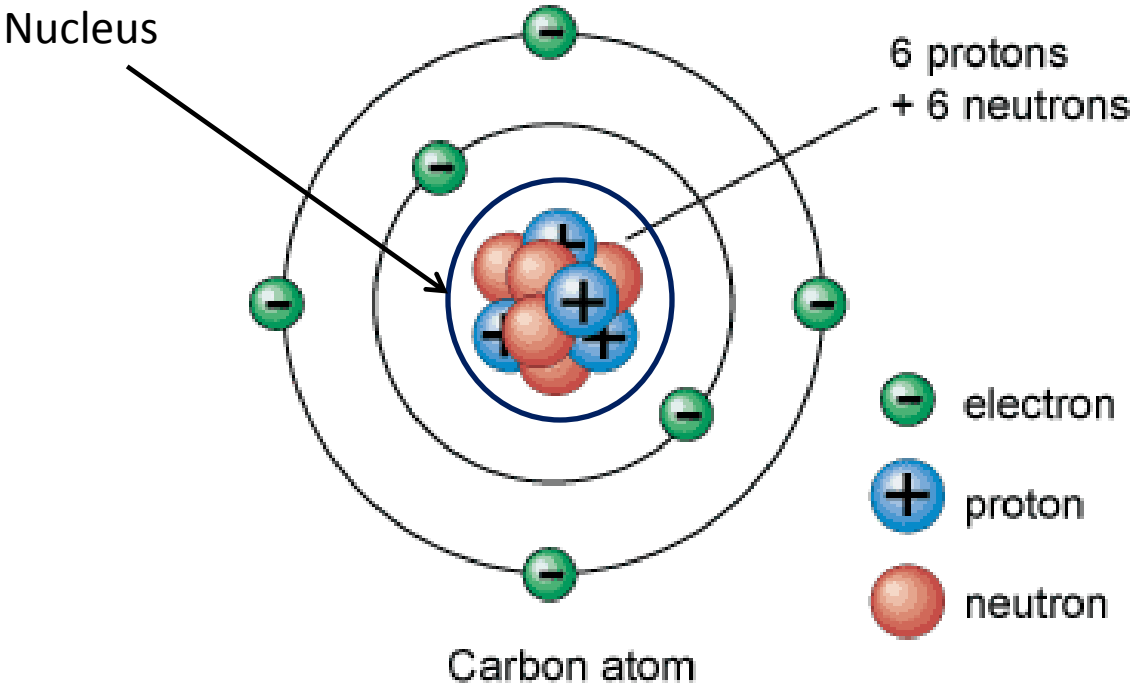
Nuclear Reactions
18.3 Part 1

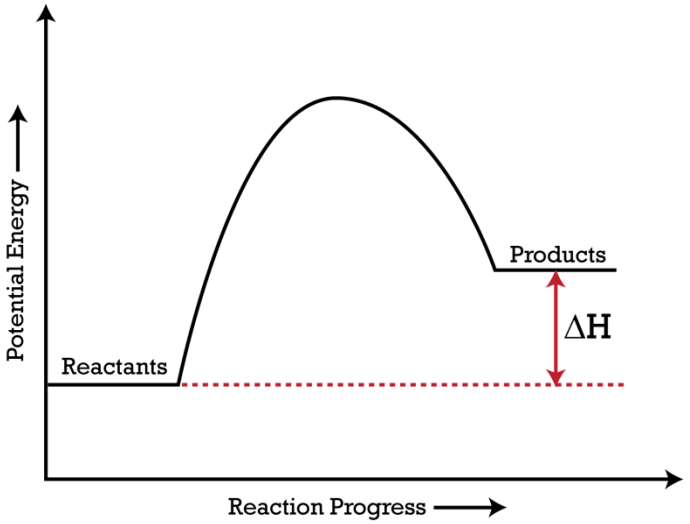
Review

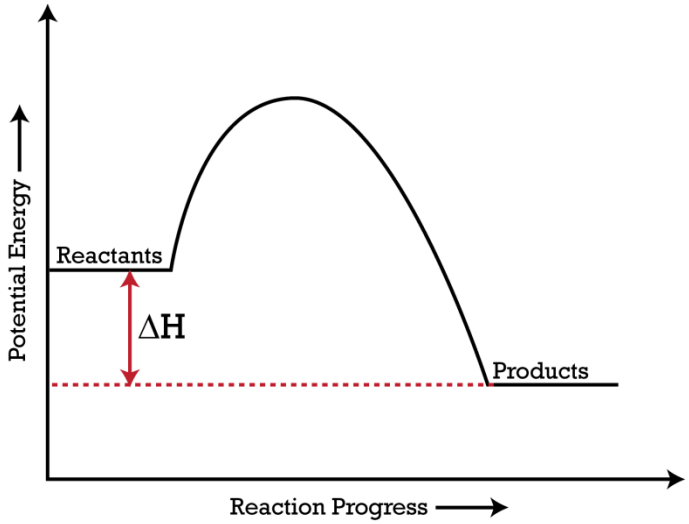


Identity of an atom determined by NUMBER OF PROTONS
Mass determined by PROTONS AND NEUTRONS (1 atm each)

Review

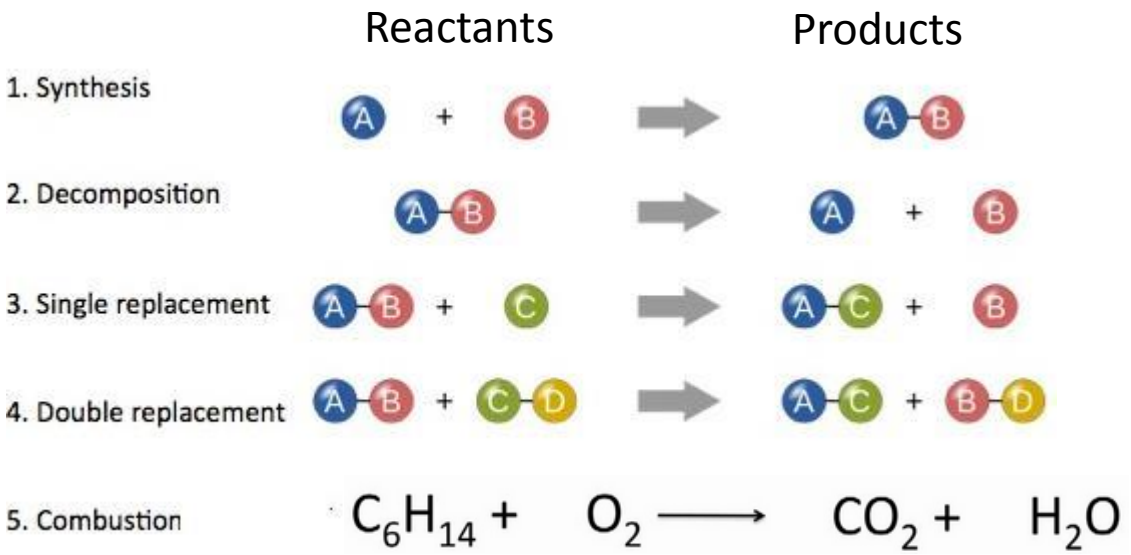
- Energy is ALWAYS involved in a <u>chemical reaction</u> when breaking/making bonds
  - Released = exothermic (most reactions)
  - Absorbed = endothermic (photosynthesis)





Key Question

- Are chemical reactions and nuclear reactions the same?
- **NO**

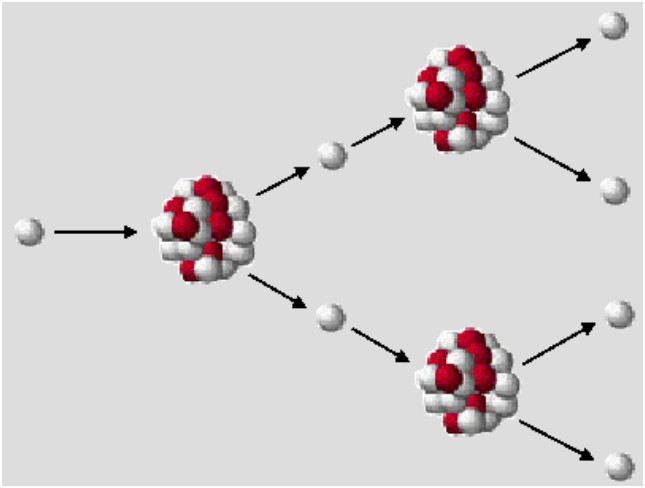


$$^{58}_{26}\mathrm{Fe} + {}^{1}_{0}\mathrm{n} \rightarrow {}^{59}_{26}\mathrm{Fe}$$

$$^{59}_{26}\mathrm{Fe} \rightarrow {}^{59}_{27}\mathrm{Co} + {}^{0}_{-1}\mathrm{e}$$

$$^{59}_{27}\mathrm{Co} + {}^{1}_{0}\mathrm{n} \rightarrow {}^{60}_{27}\mathrm{Co}$$

Nuclear Reactions



- Nuclear Reaction: a rxn in which the # of protons and/or neutrons is altered.

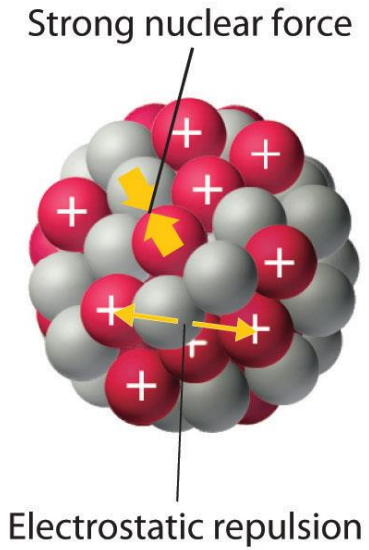
- https://www.youtube.com/watch?v=ESpRFkXon7g

Chemical vs. Nuclear Reactions

	Chemical Rxns	Nuclear Rxns
Part of Atom	Outermost (valence) electrons	Nucleus (neutrons and protons)
Start of Rxn	High temp, high pressure, catalysts, increasing concentration	High temp OR bombardment with high speed particles
Rxn Outcome	Formation of ionic or covalent bonds	# of protons or neutron changes
Energy Involved	Small amount	HUGE amount
Examples	Burning fossil fuels, digesting food	Nuclear energy, x-rays, chemotherapy, pasteurization

Cause of Nuclear Reactions and radioactivity

- Opposites attract &
- Like repels like
- Strong nuclear force – attraction btw (n) & (+). Strongest known force known to man
- If ratio of (n) and (+) is off, the nucleus becomes unstable



Review of Radioactivity

- Alpha

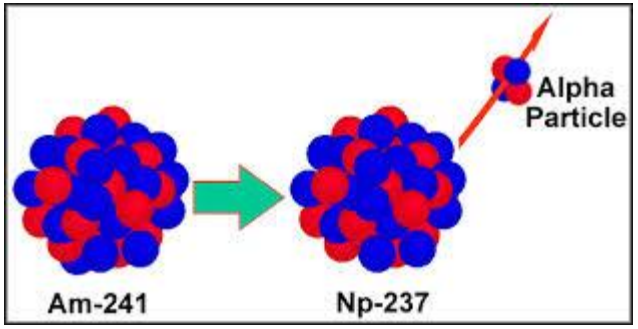
Beta

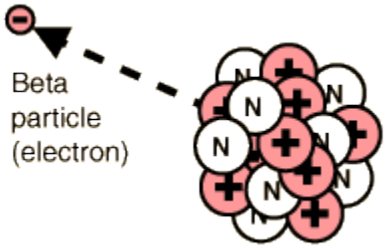
Gamma

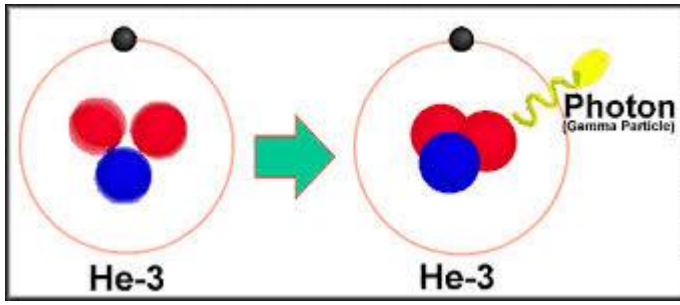
A helium is released [2 (+) and 2 (n)], causing the atomic number to go down by 2

A (n) is turned into a (+) and an e^-. The e^- is then emitted

Emits a high energy photon known as a gamma particle

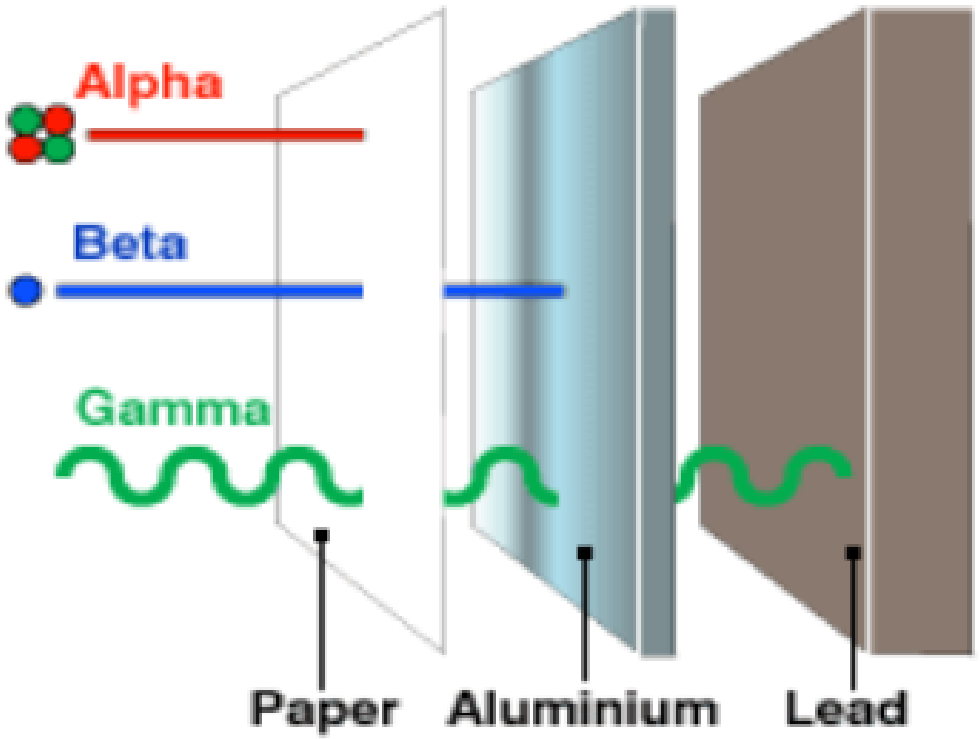






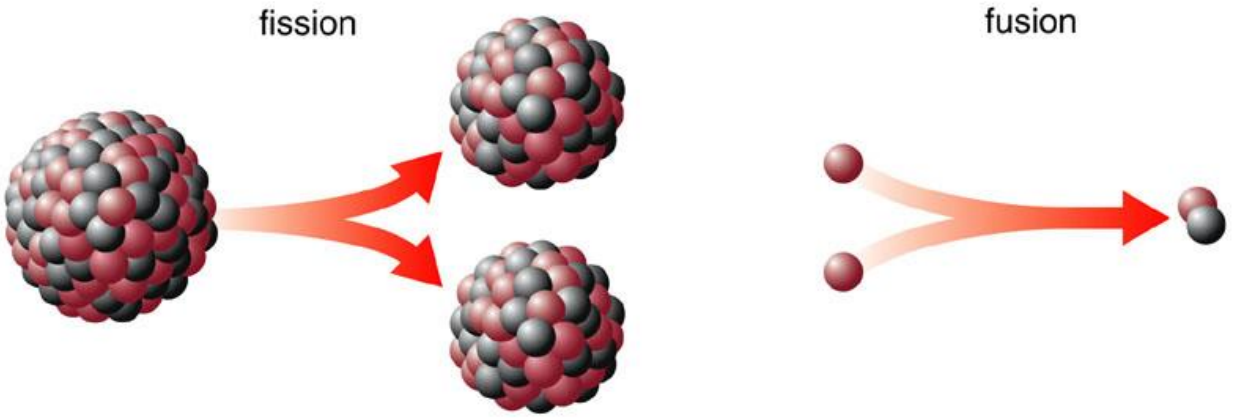
Helium > Electron > Photon

Review of Radioactivity



Types of Nuclear Reactions

- Nuclear Fission – nuclei of heavy atom breaks apart to make lighter atoms.
- Nuclear Fusion – nuclei of light atoms combine to make heavier atom



Nuclear Energy

- https://www.youtube.com/watch?v=VJfIbBDR3e8

- https://www.youtube.com/watch?v=UK8ccWSZkic