

Gen Chem w/ Doc M

Today 4/10 Nuclear Chem Sect 19.1 - 19.4

Wednesday 4/12 Finish Chp 19

Easter Break - Start looking at review for final

Tuesday 4/18 Review session w/ Monika HTTC 108
5-6:30pm

Wednesday 4/19 Start Chp 11

Thursday 4/20 Last Lab Expt #12

Isotopes

#p + #n → 12

#p → 6C

${}^{13}_{6}\text{C}$

${}^{14}_{6}\text{C}$

← Unstable nucleus
"decays"

C-12

C-13

C-14

6p

6p

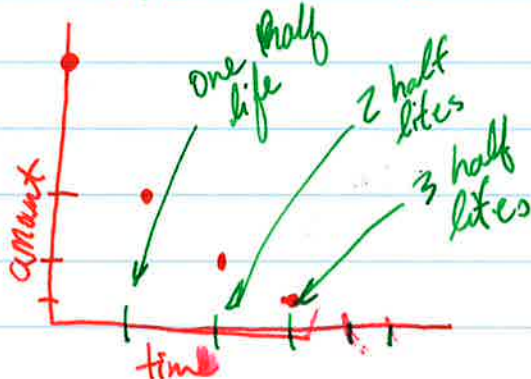
6p

6n

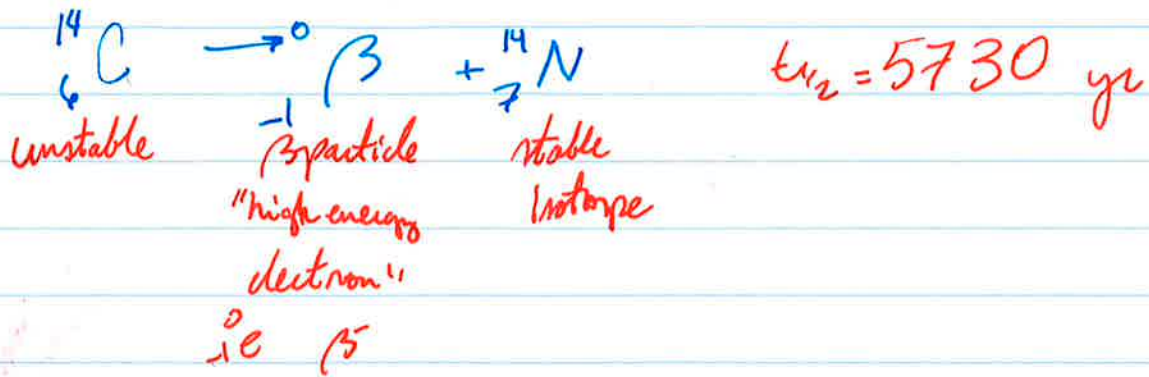
7n

8n

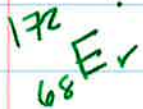
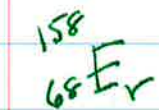
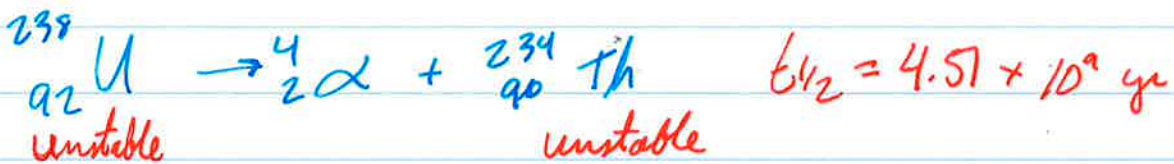
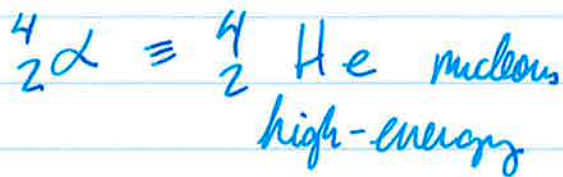
Nuclear decay
processes follow
1st order kinetics



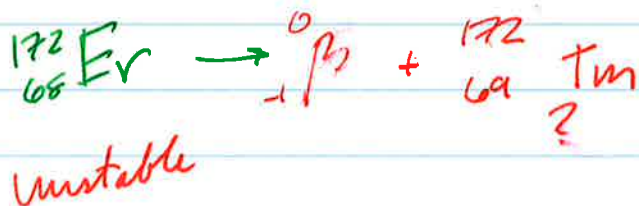
half life = amount
of time it takes
for half of material
to decay (or go away)



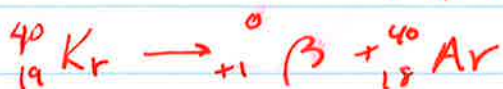
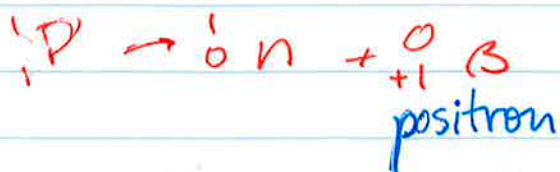
α particle emission



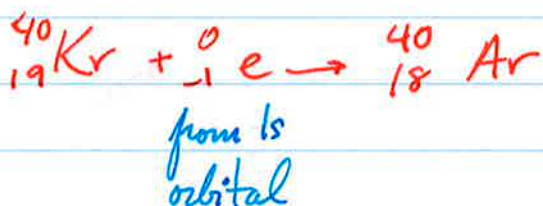
too many neutrons (unstable)



Positron Emission



Electron capture



1st Order Kinetics: time conc expression

$$\ln \frac{[A]_0}{[A]_t} = kt$$

$$\ln \left(\frac{N_0}{N_t} \right) = kt \Rightarrow N \text{ is amount of something, moles, conc, mass, \%}$$

try to find $t_{1/2}$

$$\ln \left(\frac{100\%}{50\%} \right) = \ln 2 = kt$$

$$t = \ln 2 / k = 0.693/k$$

given $t_{1/2} \rightarrow k \rightarrow$ then use time-gty expression
$$\ln\left(\frac{N_0}{N_t}\right) = kt$$

$^{131}_{53}\text{I}$ is used to treat thyroid cancer. It has $t_{1/2} = 8.05 \text{ days}$
How long does it take for a sample to decrease
to 5% of its original amt?

$$k = \frac{0.693}{t_{1/2}} = \frac{0.693}{8.05 \text{ days}} = 8.61 \times 10^{-2} \text{ days}^{-1}$$

$$\ln\left(\frac{N_0}{N_t}\right) = \ln\left(\frac{100.0}{5.0}\right) = kt$$

$$t = \ln\left(\frac{100}{5}\right) / k =$$

Living tissue emits 920 dph/g Carbon

How long ago did a cat live \rightarrow disintegrations per hour
for which the rate of C-14 decay is now 280 dph/g

$$k = \frac{0.693}{5730 \text{ yr}} = 1.21 \times 10^{-4} \text{ yr}^{-1}$$

$$\ln\left(\frac{920 \text{ dph/gC}}{280 \text{ dph/gC}}\right) = 1.21 \times 10^{-4} * t$$

$$t = 9830 \text{ yrs}$$