



ATOMIC THEORY TIMELINE: In each box, provide information on what the idea/discovery was and how it was made. Where possible, draw pictures or diagrams to explain the event.

Democritus (@400 BC):

“cut the cheese” – eventually, you are left with a piece too small to be cut any more



“ATOMOS” – Latin for “uncuttable”; refers to the smallest individual unit of matter...the “atom”



Thomson (1897): DISCOVERY OF ELECTRONS

Cathode Ray Tube – JJ Thomson put a magnet next to the CRT and bent the beam


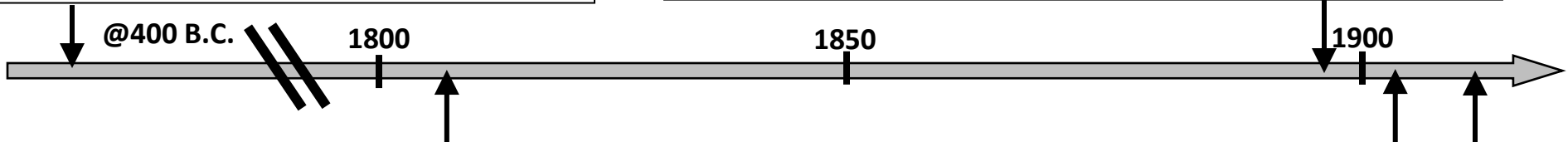
- Evidence that the beam is made of negatively charged particles (not light)

Electrons:

Charge – negative (-1)

Location – surrounding the nucleus

Mass – 2000 times less than protons





Dalton (1808): EARLY ATOMIC THEORY

Key Ideas:

- 1) All matter is composed of atoms
- 2) Atoms of each element have a unique type of atom
- 3) Atoms cannot be subdivided (cut) or destroyed

Visualize atoms as: tiny, solid balls of matter



Nagaoka (1904): PROPOSAL OF NUCLEUS

Visualize the atom as: Solar System

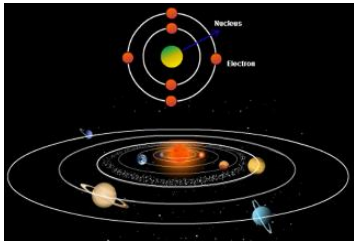
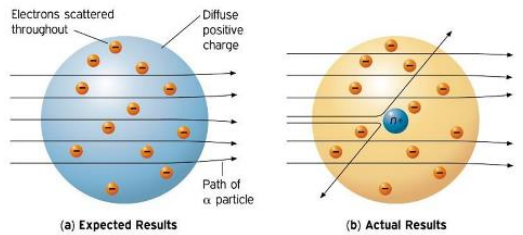
Evidence – NONE!!!

Rutherford (1911): EVIDENCE OF NUCLEUS

Alpha Particle Cannon – Shot alpha-particles at gold foil; expected them to pass right through, but some bounced back

Important Conclusions:

- 1) Atom is mostly empty space
- 2) Extremely small, dense, positive nucleus

Bohr (1913): ENERGY LEVELS & VALENCE ELECTRONS

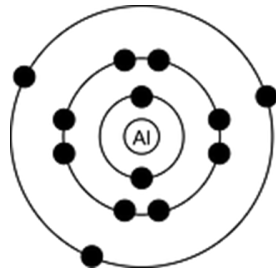
Energy Levels: Electrons are more likely to reside in certain areas of the atom (closer to nucleus)

Visualize the atom as:

Onion



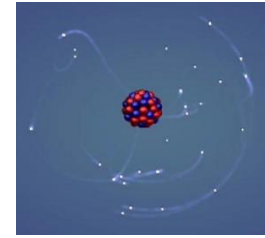
Valence Electrons:
Electrons farthest from the nucleus
On the "outer shell"



Modern "Electron Cloud" Model (1920's-Present):

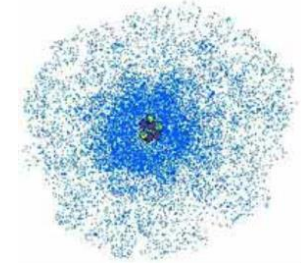
Nucleus:

- Extremely small, dense
- Positive charge
- Contains protons and neutrons
- Basically ALL of the mass of the atom



Electron Cloud:

- Surrounds the nucleus
- Mostly empty space
- Contains negative electrons
- Electrons "live" in regions based on probability



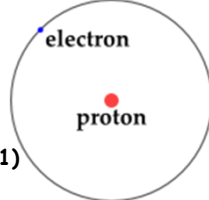
1900

1950

2000

Rutherford (1917): DISCOVERY OF PROTONS

Alpha Particles – turned out to be protons (nucleus of hydrogen atom)



Protons:

Charge – positive (+1)

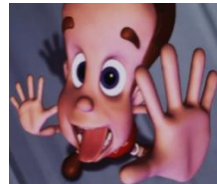
Location – nucleus

Mass – 2000 times more than an electron



Chadwick (1932): DISCOVERY OF NEUTRONS

"Extra Mass" – observed mass of atoms was double the predicted mass



Neutrons:

Charge – neutral (0)

Location – nucleus

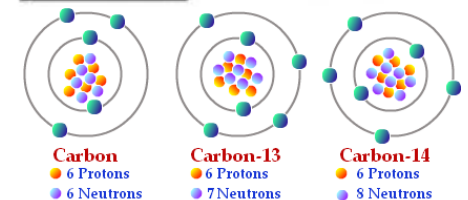
Mass – same as proton

ELEMENTS

Atomic Number:
of protons

Atomic Mass:
Avg. # of particles in nucleus
(protons + neutrons)

47	Atomic number
Ag	Symbol
107.868	Atomic mass



Isotopes:

Atoms of an element with a different number of neutrons

Ions:

Charged atoms that have gained or lost electrons

