Science 10

Notes: Types of Radioactivity

nuclear radiation comes from radioactive / unstable nuclei

Radioactive Decay

The nuclei of most isotopes are stable.

When a nucleus is unstable it will undergo radioactive or nuclear decay gaining stability by emitting radiation. Isotopes that are radioactive are called radio isotopes.

Example: carbon-12 (stable isotope) carbon-14 (unstable radio isotope)

When a radioisotope undergoes nuclear decay, it can produce 3 different kinds of radiation:

1. Alpha Radiation - radiation is a particle

   Composition: α particle is a helium nucleus $^{4}_{2}He$ or $^{4}_{2}\alpha$

   Charge: +2

   Mass: 4 mass units

   Speed: slow compared to other radiation

   Shielding needed: paper or skin

   Decay equation:

   $^{226}_{88}Ra \longrightarrow {}^{222}_{86}Rn + {}^{4}_{2}He$ (α particle that is emitted)

2. Beta Radiation

   Composition: β-particle is an electron produced when a neutron → proton + electron $^{0}_{-1}\beta$ or $^{0}_{-1}e$

   Charge: -1

   Mass: 0

   Speed: faster than α

   Shielding needed: aluminum foil, math textbook

   Decay equation:

   $^{131}_{53}I \longrightarrow {}^{131}_{54}Xe + {}^{0}_{-1}\beta$ (mass stays same)

   overall charge = 53 → overall charge = 53

alpha and beta radiation are charged particles, can be physically deflected by a magnetic or charged field

3. Gamma Radiation - pure electromagnetic radiation / waves

Composition: - not a particle; ray (like light) ${}^{0}_{0}\gamma$

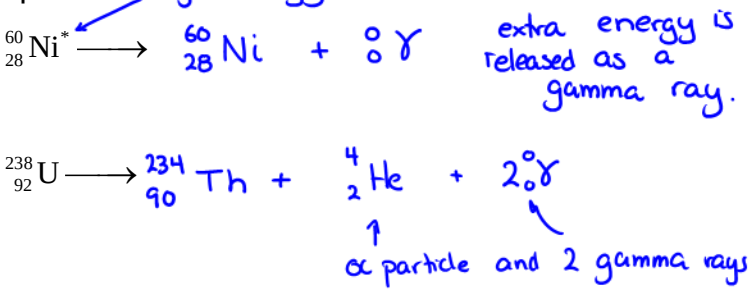
Charge: 0

Mass: 0

Speed: speed of light

Shielding needed: thick concrete or dense metals like lead

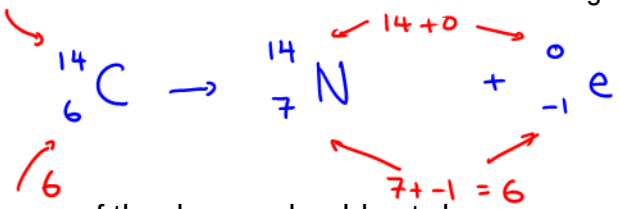
Decay equation: high energy nucleus



sometimes in α or β decay you also get production of γ-rays.

Nuclear Equations

- The sum of the mass numbers should not change



- The sum of the charges should not change

① p125-126 workbook

② worksheet