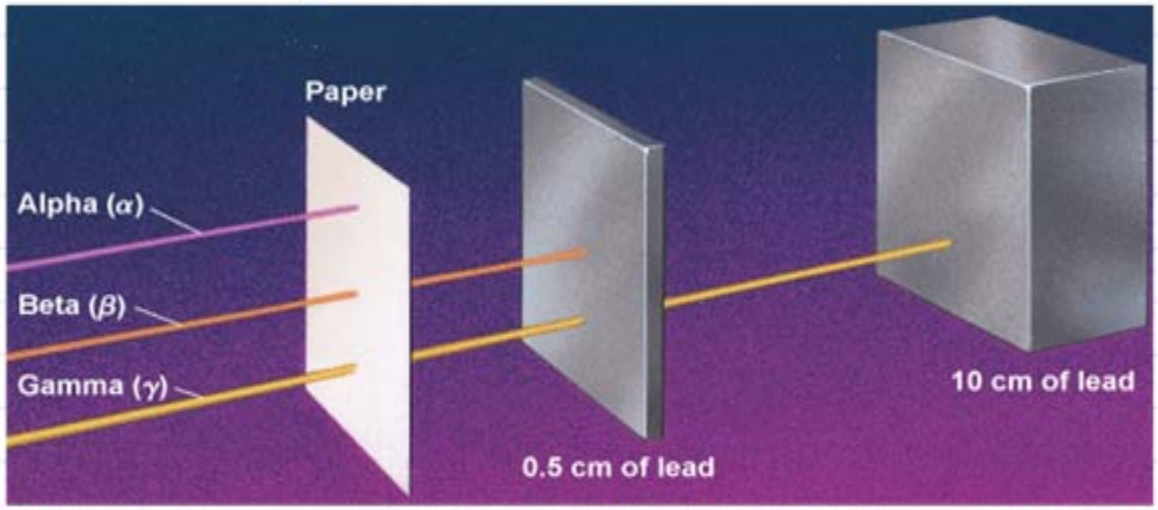
24.1 Nuclear Reactions

The Penetrating Power of Radiation

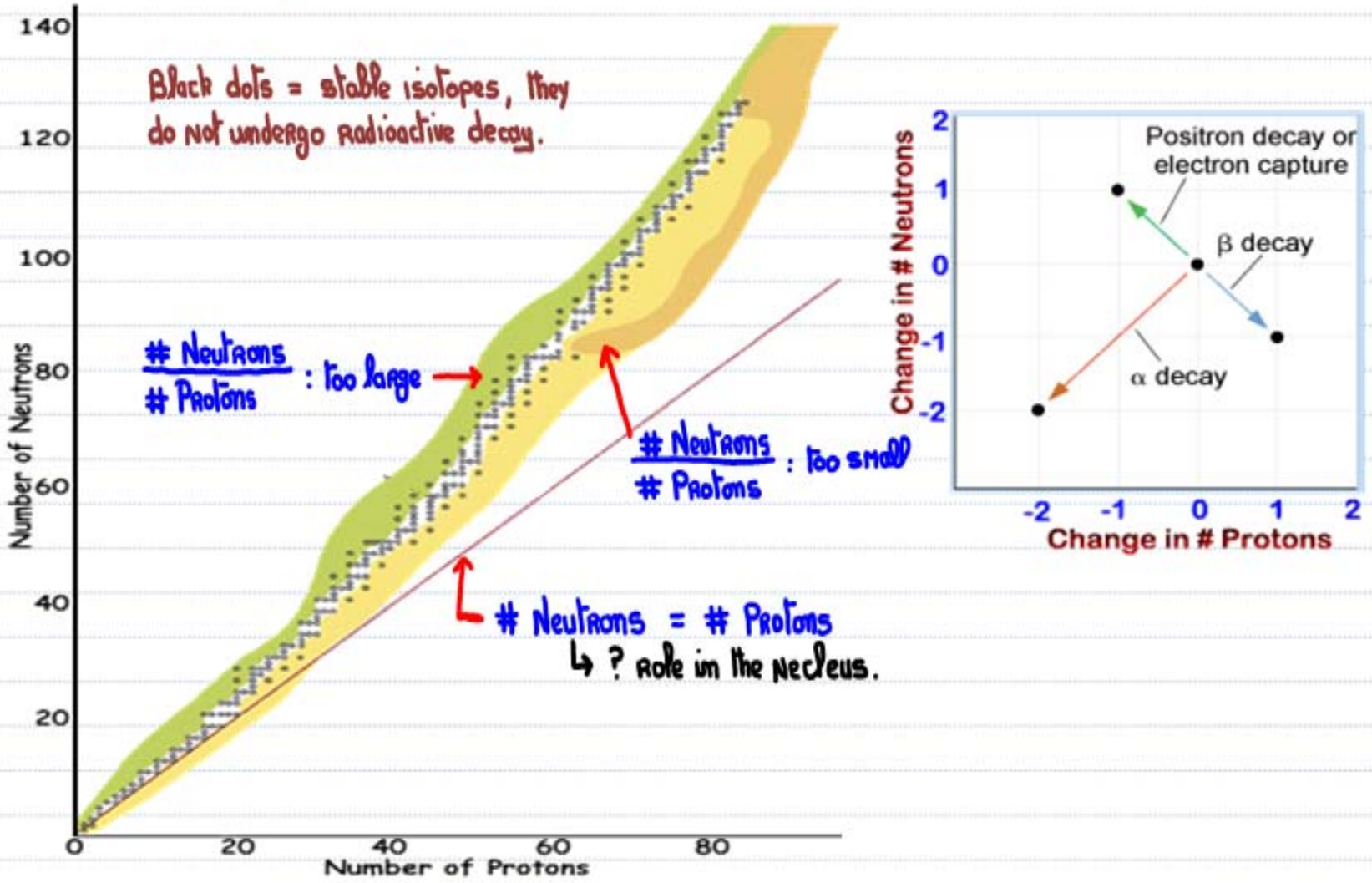


Particles: Energy Vs Penetration Power

${}^{4}_{2}He$ OR ${}^{4}_{2}\alpha$	Alpha
${}^{0}_{-1}\beta$ OR ${}^{0}_{-1}e$	Beta
${}^{0}_{+1}\beta$ OR ${}^{0}_{+1}e$	Positron
γ	Gamma

24.2 Nuclear Stability

Band of Stability



24.2 Nuclear Stability

Natural Radioactive Decay

1. Alpha Emission:

$^{4}_{2}\alpha$ OR $^{4}_{2}He$ ... ONLY: $_{2}He^{4}$

2. Beta Emission:

$^{0}_{-1}\beta$ OR $^{0}_{-1}e$ ... ONLY: $_{-1}e^{0}$

3. Positron Emission:

$^{0}_{+1}\beta$ OR $^{0}_{+1}e$ ... ONLY: $_{+1}e^{0}$

4. Electron Capture:

$^{0}_{-1}e$ .. Nucleus captures an electron.

Note:

1., 2., and 3: The emitted particle is a product.

4: The captured electron is a reactant.

24.2 Nuclear Stability

The Nucleus – Emitting Beta or Positron Particles

2. Nucleus emitting a ${}^{0}_{-1}\beta$ particle ... an electron ... where does this ${}^{0}_{-1}e$ come from?

emitted

${}^{1}_{0}n \rightarrow {}^{1}_{1}H + {}^{0}_{-1}e$

Neutron — Proton — Electron (Beta particle)

Net result in nucleus → Neutron converted to a Proton.

3. Nucleus emitting a ${}^{0}_{+1}\beta$ particle ... a positron ... where does this ${}^{0}_{+1}e$ come from?

emitted

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

Proton — Neutron — Positron

Net result in nucleus → Proton converted to a Neutron.

24.2 Nuclear Stability

The Nucleus – Capturing an Electron

4. Nucleus capturing an electron ... why? ... what does the nucleus do with an ${}^{0}_{-1}e$?

$${}^{1}_{1}H + {}^{0}_{-1}e \rightarrow {}^{1}_{0}n$$

Proton — Captured electron — Neutron

Net result in the nucleus → Proton converted to a Neutron.