EARLY MODELS OF THE ATOM

A. Ancient Models of Matter (5th Century B.C.)

- **Empedocles –** proposed that all substances were made of Earth, Air, Fire, and Water
- **Democritus –** proposed that all matter was made up of tiny particles of empty space called the atom (*smallest particle of an element that has all the properties of that element*)
- **Alchemists –** used experimentation to test their hypotheses, tried to turn metals into gold

B. Dalton's Atomic Theory (1803)

- Matter consists of definite particles called atoms
- Each element is made up of its own type of atom
- Atoms of different elements have different properties
- Atoms of two or more elements can combine in constant ratios to form new substances
- Atoms cannot be created, destroyed, or subdivided in a chemical change
- *This is also called the* ***Billiard Ball Model*** *– atom is a completely featureless sphere*

C. The Subatomic Particles

- **Thomson – (1897)** proposed that the atom was a positively charged sphere with negatively charged particles embedded within it (electrons)
- *This model is called the* ***Raisin Bun Model*** *(dough is positively charged sphere with raisins = electrons)*
- **Rutherford – (1911)** conducted the **GOLD FOIL EXPERIMENT** and found atoms have a positively charged nucleus surrounded by empty space that contains some electrons, later called the particles in the nucleus - protons
- **Chadwick – (1932)** modified Rutherford's theory and suggested that neutrons also exist in the nucleus

D. **Niels Bohr – (1885-1962)**

- Modified Rutherford's model to explain why the nucleus does not collapse the electron rings outside it