

Name:

Date:

Pd:

BUILD AN ATOM: INVESTIGATING ATOMS AND IONS

Visit the website <https://phet.colorado.edu/en/simulation/build-an-atom>. Click the "Play" button on the image to open the simulation. Choose the **Atom** version.

1. What subatomic particle(s) go in the center of the atom? _____
 - a. What do you call the center of the atom? _____
2. Add one proton to the nucleus of the atom (the X). What element did you create? _____
3. Add another proton. What element do you now have? _____
4. What subatomic particle determines the name of the element you built? _____

Click the **plus sign** on "Net Charge".

5. What is the charge on this atom (2 protons, no neutrons or electrons)? _____
6. Make an **ion** with 3 protons and 2 electrons. What is the charge on this **ion**? _____
7. Make an **ion** with 3 protons and 4 electrons. What is the charge on this **ion**? _____
8. Write 2 rules to determine if an ion will be positively charged or negatively charged.
 - a. **Cations:** _____ charged ions formed when there are _____ protons than electrons in an atom.
 - b. **Anions:** _____ charged ions formed when there are _____ protons than electrons in an atom.

Click the **plus sign** that says "Mass Number".

9. Create a beryllium (Be) atom with 4 protons, 4 electrons, and 4 neutrons.
 - a. What is the mass number of this atom? _____
 - b. Add 1 neutron to the atom. What is the mass number of the atom? _____
 - c. Remove 2 neutrons from the atom. What is the mass number of the atom? _____
 - d. Add 1 proton to the atom. What element has formed? _____ What is the mass number of the atom? _____
 - e. Describe how mass number is calculated. _____

 - i. If neutrons are removed, mass number _____.
 - ii. If neutrons are added, mass number _____.
 - iii. If protons are added, mass number _____ and the element changes.
 - iv. If protons are removed, mass number _____ and the element changes.
10. Explain why atoms of the same element may have different masses.

Click the **box** that says “stable/unstable”.

11. Make a Lithium atom with 3 protons and 3 electrons. Is this atom considered to be stable? _____
 12. Add some neutrons. What happens if too many neutrons are added? _____
 - a. There is no rule for the ratio of protons to neutrons that makes an atom stable. The atom simply needs “enough” neutrons to make it stable, without having “too many”.
 - b. Make a **prediction** of what will occur if an atom is unstable.
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Create the following atoms and ions.

Element Name	# protons	# neutrons	# electrons	Charge	Stable or Unstable	Atom or Ion?
	5	5	5			
	5	6	5			
	5	5	3			
	5	5	6			

Highlight the rows that represent isotopes of each other.

Highlight the cation with a different color

Summary: Write 2 or more sentences summarizing what you learned about atoms, isotopes, ions, and the subatomic particles.