



Intro to the Energy of NUCLEAR REACTIONS

Unit 7 Learning Targets



1. I understand why some elements are unstable aka "radioactive"

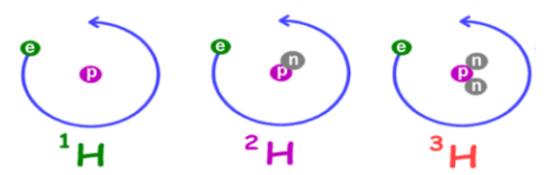
✓ I understand all Alternate forms of the ATOM:

- Isotope = Δ in neutrons
 - change in atomic mass (ex: carbon-14)
- Ion = Δ in electrons
 - change from neutral atom to + or - charged atom
- Identity = Δ in protons
 - new identification of atom (element name)

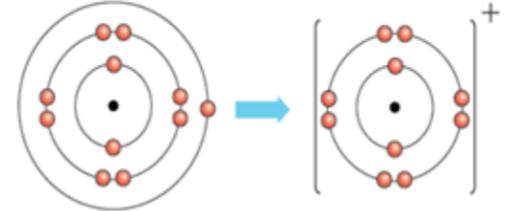
✓ I know what makes a nucleus unstable:

- Large nuclei have too many protons (+ charges) to keep packed in 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!!!
 - "Falling Apart" means losing nucleons (protons, neutrons)

Three Isotopes of Hydrogen



Ionization of Sodium

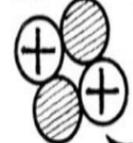


2. I can identify the three types of radiation via the radioactive particle

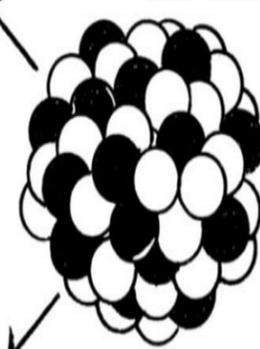
✓ I know the basic properties of Alpha, Beta & Gamma particles.

- Alpha Particle = Helium Nuclei with +2 charge
 - The alpha particle has the largest mass and the highest magnitude of charge at +2
 - The alpha particle has the least amount of energy and penetrating ability due to previous fact.
- Beta Particle = electron
 - Occurs when a neutron breaks down in the nucleus and shoots out an electron.
 - Has less mass than Alpha, but still has mass. Beta particles have a -1 charge.
- Gamma Radiation = gamma ray (gamma wave)
 - Gamma radiation is pure energy in the form of a wave.
 - It has the most energy and penetrating ability out of all radiation
 - It has no mass and no charge, so nothing can stop it but Lead (Pb), thick concrete or a lot of Earth

ALPHA PARTICLE



ATOMIC NUCLEUS



GAMMA RAY

BETA PARTICLE

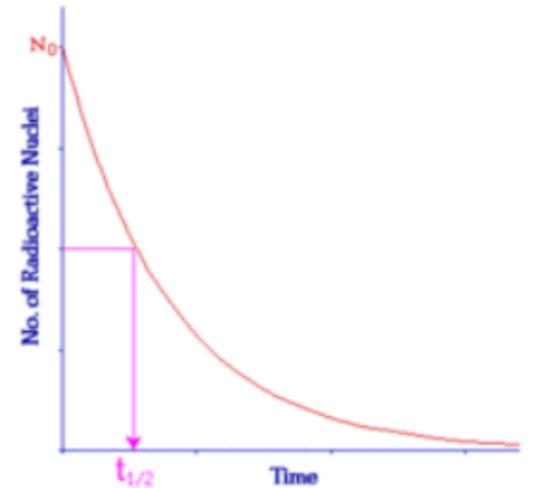


3. I understand 1/2 Life and Carbon Dating

✓ I can analyze data and graphs to discuss half-life

✓ I can use computational thinking to determine the age of a sample based on Half-life concepts

- 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 mass, %, or fraction of original sample remaining.
- Half Life is exponential decay



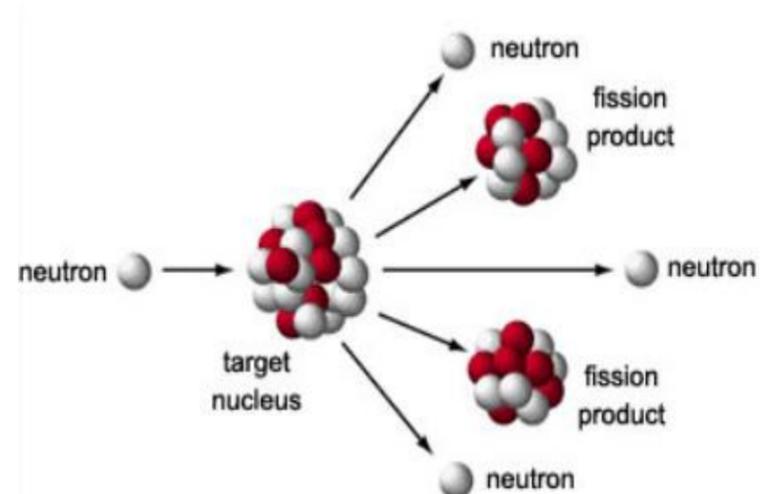
4. I know the chemistry of Nuclear Fission and Nuclear Fusion

✓ 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!!!)

✓ Nuclear Fusion is the combining of atomic nuclei

- 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 combining 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



5. I can discuss the use of Nuclear Energy (Fission and Fusion)

✓ 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.

