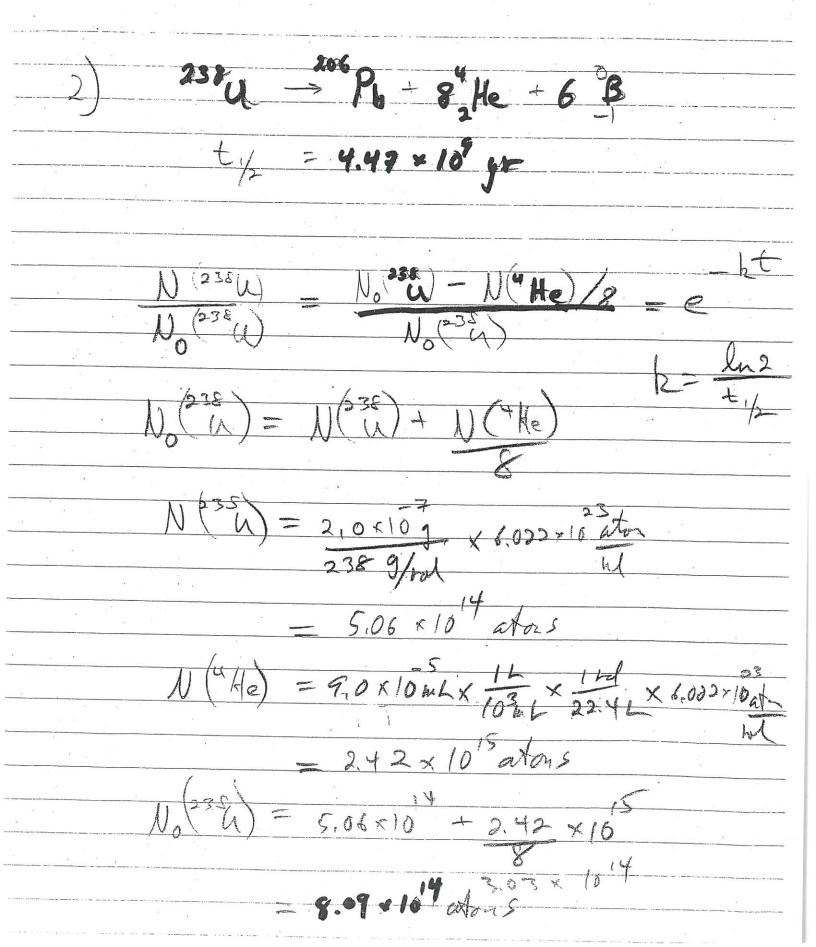
- Tritium (³H) decays by beta emission with a half-life of 12.26 years. A sample of tritiated compound has an initial activity of 0.833 Bq. Calculate the number N_i of tritium nuclei in the sample initially, the decay constant k, and the activity after 2.50 years.
- 2. Over geological time, an atom of ²³⁸U decays to a stable ²⁰⁶Pb atoms by the emission of eight alpha emissions, each of which leads to the formation of one helium atom. A geochemist analyzes a rock and finds that it contains 9.0 x 10⁻⁵ mL of helium (at STP) per gram and 2.0 x 10⁻⁷ g of ²³⁸U per gram. Estimate the age of the mineral, given that the half life of ²³⁸U is 4.47 x 10⁹ years.
- 3. The half lives of 235 U and 238 U are 7.04 x 10^8 and 4.47 x 10^9 years respectively, and the present abundance ratio is 238 U/ 235 U = 137.7. It is thought that their abundance ratio was 1 at some time **before** our earth and solar system were formed about 4.5 x 10^9 years ago. Estimate how long ago the supernova occurred that supposedly produced all the uranium isotopes in equal abundance, including the two longest lived isotopes, 238 U and 235 U.
- 4. The beta decay of ⁴⁰K that is a natural part of the body makes all human beings slightly radioactive. An adult weighing 70.0 kg contains about 170 g of potassium. The relative abundance of ⁴⁰K is 0.0118%, its half-life is 1.28 x 10⁹ years, and its beta particles have an average kinetic energy of 0.55 MeV. (There are 1.602 x 10⁻¹³J/MeV)

a. Calculate the total activity of ⁴⁰K in this person.

b. Determine (in rad per year) the annual radiation absorbed dose arising from this internal ⁴⁰K.

Some Nuclear Chemistry Publems $) A = A_0 e^{-kt}$ and $A = -\frac{dV}{dt} = kV$ Ao = 0.833 Be t/ = 12.26 year R = tu2 12.26 years = 5.6537 × 10 gr = (365 × 24 × 60 × 60) s × 5.6537 × 10 - 4 $= 1.7928 \times 10^{-9} \text{ s}^{-1}$ $N_0 = A_0 = 0.833 \frac{3H}{S} = \frac{4.6464 \times 10^{3} H}{1.7928 \times 10^{-9} J}$ $A = A_0 = -0.633B_0 = 0.633B_0$

 $= 0.833 \times 0.8682 \quad B_{6}$ $= 0.723 \quad B_{6}$



2) 04 N (235W) ln 0.625 = -1.55/×10'5' t $t = \frac{\ln 6.605}{-1.551 \times 10^{10}} = \frac{-0.470}{-1.551 \times 10^{10}}$ = 3,0 × 10 /2 3.0 billion years ago noch was formed,

3) Cons

In 137,7 = 8,295 ×10 t

E= 293 ×10-10

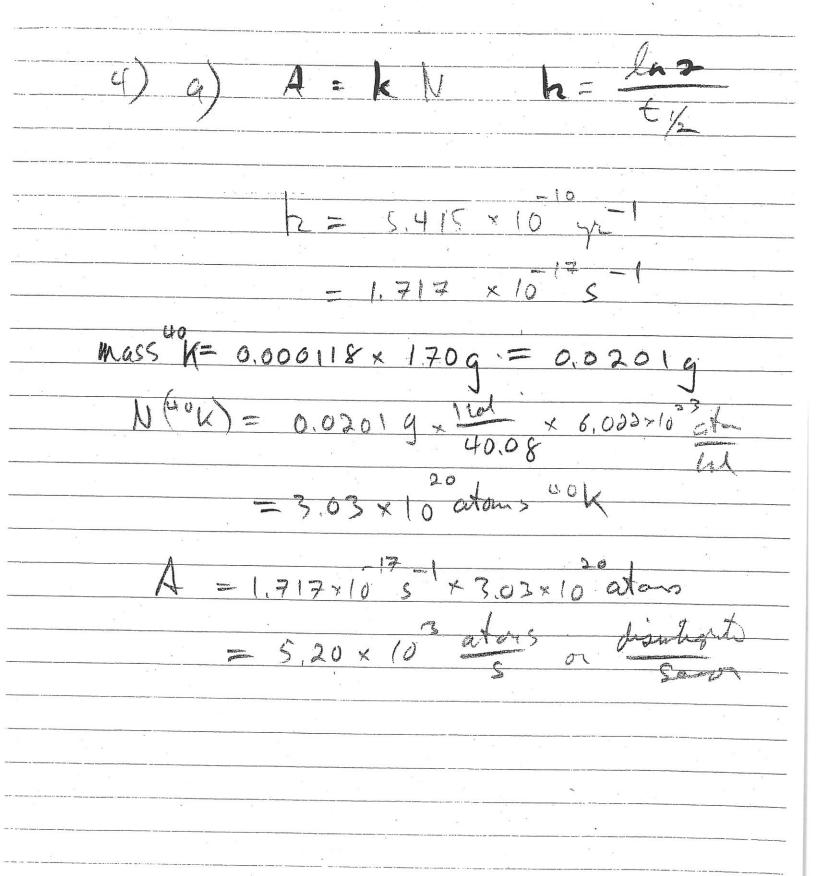
= 4,925 8,295 × 10

= 5,9 × (0 years

6 hillion years ago

a hove created the seromin

235 8,295 × 10 t 132.7



4 b) Energy rulensed per year =

3.154×10 5×15.20×10 \$ x 0.55 MoV x 1.602×10 \$

= 1.45×10 \$ a. 1.45 c.)

1.45 cd = 2.1 x10 cd | Kgy

 $= 2.1 \times 10^{-2} \text{ vad}$

= 21 m tad