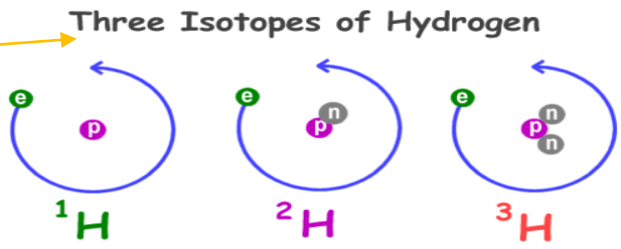
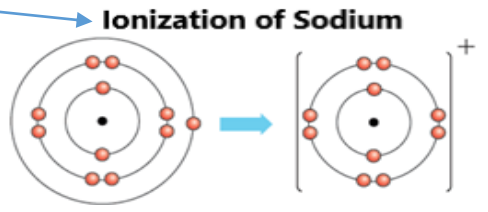
Intro to the Energy of **NUCLEAR REACTIONS**

Unit 7 Learning Targets

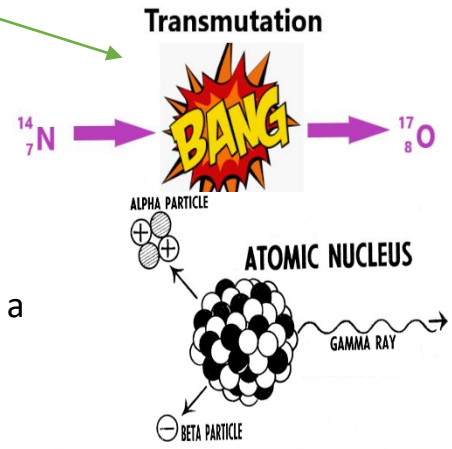
1.I Generally understand Nuclear Stability vs Radioactive Nuclei"

- ✓ I understand all Alternate forms of the ATOM:
  - **Isotope= Δ in neutrons**
    - change in atomic mass (ex: carbon-14)
  - **Ion = Δ in electrons**
    - change from neutral atom to + or – charged atom
  - **Transmutation = Δ in protons**
    - new identification of atom (element name)



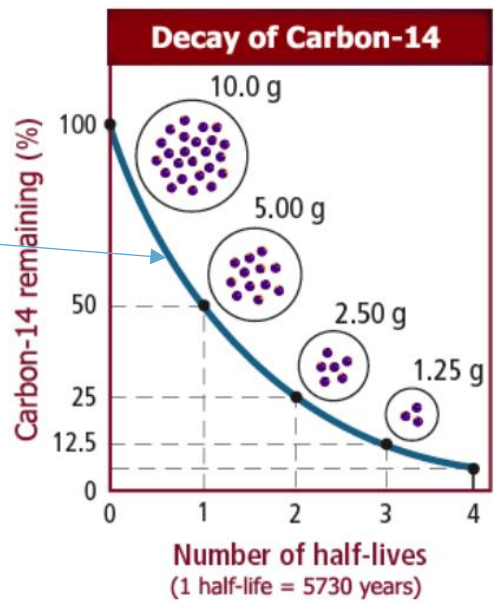


- ✓ I know what makes a nucleus unstable:
  - Large nuclei have to many protons
    - Can't keep all the protons (+ charges) packed together in the nucleus so they fall apart.
  - When an atom starts falling apart this is known as radioactive decay
    - Nuclear Force: The VERY STRONG force that acts within the nucleus to hold it together.
    - Protons in the nucleus repel (like charges repel) the nuclear force keeps them packed in tight!!!
- ✓ I know how to explain the basics of nuclear radiation.
    - Transmutation: change in identify of an element due to nuclear radiation or reactions.
    - Releasing energy or matter is due to nuclear instability, the results of radiation are a more stable version of the nuclei.



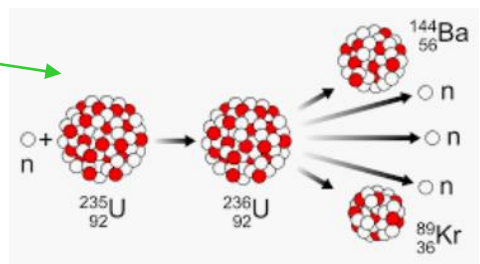
2.I understand ½ Life and Carbon Dating of natural radioactive isotopes.

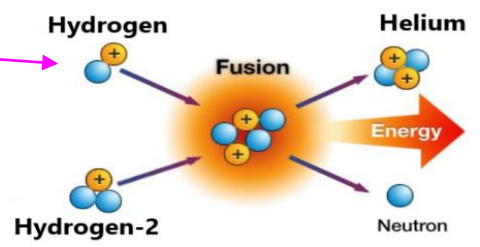
- ✓ I can analyze **data and graphs to discuss half-life**
  - Half Life is **exponential decay**
- ✓ I can determine the age of samples based on its Half-life
  - Half Life is based on "packets" of years
    - After every half-life "packet of years" has passed only half (50%) of sample remains.
  - Determine Age based on remaining mass, %, or fraction



3.I Know the basics of Nuclear Fission & Nuclear Fusion

- ✓ **Nuclear Fission** is the splitting of atomic nuclei
  - Nuclear Fission is a nuclear reaction in which some heavy, unstable nuclei is split (usually on impact with another particle). This breaks and releases the very strong nuclear force (Releasing a tremendous amount of energy. Think Atomic Bomb!!!
  - I can identify chemical equations as fission reactions
  - I can develop and identify flow charts or diagrams of fission
  - I know some common examples of Fission
    - Atomic Bombs, Nuclear Power plants, Nuclear Powered Submarines/Air Craft Carriers
- ✓ **Nuclear Fusion** is the combining of atomic nuclei
  - I can identify chemical equations as fusion reactions
  - I can develop and Identify flow charts or diagrams of fusion
  - I know some common examples of Fusion
    - The Sun, Hydrogen Bombs





- ✓ I can discuss the use of Nuclear Energy
  - Nuclear Energy is considered a clean and renewable source of energy
  - Nuclear Fission is currently used in nuclear power plants
  - Using Nuclear Fusion would solve the world energy crises
  - I am able to discuss the pros and cons of nuclear energy.
    - Fission no air pollution, but nuclear Waste remains radioactive for thousands of years
    - Nuclear Fusion creates no air pollution or nuclear waste.

4.I understand the Scientific Law of Conservation of Mass.

- ✓ I can predict the products of nuclear reactions based on conservation of mass.
- ✓ I can balance chemical equations to satisfy the law of conservation of mass.
- ✓ I can Quantify the amount of atom in a compound.
- ✓ I understand that conservation of Energy is the same concept.