B. Sc. Sem - I
Chemistry subsidiary
Gr. - 1

Model questions Hcity study materials.

## MCQ questions

1. The correct configuration of $Cu_{29}$ is

(a) $[Ar]\ 4s^1$ (b) $[Ar]\ 4s^2$ (c) $[Ar]\ 3d^{10}4s^1$
(d) $[Ar]\ 3d^{10}4s^2$

2. The atomic orbitals are progressively filled in order to increasing energy. This Principle is called
(a) Hund's rule (b) Aufbau Principle (c) Exclusion Principle (d) de-Broglie rule

3. $^{13}_{6}C$ and $^{12}_{6}C$ differ from each in respect of number of
(a) Electrons (b) Protons (c) neutrons
(d) Non of these

4. The spectrum of $He^+$ is expected to be similar to that of

(a) $Li^+$ (b) H (c) Na (d) He

5. The maximum number of electrons that can be accommodated in fifth energy level is

(a) 10 (b) 25 (c) 50 (d) 32

6. Which of the following is non-polar molecule?

(a) $PCl_3$ (b) $CHCl_3$ (c) $BF_3$ (d) $NH_3$

7. A $CO_2$ molecule contains

(a) Three sigma bonds and one Pi bond

(b) Four Pi bonds

(c) one sigma bonds and two Pi bonds

(d) Four sigma bonds.

8. Which of the following species is octahedral

(a) $SF_6$ (b) $BF_4^-$ (c) $PCl_5$ (d) $BO_3^{3-}$

9. Thy hybrid state of C, in diamond, graphite and ethyne is respectively:

(a) $sp^3$, $sp^2$, sp (b) $sp^2$, $sp^3$, sp

(c) sp, $sp^2$, $sp^3$ (d) $sp^3$, $sp^3$, sp.

10. Which of the following types of hybridisation leads to three dimensional geometry of bonds around the carbon atom?

(a) Sp (b) $sp^2$ (c) $sp^3$ (d) Non of these.

11. Which of the following structures will have a bond angle of 120° around the central atom?

(a) Linear (b) Tetrahedral (c) Triangular
(d) Squar Planner.

12. The addition of HBr on Propene occurs in accordance with

(a) Kono Walov's rule (b) Torutom's rule
(c) Hund's rule (d) Markovnikov's Rule

13. Which of the following reagents can be used for the conversion of n-Butane to iso-butane?

(a) $NaBH_4$ (b) Lindlar's Catalyst
(c) $AlCl_3$ (d) $LiAlH_4$

14. Isopropyl bromide on Wurtz reaction gives

(a) Hexane (b) Propane
(c) 2,3- Dimethyl butane
(d) Neohexane.

15. $C_2H_2 \xrightarrow[H_2SO_4]{HgSO_4} A \xrightarrow{[O]} B$

The compounds B is

(a) An acid (b) An aldehyde
(c) Acetone (d) Ethanol.

Answers of MCQ

1.(c), 2.(b), 3.(c), 4.(b), 5.(c)
6.(c), 7.(c), 8(c), 9(c), 10(a)
11.(c), 12.(a), 13.(c), 14.(c), 15.(a)

# Long/Short questions (Model Papers)

1. Write notes on:
(a) Wurtz reaction, (b) Kolbe's reaction

(a) Wurtz reaction:-

Ans:- It involves the chemical reaction bet$^n$ alkyl halides (usually alkyl bromides & iodides) and metallic Sodium in the presence of dry ether. It produced Symmetrical higher alkane. Containing even no. of Carbon atom

$$R-X + 2Na + X-R \xrightarrow[\text{ether}]{\text{Dry}} R-R + 2NaX$$

$$2C_2H_5I + 2Na \xrightarrow[\text{ether}]{\text{Dry}} C_2H_5-C_2H_5 + 2NaX$$

Methane Cannot be Prepared by this method.

(b) Kolbe's reaction

Sodium / Pottasium Salt of fatty acid after electrolysis give higher alkane.

$$2CH_3COOK \xrightarrow[\text{Current}]{\text{Electric}} 2CH_3COO^- + 2K^+$$

At anode (+ve)

$$2CH_3COO^- - 2e \longrightarrow CH_3-CH_3 + 2CO_2\uparrow$$

At Cathode(-ve) $2K^+ + 2H_2O \longrightarrow 2KOH + H_2\uparrow$

Q 2. What is Sodalime - Decarboxylation

Ans:- It involves the treatment of Sodium salt of Carboxylic acid with Sodalime (NaOH & CaO 3:1)

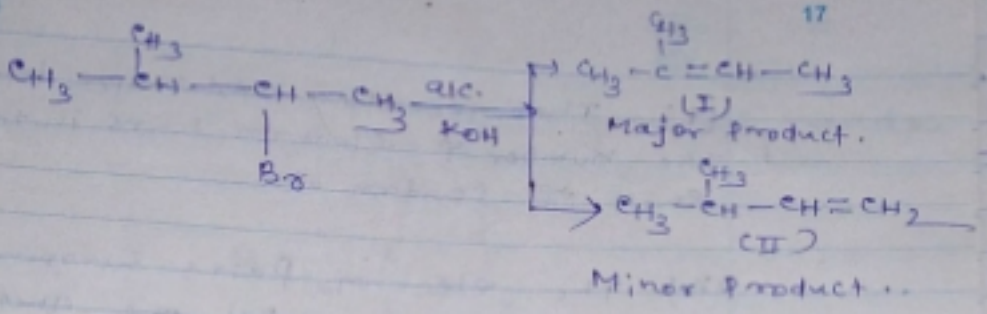
The alkane formed has one Carbon atom less than the Sodium salt of Carboxylic acids. In this reaction CaO helps in fusion of the mixture.

$$RCOONa + NaOH \xrightarrow[\Delta]{CaO} RH + Na_2CO_3$$

$$CH_3COONa + NaOH \xrightarrow[\Delta]{CaO} CH_4 + Na_2CO_3$$

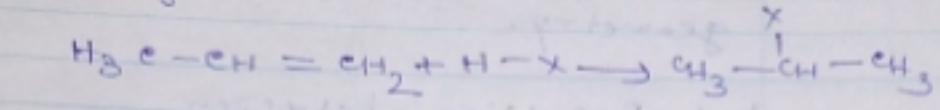
3. Discuss Saytzeff rule

Ans. In case the alkyl halide undergo dehydrohalogenation in two diff. ways, the preferred alkene is the one which is more alkylated which carries more number of alkyl groups attached to double bonded carbon atoms. This generalization is known as Saytzeff rule.

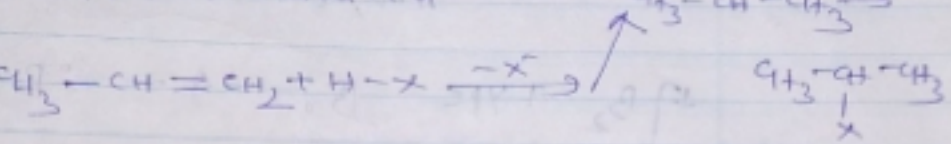



4. State Markownikov's rule with examples

Ans:- This rule state that during the addition across unsymmetrical double bond, the negative part of the adding molecule attaches itself to the carbon atom carrying less no. of hydrogen atoms.



Mechanism of addition



(Major Product)

Secondary Carbocation is form

5. State VSEPR theory

This theory provides a simple method to predict the shape of covalent molecules.

(i) The geometry and shape depend upon the number of electron pairs in the valence shell of Central atom.

(ii) The electron pairs surrounding the Central atom repel one another.

iii) To minimise the repulsion electron pairs are so arranged and gives a Symmetrical geometry.

(iv) If lone pair is present along with bond pair gives distorted geometry.

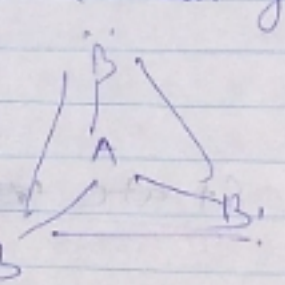
(v) Repulsion between

l-p, l-p > lp-bp > bp-bp.

$AB_2$ Type B :— A —: B

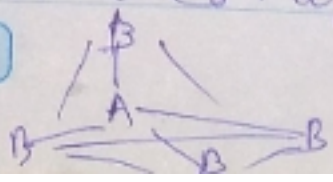
Two bond pair Linear geometry

$AB_3$ ⟶ 3 bp

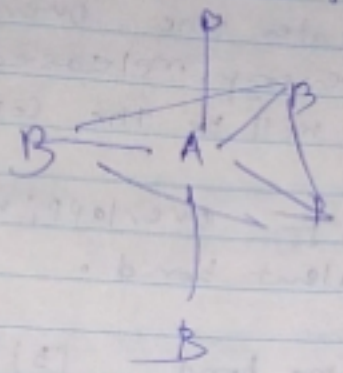



Trigonal Planner

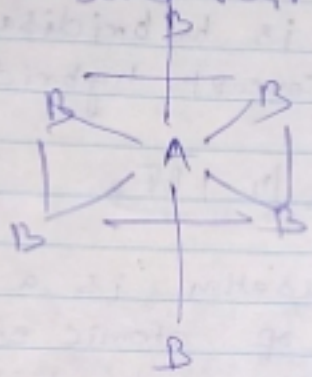
$AB_4$ ⟶ Sq Tetrahedral.



$AB_5$ → 5 bond pair – Trigonal bipyramidal




$AB_6$ → 6 bond pair – Octahedral.




6. Write the ~~Postal~~ Valence bond theory.

(i) Covalent bonds are formed by the overlapping of half filled atomic orbitals present in the valence shell of the atoms participating in bonding.

(ii) The orbitals undergoing overlapping must have electron with opposite spin.

(iii) The strength of covalent bond depends

upon the extent of overlapping. The greater the overlapping, more is the energy released and consequently stronger will be the covalent bonding.

Types of overlapping and nature of covalent bond.

(1) Sigma bond (2) Pi bond.

Q. (7) What is hybridisation? Making use of the concept hybridisation discuss the shape of

(i) $BeCl_2$ (ii) $BF_3$

Hybridisation is a process of intermixing of atomic orbitals of comparable energy to give hybridising orbitals.

(i) The atomic Orbitals must have equivalent energy or small difference in energy.

(ii) Both half filled and full filled Orbitals can take part in the hybridisation

(iii) No. of atomic orbitals before

hybridisation is equal to hybridising orbitals.

It takes place in two different ways.

(i) ~~Energy~~ ~~initial~~ Excitation
(ii) Re distribution of energy.

The hybridisations are Sp, $sp^2$, $sp^3$ etc.

(i) $BeCl_2$ —

$_4Be \rightarrow 1s^2, 2s^2$

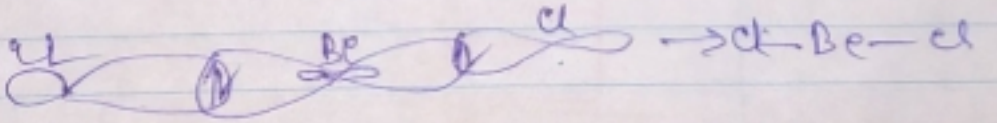
$Be^* \rightarrow 1s^2\ 2s^1\ 2p^1$

one S orbital & one P orbital intermix give two sp-hybridising orbitals.

$_{17}Cl \rightarrow 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

$\boxed{\uparrow\downarrow}\ \boxed{\uparrow\downarrow}\ \boxed{\uparrow}$

$3p_z$ orbital over lapped with Sp- hybridising orbital.




Shape - linear, Bond angle - 180°

Long questions & short questions

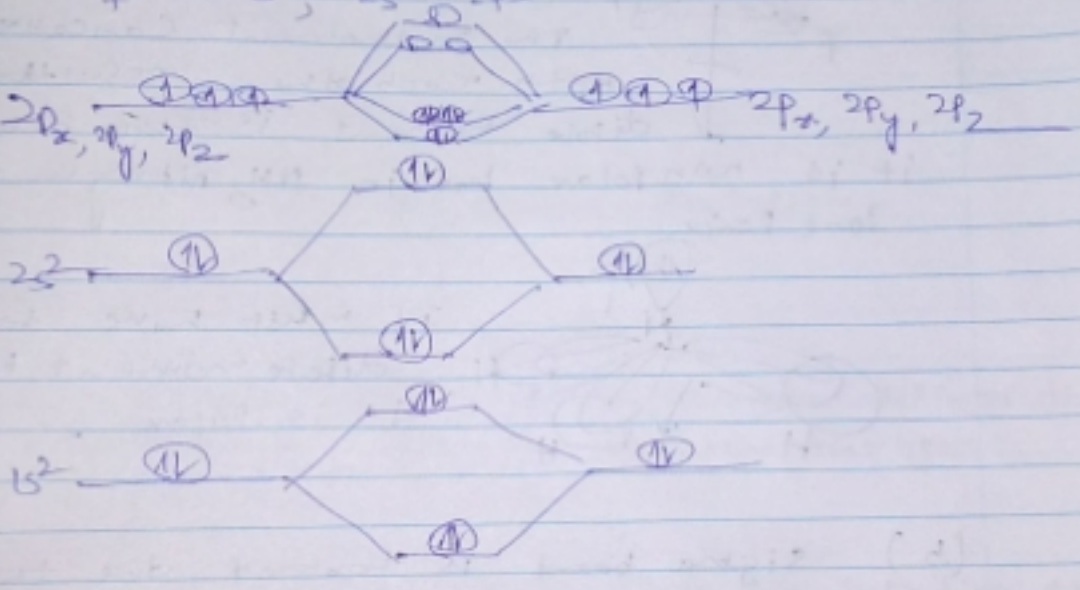
8. Give MO configuration of following species. Find bond order and magnetic properties.

(i) $N_2$ ~~(ii) $O_2$~~

Sol$^n$:- In $N_2$ molecule has 14 electrons.

$$(\sigma_{1s})^2 (\sigma_{1s}^*)^2 (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\pi 2p_x)^2 (\pi 2p_y)^2 (\sigma 2p_z)^2$$

$_7N \rightarrow 1s^2, 2s^2 2p^3$




Bond order $= \frac{1}{2}[N_b - N_a] = \frac{1}{2}[10-4] = 3$

diamagnetic because all these molecular orbitals are completely filled.

Same $O_2$ also.

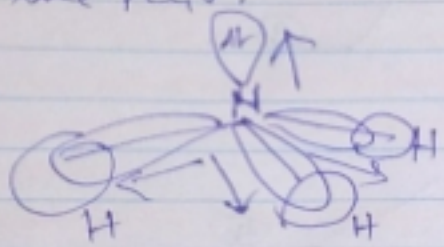
9. Account for the following:

(a) $BF_3$ is non-polar where $NF_3$ is not?

(b) Why Sigma bonds are stronger than $\pi$ bonds?

(c) Why ice is lighter than water through inter-molecular forces in both are H-bonds?

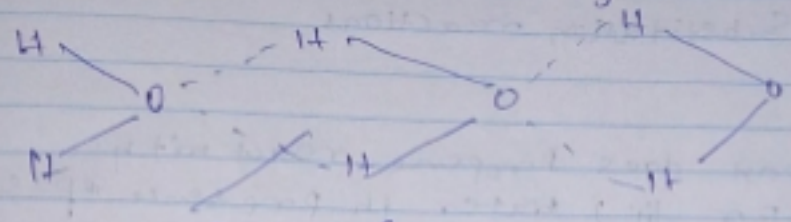
Ans:- (a) In $BF_3$ there is no lone pair on boron all are bond pair. The bond moment cancelled with each other resultant dipole moment is zero hence it is non polar but in $NH_3$ nitrogen has lone pair.



It must have some dipole moment hence is is polar.

(b) Sigma bond is formed due to head on overlapping where extent of overlapping is more where as $\pi$ bond is form due to sidewise/ lateral overlapping hence it is weak.

(c) In ice due to Presence of Cage like structure volume is more density is less hence it is lighter..



cage structure.

10. Write Short notes on:

(a) Aufbau Rule

(b) Pauli's Exclusion Principle.

(c)

11. What is quantum number discuss the different types of quantum numbers.

12. Use Markonikov's rule to predict the Product of the reaction

(i) HBr with $CH_3CH=CH_2$

(ii) HBr with $CH_3CH=C(CH_3)_2$

12. Write short notes on:

(i) Polymerisation

(ii) Substitution reactions

13. How does Propene react with

(i) HBr (ii) Water in presence of Suphuric acids.

Ans: $CH_3-CH=CH_2 + HBr \longrightarrow CH_3-\underset{Br}{CH}-CH_3$

2-Bromo, Propane.

$CH_3-CH=CH_2 + H_2O \xrightarrow{Conc.\ H_2SO_4} CH_3-\underset{OH}{CH}-CH_3$

Propan-2-ol.

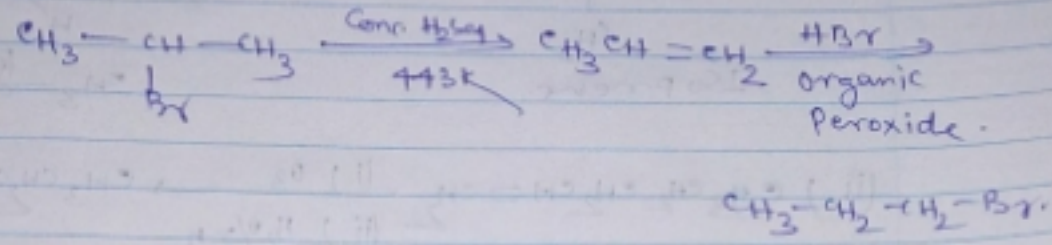
14. Bring out the following Conversions:

(i) Isopropyl bromide to n-propyl bromide.

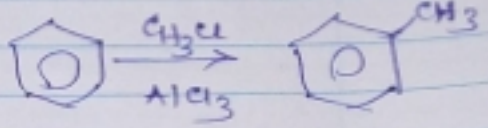
(ii) Ethyne to toluene

(iii) Ethyne to ethanoic acid

Ans:- (i)




$CH_3-CH_2-CH_2-Br$.

(ii) $3\ CH\equiv CH \xrightarrow[\text{tube}]{\text{Red hot}}$  $\xrightarrow[AlCl_3]{CH_3Cl}$ 

(iii) $HC\equiv CH \xrightarrow[HgSO_4/H_2SO_4]{H_2O} H_2C=CHOH \longrightarrow CH_3CHO$

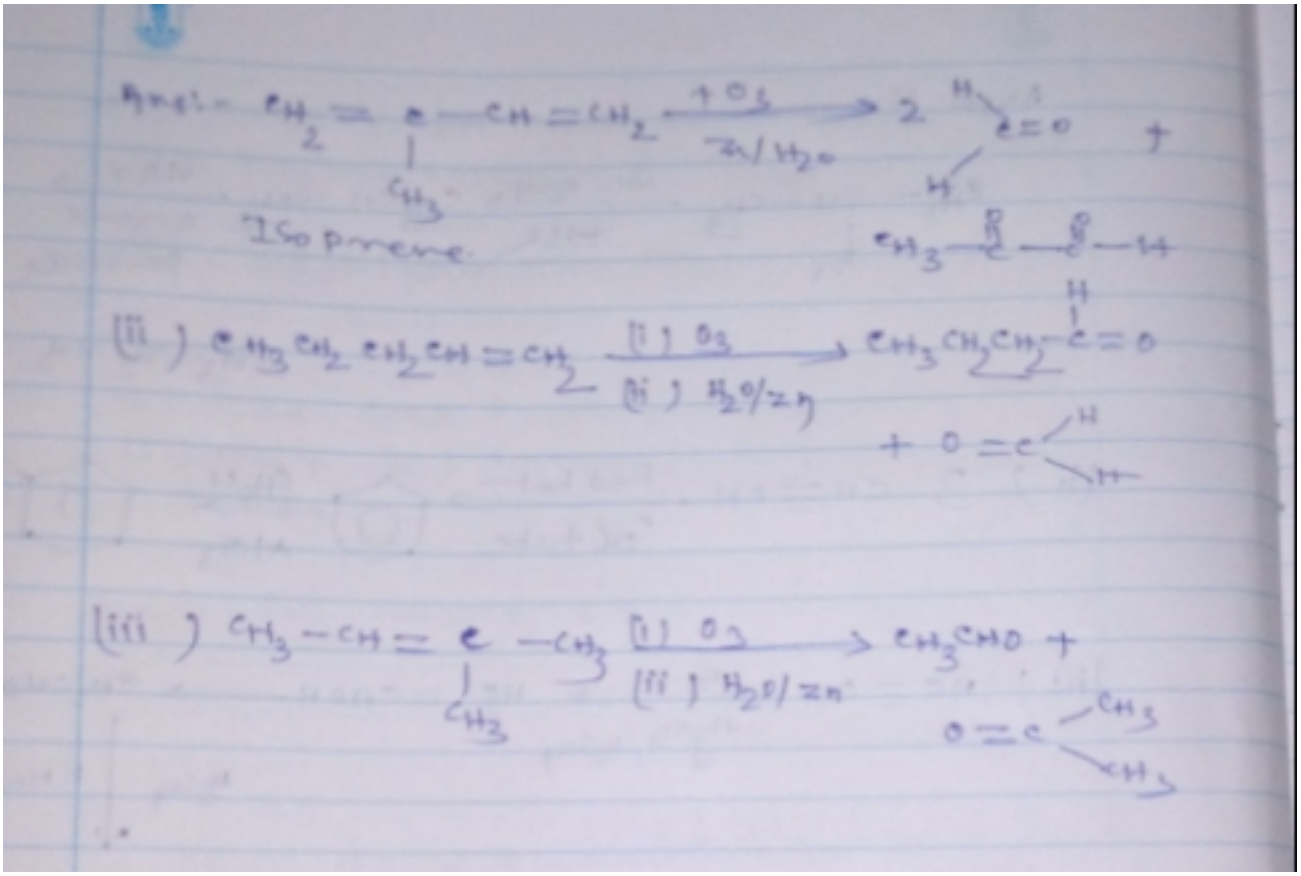
$CH_3CHO \xrightarrow[H_2SO_4]{KMnO_4} CH_3COOH$

Ethanoic acid.

15. Give the Product of ozonolysis of

(i) Isoprene (ii) $CH_3CH_2CH_2CH=CH_2$

(iii) $CH_3-CH=\underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}-CH_3$


Ans:-
Isoprene
(ii)
(iii)