# 12TH CHEMISTRY PUBLIC QUESTION AND ANSWER

S.MANIKANDAN.M.Sc.,B.Ed.,

## Government Public questions

**March-2020**

**Instant-2020**

**September-2020**

**August-2021**

**May-2022**

**july-2022**

# INDEX

# PREFACE

**"Praise the lord"**

"Education is not the learning of facts,
But the training of the mind to think"

-Albert Einstein

"Education is the movement from darkness to light "

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**Respected Teachers/ Dear students**

This guide is based on the six government public 12TH chemistry questions and answers unit wise. This guide contains more than 170 questions and answers. 90 One mark question and answer .

The questions asked in government public examination are very important so Students should keep reading this well. You have any doubt in this material contact me

The purpose of creating this guide is for students to get higher marks.This guideis also created for slow learning students to pass.

I hope this guide will be very useful for Students and Teachers. All the answer stated in this guide are very correct.

My heartfelt **thanks** to all the **educational webpage**.Teachers or students can let me know their valuable feedback regarding this guide.

**God bless all**

**All the best**

**S.MANIKANDAN.M.Sc., B.Ed.,**
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**NOTE:**

| | |
|---|---|
| Government public question paper march 2020 | - mar20 |
| Government public question paper instant 2020 | - inst20 |
| Government public question paper September 2020 | - sep20 |
| Government public question paper augest2021 | -aug21 |
| Government public question paper may 2022 | -may22 |
| Government public question paper july2022 | -july22 |

**Time allowed : 3.00 hours** **MARCH20** **Maximuim marks : 70**

**PART-I**

**i)Answer all the questions.** **15 X1 =15**

**ii)choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer**

1. Match the following

(1) Fluorine (i) Identification of coloured metal ions

(2) Borax (ii) strong oxidizing agent

(3) Aluminium (iii) Chalcogen present in volcanic ashes

(4) Sulphur (iv) Most abundant element

(a) (1) –(iii) (2)-(ii) (3)-(iv) (4)-(i) (b) (1)-(ii) (2)-(i) (3)-(iv) (4)-(iii)

(c) (1)-(iv) (2)-(iii) (3)-(ii) (4)-(i) (d) (1)-(ii) (2)-(iv) (3)-(i) (4)-(iii)

2. wolframite ore is separated from tinstone by the process of _____

(a) electromagnetic separation. (b) smelting

(c) calcination (d) Roasting

3. The transition element which has only +3 oxidation state is

(a) Ni (b) Mn (c) Cr (d) Sc

4. The medicinal value of drugs is measured in terms of its

(a) Deoxyribose (b) Gold number

(c) Therapeutic Intex (d) Equilibrium constant

5. The aqueous solutions of sodium formate, anilinium chloride and potassium cyanide respectively.

(a) acidic,acidic,acidic (b) acidic ,acidic ,basic

(c) Basic acidic basic (d) basic,netral ,basic

6. If one strand of the DNA has the sequence ATGCTTGA then the sequence of complementary strand would be

(a) TACGRAGT (b) TACGAACT (c) TCCGAACT (d) TACGTACT

7.Which one of the following is most basic?

(a) 2, 4-dibromo aniline (b) 2, 4-dichloro aniline

(c) 2, 4-dimethyl aniline (d) 2, 4-dinitro aniline

8. how many faradays of electricity are required for the following reaction to occur $MnO^{4-} \rightarrow Mn^{2+}$.

(a) 7F (b) 5F (c) 3F (d) 1F

9. .Assertion : p-N,N- dimethyl amino benzaldehyde undergoes benzoin condensation
Reason : the aldehydic(CHO)group is meta directing.
(a) Both Assertion and reason are false
(b) Both assertion and reason are true but reason is the correct explanation of assertion
(c) Both assertion and reason are true but reason is not the correct explanation of assertion
(d) Assertion is true but Reason is false

10. Laptops have_____
(a) Lead storage battery (b) Fuel cell
(c) Mercury button cell (d) Lithium-ion battery

11. Formula for hyponitrous acid
(a) HOONO (b) $H_2N_2O_2$ (c) $HNO_2$ (d) $HNO_4$

12. Williamson synthesis of preparing dimethyl ether is a/an
(a) Electrophilic substitution reaction (b) $S_N1$ reaction
(c) $S_N2$ reaction (d) Electrophilic addition reaction

13. .The vacant space in BCC lattice unit cell is
(a) 26% (b) 48% (c) 23% (d) 32%

14. .time required for the reactant concentration to reach one half of its initial value is called
(a) half life period (b) first order
(c) zero order (d) second order

15. the major product obtained when phenol reacts with corn $H_2SO_4$ at 280 K is :
(a) Salicylic acid (b) Picric acid
(c) O-phenol sulphonicacid (d) p-phenol sulphonicacid

**PART-II**

**Note : Answer any six questions. Question no .24 is compulsory . 6 X 2 = 12**

16.How is bleaching powder prepared ?

17.Classify the following elements into d-block and f-block elements
i) Tungsten ii) Ruthenium iii) Promethium iv) Einsteinium

18.Write any two hydrate isomers of the complex with the molecular formula $CrCl_3.6H_2O$

19.If the no.of close packed sphere is 6 , calculate the number of octahedral voids and tetrahedral voids generated.

20.What are Lewis acids and bases? Give an example for each

21.Write the dispersed phase and dispersion medium of butter

22.Name the catalyst used in Rosenmund reduction and state its importance

23.How is chloropicrin prepared ?

24.Why is C-O –C bond angle in ether slightly greater than the tetrahedral bond angle?

## PART-III

**Note : Answer any six questions. Question no .33 is compulsory . 6 X 3 = 18**

25.Write the chromyl chloride test.

26.$[Sc(H_2O)_6]^{3+}$ is colourless -Explain

27.Derive Henderson equation.

28.How are metals protected from corrosion by cathodic protection method?

29. Mention the shape of the following colloidal particles

a) $As_2s_3$ b) blue gold sol c) tungstic acid sol

30. formic acid reduces tollen's reagent whereas acetic acid does not reduce give reason

31.How are proteins classified based on their structure ? explain

32.State any three advantages of food additives

33.There is only a marginal differences in decrease in ionisation enthalpy from aluminium to thallium – explain why ?

## PART-IV

**Note : answer all the questions 5 X 5 = 25**

34. a) Explain zone refining process

(OR)

b) i) Write any two conditions for catenation ?

ii) why HF can't be stored in glass bottles ?

35. a) i) write the molecular formula and draw the structure of sulphurous acid Marshall's acid

ii) Write the IUPAC name of the following

I) $[Ag(NH_3)_2]^+$ ii) $[Co(NH_3)_5Cl]^{2+}$

(OR)

b) i) Calculate the magnetic moment and magnetic property of $[CoF_6]^{3-}$

ii) Write a note on frenkel defect

36. a) Derive integrated rate law for a first order reaction A →product

(OR)

b) i) Write the pH value of following substances

a) Vinegar b) black coffee. C) packing soda d) soapy water

ii) A conductivity cell has two platinum electrodes separated by a distance of 1.5 cm and the cross sectional area of each electrode is 4.5 sq cm using this cell the resistance of 0.5 N electrolytic solution was measured as 15 ohms find the specific conductance of the solution

37. a) i) Give any three difference between chemisorption and physisorption

ii) What is vulcanization

(OR)

b) i) Give the coupling reaction of phenol

ii) how will you prepare the following by using grignard reagent ?

a) Propan-1-ol b) propan-2-ol

38. a) i) What is formalin ? what is its use ?

ii) What is glycosidic linkage ?

(OR)

b) i) what is gomberg reaction explain

ii) .Identify A and B

A. $\xrightarrow{Na(Hg)/C_2H_5OH/4[H]}$ $CH_3\text{-}CH_2\text{-}NH_2$

B $\xrightarrow{Na(Hg)/C_2H_5OH/4[H]}$ $CH_3\text{-}NH\text{-}CH_3$

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**Time allowed : 3.00 hours** **INSTANT20** **Maximuim marks : 70**

**PART-I** **15 X1 =15**

**i)Answer all the questions.**

**ii)choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer**

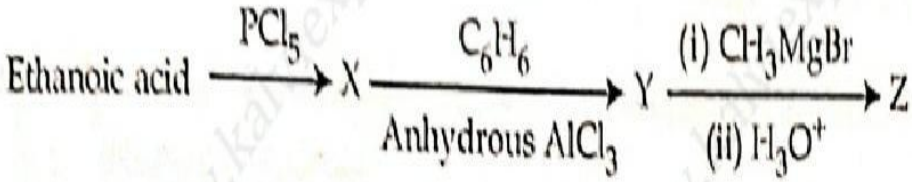
1. the incorrect statement among the following is
   (a) Nickel is refined by mond's process
   (b) Titanium is refined by van-Arkel's process
   (c) Zinc blende (ZnS) is connected by froth floatation process
   (d) In the metallurgy of gold the metal is leached with dilute sodium chloride solution
2. The metal which is used packing material for food items
   (a) Zn (b) Zr (c) Al (d) Au
3. Sodium salt of tetraboric acid is known as
   (a) $B_2H_6$ (b) $Na_2BO_3$ (c) $H_3BO_3$ (d) $Na_2B_4O_7.10H_2O$
4. _____ is used for producing smoke screen as it gives large smoke
   (a) Borax (b) Diborane (c) Potash alum (d) Phosphine
5. The actual position of lanthanoids in the periodic table is at
   (a) group number 3 period number 4 (b) group number 6 period number 3
   (c) group number 4 period number 4 (d) group number 3 period number 6
6. Fac-mer isomerism is shown by :
   (a) $[Co(en)_3]^{3+}$ (b) $[Co(NH_3)_4Cl_2]^{+}$
   (c) $[Co(NH_3)_3Cl_3]$ (d) $[Co(NH_3)_5Cl]\ SO_4$
7. Packing efficiency of body centred cubic (BCC)
   (a) 52.31% (b) 68% (c) 86% (d) 52.13%
8. The rate constant of a reaction is $5.8 \times 10^{-2} s^{-2}$.the order of reaction is
   (a) First order (b) Zero order
   (c) second order (d) Third order
9. Conjugated base for bronsted acids $H_2O$ and HF are :
   (a) $OH^-$ and $H_2FH^-$ respectively (b) $H_3O^+$ and $F^-$ respectively
   (c) $OH^-$ and $F^-$ respective (d) $H_3O^-$ and $H_2F^+$ respectively
10. when $\Delta S < 0$ and $T\Delta S$ is negative :
    (a) adsorption is exothermic (b) absorption is exothermic
    (c) adsorption is endothermic (d) absorption is endothermic

11. in the preparation of ether by Williamson synthesis using primary alkyl halide involves :

(a) $E_1$ mechanism (b) $S_N2$ mechanism

(c) $SN^1$ mechanism (d) $E_2$ mechanism

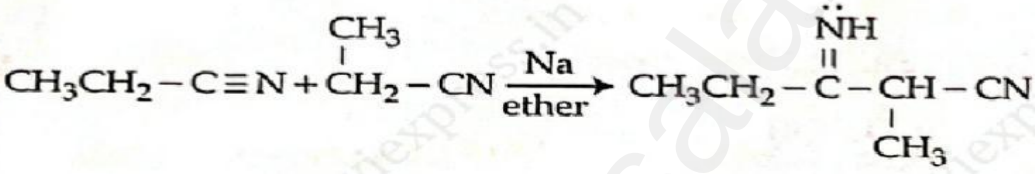
12. .Predict the product Z in the following series of reactions




(a) $(CH_3)_2C(OH)C_6H_5$ (b) $CH_3CH(OH)C_6H_5$

(c) $CH_3CH(OH)CH_2CH_3$ (d) $C_6H_5$-$CH_2$-OH

13.




The above reaction is :

(a) Thorpe nitrile condensation (b) Levine and Hauser acetylation

(c) Lederer-manasse reaction (d) Aldol condensation

14. Cheilosis is a vitamin deficiency disease caused by

(a) Vitamin $B_6$ (b) Vitamin $B_9$

(c) Vitamin $B_7$ (d) Vitamin $B_2$

15. Match the following

| | |
|---|---|
| (1) Major tranquilizers | (i) Non steroidal anti-inflammatory drug |
| (2) Analgesics | (ii) propofol |
| (3) NSAIDs | (iii) clozapine |
| (4)Intravenous general anaesthetics | (iv) Aspirin |

(a) (1) –(iii) (2)-(iv) (3)-(i) (4)-(ii) (b) (1)-(i) (2)-(ii) (3)-(iii) (4)-(iv)

(c) (1)-(ii) (2)-(i) (3)-(iv) (4)-(iii) (d) (1)-(iv) (2)-(iii) (3)-(ii) (4)-(i)

## PART-II

**Note : Answer any six questions. Question no .24 is compulsory . 6 X 2 = 12**

16. Explain the following terms with suitable example

I) Gangue II) slag

17. Give the uses of helium

18. What are interstitial compounds

19. .Distinguish between isotropy and anisotropy in solids

20. The rate of the reaction. $x + 2y \rightarrow$ product is $4 \times 10^{-3}$ mol $L^{-1}$ $s^{-1}$ if [x] =[y]=0.2M and rate constant at 400k is $2 \times 10^{-2}$ $s^{-1}$ what is the overall order of the reaction ?
21. Calculate the pH of 0.1 M$CH_3COONa$ solution ($_p$kafor $CH_3COOH$ is 4.74)
22. Convert glycerol to acrolein
23.Write a note on denaturation of proteins
24. How is aryl halide prepared by using $Cu_2Cl_2$ /HCl(or) $Cu_2Br_2$/HBr. ?

**PART-III**

**Note : Answer any six questions. Question no .33 is compulsory . 6 X 3 = 18**

25. what are the factors responsible for the anomalous behaviour of first element of the p-block ?
26. which metal in the 3d series exhibits + 1 oxidation State most frequently and why ?
27. mention the metal complexes and its metal ions are used in biological system
28. Define ionic product of water .Give its value at room temperature
29. What is inversion of phase ? give an example
30. Explain Benedict's solution test
31.Write any three biological importance of lipids ?
32.How is neoprene prepared ?
33. A solution of silver nitrate is electrolysed for 30 minutes with a current of 2 Ampere calculate the mass of silver deposited at the cathode.

**PART-IV**

**Note : answer all the questions 5 X 5 = 25**

34. a) i) What are the difference between minerals and ores ?
ii) Write the balanced equation for the overall reaction of chlorine with cold NaOH and hot NaOH

(OR)

b) i) What is catenation ?
ii) Write a short note on Holmes signal

35. a) write the postulates of werner's theory

(OR)

b) i) .Explain Schottky defect
ii) Identify the auto catalyst in the following reaction
(A) $CH_3COOC_2H_5 + H_2O \rightarrow CH_3COOH + C_2H_5OH$
(B) $AsH_3 \rightarrow 2As + 3H_2$

36. a) i) Explain the effect of catalyst on reaction rate with an example

ii) Classify the following into Lewis acid and Lewis bases

(A) $BF_3$ (B) $CO_2$ (C) MgO (D) $CH_3$

(OR)

b) Derive an expression for Nernst equation

37. a) i) .Name the factors affecting adsorption

ii) Explain auto oxidation of ethers

(OR)

b) i) What is Baeyer's regent ? how it is useful to convert ethene to ethane 1 2 diol ?

ii) Howto antiseptics differ from disinfectants ?

38. a) Write the mechanism of aldol condensation reaction

(OR)

b) i) Name the reducing agent used in the reduction of nitrobenzene to the following compounds

A)Aniline

B) phenyl hydroxylamine

C) Nitroso benzene

ii) Write mustard oil reaction ?

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**Time allowed : 3.00 hours** **SEPTEMBER20** **Maximuim marks : 70**

**PART-I** **15 X1 =15**

**i)Answer all the questions.**

**ii)choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer**

1. Glucose and mannose are epimers at

(a) C3 carbon (b) C4 carbon

(c) C1 carbon (d) C2 carbon

2. $C_6H_5N_2Cl \xrightarrow{Cu_2Cl_2/\ HCl} C_6H_5Cl + N_2$ this reaction is known as

(a) Gattermann reaction (b) Gomberg reaction

(c) Schotten-Baumann reaction (d) Sandmeyerreaction

3. In $H_2$-$O_2$ fuel cell the reaction occurs at cathode is

(a) $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$ (b) $H^+ + e^- \rightarrow 1/2\ H_2$

(c) $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$ (d) $H+ (aq) + OH^-(aq) \rightarrow H_2O_{(l)}$

4._____ is used in the manufacture of thermosoftening plastic perspex

(a) Benzaldehyde (b) Acetone

(c) Acetaldehyde (d) Benzophenone

5. .The pH of an aqueous solution is zero. The solution is

(a) neutral (b) basic

(c) slightly acidic (d) stongly acidic

6. Inorganic benzene is

(a) $B_2H_6$ (b) $B_3N_3H_6$ (c) $H_3BO_3$ (d) $H_2B_4O_7$

7. Extraction of gold involves leaching with cyanide ion Gold is later recovered by :

(a) metal displacement with zinc. (b) Liquation

(c) Distillation (d) Zone refining

8. cold dilute alkaline $KMnO_4$ is known as.

(a) Schiff's reagent (b) Fenton's reagent

(c) Bayer's reagent (d) Nessler's reagent

9. Amide- linked local anaesthetic is

(a) Ranitidine (b) Omeprazole

(c) Procaine (d) Lidocaine

10. the formula used to identify density of unit cell

(a) $\rho = a^3N_A \times nM$ (b) $a^3N_A - nM$

(c) $\rho = nM/a^3N_A$ (d) ) $\rho = a^3N_A /NM$

11. The oxidation state of chlorine in. $Cl_2O_7$ is

(a) +6 (b) +7 (c) +4 (d) +5

12. The common name of 1,2,3 trihydroxy benzene is :

(a) pyrogallol (b) Resorcinol

(c) Hydroxyquinol (d) phloroglucinol

13.match the following

1) $[Ni(CO)_4]$ i) trigonal bipyramidal

2) $[Pt(NH_3)_4]^{2+}$ ii) octahedral

3) $[Fe(CO)_5]$ iii) tetrahedral

4) [Co(NH3)6]3+ iv) square planar

(a) (1) –(ii) (2)-(iii) (3)-(iv) (4)-(i) (b) (1)-(iii) (2)-(i) (3)-(iv) (4)-(ii)

(c) (1)-(iii) (2)-(iv) (3)-(i) (4)-(ii) (d) (1)-(iv) (2)-(i) (3)-(ii) (4)-(iii)

14. The magnetic moment of 1.73 BM will be shown by one among the following

(a) $[Cu(NH_3)_4]^{2+}$ (b) $[Ni(CN)_4]^{2-}$

(c) $TiCl_4$ (d) $[COCl_6]^{4-}$

15. The mechanism proposed for the enzyme catalysis reaction is

(a) $P + E \longrightarrow E+S \rightleftharpoons ES$ (b) $E + S \rightleftharpoons ES \longrightarrow P+E$

(c) $ES \rightleftharpoons P + E \longrightarrow E+ S$ (d) $E + S \longrightarrow ES \rightleftharpoons P+ E$

## PART-II

**Note : Answer any six questions. Question no .24 is compulsory . 6 X 2 = 12**

16. What is the role of limestone in the extraction of iron from its oxide $Fe_2O_3$ ?

17. Give the difference between double salt and coordination compound ?

18. Define buffer action

19. Define common ion effect

20. Write a note on tyndall effect

21. What is urotropine ? how it is prepared ?

22.Aniline does not undergo friedel crafts reaction give reason

23.Name the vitamins whose deficiency causes

(a) rickets (b) Scurvy

24. A hydride of second period alkali metal (A) on reaction with compound of boron B in the presence of ether to give a reducing agent C . Identify A B and c

## PART-III

**Note : Answer any six questions. Question no .33 is compulsory . 6 X 3 = 18**

25. which types of ores can be concentrated by froth flotation method givetwo examples

26. What type of hybridization is found in the following

I) BrF. Ii) $BrF_5$. Iii) $BrF_3$.

27.In an octahedral crystal field ,draw the figure to show splitting of d-orbitals

28. differentiate between crystalline solid and amorphous solid

29. Derive an expression for Ostwald's dilution law

30. Mention the mechanism in the following reactions

I) One mole of HI reacts with methoxy ethane

ii) One mole of HI reacts with 2 methoxy 2 -methylpropane

31. Write the test for carboxylic acid group

32. write short note on Gabriel phthalimide synthesis

33. Powdered $CaCO_3$ reacts much faster with dilute HCl than with the same mass of $CaCO_3$ as marble . give Reason ?

## PART-IV

**Note : answer all the questions 5 X 5 = 25**

34. a) i) How is potash alum prepared ?

ii) Indicate the possible type of isomerism for the following complexes

(A)$[Co(en)_3]^{3+}$ (B) $[Pt(NH_3)_2Cl_2]^{2+.}$

(OR)

b) i) explain the Deacons's process for manufacture of chlorine.

ii) Sulphuric acid is a dibasic acid prove it

35. a) What is lanthanide or lanthanoide contraction explain its consequences

(OR)

b) i) If the Radius ratio of the compound is between 0.155 to 0.225 find out the coordination number and structure of the compound.

ii) Arrange the following in the increasing order of relative reactivity of acid derivatives and mention the reason alone

$CH_3COOC_2H_5$ $CH_3COCl$ $CH_3CONH_2$ $CH_3COOCOCH_3$

36. a) i) the rate constant for a first order reaction is $1.54 \times 10^{-3}\ s^{-1}$ . calculate its half life time

ii) Identify the conjugate acid base pair for the following reaction in aqueous solution

(A) $HS^-(aq) + HF \rightleftharpoons F^-(aq) + H_2S(aq)$

(B) $HPO_4^{2-} + SO_3^{2-} \rightleftharpoons PO_4^{3-} + HSO_3^-$

(OR)

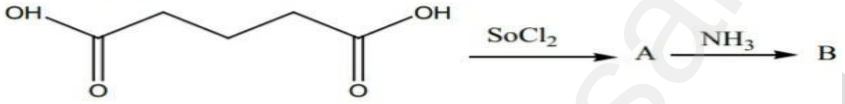
b) State kohlrausch law and explain any one of the application

37. a) Write any five characteristics of catalysts

(OR)

b) How to distinguish $1^0$ , $2^0$ , and $3^0$ alcohols by victor Meyer test

i. Indentify A,B and C




38. a) i)

ii) How are RNA molecules classified ? explain

(OR)

b) i) Give a brief account on antioxidants

ii) How do you classify the following into various class of drugs

a)Milk of magnesia b)Aspirin

c)penicillin d)procaine

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**Time allowed : 3.00 hours** **AUGUST21** **Maximuim marks : 70**

**PART-I** **15 X1 =15**

**i)Answer all the questions.**

**ii)choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer**

1. The crystal with a metal deficiency defect is.
   (a) ZnO (b) NaCl (c) KCl (d) FeO
2. The pyrimidine bases present in DNA are
   (a) cytosine and Thiamine (b) cytosine and Adenine
   (c) cytosine and Uracil (d) cytosine and Guanine
3. The pH of an aqueous solution is zero. The solution is
   (a) Neutral (b) Slightly acidic
   (c) Basic (d) stonglyacidic
4. on reacting with neutral ferric chloride. Phenol gives
   (a) Dark green colour (b) Red colour
   (c) No colouration (d) violet colour
5. .In the following reaction

$$CH \equiv CH \xrightarrow{H_2SO_4/HgSO_4} X$$

Product 'X' will not give
   (a) Iodoform test (b) Tollen's test
   (c) Fehling solution test (d) victor meyertest.

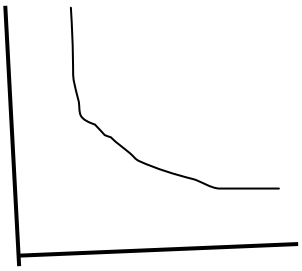
6. $CH_3$ -CHO + CO $\xrightarrow{\text{Rh/ Ir complex}}$ ?
   (a) Poly propylene (b) Butan-1-al
   (c) Acetic acid (d) Acetate
7. The number of electrons that have a total charge of 9650 coulombs is
   (a) $6.022 \times 10^{22.}$ (b) $6.22 \times 10^{23.}$
   (c) $6.022 \times 10^{-34.}$ (d) $6.022 \times 10^{24}$
8. Match the following.

| | |
|---|---|
| 1. Emulsion | i) whipped cream |
| 2.gel | ii) ink |
| 3.foam | iii) cream |
| 4.sol | iv) butter |

(a) (1) –(iv) (2)-(iii) (3)-(ii) (4)-(i) (b) (1)-(iii) (2)-(i) (3)-(ii) (4)-(iv)
(c) (1)-(ii) (2)-(i) (3)-(iv) (4)-(iii) (d) (1)-(iii) (2)-(iv) (3)-(i) (4)-(ii)

9.among the following graphs showing variation of rate constant with temperature(T) for a reaction, the one that exhibits Arrhenius behavior over the entire temperature range is

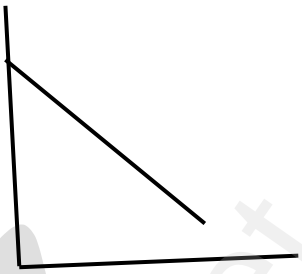
log k
(a)



1/T

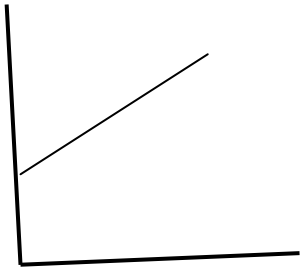
(b)

log k



1/T

(c) log k



1/T

(d) both (b) and (c)

10. which one of the following compounds is not formed?

(a) $XeF_2$ (b) $XeOF_4$ (c) $NeF_2$ (d) $XeO_3$

11. The phenomenon observed when a beam of light is passed through a colloidal solution is
(a) Coagulation (b) Cataphoresis
(c) Tyndall effect. (d) Electrophoresis

12. In $K_4$ [$Fe(CN)_6$] the co-ordination number of $Fe^{2+}$ is _____
(a) 4 (b) 2 (c) 3 (d) 6

13. The following set of reactions are used in refining zirconium. This method is called as___

$$Zr(impure) + 2I_2 \xrightarrow{523K} ZrI_4$$

$$ZrI_4 \xrightarrow{1800K} Zr(pure) + 2I_2$$

(a) Zone refining (b) Liquation
(c) Mond's process (d) van Arkel process

14. which of the following is not $sp^2$hybridised?
(a) Fullerene (b) Graphite
(c) Diamond (d) Graphene

15. IUPAC name for the amine $H_2N\text{-}CH_2\text{-}(CH_2)_4\text{-}CH_2\text{-}NH_2$

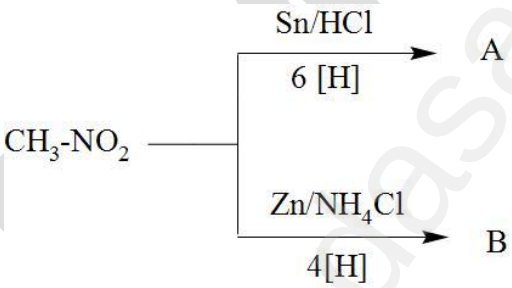
(a) Heptane-1,7-diamine (b) Hexamethylene diamine

(c) Hexane-1,6-amine (d) Hexane-1,6-diamine

## PART-II

**Note : Answer any six questions. Question no .24 is compulsory . 6 X 2 = 12**

16. give the uses of borax .
17. why d block elements exhibit variable oxidation state?
18. Define unit cell
19. State ostwald's dilution law
20. Define equivalent conductance
21. Mention any two factors that affect electrolytic conductance
22. What is mean by electro osmosis?
23. Write a short note on peptide bond
24. From the following reaction identify A and B




## PART-III

**Note : Answer any six questions. Question no .33 is compulsory . 6 X 3 = 18**

25. What is meant by term coordination number? What is the coordination number of atoms in a BCC structure?
26. What are interhalogen compounds ? give two examples
27. Give the difference between double salt and coordination compound
28. Mention the factors responsible for the anomalous behaviour of the first element of p-block
29. State faraday's law of electrolysis ?
30. How are the following conversion effected?

I) ethylene glycol → acetaldehyde

ii) glycerol → acrolein

31. Give the test for carboxylic acid group
32. Give any three differences between DNA and RNA
33. Glassify the following into Covalent molecular ionic and metallic solids

i) Diamond ii) brass iii) NaCl

iv) Naphthalene v) glucose vi) $SiO_2$

## PART-IV

**Note : answer all the questions** **5 X 5 = 25**

34. a) Explain froth flotation process

(OR)

b) i) explain the bleaching action of Sulphur dioxide

ii)Write any two uses of helium

35. a) i) What are interstitial compounds ?

ii) Calculate the number of unpaired electrons in $Ti^{3+}$, $Mn^{2+}$ and calculate the spin only magnatic moment ?

(OR)

b) i) what are the limitations of VB theory ?

ii) based on the VB theory ,explain why$[Ni(CN)_4]^{2-}$ it is diamagnetic

36. a) i) write two difference between rate and rate constant of a reaction

ii) derive integrated rate law for a zero order reaction A→ product

(OR)

b) find the pH of buffer solution containing 0.20 mole per litre sodium acetate and 0.18 mole per litre acetic acid .$K_a$ for acetic acid is $1.8 \times 10^{-5}$.

37. a) how will you convert benzaldehyde into the following compounds?

i) benzoin ii)cinnamic acid iii) malachite green

(OR)

b) i) differentiate primary secondary and tertiary alcohols using Lucas test

ii) give the uses of diethyl ether

38. a) describe adsorption theory of catalysis.

(OR)

b) A compound 'A' of molecular formula $C_2H_3N$ on reduction with $Na(Hg)/C_2H_5OH$ gives 'B' of molecular formula $C_2H_7N$ which undergoes carbylamine test.Compound 'B' on reduction with nitrous acid gives compound 'C' of molecular formula $C_2H_6O$ by liberating nitrogen. Identify A,B and C and write the reaction involved.

**********

**Time allowed : 3.00 hours** **MAY22** **Maximuim marks : 70**

**PART-I**

**Note : i) answer all the questions** **15 X 1 = 15**

**ii) choose the most appropriate answer from the given four alternatives and write the option code the corresponding answer .**

1.An element belongs to group-15 and 3rd period of the periodic table .its electronic configuration would be

a) $1S^2\ 2S^2\ 2P^6\ 3S^2\ 3P^2$ b) $1S^2\ 2S^2\ 2P^4$

c) $1S^2\ 2S^2\ 2P^6\ 3S^2\ 3P^3$ d) $1S^2\ 2S^2\ 2P^3$

2.Bauxite has the composition :

a)$Al_2O_3.nH_2O$ b) $Fe_2O_3.2H_2O$ c) $Al_2O_3$ d) none of the above

3.If 75% of a first order reaction was completed in 60 min , 50% of the same reaction under the same conditions would be completed in :

a) 35 minutes b) 20 minutes c) 75 minutes d) 30 minutes

4.Which of the following reagent can be used to convert nitrobenzene to aniline

a) Zn/Hg/NaOH b) $Zn/NH_4Cl$ c) Sn/HCl d) All of these

5.$HO\text{-}CH_2\text{-}CH_2\text{-}OH$ on heating with periodic acid gives

a) methanal b) methanoic acid c) $CO_2$ d) Glyoxal

6. A complex in which the oxidation number of the metal is zero is

a) $K_4[Fe(CN)_6]$ b) $[Fe(CN)_3(NH_3)_3]$ c) $[Fe(CO)_5]$ d) both b and c

7.Which of the following can act as lowery-bronsted acid as well as base ?

a) $HPO_4^{2-}$ b) HCl c) Br- d) $SO_4^{2-}$

8.An aqueous solution of borax is

a) basic b) neutral c) amphoteric d) acidic

9.Which one of the following is an example for homogeneous catalysis ?

a) Hydrogenation of oil

b) manufacture of ammonia by haber's process

c) Hydrolysis of sucrose in presence of dil.HCl

d) Manufacture of sulphuric acid by contact process

10.The formation of cyanohydrins from acetone is an example of

a) electrophilic addition b) nucleophilic substitution

c) nucleophilic addition d) electrophilic substitution

11.Which of the following oxidation states in most common among the lanthanoids?

a) +5 b) +4 c) +3 d) +2

12.Faraday constant is defined as

a) Charge required to deposit one mole of substance b) charge carried by 1 electrton

c) Charge carried by $6.22X10^{10}$ electrons d) Charge carried by one mole of electrons

13.Which of the following amino acids are achiral ?

a) Proline b) Alanine c) Glycine d) Leucine

14. The crystal with a metal deficiency defect is

a) ZnO b) NaCl c) KCl d) FeO

15.Fog is colloidal solution of

a) liquid in gas b) solid in gas c) gas in liquid d) gas in gas

**PART-II**

**Note : answer any six questions. Question No.24 is compulsory** **6 X 2 = 12**

16.What are the difference between minerals and ores ?

17.Which is more stable $Fe^{2+}$ or $Fe^{3+}$ ? why ?

18.Define Coordination number

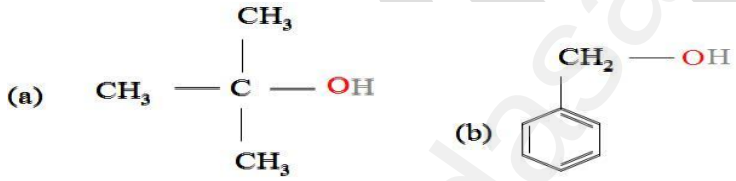
19.Define covalent solids

20.Give examples for the first order reactions.

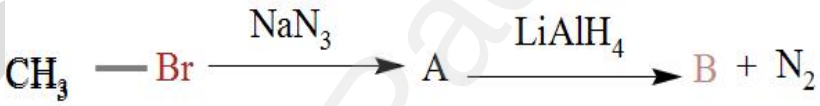
21.What are the limitations of Arrhenius concept ?

22.Write a note on Electrophoresis.

23.Give the IUPAC names




24.Identify A and B in the following sequence of reactions




**PART-III**

**Note : answer any six questions. Question No.33 is compulsory** **6 X 3 = 18**

25.What are interhalogens compounds ? Give examples

26.What are the properties of interstitial compounds ?

27.Write Arrhenius equation and explain the terms involved

28.What are the factors that affects electrolytic conductance ?

29.What is homogeneous catalysis ? Give example

30.Write any one method of preparation of diethyl ether

31.Write haloform reaction

32.What are epimers ? give example

33.Write the following for the complex $[Ag(NH_3)_2]^+$

a)ligand b) central metal ion c) IUPAC name

## PART-IV

**Note : Answer All The Questions** **5 X 5 = 25**

34. a) i) Write a note on gravity separation method ?

ii) Explain the mond's process of refining nickel.

(OR)

b) i)What is inert pair effect ?

ii) What are the uses of boric acid ?

35. a) i) What are the uses of oxygen ?

ii) How will you prepare bleaching powder ?

(OR)

b) Write the postulates of werner's theory .

36. a) Differentiate crystalline solids and amorphous solid

(OR)

b) i) Define PH

ii)Explain common ion effect with example

37. a) Derive an expression for Nernst equation.

(OR)

b) What are the characteristics of catalyst ?

38. a) Explain the reducing action of formic acid with example

(OR)

b) Write a note on :

i) Carbylamine reaction

ii) Gabriel phthalimide synthesis

**********

**Time allowed : 3.00 hours** **JULY22** **Maximuim marks : 70**

**PART-I**

**Note : i) answer all the questions .** **15 X 1 = 15**

**ii) choose the most appropriate answer from the given four alternatives and write the option code the corresponding answer .**

1.Zinc is obtained from ZnO by

a) carbon reduction b) reduction using silver

c) Electrochemical process d) Acid leaching

2.The element that shows lowest catenation among the following p-block elements is

a) carbon b) silicon c) lead d) germanium

3.$XeF_6$ on complete hydrolysis produces

a) $XeOF_4$ b) $XeO_2F_2$ c) $XeO_3$ d) $XeO_2$

4.The actinoid elements which show the highest oxidation state of +7 are

a) Np,Pu,Am b) U,Fm,Th c) U,Th,Md d) Es,No,Lr

5.An example for double salt

a) $FeSO_4$ b) $FeSO_4(NH_4)_2SO_4.6H_2O$ c) $K_4[Fe(CN)_6]$ d) $K_2SO_4.2H_2O$

6.Graphite and Diamond are

a) Covalent and molecular crystals b) ionic and covalent crystals

c) both are covalent crystals d) both are molecular crystals

7.Half-life period for first order reaction :

a) $t_{1/2} = \frac{0.6932}{K}$ b) $t_{1/2} = \frac{K}{0.6932}$ c) $t_{1/2} = \frac{2.303}{K}$ d) $t_{1/2} = \frac{K}{2.303}$

8.Which of these in not likely to act as lewis base ?

a) $BF_3$ b) $PF_3$ c) CO d) $F^-$

9.How many faradays of electricity are required for the following reactions to occur ?

MnO4- → Mn2+

a) 5F b) 3F c) 1F d) 7F

10.The phenomenon observed when a beam of light is passed through a colloidal solution is

a) cataphoresis b) Electrophoresis c) coagulation d) tyndall effect

11.Which of the following compounds can be used as antifreeze in automobile radiators

a) Methanol b) ethanol c) Neo-pentyl alcohol d) ethan-1,2-diol

12.Which of the following represents the correct order of acidity in the given compounds

a) $FCH_2COOH > CH_3COOH > BrCH_2COOH > ClCH_2COOH$

b) $FCH_2COOH > ClCH_2COOH > BrCH_2COOH > CH_3COOH$

c) $CH_3COOH > ClCH_2COOH > FCH_2COOH > BrCH_2COOH$

d) $ClCH_2COOH > CH_3COOH > BrCH_2COOH > ICH_2COOH$

13.Aniline + benzoyl chloride $\xrightarrow{NaOH}$ $C_6H_5$-NH-$COC_6H_5$ .this reaction is known as

a) Fridel- crafts reaction b) HVZ reaction

c) Schotten-Baumann reaction d) Kolbe's reaction

14. Which of the following are epimers ?

a) D(+)- glucose and D(+)-galactose b) D(+)-glucose and D(+)-mannose

c) neither a and b d) both a and b

15.Which of the following reduces tollen's reagent ?

a) formic acid b) acetic acid c) benzophenone d) none of these

**PART-II**

**Note : answer any six questions. Question No.24 is compulsory 6 X 2 = 12**

16.Give the uses of argon

17.Write a note on zeigler –Natta catalysis .Give its use

18.What are the limitation of VB theory ?

19.Define unit cell

20.What are the Lewis acids and bases ? Give an example for each

21.What are the uses of glycerol

22.Write a note on Rosenmund reduction

23.Draw the structure of D(+) fructose

24.A solution of silver nitrate is electrolysed for 20 minutes with a current of 2 amperes. Calculate the mass of silver deposited at the cathode .

**PART-III**

**Note : answer any six questions. Question No.33 is compulsory . 6 X 3 = 18**

25.Explain Acid leaching with an example

26.What are the uses of boric acid ?

27.Write the IUPAC ligand name for the following

a) $C_2O_4^{2-}$ b) $H_2O$ c) $Cl^-$

28.Define order and molecularity of a reaction

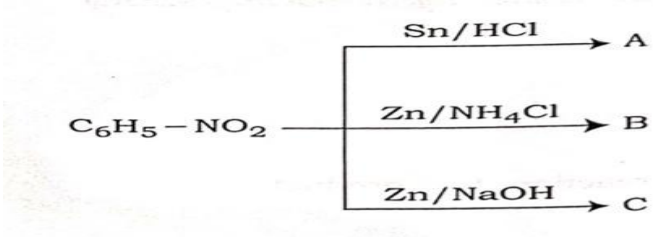
29.What is buffer solution ? Give an example

30.What is heterogeneous catalysis ? give example

31.Write a bromination rection of anisole

32.What is called zwitter ion ? give an example

33.Identify compounds A,B and C for the following



## PART-IV

**Note : Answer All The Questions** **5 X 5 = 25**

34. a) Explain the principle of electrolytic refining with an example

(OR)

b) What is catenation ? Write the conditions for catenation property ?

35. a) Write the properties of inter halogen compounds

(OR)

b) Compare lanthanide and actinides

36. a) i) What is packing efficiency ?

ii) Write a note on frenkel defect ?

(OR)

b) Derive integrated rate law for a zero order reaction A→ product

37. a) Derive an expression for Nernst equation

(OR)

b) Describe adsorption theory of catalysis

38. a) i)Write three tests for the identification of carboxylic acid group

ii)Write note on benzoin condensation.

(OR)

b) Write a note on

i) Bromination of aniline

ii) Mustard oil reaction.

**********

# QUESTION AND ANSWER UNITWISE

# 1. METALLURGY

**ONE MARKS :-**

1. wolframite ore is separated from tinstone by the process of _____(mar20)
   **(a) electromagnetic separation.** (b) smelting
   (c) calcination (d) Roasting
2. the incorrect statement among the following is(ins20)
   (a) Nickel is refined by mond's process
   (b) Titanium is refined by van-Arkel's process
   (c) Zinc blende (ZnS) is connected by froth floatation process
   **(d) In the metallurgy of gold the metal is leached with dilute sodium chloride solution**
3. The metal which is used packing material for food items
   (a) Zn (b) Zr **(c) Al** (d) Au
4. Extraction of gold involves leaching with cyanide ion Gold is later recovered by : (sep20)
   **(a) metal displacement with zinc.** (b) Liquation
   (c) Distillation (d) Zone refining
5. The following set of reactions are used in refining zirconium. This method is called as___ (Aug21)

$$Zr(impure) + 2I_2 \xrightarrow{523K} ZrI_4$$

$$ZrI_4 \xrightarrow{1800K} Zr(pure) + 2I_2$$

   (a) Zone refining (b) Liquation
   (c) Mond's process **(d) van Arkel process**
6. Bauxite has the composition : (May22)
   **a)$Al_2O_3.nH_2O$** b) $Fe_2O_3.2H_2O$ c) $Al_2O_3$ d) none of the above
7. Zinc is obtained from ZnO by (jul22)
   **a) carbon reduction** b) reduction using silver
   c) Electrochemical process d) Acid leaching

2 &3&5 MARKS :-

**1. Explain zone refining process (mar 20)**

- This method is based on the principles of fractional crystallisation. When an impure metal is melted and allowed to solidify, the impurities will prefer to be in the molten region. i.e. impurities are more soluble in the melt than in the solid state metal.
- In this process the impure metal is taken in the form of a rod. One end of the rod is heated using a mobile induction heater which results in melting of the metal on that portion of the rod.
- When the heater is slowly moved to the other end the pure metal crystallises while the impurities will move on to the adjacent molten zone formed due to the movement of the heater.
- As the heater moves further away, the molten zone containing impurities also moves along with it. The process is repeated several times by moving the heater in the same direction again and again to achieve the desired purity level.
- This process is carried out in an inert gas atmosphere to prevent the oxidation of metals . Elements such as germanium (Ge), silicon (Si) and galium (Ga) that are used as semiconductor are refined using this process.

**2.What is the role of limestone in the extraction of iron from its oxide $Fe_2O_3$ (sep 20)**

- Lime stone acts as a flux
- It combine with silica and get converted into calcium silicate called as slag

$CaO_{(S)}$ + $SiO_{2(S)}$ → $CaSiO_{3(S)}$
Flux Gangue slag

**3. Which type of ores can be concentrated by froth flotation method give two example (sep 20)**

Sulphide ore can be concentrated by froth floatation method e.g.,

i. Copper pyrites ( $CuFeS_2$)
ii. Zinc blende ( ZnS )
iii. Galena(PbS)

**4.Explain the following terms with suitable example ( inst 20)**

**I) Gangue. II) slag**

i) Gangue :

The impurities associated with the minerals are known as Gangue or Matrix

Ex : $SiO_2$ is the gangue present in the iron ore

ii) Slag :

A compound formed when gangue is combined with flux is called slag

Ex :$CaO_{(S)}$ + $SiO_{2(S)}$ → $CaSiO_{3(S)}$
Flux Gangue slag

**5.What are the difference between minerals and ores(inst 20)** (may22)

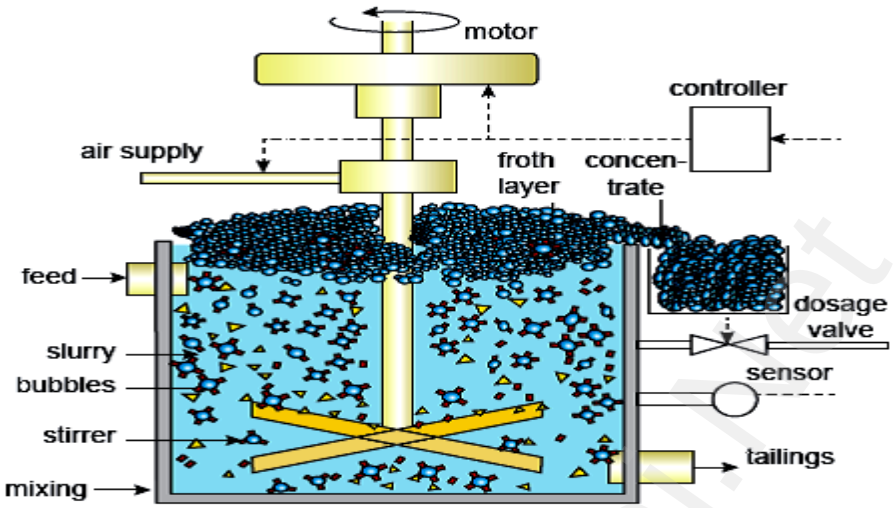
| S.NO | MINERALS | ORES |
|---|---|---|
| 1 | A natturally occurring substance obtained by mining which contain the metal in free state or in the form of compounds | Ore contains a high percentage of metal , from which it can be extracted conveniently and economically |
| 2 | All minerals are not ores | All ores are minerals |
| 3 | Low percentage of metal | High percentage of metal |
| 4 | Ex : bauxite and china clay | Ex :bauxite |

**6.Explain froth flotation process (aug 21)**

- This method is commonly used to concentrate **sulphide ores such as galena (PbS)**, **zincblende (ZnS)** etc... In this method, the metallic ore particles which are preferentially wetted by oil can be separated from gangue.

- In this method, the crushed ore is suspended in water and mixed with **frothing agent** such as **pine oil, eucalyptus oil** etc. A small quantity of **sodium ethyl xanthate**which **acts as a collector** is also added.

- A froth is generated by blowing air through this mixture. The collector molecules attach to the ore particle and make them water repellent. As a result, ore particles, wetted by the oil, rise to the surface along with the froth. The froth is skimmed off and dried to recover the concentrated ore.




- The gangue particles that are preferentially wetted by water settle at the bottom. When a sulphide ore of a metal of interest contains other metal sulphides as impurities, **depressingagents such as sodium cyanide, sodium carbonate** etc are used to selectively prevent other metal sulphides from coming to the froth.

- For example, when impurities such as ZnS is present in galena (PbS), sodium cyanide (NaCN) is added to depresses the flotation property of ZnS by forming a layer of zinc complex $Na_2[Zn(CN)_4]$ on the surface of zinc sulphide.

7. Describe mond process for refining nickel. (may 22)

- **Mond process for refining nickel:**
  The impure nickel is heated in a stream of carbon monoxide at around 350 K. The nickel reacts with the CO to form a highly volatile nickel tetracarbonyl. The solid impurities are left behind.

$$Ni\ (s) + 4\ CO\ (g) \longrightarrow Ni(CO)_4\ (g)$$

- On heating the nickel tetracarbonyl around 460 K, the complex decomposes to give pure metal

$$Ni(CO)_4\ (g) \longrightarrow Ni\ (s) + 4\ CO\ (g)$$

8..Explain Acid leaching with an example (jul 22)

- **Acid leaching**
  Leaching of sulphide ores such as ZnS, PbS etc., can be done by treating them with hot aqueous sulphuric acid

$$2ZnS\ (s) + 2H_2SO_4\ (aq) + O_2(g) \longrightarrow 2ZnSO_4\ (aq) + 2S\ (s) + H_2O$$

- In this process the insoluble sulphide is converted into soluble sulphate and elemental sulphur

9. Explain the principle of electrolytic refining with an example (jul 22)

- **Electrochemial extraction of aluminium - Hall-Herold process:**
  In this method, electrolysis is carried out in an iron tank lined with carbon which acts as a cathode. The carbon blocks immersed in the electrolyte acts as a anode.
- A 20% solutionof alumina, obtained from the bauxite ore is mixed with molten cyrolite and is taken in theelectrolysis chamber.
- About 10% calcium chloride is also added to the solution. Here calciumchloride helps to lower the melting point of the mixture.
- The fused mixture is maintained at a temperature of above 1270 K. The chemical reactions involved in this process are as follows.

Ionisaiton of alumina $Al_2O_3 \longrightarrow 2Al^{3+} + 3O^{2-}$

Reaction at cathode $2Al^{3+}\ (melt) + 3e^- \longrightarrow Al\ (l)$

Reaction at anode $2O^{2-}\ (melt) \longrightarrow O2 + 3e^-$

- Since carbon acts as anode the following reaction also takes place on it.

$$C\ (s) + O^{2-}\ (melt) \longrightarrow CO + 2e^-$$

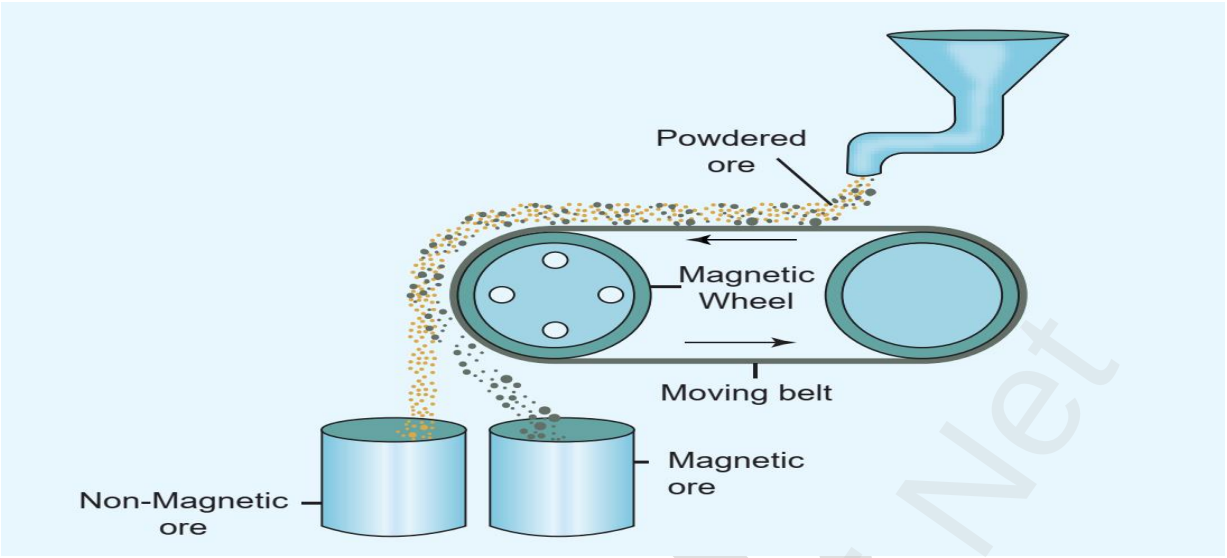
$$C\ (s) + 2O^{2-}\ (melt) \longrightarrow CO_2 + 4e^-$$

- Due to the above two reactions, anodes are slowly consumed during the electrolysis.
- The pure aluminium is formed at the cathode and settles at the bottom. The net electrolysis reaction can be written as follows

$$4Al^{3+}\ (melt) + 6O^{2-}\ (melt) + 3C\ (s) \longrightarrow 4Al\ (l) + 3CO_2\ (g)$$

**10.Write a note on gravity separation method ? (may 22)**

- This method is applicable to ferromagnetic ores and it is based on the difference in the magnetic properties of the ore and the impurities.
- For example tin stone can be separated from the wolframite impurities which is magnetic. Similarly, ores such as chromite, pyrolusite having magnetic property can be removed from the non magnetic siliceous impurities.
- The crushed ore is poured on to an electromagnetic separator consisting of a belt moving over two rollers of which one is magnetic.
- The magnetic part of the ore is attracted towards the magnet and falls as a heap close to the magnetic region while the nonmagnetic part falls away from it as shown in the figure.



# 2.P-BLOCK ELEMENTS-I

**ONE MARKS :-**

1.Match the following (mar20)

(1) Fluorine (i) Identification of coloured metal ions
(2) Borax (ii) strong oxidizing agent
(3) Aluminium (iii) Chalcogen present in volcanic ashes
(4) Sulphur (iv) Most abundant element

(a) (1) –(iii) (2)-(ii) (3)-(iv) (4)-(i) **(b) (1)-(ii) (2)-(i) (3)-(iv) (4)-(iii)**
(c) (1)-(iv) (2)-(iii) (3)-(ii) (4)-(i) (d) (1)-(ii) (2)-(iv) (3)-(i) (4)-(iii)

2.Sodium salt of tetraboric acid is known as(ins20)

(a) $B_2H_6$ (b) $Na_2BO_3$ (c) $H_3BO_3$ **(d) $Na_2B_4O_7.10H_2O$**

3. Inorganic benzene is(sep20)

(a) $B_2H_6$ **(b) $B_3N_3H_6$** `` (c) $H_3BO_3$ (d) $H_2B_4O_7$

4. which of the following is not $sp^2$hybridised? (Aug21)

(a) Fullerene (b) Graphite
**(c) Diamond** (d) Graphene

5.An aqueous solution of borax is(May22)

**a) basic** b) neutral c) amphoteric d) acidic

6.The element that shows lowest catenation among the following p-block elements is(jul22)

a) carbon b) silicon **c) lead** d) germanium

*2 &3&5MARK QUESTIONS :-*

**1. There is only marginal difference in decrease in ionisation enthalpy from aluminium to thallium explain Why? (mar20) ( compulsory 3 mark )**

- This is due to the presence of inner d and f-electrons which has poor shielding effect compared to s and p-electrons. As a result, the effective nuclear charge on the valance electrons increases.

**2.Write the conditions for catenation property ? (jul 22)**

i)thevalency of element is greater than or equal to two,
(ii) element should have an ability to bond with itself
(iii) theself bond must be as strong as its bond with other elements
(iv) kinetic inertness of catenated compound towards other molecules.

**3.A hydride of second period alkali metal (A) on reaction with compound of boron B in the presence of ether to give a reducing agent C . Identify A B and c (sep 20) ( compulsory 2 mark )**

i) A hydride of 2nd period alkali metal (A) IS lithium hydride (LiH)
ii)Lithium hydride (A) reacts with diborane (B) to give lithium borohydride (C) which is act as reducing agent

$$B_2H_6 + 2LiH \xrightarrow{\text{Ether}} 2LiBH_4$$

(Diborane) (B) (lithiumhydride) (A) (lithiumborohydride) (C)

| COMPOUNDS | NAME | FORMULA |
|---|---|---|
| A | lithiumhydride | LiH |
| B | Diborane | $B_2H_6$ |
| C | Lithiumborohydride | $LiBH_4$ |

**4. How is potash alum prepared (sep 20)**

- The alunite the alum stone is the naturally occurring form and it is $K_2SO_4$. $Al_2(SO_4)_3.4Al(OH)_3$. When alum stone is treated with excess of sulphuric acid, the aluminium hydroxide is converted to aluminiumsulphate.
- A calculated quality of potassium sulphate is added and the solution is crystallised to generate potash alum. It is purified by recrystallisation.

$$K_2SO_4.Al_2(SO_4)_3.4Al(OH)_3 + 6H_2SO_4 \longrightarrow K_2SO_4 + Al_2(SO_4)_3 + 12\ H_2O$$

$$K_2SO_4 + Al_2(SO_4)_3 + 24\ H_2O \longrightarrow K_2SO_4.Al_2(SO_4)_3.24\ H_2O$$

**5. What are the factors responsible for the anomalous behaviour of first element of the p-block ?( inst 20) (aug21)**

In p-block elements, the first member of each group differs from the other elements of the corresponding group. The following factors are responsible for this anomalous behavior.

1. Small size of the first member
2. High ionisation enthalpy and high electronegativity
3. Absence of d orbitals in their valance shell

**6.What is catenation ?( inst 20)**

- Catenation is an ability of an element to form chain of atoms.
- The following conditions are necessary for catenation.

(i)thevalency of element is greater than or equal to two,
(ii) element should have an ability to bond with itself
(iii) theself bond must be as strong as its bond with other elements
(iv) kinetic inertness of catenated compound towards other molecules. Carbon possesses all the above properties and forms a wide range of compounds with itself and with other elements such as H, O, N, S and halogens

**7.Give the uses of borax . (aug21)**

1. Borax is used for the identification of coloured metal ions
2. In the manufacture optical and borosilicate glass, enamels and glazes for pottery
3. It is also used as a flux in metallurgy and also acts as a good preservative

**8.What is inert pair effect ? (may 22)**

- Thus in heavier posttransition metals, the outer s electrons (ns) have a tendency to remain inert and show reluctance to take part in the bonding, which is known as inert pair effect. This effect is also observed in groups 14, 15 and 16

**9.What are the uses of boric acid ? (may 22) (jul 22)**

1. Boric acid is used in the manufacture of pottery glazes, glass, enamels and pigments.
2. It is used as an antiseptic and as an eye lotion.
3. It is also used as a food preservative.

# 3.P-BLOCK ELEMENTS-II

**ONE MARKS :-**

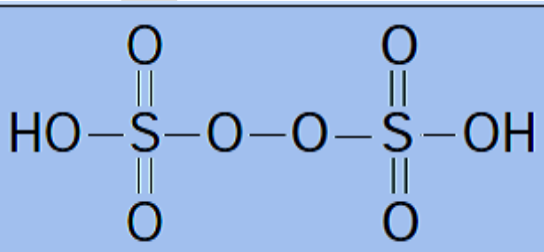
1. Formula for hyponitrous acid (mar20)
   (a) HOONO **(b) $H_2N_2O_2$** (c) $HNO_2$ (d) $HNO_4$
2. _____ is used for producing smoke screen as it gives large smoke (ins20)
   (a) Borax (b) Diborane (c) Potash alum **(d) Phosphine**
3. The oxidation state of chlorine in. $Cl_2O_7$ is (sep20)
   (a) +6 **(b) +7** (c) +4 (d) +5
4. which one of the following compounds is not formed? (Aug21)
   (a) $XeF_2$ (b) $XeOF_4$ **(c) $NeF_2$** (d) $XeO_3$
5. An element belongs to group-15 and 3rd period of the periodic table .its electronic configuration would be (May22)
   a) $1S^2\ 2S^2\ 2P^6\ 3S^2\ 3P^2$ b) $1S^2\ 2S^2\ 2P^4$
   **c) $1S^2\ 2S^2\ 2P^6\ 3S^2\ 3P^3$** d) $1S^2\ 2S^2\ 2P^3$
6. $XeF_6$ on complete hydrolysis produces (jul22)
   a) $XeOF_4$ b) $XeO_2F_2$ **c) $XeO_3$** d) $XeO_2$

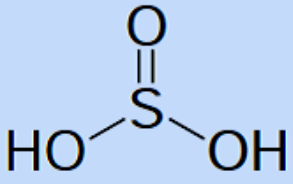
*2 &3&5MARK QUESTIONS :-*

**1. How is bleaching powder prepared? (Mar 20) (may 22)**

Bleaching powder is produced by passing chlorine gas through dry slaked lime (calcium hydroxide)
$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

**2. Write the molecular formula and draw the structure of sulphurous acid marshals acid (mar 20)**

| | | |
|---|---|---|
| Peroxodisulphuric acid. Marshall's acid | $H_2S_2O_8$ |  |

| Name | Molecular Formula | Structure |
|---|---|---|
| Sulphurous acid | $H_2SO_3$ |  |

**3. What type of hybridization is found in the following (sep 20)**
**I) BrF Ii) $BrF_5$ Iii) $BrF_3$**

| COMPOUNDS | HYBRIDIZATION |
|---|---|
| i) BrF | $Sp^3$ |
| ii) $BrF_5$ | $Sp^3d^2$ |
| iii) $BrF_3$ | $Sp^3d$ |

**4.Powdered $CaCO_3$ reacts much faster with dilute HCl than with the same mass of $CaCO_3$ as marble give Reason ? (Sep 20) ( compulsory 3 mark )**

**Reason**

For a given mass of react and when a particle decrease, surface are increases, Increase in surface area of the reactant leads to more collisions per litre per second and hence the rate of reaction also increases

**Reaction**

$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2$$

**5. Explain the Deacons's process for manufacture of chlorine (sep 20)**

**Deacon's process:-**

- In this process a mixture of air and hydrochloric acid is passed up a chamber containing a number o shelves, pumice stones soaked in cuprous chloride are placed. Hot gases at about 723 K are passe through a jacket that surrounds the chamber.

$$4HCl + O_2 \xrightarrow[Cu_2Cl_2]{400^0C} 2H_2O + Cl_2 \uparrow$$

- The chlorine obtained by this method is dilute and is employed for the manufacture of bleaching powder The catalysed reaction is given below,

$$2Cu_2Cl_2 + O_2 \longrightarrow \underset{\text{Cuprous oxy chloride}}{2Cu_2OCl_2}$$

$$Cu_2OCl_2 + 2HCl \longrightarrow \underset{\text{Cupric chloride}}{2CuCl_2} + H_2O$$

$$2CuCl_2 \longrightarrow \underset{\text{Cuprous chloride}}{Cu_2Cl_2} + Cl_2$$

**6. Sulphuric acid dibasic acid prove it (sep 20)**

It is a strong dibasic acid. Hence it forms two types of salts namely sulphates and bisulphates.

$$H_2SO_4 + NaOH \longrightarrow \underset{\text{sodium bisulphate}}{NaHSO_4} + H_2O$$

$$H_2SO_4 + 2NaOH \longrightarrow \underset{\text{sodium sulphate}}{Na_2SO_4} + 2H_2O$$

$$H_2SO_4 + 2NH_3 \longrightarrow \underset{\text{Ammonium sulphate}}{(NH_4)_2SO_4}$$

**7.Give the uses of helium (inst 20) (aug21)**

1. Helium and oxygen mixture is used by divers in place of air oxygen mixture. This prevents the painfu dangerous condition called bends.
2. Helium is used to provide inert atmosphere in electric arc welding of metals
3. Helium has lowest boiling point hence used in cryogenics (low temperature science).
4. It is much less denser than air and hence used for filling air balloons

**8.Write the balanced equation for the overall reaction of chlorine with cold NaOH and hotNaOH ( inst 20)**

- Chlorine reacts with cold dilute alkali to give chloride and hypochlorite

$$Cl_2 + 2NaOH \longrightarrow \underset{\text{sodium hypo chlorite}}{NaOCl} + NaCl + H_2O$$

- Chlorine reacts with hot concentrated alkali chlorides and chlorates are formed.

$$3Cl_2 + 6NaOH \longrightarrow \underset{\text{sodium chlorate}}{NaClO_3} + 5NaCl + 3H_2O$$

**9.Write a short note on Holmes signal (inst 20)**

- Phosphine is used for producing smoke screen as it gives large smoke. In a ship, a pierced container with a mixture of calcium carbide and calcium phosphide, liberates phosphine and acetylene when thrown into sea.
- The liberated phosphine catches fire and ignites acetylene. These burning gases serves as a signal to the approaching ships. This is known as**Holmes signal**.

**10.HF can't be stored in glass bottle (mar 20)**

Moist hydrofluoric acid (not dry) rapidly react with silica and glass.

$$SiO_2 + 4HF \longrightarrow SiF_4 + 2H_2O$$

$$Na_2SiO_3 + 6HF \longrightarrow Na_2SiF_6 + 3H_2O$$

**11.What are interhalogencompounds? Give two examples (aug 21) (may 22)**

- Each halogen combines with other halogens to form a series of compounds called inter halogen compounds.
- Example : $IF_7$, BrF, ClF

**12. Explain the bleaching action of Sulphur dioxide.(aug 21)**

- In presence of water, sulphur dioxide bleaches coloured wool, silk, sponges and straw into colourless due to its reducing property

$$SO_2 + 2H_2O \longrightarrow 2\,H_2SO_4 + 2(H)$$

$$\underset{\text{Coloured}}{X} + 2(H) \longrightarrow \underset{\text{Colourless}}{XH_2}$$

- However, the bleached product (colourless) is allowed to stand in air, it is reoxidised by atmospheric oxygen to its original colour. Hence bleaching action of sulphur dioxide is temporary

**13.What are the uses of oxygen ? (may 22)**
**Give the uses of argon (jul 22)**

1. Oxygen is one of the essential component for the survival of living organisms.
2. It is used in welding (oxyacetylene welding)
3. Liquid oxygen is used as fuel in rockets etc...

**14.Write the properties of inter halogen compounds (jul 22)**

**Properties of inter halogen compounds:**

i. The central atom will be the larger one

ii. It can be formed only between two halogen and not more than two halogens.

iii. Fluorine can't act as a central metal atom being the smallest one

iv. Due to high electronegativity with small size fluorine helps the central atom to attain high coordination number

v. They can undergo the auto ionization.

$$2\ ICl \rightleftharpoons I^+ + ICl_2^-$$

$$2\ ICl_3 \rightleftharpoons ICl_2^+ + ICl_4^-$$

vi. They are strong oxidizing agents

# 4.TRANSITION AND INNER TRANSITION ELEMENTS

**ONE MARKS :-**

1. The transition element which has only +3 oxidation state is (mar20)

(a) Ni (b) Mn (c) Cr **(d) Sc**

2. The actual position of lanthanoids in the periodic table is at (ins20)

(a) group number 3 period number 4 (b) group number 6 period number 3

(c) group number 4 period number 4 **(d) group number 3 period number 6**

3. $CH_3$ -CHO + CO $\xrightarrow{\text{Rh/ Ir complex}}$ ? (Aug21)

(a) Poly propylene (b) Butan-1-al

**(c) Acetic acid** (d) Acetate

4.Which of the following oxidation states in most common among the lanthanoids? (May22)

a) +5 b) +4 **c) +3** d) +2

5.The actinoid elements which show the highest oxidation state of +7 are (jul22)

**a) Np,Pu,Am** b) U,Fm,Th c) U,Th,Md d) Es,No,Lr

*2 &3&5MARK QUESTIONS :-*

1. **Write chromyl chloride test (mar 20)**

- When potassium dichromate is heated with any chloride salt in the presence of Conc $H_2SO_4$, orange red vapours of chromyl chloride ($CrO_2Cl_2$) is evolved.
- This reaction is used to confirm the presence of chloride ion in inorganic qualitative analysis.

$$K_2Cr_2O_7 + 4NaCl + 6H_2SO_4 \longrightarrow 2KHSO_4 + 4NaHSO_4 + \underset{\text{Chromyl chloride}}{2CrO_2Cl_2}\uparrow + 3H_2O$$

**2.Classify the following elements into d block and f block elements March 2020**

**a)tungston. b) ruthenium c) promethium. d) einstenium**

| d block elements | f block elements |
|---|---|
| a) tungston | c)promethium |
| b) ruthenium | d)einstenium |

**3.What is lanthanide or lanthanoide contraction explain its consequences (sep 20)**

**Lanthanoidecontraction :-**

As we move across 4f series, the atomic and ionic radii of lanthanoids show gradual decrease with increse in atomic number. This decrese in ionic size is called lanthanoid contraction.

**Consequences of lanthanoid contraction:**

**1. Basicity differences**

As we from Ce3+ to Lu3+ , the basic character of Ln3+ ions decrease. Due to the decrease in the size o Ln3+ ions, the ionic character of Ln OH −bond decreases (covalent character increases) which results in th decrease in the basicity.

**2. Similarities among lanthanoids:**

In the complete f - series only 10 pm decrease in atomic radii and 20 pm decrease in ionic radii is observed.because of this very small change in radii of lanthanoids, their chemical properties are quite similar.The elements of the second and third transition serieses resemble each other more closely than the elements of the first and second transition serieses. For example

| Series | Element | Atomic radius |
|---|---|---|
| 3d Series | Ti | 132 pm |
| 4d Series | Zr | 145 pm |
| 5d Series | Hf | 144 pm |

**4.What are interstitial compounds(inst 20) (aug21)**

- An interstitial compound or alloy is a compound that is formed when small atoms like hydrogen, boron, carbon or nitrogen are trapped in the interstitial holes in a metal lattice.
- They are usually non-stoichiometric compounds.Transition metals form a number of interstitial compounds such as TiC, $ZrH_{1.92}$ , $Mn_4N$ etc

**5 .which metal in the 3d series exhibits + 1 oxidation State most frequently and why ?( inst 20)**

- The first transition metal copper exhibits only only +1 oxidation state
- It is unique in 3d series having a stable +1 oxidation state
- Cu (Z =29) Electronic configuration is [Ar] $3d^{10}$ $4S^1$
- So cupper elements only can have +1 oxidation state

**6.Why d block elements exhibit variable oxidation state? (aug 21)**

- all transition elements exhibit variable oxidation states by loosing electrons from (n-1)d orbital and ns orbital as the energy difference between them is very small.

**7. Calculate the number of unpaired electron in $Ti^{3+}$, $Mn^{2+}$ and calculate the spin only magnetic moment .(aug 21)**

| | | | | |
|---|---|---|---|---|
| $Ti^{3+}$, $V^{4+}$ | $d^1$ | 1 | $\mu = \sqrt{1(1+2)} = \sqrt{3} = 1.73\ \mu_B$ | 1.75 |
| $Mn^{2+}$, $Fe^{3+}$ | $d^5$ | 5 | $\mu = \sqrt{5(5+2)} = \sqrt{35} = 5.91\ \mu_B$ | 5.96 |
| **Ion** | **Configuration** | **n** | $\mu = \sqrt{n(n+2)}\ \mu_B$ | $\mu_{(observed)}$ |

8.Compare the properties of lanthanides and actinides. (jul 22)

| S.NO | LANTHANOIDS | ACTINOIDS |
|---|---|---|
| 1 | Differentiating electron eneters in 4f orbital | Differentiating electron eneters in 5f orbital |
| 2 | Binding energy of 4f orbitals are higher | Binding energy of 5f orbitals are lower |
| 3 | They show less tendency to form complexes | They show greater tendency to form complexes |
| 4 | Most of the lanthanoids are colourless | Most of the actinoids are coloured. For example. $U^{3+}$ (red), $U^{4+}$ (green) , $UO_2^{2+}$ |
| 5 | They do not form oxo cations | They do form oxo cations such as $UO_2^{2+}$ ,$NpO_2^{2+}$ etc |
| 6 | Besides +3 oxidation states lanthanoids show +2 and +4 oxidation states in few cases | Besides +3 oxidation states actinoids show higher oxidation states such as +4, +5, +6 and +7 |

9.Which is more stable $Fe^{2+}$ or $Fe^{3+}$ ? why ? (may 22)

- $Fe^{2+}$ : $1S^2\ 2S^2\ 2P^6\ 3S^2\ 3P^6\ 4S^0\ 4d^6$
- $Fe^{3+}$ : $1S^2\ 2S^2\ 2P^6\ 3S^2\ 3P^6\ 4S^0\ 4d^5$
- $Fe^{3+}$ is more stable because half filled orbital is more stable than partially filled orbital

10.What are the properties of interstitial compounds ? (may 22)

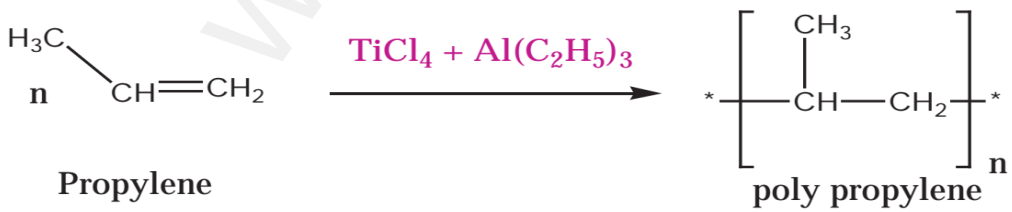
(i) They are hard and show electrical land thermal conductivity
(ii) They have high melting points higher than those of pure metals
(iii) Transition metal hydrides are used as powerful reducing agents
(iv) Metallic carbides are chemically inert.

11.Write a note on zeigler –Natta catalysis .Give its use (jul 22)

what is zeiglar-Nata catalyst ? in which reaction it is used ? give equation.

Zeigler – Natta catalyst

A mixture of TiCl4 and trialkyl aluminium is used for polymerization.




Propylene poly propylene

# 5.COORDINATION CHEMISTRY

**ONE MARKS :-**

1. Fac-mer isomerism is shown by : (ins20)

(a) $[Co(en)_3]^{3+}$ (b) $[Co(NH_3)_4Cl_2]^{+}$

**(c) $[Co(NH_3)_3Cl_3]$** (d) $[Co(NH_3)_5Cl]\ SO_4$

2.match the following (sep20)

1) $[Ni(CO)_4]$ i) trigonal bipyramidal

2) $[Pt(NH_3)_4]^{2+}$ ii) octahedral

3) $[Fe(CO)_5]$ iii) tetrahedral

4) [Co(NH3)6]3+ iv) square planar

(a) (1) –(ii) (2)-(iii) (3)-(iv) (4)-(i) (b) (1)-(iii) (2)-(i) (3)-(iv) (4)-(ii)

**(c) (1)-(iii) (2)-(iv) (3)-(i) (4)-(ii)** (d) (1)-(iv) (2)-(i) (3)-(ii) (4)-(iii)

3. In $K_4\ [Fe(CN)_6]$ the co-ordination number of $Fe^{2+}$ is _____(Aug21)

(a) 4 (b) 2 (c) 3 **(d) 6**

4. A complex in which the oxidation number of the metal is zero is (May22)

a) $K_4[Fe(CN)_6]$ b) $[Fe(CN)_3(NH_3)_3]$ **c) $[Fe(CO)_5]$** d) both b and c

5.An example for double salt (jul22)

a) $FeSO_4$ **b) $FeSO_4(NH_4)_2SO_4.6H_2O$** c) $K_4[Fe(CN)_6]$ d) $K_2SO_4.2H_2O$

6. The magnetic moment of 1.73 BM will be shown by one among the following(sep20)

**(a) $[Cu(NH_3)_4]^{2+}$** (b) $[Ni(CN)_4]^{2-}$

(c) $TiCl_4$ (d) $[COCl_6]^{4-}$

*2 &3&5MARK QUESTIONS :-*

**1.Write any two hydrate isomers of the complex with the molecular formula $CrCl_3\ 6H_2O$ (mar 20)**

- Isomers in which there is exchange of solvent (water) ligands between coordinationand ionisation sphere are called hydrate isomers
- $CrCl_3.6H_2O$ has three hydrate isomers as shown below.

| Compound | Type of hydrate isomers |
|---|---|
| CrCl3.6H2O | $[Cr(H_2O)_6]Cl_3$ |
| | $[Cr(H_2O)_5Cl]Cl_2.H_2O$ |
| | $[Cr(H_2O)_4Cl_2]Cl.2H_2O$ |

**2.$[Sc(H_2O)_6]^{3+}$ IS COLOURLESS EXPLAIN (mar 20)**

- $[Sc(H_2O)_6]^{3+}$The outer electronic configuration of metal ion $sc^{3+}$ is $3d^0$
- Since there is no electron in d orbital ,d-d transition is not possible
- Hence is colourless $[Sc(H_2O)_6]^{3+}$

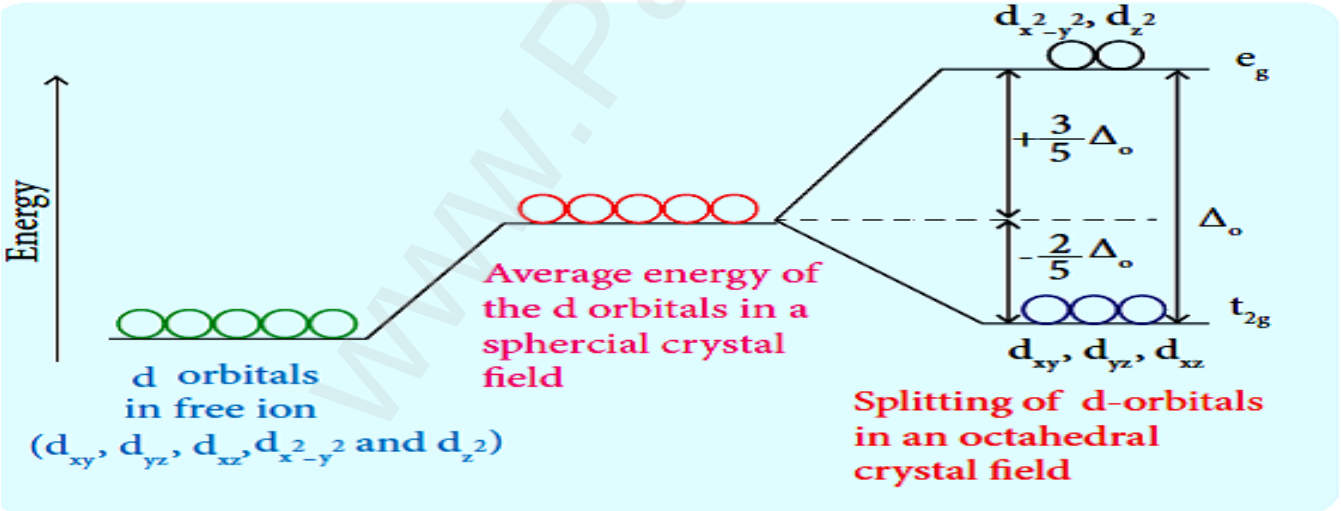
**3. Write the IUPAC name of the following (mar 20) $[Ag(NH_3)_2]^+$ ii)$[Co(NH_3)_5Cl]^{2+}$**

| S.NO | COMLEX | IUPAC NAME |
|---|---|---|
| i) | $[Ag(NH_3)_2]^+$ | Diammainesilver(I)ion |
| ii) | $[Co(NH_3)_5Cl]^{2+}$ | Pentaamminechlorocobalt(III)ion |

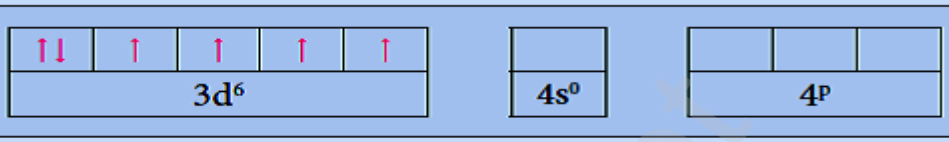
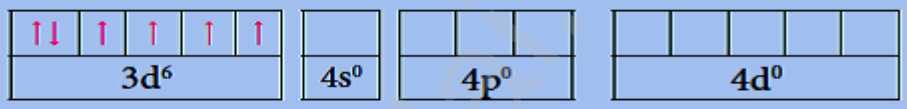
**4.Give the difference between double salt and coordination compound (sep 20) (AUG 21)**

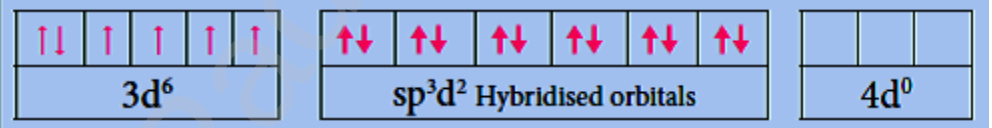
| S.no | Double salt | Coordination compound |
|---|---|---|
| 1 | It is a compoundprepare by the combination ofTwo different salt components | It is a compounds formed from a lewis acid and a lewis base |
| 2 | Completely dissociate into its ions in water | Do not completely dissociate into its ions in water |
| 3 | Give simple ions when added to water | Do not give simple ions |
| 4 | Answer the tests for simple ions $Fe^{2+}$, $NH^{4+}$ | Does not answer for simple ions $Fe^{3+}$, $SCN^-$ |
| 5 | Example : Potash alum $K_2SO_4.Al_2(SO_4)_3.24H_2O$ | EXAMPLE : Potassium ferro cyanide $K_4[Fe(CN)_6]$ |

**5.In an octahedral crystal field draw the figure to shoe splitting of d orbitals (Sep20)**



**6.Calculate the magnetic moment and magnetic propertyof $[CoF_6]^{3-}$ (mar 20)**

| Complex | $[CoF_6]^{3-}$ |
|---|---|
| Central metal atom and its outer electronic configuration | $Co^{3+}$: $3d^6$, $4s^0$ |
| Outer orbitals of metal atom/ion |   |
| Nature of ligand | $F^-$ Weak field ligand and hence no pairing of 3d electrons in the metal |
| Outer orbitals of metal atom/ion in presence of ligand |   |
| Hybridisation | Coordination number - 6 Hybridsation - $sp^3d^2$ |

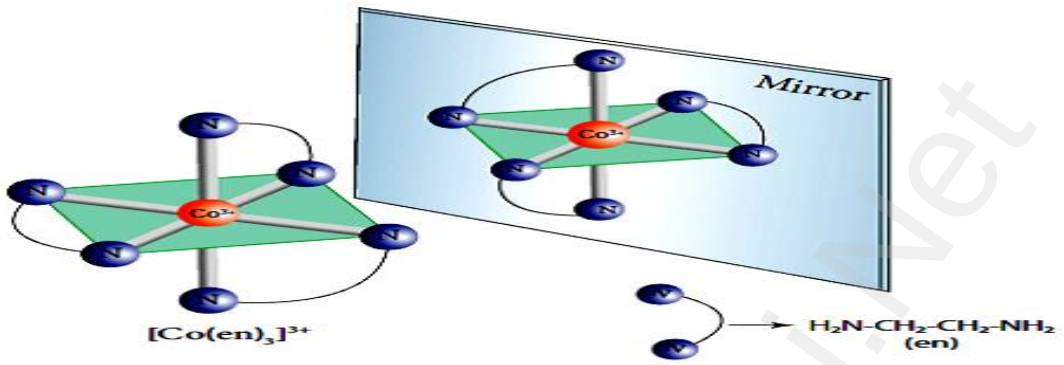
| Complex | $[CoF_6]^{3-}$ |
|---|---|
| Hybridised orbitals of the metal atom in the complex |   |
| Geometry | Octahedral In this complex outer d orbitals are involved in the hybridisaion and hence the complex is called outer orbital complex |
| Magnetic property | No. of unparied electrons = 4; Hence paramagnetic |
| Magnetic moment (Using spin only formula) | $\mu_s = \sqrt{n(n+2)} \square \sqrt{4(4+2)} \square 4.899\ BM$ |

**7.Indicate the possible type of isomerism for the following complexes (sep 20)**

**a).$[Co(en)_3]^{3+.}$ b).$[Pt(NH_3)_2Cl_2]^{2+.}$**

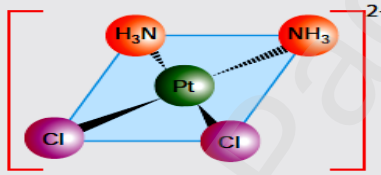
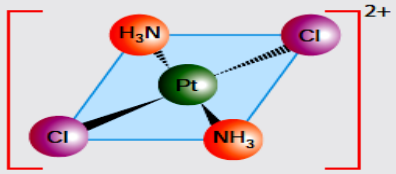
a).$[Co(en)_3]^{3+.}$

- It shows two optical isomers




b).$[Pt(NH_3)_2Cl_2]^{2+.}$

- It shows Geometrical isomers

| Type | Example | |
|---|---|---|
| | Cis Isomer | Trans isomer |
| $MA_2B_2$ |  |  |

**8. Mention the metal complex and its metal ions are used in biological system( inst 20)**

(i) A red blood corpuscles (RBC) is composed of heme group, which is $Fe^{2+}$ Porphyrin complex.it plays a important role in carrying oxygen from lungs to tissues and carbon dioxide from tissues to lungs.

(ii) Chlorophyll, a green pigment present in green plants and algae, is a coordination complex containing $Mg^{2+}$ as central metal ion surrounded by a modified Porphyrin ligand called corrin ring. It plays a important role in photosynthesis, by which plants converts $CO_2$ and water into carbohydrates an oxygen.

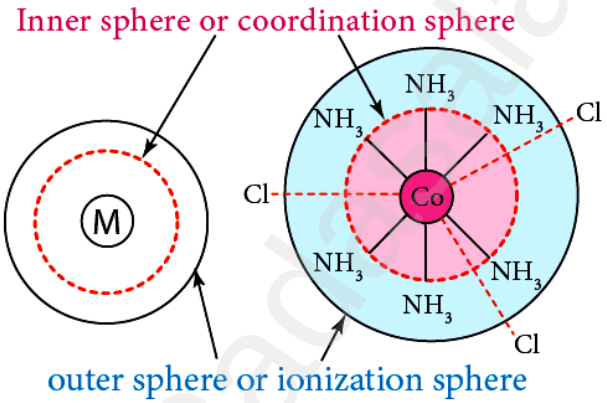
(iii) Vitamin $B_{12}$(cyanocobalamine) is the only vitamin consist of metal ion. it is a coordination complex i which the central metal ion is $Co^{+}$ surrounded by Porphyrin like ligand.

(iv) Many enzymes are known to be metal complexes, they regulate biological processes. For example,

Carboxypeptidase is a protease enzyme that hydrolytic enzyme important in digestion, contains a zinc ion coordinated to the protein.

**9. write the postulates of werner's theory( inst 20)** (may 22)

1. Most of the elements exhibit, two types of valence namely primary valence and secondary valence and each element tend to satisfy both the valences.In modern terminology, the primary valence is referred as the oxidation state of the metal atom and the secondary valence as the coordination number. For example according to Werner, the primary and secondary valences of cobalt are 3 and 6 respectively.
2. The primary valence of a metal ion is positive in most of the cases and zero in certain cases. They are always satisfied by negative ions. For example in the complex $CoCl_3.6NH_3$, The primary valence of Co is +3 and is satisfied by 3Cl- ions.
3. The secondary valence is satisfied by negative ions, neutral molecules, positive ions or the combination of these. For example, in $CoCl_3.6NH_3$the secondary valence of cobalt is 6 and is satisfied by six neutral ammonia molecules, whereas in $CoCl_3.5NH_3$the secondary valence of cobalt is satisfied by five neutral ammonia molecules and a Cl- ion.




For example $[Co(NH_3)_6]Cl_3$

4. According to Werner, there are two spheres of attraction around a metal atom/ion in a complex. The inner sphere is known as coordination sphere and the groups present in this sphere are firmly attached to the metal. The outer sphere is called ionisation sphere. The groups present in this sphere are loosely bound to the central metal ion and hence can be separated into ions upon dissolving the complex in a suitable solvent

The primary valences are non-directional while the secondary valences are directional. The geometry of the complex is determined by the spacial arrangement of the groups which satisfy the secondary valence. For example, if a metal ion has a secondary valence of six, it has an octahedral geometry. If the secondary valence is 4, it has either tetrahedral or square planar geometry.

**Defects :-**

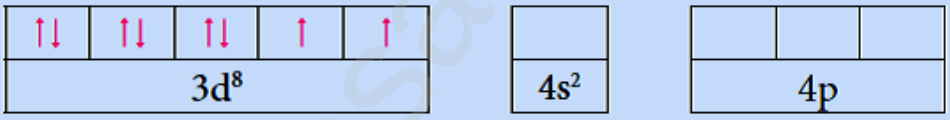
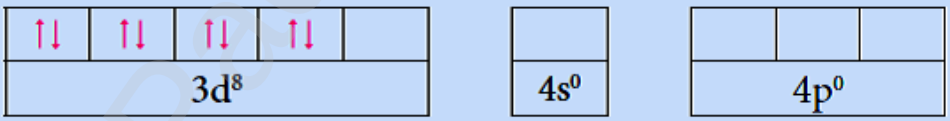
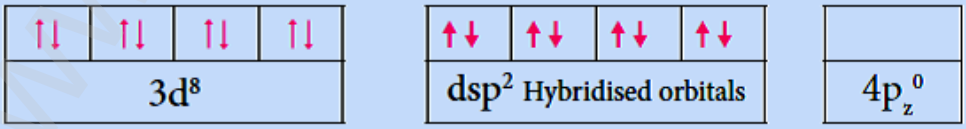
It does not explain the magnetic and spectral properties

**10.what are the limitation of VB theory ? (aug 21)** (jul 22)

**Limitations of VBT** :-

1. It does not explain the colour of the complex
2. It considers only the spin only magnetic moments and does not consider the other components of magnetic moments.
3. It does not provide a quantitative explanation as to why certain complexes are inner orbital complexes and the others are outer orbital complexes for the same metal. For example, $[Fe(CN)_6]^{4-}$ is diamagnetic (low spin) whereas $[FeF_6]^{4-}$ is paramagnetic (high spin).

**11. Based on the VB theory,explain why$[Ni(CN)_4]^{2-}$ it is diamagnetic. (aug 21)**

| **Complex** | $[Ni(CN)_4]^{4-}$ |
|---|---|
| **Central metal atom/ion and its outer electronic configuration** | $Ni^{2+}$: $3d^8$, $4s^0$ |
| **Outer orbitals of metal atom/ion** |   |
| **Nature of ligand** | $CN^-$<br>Strong field ligand causes the pairing of 3d electrons in the metal |
| **Outer orbitals of metal atom/ion in presence of ligands** |   |
| **Hybridisation** | Coordination number - 4<br>Hybridsation - dsp2 |
| **Hybridised orbitals of the metal atom in the complex** |   |
| **Geometry** | Square planar |
| **Magnetic property** | No. of unparied electrons = 0;<br>Hence diamagnetic |
| **Magnetic moment (Using spin only formula)** | $\mu_s = \sqrt{n(n+2)} = 0$ |

**12.Define Coordination number (may 22) (In.p.no :134)**

- The number of ligand donor atoms bonded to a central metal ion in a complex is called the coordination number of the metal. In other words, the coordination number is equal to the number of σ-bonds between ligands and the central atom.

  **For example,**

  In $K_4[Fe(CN)_6]$, the coordination number of $Fe^{2+}$ is 6

**13..Write the following for the complex $[Ag(NH_3)_2]^+$ (may 22) (In.p.no :140 )**
**a)ligand b) central metal ion c) IUPAC name (may 22)(compulsory 3 mark )**

| complex | | $[Ag(NH_3)_2]^+$ |
|---|---|---|
| A | Ligand | $NH_3$ ammaine |
| B | Central metal ion | $Ag^+$ |
| c | IUPAC name | Diammainesilver(I)ion |

**14..Write the IUPAC ligand name for the following (jul 22) (In.p.no :137 )**
**a) $C_2O_4^{2-}$ b) $H_2O$ c) $Cl^-$**

| Ligand | IUPAC name |
|---|---|
| a) $C_2O_4^{2-}$ | oxalato |
| b) $H_2O$ | aqua |
| c) $Cl^-$ | chlorido |

# 6.SOLID STATE

**ONE MARKS :-**

1. .The vacant space in BCC lattice unit cell is (mar20)

(a) 26% (b) 48% (c) 23% **(d) 32%**

2. Packing efficiency of body centred cubic (BCC) (ins20)

(a) 52.31% **(b) 68%** (c) 86% (d) 52.13%

3. the formula used to identify density of unit cell(sep20)

(a) $\rho = a^3N_A \times nM$ (b) $\rho = a^3N_A - nM$

**(c)** $\rho = nM/a^3N_A$ (d) ) $\rho = a^3N_A /NM$

4. The crystal with a metal deficiency defect is.(Aug21)

(a) ZnO (b) NaCl (c) KCl **(d) FeO**

5. The crystal with a metal deficiency defect is (May22)

a) ZnO b) NaCl c) KCl **d) FeO**

6.Graphite and Diamond are (jul22)

a) Covalent and molecular crystals b) ionic and covalent crystals

**c) both are covalent crystals** d) both are molecular crystals

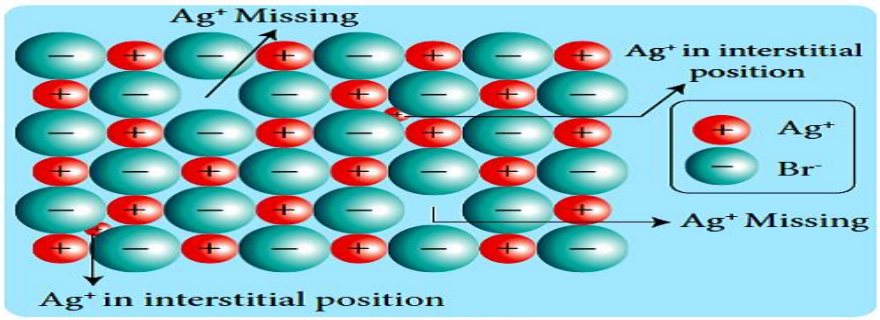
*2 &3&5MARK QUESTIONS :-*

**1. If the the number of close packed sphere is 6 calculate the number of octahedral voids and tetrahedral voids generated (mar 20)**

| S.NO | VOIDS | FORMULA | SOLUTION |
|---|---|---|---|
| 1 | Close packed sphere | n | 6 |
| 2 | Number of octahedral voids | n | 6 |
| 3 | Number of tetrahedral voids | 2n | 12 |

**2.Write a note on frenkel defect (mar 20)** (jul 22)

- Frenkel defect arises due to the dislocation of ions from its crystal lattice. The ion which is missing from the lattice point occupies an interstitial position.
- This defect is shown by ionic solids in which cation and anion differ in size. Unlike Schottky defect, this defect does not affect the density of the crystal.
- For example AgBr, in this case, small Ag+ ion leaves its normal site and occupies an interstitial position as shown in the figure.




Frenkel Defect

**3. Differentiate between crystalline solid and amorphous solid (sep 20)** (may22)

| S.NO | Crystalline solids | Amorphous solid |
|---|---|---|
| 1 | Long range orderly arrangement of constituents. | Short range, random arrangement of constituents. |
| 2 | Definite shape | Irregular shape |
| 3 | Generally crystalline solids are anisotropic in nature | They are isotropic* like liquids |
| 4 | They are true solids | They are considered as pseudo solids (or) super cooled liquids |
| 5 | Definite Heat of fusion | Heat of fusion is not definite |
| 6 | They have sharp melting points. | Gradually soften over a range of temperature and so can be moulded. |
| 7 | Examples: NaCl , diamond etc., | Examples: Rubber , plastics, glass etc |

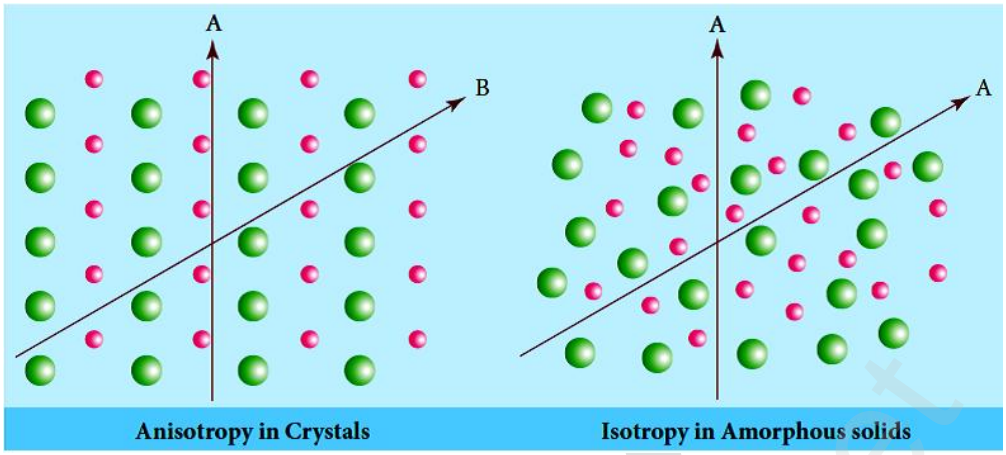
**4.If the Radius ratio of the compound is between 0.155 to 0.225 find out the coordination number and structure of the compound. (sep 20)**

| $(r_{C+}/r_{A-})$ | Coordination number | Structure | Example |
|---|---|---|---|
| 0.155 to 0.225 | 3 | Trigonal planar | $B_2O_3$ |

**5.Distinguish between isotropy and anisotropy in solids(inst 20)**

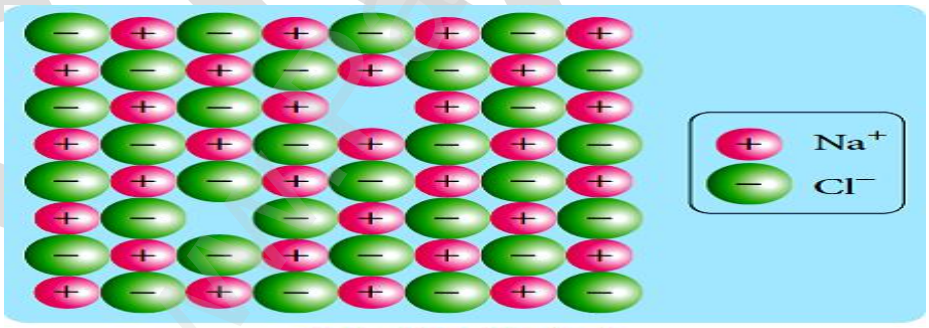
***Isotropy**

- Isotropy means uniformity in all directions. In solid state isotropy means having identical values o physical properties such as refractive index, electrical conductance etc.,
- In all directions, whereas anisotropy is the property which depends on the direction of measurement.
- Crystalline solids areanisotropic and they show different values of physical properties when measure along different directions.
- The following figure illustrates the anisotropy in crystals due to different arrangement of their constituent along different directions.




**6.Explain Schottydefect(inst 20)**

- Schottky defect arises due to the missing of equal number of cations and anions from the crystal lattice This effect does not change the stoichiometry of the crystal.
- Ionic solids in which the cation and anion are of almost of similar size show schottky defect. Example NaCl.
- Presence of large number of schottky defects in a crystal, lowers its density.
- For example, the theoretical density of vanadium monoxide (VO) calculated using the edge length of the unit cell is 6.5 g $cm^{-3}$, but the actual experimental density is 5.6 g $cm^{-3}$.It indicates that there is approximately 14% Schottky defect in VO crystal.
- Presence of Schottky defect in the crystal provides a simple way by which atoms or ions can move within the crystal lattice.



Schottky Defect

**7.What is mean by term coordination number? What is the coordination number of atom in a BCC structure? (aug 21)**

- The number of nearest neighbours that surrounding a particle in a crystal is called the coordination number of that particle
- coordination number of atom in a BCC structure is 8

**8.Glassify the following into Covalent molecular ionic and metallic solids (aug 21)**

**I) Diamond ii) brass iii) Nacliv) Naphthalene v) glucose vi) $SiO_2$( compulsory 3 mark )**

| S.NO | SOLIDS | TYPE OF SOLIDS |
|---|---|---|
| i | Diamond | covalent solid |
| ii | brass | metallic solid |
| iii | Nacl | ionic solid |
| iv | Naphthalene | molecular solid |
| v | glucose | molecular solid |
| vi | $SiO_2$ | covalent solid |

9.Define covalent solids(may 22)

- In covalent solids, the constituents (atoms) are bound together in a three dimensional network entirely by covalent bonds.
- Examples:
- Diamond, silicon carbide etc. Such covalent network crystals are very hard, and have high melting point.
- They are usually poor thermal and electrical conductors

10.Define unit cell (jul 22)(aug21)

- Crystalline solid is characterised by a definite orientation of atoms, ions or molecules, relative to one another in a three dimensional pattern.
- The regular arrangement of these species throughout the crystal is called a crystal lattice. **A basic repeating structural unit of a crystalline solid is called a unit cell.**

11.What is packing efficiency ? (jul 22)

- There is some free space between the spheres of a single layer and the spheres of successive layers. The percentage of total volume occupied by these constituent spheres gives the packing efficiency of an arrangement. Let us calculate the packing efficiency in simple cubic arrangement,

$$\left\{\begin{matrix}\text{Packing fraction}\\ \text{(or) efficiency}\end{matrix}\right\} = \frac{\left\{\begin{matrix}\text{Total volume occupied by}\\ \text{spheres in a unit cell}\end{matrix}\right\}}{\text{Volume of the unit cell}} \times 100$$

# 7.CHEMICAL KINETICS

**ONE MARKS :-**

1 .time required for the reactant concentration to reach one half of its initial value is Called (mar20)

**(a) half life period** (b) first order

(c) zero order (d) second order

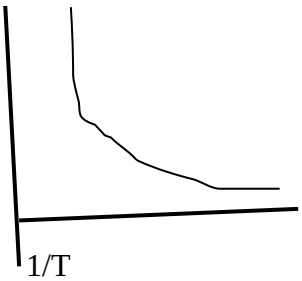
2. The rate constant of a reaction is 5.8 x $10^{-2}s^{-2}$.the order of reaction is (ins20)

**(a) First order** (b) Zero order

(c) second order (d) Third order

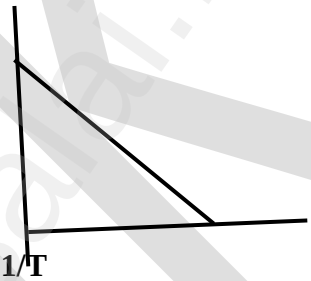
3.among the following graphs showing variation of rate constant with temperature(T) for a reaction, the one that exhibits Arrhenius behavior over the entire temperature range is (Aug21)

log k
(a)

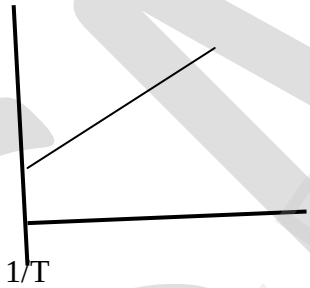



**(b)**

**log k**




(c) log k




(d) both (b) and (c)

4.If 75% of a first order reaction was completed in 60 min , 50% of the same reaction under the same conditions would be completed in : (May22)

a) 35 minutes b) 20 minutes c) 75 minutes **d) 30 minutes**

5.Half-life period for first order reaction : (jul22)

**a)** $\mathbf{t_{1/2} = \frac{0.6932}{K}}$ b) $t_{1/2} = \frac{K}{0.6932}$ c) $t_{1/2} = \frac{2.303}{K}$ d) $t_{1/2} = \frac{K}{2.303}$

*2 &3&5MARK QUESTIONS :-*

**1.Derive integrated rate law for a first order reaction A →product (mar 20)**

A reaction whose rate depends on the reactant concentration raised to the first power is called a first order reaction. Let us consider the following Cl2 first order reaction

$A \longrightarrow$ product

Rate law can be expressed as

$$\text{Rate} = k[A]^1$$

Where, k is the first order rate constant.

$$\frac{-d[A]}{dt} = k[A]^1$$

$$\Rightarrow \frac{-d[A]}{[A]} = k\,dt \qquad \ldots(1)$$

Integrate the above equation between the limits of time t = 0 and time equal to t, while the concentration varies from the initial concentration $[A_0]$ to [A] at the later time.

$$\int_{[A_0]}^{[A]} \frac{-d[A]}{[A]} = k\int_0^t dt$$

$$\left(-\ln[A]\right)_{[A_0]}^{[A]} = k(t)_0^t$$

$$-\ln[A] - \left(-\ln[A_0]\right) = k\,(t-0)$$

$$-\ln[A] + \ln[A_0] = kt$$

$$\ln\left(\frac{[A_0]}{[A]}\right) = kt \qquad \ldots(2)$$

This equation is in natural logarithm. To convert it into usual logarithm with base 10, we have to multiply the term by 2.303.

$$2.303\log\left(\frac{[A_0]}{[A]}\right) = kt$$

$$k = \frac{2.303}{t}\log\left(\frac{[A_0]}{[A]}\right) \text{ ---- (3)}$$

Equation (2) can be written in the form $y = mx + c$ as below

$$\ln[A_0] - \ln[A] = kt$$

$$\ln[A] = \ln[A_0] - kt$$

$$\Rightarrow y = c + mx$$

If we follow the reaction by measuring the concentration of the reactants at regular time interval‘t’, a plot of ln[A] against ‘t’ yields a straight line with a negative slope.From this, the rate constant is calculated.

**2. The rate constant for a first order reaction is 1.54 x $10^{-3}$ $s^{-1}$ .calculate its half life time (sep 20)**

**Solution:**

We know that, $t_{1/2} = 0.693/ k$

$t_{1/2} = 0.693/1.54x\ 10^{-3}\ s^{-1} = 450\ s$

**3. The rate of the reaction. x + 2y →product is 4 x $10^{-3}$mol $L^{-1}$ $s^{-1}$ if [x] =[y]=0.2M and rate constant at 400k is 2 x $10^{-3}$ $s^{-1}$ what is the overall order of the reaction ? ( inst 20)**

**Solution :**

$Rate = k\,[x]^n[y]^m$

$4 \times 10^{-3}\,mol\,L^{-1}s^{-1} = 2 \times 10^{-2}\,s^{-1}(0.2mol\,L^{-1})^n(0.2mol\,L^{-1})^m$

$$\frac{4 \times 10^{-3}\,mol\,L^{-1}s^{-1}}{2 \times 10^{-2}s^{-1}} = (0.2)^{n+m}\left(mol\,L^{-1}\right)^{n+m}$$

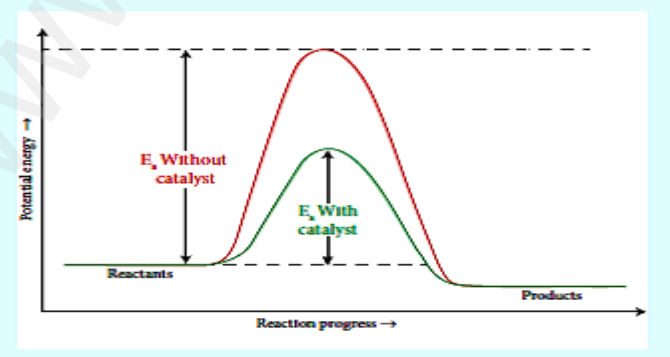
$$0.2\left(mol\,L^{-1}\right) = (0.2)^{n+m}\left(mol\,L^{-1}\right)^{n+m}$$

Comparing the powers on both sides

The overall order of the reaction $n + m = 1$

**4.Explain the effect of catalyst on reaction rate with an example(inst 20)**

- significant changes in the reaction can be brought out by the addition of a substance called catalyst.
- A catalyst is substance which alters the rate of a reaction without itself undergoing any permanen chemical change.
- They may participate in the reaction, but again regenerated and the end of the reaction.
- In the presence of a catalyst, the energy of activation is lowered and hence, greater number o molecules can cross the energy barrier and change over to products, thereby increasing the rate o the reaction.




Example :

- Take two test tubes and label them as A and B. Add 7 ml of 0.1N oxalic acid solution, 5 ml of 0.1N KMnO4 solution and 5 ml of 2N dilute $H_2SO_4$in both the test tubes. The colour of the solution is pinl in both the test tubes.

- Now add few crystals of manganese sulphate to the content in test tube A. the pink colour fades up and disappears. In this case, MnSO4 acts as a catalyst and increases the rate of oxidation of $C_2O_4^{2-}$ by $MnO^{4-}$

**5.Write two difference between rate and rate constant of arreactio(aug21)**

| S.NO | Rate of a reaction | Rate constant of a reaction |
|---|---|---|
| 1 | It represents the speed at which the reactants are converted into products at any instant. | It is a proportionality constant |
| 2 | It is measured as decrease in the concentration of the reactants or increase inthe concentration of products. | it is equal to the rate of reaction, when the concentration of each of the reactants in unity |
| 3 | It depends on the initial concentration of reactants | It does not depend on the initial concentration of reactants. |

**6. Derive integrated rate law for a zero order reaction A→ product. (aug 21)** (jul 22)

A reaction in which the rate is independent of the concentration of the reactant over a wide range o concentrations is called as zero order reactions. Such reactions are rare. Let us consider the following hypothetical zero order reaction.

A →product

The rate law can be written as,

$$\text{Rate} = k[A]^0$$

$$\frac{-d[A]}{dt} = k(1) \qquad (\because [A]^0 = 1)$$

$$\Rightarrow -d[A] = k\,dt$$

Integrate the above equation between the limits of $[A_0]$ at zero time and [A] at some later time 't',

$$-\int_{[A_0]}^{[A]} d[A] = k\int_0^t dt$$

$$-([A])_{[A_0]}^{[A]} = k(t)_0^t$$

$$[A_0]-[A] = kt$$

$$k = \frac{[A_0]-[A]}{t}$$

Equation (2) is in the form of a straight line y = mx + c

$$\text{Ie., } [A] = -kt + [A_0]$$

$$\Rightarrow y = c + mx$$

A plot of [A] Vs time gives a straight line with a slope of −k and y - intercept of $[A_0]$

7.Write Arrhenius equation and explain the terms involved (may22)

$$k = Ae^{-\left(\frac{E_a}{RT}\right)}$$

Where A the frequency factor,
R the gas constant,
Ea the activation energy of the reaction
and, T the absolute temperature (in K)

8. Give examples for the first order reactions. (may 22)

(i) Decomposition of dinitrogen pentoxide

$$N_2O_5(g) \longrightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$$

(ii) Decomposition of thionylchloride; $SO_2Cl_2(l) \longrightarrow SO_2(g) + Cl_2(g)$

(iii) Decomposition of the $H_2O_2$ in aqueous solution; $H_2O_2(aq) \longrightarrow H_2O(l) + \frac{1}{2}O_2(g)$

(iv) Isomerisation of cyclopropane to propene.

9.Define order and molecularity of a reaction (jul 22)

| s.no | **Order of a reaction** | **Molecularity of a reaction** |
|---|---|---|
| 1 | It is the sum of the powers of concentration terms involved in the experimentally determined rate law | It is the total number of reactant species that are involved in an elementary step |
| 2 | It can be zero (or) fractional (or) integer | It is always a whole number, cannot be zero or a fractional number |
| 3 | It is assigned for a overall reaction | It is assigned for each elementary step of mechanism. |

# 8.IONIC EQUILIBRIUM

**ONE MARKS :-**

1.The aqueous solutions of sodium formate, anilinium chloride and potassium cyanide respectively. (mar20)

(a) acidic,acidic,acidic (b) acidic ,acidic ,basic

**(c) Basic acidic basic** (d) basic,netral ,basic

2. Conjugated base for bronsted acids $H_2O$ and HF are : (ins20)

(a) $OH^-$ and $H_2FH^-$ respectively (b) $H_3O^+$ and $F^-$ respectively

**(c) $OH^-$ and $F^-$ respective** (d) $H_3O^-$ and $H_2F^+$ respectively

3 .The pH of an aqueous solution is zero. The solution is (sep20)

(a) neutral (b) basic

(c) slightly acidic **(d) stongly acidic**

4. The pH of an aqueous solution is zero. The solution is (Aug21)

(a) Neutral (b) Slightly acidic

(c) Basic **(d) stonglyacidic**

5.Which of the following can act as lowery-bronsted acid as well as base ? (May22)

**a) $HPO_4^{2-}$** b) HCl c) Br- d) $SO_4^{2-}$

6.Which of these in not likely to act as lewis base ? (jul22)

**a) $BF_3$** b) $PF_3$ c) CO d) $F^-$

2 &3&5MARK QUESTIONS :-

**1.Derive henderson equation (mar 20)**

We have already learnt that the concentration of hydronium ion in an acidic buffer solutiondepends on the ratio of the concentration of the weak acid to the concentration of its conjugatebase present in the solution i.e.

$$[H_3O^+] = K_a \frac{[acid]_{eq}}{[base]_{aq}}$$

The weak acid is dissociated only to a small extent. Moreover, due to common ion effect,the dissociation is further suppressed and hence the equilibrium concentration of the acid isnearly equal to the initial concentration of the unionised acid. Similarly, the concentration ofthe conjugate base is nearly equal to the initial concentration of the added salt.

$$[H_3O^+] = K_a \frac{[acid]}{[salt]}$$

Here [acid] and [salt] represent the initial concentration of the acid and salt, respectivelyused to prepare the buffer solutionTaking logarithm on both sides of the equation.

$$\log [H_3O^+] = \log K_a + \log \frac{[acid]}{[salt]}$$

reverse the sign on both sides

$$-\log [H_3O^+] = -\log K_a - \log \frac{[acid]}{[salt]}$$

We know that

$pH = -\log [H_3O^+]$ and $pK_a = -\log K_a$

$$\Rightarrow pH = pK_a - \log \frac{[acid]}{[salt]}$$

$$\Rightarrow pH = pK_a + \log \frac{[salt]}{[acid]}$$

Similarly basic buffer

$$pOH = pK_b + \log \frac{[salt]}{[base]}$$

**2.Write the pH value of following substance (mar 20) ( in.p.no : 10. )**

**a).Vinegar b).black coffee C). packing soda d).Soapy water**

| s.no | substance | $P^H$value |
|---|---|---|
| a | Vinegar | 2 |
| b | black coffee | 5 |
| c | packing soda | 9 |
| d | Soapy water | 12 |

**3.Define buffer action (sep 20)**

- Buffer is a solution which consists of a mixture of a weak acid and its conjugate base (or)a weak base and its conjugate acid.
- This buffer solution resists drastic changes in its pH uponaddition of a small quantities of acids (or) bases, and this ability is called buffer action.

**4.Define common ion effect (sep 20). (May22)**

- When a salt of a weak acid is added to the acid itself, the dissociation of the weak acid issuppressed further.
- For example, the addition of sodium acetate to acetic acid solution leads tothe suppression in the dissociation of acetic acid which is already weakly dissociated. In thiscase, $CH_3COOH$ and $CH_3COONa$ have the common ion,$CH_3COO^-$

**5.Derive an expression for ostwald dilution law (sep 20)**

when dilution increases, the degree of dissociationof weak electrolyte also increases. This statement isknown as Ostwald's dilution Law.

Ostwald's dilution law relates the dissociation constant of the weak acid ($K_a$) with itsdegree of dissociation (α) and the concentration (c). Degree of dissociation (α) is the fractionof the total number of moles of a substance that dissociates at equilibrium.

$$\alpha = \frac{\text{Number of moles dissociated}}{\text{total number of moles}}$$

We shall derive an expression for ostwald's law by considering a weak acid, i.e. acetic acid ($CH_3COOH$) . The dissociation of acetic acid can be represented as

$$CH_3COOH \rightleftharpoons H^+ + CH_3COO^-$$

The dissociation constant of acetic acid is,

$$k_a = \frac{[H^+][CH_3COO^-]}{[CH_3COOH]} \text{.....(8.13)}$$

| | $CH_3COOH$ | $H^+$ | $CH_3COO^-$ |
|---|---|---|---|
| **Initial number of moles** | 1 | - | - |
| **Degree of dissociation of $CH_3COOH$** | α | - | - |
| **Number of moles at equilibrium** | 1- α | α | α |
| **Equilibrium concentration** | (1-α)C | αC | αC |

Substituting the equilibrium concentration in equation

$$k_a = \frac{(\alpha C)(\alpha C)}{(1-\alpha)C}$$

$$k_a = \frac{\alpha^2 C}{1-\alpha} \text{.....(8.14)}$$

We know that weak acid dissociates only to a very small extent compared to one,α is sosmall and hence in the denominator (1 - α) =1. The above expression (8.14) now becomes,

$$K_a = \alpha^2 C$$

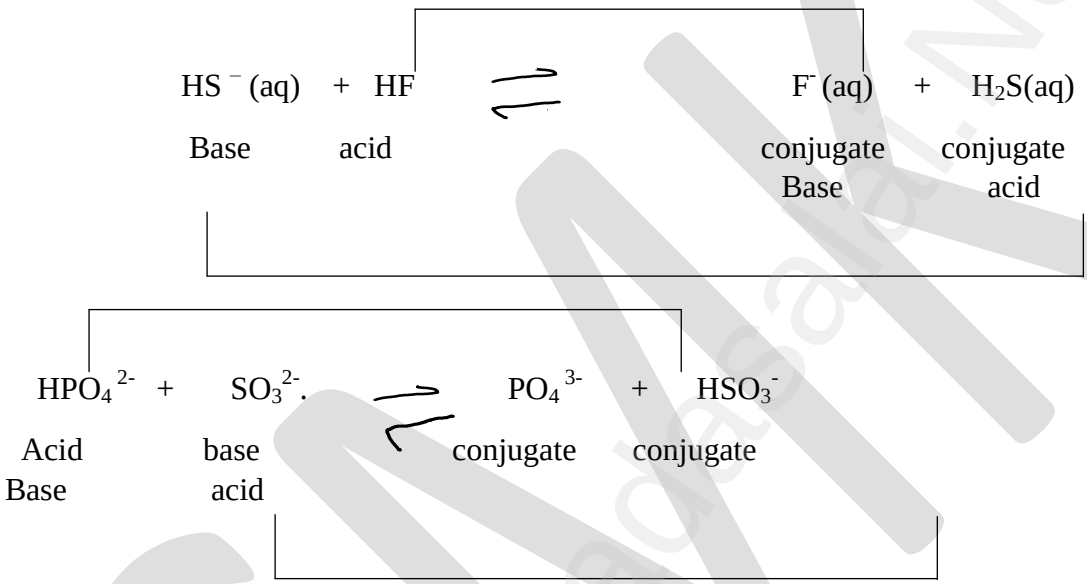
$$\Rightarrow \alpha^2 = \frac{K_a}{C}$$

$$\alpha = \sqrt{\frac{K_a}{c}} \quad \ldots\ldots(8.15)$$

**6.Identify the conjugate acid base pair for the following reaction in aqueous solution (sep 20)**

**$HS^-$ (aq) + HF ⇌ $F^-$ (aq) + $H_2S$(aq)**

**$HPO_4^{2-}$ + $SO_3^{2-}$. ⇌ $PO_4^{3-}$ +$HSO_3^-$**




**7.Calculate the pH of 0.1 M $CH_3COONa$ solution ($_p$ka for $CH_3COOH$ is 4.74) ( inst 20)**

Give that $pK_a = 4.74$

$pK_a = -\log K_a$

i.e., $K_a$ = antilog of $(-pK_a)$

= antilog of (-4.74)

= antilog of (-5 + 0.26)

$= 10^{-5} \times 1.8$

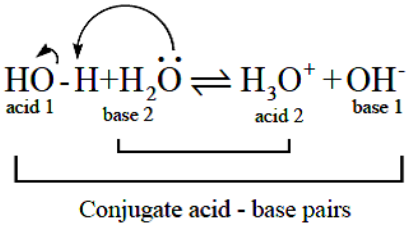
[antilog of 0.26 = 1.82 ≃ 1.8]

$$pH = 7 + \frac{pK_a}{2} + \frac{\log C}{2}$$

$$= 7 + \frac{4.74}{2} + \frac{\log 0.1}{2} = 7 + 2.37 - 0.5$$

$$= 8.87$$

**8. Define ionic product product of water give its value at room temperature (inst 20)**




$$K = \frac{[H_3O^+][OH^-]}{[H_2O]^2} .....$$

The concentration of pure liquid water is one. i.e,$[H_2O]^2 = 1$

$$\because K_w = [H_3O^+][OH^-] .....(8.4)$$

Here, Kw represents the ionic product (ionic product constant) of waterIt was experimentally found that the concentration of $H_3O^+$ in pure water is $1\times10^{-7}$ at $25^0$C.
Since the dissociation of water produces equal number of $H_3O^+$ and $OH^-$the concentrationof OH- is also equal to $1\times10^{-7}$at $25^0$C
Therefore, the ionic product of water at $25^0$C is

$$K_W = [H_3O]^+[OH^-] .....(8.4)$$

$$K_W = (1\times10^{-7})(1\times10^{-7})$$

$$= 1\times10^{-14}.$$

**9.Glassify the following into Lewis acid and Lewis bases( inst 20)**

**(A) $BF_3$ (B) $CO_2$ (C) MgO (D) $CH_3^-$**

| Lewis acid | Lewis bases |
|---|---|
| (A) $BF_3$ | (C) MgO |
| (B) $CO_2$ | (D) $CH_3^-$ |

**10. state Oswald's dilution law. (only law) (aug 21)**

when dilution increases, the degree of dissociation of weak electrolyte also increases. This statement isknown as Ostwald's dilution Law.

**11. What are Lewis acid and bases give one example for each (mar 20)** (jul 22)

| S.NO | Lewis acids | Lewis base |
|---|---|---|
| 1 | Electron deficient molecules such as $BF_3$,$AlCl_3$,$BeF_2$etc... | Molecules with one (or) more lone pairs of electrons. $NH_3$,$H_2O$,R-O-H,R-O-R, R – $NH_2$ |
| 2 | All metal ions (or) atoms Examples: $Fe^{2+}$,$Fe^{3+}$ ,$Cr^{3+}$ ,$Cu^{2+}$ etc... | All anions $F^-$,$Cl^-$ ,$CN^-$ ,$SCN^-$ ,$SO_4^{2-}$ etc... |
| 3 | Molecules that contain a polar double bond Examples : $SO_2$,$CO_2$ ,$SO_3$etc... | Molecules that contain carbon – carbon multiple bond Examples: $CH_2=CH_2$ ,CH≡CH etc... |
| 4 | Molecules in which the central atom can expand its octet due to the availability of empty d – orbitals Example: $SiF_4$,$SF_4$ ,$FeCl_3$ etc.. | All metal oxides CaO,MgO,$Na_2O$ etc... |
| 5 | Carbonium ion $(CH3)_3C^+$ | Carbanion $CH3^-$ |

**12.find the pH of buffer solution containing 0.20 mole per litre sodium acetate and 0.18 mole per litre acetic acid .$K_a$ for acetic acid is 1.8 X $10^{-5}$. (aug 21)**

$$pH = pK_a + \log\frac{[salt]}{[acid]}$$

Given that $K_a = 1.8 \times 10^{-5}$

$$\therefore pK_a = -\log(1.8\times10^{-5}) = 5 - \log 1.8$$
$$= 5 - 0.26$$
$$= 4.74$$

$$\therefore pH = 4.74 + \log\frac{0.20}{0.18}$$
$$= 4.74 + \log {}^{10}\!/_{9}$$
$$= 4.74 + \log 10 - \log 9$$
$$= 4.74 + 1 - 0.95$$
$$= 5.74 - 0.95$$
$$= 4.79$$

**8.What are the limitations of Arrhenius concept ? (May22)(jul22)**

i. Arrhenius theory does not explain the behaviour of acids and bases in non aqueous solvents such as acetone, Tetrahydrofuran etc...

ii. This theory does not account for the basicity of the substances like ammonia (NH3) which do not possess hydroxyl group

**9.What is buffer solution ? Give an example (jul 22)**

- **Buffer is a solution which consists of a mixture of a weak acid and its conjugate base (or) a weak base and its conjugate acid**.
- This buffer solution resists drastic changes in its pH upon addition of a small quantities of acids (or) bases, and this ability is called buffer action. The buffer containing carbonic acid (H2 3 CO ) and its conjugate base HCO3 - is present in our blood.
- **There are two types of buffer solutions.**
  **1. Acidic buffer solution : a solution containing a weak acid and its salt.**
  **Example : solution containing acetic acid and sodium acetate**
  **2. Basic buffer solution : a solution containing a weak base and its salt.**
  **Example : Solution containing NH4OH and NH4Cl**

**10.Define $P^H$ (MAY22)**

- We usually deal with acid / base solution in the concentration range 0.1 to 10-7M . To express the strength of such low concentrations, Sorensen introduced a logarithmic scale known as the pH scale.

- The term pH is derived from the French word *'Purissance de hydrogene'* meaning, the power of hydrogen**. pH of a solution is defined as the negative logarithm of base 10 of the molar concentration of the hydronium ions present in the solution**

$$pH = - \log_{10}[H_3O^+]$$

# 9.ELECTROCHEMISTRY

**ONE MARKS :-**

1. how many faradays of electricity are required for the following reaction to occur
$MnO^{4-} \rightarrow Mn^{2+}$. (mar20)
(a) 7F **(b) 5F** (c) 3F (d) 1F

2. Laptops have_____(mar20)
(a) Lead storage battery (b) Fuel cell
(c) Mercury button cell **(d) Lithium-ion battery**

3. In $H_2$-$O_2$ fuel cell the reaction occurs at cathode is(sep20)
(a) $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$ (b) $H^+ + e^- \rightarrow 1/2\ H_2$
**(c) $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$** (d) $H+ (aq) + OH^-(aq) \rightarrow H_2O_{(l)}$

4. The number of electrons that have a total charge of 9650 coulombs is (Aug21)
**(a) $6.022 \times 10^{22}$.** (b) $6.22 \times 10^{23}$.
(c) $6.022 \times 10^{-34}$. (d) $6.022 \times 10^{24}$

5.Faraday constant is defined as(May22)
a) Charge required to deposit one mole of substance b) charge carried by 1 electrton
c) Charge carried by $6.22X10^{10}$ electrons **d) Charge carried by one mole of electrons**

6.How many faradays of electricity are required for the following reactions to occur ? $MnO^{4-} \rightarrow Mn^{2+}$(jul22)
**a) 5F** b) 3F c) 1F d) 7F

*2&3&5MARK QUESTIONS :-*

**1. How are metals protected from corrosion by cathodic protection method (mar 20)**

Cathotic protection - In this technique, unlike galvanising the entire surface of the metal tobe protected need not be covered with a protecting metal instead, metals such as .Mg .or zincwhich is corroded more easily than iron can be used as a sacrificial anode and the iron materialacts as a cathode. So iron is Protected, but Mg or Zn is corroded.

**2.A conductivity cell has two platinum electrodes separated by a distance of 1.5 cm and the cross sectional area of each electrode is 4.5 sq cm using this cell the resistance of 0.5 N electrolytic solution was measured as 15 ohms .find the specific conductance of the solution (mar 20)**

**Solution**

$$\kappa = \frac{1}{R}\left(\frac{l}{A}\right)$$

$$\kappa = \frac{1}{15\Omega} \times \frac{1.5\times10^{-2}\,m}{4.5\times10^{-4}\,m^2}$$

$$= 2.22\ Sm^{-1}$$

$l = 1.5\ cm = 1.5\times10^{-2}m$

$A = 4.5\ cm^2 = 4.5\times(10^{-4})m^2$

$R = 15\Omega$

**3.State kohlrausch law and explain any one of the application (sep 20).**

The limiting molar conductance $/\backslash_m^0$ is the basis for kohlraush law. At infinite dilution,the limiting molar conductivity of an electrolyte is equal to the some of the limiting molarconductivities of its constituent ions. i.e., the molar conductivity is due to the independentmigration of cations in one direction and anions in the opposite direction.For a uni – univalent electrolyte such as NaCl, the Kohlraush's law is expressed as

$$\left(\Lambda_m^0\right)_{NaCl} = \left(\lambda_m^0\right)_{Na^+} + \left(\lambda_m^0\right)_{Cl^-}$$

**Calculation of molar conductance atinfinite dilution of a weak electrolyte.**

It is impossible to determine the molarconductance at infinite dilution for weakelectrolytes experimentally. However, the same can be calculated using Kohlraush's Law.For example, the molar conductance of $CH_3$ COOHcan be calculatedusing the experimentally determined molar conductivities of strong electrolytes HCl, NaCl and $CH_3COONa$ .

$$\Lambda^\circ_{CH_3COONa} = \lambda^\circ_{Na^+} + \lambda^\circ_{CH_3COO^-} \ldots\ldots\ldots(1)$$

$$\Lambda^\circ_{HCl} = \lambda^\circ_{H^+} + \lambda^\circ_{Cl^-} \ldots\ldots(2)$$

$$\Lambda^\circ_{NaCl} = \lambda^\circ_{Na^+} + \lambda^\circ_{Cl^-} \ldots\ldots(3)$$

Equation (1) + Equation (2) – Equation (3) gives,

$$\left(\Lambda^\circ_{CH_3COONa}\right) + \left(\Lambda^\circ_{HCl}\right) - \left(\Lambda^\circ_{NaCl}\right) = \lambda^\circ_{H^+} + \lambda^\circ_{CH_3COO^-}$$

$$= \Lambda^\circ_{CH_3COOH}$$

**4. A solution of silver nitrate is electrolysed for 30 minutes with a current of 2 ampere calculate the mass of silver deposited at the cathode. ( inst 20) ( compulsory 2 mark )**

Solution :-

Electrochemical reaction at cathode is

$Ag^+ + e^- \longrightarrow Ag$ (reduction)

$m = ZIt$

$m = \frac{108\ g\ mol^{-1}}{96500\ C\ mol^{-1}} \times 3600\ C$

$m = 4.029\ g$

$Z = \frac{\text{molar mass of Ag}}{96500} = \frac{108}{1 \times 96500}$

$I = 2A$

$t = 30 \times 60\ S = 1800\ S$

$It = 2A \times 1800\ S = 3600\ C$

mass of silver deposited at the cathode

$m = 4.029\ g$

**5.Derive an expression for Nernstequation(inst 20)** (May22)(jul22)

Nernst equation is the one which relates the cell potential and the concentration of thespecies involved in an electrochemical reaction. Let us consider an electrochemical cell forwhich the overall redox reaction is,

$xA + yB \rightleftharpoons lC + mD$

The reaction quotient Q for the above reaction is given below

$$Q = \frac{[C]^l [D]^m}{[A]^x [B]^y} \quad \ldots\ldots\ldots \quad 1$$

We have already learnt that,

$$\Delta G = \Delta G^\circ + RT \ln Q \quad \ldots\ldots\ldots\ldots \quad 2$$

$\Delta G = -nFE_{cell}$ ; $\Delta G^\circ = -nFE^\circ_{cell}$

Substitute these values and Q from 1 ) in the equation 2

$$(9.29) \Rightarrow -nFE_{cell} = -nFE^\circ_{cell} + RT \ln \frac{[C]^l [D]^m}{[A]^x [B]^y} \quad \ldots\ldots\ldots \quad 3$$

Divide the whole equation 3 ) by (-nF)

$$(9.25) \Rightarrow E_{cell} = E^\circ_{cell} - \frac{RT}{nF} \ln \frac{[C]^l [D]^m}{[A]^x [B]^y}$$

$$(\text{or}) \; E_{cell} = E^\circ_{cell} - \frac{2.303RT}{nF} \log \frac{[C]^l [D]^m}{[A]^x [B]^y} \quad \ldots\ldots \quad 4$$

The above equation 4 ) is called the Nernst equation

**6.Define equivalent conductance (aug 21)**

- Equivalent conductance is defined as the conductance of 'V' $m^3$ of electrolytic solutioncontaining one gram equivalent of electrolyte in a conductivity cell in which the electrodes areone metre apart.

**7.Mention any two factors that affect electrolytic conductance. (aug 21)**

**What are the factors that affects electrolytic conductance ? (May22)**

- If the interionic attraction between the oppositely charged ions of solutes increases, theconductance will decrease.Solvent of higher dielectric constant show high conductance in solution.
- Conductance is inversely proportional to the Viscosity of the medium. i.e., conductivityincreases with the decrease in viscosity.
- If the temperature of the electrolytic solution increases, conductance also increases. Increasein temperature increases the kinetic energy of the ions and decreases the attractive forcebetween the oppositely charged ions and hence conductivity increases.
- Molar conductance of a solution increases with increase in dilution. This is because, fora strong electrolyte, interionic forces of attraction decrease with dilution. For a weakelectrolyte, degree of dissociation increases with dilution.

**8.State faraday's law of electrolysis ?(aug 21)**

**First Law**

The mass of the substance (m) liberated at an electrode during electrolysis is directlyproportional to the quantity of charge (Q) passed through the cell.

i.e $m \alpha Q$

We know that the charge is related to the current by the equation

$\therefore \quad m \alpha It$

Second law

When the same quantity of charge is passed through the solutions of different electrolytes,the amount o substances liberated at the respective electrodes are directly proportional totheir electrochemical quivalents. According to Faraday's second Law,

$$m_{Ag} \alpha Z_{Ag}, m_{Zn} \alpha Z_{Zn} \text{ and } m_{Cu} \alpha Z_{Cu}$$

(or)

$$\frac{m_{Ag}}{Z_{Ag}} = \frac{m_{Zn}}{Z_{Zn}} = \frac{m_{Cu}}{Z_{Cu}}$$

m= mass of substance

z=electrochemical equivalent

e=equivalent mass

**8. A solution of silver nitrate is electrolysed for 20 minutes with a current of 2 ampere calculate the mass of silver deposited at the cathode.jul22 ( compulsory 3 mark)**

Electrochemical reaction at cathode is Ag+ - +e- –->Ag (reduction)

$m = ZIT$

$m = \frac{108 \text{ gmol}^{-1}}{96500 \text{ C mol}^{-1}} \times 2400 C$

$m = 2.68 \text{ g.}$

$Z = \frac{\text{molarmass of Ag}}{(96500)} = \frac{108}{1 \times 96500}$

$I = 2A$

$t = 20 \times 60S = 1200 \text{ S}$

$It = 2A \times 1200S = 2400C$

# 10. SURFACE CHEMISTRY

**ONE MARKS :-**

1. when $\Delta S < 0$ and $T\Delta S$ is negative : (ins20)

**(a) adsorption is exothermic** (b) absorption is exothermic

(c) adsorption is endothermic (d) absorption is endothermic

2. The mechanism proposed for the enzyme catalysis reaction is (sep20)

(a) $P + E \longrightarrow E+S \rightleftharpoons ES$ **(b) $E + S \rightleftharpoons ES \longrightarrow P+E$**

(c) $ES \rightleftharpoons P + E \longrightarrow E+ S$ (d) $E + S \longrightarrow ES \rightleftharpoons P+ E$

3. Match the following. (Aug21)

| | |
|---|---|
| 1. Emulsion | i) whipped cream |
| 2.gel | ii) ink |
| 3.foam | iii) cream |
| 4.sol | iv) butter |

(a) (1) –(iv) (2)-(iii) (3)-(ii) (4)-(i) (b) (1)-(iii) (2)-(i) (3)-(ii) (4)-(iv)

(c) (1)-(ii) (2)-(i) (3)-(iv) (4)-(iii) **(d) (1)-(iii) (2)-(iv) (3)-(i) (4)-(ii)**

4. The phenomenon observed when a beam of light is passed through a colloidal solution is (Aug21)

(a) Coagulation (b) Cataphoresis

**(c) Tyndall effect.** (d) Electrophoresis

5.Which one of the following is an example for homogeneous catalysis ? (May22)

a) Hydrogenation of oil b) manufacture of ammonia by haber's process

**c) Hydrolysis of sucrose in presence of dil.HCl**

d) Manufacture of sulphuric acid by contact process

6.Fog is colloidal solution of (May22)

**a) liquid in gas** b) solid in gas c) gas in liquid d) gas in gas

7.The phenomenon observed when a beam of light is passed through a colloidal solution is (jul22)

a) cataphoresis b) Electrophoresis c) coagulation **d) tyndall effect**

*2 &3&5MARK QUESTIONS :-*

**1.Write this dispersed phase and dispersion medium of butter (mar 20)**

| Substance | dispersed phase | dispersion medium |
|---|---|---|
| Butter | liquid | solid |

**2.Mention the shape of the following colloidal particles**

**I).As2s3 b).blue gold sol c).tungstic acid sol**

| S.NO | Colloidal particles | Shapes |
|---|---|---|
| A | $AS_2S_3$ | Spherical |
| B | $Fe(OH)_3$ sol (blue gold sol) | Disc or plate like |
| C | $W_3O_5$(tungtic acid sol) | Rod like |

**3. Give any three difference between chemisorption and physisorption (mar 20)**

| S.NO | **Chemical adsorption or Chemisorption or Activated adsorption** | **Physical adsorption or van der waals adsorption or Physisorption** |
|---|---|---|
| 1 | It is very slow | It is instantaneous |
| 2 | It is very specific depends on nature of adsorbent and adsorbate. | It is non-specific |
| 3 | chemical adsorption is fast with increase pressure, it can not alter the amount. | In Physisorption, when pressure increases the amount of adsorption increases. |
| 4 | When temperature is raised chemisorption first increases and then decreases. | Physisorption decreases with increase in temperature. |
| 5 | Chemisorption involves transfer of electrons between the adsorbent and adsorbate. | No transfer of electrons |
| 6 | Heat of adsorption is high i.e., from 40-400kJ/mole. | Heat of adsorption is low in the order of 40kJ/mole. |
| 7 | Monolayer of the adsorbate is formed. | Multilayer of the adsorbate is formed on the adsorbent. |
| 8 | Adsorption occurs at fixed sites called activecentres. It depends on surface area | It occurs on all sides. |
| 9 | Chemisorption involves the formation of activated complex with appreciable activation energy. | Activation energy is insignificant. |

**4.What is inversion of phase ? give an example( inst 20)**

The change of W/O emulsion into O/W emulsion is called inversion of phases.

**For example:**

An oil in water emulsion containing potassium soap as emulsifying agent can be converted into water in oil emulsion by adding CaCl2 or AlCl3. The mechanism of inversion is in the recent developments of research.

**5.Write a note on tyndall effect (sep 20)**

- Colloids have optical property. When a homogeneous solution is seen in the direction oflight, it appears clear but it appears dark, in a perpendicular direction.
- But **when light passes through colloidal solution, it is scattered in all directions**.
- This effectwas first observed by Faraday, but investigations are made by Tyndall in detail, hence called asTyndall effect.

**6.Write any five characters of catalysts (sep 20)** (May22)

1. For a chemical reaction, catalyst is needed in very small quantity. Generally, a pinch of catalyst is enough for a reaction in bulk.
2. There may be some physical changes, but the catalyst remains unchanged in mass and chemical composition in a chemical reaction.
3. A catalyst itself can not initiate a reaction. It means it can not start a reaction which is not taking place. But, if the reaction is taking place in a slow rate it can increase its rate.
4. A solid catalyst will be more effective if it is taken in a finely divided form.
5. A catalyst can catalyse a particular type of reaction, hence they are said to be specific in nature.
6. In an equilibrium reaction, presence of catalyst reduces the time for attainment of equilibrium and hence it does not affect the position of equilibrium and the value of equilibrium constant.
7. A catalyst is highly effective at a particular temperature called as optimum temperature.
8. Presence of a catalyst generally does not change the nature of products

**7.Identify the auto catalyst in the following reaction(inst 20)**

**$CH_3COOC_2H_5$ + H2O. →$CH_3COOH$ + $C_2H_5OH$ $2AsH_3$→ 2As + $3H_2$**

Auto catalysis is observed in the following reactions.

$$CH_3COOC_2H_5+H_2O \rightarrow CH_3COOH+C_2H_5OH$$

Acetic acid acts as the autocatalyst

$$2AsH_3 \rightarrow 2As+3H_2$$

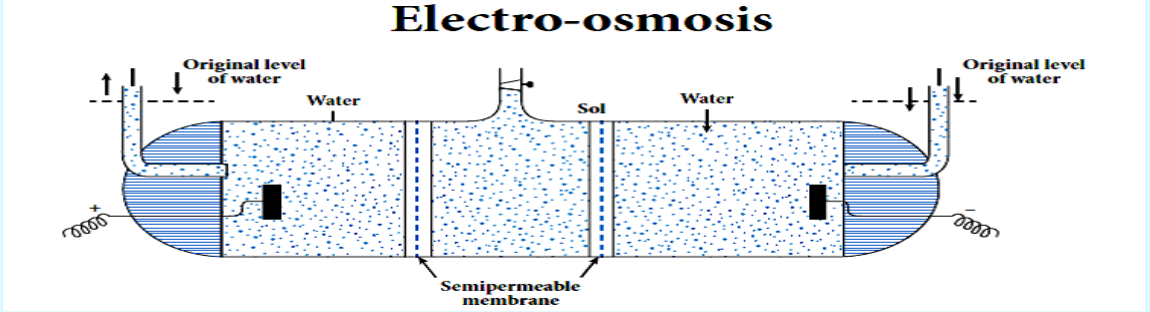
Arsenic acts as an autocatalyst

**8.Name the factors affecting adoption(inst 20)**

(i) Nature of adsorbent (ii) Nature of adsorbate
(iii) Pressure (iv) Concentration at a given temperature.

**9.What is mean by electro osmosis? (aug 21)**

- A sol is electrically neutral. Hence the medium carries an equal but opposite charge to that ofdispersed particles. When sol particles are prevented from moving, under the influence of electricfield the medium moves in a direction opposite to that of the sol particles.
- This movement ofdispersion medium under the influence of electric potential is called electro osmosis.



**10. Describe adsorption theory of catalysis. (aug 21)** (jul 22)

- Langmuir explained the action of catalyst in heterogeneous catalysed reactions based onadsorption. The reactant molecules are adsorbed on the catalyst surfaces, so this can also becalled as contact catalysis.
- According to this theory, the reactants are adsorbed on the catalyst surface to form anactivated complex which subsequently decomposes and gives the product.
- The various steps involved in a heterogeneous catalysed reaction are given as follows:

1. Reactant molecules diffuse from bulk to the catalyst surface.
2. The reactant molecules are adsorbed on the surface of the catalyst.
3. The adsorbed reactant molecules are activated and form activated complex which is decomposed to form the products.
4. The product molecules are desorbed.
5. The product diffuse away from the surface of the catalyst

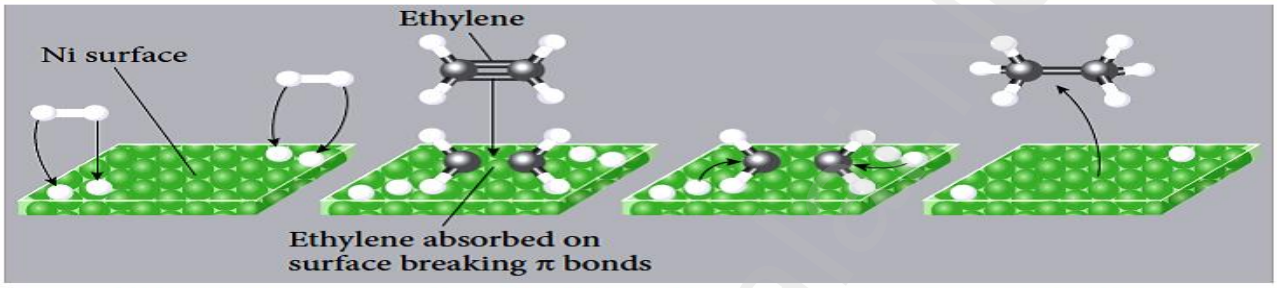



Fig 10.3 Hydrogenation of ethylene in presence of a nickel catalyst.

11.Write a note on Electrophoresis. (May22)

- When electric potential is applied across two platinum electrodes dipped in a hydrophilic sol, the dispersed particles move toward one or other electrode.
- This migration of sol particles under the influence of electric field is called electrophoresis or cataphoresis.

12.What is homogeneous catalysis ? Give example (May22)

- In a catalysed reaction, the reactants, products and catalyst are present in the same phase.

$$2SO_2 + O_2 + [NO] \rightarrow 2SO_3 + [NO]$$

- In this reaction the catalyst NO, reactants, SO2 and O2 , and product, SO3 are present in the gaseous form

13.What is heterogeneous catalysis ? give example (jul 22)

- In a reaction, the catalyst is present in a different phase i.e. It is not present in the same phase as that of reactants or products. This is generally referred as contact catalysis and the catalyst present is in the form of finely divided metal or as gauze

$$2SO_2 + O_2 \xrightarrow{\text{Pt or } V_2O_5} 2SO_3$$

- In the manufacture of sulphuric acid by contact process SO3 is prepared by the action of SO2 and O2 in the presence of Pt or V2O5 as a catalyst

# 11.HYDROXY COMPOUNDS AND ETHERS

**ONE MARKS**

1. Williamson synthesis of preparing dimethyl ether is a/an(mar20)

(a) Electrophilic substitution reaction (b) $S_N1$ reaction

**(c) $S_N2$ reaction** (d) Electrophilic addition reaction(mar20)

2. the major product obtained when phenol reacts with corn $H_2SO_4$ at 280 K is :

(a) Salicylic acid (b) Picric acid

**(c) O-phenol sulphonicacid** (d) p-phenol sulphonicacid

3. in the preparation of ether by Williamson synthesis using primary alkyl halide involves : (ins20)

(a) $E_1$ mechanism **(b) $S_N2$ mechanism**

(c) $SN^1$ mechanism (d) $E_2$ mechanism

4. cold dilute alkaline $KMnO_4$ is known as. (sep20)

(a) Schiff's reagent (b) Fenton's reagent

**(c) Bayer's reagent** (d) Nessler's reagent

5. The common name of 1,2,3 trihydroxy benzene is : (sep20)

**(a) pyrogallol** (b) Resorcinol

(c) Hydroxyquinol (d) phloroglucinol

6. on reacting with neutral ferric chloride. Phenol gives (Aug21)

(a) Dark green colour (b) Red colour

(c) No colouration **(d) violet colour**

7.$HO-CH_2-CH_2-OH$ on heating with periodic acid gives (May22)

**a) methanal** b) methanoic acid c) $CO_2$ d) Glyoxal

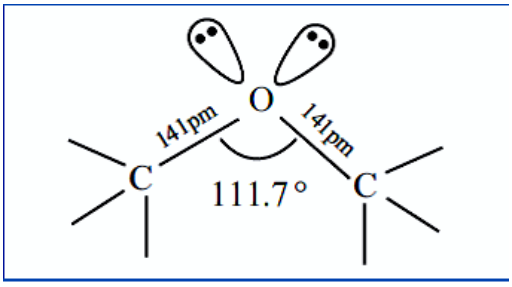
8.Which of the following compounds can be used as antifreeze in automobile radiators(jul22)

a) Methanol b) ethanol c) Neo-pentyl alcohol **d) ethan-1,2-diol**

*2 &3&5MARK QUESTIONS :-*

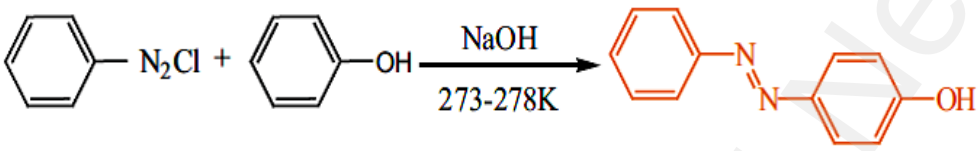
**1. Why is C-O-C bond angle in ether slightly greater than thebond angle (mar 20) ( compulsory 2 mark )**

- The structure of ethereal oxygen which is attached to two alkyl groups is similar to the structureof -O-H group of alcohol.
- The oxygen atom is $sp^3$hybridized. Two sp3 hybridized orbitals of oxygenlinearly overlap with two sp3 hybrid orbitals of the carbon which are directly attached to the oxygenforming two C-O'σbonds.
- The C-O-C bond angle is slightly greater than the tetrahedral bondangle due to the repulsive interaction between the two bulkier alkyl groups.




**2.Give the coupling reaction of phenol (mar 20)**

Phenol couples with benzene diazonium chloride in an alkaline solution to form p-hydroxyazobenzene(a red orange dye).




Benzene diazonium chloride — Phenol — p-hydroxy azobenzene

**3.how will you prepare the following by using grignard reagent (mar 20)**

**a).Propan-1-ol b).propan-2-ol**

**a).Propan-1-ol**

$CH_3CH_2MgBr$ (Ethyl magnesium bromide) + HCHO (formaldehyde) $\xrightarrow{\text{ether solvent}}$ $CH_3CH_2CH_2\text{-}OH$ (propan-1ol) $+MgBr(OH)$

**b).propan-2-ol**

Formate ester is used to prepare a secondary alcohol with identical alkyl groups

Example

$$2CH_3MgBr + H\text{-}\underset{\text{ethylmethanoate}}{\overset{O}{\overset{\|}{C}}}\text{-}O\text{-}CH_2\text{-}CH_3 \xrightarrow[\text{ii) } H_3O^+]{\text{i) ether solvent}} \underset{\text{propan-2-ol}}{CH_3\text{—}\overset{OH}{\overset{|}{C}}H\text{—}CH_3} + Mg\langle^{Br}_{OCH_2\text{-}CH_3}$$

**4. Mention the mechanism in the following reactions (sep 20)**

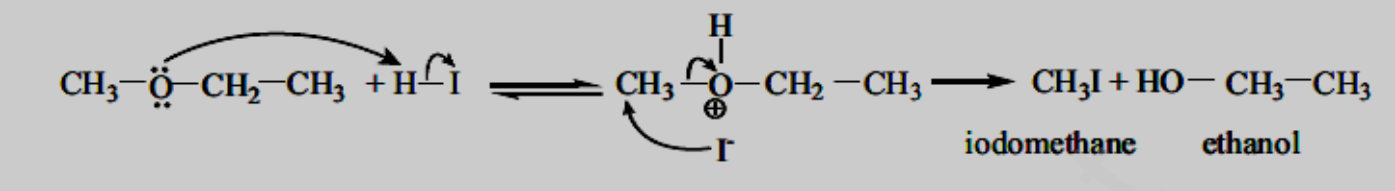
**I).One mole of HI reacts with methoxy ethane**

**Reaction :-**

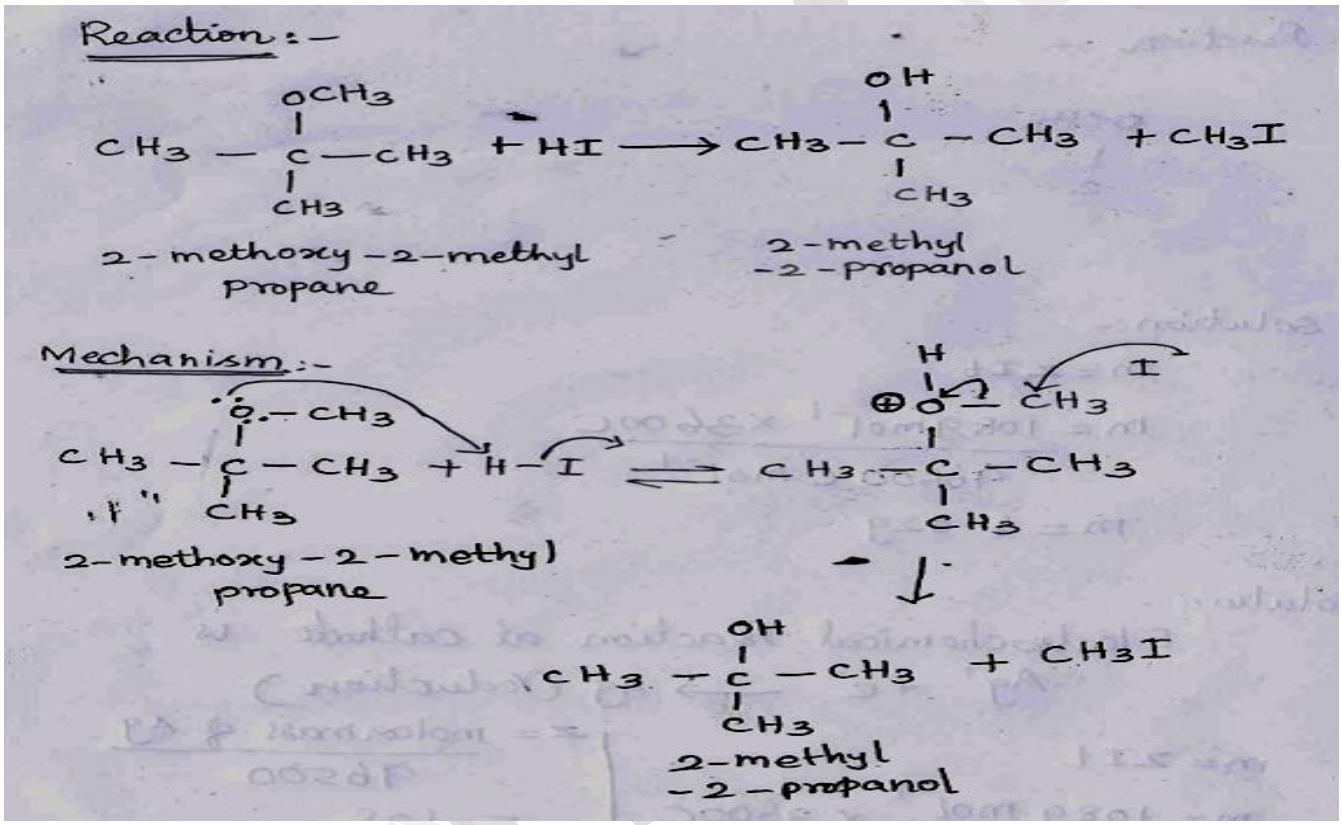
$$\underset{\text{methoxy ethane}}{CH_3\text{-}O\text{-}CH_2\text{-}CH_3} + HI \xrightarrow{\Delta} \underset{\text{iodo methane}}{CH_3I} + \underset{\text{ethanol}}{CH_3\text{-}CH_2\text{-}OH}$$

**Mechanism :-**

Ethers having primary alkyl group undergo SN2 reaction while tertiary alkyl ether undergo SN1 reaction.Protonation of ether is followed by the attack of halide ion.The halide ion preferentially attacks the less sterically hindered of the two alkyl groups which are attachedto etherial oxygen.

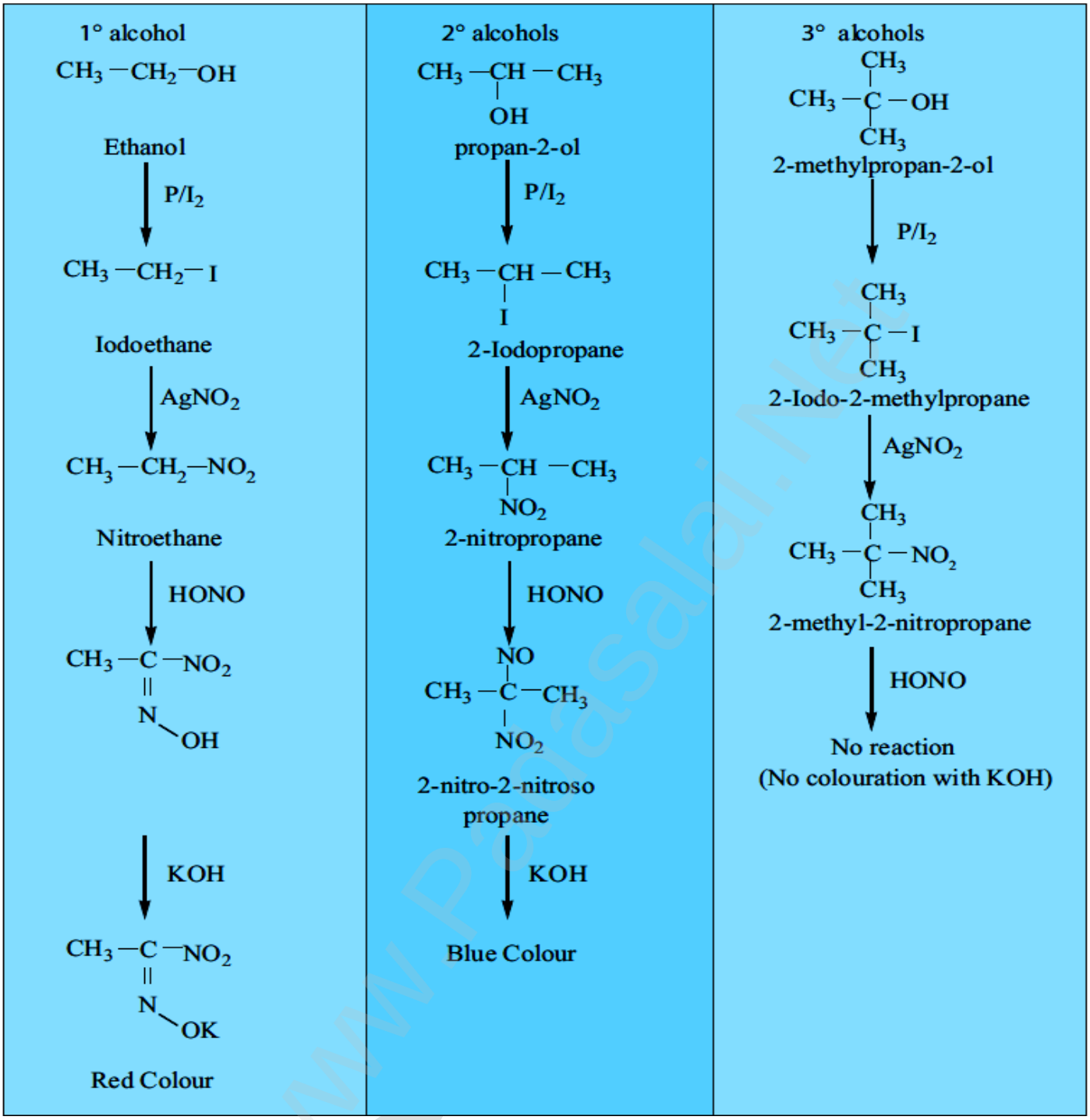



**ii) One mole of HI reacts with 2 methoxy 2 –methylpropane**




**5.How to distinguish $1^0$ , $2^0$ , and $3^0$ alcoholby victor Meyer test (sep 20)**

- This test is based on the behaviour of the different nitro alkanes formed by the three typesof alcohols with nitrous acid and it consists of the following steps.
- Alcohols are converted into alkyl iodide by treating it with $I_2$ /P
- Alkyl iodide so formed is then treated with $AgNO_2$ to form nitro alkanes.
- Nitro alkanes are finally treated with $HNO_2$ (mixture of $NaNO_2$/HCl) and the resultant solution is made alkaline with KOH.

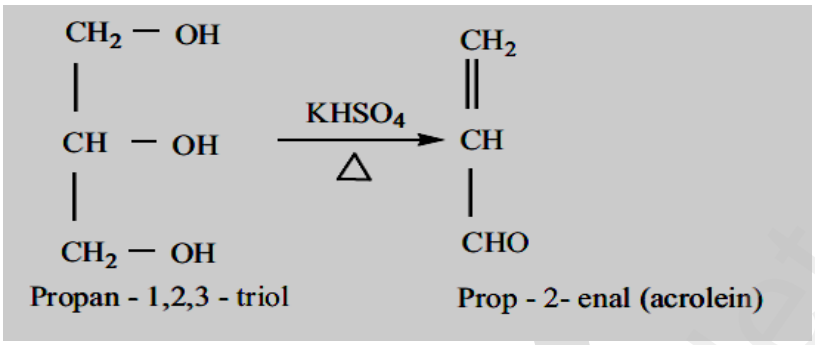



**Result:**

- Primary alcohol gives red colour
- Secondary alcohol gives blue colour.
- No colouration will be observed in case of tertiary alcohol.

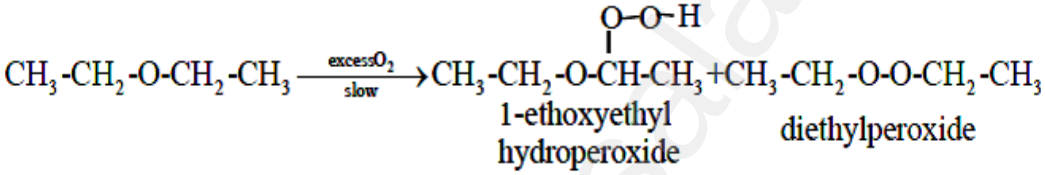
**6.Convert glycerol to acrolein(inst20)**

When glycerol is heated with dehydrating agents such as Con H SO ,KHSO 2 4 4 etc….,it undergoes dehydration to form acrolein.



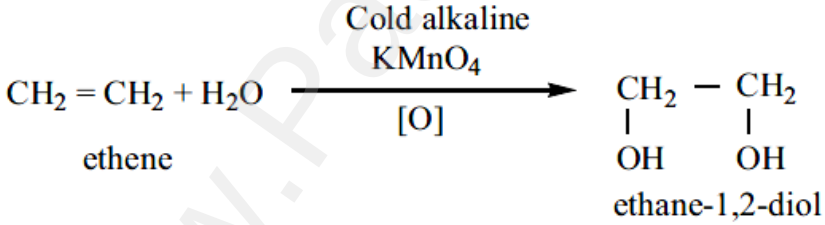

**7.Explain auto oxidation of ethers(inst 20)**

When ethers are stored in the presence of atmospheric oxygen, they slowly oxidise toform hydroperoxides and dialkylperoxides. These are explosive in nature. Such a spontaneousoxidation by atmospheric oxygen is called autooxidation.




**8.What is Baeyer's regent ? how it is useful to convertethene to ethane 1 2 diol ( inst 20)**

We have already learnt that the hydroxylation of ethylene using cold alkaline solution ofpotassium permanganate (Baeyer's reagent) gives ethylene glycol.

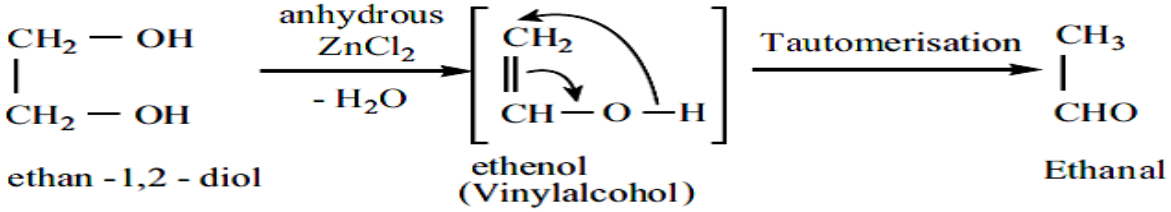



**9.How are the following conversion effected? (aug 21)I) ethylene glycol → acetaldehyde**

**ii) glycerol→acrolein**

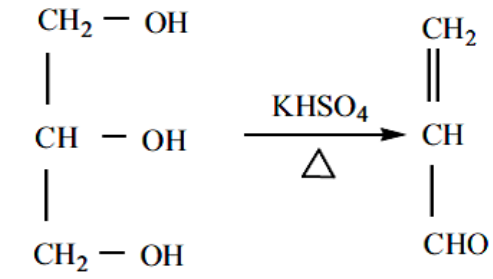
I) ethylene glycol → acetaldehyde

When heated with dilute sulphuric acid (or) anhydrous ZnCl2 under pressure in a sealedtube, it gives acetaldehyde.



ii) glycerol→acrolein (in.p.no.121)

When glycerol is heated with dehydrating agents such as Con H SO ,KHSO 2 4 4 etc….,it undergoes dehydration to form acrolein.

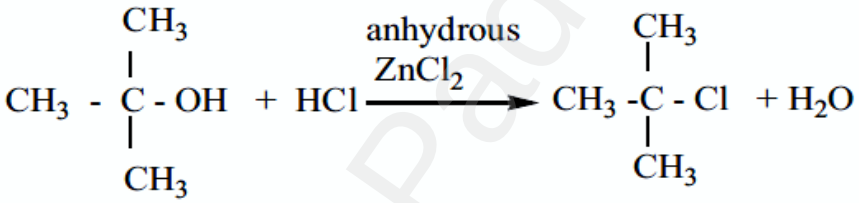



Propan - 1,2,3 - triol Prop - 2- enal (acrolein)

**10. Differentiate primary secondary and tertiary alcohols using Lucas test (aug 21)**

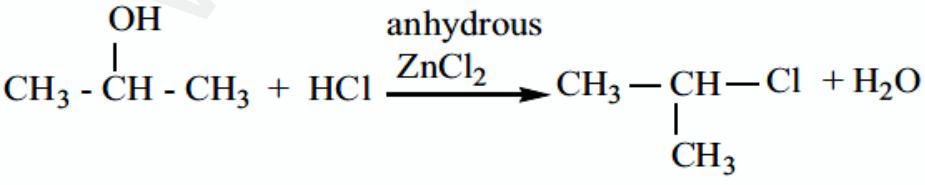
- **Lucas reagent is conHCl+ unhyd.$ZnCl_2$**
- Lucas agent react with alcohol to form alkyl halide

**Test for tertiary alcohol :-**




2-methylpropan-2-ol 2 -chloro-2-methylpropane
(immediate appearance of turbidity)

**Test for secondary alcohol :-**




propan-2-ol 2 -chloropropane
(slow appearance of turbidity)

**Test for Primaryalcohol :-**

$$CH_3\text{-}CH_2\text{-}OH + HCl \xrightarrow[ZnCl_2]{\text{anhydrous}} \text{No reaction at room temperature}$$

ethanol (Turbidity appears only on heating)

**Result :-**

**i)Tertiary alcohol is immediately turbidity form**

**ii)secondary alcohol is with in 10minutes turbidity form**

**iii) Primary alcohol is no turbidity at room temperature**

**11. Give the uses of diethyl ether. (aug 21)**

1. Diethyl ether is used as a surgical anesthetic agent in surgery.
2. It is a good solvent for organic reactions and extraction.
3. It is used as a volatile starting fluid for diesel and gasoline engine.
4. It is used as a refrigerant.

**12.Write any one method of preparation of diethyl ether(May22)**

**Williamsons synthesis:**

When an alkyl halide is heated with an alcoholic solution of sodium alkoxide, the corresponding ethers are obtained. The reaction involves SN2 mechanism.

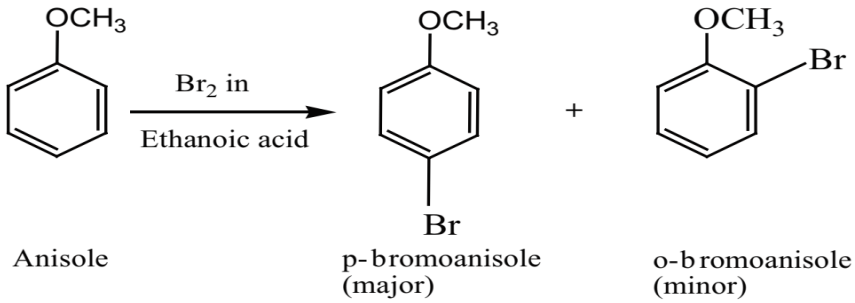
$$CH_3\text{-}ONa + Br\text{-}C_2H_5 \xrightarrow{\Delta} CH_3\text{-}O\text{-}C_2H_5 + NaBr$$

**13.What are the uses of glycerol (jul 22)**

1. Glycerol is used as a sweetening agent in confectionery and beverages.
2. It is used in the manufacture of cosmetics and transparent soaps.
3. It is used in making printing inks and stamp pad ink and lubricant for watches and clocks.
4. It is used in the manufacture of explosive like dynamite and cordite by mixing it with chaina clay

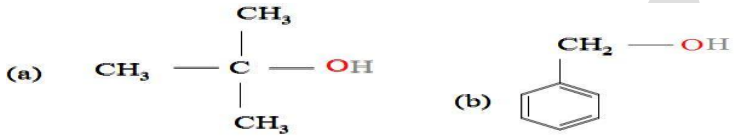
**14.Write a bromination rection of anisole (jul 22)**

Anisole undergoes bromination with bromine in acetic acid even in the absence of a catalyst, para isomer is obtained as the major product.




Anisole | p-bromoanisole (major) | o-bromoanisole (minor)

15.Give the IUPAC names (May22)




a) 2-methyl-2-propanol b) phenyl methan

# 12.CARBONYL COMPOUNDS AND CARBOXYLIC ACIDS

**ONE MARKS :-**

1 .Assertion : p-N,N- dimethyl amino benzaldehyde undergoes benzoin condensation (mar20)

Reason : the aldehydic(CHO)group is meta directing.

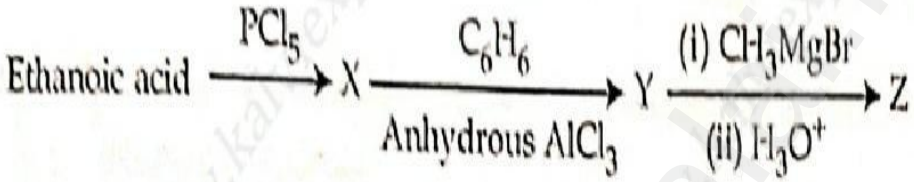
(a) Both Assertion and reason are false

(b) Both assertion and reason are true but reason is the correct explanation of assertion

**(c) Both assertion and reason are true but reason is not the correct explanation of assertion**

(d) Assertion is true but Reason is false

2.Predict the product Z in the following series of reactions(ins20)




**(a) $(CH_3)_2C(OH)C_6H_5$** (b) $CH_3CH(OH)C_6H_5$

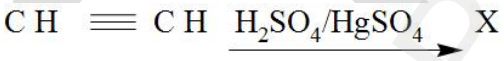
(c) $CH_3CH(OH)CH_2CH_3$ (d) $C_6H_5$-$CH_2$-OH

3._____ is used in the manufacture of thermosoftening plastic perspex(sep20)

(a) Benzaldehyde **(b) Acetone**

(c) Acetaldehyde (d) Benzophenone

4 .In the following reaction (Aug21)




Product 'X' will not give

(a) Iodoform test (b) Tollen's test

(c) Fehling solution test **(d) victor meyertest.**

5.The formation of cyanohydrins from acetone is an example of (May22)

a) electrophilic addition b) nucleophilic substitution

**c) nucleophilic addition** d) electrophilic substitution

6.Which of the following represents the correct order of acidity in the given compounds(jul22)

**a) $FCH_2COOH > CH_3COOH > BrCH_2COOH > ClCH_2COOH$**

b) $FCH_2COOH > ClCH_2COOH > BrCH_2COOH > CH_3COOH$

c) $CH_3COOH > ClCH_2COOH > FCH_2COOH > BrCH_2COOH$

d) $ClCH_2COOH > CH_3COOH > BrCH_2COOH > ICH_2COOH$

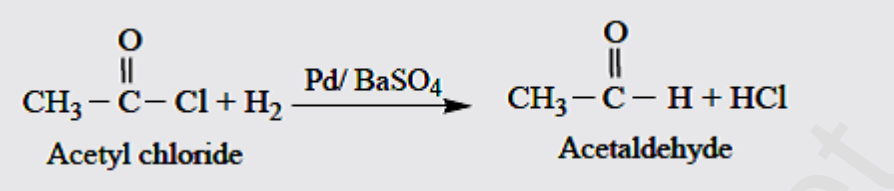
7.Which of the following reduces tollen's reagent ? (jul22)

**a) formic acid** b) acetic acid c) benzophenone d) none of these

**2 &3 &5 mark**

**1.name the catalyst used in rosenmund reduction and state its importance (mar 20)** (jul 22)

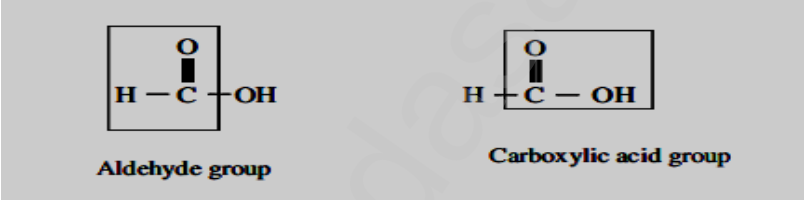
**Aldehydes** can be prepared by the hydrogenation of acid chloride, in the presence ofpalladium supported by barium sulphate. This reaction is called **Rosenmund reduction**.



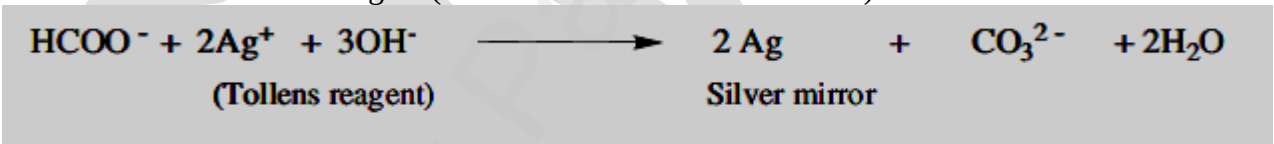

In this reaction, barium sulphate act as a catalytic poison to palladium catalyst, so thataldehyde cannot be further reduced to alcohol.Formaldehyde and ketones cannot be prepared by this method.

**2. Formic acid reduces tollen's reagent whereas acetic acid does not reducegive reason (mar 20)** (May22)

Formic acid contains both an aldehyde as well as an acid group. Hence, like other aldehydes,formic acid can easily be oxidised and therefore acts as a strong reducing agent




i) Formic acid reduces Tollens reagent (ammonical silver nitrate solution) to metallicsilver.



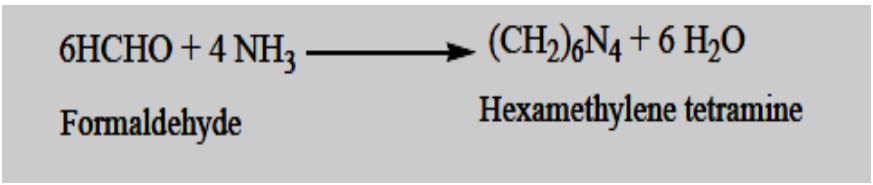

ii) Formic acid reduces Fehlings solution. It reduces blue coloured cupric ions to red colouredcuprous ions.


**3.What is formalin what is its use (mar 20)**

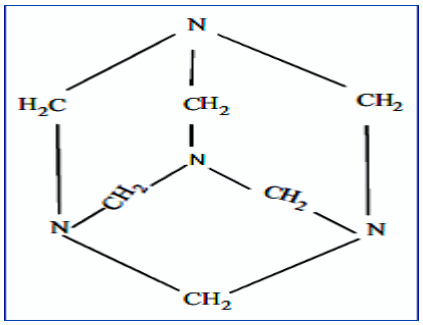
- 40% aqueous solution of formaldehyde is called formalin.
- It is used for preservingbiological specimes.

**4.What is urotropine how it is prepared (sep 20)**

Formaldehyde reacts with ammonia to form hexa methylene tetramine, which is alsoknown as **Urotropine**.



**Structure**



**5.Write the test for carboxylic acid group (sep 20)(aug21) (jul 22)**

**Tests for carboxylic acid group**

i) In aqueous solution carboxylic acid turn blue litmus red.
ii) Carboxylic acids give brisk effervescence with sodium bicarbonate due to the evolutionof carbon-di -oxide
iii) When carboxylic acid is warmed with alcohol and Con $H_2SO_4$ it forms an ester, whichis detected by its fruity odour.

**6.Arrange the following in the increasing order of relative reactivity of acid derivative and mention the reason alone (sep 20)**

$CH_3COOC_2H_5$ $CH_3COCl$ $CH_3CONH_2$ $CH_3COOCOCH_3$

**increasing order of relative reactivity of acid derivative :-**

$CH_3CONH_2$< $CH_3COOC_2H_5$<$CH_3COOCOCH_3$ <$CH_3COCl$

**reason :-**

The above order of reactivity can be explained in terms of
i) Basicity of the leaving group
ii) Resonance effect

**(i) Basicity of the leaving group**

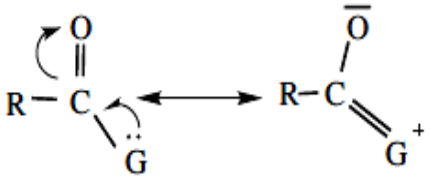
Weaker bases are good leaving groups. Hence acyl derivatives with weaker bases as leaving groups (L) can easily rupture the bond and are more reactive. The correct order of the basicity of the leaving group is

$$N2N^- : > :^- OR > RCOO^- : > : Cl^-$$

Hence the reverse is the order of reactivity.

**(ii) Resonance effect**

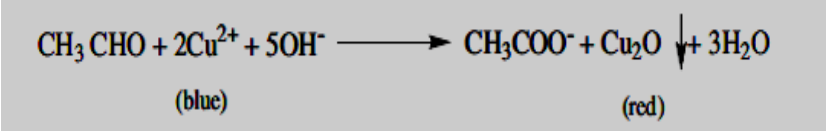
Lesser the electronegativity of the group, greater would be the resonance stabilization as shown below.



This effect makes the molecule more stable and reduces the reactivity of the acyl compouThe order of electronegativity of the leaving groups follows the order $^-Cl >^- OCOR >^- OR >^- NH2$

**7.Explain Benedict's solution test(inst 20)**

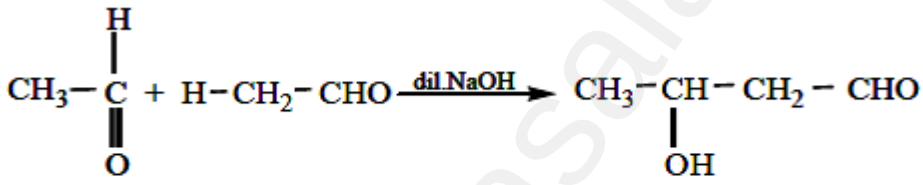
Benedicts solution is a mixture of CuSO4 + sodium citrate + NaOH. Cu2+ is reduced byaldehyde to give red precipitate of cuprous oxide.




**8.Write the mechanism of aldol condensation reaction( inst 20)**

**Reaction :-**

The carbon attached to carbonyl carbon is called α - **carbon** and the hydrogen atom attached to α - carbon is called α - hydrogen.In presence of dilute base NaOH, or KOH, two molecules of an aldehyde or ketone havingα - hydrogen add together to give β- hydroxyl aldehyde (aldol) or β - hydroxyl ketone (ketol).The reaction is called **aldol condensation reaction**. The aldol or ketol readily loses water to give α,β – unsaturated compounds which are aldol condensation products.
Acetaldehyde when warmed with dilNaOH gives β - hydroxyl butraldehyde (acetaldol)



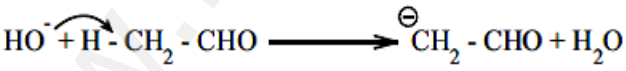

Acetaldehyde — Acetaldol (3 - Hydroxy butanal)

**Mechanism**

The mechanism of aldol condensation of acetaldehyde takes place in three steps.

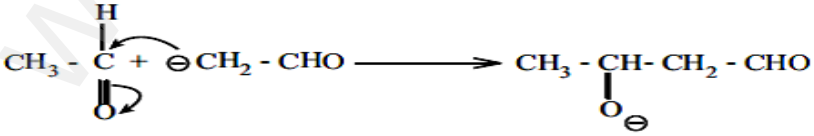
**Step 1 :**

The carbanion is formed as the α- **hydrogen atom** is removed as a proton by the base.



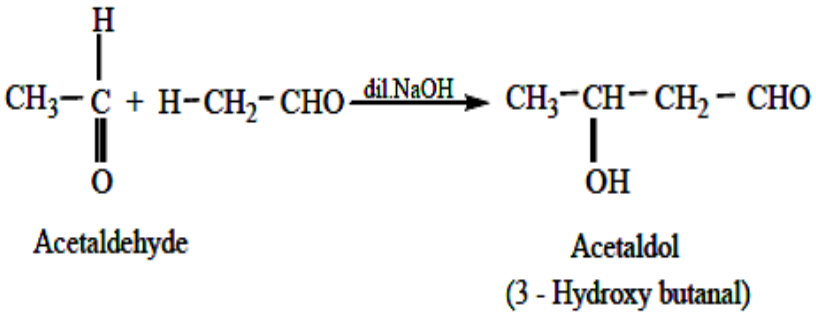

**Step 2 :**

The carbanion attacks the carbonyl carbon of another unionized aldehyde to form an alkoxide ion.




**Step 3 :**

The alkoxide ion formed is protonated by water to form aldol.



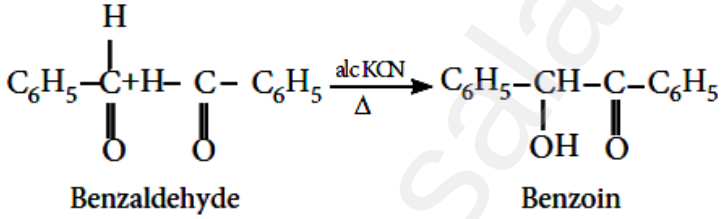

**9.how will you convert benzaldehyde into the following compounds? (Aug21)**

**i) benzoin ii)cinnamic acid iii) malachite green**

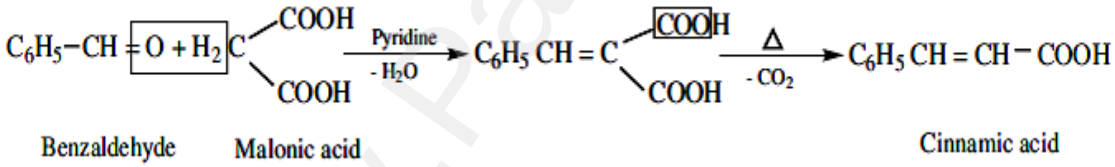
i)The Benzoin condensation involves the treatment of an aromatic aldehyde with aqueousalcoholic KCN. The products are - hydroxyl ketone.

**Example**

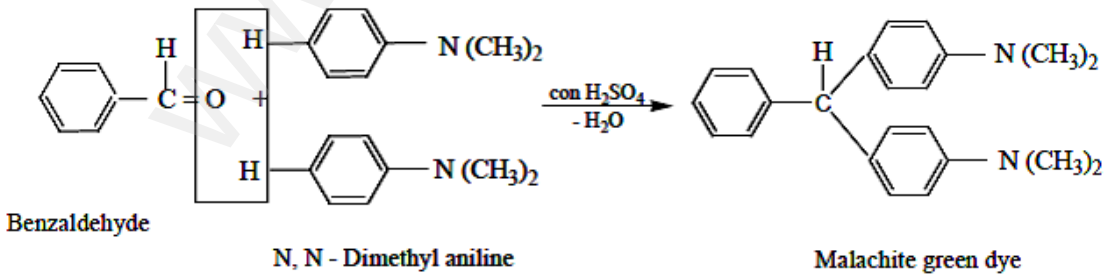
Benzaldehyde reacts with alcoholic KCN to form benzoin




ii)Benzaldehyde condenses with malonic acid in presence of pyridine forming cinnamic acid, Pyridine act as the basic catalyst.




iii)Benzaldehyde condenses with tertiary aromatic amines like N, N – dimethyl aniline in the presence of strong acids to from triphenyl methane dye.

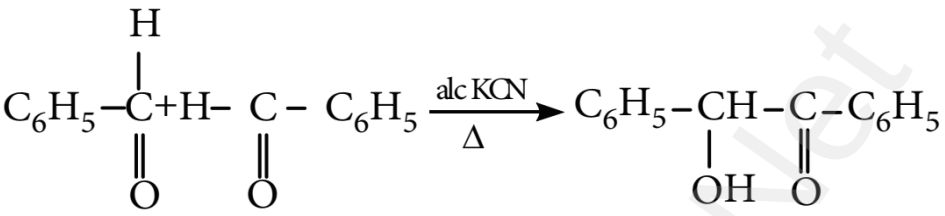


**10.Write note on benzoin condensation. (jul 22)**

The Benzoin condensation involves the treatment of an aromatic aldehyde with aqueous alcoholic KCN. The products are - hydroxyl ketone.

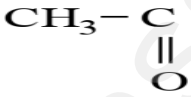
**Example**

Benzaldehyde reacts with alcoholic KCN to form benzoin

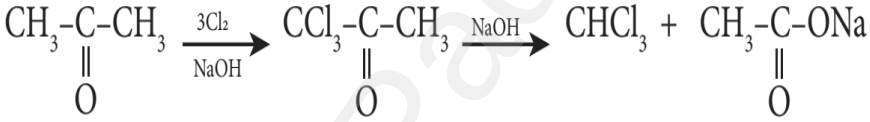



Benzaldehyde Benzoin

**11.Write the haloform reaction with an example(May22)**




Acetaldehyde and methyl ketones, containing group, when treated with halogen and alkali give the corresponding haloform This is known as Haloform reaction.



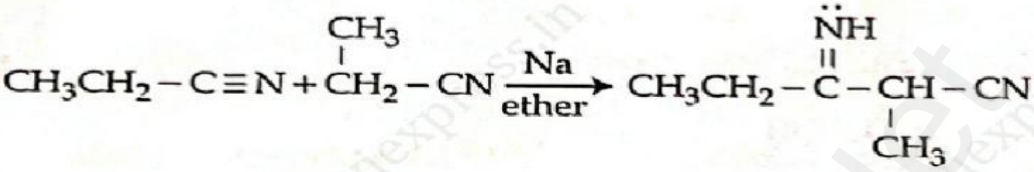
# 13.ORGANIC NITROGEN COMPOUNDS

**ONE MARKS :-**

1.Which one of the following is most basic? (mar20)

(a) 2, 4-dibromo aniline (b) 2, 4-dichloro aniline

**(c) 2, 4-dimethyl aniline** (d) 2, 4-dinitro aniline



2.

The above reaction is : (ins20)

(a) Thorpe nitrile condensation **(b) Levine and Hauser acetylation**

(c) Lederer-manasse reaction (d) Aldol condensation

3. $C_6H_5N_2Cl \xrightarrow{Cu_2Cl_2/\ HCl} C_6H_5Cl + N_2$ this reaction is known as(sep20)

(a) Gattermann reaction (b) Gomberg reaction

(c) Schotten-Baumann reaction **(d) Sandmeyerreaction**

4. IUPAC name for the amine $H_2N\text{-}CH_2\text{-}(CH_2)_4\text{-}CH_2\text{-}NH_2$(Aug21)

**(a) Heptane-1,7-diamine** (b) Hexamethylene diamine

(c) Hexane-1,6-amine (d) Hexane-1,6-diamine

5.Which of the following reagent can be used to convert nitrobenzene to aniline(May22)

a) Zn/Hg/NaOH b) $Zn/NH_4Cl$ **c) Sn/HCl** d) All of these

6.Aniline + benzoyl chloride $\xrightarrow{NaOH}$ $C_6H_5\text{-}NH\text{-}COC_6H_5$ .this reaction is known as (jul22)

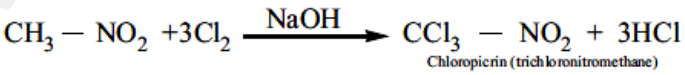
a) Fridel- crafts reaction b) HVZ reaction

**c) Schotten-Baumann reaction** d) Kolbe's reaction

*2 &3&5MARK QUESTIONS :-*

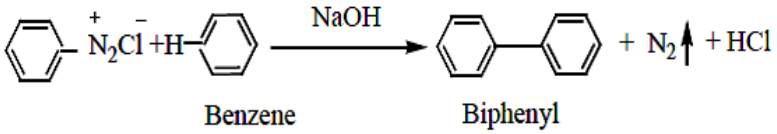
**1.How is chloropicrin prepared (mar 20)**

Primary and secondary nitroalkane on treatment with Cl2 or Br2 in the presence of NaOH give halonitroalkanes. The α-H atom of nitroalkanesare successively replaced by halogen atoms.




**2 what is gomberg reaction explain (mar 20)**

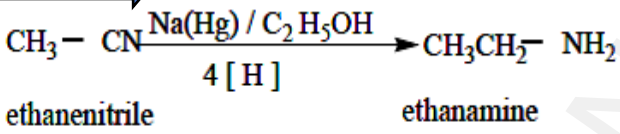
Benzene diazoniumchloride reacts with benzene in the presence of sodium hydroxide to give biphenyl .This reaction in known as the gombergreaction.

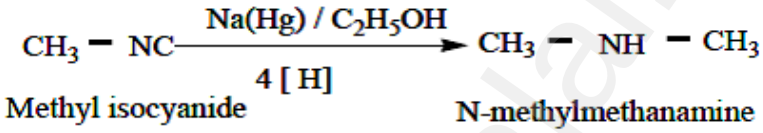



**3. Identify A and B (mar 20).**

**A.** $Na(Hg)/C_2H_5OH./4[H]$ → $CH_3\text{-}CH_2\text{-}NH_2$

**B.** $Na(Hg)/C_2H_5OH./4[H]$ → $CH_3\text{-}NH\text{-}CH_3$



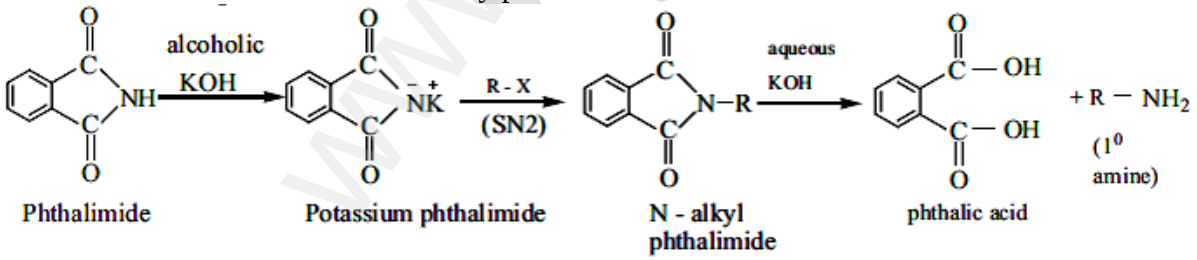



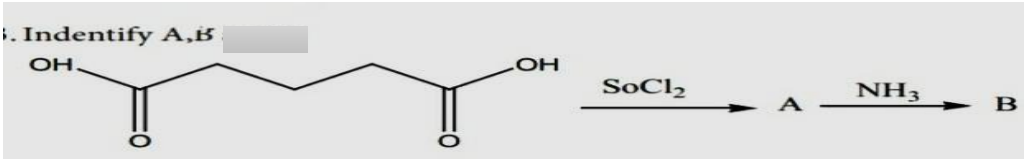

**4.Aniline does not undergo friedel crafts reaction give reason (sep 20)**

- Aniline does not undegofriedel- craft reaction, because aniline is basic in nature
- Aniline donates its lone lonepaire to the lewis acid AlCl3 to form an adduct which inhibits further electrophilic substitution reaction.

**5.New short note on Gabriel phthalimide synthesis (sep 20) (May22)**

- Gabriel synthesis is used for the preparation of Aliphatic primary amines.
- Phthalimideon treatment with ethanolic KOH forms potassium salt of phthalimide which on heating withalkyl halide followed by alkaline hydrolysis gives primary amine.
- Aniline cannot be prepared by this method because the arylhalides do not undergo nucleophilic substitution with theanion formed by phthalimide

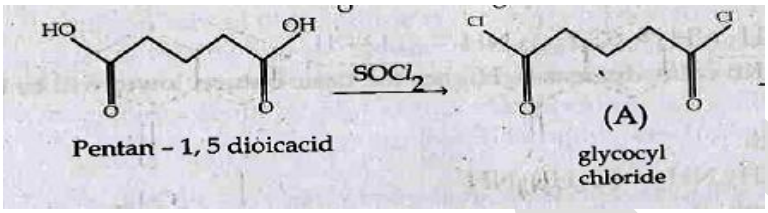


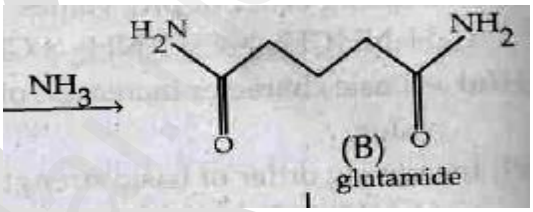



6.(sep 20)

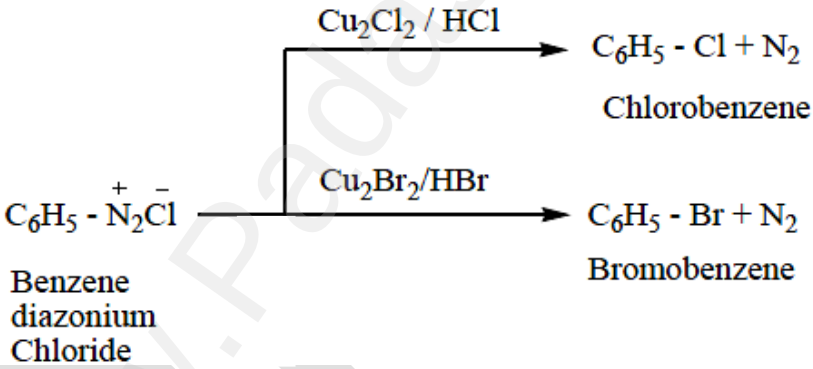
**Answer**

A = glycoyl chloride B = Glutamide




**7.How is aryl halide prepared by using $Cu_2Cl_2$ /HCl (or) $Cu_2Br_2$/HBr?( inst20) (compulsory 2 mark )**




**8. name the reducing agent used in the reduction of nitrobenzene to the following compounds(inst 20)**

**A)AnilineB)phenyl hydroxylamine**

**C)Nitroso benzeneD)mustard oil reaction**

a) $C_6H_5-NO_2 \xrightarrow[6(H)]{Sn/HCl} C_6H_5-NH_2$ (acid medium)

Aniline

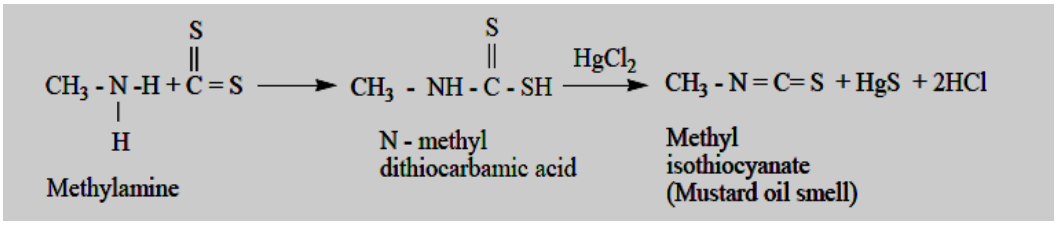
b) $C_6H_5-NO_2 \xrightarrow[4(H)]{Zn/NH_4Cl} C_6H_5-NH-OH$

Phenyl hydroxylamine

c $C_6H_5-NO_2 \xrightarrow[2(H)]{Fe/H_2O(steam)} C_6H_5-N=O$

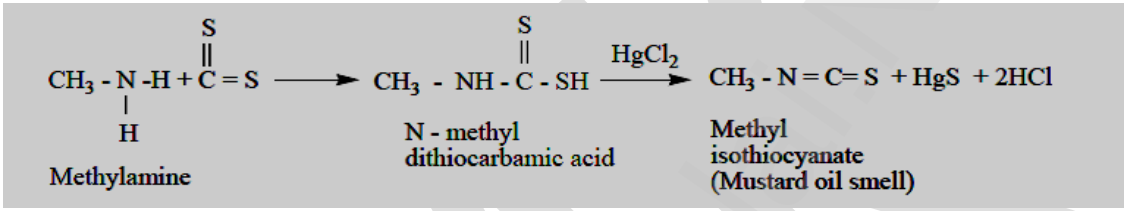
Nitrosobenzene

d)

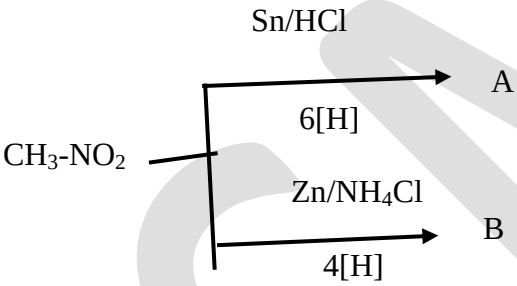


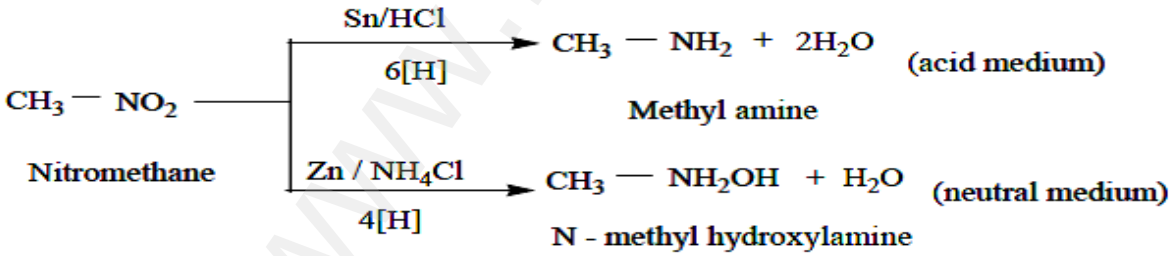

**9. Write mustard oil reaction ( inst 20)**

When primary amines are treated with carbon disulphide ($CS_2$) , N -alkyldithio carbonic acid is formed which on subsequent treatment with $HgCl_2$ ,give an alkyl isothiocyanate.




**10.From the following reaction identify A and B (Aug21)**




**Answer :-**

A= $CH_3$-$NH_2$ (Methyl amine),. B= $CH_3$-$NH_2OH$ ( N-methyl hydroxylamine )

**11.A compound 'A' of molecular formula $C_2H_3N$ on reduction with Na(Hg)/$C_2H_5OH$ gives 'B' of molecular formula $C_2H_7N$ which undergoes carbylaminetest.Compound 'B' on reduction with nitrous acid gives compound 'C' of molecular formula $C_2H_6O$ by liberating nitrogen. Identify A,B and C and write the reaction involved. (Aug21)**

**Answer :-**

$CH_3$-CN. $\xrightarrow[C_2H_5OH]{Na/Hg}$ $CH_3$-$CH_2$ -$NH_2$

Methyl cyanide (A) ethyl amine (B)

$CH_3$-$CH_2$-$NH_2$ + $HNO_2$ $\longrightarrow$ $CH_3$-$CH_2$-OH +$N_2$

Ethyl amine (B) ethanol (C)

| S.NO | COMPOUND | NAME | FORMULA |
|---|---|---|---|
| 1 | A | Methyl cyanide | $CH_3$-CN |
| 2 | B | Ethyl amine | $CH_3$-$CH_2$-$NH_2$ |
| 3 | C | Ethanol | $CH_3$-$CH_2$-OH |

12.Identify A and B in the following sequence of reactions (May22)
(in.p.no : 210) ( compulsory 2 mark)

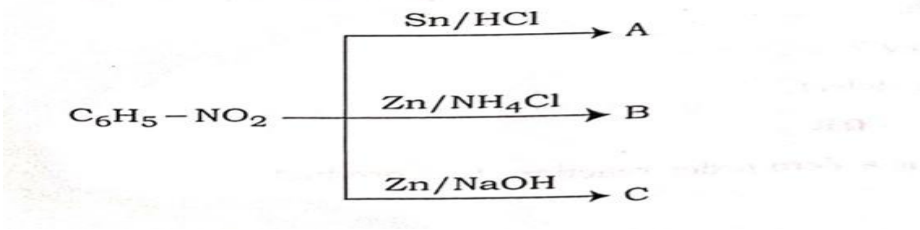
$CH_3-Br \xrightarrow{NaN_3} A \xrightarrow{LiAlH_4} B + N_2$

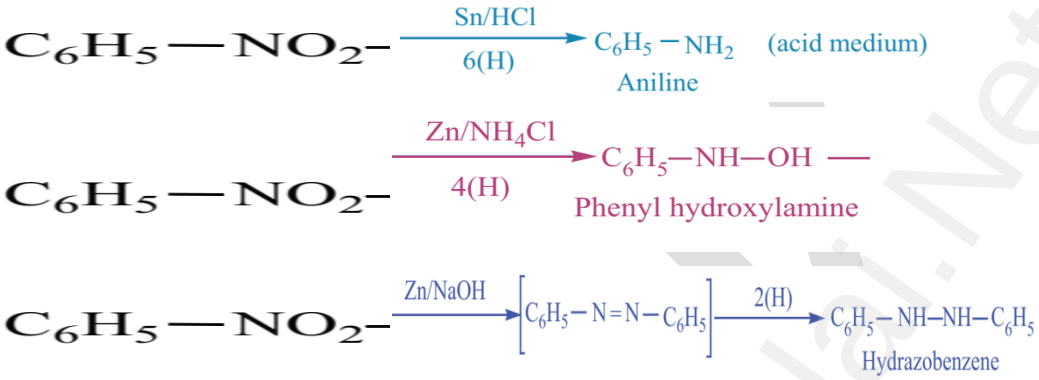
$CH_3-Br \xrightarrow{NaN_3} CH_3-N_3 \xrightarrow{LiAlH_4} CH_3-NH_2 + N_2$

Methylbromide Methyl azide Methylamine

A = Methyl azide B= methylamine

13.Identify compounds A,B and C for the following (jul 22) ( compulsory 3 mark)



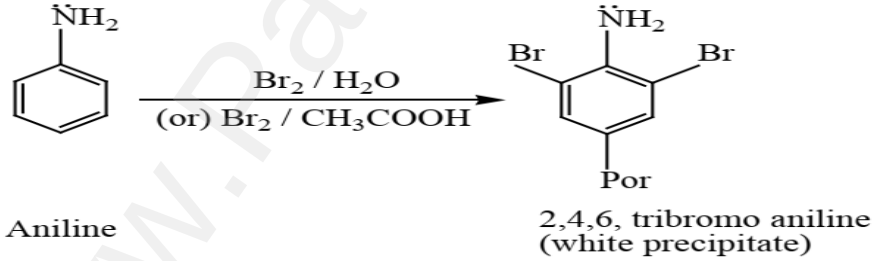




**A= Aniline B= phenyl hydroxylamine C= hydrazobenzene**

**14.Write a note on (jul 22)**

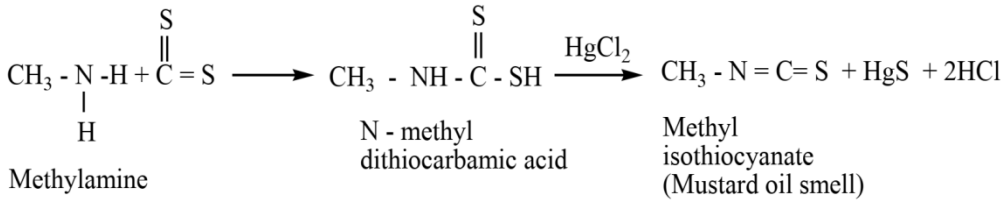
**i) Bromination of aniline ii) Mustard oil reaction**

Aniline reacts with $Br_2$ / $H_2O$ to give 2,4,6 – tribromo aniline a white precipitate




**ii) Mustard oil reaction**

When primary amines are treated with carbon disulphide (CS2), N - alkyldithio carbonic acid is formed which on subsequent treatment with HgCl2 , give an alkyl isothiocyanate



**15. What is carbylamine rreaction (May22)**

- Aliphatic (or) aromatic primary amines react with chloroform and alcoholic KOH to give isocyanides (carbylamines), which has an unpleasant smell.
- This reaction is known as carbylamines test. This test used to identify the primary amines.

$$\underset{\text{Ethylamine}}{C_2H_5 - NH_2} + \underset{\text{Chloroform}}{CHCl_3} + 3KOH \longrightarrow \underset{\text{Ethylisocyanide}}{C_2H_5 - NC} + 3KCl + 3H_2O$$

# 14. BIOMOLECULES

**ONE MARKS :-**

1. If one strand of the DNA has the sequence ATGCTTGA then the sequence of complementary strand would be (mar20)

(a) TACGRAGT **(b) TACGAACT** (c) TCCGAACT (d) TACGTACT

2. Cheilosis is a vitamin deficiency disease caused by (ins20)

(a) Vitamin $B_6$ (b) Vitamin $B_9$

(c) Vitamin $B_7$ **(d) Vitamin $B_2$**

3. Glucose and mannose are epimers at (sep20)

(a) C3 carbon (b) C4 carbon

(c) C1 carbon **(d) C2 carbon**

4. The pyrimidine bases present in DNA are (Aug21)

**(a) cytosine and Thiamine** (b) cytosine and Adenine

(c) cytosine and Uracil (d) cytosine and Guanine

5.Which of the following amino acids are achiral ? (May22)

a) Proline b) Alanine **c) Glycine** d) Leucine

6. Which of the following are epimers ? (jul22)

a) D(+)- glucose and D(+)-galactose b) D(+)-glucose and D(+)-mannose

c) neither a and b **d) both a and b**

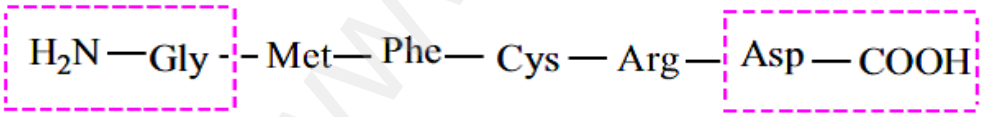
*2 &3&5MARK QUESTIONS :-*

**1.How are proteins classified based on their structure explain (mar 20)**

Proteins are polymers of amino acids. Their three dimensional structure depends mainlyon the sequence o amino acids (residues). The protein structure can be described at fourhierarchal levels called primary, secondary, tertiary and quaternary structures as shown in the

**i) Primary structure of proteins:**

Proteins are polypeptide chains made up of amino acids connected through peptidebonds. The relative arrangement of the amino acids in the polypeptide chain is called theprimary structure of the protein. Knowledge of this is essential as even small changes havepotential to alter the overall structure and function of a protein.




**ii) Secondary structure of proteins:**

The amino acids in the polypeptide chain forms highly regular shapes (sub-structures)through the hydrogen bond between the carbonyl oxygen (-C=O) and the neighbouring aminehydrogen (-NH)of the main chain.α-Helix and β-strands or sheets are two most common substructuresformed by proteins.

**α-Helix**

- In the α-helix sub-structure, the amino acids are arranged in a righthanded helical (spiral)structure and are stabilised by the hydrogen bond between the carbonyl oxygen one aminoacid (nth residue) with amino hydrogen of the fifth residue (n+4th residue).

- The side chains ofthe residues protrude outside of the helix. Each turn of anα-helix contains about 3.6 residuesand is about 5.4 A $^{0}$long.
- The amino acid proline produces a kink in the helical structure andoften called as a helix breaker due to its rigid cyclic structure.

**β-Strands**

- β-Strands are extended peptide chain rather than coiled. The hydrogen bonds occur betweenmain chain carbonyl group one such strand and the amino group of the adjacent strandresulting in the formation of a sheet like structure. This arrangement is called β-sheets.

**iii) Tertiary structure:**

- The secondary structure elements (α-helix&β-sheets) further folds to form the threedimensional arrangement.
- This structure is called tertiary structure of the polypeptide(protein). Tertiary structure of proteins are stabilised by the interactions between the sidechains of the amino acids.
- These interactions include the disulphide bridges between cysteineresidues, electrostatic, hydrophobic, hydrogen bonds and van der Waals interactions.

**iv) Quaternary Structure**

- Some proteins are made up of more than one polypeptide chains. For example, the oxygentransporting protein, haemoglobincontains four polypeptide chains while DNA polymeraseenzyme that make copies of DNA, has ten polypeptide chains.
- In these proteins the individualpolypeptide chains (subunits) interacts with each other to form the multimeric structurewhich known as quaternary structure. The interactions that stabilises the tertiary structuresalso stabilises the quaternary structures.

**2.What is glycosidic linkage (mar 20)**

- Disaccharides are sugars that yield two molecules of monosaccharides on hydrolysis. Thisreaction is usually catalysed by dilute acid or enzyme. Disaccharides have general formulaCn(H2O)n-1.
- In disaccharides two monosaccharide's are linked by *oxide linkage* called '*glycosidiclinkage*', which is formed by the reaction of the anomeric carbon of one monosaccharide reactswith a hydroxyl group of another monosaccharide.Example: Sucrose, Lactose, Maltose

**3. How are RNA molecules classified ?explain (sep 20)**

**Types of RNA molecules**

Ribonucleic acids are similar to DNA. Cells contain up to eight times high quantity ofRNA than DNA. RNA is found in large amount in the cytoplasm and a lesser amount in thenucleus. In the cytoplasm it is mainly found in ribosomes and in the nucleus, it is found innucleolus.RNA molecules are classified according to their structure and function into three majortypes

i. Ribosomal RNA (rRNA)
ii. Messenger RNA (mRNA)
iii. Transfer RNA (tRNA)

- **rRNA**
  rRNA is mainly found in cytoplasm and in ribosomes, which contain 60% RNA and 40%protein. Ribosomes are the sites at which protein synthesis takes place.
- **tRNA**
  tRNA molecules have lowest molecular weight of all nucleic acids. They consist of 73 –94 nucleotides in a single chain. The function of tRNA is to carry amino acids to the sites ofprotein synthesis on ribosomes.
- **mRNA**

mRNA is present in small quantity and very short lived. They are single stranded, and theirsynthesis takes place on DNA. The synthesis of mRNA from DNA strand is called transcription.mRNA carries genetic information from DNA to the ribosomes for protein synthesis

**4.Write a note on denaturation of proteins( inst 20)**

- Each protein has a unique three-dimensional structure formed by interactions such as disulphide bond, hydrogen bond, hydrophobic and electrostatic interactions.
- These interactionscan be disturbed when the protein is exposed to a higher temperature, certain chemicalssuch as urea, alteration of pH, ionic strength etc.,
- It leads to the loss of the three-dimensional tructure partially or completely.
- The process of a protein-losing its higher order structure without losing the primary structure, it called denaturation.
- When a protein denatures, its biological function is also lost.
- Since the primary structure is intact, this process can be reversed in certain proteins. This can happen spontaneously upon restoring the original conditions or with the help of special enzymes called cheperons (proteins that help proteins fold correctly).
- Example: coagulation of egg white by action of heat.

**5. Write any three biological importance of lipids(inst 20)**

1. Lipids are the integral component of cell membrane. They are necessary of structuralintegrity of the cell.
2. The main function of triglycerides in animals is as an energy reserve. They yield moreenergy than carbohydrates and proteins.
3. They act as protective coating in aquatic organisms.
4. Lipids of connective tissue give protection to internal organs.
5. Lipids help in the absorption and transport of fat soluble vitamins.
6. They are essential for activation of enzymes such as lipases.
7. Lipids act as emulsifier in fat metabolism.

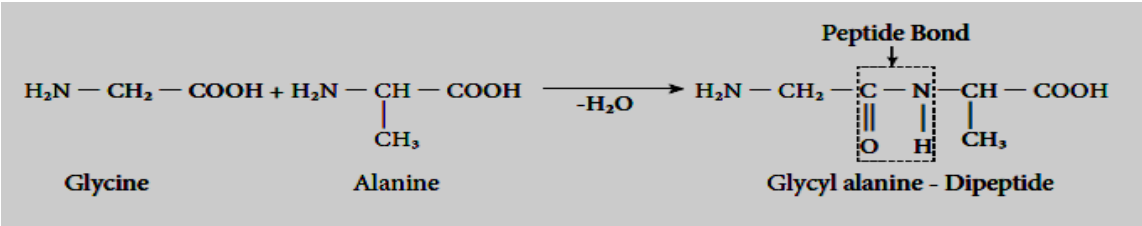
**6. Name the vitamins whose deficiency causes (sep 20)**

**A) Rickets B).scurvy**

| Diseases | deficiency |
|---|---|
| A) Rickets | vitamin D |
| B).scurvy | vitamin C |

**7.Write a short note on peptide bond (Aug21)**

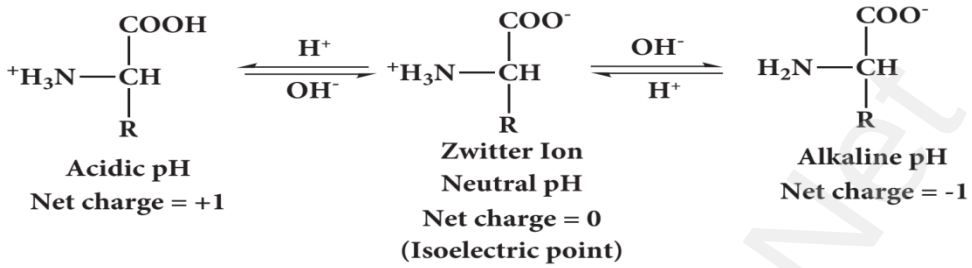
- The amino acids are linked covalently by peptide bonds. **The carboxyl group of the first aminoacid react with the amino group of the second amino acid to give an amide linkage betweenthese amino acids. This amide linkage is called peptide bond**. The resulting compound iscalled a dipeptide. Addition of another amino acid this dipeptide by a second peptide bondresults in tripeptide. Thus we can generate tetra peptide, penta peptide etc…
- When you havemore number of amino acids linked this way you get a polypeptide. If the number of aminoacids are less it is called as a polypeptide, if it has large number of amino acids (and preferablyhas a function) then it is called a protein. The amino end of the peptide is known as N-terminal or amino terminal while the carboxy



end is called C-terminal or carboxy terminal. In general protein sequences are written fromN-Terminal to C-Terminal. The atoms other than the side chains (R-groups) are called mainchain or the back bone of the polypeptide.

**8. What is called zwitter ion ? give an example (jul 22)**

At aqueous solution the proton from carboxyl group can be transferred to the amino group o an amino acid leaving these groups with opposite charges. Despite having both positive and negative charge this molecule is neutral and has amphoteric behaviour. These ions are called zwitter ions.




**9.Give any three difference between DNA and RNA (Aug21)**

| S.NO | DNA | RNA |
|---|---|---|
| 1 | It is mainly present in nucleus, mitochondria and chloroplast | It is mainly present in cytoplasm, nucleolus and ribosomes |
| 2 | t contains deoxyribose sugar | It contains ribose sugar |
| 3 | Base pair A = T. G ≡C | Base pair A = U. C ≡G |
| 4 | Double stranded molecules | Single stranded molecules |
| 5 | It's life time is high | It is Short lived |
| 6 | It is stable and not hydrolysed easily byalkalis | It is unstable and hydrolyzed easily by alkalis |
| 7 | It can replicate itself | It cannot replicate itself. It is formed from DNA. |

**10.What are epimers ? give example (May22)**

Sugar differing in configuration at an asymmetric centre is known as epimers. The process by which one epimer is converted into other is called epimerisation and it requires the enzymes epimerase. Galactose is converted to glucose by this manner in our body.

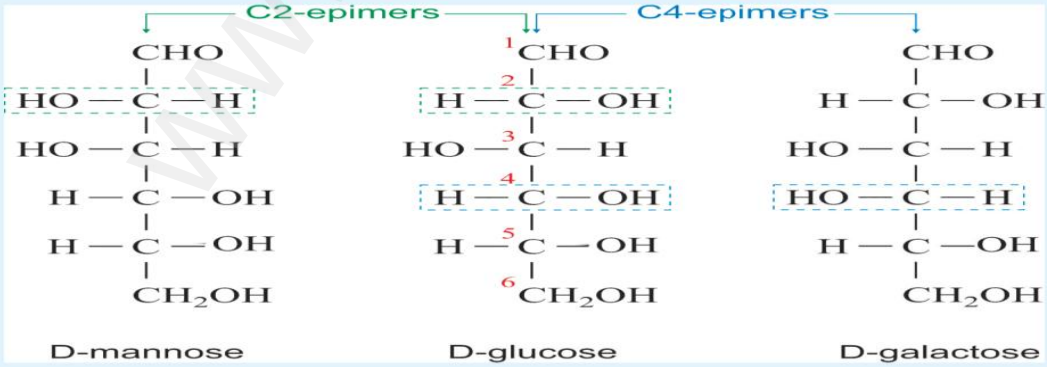
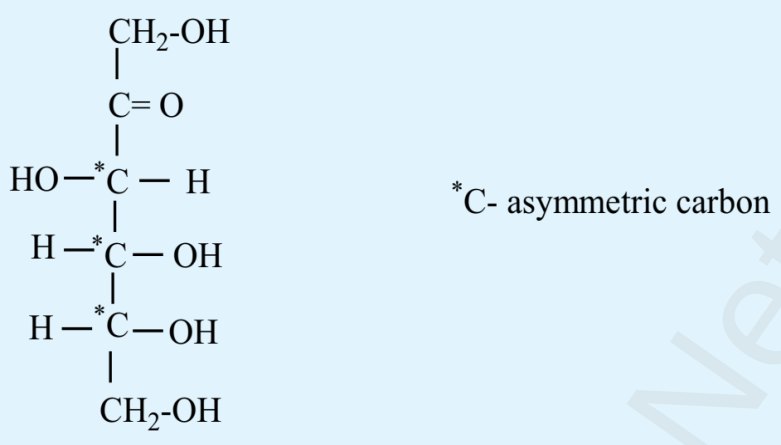



**Figure 14.6 Epimers: glucose and mannose are epimers at C2 carbon and glucose and galactose are epimers at C4 carbon**

**11. Draw the structure of D(+) fructose(jul 22)**



# 15.CHEMISTRY IN EVERYDAY LIFE

**One mark :-**

1.The medicinal value of drugs is measured in terms of its **Therapeutic Intex.** (mar20)

2. Major tranquilizers – **clozapine** (ins ex20)

Analgesics – **Aspirin**

NSAIDs – **Non steroidal anti-inflammatory drug**

Intravenous general anaesthetics – **propofol**

3.Amide- linked local anesthetics is **Lidocaine**(sep20)

**Other questions :-**

**1. State any three advantage of food additives (mar 20)**

**Advantages of food additives:**

1. Uses of preservatives reduce the product spoilage and extend the shelf-life of food
2. Addition of vitamins and minerals reduces the mall nutrient
3. Flavouring agents enhance the aroma of the food
4. Antioxidants prevent the formation of potentially toxic oxidation products of lipidsand other food constituents

**2. What is vulcanization (mar 20)**

- In the year 1839, Charles Good year accidently dropped a mixture of natural rubber and sulphur onto a hot stove. He was surprised to find that the rubber had become strong and elastic. This discovery led to the process that Good year called vulcanization.
- Natural rubber is mixed with 3-5% sulphur and heated at 100-150˚C causes cross linkingof the cis-1,4-polyisoprene chains through disulphide (-S-S-) bonds.
- The physical propertiesof rubber can be altered by controlling the amount of sulphur that is used for vulcanization.
- Insulphur rubber, made with about 1 to 3% sulphur is soft and stretchy.
- When 3 to 10% sulphuris used the resultant rubber is somewhat harder but flexible

**3.. Give a brief account antioxidants (sep 20)**

- Antioxidants are substances which retard the oxidative deteriorations of food.
- Foodcontaining fats and oils is easily oxidised and turn rancid. To prevent the oxidation of the fatsand oils, chemical BHT(butylhydroxy toluene), BHA(Butylatedhydroxy anisole) are addedas food additives.
- They are generally called antioxidants. These materials readily undergooxidation by reacting with free radicals generated by the oxidation of oils, thereby stop thechain reaction of oxidation of food.
- Sulphur dioxide and sulphites are also used as foodadditives. They act as anti-microbial agents antioxidants and enzyme inhibitors
-

**4.How do you classify the following into various class of drugs (sep 20)**

**a).Milk of magnesia b).Aspirin**

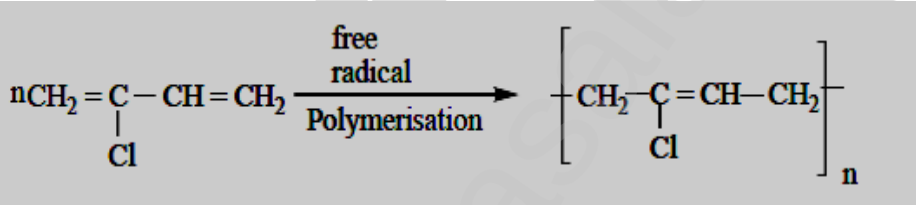
**c).penicillin d).procaine**

| Drugs | class of drugs |
|---|---|
| a).Milk of magnesia | Antacids |
| b).Aspirin | Antiinflammatory drugs(analgesics-non narcotic) |
| c).penicillin | Antimicrobials(beta-lactams) |
| d).procaine | Local anaesthetics(anaesthetics) |

**5.How is neoprene prepared ?( inst 20)**

**Preparation of Neoprene:**

The free radical polymeristion of the monomer, 2-chloro buta-1,3-diene(chloroprene) gives neoprene.




It is superior to rubber and resistant to chemical action.

**Uses:** It is used in the manufacture of chemical containers, conveyer belts.

**6.How to antiseptics differ from disinfectants ? ( inst 20)**

| S.NO | Antiseptics | Disinfectants |
|---|---|---|
| 1 | Stop or slow down the growth of microorganisms applied to living tissue | Stop or slow down the growth of microorganisms generally used on inanimate objects |
| 2 | Eg : $H_2O_2$povidone- iodine | Eg : Chlorine compounds alcohol , hydrogen peroxide |

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# YOUR HINTS



**"Life is nothing without chemistry**

**All are made up of atoms and molecules"**