Today: ch 19 continued
Friday / Monday: no class
Tuesday: Problem club with Ali is canceled

· for galvanic cells...
- the species that is easiest to reduce = best oxidizing agent = most positive E°
- the species that is easiest to oxidize = best reducing agent = most negative E°

· nuclear

Kr	36
83.8	

$^{83}_{36}Kr$ $^{84}_{36}Kr$ $^{86}_{36}Kr$ — stable isotopes

$^{91}_{36}Kr \rightarrow {}^{0}_{-1}\beta + {}^{91}_{37}Rb \rightarrow {}^{0}_{-1}\beta + {}^{91}_{38}Sr$

also too many neutrons

too many neutrons → β emission

probably stable ∴

too few neutrons: $^{1}_{1}p + {}^{0}_{-1}e \rightarrow {}^{1}_{0}n$ (electron capture) OR $^{1}_{1}p \rightarrow {}^{1}_{0}n + {}^{0}_{+1}\beta$ (positron emission)

$^{80}_{36}Kr + {}^{0}_{-1}e \rightarrow {}^{80}_{35}Br$ stable ∴ OR $^{80}_{36}Kr \rightarrow {}^{0}_{+1}\beta + {}^{80}_{35}Br$ stable ∴

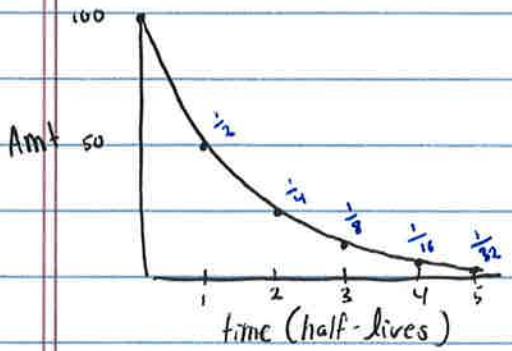
· First order kinetics

$$\ln\left(\frac{[A]_0}{[A]_t}\right) = kt$$

or $\frac{N_0}{N_t}$ or $\frac{100\%}{Pct_t}$ or $\frac{m_0}{m_t}$ or $\frac{\text{activity}_0}{\text{activity}_t}$ (as long as units are the same top/bottom ✓)

$$t_{1/2} = \frac{0.693}{k} \quad \text{or} \quad k = \frac{0.693}{t_{1/2}}$$

$$\text{rate} = k[A]^1 = kN^1$$



after n half lives, $\frac{1}{2^n}$ remains

· What % of a dose remains after 1 week? $^{99}_{43}Tc$ $t_{1/2} = 6.00\,hrs$

$k = \frac{0.693}{6.00\,hrs} = 0.1155\,hr^{-1}$

$\ln\left(\frac{100}{Pot_t}\right) = (0.1155\,hr^{-1})\left(\frac{1\,week}{1\,week}\left|\frac{7\,days}{1\,week}\right|\frac{24\,hr}{1\,day}\right)$

$Pt_t = 3.7 \times 10^{-7}\,\%$

19.55. ^{36}Cl has a $t_{1/2} = 3.0 \times 10^5$ yrs. How many beta particles are emitted per minute from a 5.0 mg sample?

$k = \frac{0.693}{3.0 \times 10^5\,yrs} = 2.31 \times 10^{-6}\,yrs^{-1}$ → [redacted] $4.33 \times 10^{-12}\,min^{-1}$

$N = \frac{5.0 \times 10^{-3}\,g}{36\,g}\left|\frac{mol}{mol}\right|\frac{6.02 \times 10^{23}}{mol} = 8.4 \times 10^{19}$ atoms

rate $= kN^+ = (4.33 \times 10^{-12}\,min^{-1})(8.4 \times 10^{19}\,atoms) =$ 3.6×10^8 atoms/minute

$^{238}_{92}U \rightarrow {}^{4}_{2}\alpha + {}^{234}_{90}Th$ $\quad t_{1/2} = 4.51 \times 10^9$ yrs

$^{234}_{90}Th \rightarrow {}^{0}_{-1}\beta + {}^{234}_{91}Pa$ $\quad t_{1/2} = 24$ days

$^{234}_{91}Pa \rightarrow {}^{0}_{-1}\beta + {}^{234}_{92}U$ $\quad t_{1/2} = 6.8$

$^{234}_{92}U \rightarrow {}^{4}_{2}\alpha + {}^{230}_{90}Th$ $\quad t_{1/2} = 247{,}000$ yr

$^{230}_{90}Th \rightarrow {}^{4}_{2}\alpha + {}^{226}_{88}Ra$ $\quad t_{1/2} = 80{,}000$ yr

eventually overall: $^{238}_{92} \rightarrow 6\,{}^{0}_{-1}\beta + 8\,{}^{4}_{2}\alpha + {}^{206}_{82}Pb$ (balance top number first)

$t_{1/2} = 4.51 \times 10^9$ yrs