# Unit 2.1: Atomic Structure

**Further Reference: 4.2 Structure of Atoms**

**THE ATOM**

1. The atom is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. It is the basic building block \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. The atom is made of the following 3 parts:
		1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. The atom is composed of 2 parts: the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. The nucleus is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged
		1. Contains \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_
		2. Protons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged
		3. Neutrons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged
			1. Neutrons act like\_\_\_\_\_\_\_\_\_\_\_\_ for the nucleus
	2. The electrons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged
		1. Electrons occupy the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ around the nucleus
		2. Electrons are arranged into \_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_
		3. Electrons are \_\_\_\_\_\_\_\_\_ moving in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ around the nucleus. Their movement is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		4. The electron cloud give us \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ location

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Location | Charge | Mass | Special Fact |
| Protons |  |  |  |  |
| Neutrons |  |  |  |  |
| Electrons |  |  |  |  |

**PROPERTIES OF ATOMS**



1. **Atomic number** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. Each element has its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. In a NEUTRAL ATOM, this is also \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **(Average) Atomic Mass** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Mass number**  is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. It is the sum of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_ in the nucleus
	2. Mass number = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. Isotope Notation:

**PRACTICE WITH ELEMENT PARTS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Element** | **Symbol** | **Atomic #** | **Protons** | **Neutrons** | **Mass #** |
| Boron – 11 | B |  |  |  |  |
| Carbon – 12 |  |  | 6 | 6 |  |
| Magnesium – 23 |  | 12 |  |  | 23 |
| Copper – 64 |  | 29 |  | 35 |  |
|  |  |  |  | 20 |  |

# Unit 2.2: Isotopes and Ions

**Further Reference: 4.2 Structure of Atoms**

**ISOTOPES**

1. Isotopes are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. Two isotopes of an element will have the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ but different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
	2. Looking at the carbon atoms to the right:
		1. What is the mass number of the carbon atom on the left \_\_\_\_\_\_\_
		2. What is the mass number of the carbon atom on the right \_\_\_\_\_\_
		3. What is the atomic number of the carbon atom on the left \_\_\_\_\_\_
		4. What is the atomic number of the carbon atom on the right \_\_\_\_\_\_
2. Isotope notation you write the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the top left and the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the bottom left

* 1. Write an example of carbon-14 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
|  |  **7 14 N** | **7 15 N** | **7 16 N** |
| Protons |  |  |  |
| Neutrons |  |  |  |
| Electrons |  |  |  |

**IONS**

1. Ions are atoms or groups of atoms with a \_\_\_\_\_\_\_\_\_\_\_\_\_ or a \_\_\_\_\_\_\_\_\_\_\_\_\_ charge
	1. Ions differ in the number of \_\_\_\_\_\_\_\_\_\_\_\_\_
		1. For neutral atoms are where the number of electrons are \_\_\_\_\_\_\_\_\_\_\_\_ to the number of protons
		2. For ions, the \_\_\_\_\_\_\_\_\_\_ stay the same and the \_\_\_\_\_\_\_\_\_\_\_\_ are

different. You can either \_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_ electrons.

* 1. Examples of Neutral Atoms: \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, \_\_\_\_\_\_\_
	2. Examples of Ions: \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_
1. Taking away an electron gives an atom a \_\_\_\_\_\_\_\_\_\_\_\_\_ charge because there are now more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. This is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. So if the Mg atom loses 2 electrons, it becomes \_\_\_\_\_\_\_\_\_\_\_\_\_
2. Gaining an electron gives an atom a \_\_\_\_\_\_\_\_\_\_\_\_\_ charge because there are now more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. This is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. So if the F atom gains 1 electron, it becomes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
|  |  **19 39N+** | **8 16N-2** | **20 41N+2** |
| Protons |  |  |  |
| Neutrons |  |  |  |
| Electrons |  |  |  |

# Unit 2.3: Electron Arrangement

**Further Reference: 4.3 Modern Atomic Theory**

**ENERGY LEVELS**

1. Electrons that are closer to the nucleus have \_\_\_\_\_\_\_\_\_\_\_\_ energy
	1. Further away from the nucleus means you have \_\_\_\_\_\_\_\_\_\_ energy
2. Each level (or shell) has a maximum number of \_\_\_\_\_\_\_\_\_\_ that it can hold.
	1. 1st level = \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. 2nd level = \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	3. 3rd level = \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	4. 4th level = \_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Electrons must occupy the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ first

**BOHR DIAGRAMS**

1. Bohr diagrams show the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the atom
	1. They show \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that an atom has orbiting around it.
2. These electrons are organized into different \_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. \_\_\_\_\_\_\_\_\_\_\_\_ = 2 electrons
	2. \_\_\_\_\_\_\_\_\_\_\_\_ = 8 electrons
	3. \_\_\_\_\_\_\_\_\_\_\_\_ = 18 electrons
3. Draw the following Bohr Diagrams:

|  |  |
| --- | --- |
| H | B |
| F | Si |

1. Valence electrons are electrons \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. Valence electrons determine the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. Each column has a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		1. Sodium (Na) has \_\_\_\_\_\_\_\_\_\_\_\_ valence electrons
		2. Boron (B) has \_\_\_\_\_\_\_\_\_\_\_\_ valence electrons
		3. Chlorine (Cl) has \_\_\_\_\_\_\_\_\_\_\_\_ valence electrons
		4. Neon (Ne) has \_\_\_\_\_\_\_\_\_\_\_\_ valence electrons

**LEWIS DOT DIAGRAMS**

1. Lewis dot diagrams use the symbol and dots to represent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. How to…
		1. Write the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the element
		2. Figure out how many \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it has
		3. Each side of the symbol can only hold \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			1. 1 dot = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			2. Each side must get \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ before any side can get \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		4. Maximum number is \_\_\_\_\_\_\_\_\_\_dots
2. Draw the following Lewis Dot:

|  |  |
| --- | --- |
| H | Al |
| Cl | Ne |