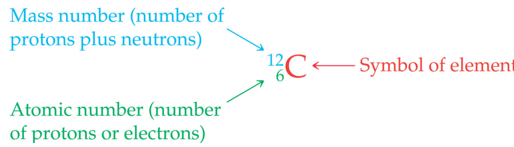
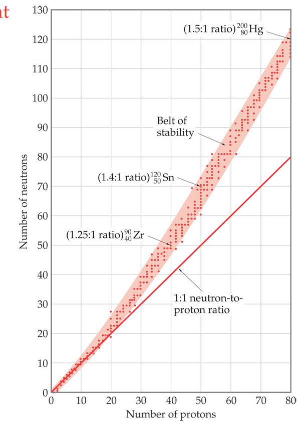




I. Things to remember:
  A. The nucleus is made up of
  B.
  C.
  D. Isotopes:
II. Radioactivity
  A. Many nuclei are
  B. To become stable, these nuclei will
III. Why are they radioactive?
  A. Remember that protons and that a
  B. Neutrons
  C. Therefore, the
  D. For elements 1-20, stable nuclei have a
  E. Larger nuclei need
  F. The region where the p^+ to n^o ratio yields stable nuclei is known as the

I. To become stable, unstable nuclei into more stable ones.
II. Types of nuclear particles
  A. Alpha particle: or
    1.
  B. Beta particle: ;
    1.
    2. Beta particle production
    3.

  C. Gamma particle:
    1.
    2. Almost always
  D. Positron: ; known as
    1.
    2.
  E. Neutron: ;
  F. Proton: ;
III. Balancing nuclear equations:
  A. The atomic masses and numbers must be ________ on both sides of the _______
  B. Examples:

IV. Predicting decay reactions:
  A. The nuclear particle involved and the initial nucleus is always stated in the problem.
  B. Write the initial nucleus as the ____________________ (look up the atomic # from the PT) and the nuclear particle where it belongs then fill in the blank!
  C. Examples:
    1. alpha decay of iridium-174

    2. beta decay of platinum-199

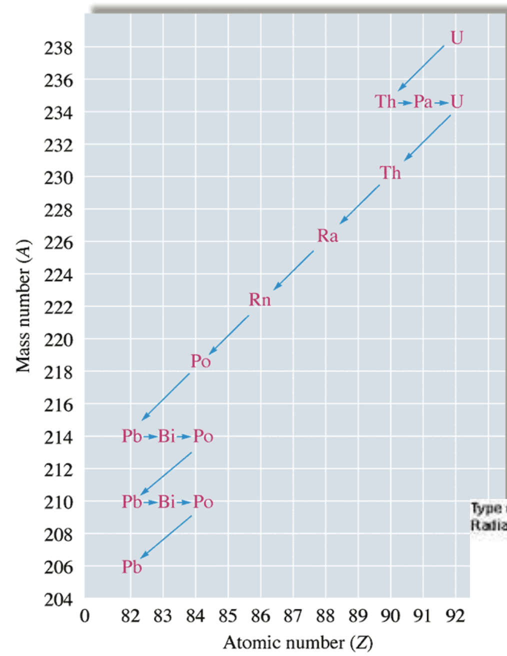
    3. positron emission of sulfur-31

    4. krypton undergoes electron capture

V. Decay series: A set of decay reactions a nucleus goes through to become a stable product (some go through A LOT!)

A. Uranium-238 undergoes the following:

B. Write the reactions and determine the final products.



VI. _______________ of nuclear decay.

A. Radioactive decay is ALWAYS ____________________!

B. Equations: __________________ ; ________________________ ; ________________________

1. $[A]_t$ = ________________
2. $[A]_0$ = _________________
3. k = _________________

C. Examples:

1. Technetium-99 is used to form pictures of internal organs in the body and is often used to assess heart damage. The rate constant for $^{99}_{43}Tc$ is known to be 1.16 x 10^{-1} hours. What is the half-life of this nuclide?

a. _____________________

2. The half-life of molybdenum-99 is 67.0 hours. How much of a 1.000 mg sample of $^{99}_{42}Mo$ remains after 335 hours?

3. A wooden artifact from a Chinese temple has a Carbon-14 activity of 24.9 counts per minute as compared with an activity of 32.5 counts per minute for a standard zero age. From a half-life of 5715 yr, determine the age of the artifact.

a. ________________________

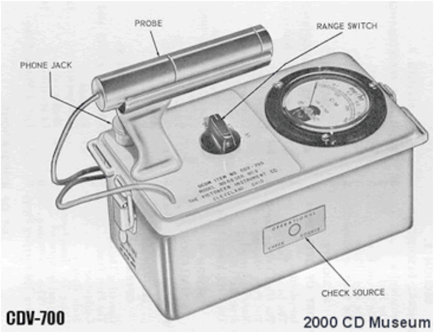
VII. Detection and uses for radioactive decay:

A. Detected using a _________________________________:

1. Different probes detect different things.

B. Uses:

1. How old things are (______________________________)
2. Medical uses (______________________________)
3. Energy (______________________________)
4. Weapons (______________________________)

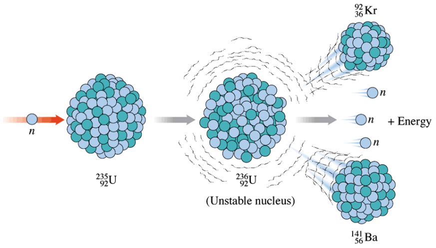


VIII. Why is the nucleus so significant?

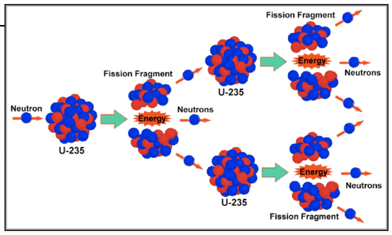
A. You can get A LOT of energy from a little bit of mass.

B. ______________________________

C. Formation of oxygen nuclei: 8 p^+ and 8 n^o; mass of p^+ = 1.67262×10^{-27} kg; mass of n^o = 1.67493×10^{-27} kg; Actual mass of oxygen = 2.65535×10^{-26} kg



1. Theoretical mass of oxygen nuclei: 2.67804×10^{-26} kg
2. Mass difference: __________________
3. Mass became energy!!!
4. From above equation, amount of energy gained from mass lost = __________________
5. Energy from one mole = ______________________________
6. All this energy is called ______________________________!
7. Energy released from one mole of CH_4 = 882 kJ/mol



I. Fission:

A. When large nuclei ____________

B. A ____________ is usually needed for this to happen

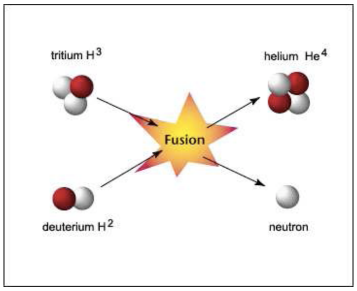
C. A fission reaction yields more neutrons to cause other nuclei to split. (called a ______________________________)

II. Fusion:

A. When small nuclei ______________________________

B. Happens on the ____________.

C. The neutron can be used for other reactions (____________)



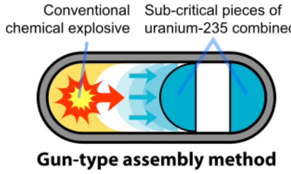
III. How does a nuclear bomb works:

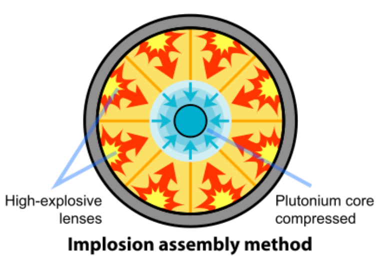
A. Need a ______________________

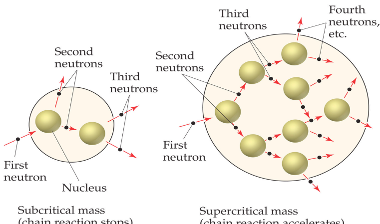
1. If you don't have enough of the neutrons, you are __________________
2. If you just have enough neutrons, you have ________________
3. If you have a lot more than you need, you are ______________________and the reaction speeds up! That's what you need in a bomb.
4. You need a big mass because you want to neutrons to bounce around within the mass. If it's too small, the neutrons fly out and they won't cause the radioactive nuclei to split!

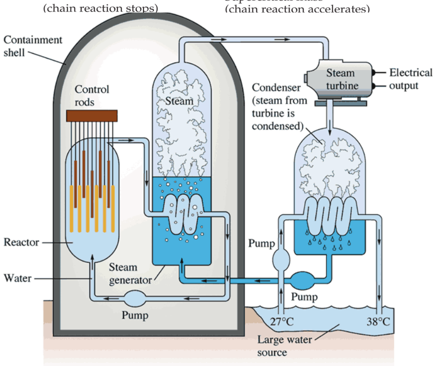
B. Types: An explosion

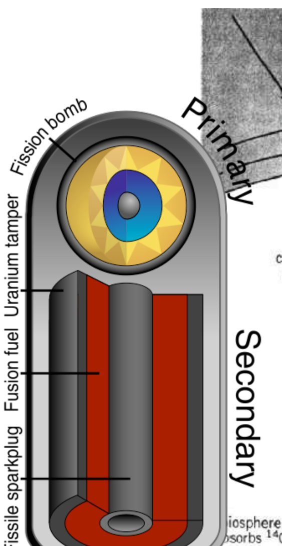
1. Gun-type assembly
2. Implosion assembly
3. Hydrogen bomb











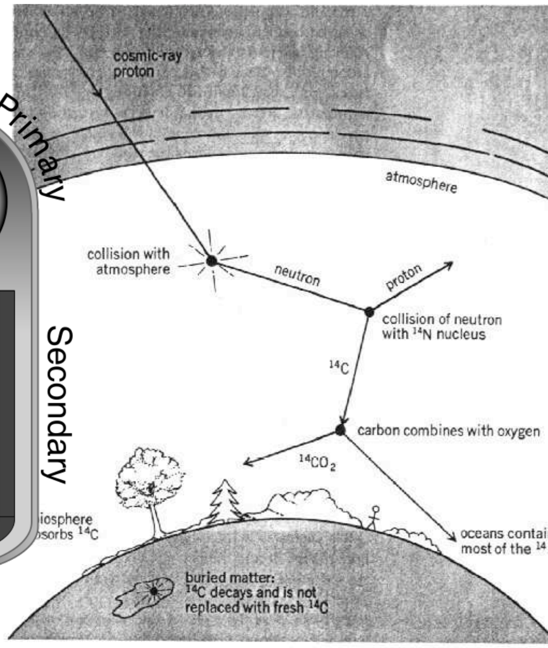


Fig. 1. Generation, distribution, and decay of ^{14}C.