

Bohr Rutherford Diagrams

- Nucleus contains number of protons and neutrons

Energy levels:

- 1st energy level can have a maximum number of 2 electrons
- 2nd and 3rd can have a maximum number of 8 electrons

Acids and Bases

Acid → A molecular compound that when dissolved in solution release H^+ ions, called hydrogen ions. Most of the time, the hydrogen ion reacts with water to produce H_3O^+ , also known as hydronium.

Base → An ionic compound that when dissolved in solution will release OH^- ions, called hydroxide ions.

Atoms and Ions

Atom: An electrically neutral particle with an equal number of protons and electrons.

Ion: A charged particle that results when an atom gains or loses one or more electrons.

Atoms tend to gain, lose, or share electrons so that the valence shell has 8 electrons. Ionic compounds are stable when the outermost shell is full. when an atom transfers electrons to another atom, ions are created.

Balancing Chemical Equations

Step 1: Count number of atoms of each element

Step 2: Pick an element that doesn't have equal number of atoms on each side (usually do H and O at the end)

Step 3: Add coefficients in front of formula unit/molecule with that element and adjust counts

Balancing Chemical Equations (cont)

Step 4: Continue adding coefficients until there is the same number of atoms on each side.

Chemical Formula of Ionic Compounds

Step 1: Write symbols → metal first, non-metal second.

Step 2: Write ionic charge above each symbol.

Step 3: Criss cross the numbers → they become the subscript on the opposite element symbol.

Step 4: Write formula and reduce to the lowest terms.

Chemical Formulas for Compound w/ Polyatomic Ions

Step 1: Write symbols, metal first, polyatomic ion second.

Step 2: Write ionic charge next to each symbol.

Step 3: Criss-cross the numbers, using them as subscripts.

Step 4: Write the formula and reduce to lowest terms.

Cation vs. Anion

Cations (Metals): Tend to lose electrons, positive charge
Elements in groups 1, 2, & 13 form cations.

Anions (Non-Metals): Tend to gain electrons, negative charge
Elements in groups 15, 16, & 17 form anions.

POLYATOMIC IONS

Hydroxide →	OH^-
Nitrate →	NO_3^-
Carbonate →	CO_3^{2-}
Chlorate →	ClO_3^-
Hydrogen Carbonate →	HCO_3^-
Sulfate →	SO_4^{2-}
Phosphate →	PO_4^{3-}
Ammonium →	NH_4^+

Evidences of a Chemical Reaction

- Formation of a gas
- Formation of a precipitate (solid)
- Change in colour
- Change in energy.

Naming Bases

Bases- Contain hydroxide ions and a metal.

Step 1: Add the name of the metal.

Step 2: Add hydroxide.

Types of Chemical Reactions

Synthesis: Two reactants combine to make a larger product. $A + B \rightarrow AB$

Decomposition: A large reactant breaks down to form two or more simpler products.
 $AB \rightarrow A + B$

Single Displacement: An element displaces another element in a compound, producing a new compound and a new product.
 $AB + CD \rightarrow CB + AD$

Double Displacement: Elements in different compounds displace each other, producing two new compounds. $AB + CB \rightarrow AD + CB$



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The Law of Conservation of Mass

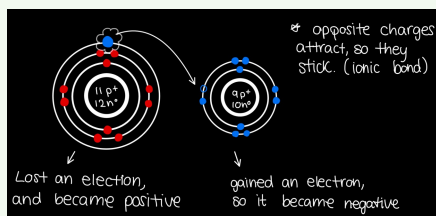
The Law of Conservation of Mass states that in any chemical reaction, **the total mass of the reactants is equal to the total mass of the products.** (Atoms can't be created or destroyed.)

Tricky Metals

Some metals can form more than one kind of ion. For example, copper can have an ionic charge of 1 or 2 depending on the reaction.

CuCl is called **Copper (I) Chloride** CuCl₂ is called **Copper (II) Chloride**

Atoms and Ions



Bohr Rutherford



The Periodic Table

- Groups are the number of valence electrons (1-8), and periods represent the number of orbits (1-7).
- **Atomic number:** Number of protons and electrons.
- **Atomic mass:** Relative mass of the atom.
- Neutrons = Atomic number - atomic mass.

Naming Compounds With Tricky Metals

Step 1: Move each subscript to the opposite element

Step 2: Change subscript values to an ionic charge

Step 3: Check to see if the non-metals ionic charge is correct

Step 4: If step 3 is incorrect, multiply both ionic charges to equal the correct value

Molecules and Covalent Bonding

Molecular (covalent) compound: A pure substance formed between two or more non-metals.

Covalent bond: Bond that forms from the sharing of outer electrons between non-metal atoms.

Diatomic molecule: Molecule consisting of two atoms joined by a covalent bond.

Halogens can form diatomic molecules.

Writing Chemical Formulas for Molecular Compounds

Prefixes in names become subscripts in the formula.

Nitrogen monoxide →	NO
Sulfur dioxide →	SO ₂
Arsenic tribromide →	AsBr ₃

Ionic Compounds

Ionic Compound → Bond that forms between a positive ion (**cation**) and a negative ion (**anion**).

Ionic compounds form whenever an electron is transferred from a metal to a non-metal. The oppositely charged ions attract each other.

Lewis diagram: Symbol with valence electrons

Neutralization Reaction

Acid + Base → Salt + Water

Neutralization reaction: A reaction between an acid and base to form an ionic compound (salt) and water.

aq stands for aqueous solution.

Naming Acids

Binary acids → Contain only two elements; hydrogen, and a non-metal.

Step 1: Use hydro as a prefix

Step 2: Add the stem name of the non-metal

Step 3: Change the ending of the non-metal to ic

Step 4: Add 'acid'

Oxyacids → contain three or more elements; hydrogen, oxygen, and a non-metal.

Step 1: Polyatomic ending "ate" dropped

Step 2: Ending "ic acid" is added.

Groups

1. **Alkali Metals** - One valence electrons, highly reactive (especially with water), soft, reactivity decreases moving up.

2. **Alkaline Earth Metals** - Two valence electrons, reactive, mineral nutrients.

3-12. **Transition Metals** - Hard, multiple ionic charges

17. **Halogens** - Seven valence electrons, reactive non-metals.

18. **Noble Gases** - Full valence shell, stable.



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