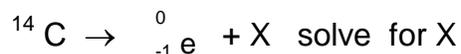


Nuclear Chemistry:

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 | γ | 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