

Chemistry 11
Stoichiometry I

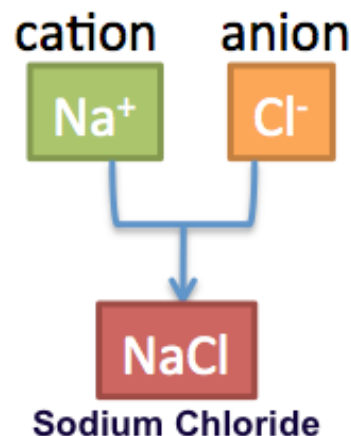
Name:
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Block:

1. Naming and Writing Formulas
2. Writing Chemical Equations
3. Balancing Reactions

Naming and Writing Formulas

Key Points for naming **ionic compounds**:

- Cations (metals) are positively charged and are written first
- Anions (non-metals) are negatively charged and are written last
 - Change the ending of the anion to "ide"
- Don't forget: When naming compounds that have multivalent ions, use roman numerals
 - Example: iron (III) oxide



Name the following *ionic* compounds:

- 1) NaBr _____
- 2) CaO _____
- 3) CuS _____
- 4) MgBr_2 _____
- 5) $\text{Be}(\text{OH})_2$ _____

Write the formulas for the following *ionic* compounds:

- | | |
|----------------------------------|-----------------------------------|
| 6) potassium iodide
_____ | 14) sodium phosphate
_____ |
| 7) tin (IV) oxide
_____ | 15) aluminum carbonate
_____ |
| 8) aluminum chloride
_____ | 16) nickel (II) chloride
_____ |
| 9) sodium nitrate
_____ | 17) sodium cyanide
_____ |
| 10) calcium carbonate
_____ | 18) aluminum oxide
_____ |
| 11) lithium sulfate
_____ | 19) magnesium acetate
_____ |
| 12) beryllium phosphide
_____ | 20) ammonium chloride
_____ |
| 13) magnesium hydroxide
_____ | |

Prefixes

1	Mono
2	Di
3	Tri
4	Tetra
5	Penta
6	Hexa
7	Hepta
8	Octa

Key Points for naming **covalent compounds**:

- Covalent compounds form between two non-metals (anions)
- Use prefixes to indicate the number of atoms
 - Change the ending of the 2nd non-metal to "ide"
 - Exception: don't use mono- for the first atom
- Exceptions: water (H₂O), ammonia (NH₃), methane (CH₄)

Write the names of the following *covalent* compounds:

21) SO₃ _____

26) CO _____

22) N₂S _____

27) SiO₂ _____

23) PH₃ _____

28) SF₆ _____

24) BF₃ _____

29) NH₃ _____

25) P₂Br₄ _____

30) NO₂ _____

Write the formulas of the following *covalent* compounds:

31) nitrogen trichloride

36) sulfur dibromide

32) disilicon hexaiodide

37) diboron tetrahydride

33) dinitrogen trioxide

38) oxygen difluoride

34) phosphorus pentafluoride

39) carbon disulfide

35) methane

40) nitrogen monoxide

Reaction Types

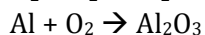
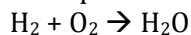
Synthesis

General Formula: $A + B \rightarrow AB$

Things you need to remember:

- When elements are by themselves, they are neutral
- $H_2 N_2 O_2 F_2 Cl_2 Br_2 I_2 P_4 S_8$
- When they partner up and form a molecule, you need to remember their charge!

Examples:



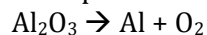
Decomposition

General Formula: $AB \rightarrow A + B$

Things you need to remember:

- Breaks down into its elements
- When elements are by themselves, they are neutral
- $H_2 N_2 O_2 F_2 Cl_2 Br_2 I_2 P_4 S_8$
- When they partner up and form a molecule, you need to remember their charge!

Examples:



Single Replacement

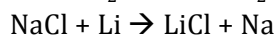
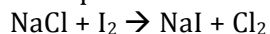
General Formula: $AB + C \rightarrow AC + B$
<OR> $AB + D \rightarrow DB + A$

- C = will form a negative charge
- D = will form a positive charge

Things you need to remember:

- The "incoming" element's charge is important because it determines whether "A" or "B" is replaced
- When they partner up and form a molecule, you need to remember their charge!

Examples:



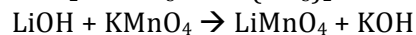
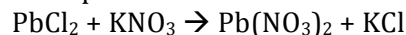
Double Replacement

General Formula: $AB + CD \rightarrow AD + CB$

Things you need to remember:

- The ions switch partners!
- The positive ion is written first!
- When they partner up and form a molecule, you need to remember their charge!

Examples:



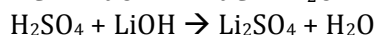
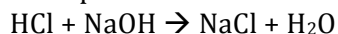
Neutralization

General Formula: $Acid + Base \rightarrow Salt + Water$

Things you need to remember:

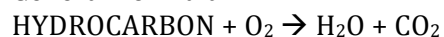
- Acid = Usually starts with "H-" (ex. HCl , H_2SO_4 , H_3PO_4)
- Base = Ends with "-OH" (ex. $NaOH$, $Ca(OH)_2$)
- Products are always a salt (has a positive and negative ion) and water
- It is essentially a double replacement

Examples:



Combustion

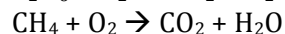
General Formula:



Things you need to remember:

- Hydrocarbon = contains carbon and hydrogen and sometimes oxygen
- Key word: BURN \rightarrow means to react with oxygen!
- Products are always carbon dioxide (CO_2) and water (H_2O)

Examples:



Writing Chemical Equations

Write the type chemical reaction on the line—synthesis, decomposition, combustion, single replacement, or double replacement. It is not necessary to balance the equations.



Balancing Reactions

Methods:

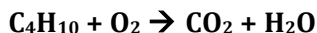
1. Inspection

- Quick & easy; good for simple equations

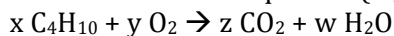
2. Algebraic

- Longer & more involved; good for equations that cannot be solved by inspection

Steps:



1. Place coefficients in front of each molecule in the equation (w, x, y, z)



2. For each atom, write out an equation using the unknowns

$$\text{For carbon: } 4x = z$$

$$\text{For hydrogen: } 10x = 2w$$

$$\text{For oxygen: } 2y = 2z + w$$

3. Let one of your coefficients be equal to 1, and solve for the remaining coefficients

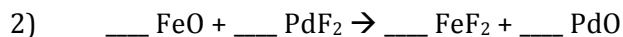
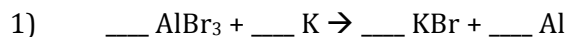
$$\text{Let } x = 1$$

$$\text{If } x=1, z=4, w=5 \text{ and } y=6.5$$

Can't have 0.5's, so multiply everything by 2



Balance these equations!



- 3) $\text{___ P}_4 + \text{___ Br}_2 \rightarrow \text{___ PBr}_3$
- 4) $\text{___ LiCl} + \text{___ Br}_2 \rightarrow \text{___ LiBr} + \text{___ Cl}_2$
- 5) $\text{___ PbBr}_2 + \text{___ HCl} \rightarrow \text{___ HBr} + \text{___ PbCl}_2$
- 6) $\text{___ CoBr}_3 + \text{___ CaSO}_4 \rightarrow \text{___ CaBr}_2 + \text{___ Co}_2(\text{SO}_4)_3$
- 7) $\text{___ Na}_3\text{P} + \text{___ CaF}_2 \rightarrow \text{___ NaF} + \text{___ Ca}_3\text{P}_2$
- 8) $\text{___ Mn} + \text{___ HI} \rightarrow \text{___ H}_2 + \text{___ MnI}_3$
- 9) $\text{___ Li}_3\text{PO}_4 + \text{___ NaBr} \rightarrow \text{___ Na}_3\text{PO}_4 + \text{___ LiBr}$
- 10) $\text{___ CaF}_2 + \text{___ Li}_2\text{SO}_4 \rightarrow \text{___ CaSO}_4 + \text{___ LiF}$
- 11) $\text{___ HBr} + \text{___ Mg(OH)}_2 \rightarrow \text{___ MgBr}_2 + \text{___ H}_2\text{O}$
- 12) $\text{___ LiNO}_3 + \text{___ CaBr}_2 \rightarrow \text{___ Ca(NO}_3)_2 + \text{___ LiBr}$
- 13) $\text{___ AgNO}_3 + \text{___ Li} \rightarrow \text{___ LiNO}_3 + \text{___ Ag}$
- 14) $\text{___ Si(OH)}_4 + \text{___ NaBr} \rightarrow \text{___ SiBr}_4 + \text{___ NaOH}$
- 15) $\text{___ NaCN} + \text{___ CuCO}_3 \rightarrow \text{___ Na}_2\text{CO}_3 + \text{___ Cu(CN)}_2$

Predict the products for the following reactions. Then balance the reactions.

