Name:

Date:

Period:

BUILD AN ATOM

**PART I: ATOM SCREEN**

*Build an Atom simulation* (<http://phet.colorado.edu/en/simulation/build-an-atom>)

1. Explore the ***Build an Atom*** simulation
   1. What particle(s) are found in the center of the atom?
   2. What particle(s) are not found in the center of the atom?

1. Play until you discover which **particle(s)** determine(s) the name of the **element** you build. What did you discover?
2. What is the **element name** of the following atoms?
3. An atom with 3 protons and 4 neutrons: \_\_\_\_\_\_\_\_\_\_\_\_\_
4. An atom with 2 protons and 4 neutrons: \_\_\_\_\_\_\_\_\_\_\_\_\_
5. An atom with 4 protons and 4 neutrons: \_\_\_\_\_\_\_\_\_\_\_\_\_
6. Play with the simulation to discover which particles affect the **charge** of an atom or ion. (Click on + on net charge to expand and show the charge on the atom/ion)
7. Fill in the blanks below to show your results:

Neutral atoms have the same number of protons and electrons.

Positive ions have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ protons than electrons.

Negative ions have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ protons than electrons.

1. Develop a relationship (in the form of a single sentence or equation) that can predict the charge based on the number and types of particle.
2. Play with the simulation to discover what affects the **mass** **number** of your atom or ion. (Click on + on mass number to expand and show the mass of the atom/ion)
3. What is a rule for determining the mass number of an atom or ion?

1. Practice applying your understanding by playing 1st and 2nd levels on the game screen.

PART II: Symbol SCREEN

1. Click on the Symbol option. Using the *Symbol* readout box, figure out **which particles** affect each component of the atomic symbol.
2. In the atomic symbol below, label each letter (*a*, *b*, *c*, and *d*) with:

* the **particle(s)** used to determine the letter, and
* **how** the value of each letter is determined.



1. Create a definition (using a complete sentence) for each of these items based on your labels from the atomic symbol above.
   * + - 1. Element Symbol
         2. Charge
         3. Atomic Number
         4. Mass Number
2. Practice applying your understanding by playing the 3rd and 4th game levels. Play until you can get all the questions correct on the 4th level.

PART III: ISOTOPES

1. Play with the simulation to determine (make sure to turn on stable/unstable in the bottom right corner):
   1. Which particles affect the stability of the atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Which particles do not affect the stability of the atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What are the names of the stable forms of oxygen?
3. Oxygen-16
4. Oxygen-\_\_\_\_
5. Oxygen-\_\_\_\_
6. List all of the things that are the same about these atoms (ignore the electrons).
7. List all of the things that are different about these atoms (ignore the electrons).
8. The atoms in the previous question are **isotopes** of each other. Based on this information, list the requirements for two atoms to be isotopes of each other.

1. 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 atom 2 |
|  |  | Isotopes  Same Atom, Not Isotopes of Each Other  Different Element |
| An atom with 6 protons and 12 neutrons |  | Isotopes  Same Atom, Not Isotopes of Each Other  Different Element |
|  |  | Isotopes  Same Atom, Not Isotopes of Each Other  Different Element |
|  |  | Isotopes  Same Atom, Not Isotopes of Each Other  Different Element |
| An atom with 13 protons and 13 neutrons | An atom with 14 protons and 13 neutrons | Isotopes  Same Atom, Not Isotopes of Each Other  Different Element |

EXERCISES

1. The periodic table has a great deal of information about every atom. Using your periodic table, answer the following questions:
2. What is the atomic number of chlorine (Cl)? \_\_\_\_\_
3. What is the atomic number of tungsten (W)? \_\_\_\_\_
4. How many protons are there in any Cl atom?\_\_\_\_\_
5. How many protons are there in any Te atom? \_\_\_\_\_
6. ­Can you tell from the periodic table exactly how many neutrons are in an atom?