CARBON-14 DATING METHOD

Sources of Carbon in the Nature

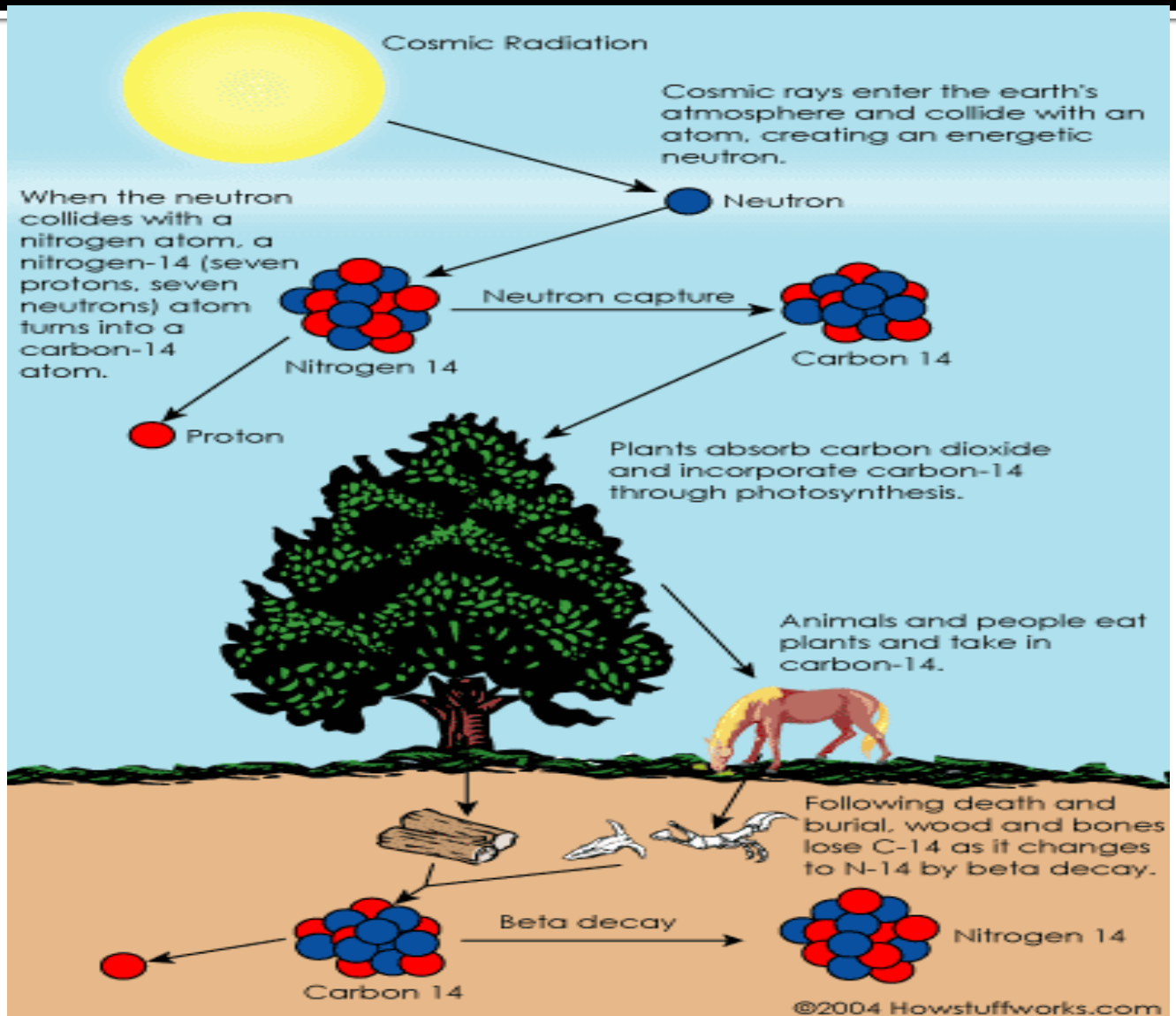
- In every organic molecules,
- As diamond or coal,
- As Graphite

- In different forms of isotopes

Isotopes of Carbon

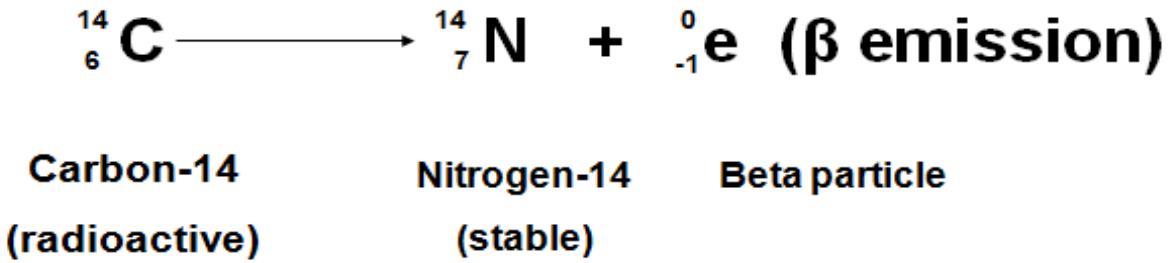
Atom	Protons	Neutrons
Stable Carbon	6	6
Stable Nitrogen	7	7
Carbon 14	6	8

Production of Carbon 14



Production of Carbon 14

1-cosmic rays knock neutrons out of atomic nuclei in the upper atmosphere
2-Accelerated neutrons hit ^{14}N at lower altitudes, converting it into ^{14}C
3-^{14}C is radioactive element and makes beta decay with halflife 5700 years.



After the production of C-14

- Carbon 14 atoms makes compound with oxygen molecules
- Then $CO_2(C_{14})$ molecules absorb from plants and used for photosynthesis.
- As a result animals eats the plants that contains C_{14}

Dating

- C14 dating method can be used only lived creatures such as animals, plants or other organic materials.

- The carbon 14 to carbon 12 ratio is not change in the athmosphere, BUT when a living creature dead the carbon 14 to carbon 12 ratio decreases. Since C_{14} is radioactive isotope.

Calculation

- $t = [\ln (N_f/N_o) / (-0.693)] \times t_{1/2}$

- N_f/N_o is % of Carbon 14 ratio sample over living tissue.
- $t_{½}$ half life of Carbon 14

Maximum measurable range

- Since measurable activity is 10 half-life of parent nuclei carbon 14 dating system can make dating up to 57000-60000 years, half-life of C14 is 5700 years.