

Nuclear Chemistry Overview (Ch. 21)

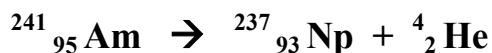
- I. Atom review
- A. **atomic number**— *number of protons in the nucleus* (listed on per. table)
 - B. **mass number**— *total protons and neutrons in the nucleus* (not listed on per. table)
 - C. **isotope**— *atoms of the same element that contain different numbers of neutrons*

mass number	14
SYMBOL	C
atomic number	6

- II. Nuclear reactions
- A. **nuclear reactions**—*chemical reactions converting matter to energy*
 - B. violate the Conservation Laws
 - C. involves **transmutation**—*the changing of one element into another element*

- III. Radioisotopes
- A. **radioisotopes** (*radioactive isotopes or radionuclides*)
 - 1) *radioactive forms of an element*
 - 2) *unstable isotopes which spontaneously release particles*
 - B. **half life**—*the time it takes for half the amount of a radioisotope to decay*
(from a fraction of a second to thousands of years)

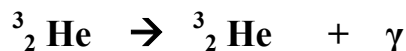
- IV. **Radiation**—*emissions from a radioactive material*
- A. **alpha particle (α)**
 - 1) characteristics: made of He nuclei (2 protons, 2 neutrons); *positively charged*
 - 2) alpha decay example:



- B. **beta particle (β)**
 - 1) characteristics: made of electrons; *negatively charged*
 - 2) beta decay example:



- C. **gamma radiation (γ)**
 - 1) characteristics: made of electromagnetic (em) radiation, no charge
 - 2) gamma decay example:



${}^4_2\text{He or } \alpha$	${}^0_{-1}\text{e or } \beta^-$	γ
ALPHA	BETA	GAMMA

V. **Fission**

- A. *splitting of a nucleus into smaller fragments, changing the identity of the atoms involved*
- B. done with neutron (n^0) bombardment
- C. more neutrons are released, causing even more rxns.--- “chain reaction”



VI. **Fusion**

- A. **fusion**—*combining of two nuclei to form a new, heavier nucleus, changing the identity of the atoms involved*
- B. *gives off huge amounts of energy*
- C. fusion examples
 - 1) fusion in the sun
 - a) *proton-proton chain*
 - b) summary



- 2) fusion reaction for possible power generation
 - a) *deuterium-tritium reaction – D-T Reaction*
 - b) summary

RADIOACTIVITY SYMBOL

