

Atoms and Molecular Bonding

| • What is matter? | Anything that takes up space and has mass | | | | | | | | | | | | | | | | |
|---|--|-----------------|------------|----------|------|---------|---|---------|-------|----------|------|---------|-------|-----------|---|-----------------|------------|
| • What are atoms? | Basic building blocks of all matter | | | | | | | | | | | | | | | | |
| • What are atoms composed of? | <table border="1"> <thead> <tr> <th>Particle</th> <th>Charge</th> <th>Location</th> <th>Size</th> </tr> </thead> <tbody> <tr> <td>Protons</td> <td>+</td> <td>Nucleus</td> <td>1 amu</td> </tr> <tr> <td>Neutrons</td> <td>None</td> <td>Nucleus</td> <td>1 amu</td> </tr> <tr> <td>Electrons</td> <td>-</td> <td>Outside nucleus</td> <td>1/1836 amu</td> </tr> </tbody> </table> | Particle | Charge | Location | Size | Protons | + | Nucleus | 1 amu | Neutrons | None | Nucleus | 1 amu | Electrons | - | Outside nucleus | 1/1836 amu |
| Particle | Charge | Location | Size | | | | | | | | | | | | | | |
| Protons | + | Nucleus | 1 amu | | | | | | | | | | | | | | |
| Neutrons | None | Nucleus | 1 amu | | | | | | | | | | | | | | |
| Electrons | - | Outside nucleus | 1/1836 amu | | | | | | | | | | | | | | |
| • What are elements? | <p>A substance that cannot be broken down to other substance by chemical reactions</p> <p>Periodic table of elements lists all the known elements</p> <p>Elements are abbreviated using chemical symbols</p> <p>Carbon – C Oxygen – O Iron - Fe</p> | | | | | | | | | | | | | | | | |
| • What is the atomic number and why is the atomic number important? | <p>Number of protons in the nucleus of an atom</p> <p>Every element has a different atomic number</p> <p>Carbon and only carbon has 6 protons (atomic number 6)</p> <p>Oxygen and only oxygen has 8 protons (atomic number 8)</p> | | | | | | | | | | | | | | | | |
| • What kind of charges do atoms have and what causes these charges? | <p>Proton number never changes for a given element, but electron number can change</p> <p>The electric charge of an atom depends on the number of protons and electrons</p> <p>Proton number = electron number – Atom has no charge</p> <p>Proton number > electron number – Atom has a positive charge and is a cation</p> <p>Proton number < electron number - Atom has a negative charge and is a anion</p> | | | | | | | | | | | | | | | | |
| • Where are electrons located? | <p>Electrons move around the nucleus randomly but at set distances</p> <p>The electrons in an atoms outermost energy level</p> <p>The distance depends on the energy level of the electron</p> <p>Energy levels are also known as electron shells</p> <p>First energy level holds 2 electrons</p> <p>Second energy level holds 8 electrons</p> <p>Third energy level holds 8 electrons</p> | | | | | | | | | | | | | | | | |
| • What are valence electrons? | <p>The electrons in an atoms outermost energy level</p> <p>Outermost energy level is also known as valence shell</p> | | | | | | | | | | | | | | | | |
| • What are covalent bonds? | <p>A bond formed between two atoms through the sharing of valence electrons</p> <p>Atoms share electrons to fill the valence shell to its max capacity</p> | | | | | | | | | | | | | | | | |
| • What are molecules? | <p>Substances created through the covalent bonding of atoms</p> <p>A water molecule is composed of one oxygen atom and two hydrogen atoms</p> | | | | | | | | | | | | | | | | |
| • What are ionic bonds? | <p>A bond formed between a positively charged atom and a negatively charged atom</p> <p>The total charge of an ionic molecule is zero</p> <p>Example: sodium chloride, or table salt Na^+Cl^-</p> | | | | | | | | | | | | | | | | |
| • What are hydrogen bonds? | <p>A bond formed between two polar molecules</p> <p>A polar molecule is a molecule that has a part to it with a partial positive charge and a partial negative charge</p> <p>Hydrogen bonds are very weak, but important for biological molecules</p> | | | | | | | | | | | | | | | | |
| • What is a chemical Reaction? | <p>A process in which one or more substances, the reactants, are converted to one or more different substances, the products.</p> | | | | | | | | | | | | | | | | |
| • What is a chemical equation? | <p>A representation of a chemical reaction in which the reactants and products are expressed as formulas</p> <p>Ex.</p> <p>$\text{CH}_4 + 2 \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O}$</p> <p>Reactants → Products</p> | | | | | | | | | | | | | | | | |