Cheatography

# Chemistry Cheat Sheet

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## The 4 Quantum Numbers

| Principle Quantum Number | Secondary Quantum Number | Magnetic Quantum Number | Spin Quantum Number |
|---|---|---|---|
| n | l | ml | ms |

## Electron Configurations

Electrons fill orbitals from **lowest to highest** energy. Therefore, orbital 1s fills before 2s and 2p. However, an orbit does not necessarily fill completely before the next begins.

## Types of Bonds

**IONIC**

- metals give electrons to non-metals
- metals form cations (+)
- non-metals form anions (-)
- this gives both atoms a stable electron configuration
- the energy level of each atom is decreased

If attraction outweighs repulsion, then a bond will form

Characteristics

- conductive in the dissolved or molten state
- solid, hard, brittle
- **high** melting point, **low** boiling point

**COVALENT BONDING**

1. Non-polar ▸ equal sharing of electrons for bonds
2. Polar ▸ unequal sharing of electrons, atom with higher ▲EN is slightly +, lower ▲EN is slightly -
3. Coordinate Covalent Bonds ▸ - both electrons forming the bond come from the same atom

Characteristics

- generally low boiling points
- solid, liquid, gas
- do not conduct electricity
- dull
- don't dissolve in water

## Intermolecular Forces

## Intermolecular Forces (cont)

3. **Dipole-Dipole⟶** the attraction between oppositely charged dipoles of 2 polar molecules
- strength depends on the polarity of the molecule (more polar=stronger dipole force)
- H-bonding is a special type which is the strongest (5% of covalent bond strength)
- H bonded to N, O, F
- a lone pair of electrons must be on the neighbouring molecule for the H to bond with
- strength depends on the number of H bonds

4. **Dipole-Induced Dipole⟶**- nonpolar molecule forced into polarity

4. **Induced Dipole-Induced Dipole⟶** a.k.a. London Dispersion Forces
- the random motion of electrons creates a temporary dipole in one nonpolar molecule. This induces polarity in the neighbouring molecule. Strength depends on # of electrons (and protons) in a molecule.

## Types of Solids

| | |
|---|---|
| **Metallic Crystals** (Metallic Bonding) | - valence electrons from a mobile sea of electrons which comprise the metallic bond<br>- high melting and boiling points |
| **Ionic Crystals** (Ionic Bonding) | - attraction of charged ions for one another. Lattice energy is a measure of ionic strength<br>- high melting and boiling points |
| **Covalent Crystals** (Network Covalent Bonding) | - network solids are extremely hard compounds with very high melting and boiling points due to their endless 3-D network of covalent bonds |

## Types of Solids (cont)

| | |
|---|---|
| **Molecular Crystals** a)H-bonding b)LDF c)Dipole-Dipole Forces | a) H-bonds are weaker than covalent bonds, but stronger than b) or c) below<br>b) universal force of attraction between instantaneous dipoles. These forces are weak for small, low-molecular weight molecules, but large for heavy, long/highly polarizable molecules. They are stronger than c) below<br>c) these forces act between **polar** molecules. They are much weaker than H-bonding |
| **Atomic Crystals** (Dispersion Forces) | - see section b) above |

**Physical properties** depend on these forces. The **stronger** the forces between particles,
- the ↑ the melting and boiling point
- the ↓ the vapour pressure
- the ↑ the viscosity
- the **greater** the surface tension

An attraction holding neighbouring molecules or ions together. **These are not bonds**

1. **Ion-Ion→** whole charges attract

2. **Ion-Dipole→** an ion is attracted to a polar molecule. The cation is attracted to the slightly negative portion of polar molecules and the anion to the slightly positive end

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