HONORS CHEMISTRY UNIT 5 NOTES (NUCLEAR CHEMISTRY)

RADIOACTIVE DECAY

Radioactive

Becquerel and the Curies





Nucleons

Nuclide

Reminder: Mass number and Atomic Number

Types of Radioactive Decay

|  |  |  |
| --- | --- | --- |
| PARTICLE/RAY | SYMBOL(S) | PENETRATING POWER |
| Alpha Particle |  |  |
| Beta Particle |  |  |
| Gamma Ray |  |  |
| Positron |  |  |
| Neutron |  |  |
| Proton |  |  |

Terminology used with the above particles

1. Emission(emitted)
2. Production
3. Capture
4. Release
5. Absorbed

The purpose of radioactive decay

Decay series

Balancing nuclear reactions

Reactant mass numbers and atomic numbers must equal product mass numbers and atomic numbers.

Examples

23592U → 42He + \_\_\_\_\_\_\_

Carbon-11 produces a positron

23592U + 0-1e → \_\_\_\_\_\_\_

22688Ra decays by alpha emission

CHECK POINT:

Bismuth-241 produces a beta particle

19579Au + \_\_\_\_\_\_ → 19578Pt

3819K → 3818Ar + \_\_\_\_\_\_

Thorium-232 decays by proton capture

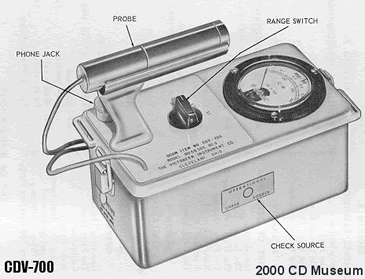
NUCLEAR TRANSFORMATIONS

History

How is it done?

DETECTION OF RADIOACTIVITY AND THE CONCEPT OF HALF-LIFE

Geiger Counter



Half-life

Variables in solving half-life problems

mo

mt

t

t1/2

EXAMPLES

1. mo= 100 g, mt = 25 g, t1/2 = 5 minutes, t =

2. mo = 200 g, mt = , t1/2 = 15 years, t = 60 years

3. mo= , mt = 90 g, t1/2 = 1.2 x 104 years, t = 6.0 x 104 years

4. mo = 50 g, mt = 6.25 g, t1/2 = t = 12 seconds

DATING BY RADIOACTIVITY

MEDICAL APPLICATIONS OF RADIOACTIVITY

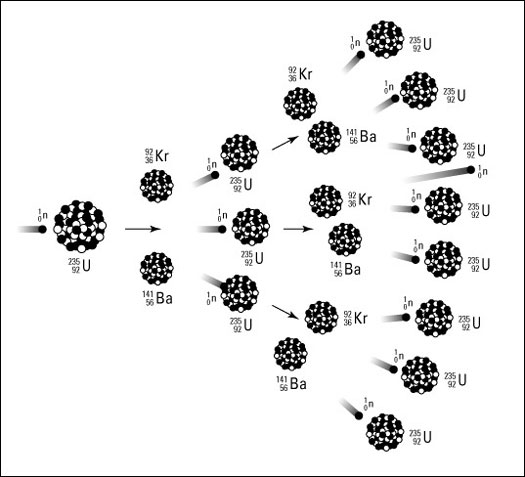
NUCLEAR ENERGY

Fission

Fusion

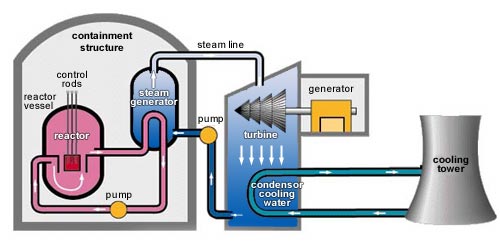
NUCLEAR FISSION

Chain reaction



Critical mass

NUCLEAR REACTORS



NUCLEAR FUSION

EFFECTS OF RADIATION