

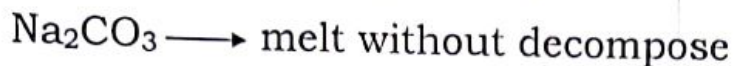
Famous compounds and uses

KNO_3	Used as gun powder
$\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$	Washing sodaremove the hardness of water
Bronze phosphors	Fans of ships ...resist corrosion
Future fertilizers	Anhydrous liquefied ammonia ...82% N
Passivity	A phenomenon in which some active metals such as iron, chromium or aluminum are not affected by concentrated nitric acid
KO_2	Used in closed places ..replace carbon dioxide with oxygen
K, Cs	Photoelectric cells
Fr ...francium	Only radioactive element in 1A..resulted from actinium
Lead,Bi,antimony alloy	Used in fuses of electric circuits ..bec. it has low melting point .
Arsenic trioxide	Treatment blood cancer leukemia
Carnallite	$\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$...the ore of potassium
Apatite	$\text{CaF}_2 \cdot \text{Ca}_3[\text{PO}_4]_2$...double salt of calcium the ore of phosphors
Haber-Bosch	Prepare ammonia in industry
$\text{Na}^+ - \text{K}^+$	<u>Sodium ions</u> ..helps in intercellular fluids in the body.... <u>potassium ions</u> helps in the process of oxidation of glucose inside cell to produce energy Sources of $\text{Na}^+ - \text{K}^+$ are milk- eggs-vegetables
Davy	prepared Na and K by electrolysis of <u>their molten halides</u> e.g. NaCl, KCl,
(<i>Solvay process</i>)	By passing ammonia and carbon dioxide gas in a saturated aqueous solution of sodium chloride (table salt) then heating $\text{NH}_3 + \text{CO}_2 + \text{NaCl} + \text{H}_2\text{O} \longrightarrow \text{NaHCO}_3 + \text{NH}_4\text{Cl}$ $2 \text{NaHCO}_3 \longrightarrow \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$
Photoelectric phenomenon	Releasing the electrons from the metal surface by effect of light .
<u>The Octet rule or electronic theory of valency :-</u> <u>The Valence bond</u>	It was proposed by Lewis and Kossel in 1916 # With the exception of H, Li, Be the atoms of all elements tend to reach the octet structure. * The (V.B.T) explains the formation of the

theory (V.B.T) :-	covalent bond as a result of the overlap of an atomic orbital of one atom which contains a single electron with another orbital of another atom.
Hybridization	<i>Mixing of pure orbitals which are different in shape and energy to form hybrid orbitals which are equivalent in shape and energy</i>
M.O.T	the molecular orbital theory considered the molecule as one unit (or a big atom with multi-nuclei) in which, all the atomic orbitals are mixed forming molecular orbitals.
Caustic soda NaOH	Soap...paper ..purify acidic impurities from oil
Arsine	AsH₃
Phosphonium	PH₄⁺
Allotropy	it is the presence of the element in more than one form, of different physical properties but of similar chemical ones
Show by balanced equation the reaction between lithium and nitrogen then adding the product to water $6 \text{Li} + \text{N}_2 \rightarrow 2 \text{Li}_3\text{N}$ $\text{Li}_3\text{N} + 3\text{H}_2\text{O} \longrightarrow \text{NH}_3 + 3\text{LiOH}$	
Show by balanced equation the reaction between potassium superoxide and carbon dioxide [G.R ...KO₂ is used to purify closed places submarines , planes .] $2\text{KO}_2 + \text{CO}_2 \xrightarrow[\text{catalyst}]{\text{CuCl}_2} \text{K}_2\text{CO}_3 + \text{O}_2$	
Mowh scale	Scale of hardness ..1e 0.5 2e..2.5 ...3e...2.75

Show by balanced equation the effect of heat on : lithium

carbonate..sodium carbonate



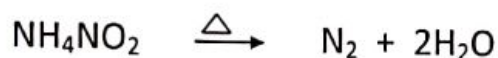
Show by balanced equation the effect of heat on potassium

nitrate

KNO_3 is used as gun powder not NaNO_3 ..deliquescent



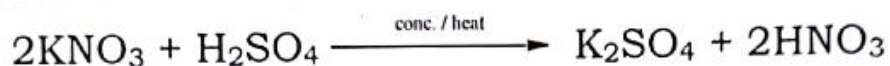
Show by balanced chemical equations preparation of nitrogen in lab from ammonium chloride and sodium nitrite



-Show by balanced equation the Preparation ammonia gas in lab By heating a mixture of ammonium chloride and slaked lime



Preparation of nitric acid in lab



Show by balanced equation The reaction of heating nitric acid



The compound	Orbitals taking part in the hybridization	Hybridized orbital formed	Angle between orbitals	Shape
Ethyne..C ₂ H ₂	1P orbital+ s orbital	2SP	180°	Linear
C ₂ H ₄ ethene	2P orbital+ s orbital	3SP ²	120°	Planar triangle
CH ₄ methane	3P orbital+ s orbital	4SP ³	109°.28'	Tetrahedral pyramid

Explain using Lwies diagram bonding in

1- Sodium with chlorine to from formula unit NaCl

2- Nitrogen with hydrogen to form ammonia molecule (NH₃).

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Compare between each two pairs of the following in terms of: (Stereo structure, Number of lone pair and bond pair of electrons)

A- CH_4 , BeF_2 B- SO_2 - BF_3

	SO_2	BeF_2
1- Stereo structure		
2- No.of lone pair		
3- No. of bonded pair		

	CH_4	BF_3
1- Stereo structure		
2- No.of lone pair		
3- No. of bonded pair		

Redraw structure of hydrazine molecule (N_2H_4) in front of you using dot diagram for electron pairs (lone and bonded):

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Define The stereo Structure for the molecule which contains two bond pair and 1 lone pair with writing abbreviation expressing it.

.....

.....

- Find number of bond pair, lone pair and also arrangement of electron pairs in the molecule which has abbreviation $AX_2 E$.

Give reasons for:

1) The chemical reactivity of alkali metals.

2) The weakness of metallic bonds between the atoms of the first group elements.

3) The use of Cesium in photo-electric cells.

4) The use of potassium super oxide in submarines.

5) Water is not used to extinguish sodium fires.

6) Sodium nitrate is not used as an explosive substance.

7) It is difficult to extract the alkali metals from their ores by the normal chemical methods.

8) Nitrogen has several oxidation states.

9) Calcium cyanamide is used as a fertilizer.

10) The alloy of bismuth, lead, cadmium and tin is used as fuses.

11) Nitric acid is considered a strong oxidizing agent.....

12) Urea is used as a fertilizer in hot countries.

13) Conc. hydrochloric acid is used in the detection of ammonia gas.

14) It's more preferable to fill car tires with nitrogen gas instead of atmospheric air.

15) Arsenic used as preservative substance for woods. Bec. Its toxic effect it kills bacteria and fungi.....arsenic trioxide is used in treatment of leukemia

The line spectra of any element are a specific.

b. The electron has a dual nature.

c. The atom is electrically neutral.

d. No electron pairing takes place until each orbital contains one electron.

e. The sublevel p takes up to 6 electrons whereas sublevel d takes 10 electrons.

Water 18 g/mole boils at 100°C whereas hydrogen sulphide 34 g/mole boils at -61°C .

The negative fluoride ion and the positive sodium ion are isoelectronic.

A coordinate bond is formed in ammonium molecule.

CO_2 molecule is nonpolar, in spite of the presence of two polar covalent bonds in it.

5) Value of bond angle in ammonia molecule is less than in water molecule.

Tricks

- 1- Al_2Cl_3 ionic compound doesn't conduct electricity..bec.....
- 2- Oxidation no. of Hydrogen in metal hydrides = -1
- 3- Oxidation no, of oxygen in KO_2 is = $-\frac{1}{2}$
- 4- Oxidation no of oxygen in peroxide = -1
- 5- The sublevel which can't be exist $1p.....2d.....3f$
- 6- Only lithium carbonate decomposes by heat ...the other melt without decompose ...
- 7- Al... metal has the strongest metallic bond and higher hardness and electric conductivity

pure covalent bond

- It is formed between atoms having the same electronegativity (usually of the same element)
- E.X: H_2 , Cl_2 , O_2 , N_2 , F_2
- The difference in electronegativity between the two atoms = 0
- The two atoms share equally in the electrons of the bond .
- the net charge on each atom is zero .

polar covalent bond .

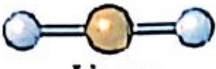
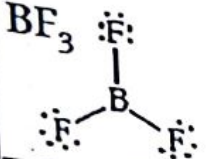
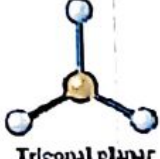
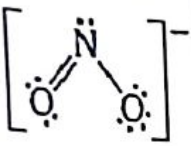
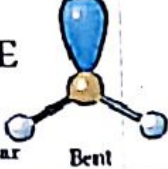
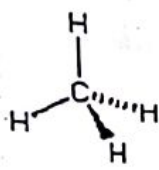
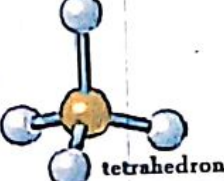
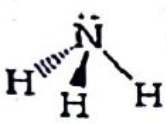
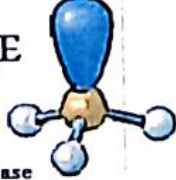
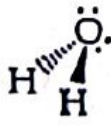
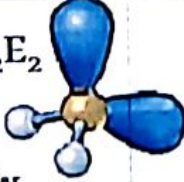
- It is formed between atoms having different electronegativity (usually atoms of different element)
- E.X: HCl , H_2O , NH_3
- The difference in electronegativity between the two atoms less than 1.7
- The two atoms don't share equally in the electrons of the bond .
- One atom has a partial (-ve) charge and the another atom has a partial (+ ve) charge .

σ	π
<ul style="list-style-type: none"> ❖ It is formed as a result of the overlap of two atomic orbital head to head (on one line) (collinear overlap) ❖ A strong bond due to the greater orbital overlap . ❖ Usually formed due to overlap of hybridized orbitals . ❖ e.g : the C-H bond in CH_4 , C_2H_4 , C_2H_2 	<ul style="list-style-type: none"> ❖ It is formed as a result of the overlap of two parallel atomic orbitals side by side (collateral overlap) ❖ Weak bond due to the less orbital overlap Usually formed due to lateral overlap of atomic orbitals . ❖ e.g : the C-C bond in C_2H_4 , C_2H_2
Coordinate bond	covalent bond .
<ul style="list-style-type: none"> • The electron pair required for the coordinate bond is donated by one of the two atoms (donor atom) and the other is called (acceptor atom) 	<ul style="list-style-type: none"> • The electron pair required for the covalent bond is donated by the two atoms forming the bond .

Points of comparison	Ionic compounds	Covalent compounds
1) Structure	<ul style="list-style-type: none"> • They occur between metals and non metals . 	<ul style="list-style-type: none"> • They occur between nonmetals
2) Solubility	<ul style="list-style-type: none"> • Dissolve in polar solvents such as water 	<ul style="list-style-type: none"> • Dissolve in non polar solvents such as benzene
3) Melting point	<ul style="list-style-type: none"> • High 	<ul style="list-style-type: none"> • Low
4) Boiling point	<ul style="list-style-type: none"> • High 	<ul style="list-style-type: none"> • Low
5) Electrical conductivity .	<ul style="list-style-type: none"> • Conduct electricity • NaCl molecule 	<ul style="list-style-type: none"> • Don't conduct electricity • HCl molecule

Point of comparison	SP ³	SP ²	SP
Formed from	Mixing of S + 3 P	Mixing of S + 2 P	Mixing of S + P
Shape	Tetrahedron	Planner triangle	Linear
angle	109 ⁰ 28 ['] To avoid repulsion force (less repulsive more stable)	120 ⁰ To avoid repulsion force (less repulsive more stable)	180 ⁰ To avoid repulsion force (less repulsive more stable)
E.X	Methane CH ₄	Ethylene C ₂ H ₄	Acetylene C ₂ H ₂

ionic bond	covalent bond
<ul style="list-style-type: none"> • It formed by transfer of electrons from one atom (metal) to another atom (non metal) • It is formed when the difference in E.N is greater than 1.7 . • It is a strong bond 	<ul style="list-style-type: none"> • It formed by sharing of electrons between two (non metal) • It is formed when the difference in E.N between the two atoms is less than 1.7 • It is a weak bond

example	Molecular geometry	Arrange of electron pairs	Free pairs	Bonded pairs	Total pairs
F-Be-F	AX ₂  Linear	linear	0	2	2
BF ₃ 	AX ₃  Trigonal planar	Planar triangle	0	3	3
	AX ₂ E  angular Bent		1	2	
	AX ₄  tetrahedron	Tetrahedral	0	4	4
	AX ₃ E  three-base pyramid		1	3	
	AX ₂ E ₂  angular Bent		2	2	