

Dear grade IX students,

This is an attempt to prepare you to easily grasp the syllabus of class-X chemistry. We'll go through all the basic concepts required to understand the chemistry chapters of grade X.

Classification of elements

You need to know following points regarding elements

a) Atomic number, atomic weight and valency of following elements.

Atomic number	Element	Symbol	Atomic weight	Valency
1	Hydrogen	H	1	1
2	Helium	He	4	0
3	Lithium	Li	7	1
4	Beryllium	Be	9	2
5	Boron	B	11	3
6	Carbon	C	12	4
7	Nitrogen	N	14	3
8	Oxygen	O	16	2
9	Fluorine	F	19	1
10	Neon	Ne	20	0
11	Sodium	Na	23	1
12	Magnesium	Mg	24	2
13	Aluminium	Al	27	3
14	Silicon	Si	28	4
15	Phosphorus	P	35	3
16	Sulphur	S	32	2
17	Chlorine	Cl	35.5	1
18	Argon	Ar	40	0
19	Potassium	K	39	1
20	Calcium	Ca	40	2

b) Beyond Calcium you need to know following elements with their valencies:

Element	State/ Symbol	Valency
Zinc	Zn	2
Silver	Ag	1
Barium	Ba	2
Iron	Ferrous(Fe)	2
	Ferric(Fe)	3
Copper	Cuprous(Cu)	1
	Cupric(Cu)	2
Lead	Plumbous(Pb)	2
	Plumbic(Pb)	4
Tin	Stannous(Sn)	2
	Stannic(Sn)	4
Mercury	Mercurous(Hg)	1
	Mercuric(Hg)	2
Gold	Aurous(Au)	1
	Auric(Au)	3
*Charges not mentioned for simplicity		

c) Remember the formulae and valencies of following radicals

Radicals	Formula	Valency
Hydroxide	OH	1
Chlorate	ClO ₃	1
Ammonium	NH ₄	1
Bicarbonate	HCO ₃	1
Bisulphate	HSO ₄	1
Cyanide	CN	1
Nitrite	NO ₂	1
Nitrate	NO ₃	2
Carbonate	CO ₃	2
Sulphate	SO ₄	2
Silicate	SiO ₃	2
Sulphite	SO ₃	2
Sulphide	S	2
Oxide	O	2
Peroxide	O ₂	2
Nitride	N	3
Phosphate	PO ₄	3

d) Now it's the turn to write molecular formula.

Sodium Sulphate =

Methane

Magnesium Oxide

Carbondioxide

Calcium hydroxide

Ammonium Carbonate

e) Now, you need to learn the basic concepts of group and periods. By this time it is sufficient if you know that for elements up to calcium.

IA	IIA	IIIA	IVA	VA	VIA	VIIA	0
H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca						

Group 'B' elements and other periods will be dealt later in grade X.

f) Learn two periodic laws:

Mendeleev's periodic law: "The physical and chemical properties of all the elements are the periodic functions of their atomic weights."

Modern periodic law: "The physical and chemical properties of all the elements are the periodic functions of their atomic numbers."

g) Group IA elements are called alkali metals. They are most reactive metals.eg; Na,K
Group IIA elements are called alkaline earth metals. They are reactive metals.eg; Mg, Ca.
Group VIIA elements are called alkali halogens. They are most reactive non-metals.eg; F,Cl
Group O elements are called noble gases. They are inert non metals.eg; He, Ne.

h) Now, let's learn how can we locate the position of elements in periodic table.

LOCATING GROUPS AND PERIODS:

Period = number of shell

Group = number of valence electron

Al :2,8,3

Mg ; 2,8,2

Cl : 2,8,7

Period = 3, Group = IIIA

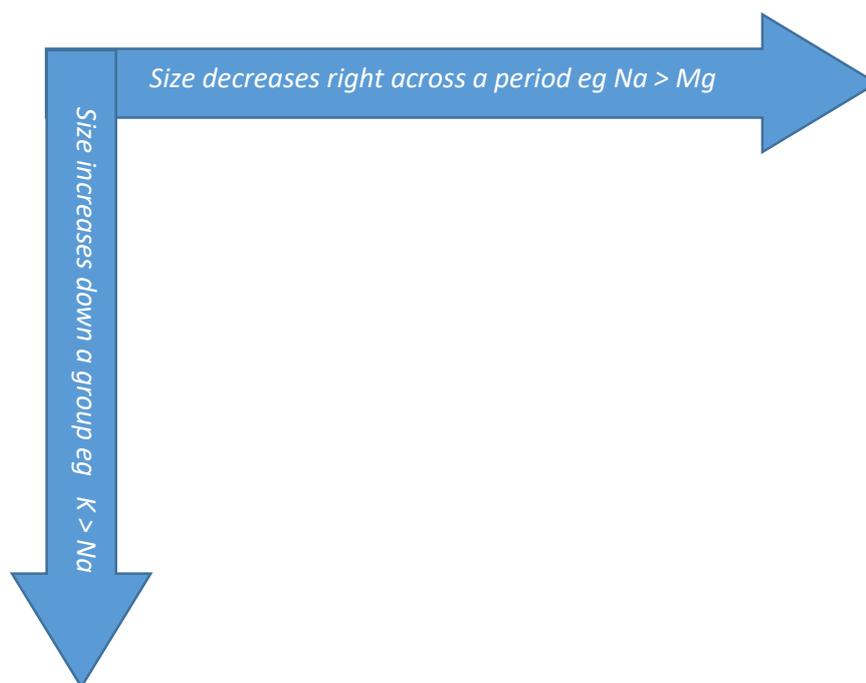
Period = 3, Group = IIA

Period = 3, Group = VIIA

Try for other elements too!!

i) Size and reactivity of elements:

Know which element is larger and which one is more reactive.



As you've learnt about the size, reactivity now turns out to be simple.

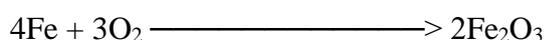
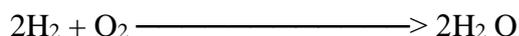
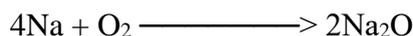
i) For metals - larger the size - greater is the reactivity $K > Na$

ii) For non metals - smaller the size - greater the reactivity $F > Cl$.

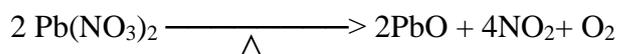
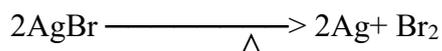
2. Chemical reactions

You've learnt to write molecular formula in chapter 1. Now its turn to write following chemical equations and balance them.

1] Addition reactions



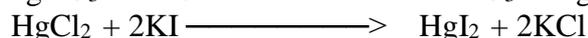
2] Decomposition reactions:



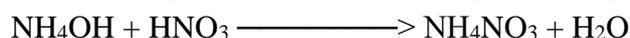
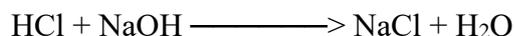
3] a) Single displacement reactions:



b) double displacement reaction



4] Neutralization reaction:



- Learn the definitions of i) Endothermic reaction and exothermic reaction ii) Positive and negative catalyst with an example of each.

3. Acids, Bases and Salts:

At present learn the name and formula of acids and bases and few examples of acid base reaction written under the heading neutralization reaction mentioned above.

Acids

- | | |
|----------------------|--------------------------------|
| 1. Hydrochloric acid | HCl |
| 2. Sulphuric acid | H ₂ SO ₄ |
| 3. Nitric acid | HNO ₃ |
| 4. Carbonic acid | H ₂ CO ₃ |
| 5. Phosphoric acid | H ₃ PO ₄ |
| 6. Formic Acid | HCOOH |
| 7. Acetic acid | CH ₃ COOH |

Bases: You can write many bases when you know that bases are the oxides and hydroxides of metals.

Sodium oxide	Na ₂ O	Sodium hydroxide	NaOH
Potassium oxide	K ₂ O	Potassium hydroxide	KOH
Magnesium oxide	MgO	Magnesium hydroxide	Mg(OH) ₂
Calcium oxide	CaO	Calcium hydroxide	Ca(OH) ₂

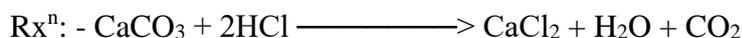
The only base without metal is NH₄OH. Alkalies are water soluble metal hydroxides eg NaOH, KOH, Ca(OH)₂ etc.

4. Gases

You have already studied the general concept of lab preparation of hydrogen, oxygen and nitrogen this year. Let's learn only the principle of lab preparation of carbon dioxide and ammonia gas

Lab preparation of carbon dioxide gas: -

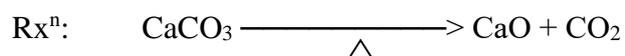
***Principle** → carbon dioxide gas is prepared in the lab by treating calcium carbonate (marble chips) with dilute hydrochloric acid.



Carbondioxide gas so produced is collected in gas jar by upward displacement of air as it is heavier than air.

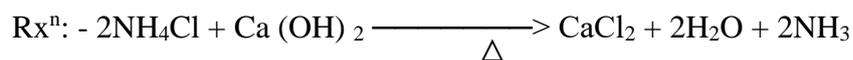
Manufacture of carbon dioxide gas: -

Carbon dioxide is manufactured in industries by heating limestone.



Lab preparation of ammonia gas: -

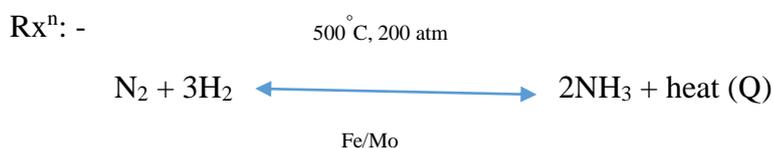
***Principle** → Ammonia is prepared in lab by heating a 2:1 mixture of ammonium chloride and calcium hydroxide (slaked lime).



Ammonia gas so prepared is collected in the gas jar by downward displacement of air.

Manufacture of ammonia gas: - [Haber's synthesis]

When 1:3 mixture of nitrogen and hydrogen is heated at 500°C and 200-900 atm in presence of finely divided iron catalyst and promoter molybdenum, ammonia is produced.



5. Metals

In this chapter, you've to learn the position in periodic table, ores, physical properties and uses of iron, aluminium, copper, silver and gold.

Physical properties like conductivity, malleability, ductility etc are common for all these metals and you can easily write the common uses of these metals as you've seen in your daily life.

So, let's put some effort to learn their position in periodic table and their ores.

Iron[Fe]: At. No: 26

At. Wt : 56

Ores: Haematite [Fe₂O₃]-main ore

Magnetite[Fe₃O₄]

Siderite[FeCO₃]

Limonite[Fe₂O₃.3H₂O]

Iron Pyrite[FeS₂]

Electronic configuration

Shell	K	L	M	N
Electron	2	8	14	2
Orbitals	1s ²	2s ² 2p ⁶	3s ² 3p ⁶ 3d ⁶	4s ²

Aluminium[Al]: At. No: 13

At. Wt : 27

Ores: Bauxite [Al₂O₃. 2H₂O]-main ore

Feldspar[KAlSi₃O₈]

Cryolite[Na₃ AlF₆]

Electronic configuration

Shell	K	L	M	N
Electron	2	8	3	
Orbitals	1s ²	2s ² 2p ⁶	3s ² 3p ¹	

Copper[Cu]: At. No: 29

At. Wt : 63.5

Ores: Chalcocopyrite [CuFeS₂]-main ore

Chalcocite[Cu₂S]

Cuperite[Cu₂O]

Malachite[Cu(OH)₂.CuCO₃]

Electronic configuration

Shell	K	L	M	N
Electron	2	8	18	1
Orbitals	1s ²	2s ² 2p ⁶	3s ² 3p ⁶ 3d ¹⁰	4s ¹

Silver[Ag]: At.no:47

At. Wt : 107.8

Ores: Argentite [Ag₂S]-main ore

Silver copper glance[(AgCu)₂S]

Horn silver: AgCl

Electronic configuration

Shell	K	L	M	N	O
Electron	2	8	18	18	1
Orbitals	1s ²	2s ² 2p ⁶	3s ² 3p ⁶ 3d ¹⁰	4s ² 4p ⁶ 4d ¹⁰	5s ¹

Gold[Au]: At.no:79

At. Wt : 197.2

Ores: [Alluvial sand]-main ore

Calverite [AuTe₂]

Electronic configuration

Shell	K	L	M	N
Electron	2	8	14	2
Orbitals	1s ²	2s ² 2p ⁶	3s ² 3p ⁶ 3d ⁶	4s ²

- Iron is not found in free state in nature as it is highly reactive. On the other hand gold is a noble metal and does not react with air, water, acids and bases. Thus, gold is found in free state.
- Aluminium is a light metal. Its use in vehicles reduces fuel consumption. It forms an inert layer of aluminium oxide on surface which protects inner metal.
- Copper, silver and gold are also called coinage metals(used to make coins)

5. carbon and its compounds

*Those compounds which are composed up of only carbon and hydrogen is called hydrocarbon.

E.g. methane (CH₄), ethane (C₂H₆), ethyne (C₂H₄) etc

*Hydrocarbon and their derivatives are known as organic compounds. E.g. methane, alcohol, glucose etc



Hence, all the hydrocarbons are organic compounds but all the organic compounds are not hydrocarbons.

→ On the basis of the bonds between carbon atoms, hydrocarbons are of two types, they are: -

1. Saturated hydrocarbons
2. Unsaturated hydrocarbons

***Saturated hydrocarbons:** - Those hydrocarbons which contain single bonds between the carbon atoms are called saturated hydrocarbons or ALKANES.

Their general formula is → [C_nH_{2n+2}]

While naming the alkanes in IUPAC** system suffix “-ane” is used and prefix is used according to number of carbon atoms.

C₁ → Meth C₂ -Eth C₃ → Pro C₄ - But C₅ - Pent etc.

→ International Union of Pure and Applied Chemistry.

Alkanes	Molecular formula	Structural formula
Methane	CH ₄	
Ethane	C ₂ H ₆	
Propane	C ₃ H ₈	
Butane	C ₄ H ₁₀	

Alkanes are known as paraffins because of their least chemical reactivity.

***Unsaturated hydrocarbon:** - Those hydrocarbon which contain multiple Bonds (at least one, double or triple bond) between carbon atoms are known as unsaturated hydrocarbons. They are of two types:

1.*# **Alkenes:** → The unsaturated hydrocarbons which contain at least one double bond between carbon atoms are called alkenes. They are commonly called alkylenes.

Their general formula is → [C_nH_{2n}]

They are called olefins because they are reactive and are derived from petroleum.

IUPAC name	Common name	Molecular Formula	Structural formula
Ethene	Ethylene	C_2H_4	
Propene	Propylene	C_3H_6	
Butene	Butylene	C_4H_8	

2.*# Alkynes: → The unsaturated hydrocarbons which contain at least one triple bond between carbon atoms are called alkynes.

Their general formula is → $[C_nH_{2n-2}]$

IUPAC name	Common Name	Molecular formula	Structural formula	Condensed formula
Ethyne	Acetylene	C_2H_2		
Propyne	Allylene	C_3H_4		
Butyne	Crotonylene	C_4H_6		

- Write the structural formula of ethyl alcohol and glycerol

6. Materials used in daily life

This chapter doesn't require general basic concepts. You need to study the introduction, preparation, properties and uses of following materials; cement, glass, ceramics, fibres, plastic, soap & detergent, fertilizers and pesticides.

- If you want to know more about these materials you can go through the complete notes of the chapters.
- If you are in need of study materials of class X, science you can ask it by sending a mail to poudeltilak2036@gmail.com