**Build an Atom Simulation - http://phet.colorado.edu/en/simulation/build-an-atom**

**Part I: Structure of an Atom (Click on the “build an atom” button found at the home screen)**

1. Explore the Build an Atom simulation. As you explore talk to your neighbor about what you find.
   1. List two things you noticed as you built your atoms. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. What particles are found in the center of an atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Play the simulation until you discover which particle determines the name/identity of the element.
   1. Which particle determines the identity/name of any given element? \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. What is the name of the following atoms?
   1. An atom with 3 protons and 4 neutrons. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   2. An atom with 2 protons and 4 neutrons. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   3. An atom with 4 protons and 4 neutrons. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. Continue to play with the simulation to discover which particles affect the charge of an atom/ion.
   1. The particle that determines the charge of an ion is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. Fill in the blanks with respect to ions/atoms.
   1. Neutral atoms have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_protons compared to electrons.
   2. Positive ions have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ protons compared to electrons.
   3. Negative ions have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ protons compared to electrons.
6. Develop a relationship (in the form of a single sentence or equation) that can predict the charge of an ion based on the number and types of each particle involved.

**Part II: Chemical Symbols (Click on the “symbol” button found at the home screen)**

1. Using the “symbol application” determine which particles affect each component of the isotope notation symbol. For each letter (a, b, c, and d) state which particles are used to determine that number and how the value of each number is determined.

dcab

1. Create a definition for each of the items (a, b, c, and d from above).
   1. Element symbol –
   2. Charge –
   3. Atomic Number –
   4. Mass Number –
2. Atoms can be represented by the atomic/chemical symbol OR name and mass number. Complete the following:

|  |  |
| --- | --- |
| **Chemical Symbol (Isotope Notation)** | **Chemical (Isotope) Name** |
| **126C+1** |  |
| **189F** |  |
| **115B** |  |

1. Describe the similarities and differences between the Isotope Notation Symbol and the Chemical Name.

**Part III: Isotopes (Click on the “atom” button found on the home screen)**

1. Play with the simulation to determine:
   1. Which particles affect the stability of an atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Which particles do not affect the stability of an atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What are the names of the stable forms of Oxygen?
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. List all of the things that are the same & different about these isotopes.
3. The atoms in “question 14” are isotopes of one another. What are the requirements for two (or more) atoms to be isotopes of one another? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Test your understanding of isotopes by examining the relationships between the pairs of atoms listed below:

|  |  |  |
| --- | --- | --- |
| **Atom 1** | **Atom 2** | **Relationship Between Atom 1 and 2 (select one bubble to fill in)** |
| 126C | 136C | * Isotopes * Same Atom, Not isotopes * Different Element |
| Carbon-12 | 126C | * Isotopes * Same Atom, Not isotopes * Different Element |
| Argon-40 | Argon-41 | * Isotopes * Same Atom, Not isotopes * Different Element |
| 115B | Boron-10 | * Isotopes * Same Atom, Not isotopes * Different Element |
| An atom with 13 P and 13 N | An atom with 14 P and 13 N | * Isotopes * Same Atom, Not isotopes * Different Element |

Play each of the four games and record your answers below:

**Game 1:**

1. Element 1 =
2. Element 2 =
3. Element 3 =
4. Element 4 =
5. Element 5 =

**Game 2:**

1. Total Charge =
2. Mass Number =
3. Total Charge =
4. Mass Number =
5. Mass Number =

**Game 3:**

1. Isotope Notation =
2. Isotope Notation =
3. Isotope Notation =
4. Isotope Notation =
5. Isotope Notation =

**Game 4:**

1. Protons = Neutrons = Electrons =
2. Isotope Notation =
3. Isotope Notation =
4. Protons = Neutrons = Electrons =
5. Protons = Neutrons = Electrons =