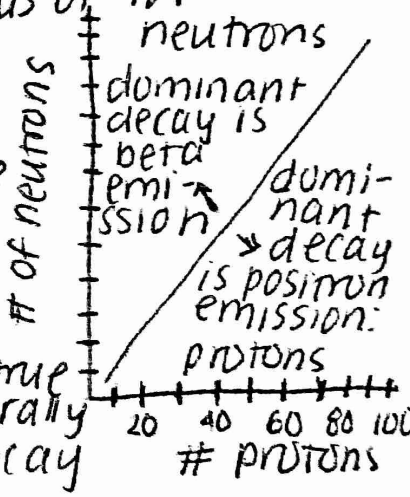
·Beta emission	${}^{A}_{Z}X \rightarrow {}^{A}_{Z+1}Y + {}^{0}_{-1}e$	+1	unchanged
·positron emission	${}^{A}_{Z}X \rightarrow {}^{A}_{Z-1}Y + {}^{0}_{+1}e$	-1	unchanged
·Electron capture	${}^{A}_{Z}X + {}^{0}_{-1}e \rightarrow {}^{A}_{Z-1}Y$	-1	unchanged

April 26, 2019 : Nuclear Chemistry

·Any atom with more than one proton has repulsions between the protons in the nucleus
- strong nuclear force helps keep the nucleus together
·Neutrons play a key role stabilizing the nucleus - ratio of neutrons to protons is an important factor

Nuclear Stability , valence electrons (8 is ideal) , not
·small elements (protons ≤ 20): stable nuclei have a neutron/proton ratio → 1:1
·Larger elements require more neutrons to stabilize nucleus of
·All nuclides with more than 83 protons are unstable
→ decay by emitting beta particles
·Nuclei above belt of stability have too many neutrons
·Nuclei below the belt have too many protons → capture
→ Become more stable by positron emission or electron



Magic Numbers : even # proton/neutron = more stable
·2, 8, 20, 28, 50, or 82 protons
·2, 8, 20, 28, 50, 82 or 126 neutrons → more stable nuclides
↳ not hard and fast rule, but generally true

Radioactive Decay
·Geiger counter: measures amount of radioactive decay
- Radiation ionizes gas molecules inside the instrument, which then measures the resulting electric current
Inside Geiger:
- Gas

Kinetics of Radioactive Decay : 1st order process

$\ln \frac{N_t}{N_0} = -kt$ half life of radioisotope: $\frac{0.693}{k} = t_{1/2}$

Radiometric Dating : + Medical Applications : Diagnosis , uses amount of carbon
- carbon dating: uses a nuclear clock to determine age
- Radioisotopes can be administered to a patient as diagnostic "tracers" because of where they accumulate in the body
- PET scan : positron emission tomography - imaging test
  · Uses compounds labeled with a positron emitter
  · Blood flow, oxygen use, and glucose metabolism can be measured