**Science 9: Review of Subatomic Particles and Bohr Models**

**Atom**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* **Proton:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged particle in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an atom; has a mass of \_\_\_\_\_\_.
* **Neutron:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ particle in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an atom; has a mass of \_\_\_\_\_\_.
* **Electron:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged particle in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ surrounding the nucleus of the atom; very \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (mass of \_\_\_\_\_\_\_\_\_\_\_\_\_\_).

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|  | **Number of Protons (p)** | **Number of Neutrons (n)** | **Number of Electrons (e)** |
| **Atom** |  |  |  |

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| 3) Complete the following table.  |
|  | protons | neutrons | electrons |
| Al |  |  |  |
| Mg |  |  |  |
| B |  |  |  |
| Ti |  |  |  |
| Ca |  |  |  |
| F |  |  |  |
| Cl |  |  |  |
| Ar |  |  |  |
| Zn |  |  |  |

*Practice:*

1. Why do atoms have the same number of protons and electrons?

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Explain why you need to subtract atomic number from atomic mass to calculate the number of neutrons in an atom.
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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Bohr Models of Atoms**

1. Calculate the number of protons, neutrons, electrons.
2. In the nucleus:
	* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Draw the electrons in energy shells:
	* Max electrons per shell from inside to outside: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	* (Except in first shell), electrons are filled ***starting at top***, going ***clockwise***, singly at first then paired

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| Example: sodium atom | Example: oxygen atom |

**Science 9: Valence Shells and Ions**

**Valence Shells and Valence Electrons:**

* **Valence shell** is the outermost shell containing electrons
* **Valence electrons** are electrons in the valence shell
1. Atoms in the same group have the same number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Atoms in the same period have the same number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

During a chemical reaction, atoms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ valence electrons with other atoms until they have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are unreactive because their valence shells are already full.

**Ion:** a charged ‘atom’ that is formed when a neutral atom \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrons

 **Cation:** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** charged ion (e.g. Ca2+, Na+), formed when atom *loses* electrons

 **Anion:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged ion (e.g. O2-, P3-), formed when atom *gains* electrons

**Bohr models of ions** are very similar to Bohr models of atoms. Two key differences:

* Valence shell is full
	+ (Note: the fewer electrons that have to move, the better. E.g. oxygen with 6 valence electrons will gain two electrons to form its 2- ion instead of losing six electrons.)
* Square brackets and ion charge

*Examples:* Draw the Bohr models of fluorine and magnesium atoms and their ions.

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| Fluorine | Beryllium  |

*Practice:*

1. Explain why metals tend to lose electrons and non-metals tend to gain them when forming ions.
2. On your periodic table, the ion charge of neon is listed as “0”. Why is this the case?
3. On the back of this page, draw the Bohr models of: a) oxygen atom and ion; b) magnesium atom and ion; c) nitrogen atom and ion; d) chlorine atom and ion