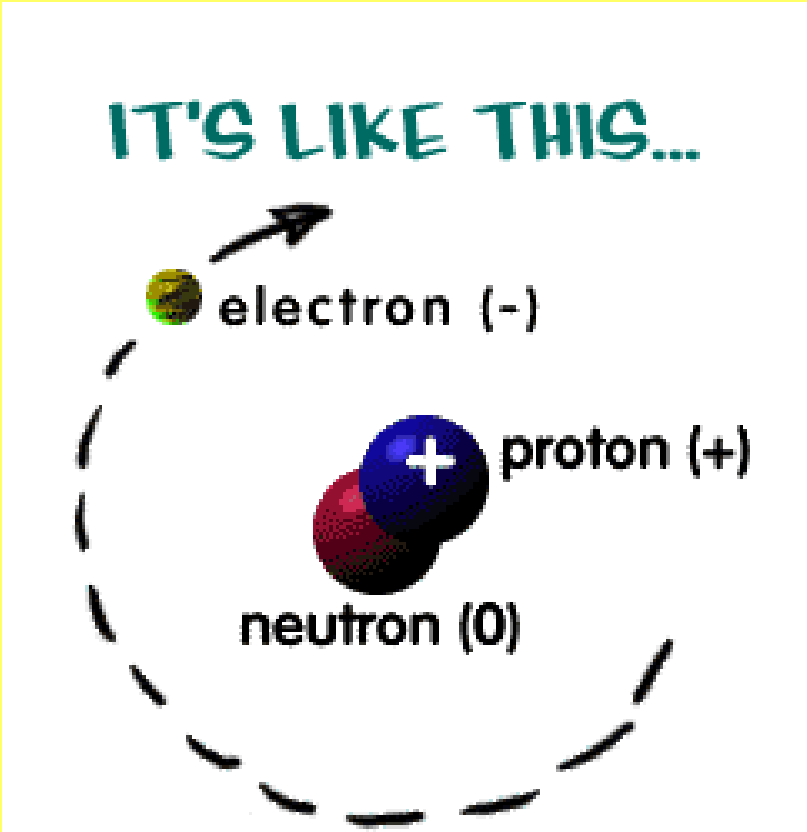
B. Electrons

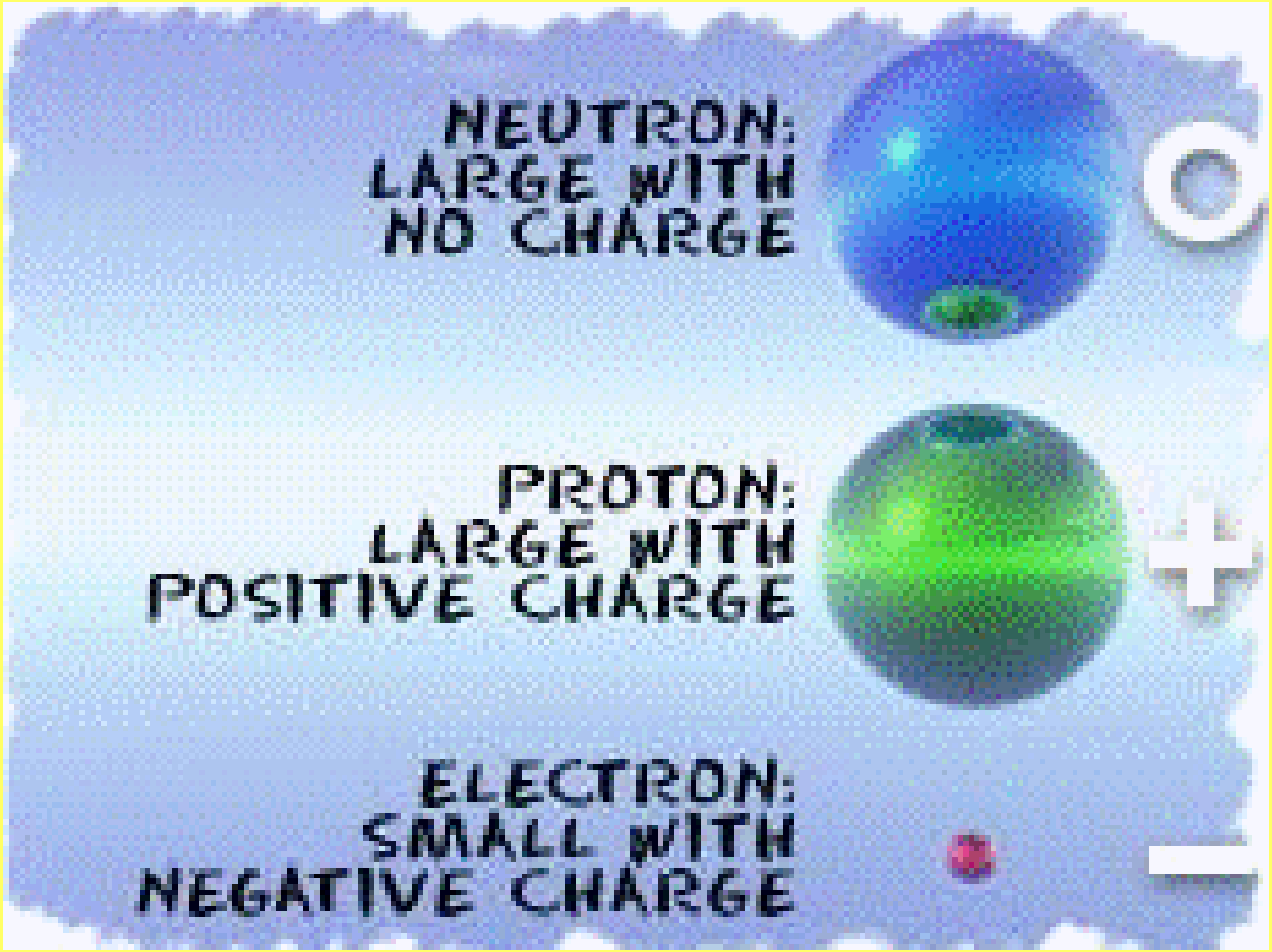
a. The positively charged nucleus is balanced by the electrons that surround the nucleus

b. *Electrons* are negatively charged particles that move around the nucleus

c. There is one electron for each proton

d. The electrons are located in the electron cloud that surrounds the nucleus




NEUTRON:
LARGE WITH
NO CHARGE
PROTON:
LARGE WITH
POSITIVE CHARGE
ELECTRON:
SMALL WITH
NEGATIVE CHARGE

III. Counting Atomic Particles

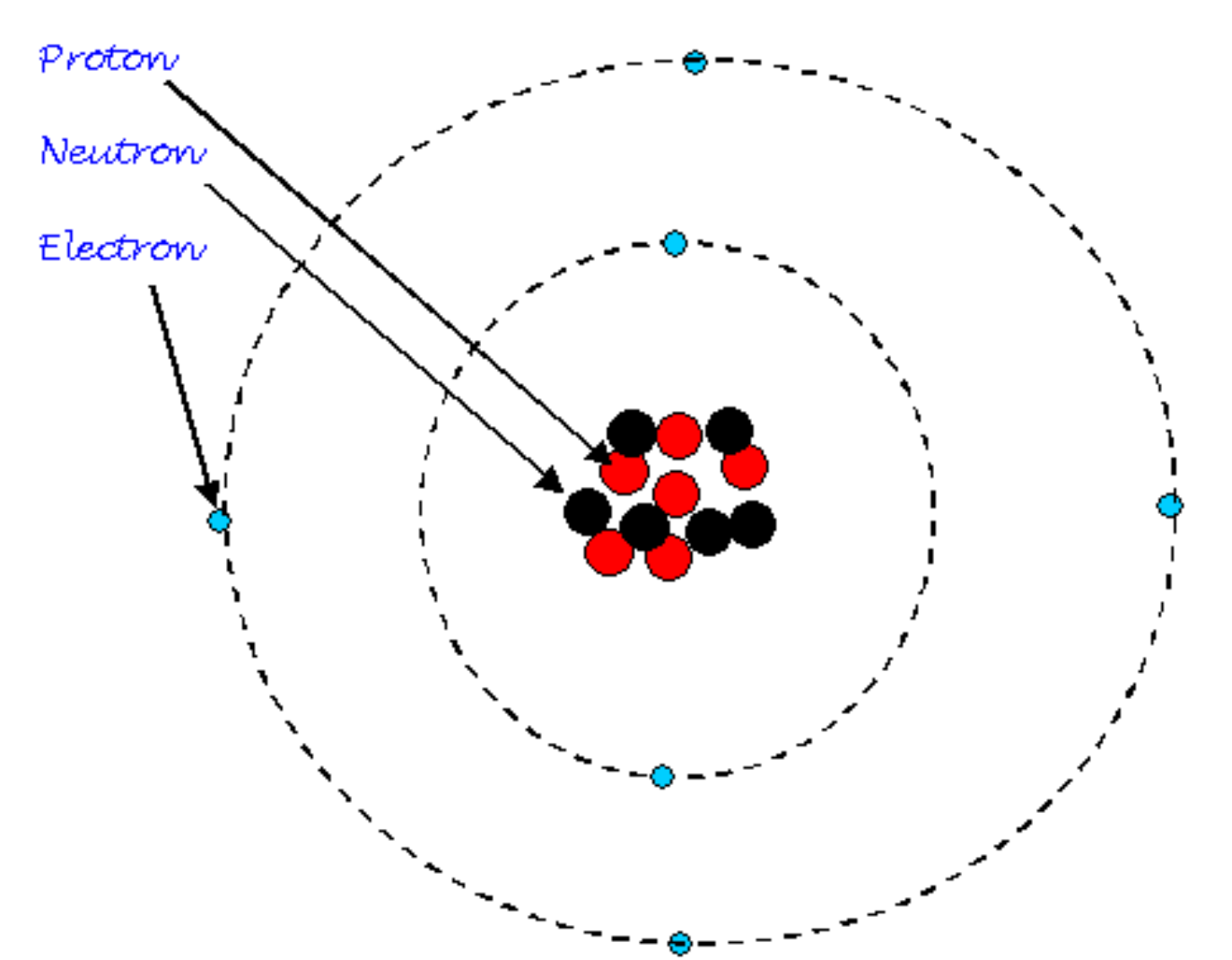
- An atom has a characteristic number of protons, neutrons, electrons and mass number

- The *Mass Number* of an atom is equal to the number of protons PLUS neutrons making up its nucleus

- The more protons and neutrons a particle has the large its mass number

- Electrons are NOT counted in the mass number because they are too small to make a difference

Mass number = 12



A. Atomic Number

a. ***Atomic Number*** equals the number of protons in its nucleus

b. This number is also the same as the number of electrons in the electron cloud

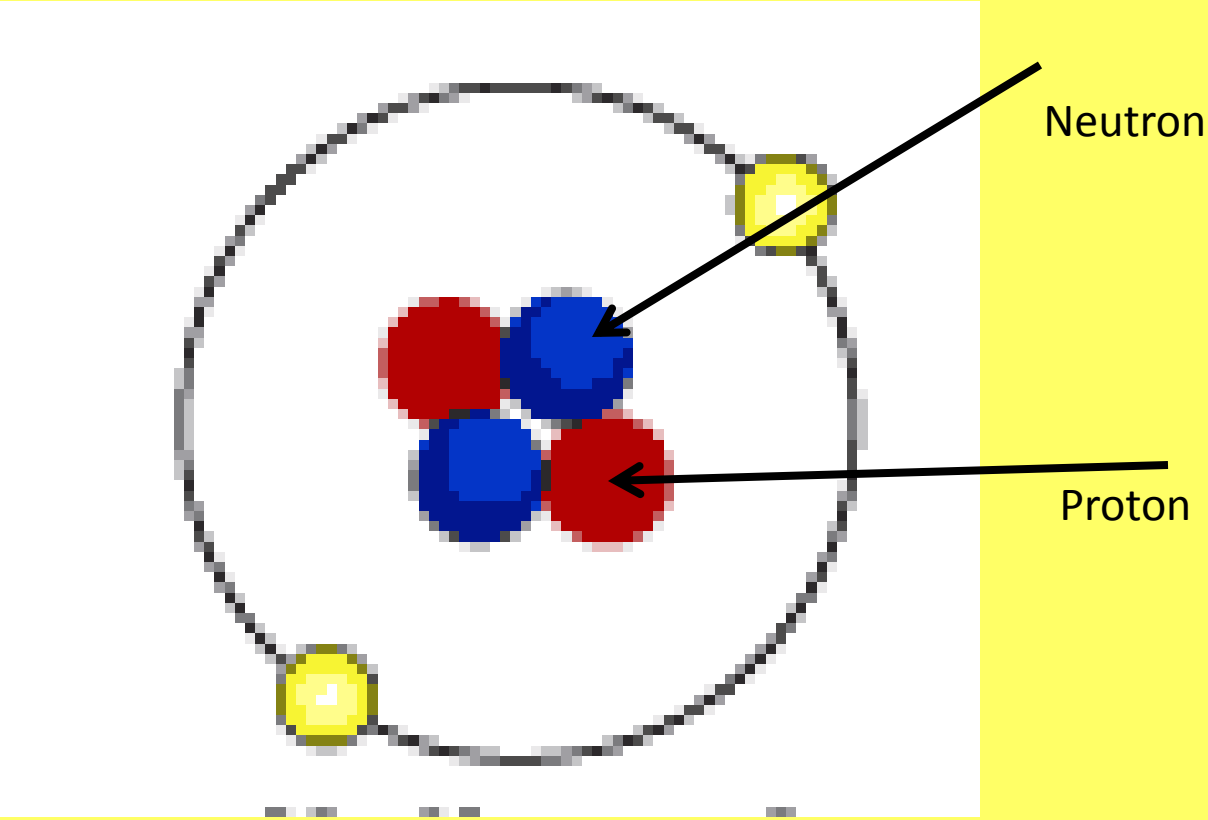
c. All atoms of a specific element have the same atomic number

Example – ALL Hydrogen atoms have 1 proton so the atomic number for ALL hydrogen atoms is 1

Atomic Mass = 4

Atomic number = 2

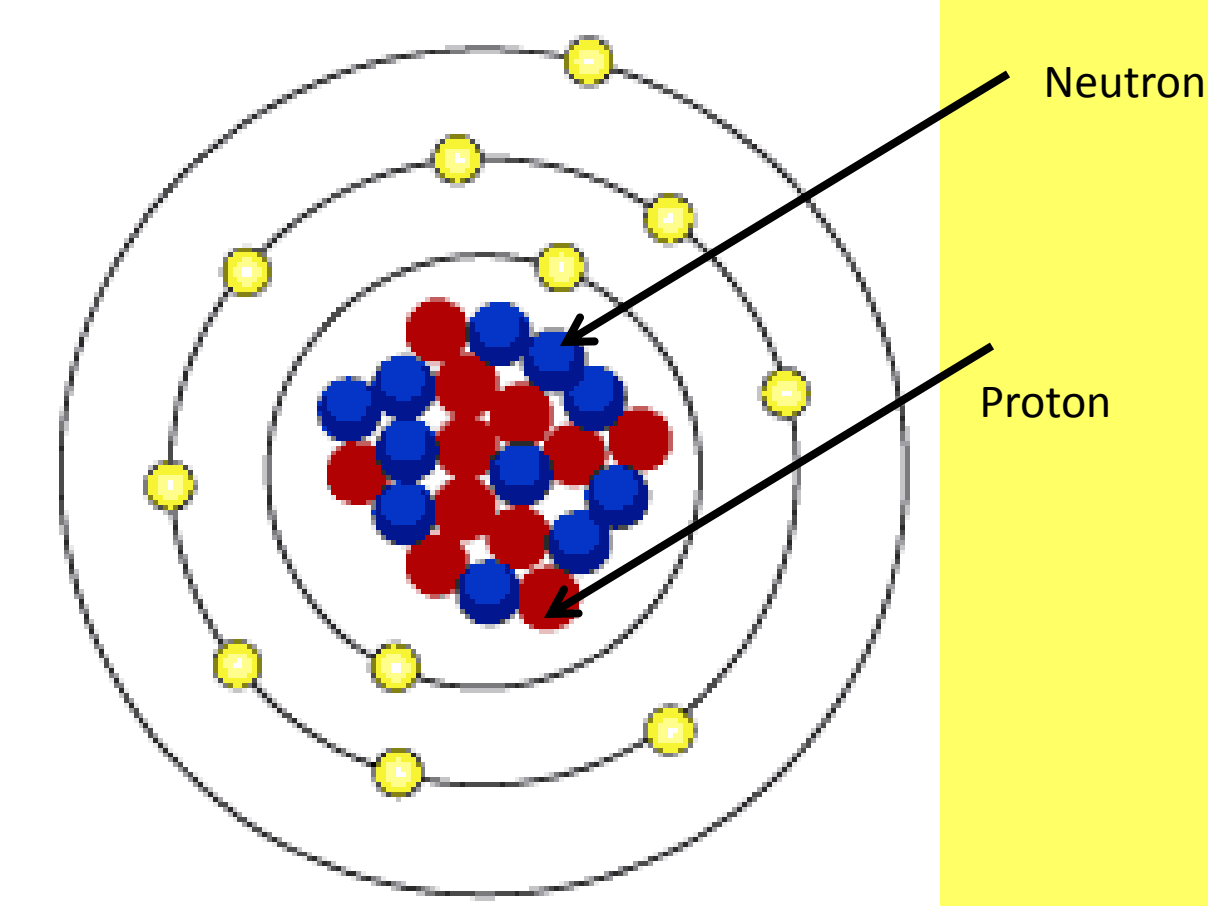
Element = Helium



Atomic Mass = 22

Atomic number = 11

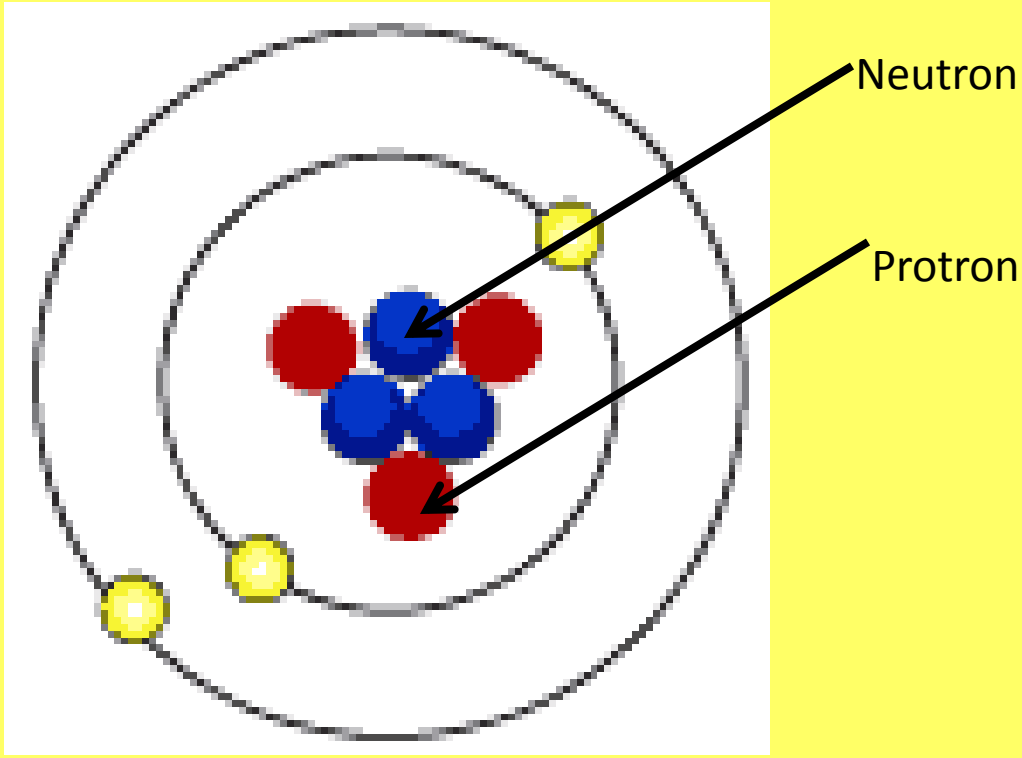
Element = Sodium



Atomic Mass = 6

Atomic number = 3

Element = Lithium

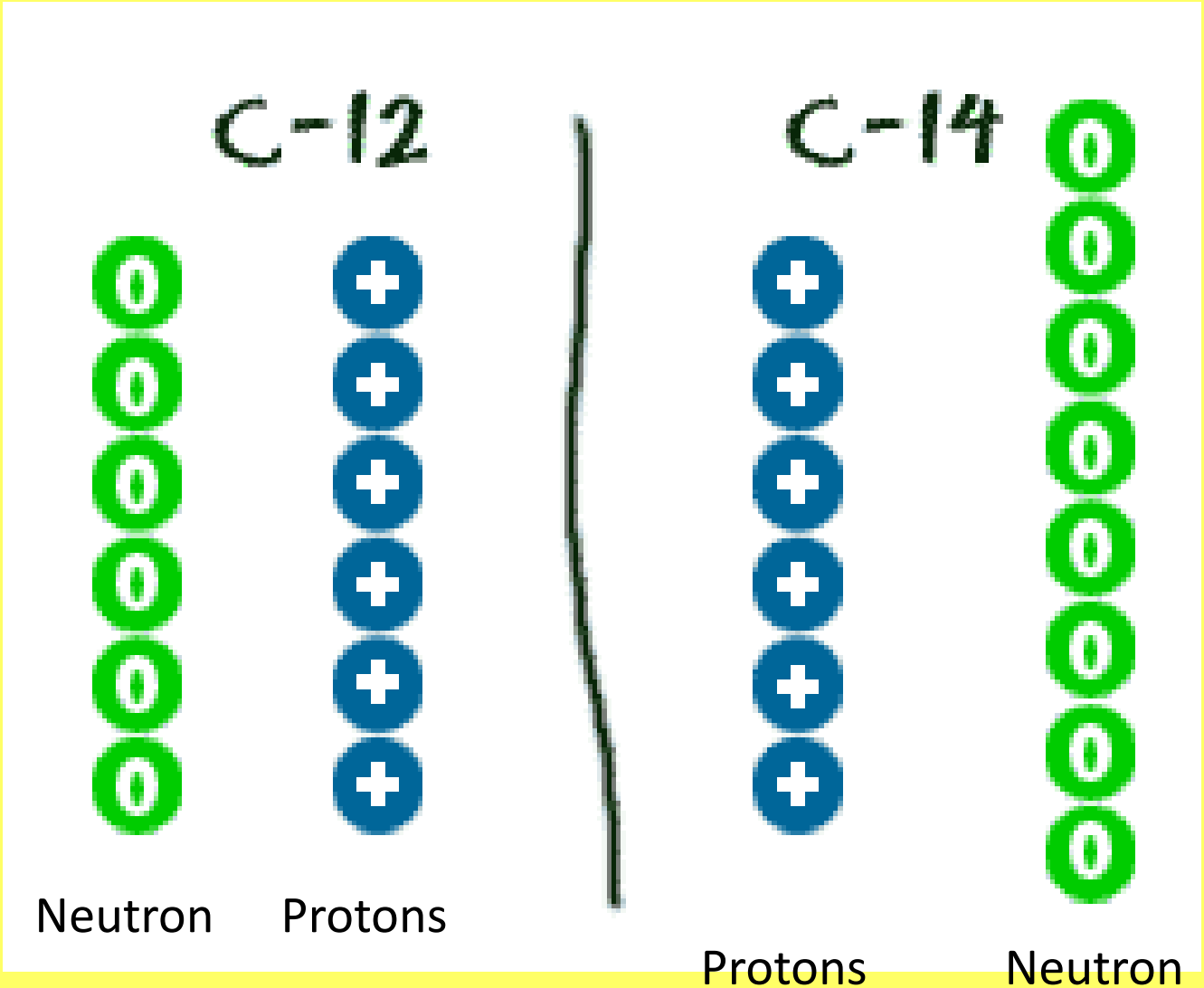


C. Isotopes

a. The number of ***neutrons*** can change without changing the element
   a. This will cause the atomic mass to change

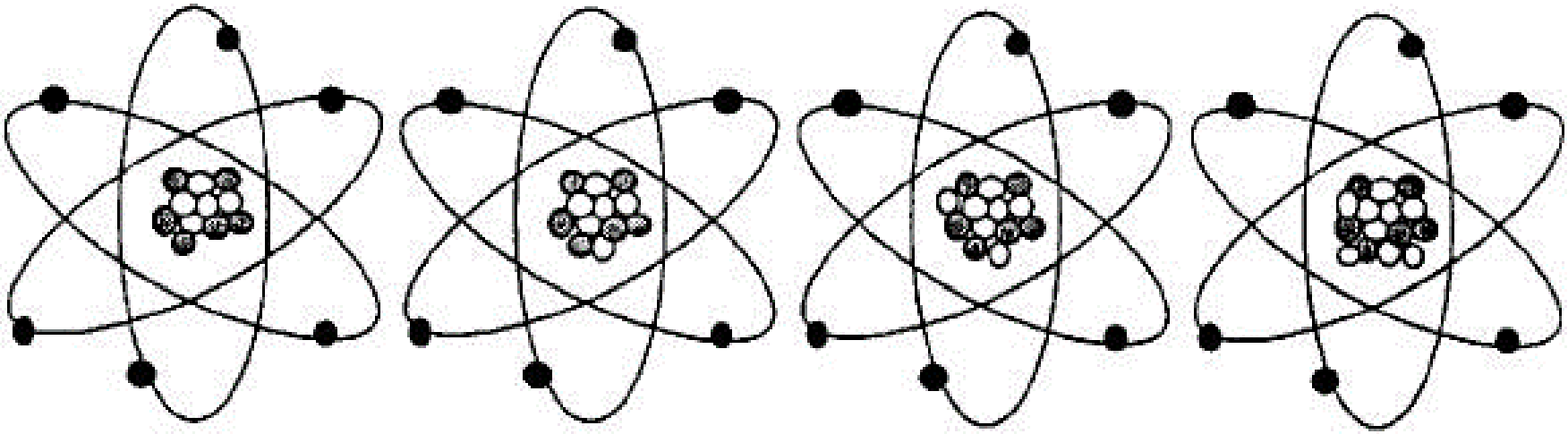
c. Atoms of the same element that have different numbers of neutrons in their nuclei are called *isotopes*
   – The number of ***protons stay the same*** just the number of neutrons change

Isotope of Carbon



Isotopes

• = Protons
○= Neutrons



What stays the same? Number of protons

What changes from atom to atom?

Number of Neutrons

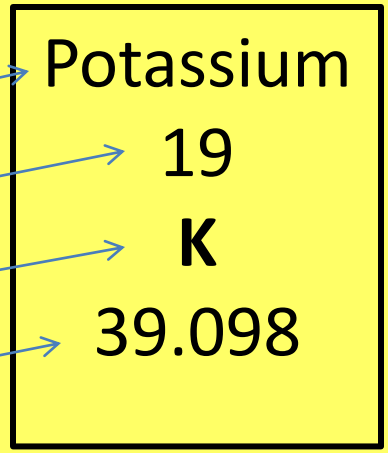
d. Isotopes may be used for medical purposes and others are used to determine the age of ancient objects

- Geologists use these isotopes to date fossils and layers of rock

- Archaeologists use them to determine the age of artifacts – like mummified bodies

IV. Modern Periodic Table

1. The table consists of boxes
   a. Boxes contain: element name
      atomic number
      symbol
      atomic mass



2. The boxes are arranged in order of increasing atomic number into a series of columns called:
   a. ***Groups or Families*** = Run vertically (up and down)
   b. ***Rows or periods*** = run horizontal (side to side)

A. Classifying the Elements

a. **Metals** - Generally shiny when smooth and clean - Good conductors of heat and electricity - Solid at room temperature

- Family 1 – Alkali metals (except Hydrogen)

- Family 2 – Alkali Earth metals

- Families 3-12 are Transition metals

b. Metalloids

- **Metalloids** (or semimetals) – elements with physical and chemical properties of both metals and nonmetals

- There is a stair step going down the right side of your periodic table. The elements above or below that line are the Metaloids
  - Boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, Polonium and Astatine

c. Non-Metals

- **Non-metals** – upper right side of periodic table
  - **Halogens** – Group 7A (Family 17) highly reactive
  - **Noble gases** – group 8A (Family 18) – extremely unreactive

- They are gasses or dull brittle solids

- Poor conductors of heat or electricity

Periodic Table

- Metal, Metalloids, & Nonmetals