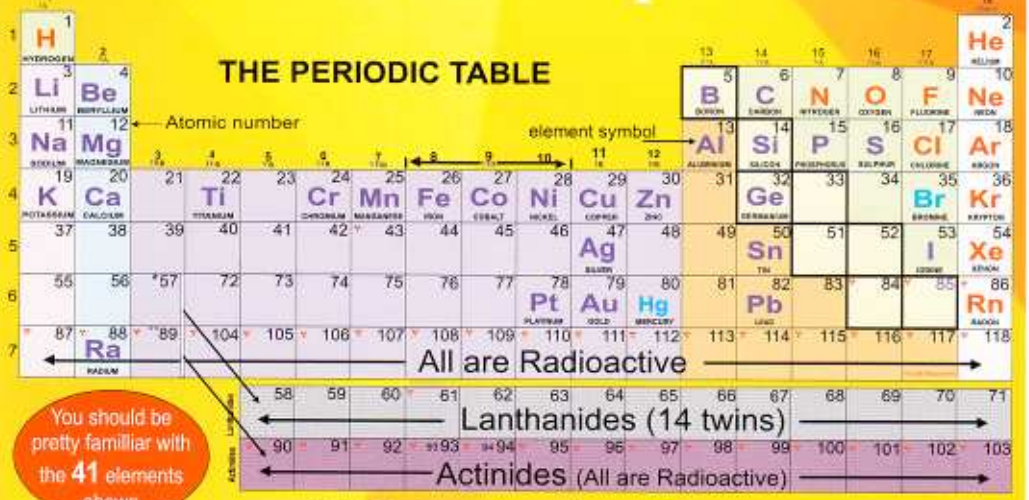
CHEMICAL Formulae & Chemical Equations.

THE PERIODIC TABLE



You should be pretty familiar with the **41** elements shown

IUPAC - International Union of Pure & Applied Chemistry

The *position* of each element in the *Periodic Table* determines the whole of its *chemical behaviour.*

ELECTRONIC CONFIGURATION OF THE ELEMENTS

At. No.

1 H - $1s^1$

2 He - $1s^2$

3 Li - $1s^2\ 2s^1$

6 C - $1s^2\ 2s^2\ 2p^2$

7 N - $1s^2\ 2s^2\ 2p^3$

8 O - $1s^2\ 2s^2\ 2p^4$

9 F - $1s^2\ 2s^2\ 2p^5$

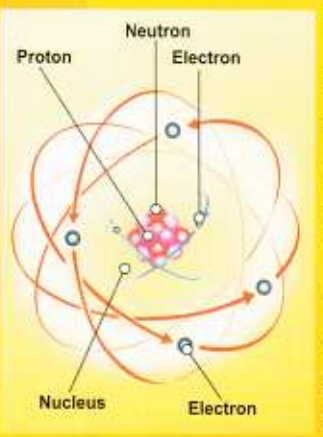
10 Ne - $1s^2\ 2s^2\ 2p^6$

Niel Bohr (1885-1962)

Energy Levels in Atom

Shell → K L M N O P Q

Subshell → s p d f



11 Na - (Ne) $3s^1$

12 Mg - (Ne) $3s^2$

13 Al - (Ne) $3s^2\ 3p^1$

14 Si - (Ne) $3s^2\ 3p^2$

16 S- (Ne) $3s^2\ 3p^4$

17 Cl - (Ne) $3s^2\ 3p^5$

18 Ar - (Ne) $3s^2\ 3p^6$

19 K - (Ar) $4s^1$

20 Ca - (Ar) $4s^2$

30 Zn - (Ar) $3d^{10}\ 4s^2$

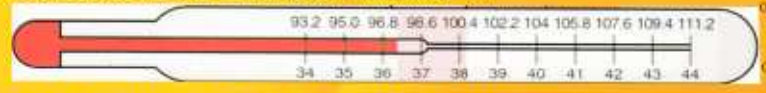
ATMOSPHERE COMPOSITION

Gas	Inhale air (breathing in)	Exhale air (breathing out)
Oxygen	21%	16%
Carbon dioxide	0.04%	4%
Nitrogen	78%	78%
Water vapour	Variable	Saturated
Other gases	1%	1%

Temperature of exhale air is always higher than inhale air

An atom contains *same* number of protons & electorns

PARTICLE	MASS (Approx)	CHARGE
Proton (p)	1u	+1
Neutron (n)	1u	0
Electron (e)	$\frac{1}{2000}$u	-1



RELATION BETWEEN THE TEMPERATURES

	Freezing point of water	Boiling point of water
Celcius	0°C	100°C
Fahrenheit	32°F	212°F
Kelvin	273K	373K

Conversion
1. $°F = \frac{9}{5}(°C) + 32$
2. $°C = \frac{5}{9}(°F - 32)$
3. $0°C = 32°F = 273K$

Atomic mass = Dalton = u

1 Carlorie = 4.184 J (Joules)

Density = mass/volume (kgm^{-3})

Volume = cubic meter (m^3)

Pressure = force/area (Nm^{-2})

pascal P_a = newton/(meter)^2

Royal Society of London Estd - 1662

Common Ions You Really Should know

Positive Ions/ Cations
Basic Radicals

Sr.	Name	Symbol	Valency
1.	Hydrogen ion	H^+	1
2.	Sodium ion	Na^+	1
3.	Silver ion	Ag^+	1
4.	Potassium ion	K^+	1
5.	Ammonium ion	NH_4^+	1
6.	Hydronium ion	H_3O^+	1
7.	Copper (I) ion	Cu^+	1
8.	Mercury (I) ion	Hg^+	1
9.	Barium ion	Ba^{2+}	2
10.	Calcium ion	Ca^{2+}	2
11.	Magnesium ion	Mg^{2+}	2
12.	Zinc ion	Zn^{2+}	2
13.	Copper (II) ion	Cu^{2+}	2
14.	Iron (II) ion	Fe^{2+}	2
15.	Tin (II) ion	Sn^{2+}	2
16.	Mercury (II) ion	Hg^{2+}	2
17.	Manganese (II) ion	Mn^{2+}	2
18.	Lead (II) ion	Pb^{2+}	2
19.	Lead (IV) ion	Pb^{4+}	4
20.	Aluminium ion	Al^{3+}	3
21.	Iron (III) ion	Fe^{3+}	3
22.	Manganese (III) ion	Mn^{3+}	3
23.	Cromium ion	Cr^{3+}	3
24.	Tin (IV) ion	Sn^{4+}	4

Negative Ions/ Anions
Acidic Radicals

Sr.	Name	Symbol	Valency
1.	Hydride ion	H^-	1
2.	Hydroxide ion	OH^-	1
3.	Cyanide ion	CN^-	1
4.	Iodide ion	I^-	1
5.	Bromide ion	Br^-	1
6.	Chloride ion	Cl^-	1
7.	Fluoride ion	F^-	1
8.	Bicarbonate ion	HCO_3^-	1
9.	Nitrite ion	NO_2^-	1
10.	Nitrate ion	NO_3^-	1
11.	Bisulphite ion	HSO_3^-	1
12.	Iodate ion	IO_3^-	1
13.	Chlorate ion	ClO_3^-	1
14.	Hypochlorite ion	ClO^-	1
15.	Hypobromite ion	BrO^-	1
16.	Oxide ion	O^{-2}	2
17.	Sulphide ion	S^{-2}	2
18.	Carbonate ion	CO_3^{-2}	2
19.	Phosphite ion	HPO_3^{-2}	2
20.	Sulphate ion	SO_4^{-2}	2
21.	Chromate ion	CrO^{-2}	2
22.	Dichromate ion	$Cr_2O_7^{-2}$	2
23.	Peroxide ion	O_2^{-2}	2
24.	Sulphite ion	SO_3^{-2}	2
25.	Nitride ion	N^{-3}	3
26.	Phosphide ion	P^{-3}	3
27.	Phosphate ion	PO_4^{-3}	3
28.	Borate ion	BO_3^{-3}	3

ALLOYS

1	Brass	$Cu_{60\%} + Zn_{40\%}$
2	Bronze	$Cu_{90\%} + Sn_{10\%}$
3	Gun- metal	$Cu_{88\%} + Sn_{10\%} + Zn_{2\%}$
4	Steel	Fe + carbon 1 – 1.5%
5	Stainless Steel	Fe + Cr + Ni
6	Bell Metal	$Cu_{78\%} + Sn_{22\%}$

1.12 gm platinum gives 2.5 km length wire

For Purity :
24 Carat gold - 100% pure

For Mass :
1 Carat = 205 mg = 0.205 g

1 gm gold - 2sq. meter sheet

Enamel - Zn + Mg coating

Inorganic Compounds : Formulae

1. H_2O – Water
2. H_2SO_4 – Sulphuric Acid
3. HNO_3 – Nitric Acid
4. $MgSO_4$ – Magnesium Sulphate
5. MgO – Magnesium Oxide
6. CaO – Calcium Oxide
7. FeO – Iron (II) Oxide
8. CuO – Cupirc Oxide
9. MnO_2 – Manganese Dioxide
10. $FeCl_2$ – Ferrous Chloride
11. $FeCl_3$ – Ferric Chloride
12. H_2O_2 – Hydrogen Peroxide
13. NH_4Cl – Ammonium Chloride
14. $(NH_4)_2SO_4$ – Ammonium Sulphate
15. $(NH_4)_2CO_3$ – Ammonium Carbonate
16. $AgNO_3$ – Silver Nitrate
17. $KMnO_4$ – Potassium permanganate
18. KCl – Potassium Chloride
19. $CaCl_2$ – Calcium Chloride
20. $KClO_3$ – Potassium Chlorate
21. NH_4OH – Ammonium Hydroxide
22. $CuSO_4$ – Copper Sulphate
23. NaCl – Sodium Chloride
24. SiO_2 – Silica (Sand)
25. NaOH – Sodium Hydroxide
26. KOH – Potassium Hydroxide
27. Na_2CO_3 - Sodium Carbonate
28. $NaHCO_3$ - Sodium Bicarbonate
29. $CaCO_3$ - Calcium Carbonate
30. $K_2SO_4.Al_2(SO_4)_3.24H_2O$ - Potash Alum
31. $MgSO_4.7H_2O$ - Epsum Salt
32. $CaSO_4.2H_2O$ - Gypsum Salt
33. PbO_2 – Lead Dioxide or Lead Peroxide
34. O_2 / N_2 / H_2 – Oxygen / Nitrogen / Hydrogen
35. CO_2 – Carbon Dioxide
36. Solid CO_2 – Dry ice (-57°C)
37. CO - Carbon Monoxide
38. $CaOCl_2$ - Calcium Oxychloride (Bleaching powder)
39. $HgCl_2$ - Mercuric Chloride
40. $CuSO_4.5H_2O$ - Blue Vitrol
41. $FeSO_4.7H_2O$ - Green Vitrol
42. $ZnSO_4.7H_2O$ - White Vitrol
43. H_2SO_4(Conc)- Oil of Vitrol
44. D_2O - Heavy Water
45. $(CO + H_2)$ - Water Gas
46. N_2O - Nitrous Oxide (Laughing gas)
47. $FeSO_4, (NH_4)_2SO_4.6H_2O$ - Mohr's Salt
48. $(CO + N_2)$ - Producer gas (Industrial Fuel)
49. Zn_3P_2 - Zinc Phosphide (Rat Killer)
50. $2(CaSO_4).H_2O$ - Plaster of Paris

Arrows in Chemistry

1. Chemical Reaction →
2. Equilibrium ⇄
3. Upward Arrow ↑ (Gas)
4. Downward Arrow ↓ (precipitate)

CATALYST

A catalyst is a substance which ***alter*** the rate of a reaction, without being changed.

e.g.

1) Nickel 2) MnO_2 3) Iron

Enzymes are catalysts
Produced by living things.

Increasing order of Metals reactivity

POTASSIUM	K
SODIUM	Na
CALCIUM	Ca
MAGNESIUM	Mg
ALUMINIUM	Al
ZINC	Zn
IRON	Fe
LEAD	Pb
COPPER	Cu
SILVER	Ag
GOLD	Au
PLATINUM	Pt

Aquaregia

HCl-75% + HNO_3- 25%
Gold gets disolved

Decimal multiples with S.I. Units

Prefix	Symbol	Fraction/ multiple
atto	a	10^{-18}
femto	f	10^{-15}
pico	p	10^{-12}
nano	**n**	$\mathbf{10^{-9}}$
micro	**μ**	$\mathbf{10^{-6}}$
milli	m	10^{-3}
centi	c	10^{-2}
deci	d	10^{-1}
deca	da	10^{1}
hecto	h	10^{2}
kilo	**k**	$\mathbf{10^{3}}$
mega	**M**	$\mathbf{10^{6}}$
giga	G	10^{9}
tera	T	10^{12}
peta	P	10^{15}
exa	E	10^{18}

Avagadro's Number $N_A = 6.023 \times 10^{23}$ mol^{-1}

Nomenclature

Notice the names: "Meth-" means "one carbon atom", "eth-" means "two C atoms", "prop-" means "three C atoms", "but-" means "four C atoms", etc.

A) Halogen Derivatives

	Formula	Common Name	IUPAC Name
1	CH_3Cl	Methyl chloride	Chloromethane
2	$CH_3 - CH_2 - Br$	Ethyl bromide	Bromoethane
3	$CH_3 - CH_2 - I$	Ethyl iodide	Iodoethane
4	$CH_3 - CH_2 - CH_2 - I$	n-Propyl Iodide	1- Iodopropane
5	$CH_3 - \underset{\displaystyle Cl}{\underset{\vert}{C}}H - CH_3$	Isopropyl chloride	2 - Chloropropane
6	$CH_3 - \underset{\displaystyle Br}{\underset{\vert}{C}}H - CH_3$	Isopropyl bromide	2 - Bromopropane
7	$CH_3 - CH_2 - CH_2 - CH_2 - I$	n-Butyl iodide	1 - Iodobutane
8	$CH_3 - \underset{\displaystyle Br}{\underset{\vert}{\overset{\displaystyle CH_3}{\overset{\vert}{C}}}} - CH_3$	tert- Butyl- bromide	2- Bromo- 2 - methyl propane

B) Organic Hydroxy Compounds

9	$CH_3 - OH$	Methyl alcohol	Methanol
10	$CH_3 - CH_2 - OH$	Ethyl alcohol	Ethanol
11	$CH_3 - CH_2 - CH_2 - OH$	n-Propyl alcohol	1- Propanol
12	$CH_3 - \underset{\displaystyle OH}{\underset{\vert}{C}}H - CH_3$	Isopropyl alcohol	2 - Propanol
13	$CH_3 - \underset{\displaystyle CH_3}{\underset{\vert}{C}}H - CH_2OH$	Isobutyl alcohol	2- Methyl -1 propanol
14	$CH_3 - \underset{\displaystyle CH_3}{\underset{\vert}{\overset{\displaystyle CH_3}{\overset{\vert}{C}}}} - OH$	tert- Butyl alcohol	2- Methyl -2 propanol

C) Aldehydes

15	$HCHO$	Formaldehyde	Metha**nal**
16	CH_3CHO	Acetaldehyde	Etha**nal**
17	$CH_3 - CH_2 - CHO$	Propionaldehyde	1- Propa**nal**
18	$CH_3 - \underset{\displaystyle CH_3}{\underset{\vert}{C}}H - CHO$	Isobutyraldehyde	2- Methylpropanal

D) Ketones

19	$CH_3 - CO - CH_3$	Acetone	Propanone
20	$C_2H_5 - CO - C_2H_5$	Diethyl ketone	3- Pentanone
21	$CH_3 - CH_2 - \underset{\displaystyle O}{\underset{\Vert}{C}} - CH_3$	Ethyl methyl ketone	Butanone
22	$CH_3 - \underset{\displaystyle O}{\underset{\Vert}{C}} - CH_2 - CH_2 - CH_3$	Methyl propyl ketone	2- Pentanone

E) Ethers

23	$CH_3 - O - CH_3$	Dimethyl ether	Methoxymethane
24	$CH_3 - O - CH_2 - CH_3$	Ethyl methyl ether	Methoxyethane
25	$C_2H_5 - O - C_2H_5$	Diethyl ether	Ethoxyethane

F) Acids & Esters

	Formula	Common Name	IUPAC Name
26	$H-COOH$	Formic acid	Methanoic acid
27	CH_3-COOH	Acetic acid	Ethanoic acid
28	CH_3-CH_2-COOH	Propionic acid	Propanoic acid
29	$CH_3-CH_2-CH_2-COOH$	n-Butyric acid	Butanoic acid
30	$HCOO-CH_3$	Methyl formate	Methyl methanoate
31	$HCOO-C_2H_5$	Ethyl formate	Ethyl methanoate
32	$CH_3-COO-C_2H_5$	Ethyl acetate	Ethyl ethanoate

G) Amines

33	CH_3-NH_2	Methylamine	Methanamine
34	$CH_3-CH_2-NH_2$	Ethylamine	Ethanamine
35	$(CH_3-CH_2)_2NH$	Diethylamine	Diethanamine
36	$CH_3-N(C_2H_5)-H$	Ethylmethylamine	N-methylethanamine

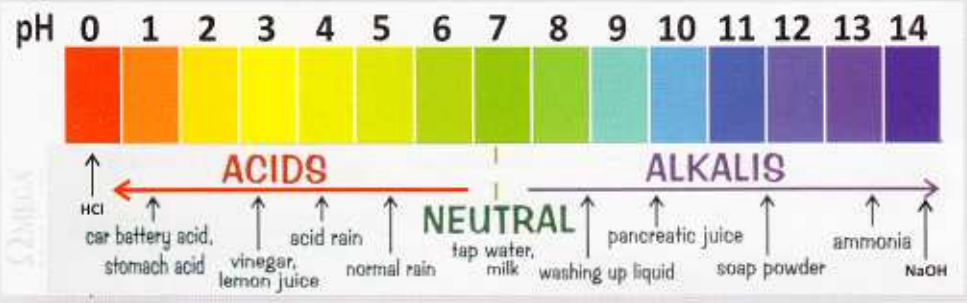
Functional Group Formulae

Hydroxyl - OH	tertiary amine $N<$	Keto $>C=O$
Nitro $-NO_2$	halo - - - $-Cl$, $-Br$, $-I$	Formyl - CHO
Primary amine $-NH_2$	Ester - COOR	Carboxylic acid - COOH
Secondary amine - $>NH$	Cyano $-C\equiv N$	Ether - O -

Alkanes have all C - C single bonds, except methane eg. ethane C_2H_6, C_nH_{2n+2}
Alkenes have a C = C double bond, eg. ethene C_2H_4, butene C_4H_8, C_nH_{2n}
Alkynes have a C ≡ C triple bond, eg. acetylene C_2H_2, C_nH_{2n-2}

Acids and Alkalis

The pH Scale and Universal Indicator



An acid base Indicator is just a Dye that changes colour with pH

The dye changes colour depending on whether it's in an acidic medium or in an alkaline medium. Universal indicator is a very useful combination of dyes which give different colours at different pH values.

The pH scale goes from 0 to 14

1) The strongest acid has pH=0. The strongest alkali has pH=14.
2) If something is neutral it has pH=7. (e.g. pure water)
3) Anything less than 7 is acidic. Anything more than 7 is alkaline.
(An alkali can also be called a base)

Acidic solutions contain higher concentration of H^+ ions than OH^- ions and vice versa.

Definitions of acids and alkalis are :
ACIDS are substances which form $H^+_{(aq)}$ ions when added to water.
ALKALIS are substances which form $OH^-_{(aq)}$ ions when added to water.

Neutralisation

A general equation for any neutralisation reaction : Make sure you learn it :

Acid + Alkali ⟶ Salt + Water

Neutralisation can also be seen in terms of ions like this, so learn it too :

$H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$

The pH affects the activity of enzymes

Synthetic indicators - Phenolphthalein, Methyl orange, Eosin etc.

ORGANIC - CHEMICAL REACTIONS

1) $CH_{4(g)} + 2O_{2(g)} \longrightarrow CO_{2(g)} + 2H_2O_{(g)}$ + energy

2) $2C_4H_{10(g)} + 13O_{2(g)} \xrightarrow{\text{exothermic combustion}} 8CO_{2(g)} + 10H_2O_{(l)}$ + 2658 KJ Heat

3) $CH_4 + O_2 \xrightarrow{\text{Limited air}} C + 2H_2O$
Carbon black

4) $CH_4 + Cl_2 \xrightarrow{\text{UV Light}} CH_3Cl + HCl.$
Methyl chloride.
'H' replaced (substituted) by Cl.

5) $CH_3CH_2I + KOH_{(aq)} \longrightarrow CH_3CH_2OH + KI$
'I' is replaced by 'OH'

6) Reaction with ethyl alcohol.
$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2 \uparrow$
Sodium ethoxide

7) $3C_2H_5OH + PCl_3 \longrightarrow 3C_2H_5Cl + H_3PO_3$
Ethyl alcohol — Phosphorous trichloride — Ethylchloride — Phosphorous acid

8) $CH_3COOH + Cl_2 \longrightarrow CH_2Cl - COOH + HCl \uparrow$
Acetic acid — Monochloro acetic acid

9) $2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2 \uparrow$

10) $CH_3COOH + C_2H_5OH \xrightarrow[ZnCl_2]{\text{anhydrous}} CH_3COOC_2H_5 + H_2O.$
Acetic acid — Ethyl alcohol. — Ethyl acetate.

11) Alcoholic fermentation :

FERMENTATION is the process of ***yeast*** converting ***sugar*** into ***carbon dioxide*** and ***alcohol.***

Glucose $\xrightarrow{\text{Zymase}}$ Carbon dioxide + Ethanol (+Energy)

National Chemistry Day - 10th December

Allotrops of Carbon

Graphite (Pure Carbon)

Diamond (Pure Carbon)

Buckminster Fullerene
(60 Carbon atoms)

Useful for All State Boards, CBSC, ICSE, IGCSE, & IB Board students

16/12/14.

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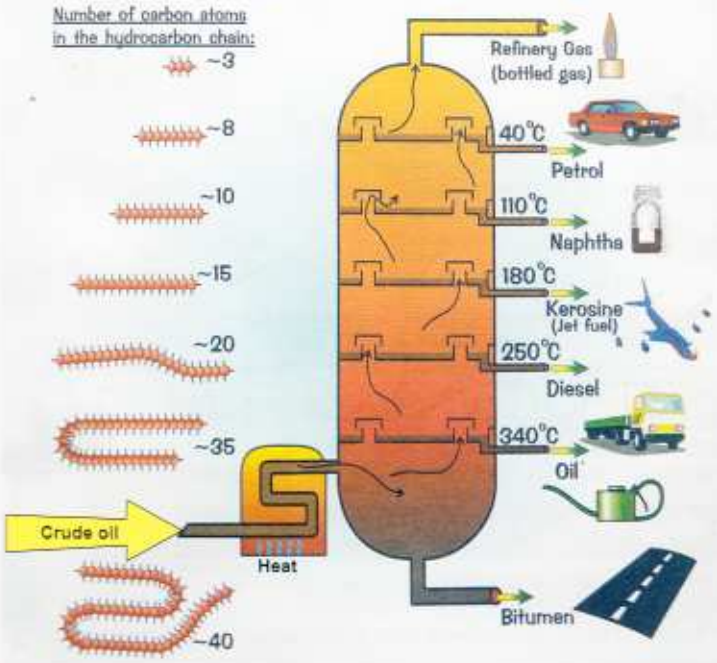
Crude oil is Split into Separate Hydrocarbons (fuels)



Crude oil is a very important part of modern life

The fractionating column works continuously, with heated crude oil piped in at the bottom and the various fractions being constantly tapped off at the different levels where they condense.

National Science Day 28th February

CHEMICAL EQUATIONS X STD

1) Edible Oil + Hydrogen $\xrightarrow{\text{Catalyst}}$ Fat
2) $2Cu + O_2 \longrightarrow 2CuO$
3) $FeS + H_2SO_4 \longrightarrow FeSO_4 + H_2S\uparrow$
4) $Zn + 2HCl \longrightarrow ZnCl_2 + H_2\uparrow$
   Metal + acid $\longrightarrow$ Salt + Hydrogen
5) $Fe_{(s)} + S_{(s)} \longrightarrow FeS_{(s)}$
6) $3CaO.Al_2O_3 + 6H_2O \longrightarrow 3CaO.Al_2O_3.6H_2O + Heat$
7) $(CaSO_4)_2.(H_2O) + 3H_2O \longrightarrow 2CaSO_4.2H_2O + Heat$
8) $KNO_3 + H_2O \xrightarrow{Heat} KNO_{3(aq)}$
9) $NaOH + H_2O \longrightarrow NaOH_{(aq)} + Heat$
10) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2\uparrow$
    Lime stone quick lime

11) $2AgBr_{(s)} \xrightarrow{Sunlight} 2Ag_{(s)} + Br_{2(g)}\uparrow$
    silver metal
12) $2AgCl_{(s)} \xrightarrow{Sunlight} 2Ag_{(s)} + Cl_{2(g)}\uparrow$
13) $CaS + 2HCl \longrightarrow CaCl_2 + H_2S\uparrow$
14) $CuSO_{4(aq)} + Zn_{(s)} \longrightarrow ZnSO_{4(aq)} + Cu_{(s)}$
15) $CuSO_{4(aq)} + Fe_{(s)} \longrightarrow FeSO_{4(aq)} + Cu_{(s)}$
16) $CuCl_2 + 2KI \longrightarrow CuI_2\downarrow + 2KCl$
17) $AgNO_3 + NaCl \longrightarrow AgCl\downarrow + NaNO_3$
18) $BaS + ZnSO_4 \longrightarrow BaSO_4\downarrow + ZnS$.
19) $4Al + 3O_2 \longrightarrow 2Al_2O_3$ (Alumina)
20) O_3 (ozone) $\xrightarrow[\text{Light}]{\Delta} O_2 + [O]$ (nascent oxygen)

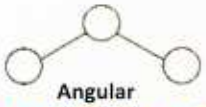
21) $BaSO_4 + 4C \longrightarrow BaS + 4CO$.
22) $Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2$
23) $CuO + 2HCl \longrightarrow CuCl_2 + H_2O$
24) $H^+ + H_2O \longrightarrow H_3O^+$
25) $2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$
26) $Ca(OH)_{2(s)} + Cl_{2(g)} \longrightarrow CaOCl_2 + H_2O$
27) $C_{12}H_{22}O_{11(s)} + H_2O_{(aq)} \xrightarrow[323\,K]{Conc\ HCl} C_6H_{12}O_6 + C_6H_{12}O_6$
    Sucrose (cane sugar) Glucose Fructose
28) $C_{12}H_{22}O_{11(s)} \xrightarrow{Heat} 12C_{(s)} + 11H_2O_{(g)}\uparrow$
29) $2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2\uparrow$
30) $C + 2H_2 \longrightarrow CH_4\uparrow$ (Methane)
31) $2H_2S + SO_2 \longrightarrow 3S + 2H_2O$
32) **Saponification :**
    Oils / fats + NaOH or KOH $\longrightarrow$ Sodium / Potasium Salts of Carboxylic Acids + Glycerol
33) **Polymerisation :**

$$n(H_2C=CH_2) \xrightarrow[\text{high pressure, catalyst}]{\text{high temp}} \left[\begin{array}{cc} H & H \\ | & | \\ -C & -C- \\ | & | \\ H & H \end{array}\right]_n$$

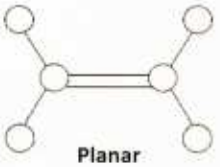
Many Single ethylenes Polyethylene or Polyethene

Shapes of Molecules & ions

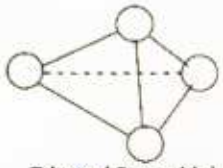
Linear (180°)
HCN, CO_2



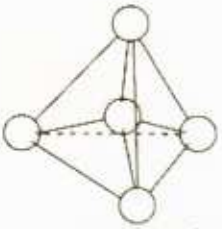
Angular
H_2O (105°), H_2S (92°)



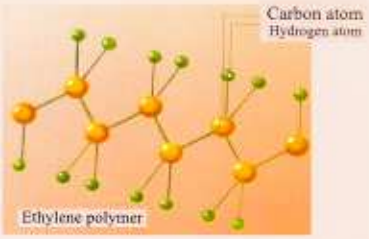
Planar



Trigonal Pyramidal
NH_3 (107°), PCl_3 (100°)



Tetrahedral (109.5°)
NH_4^+ (109.5°)



Nine Types of Chemical Change

1) Thermal decomposition - breakdown on heating
2) Neutralisation - acid + alkali gives salt + water
3) Displacement - one metal kicking another one out
4) Precipitation - solid forms in solution
5) Oxidation - loss of electrons
6) Reduction - gain of electrons
7) Exothermic Reactions - give away heat
8) Endothermic Reactions - absorb heat
9) Reversible Reactions - they go both way

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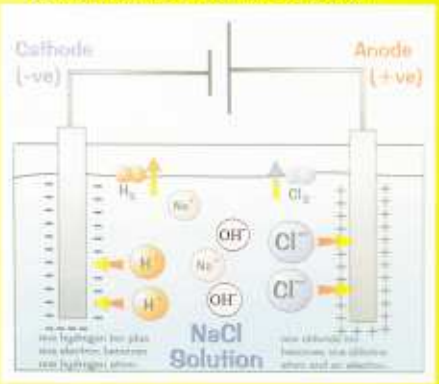
CHEMICAL EQUATIONS - STD VIII

1) $Na_{(s)} \rightarrow Na^{+}_{(aq)} + e^{-}$
2) $Mg_{(s)} \rightarrow Mg^{2+} + 2e^{-}$ oxidation
3) $Cl + e^{-} \rightarrow Cl^{-}_{(aq)}$ Reduction
4) $O + 2e^{-} \rightarrow O^{--}_{(aq)}$ Reduction
5) $Na^{+} + Cl^{-} \rightarrow NaCl$
6) $Mg^{2+} + 2Cl \rightarrow MgCl_2$
7) $Al^{3+} + 3Cl^{-} \rightarrow AlCl_3$
8) $2H_2 + O_2 \rightarrow 2H_2O$
9) $CaO + H_2O \rightarrow Ca(OH)_2 + Energy$
   qicklime — slaked lime
10) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
11) $C + O_2 \rightarrow CO_2$
12) $H_2 + Cl_2 \xrightarrow{\Delta} 2HCl$.
13) $2Mg + O_2 \xrightarrow{\Delta} 2MgO + Energy$
14) $HCl + NaOH \rightarrow NaCl + H_2O$
15) $2Fe + O_2 \xrightarrow{Moisture} 2FeO$ (Rust)
16) $Mg + 2HCl \rightarrow MgCl_2 + H_2$
17) $2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$
18) $Fe + 2HCl \rightarrow FeCl_2 + H_2$
19) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$
20) $Ag + H_2S \rightarrow AgS + H_2$
21) $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$
22) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
23) $CaO + CO_2 \rightarrow CaCO_3$
24) $CO_2 + H_2O \rightarrow H_2CO_3$
25) $2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$
26) $Na_2CO_3 + H_2O + CO_2 \rightarrow 2NaHCO_3$
27) $2NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O + 2CO_2$
28) $CO + 3H_2 \xrightarrow[Nickel]{300^{\circ}} CH_4\uparrow + H_2O$
29) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Heat\ energy$
30) $2KClO_3 \xrightarrow[MnO_2]{500^{\circ}} 2KCl + 3O_2$

Electrolysis and The Half Equations

Electrolysis means "Splitting up with Electricity"



In this Solution H^{+} ions from water get discharged at cathode in preference to Na^{+} ions, Cl^{-} ions get discharged at anode in preference to OH^{-} ions from water.

Cathode : $H^{+}_{(aq)} + e^{-} \rightarrow H$
$H + H \rightarrow H_2\uparrow$ (Gas)

Anode : $Cl^{-}_{(aq)} \rightarrow Cl + e$
$Cl + Cl \rightarrow Cl_2\uparrow$ (Gas)

Boyle's law

Pressure X Volume = a constant number

Provided the temperature and amount are kept same

Gas constant 'R' = 8.314 $JK^{-1}\ mol^{-1}$

CHEMICAL EQUATIONS - STD IX

1) $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$.
2) $2HgO \rightarrow 2Hg + O_2$
3) $PbCl_2 + 2KI \rightarrow PbI_2 + 2KCl$.
4) $Mg + 2HCl \rightarrow MgCl_2 + H_2$
5) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
6) $BaCO_3 + dil\ H_2SO_4 \rightarrow BaSO_4\downarrow + H_2O + CO_2\uparrow$
7) $CuSO_{4(aq)} + H_2S_{(g)} \rightarrow CuS\downarrow + H_2SO_{4(aq)}$
8) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4\downarrow + 2HCl$
9) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
10) $NaOH + HCl \rightarrow NaCl + H_2O$
11) $NH_{3(g)} + HCl_{(g)} \rightarrow NH_4Cl$
12) $Ca(NO_3)_2 + H_2SO_4 \rightarrow CaSO_4 + 2HNO_3$
13) $2SO_2 + O_2 \rightarrow 2SO_3$
14) $6CH_4 + O_2 \xrightarrow{1500^{\circ}C} 2C_2H_2 + 2CO\uparrow + 10H_2\uparrow$
15) $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O + Energy$
16) $2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O + Energy$
17) Photosythesis (Endothermic Reaction)

Carbon dioxide + water $\xrightarrow[chlorophyll]{sunlight}$ glucose + oxygen
(raw material) (products)

18) Aerobic respiration

Glucose + oxygen $\rightarrow$ Carbon dioxide + water + energy
(fuel) (waste products)

19) Anaerobic respiration

Glucose $\rightarrow$ lactic acid + energy
(waste products)
e.g. in human muscle cells

Energy is used to make a substance called adenosine triphosphate, or ATP

Solvent + Solute → Solution

The Rate of a Reaction Depends on Four Things.

1. Temperature
2. Concentration (or Pressure for Gases)
3. Catalyst
4. Size of Particles (or Surface area)