Class Announcements

LAST LAB: Saturday, Dec 3RD, 1:30-4:30

EXAM III: Tuesday, Dec 6th, 12:45-2:15, In class
Review, Sunday, Dec 4th, 3:00-4:45 pm, ISB 135

FINAL EXAM: Tuesday, Dec 13th, 8:00-10:00AM, ISB 135
Review, Sunday, Dec 11th, 1:00-2:30 pm, ISB 135

8.11 How do We Calculate the pH of a Buffer?

Acid Base

A buffer solution made from HF and KF has a pH of 2.84. If the pKa for HF is 3.14, what is the $[F^-]/[HF]$ in the buffer?

$$\frac{[F^-]}{[HF]} = 0.5$$

$$pH = pKa + \log_{10}\frac{[\text{Buffer base}]}{[\text{Buffer acid}]}$$

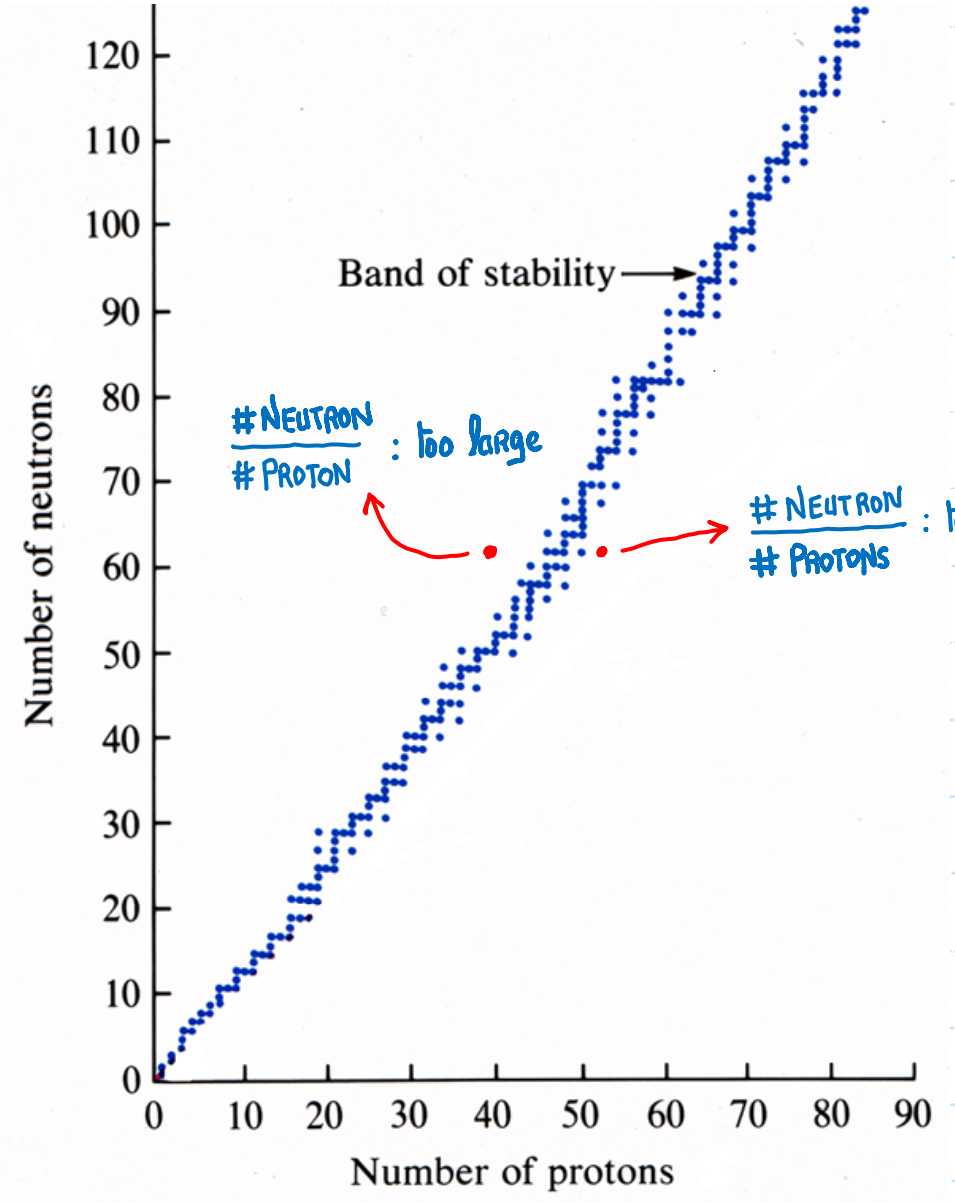
$$2.84 = 3.14 + \log_{10}\frac{[F^-]}{[HF]}$$

$$2.84 - 3.14 = \log_{10}\frac{[F^-]}{[HF]}$$

$$-0.3 = \log_{10}\frac{[F^-]}{[HF]}$$

$$[F^-]/[HF] = 10^{-0.3} = 0.501$$

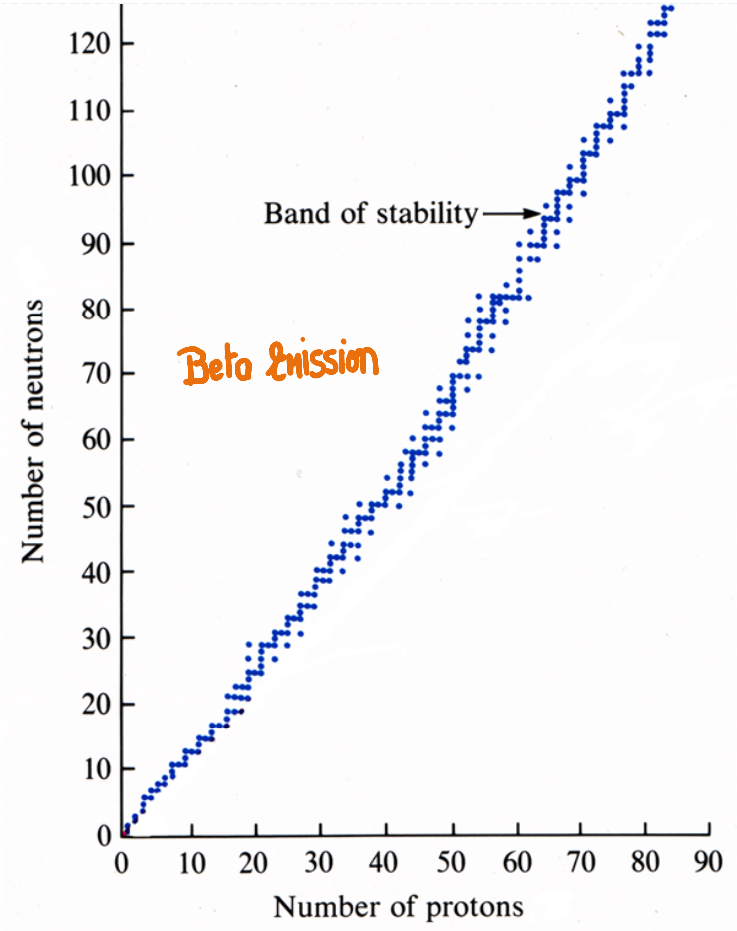
9.3 Nuclei Stability Zone?



9.3 What Happens When a Nucleus Emits Radioactivity

B – Beta Emission ($^{0}_{-1}e$)

Beta Emission ... $^{0}_{-1}\beta$ ... $^{0}_{-1}e$ .... Old $_{-1}e^{0}$



$^{60}_{27}Co \rightarrow {}^{0}_{-1}e + {}^{60}_{28}Ni$

? # Neutron / # Proton Ratio

$^{60}_{27}Co$: 33/27 = 1.222

$^{60}_{28}Ni$: 32/28 = 1.143

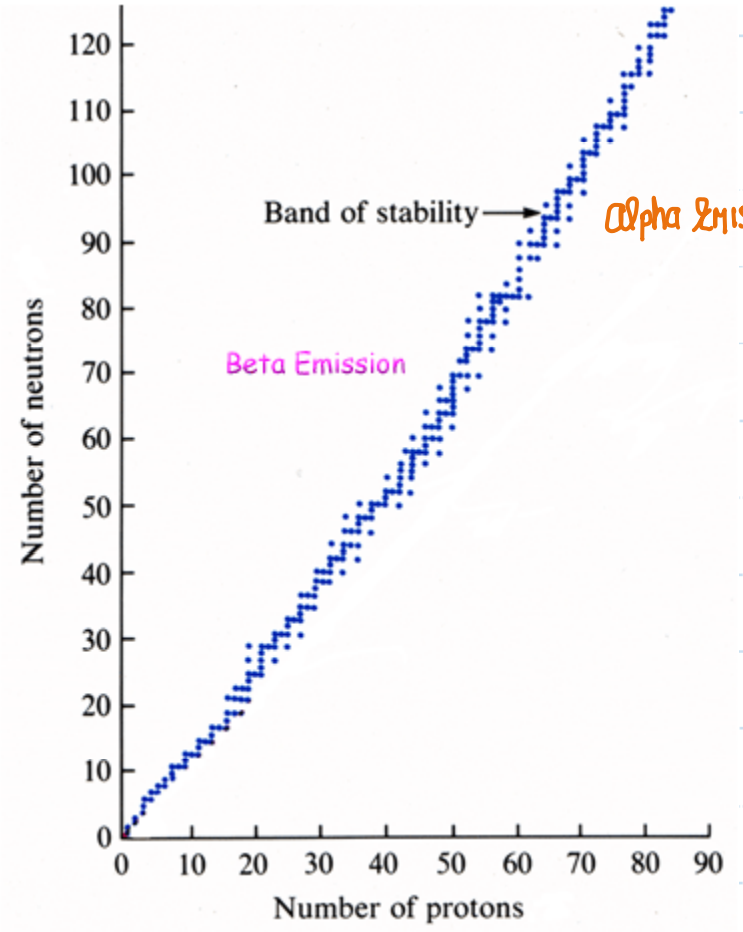
? Where does the nucleus get an electron

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

9.3 What Happens When a Nucleus Emits Radioactivity

C – Alpha Emission (^4_2He)

Alpha Emission ... $^4_2\alpha$ ... ^4_2He ... Ouf, $_2He^4$



$^{234}_{92}U \rightarrow {}^4_2He + {}^{230}_{90}Th$

? # NEUTRON/# PROTON Ratio

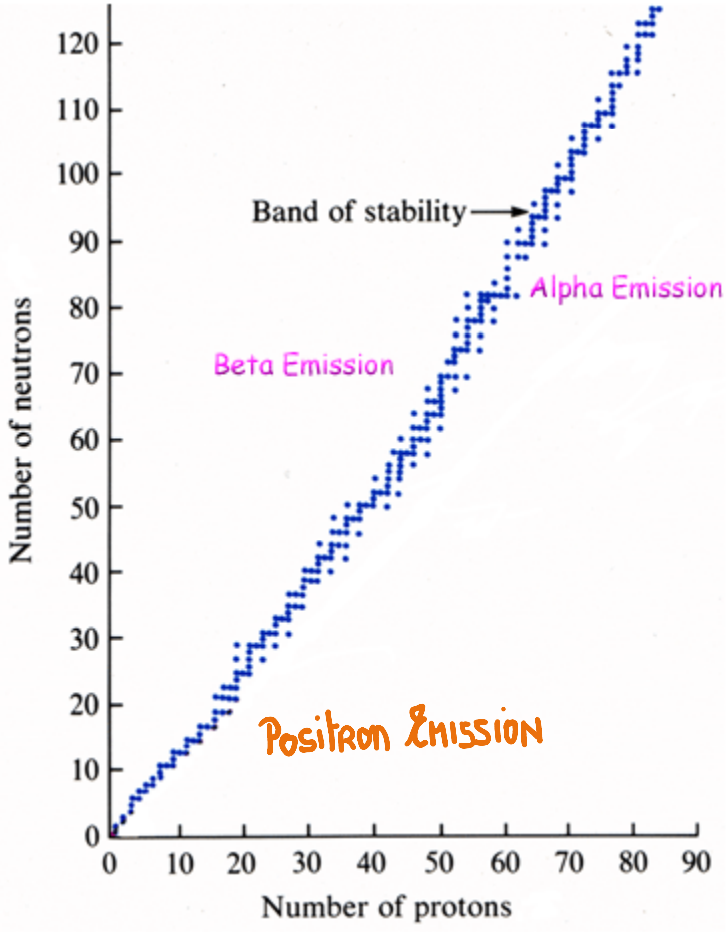
$^{234}_{92}U$: 142/92 = 1.543

$^{230}_{90}Th$: 140/90 = 1.556

9.3 What Happens When a Nucleus Emits Radioactivity

D – Positron Emission ($^{0}_{+1}e$)

Positron Emission ... $^{0}_{+1}\beta$ ... $^{0}_{+1}e$ .. Only $_{+1}e^{0}$



$^{15}_{8}O \rightarrow {}^{0}_{+1}e + {}^{15}_{7}N$ (Used in PET)

? # Neutron / # Proton Ratio

$^{15}_{8}O$: 7/8 = 0.875

$^{15}_{7}N$: 8/7 = 1.143

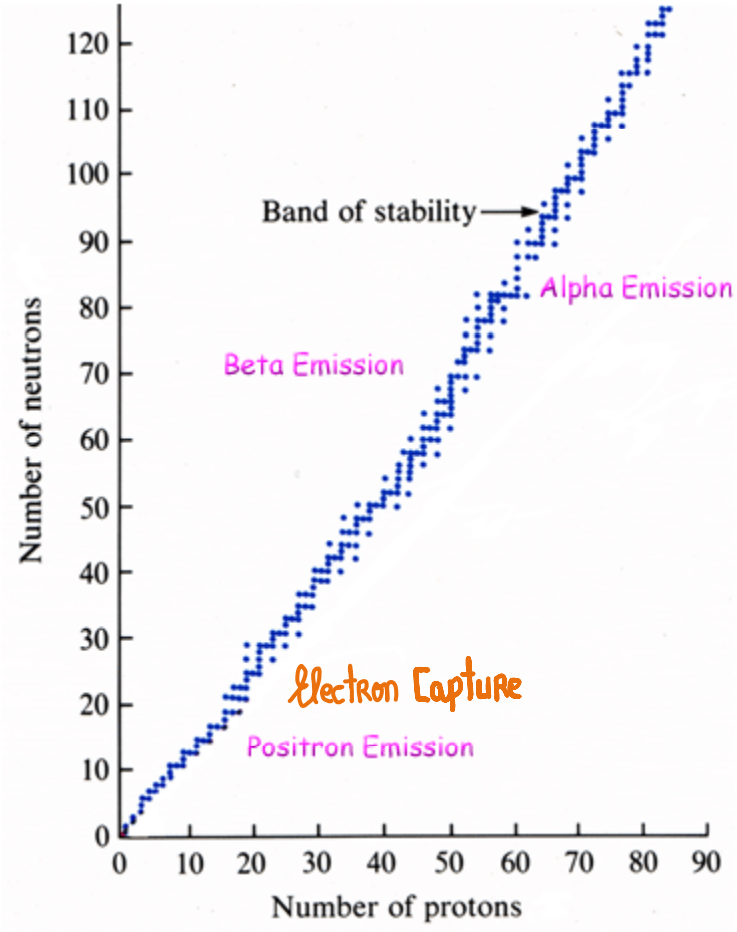
? Where does the nucleus get a positron.

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

9.3 What Happens When a Nucleus Emits Radioactivity

F – Electron Capture

Electron Capture ... Only $_{-1}e^{0}$



$^{41}_{20}Ca + {}^{0}_{-1}e \rightarrow {}^{41}_{19}K$

? # Neutron / # Proton Ratio

$^{41}_{20}Ca$: 21/20 = 1.050

$^{41}_{19}K$: 22/19 = 1.158

? An electron in the Nucleus

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

What volume of a 0.286 M solution of K_2CO_3 contains the same number of moles of K_2CO_3 as there are in 36.9 mL of a 0.155 M solution of K_2CO_3?

0.02 V(L)

$$M = \frac{\#\,mol}{V(L)} \quad \text{OR} \quad \#\,mol = M \times V(L)$$

$$\#\,mol\ K_2CO_3 = 0.155 \times 0.0369 = 5.72 \times 10^{-3}\ mol\ K_2CO_3$$

$$\#\,mol\ K_2CO_3 = M \times V(L)$$

$$5.72 \times 10^{-3} = 0.286 \times V(L)$$

$$V(L) = \frac{5.72 \times 10^{-3}}{0.286} = 0.02$$