Jumpstart #4C

GET OUT YOUR CALCULATORS!

1) How many molecules are in 15 grams of $Ca(OH)_2$

p. 65 KCQ – I can use the half life equation to solve half life problems

Half Life Calculations

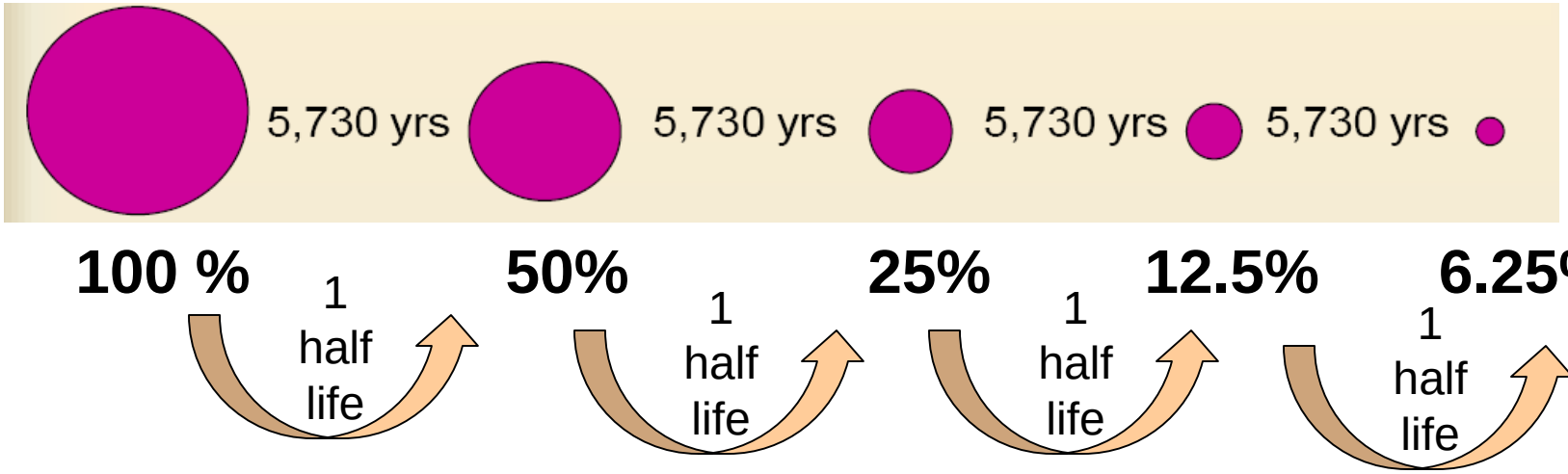
$\alpha \ \beta \ \gamma$

Rates of Decay & Half Life

- Atoms are radioactive when they have too many neutrons. Nucleus can't hold itself together.
- **Radioactive elements** have different stabilities and decay at ***different rates.***

Half Life

- The length of time it takes for 50% of the material to have undergone radioactive decay.
- Example: Carbon-14, half life = 5,730 years



Half Life Examples

Oetzi, the "ice man" was found by hikers in the Alps between Switzerland and Italy. He was carbon dated to 5,300 yrs old! One of the oldest frozen humans ever found – and the best preserved.

How much is left?

- If I start with 20 grams of Carbon-14 and the half life is 5,730 years…how many grams am I left with after 5,730 years?

5,730 years = 1 half life

20 grams/2 = 10 grams

But what if the problem is harder??? What if you started with 17.4 grams, and 12,901 years went by? How much would you be left with???

We have a handy-dandy equation we can use!!!

$$A_E = A_S \times 0.5^{\left(\frac{t}{h}\right)}$$

\# of half lives

A_E = amount ending with

A_S = amount starting with

t = time gone by

h = length of the half life

Let's give it a try!

- You start with 157 grams of carbon-14 and the half-life of carbon-14 is 5730 years. How much would be left after 2000 years?

A_E = amount ending with = ???

A_S = amount starting with = 157 grams

t = time gone by = 2000 years

h = half life = 5730 years

A_E = amount ending with = ???

A_S = amount starting with = 157 grams

t = time gone by = 2000 years

h = half life = 5730 years

$$A_E = 157 \times 0.5^{\left(\frac{2000}{5730}\right)} = 123.26 \text{ grams}$$

$$A_E = A_S \times 0.5^{\left(\frac{t}{h}\right)}$$

Fraction left over? Percent left over? Not covered in 2016

$$\frac{A_E}{A_S} = 0.5^{\left(\frac{t}{h}\right)}$$

Fraction Left Over

$$\frac{A_E}{A_S} \times 100 = \text{\% left over}$$