Name: _____ **Date:** _____

Chemistry *~ Ms. Hart* **Class:** Anions or Cations

10.1 Intro to Nuclear Chemistry- Guided Notes

SPARK

1. What particles are in the nucleus of an atom?

2. What is an isotope of an element?

3. What do you already know about radioactivity?

SWBAT:

- Describe what nuclear reactions are and how they differ from chemical reactions.
- Explain what radioactivity is and why radioactive material can be harmful to humans.
- Define nuclear fission and nuclear fusion.

Brainpop:

1) What is radioactivity?

2) What are some types of radiation? Which one is the most harmful to humans?

3) What does it mean to have an unstable nucleus?

4) What can radiation do to human cells?

Guided Notes

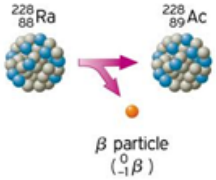
- Radioactive atoms undergo _____.
  - Atoms emit radiation:
    - Alpha Particles $^{4}_{2}\alpha$ or $^{4}_{2}He$

      $^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$

    - Beta Particles $^{0}_{-1}e$ or $^{0}_{-1}\beta$

      $^{87}_{37}Rb \rightarrow {}^{87}_{38}Sr + {}^{0}_{-1}\beta$

    - Gamma Rays

      $^{226}_{88}Ra \longrightarrow {}^{222}_{86}Rn + {}^{4}_{2}He + {}^{0}_{0}\gamma$

      $^{234}_{91}Pa \rightarrow {}^{234}_{92}U + {}^{0}_{-1}\beta + {}^{0}_{0}\gamma$

FISSION

- Neutron splits a heavy atom into _____.
- Fission reaction starts a _____.
- Small amounts of _____ **converted** to _____.
- **LOTS OF ENERGY PRODUCED… way more than a chemical reaction!**

FUSION

- 2 smaller atoms FUSE together into _____.

Transmutations

- Elements are considered radioactive when their nuclei (nucleus) are _____.
- **Transmutation** – atomic nucleus of an _____ is _____into a nucleus of a _____.
- **Natural Transmutation –** occur naturally
  - Radioactive decay
- **Artificial Transmutation –** occurs in a lab
  - Scientists bombard the nucleus with particles
  - What kind of nuclear reaction do you think is typically artificial?

How are nuclear reactions different from a typical, chemical reaction bonding of two elements?

Practice:

1. Circle the pair of isotopes
   a. ${}^{12}_{6}C,\ {}^{12}_{5}C,\ {}^{13}_{6}C,\ {}^{14}_{6}N$
   b. ${}^{18}_{8}O,\ {}^{16}_{7}O,\ {}^{16}_{8}O,\ {}^{18}_{9}O$
2. What type of particle is given off in the reaction
   a. ${}^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$ _____
   b. ${}^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}\beta$ _____
3. An atom that has 13 protons and 15 neutrons is an isotope of the element:
   a. nickel
   b. silicon
   c. aluminum
   d. phosphorus
4. Compare the atoms Carbon-12 and Carbon-11. How are they the same? How are they different?

_____

5. Complete the following chart:

Isotope name	atomic #	mass #	# of protons	# of neutrons	# of electrons
Potassium-37					
Oxygen-17					
uranium-235					
uranium-238					
boron-10					
boron-11					

6. Naturally occurring europium (Eu) consists of two isotopes was a mass of 151 and 153. Europium-151 has an abundance of 48.03% and Europium-153 has an abundance of 51.97%. What is the atomic mass of europium?