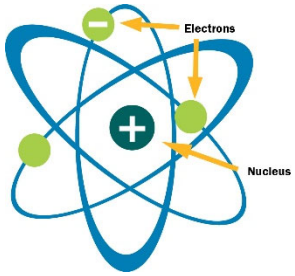
Atomic Stability Worksheet

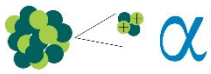
Name: _____ Date: _____

All elements are formed by atoms that are made up of:

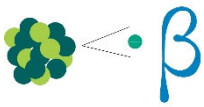
- A nucleus containing protons and neutrons.
- Protons: positively (+) charged particles within the nucleus.
- Neutrons: particles within the nucleus that have no electrical charge (neutral).
- Electrons: particles that orbit the nucleus as a cloud and have a negative (–) charge.



The atoms of radioactive elements have an unstable nucleus. As the nucleus tries to become stable it releases energy (ionizing radiation) and extra protons or neutrons in the form of alpha or beta particles.



An **alpha particle** is made up of two protons (+2) and two neutrons from the atom's nucleus. Alpha particles have a positive charge (+2).



Before a **beta particle** is released a neutron changes into a proton and an electron (-1). The proton stays in the nucleus and the electron is released or ejected from the nucleus in the form of beta particles. Beta particles have a negative charge (-1).

Collect the materials and follow the directions to learn how the release of alpha and beta particles changes the structure of an atom.

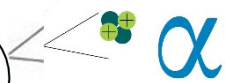
Materials:

- 10 objects to represent neutrons.
- 10 objects to represent protons.
- 1 object to represent an electron.

1. Create a pretend radioactive nucleus for Element 1 including 5 neutrons (N) and 6 protons (P).

Element 1 (N: 5, P: 6)

2. Demonstrate what happens to Element 1 when the pretend radioactive nucleus emits an alpha particle and a new element (Element 2) is formed. Then enter the number of neutrons and protons in the nucleus of Element 2.

Element 1 (N: 5, P: 6)  Element 2: (N: , P:)

What differences do you observe between the number of protons and neutrons in Element 2 and Element 1?

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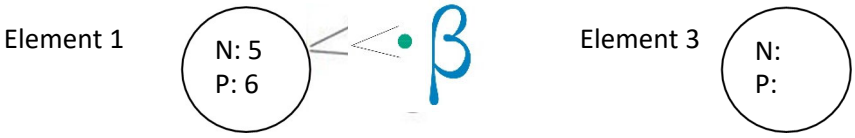
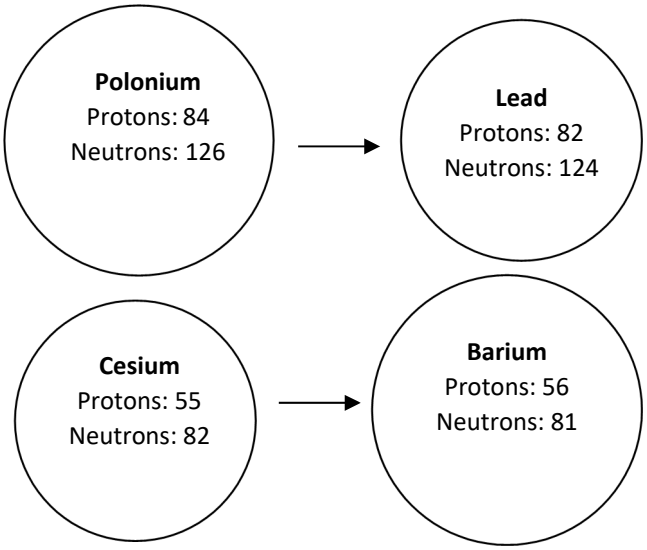
3. Return Element 2 to its original form: Element 1 (5 neutrons and 6 protons). Demonstrate what happens to Element 1 when it emits a beta particle and a new element (Element 3) is formed. Then enter the number of neutrons and protons in the nucleus of Element 3.



What differences do you observe between the number of protons and neutrons in Element 3 and Element 1?

4. Every element has a different number of protons. What happens to unstable (radioactive) atoms when they release an alpha or beta particle and the number of protons change?

5. Observe the changes in the number of protons and neutrons between the two elements below. Determine whether the examples show the release of an alpha particle or a beta particle. Circle the correct answer.



Alpha particle
Beta particle

Alpha particle
Beta particle