



Stated Clearly

EARTH'S EARLY HISTORY

- ❖ Earth is 4.6 billion years old
- ❖ Earth's early atmosphere probably contained hydrogen cyanide, carbon dioxide, carbon monoxide, nitrogen, hydrogen sulfide, and water vapor
 - Earth's early atmosphere contained little to no oxygen
- ❖ **Miller and Urey** simulated the conditions on Earth in a lab setting
 - They filled a flask with hydrogen, methane, ammonia, and water and passed electric sparks to simulate lightning
 - Over a few days amino acids were formed
 - Miller and Urey's experiments suggested how mixtures of the organic compounds necessary for life could have arisen from simpler compounds present on a primitive Earth

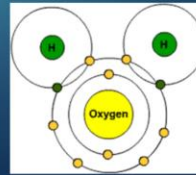
ATOMS

- All living things are made up of matter
- **Atoms** are the **smallest unit of matter**
 - Made up of 3 subatomic particles:
 - 1. **Protons**- positively charged, found in the nucleus, has mass
 - 2. **Neutrons**- neutral charge/ no charge, found in the nucleus, same mass as proton
 - 3. **Electrons**- negatively charged, has little mass

The Nature of Matter

Bonding

- For some atoms to be stable they must gain, lose, or share electrons-bonding.
- Compounds-a substance formed by the chemical combination (bonding) of 2 or more elements



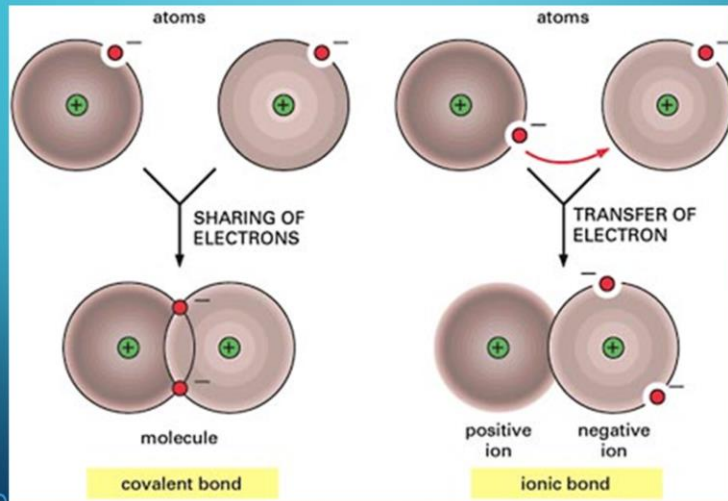
CHEMICAL COMPOUNDS

- **A chemical compound** is a substance formed by the chemical combination of 2 or more elements in definite proportions. Ex, water
- **Chemical bonds** are forces that hold the elements together in a compound.
- 2 main types of chemical bonds:
 - 1. Ionic bond
 - 2. Covalent bond

IONIC AND COVALENT BONDS

- **An ionic bond** is formed when one or more electrons are transferred from one atom to another
 - **Ions** are positively or negatively charged atoms
 - Ex. Na^+ (sodium) which has lost an electron and Cl^- (chloride) which has gained an electron. Together these form salt, (NaCl).
- **A covalent bond** forms when electrons are shared between atoms.
 - When atoms are joined together by a covalent bond, a **molecule** is formed

IONIC AND COVALENT BONDS



CHEMICAL REACTIONS

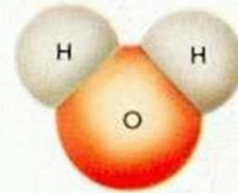
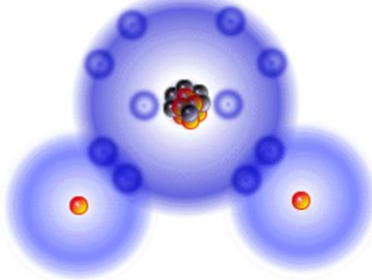
- **Chemical reactions** are often indicated by writing a chemical equation.
- The atoms or molecules to the left of an arrow are the **reactants**- the substances that react with one another to give a product(s)
- The **products** are placed to the right of the arrow.

PROPERTIES OF WATER

- A water molecule is **polar** because there is an uneven distribution of electrons between the oxygen and hydrogen atoms
- **Polar bonds** are formed when atoms in a covalent bond do not share electrons equally
- Polar molecules can attract each other and thus water is held together by hydrogen bonds- which aids in its special properties.

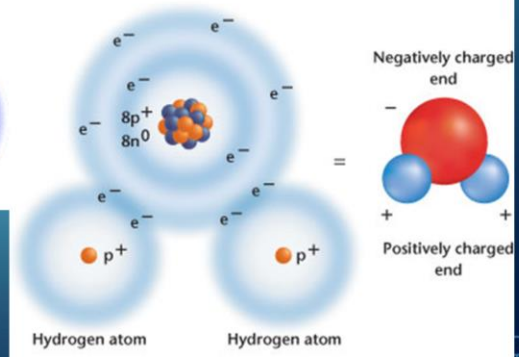
THE WATER MOLECULE

Water Molecule



Water molecule

Oxygen atom



Hydrogen atom

Hydrogen atom

PROPERTIES OF WATER

Hydrogen Bonds

- Polarity causes water molecules to attract each other like magnets
- H (+) attracts O (-) forming a hydrogen bond
- Hydrogen bonds are not as strong as covalent or ionic bonds



PROPERTIES OF WATER SOLUTIONS

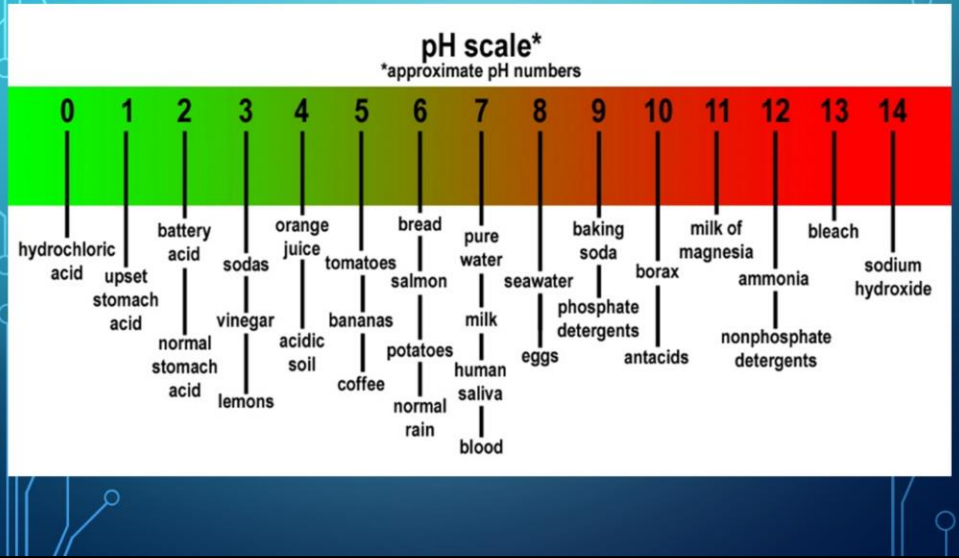
- Occurs when one substance is dissolved in another.
- A solute gets dissolved
- A solvent does the dissolving.
- Together, they create a solution



ACIDS, BASES, PH

- **pH scale** is used to indicate the concentration of hydrogen ions (H^+) in a solution
 - Ranges from 0 to 14
 - At 7 the concentration of H^+ ions and OH^- ions is equal
 - Solutions below a pH of 7 are acidic because they have more H^+ ions. *The lower the pH, the greater the acidity*
 - Solutions with a pH above 7 are called basic because they have less H^+ ions. *The higher the pH, the more basic the solution.*

PH SCALE



ACIDS, BASES, BUFFERS

- **Acids** are any compounds that form H^+ ions in a solution
 - Strong acids have pH values between 1-3
- **A base** is a compound that produces hydroxide ions (OH^- ions) in a solution.
 - Strong bases have pH values between 11-14
- **Buffers** are weak acids or bases that can react with strong acids or bases to prevent sharp, sudden changes in pH.
 - Helps to maintain homeostasis