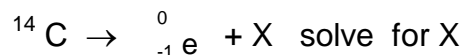


## Nuclear Chemistry:

1. Elements with atomic number greater than lead (82) are naturally radioactive.
2. **Transmutation** is the decay of the nucleus of an atom, becoming a nucleus of a totally different atom. Refer to **TABLE N** for decay modes.
3. There are three types of radiation: (**TABLE O**)

RADIATION	DESCRIPTION	CHEMICAL SYMBOL	CHARGE
ALPHA	helium nucleus	${}^4_2\text{He}$	positively charged
BETA	electron	${}^0_{-1}\text{e}$	negatively charged
POSITRON	+ charged electron	${}^0_{-1}\text{e}$	Positively charged
GAMMA	high energy radiation	$\gamma$	zero charge

4. A nuclear decay equation shows **transmutation (NUCLEAR CHANGE)**:  
example:  ${}^{14}\text{C}$  undergoes beta decay



balance top numbers...  $14 = 0 + \text{X}$  ... X must be 14

balance bottom numbers... look up C atomic number = 6 = -1 + X... X is 7 **NOT 5**

- A transmutation may be natural... One thing on the left side of the arrow
- A transmutation may **be INDUCED or ARTIFICIAL**... we make it happen... there are two or more things on the left side of the arrow.

5. Half-Life is the time for  $\frac{1}{2}$  of a radioactive sample to decay (**TABLE N**). Half-life information :

Half Life	Time	Fraction Left	Amount Left
0	0	1	

6. **Fission - the splitting of the nucleus of atoms takes place in a nuclear reactor.**  
This process is EXOTHERMIC, producing a lot of energy.
7. **Fusion is the nuclear process of joining 2 nuclei together to produce energy. Fuels for fusion are isotopes of hydrogen, deuterium and tritium. (Isotopes of Hydrogen found on Table J)**
8. Radioactive elements are helpful:
  - Iodine - 131 - used in diagnosis of thyroid disorders (cancer)
  - Cobalt-60 - used in cancer therapy
  - Carbon -14 - used in radioactive dating of fossils
  - Uranium-238 - used for geological dating