..osion → all reactions happen really fast and rapidly generate enormous amts. of gas.

Nuclear Energy - Unit 7

Day 1:

Day 2:

- Nuclear change → a lot bigger than chemical change; huge differences in amt. of energy released.
  - ~~For nuclear, any +~~ Any time there's an energy change, there's a mass ~~time~~ change.
  - For nuclear change, energy changes are so big that mass change can be measured too.
- Nuclide - bare nucleus (ignore electron)
- Chem change vs. nuclear change:

Chem change	nuclear change
- atoms rearrange, but don't change atomic identity	- change in atomic identity likely across nuclear change, matter converted to energy or energy converted to matter.

Activity:

Group A:

$^{2}_{1}H + ^{3}_{1}H \rightarrow ^{4}_{2}He + ^{1}_{0}n$

$2\,^{3}_{2}He \rightarrow ^{4}_{2}He + 2\,^{1}_{1}p$

$2\,^{12}_{6}C \rightarrow ^{23}_{12}Mg + ^{1}_{0}n$

$^{8}_{4}Be + ^{4}_{2}He \rightarrow ^{12}_{6}C$

$^{1}_{0}n + ^{235}_{95}U \rightarrow ^{141}_{56}Ba + ^{92}_{36}Kr + 3\,^{1}_{0}n$ (141 = mass, 56 = charge)

- here, losing atomic identity, but generally conserving mass.
- add up #s on top, both sides equal; add up #s on bottom, both sides equal

Group B:

$^{235}_{92}U + ^{1}_{0}n \rightarrow ^{145}_{57}La + ^{88}_{35}Br + 3\,^{1}_{0}n$

$^{235}_{92}U + ^{1}_{0}n \rightarrow ^{95}_{42}Mo + ^{139}_{57}La + 2\,^{1}_{0}n + 7\,^{0}_{-1}\beta$

p = proton
n = neutron
e = electron

240 ... 206

FUSION
Group A: lighter elements combining to make heavier ~~e~~ things

FISSION
Group B: heavier combining to make light; a lot of possible products.

TRANSMUTATION: don't know if fusion or fission; some particles getting heavier, some getting lighter.

Radioactive Decay:

$^{0}_{0}\gamma$ → no charge, no mass; it's just gamma energy

$^{0}_{1}e$ → positive charged electron; positron; when electron and positron meet, it immediate dissappears and releases energy.

$^{2}_{1}H + ^{3}_{1}H \rightarrow ^{4}_{2}He + ^{1}_{0}n$ whats the energy difference?

- final - initial (energy for each given on ws)
- Δm

$\Delta E = \Delta mc^2$

- $\Delta m = [1.00866 + 4.00151]_{products} - [2.01355 + 3.01605]_{reactants}$ amu

$= 5.01017 - 5.0296$

dec in mass means dec. in energy. energy is being released (exothermic)

$= -.01943$ amu $= -3.2263515e^{-29}$ kg

1 amu $= 1.6605 \times 10^{-27}$ kg

.... LOOK AT KEY

- change to kg, then mult. by Avagadros # to get into moles.

A chem. rxn. is about ~~1000 kg~~ 100 kg/mol.

A nuclear rxn is 10^9 kg/mol.

- WHERE is energy coming from and WHY it's changing?

- energy changes b/c change in potential energy ~~[illegible]~~. For nuclear, has to do w/ stability of nucleus. there's a difference in stability - BINDING ENERGY (energy required to take nucleus and break up into separate parts.

$^{2}_{1}H \rightarrow ^{1}_{0}n + ^{1}_{1}p$

comparing thing together vs broken up

* Always more stable together than broken up *

- ~~big nucleus = more binding energy b/c more particles.~~ MOST STABLE, lowest energy thing is Fe. Making bigger and bigger nuclei (endothermic) until @ ~~a~~ a certain pt no more fusion.
- In sun, H is turning to He and eventually will get higher in #s of nuclei until it gets to Fe. (Doesn't actually happen b/c a lot of things are involved like pressure, etc.)

* On graph, one side is exothermic, one side is endo.

ISOTOPES

*Stable Isotopes Graph

- stable combos are black dots.
- Stable isotopes are almost linear; usually ~~...~~ 1:1 proton: neutron when they're small, but as # increases, not 1:1, need more protons.
- vert. black line means more than one stable isotope for some elements.
- the graph ends → there's a pt. where afterwards, there's no more stable isotopes; they're all falling apart making smaller parts. (after Bi stops)
- when things decay, try to get back to band of stability. ; closer to band means more stable.
- unstable things fall apart → they're radioactive; spit out <u>energy</u>.