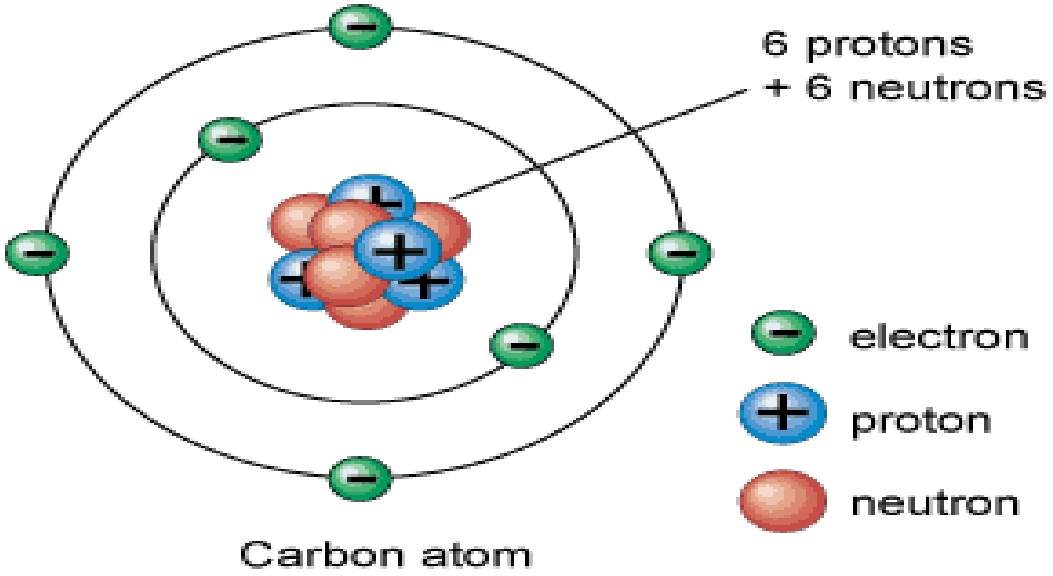
1.4 – Chemistry Basics

- **Matter** – composed of tiny particles called **atoms**
- Atoms contain protons (+), neutrons (0), and electrons (-)



Elements and Compounds

Elements – pure substances that are made of a single kind of atom

- **Atomic Number** – the number of protons in an atom
  - Determines the identity of an atom

Compounds – 2 or more atoms held together by chemical bonds(ex. H_2O, CO_2)

Chemical Bonds

Chemical bonds are made when atoms gain, lose, or share electrons

Ionic bonds – the attraction between positive and negative ions in an ionic compound (ex. NaCl)

Covalent bonds – a bond formed by the sharing of electrons between atoms in a molecule

- Molecules may have single, double, or triple covalent bonds

Electronegativity (En) – The amount of pull that an atom has on surrounding electrons

Polar Covalent Bond – a covalent bond in which + and – charges are separated because of unequally shared electrons (Ex. H2O)

Nonpolar Covalent Bond – a covalent bond in which charges are not separated because electrons are equally shared (ex. H2)

Hydrogen bonds – the force of attraction between highly polar molecules containing combinations of O, H, and N atoms

Water

Covers ¾ of the Earth's surface and makes up 2/3 of your body's mass

Polar molecule composed of 1 oxygen atom bonded to 2 hydrogen atoms (single covalent bonds)

Water molecules are polar and form H bonds with other H_2O molecules

H bonds between water molecules are hard to break and are responsible for water's high boiling point and strong surface tension

Aqueous Solutions

Solvent – substance in which another substance gets dissolved (Ex. H_2O); usually in greater quantity

Solute – substance that gets dissolved (Ex. Sugar)

Solution – solvent + solute

"Like dissolves like" – (non)polar solutes only dissolve in (non)polar solvents

- Ex. Oil cannot be dissolves in H2O because oil molecules (nonpolar) can't form H bonds with H2O molecules (polar)

Hydrophobic – a substance because does not dissolve in water because it's nonpolar

Hydrophilic – a substance that dissolves in water because it's polar (ex. NaCl)

Acids and Bases

Acids
- Sour taste
- Turns blue litmus red
- High [H+]
- pH < 7
- Ex. HCl, H_2SO_4

Bases
- Bitter taste, slippery feel
- Turn red litmus blue
- High [OH-]
- pH > 7
- Ex. NaOH, NH_3

Neutral Solutions
- Not sour or bitter, not slippery
- No colour change to litmus
- Ex. H_2O, NaCl

Neutralization Reaction – when an acid reacts with a base, water and a salt are produced

HCl + NaOH → H2O + NaCl

The pH Scale

- pH H2O = 7 = neutral
- pH < 7 = acidic
- pH > 7 = basic

Representative pH values

Substance	pH
Hydrochloric Acid, 10M	-1.0
Lead-acid battery	0.5
Gastric acid	1.5 – 2.0
Lemon juice	2.4
Cola	2.5
Vinegar	2.9
Orange or apple juice	3.5
Beer	4.5
Acid Rain	<5.0
Coffee	5.0
Tea or healthy skin	5.5
Milk	6.5
Pure Water	7.0
Healthy human saliva	6.5 – 7.4
Blood	7.34 – 7.45
Seawater	7.7 – 8.3
Hand soap	9.0 – 10.0
Household ammonia	11.5
Bleach	12.5
Household lye	13.5