**Build An Atom PhET Lab**

**Introduction:** Atoms are the smallest things that retain the properties of matter we can observe. Atoms are made of three ***subatomic*** particles; protons, neutrons, and electrons.

* Protons have a mass of \_\_\_\_\_\_\_\_\_\_\_ unit and a charge of \_\_\_\_\_\_\_\_\_\_\_.
* ****Neutrons have a mass of \_\_\_\_\_\_\_\_\_\_\_ unit and a charge of \_\_\_\_\_\_\_\_\_\_\_.
* Electrons have a mass of nearly\_\_\_\_\_\_\_\_\_\_\_ unit and a charge of \_\_\_\_\_\_\_\_\_\_\_.

In this simulation, you will build atoms, subatomic particle by subatomic particle and observe the effect of adding more of each particle. When the subatomic particles in an atom change, an **ion**, **isotope** or different element will be created.

**Procedure:** *Play with the Sims 🡪 Chemistry 🡪 Build An Atom* 

Begin by playing with the simulation for a while. Become familiar with the interface. What happens when you add protons, neutrons, or electrons? To start over, click .

Show the **symbol**, **atomic mass**, and **charge** by clicking on the .

**Analysis Questions**

1. Ions are atoms of the same element with different numbers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Isotopes are atoms of the same element with different numbers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. Adding or removing protons from an atom does what to the atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. An atom with the same number of protons and electrons has a charge of \_\_\_\_\_\_\_\_\_.
5. Adding two electrons to a neutral atom produces an ion with a charge of \_\_\_\_\_\_\_\_\_.
6. An atom with six protons and five electrons would have a charge of \_\_\_\_\_\_\_\_\_.
7. What atom is created with nine protons, nine neutrons, and nine electrons?
8. Show the full symbol for the above atom in the box at the right
9. What does the upper-left number in the symbol represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. What does the lower-left number in the symbol represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Draw the atoms described below, showing protons, neutrons, and electrons:

Hydrogen: H Carbon: C Oxygen: O Neon: Ne

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

**The Game**

With remaining class time, play a few games. Who in your lab group can get the highest score? WINNER: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Complete the table below***

Remember…when there are more electrons than protons, the charge should be: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

And when there are more protons than electrons, the charge will be: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Protons | Neutrons | Electrons | Atomic Number | Mass Number | Charge | Element | **Full** Symbol |
| **4** | **4** | **4** | **4** | **8** | **0** | **Be** |  |
| **5** | **5** | **6** | 1. | 2. | 3. | 4. | 5. |
| **8** | **8** | **7** | 6. | 7. | 8. | 9. | 10. |
| 11. | 12. | 13. | **7** | **13** | **-3** | 14. | 15. |
| 16. | 17. | 18. | **9** | **20** | **-1** | 19. | 20. |

**Conclusion Questions (use a periodic table)**

1. All Zinc atoms have (how many?) \_\_\_\_\_\_\_ protons.
2. If a Copper atom has no charge (neutral), it would contain (how many?) \_\_\_\_\_\_\_ electrons.
3. All atoms that have 14 protons are (what element?) \_\_\_\_\_\_\_\_\_\_\_\_\_.
4. If an atom of Zinc has a mass of 64, it has (how many?) \_\_\_\_\_\_\_ neutrons.
5. Silver-108 has a mass of 108. This means that it would have (how many?) \_\_\_\_\_\_\_ neutrons with its 47 protons.
6. (Sodium) has (how many?) \_\_\_\_\_\_\_ protons and (how many?) \_\_\_\_\_\_\_ neutrons for a total mass of 23.
7. A -1 ion of Bromine would have \_\_\_\_\_\_\_ protons and \_\_\_\_\_\_\_ electrons.
8. A +2 ion of Calcium would have \_\_\_\_\_\_\_ protons and \_\_\_\_\_\_\_ electrons.
9. To form an ion with a -2 charge, an atom of Sulfur would need to have \_\_\_\_\_\_\_ electrons.
10. A neutral atom of Zinc-66 has \_\_\_\_\_\_\_ protons, \_\_\_\_\_\_\_ neutrons, and \_\_\_\_\_\_\_ electrons.