

HMD

HALF YEARLY EXAMINATION - 2022

12 - Std

CHEMISTRY

Time : 3.00 hrs.

1 2 3 4 5 6 7 8 9 10 11 12

Marks : 70

SECTION - I

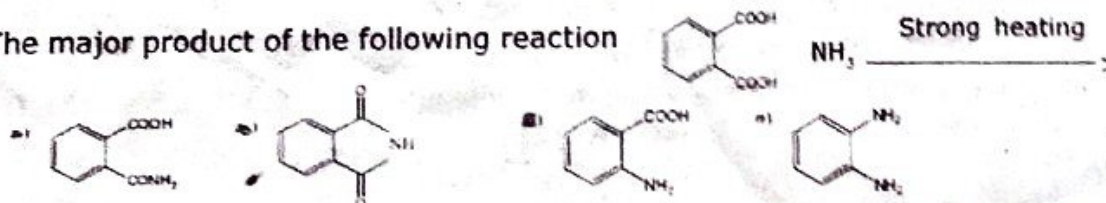
Note: 1) Answer all the questions.

15 X 1 = 15

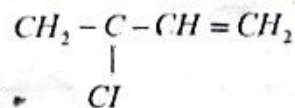
2) Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.

- Extraction of gold and silver involves leaching with cyanide ion. silver is later recovered by
a) Distillation b) Zone refining c) Displacement with zinc d) liquation
- The element that does not show catenation among the following p - block element is
a) Carbon b) Silicon c) Lead d) Germanium
- The metal used to prevent rusting of Iron and steel is
a) Au b) Zn c) Ag d) All of these
- The transition element which has only +3 oxidation state is
a) Ni b) Mn c) Cr d) Sc
- IUPAC name of the complex $K_3[Al(C_2O_4)_3]$
a) potassium trioxalato aluminium(III) b) potassium trioxalato aluminate(II)
c) potassium trisoxalato aluminate(III) d) potassium trioxalato aluminate(III)
- In a solid atom M occupies ccp lattice and $\left(\frac{1}{3}\right)$ of tetrahedral voids are occupied by atom N. find the formula of solid formed by M and N.
a) MN b) M_3N c) MN_3 d) M_3N_2
- If 50% of a first order reaction is completed in 60 minutes, 75% of the same reaction would complete in
a) 90 min b) 30 min c) 120 min d) 180 min
- Which of the following fluoro - compounds is most likely to behave as a Lewis base?
a) BF_3 b) PF_3 c) CF_4 d) SiF_4
- How many Faradays of electricity are required for the following reaction to occur
 $MnO_4^- \rightarrow Mn^{2+}$ a) 5F b) 3F c) 1F d) 7F
- On which of the following properties does the coagulating power of an ion depend?
a) Both magnitude and sign of the charge on the ion. b) size of the ion alone
c) the magnitude of the charge on the ion alone d) the sign of charge on the ion alone.
- Assertion : Phenol is more acidic than ethanol.
Reason : Phenoxide ion is resonance stabilized
a) if both assertion and reason are true and reason is the correct explanation of assertion.
b) if both assertion and reason are true but reason is not the correct explanation of assertion.
c) assertion is true but reason is false
d) both assertion and reason are false
- But-2-ene on ozonolysis followed by subsequent cleavage with zinc and water gives
a) ethanal b) propanal c) propanone d) methanal

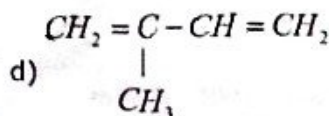
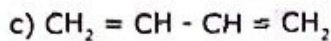
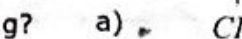
13. The major product of the following reaction



14. In a protein, various amino acids linked together by
 a) Peptide bond b) Dative bond c) α - Glycosidic bond d) β - Glycosidic bond



15. Which is the monomer of neoprene in the following?



SECTION - II

Answer any six questions and question number 23 is compulsory.

6 X 2 = 12

16. Using Ellingham diagram predict the conditions under which Magnesium could reduce alumina.
 17. Why do d - block elements forms complexes?
 18. $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ is coloured, while $[\text{Sc}(\text{H}_2\text{O})_6]^{3+}$ is colourless - explain.
 19. Atoms X and Y form bcc crystalline structure. Atom X is present at the corners of the cube and Y is at the centre of the cube. What is the formula of the compound?
 20. State Kohlraush's law.
 21. Peptising agent is added to convert precipitate into colloidal solution. Explain with an example.
 22. How will you convert glycerol into acrolein?
 23. Write short notes on Gombert reaction.
 24. Give the differences between primary and secondary structures of proteins.

SECTION - III

Answer any six questions and question number 29 is compulsory.

6 x 3 = 18

25. What is catenation? Describe briefly the catenation property of carbon.
 26. Which is more stable? Fe^{3+} or Fe^{2+} - explain.
 27. What are the limitations of VB theory?
 28. What is an elementary reaction? Give the differences between order and molecularity of a reaction.
 29. Can Fe^{3+} oxidises Bromide to bromine under standar conditions? Given
 $E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}$, $E^\circ_{\text{Br}_2/\text{Br}^-} = 1.09\text{V}$.
 30. Write a note on ultrafiltration.
 31. How will you distinguish primary, secondary and tertiary alcohol by Victor Meyer's method?
 32. Identify A, B and C ethanoic acid $\xrightarrow{\text{SOCl}_2}$ A $\xrightarrow{\text{Pd/BaSO}_4}$ B dil NaOH C
 33. What are bio degradable polymers? Give examples

SECTION - IV

Answer all the questions.

5 x 5 = 25

34. A) (i) What are the differences between minerals and ores? (2)
 (ii) Describe a method for refining nickel. (3) (OR)
 B) (i) Write a note on Fisher tropesch synthesis. (2)
 (ii) Write a short note on hydroboration. (3)
 35. A) (i) Give the uses of helium (2) (ii) Give the balanced equation for the reaction between chlorine with cold NaOH and hot NaOH. (3) (OR)
 B) Based on VB theory explain why $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is paramagnetic, while $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic. (5)
 36. A) Explain Schottky and Frenkel defect (5) (OR)
 B) (i) What is common ion effect? (2) (ii) Derive an expression for Ostwald's dilution law. (3)
 37. A) (i) Why does conductivity of a solution decreases on dilution of the solution? (2) (ii) Derive an expression for Nernst equation. (3) (OR)
 B) (i) Give any two differences between a sol and a gel. (2)
 (ii) Describe adsorption theory of catalysis. (3)
 38. A) Distinguish between primary, secondary and tertiary amines (any 5 differences)(5) (OR)
 B) (i) How do antiseptics differ from disinfectant? (2)
 (ii) Write a short notes on peptide bond. (3)

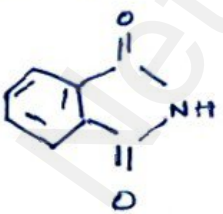
HND
12-Std

HAIF YEARLY EXAM - 2022

CHEMISTRY

SECTION - I

CHOOSE the correct answer.

- | | |
|---|--|
| 1) a) Displacement with zinc | 11) a) Both A and R are true R is correct explanation A |
| 2) c) lead | 12) a) ethanol |
| 3) b) Zn | 13) b)  |
| 4) d) sc | 14) a) peptide bond |
| 5) d) potassium trioxalato aluminate(III) | 15) a) $\text{CH}_2 - \underset{\text{Cl}}{\text{C}} - \text{CH} = \text{CH}_2$ |
| 6) d) M_3N_2 | |
| 7) b) 30 min | |
| 8) b) PF_3 | |
| 9) a) BF | |
| 10) a) Both magnitude and sign of charge on the ion | |

SECTION - II

2 MARKS

16. * ΔG° value of Mg is lower than ΔG° of alumina (1)
 * Below 1650K Mg reduce alumina into Aluminium (1)
17. * small size and high positive charge density (1)
 * They have vacant d orbital which accepts lone pair of electron from ligand to form complex ion (1)

18. $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ * Electronic configuration of $\text{Ti}^{3+} \Rightarrow 3d^1$ (2)
 * d-d transition is possible (2)
 * complex is coloured.
- $[\text{Sc}(\text{H}_2\text{O})_6]^{3+}$ * Electronic configuration of $\text{Sc}^{3+} \Rightarrow 3d^0$ (2)
 * d-d transition is not possible (2)
 * complex is colourless.

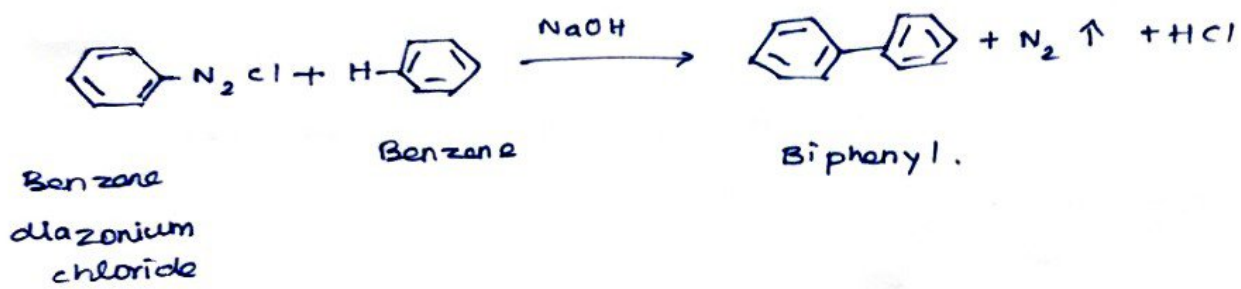
19.
 $x \Rightarrow$ corner of cube
 $y \rightarrow$ centre of cube
- $$x = 8 \times \frac{1}{8} = 1 \qquad y = 1 \times 1 = 1 \qquad [1]$$
- Molecular formula = xy [1]

20. Kohlrausch's Law
 * At infinite dilution, limiting molar conductivity of electrolyte is equal to sum of limiting molar conductivity of constituent ions. [2]



21.
 peptisation is process by which peptising agent is added to convert precipitate into colloidal solution [1]
- Example $\text{AgCl} \xrightarrow{\text{HCl}} \text{AgCl}$
 precipitate colloid. [1]

22. glycerol \rightarrow acrolein. [2]
- $$\begin{array}{ccc} \text{CH}_2 - \text{OH} & & \text{CH}_2 \\ | & & || \\ \text{CH} - \text{OH} & \xrightarrow[\Delta]{\text{KHSO}_4} & \text{CH} \\ | & & | \\ \text{CH}_2 - \text{OH} & & \text{CHO} \\ \text{glycerol} & & \text{acrolein (prop-2-enal)} \end{array}$$

(2)

3. Gomberg reaction

P4.

primary protein	secondary protein
 <p>* Relative arrangement of amino acids in the polypeptide chain</p> <p>* It is essential as even small changes can alter the overall structure</p>	 <p>* The amino acid in the polypeptide chain highly forms regular shapes through H-bond.</p> <p>* sub-structure</p> <ul style="list-style-type: none"> * α-helix * β-helix

SECTION - III

25. catenation:-

* catenation is the Ability of a element to form chain of atoms [1]

condition:-[any 2 \rightarrow 2]

- 1) The valency of the element should be greater than 2
- 2) The element should have ability to bond itself
- 3) The self bond should be strong bond.
- 4) Kinetic inertness of compound towards other molecule

26. $Fe^{+2} : [Ne] 4s^0 3d^6$ (1)
- $Fe^{+3} : [Ne] 4s^0 3d^5$ (1)
- * Fe^{+3} is more stable than Fe^{+2} because it has half-filled stable $3d^5$ electronic configuration. (1)

27. Limitation of VB Theory (any 3) $\rightarrow 3$
- * It fails to explain colour of complex
 - * It fails to explain inner and outer orbital complex of same metal.
 - * It considers only spin of magnetic moment. It does not consider the other components.

28. Elementary reaction:-

- * Each and every single step in a reaction mechanism is called as elementary reaction (1)

order of reaction	molecularity
<ul style="list-style-type: none"> * sum of the powers of concentration of coordi terms present in rate law * It's value can be zero fraction or a integer 	<ul style="list-style-type: none"> * It is total number of reactants present in elementary step * It's value is always whole number.

29. $E_{cell} = (E_{ox}^{\circ}) + (E_{red}^{\circ})$ (1)

$= -1.09 + 0.771$

$= -0.319V$ (1)

E_{cell} is negative ; ΔG is +ve and cell reaction is non-spontaneous

Hence, Fe^{3+} cannot oxidise Br^- to Br_2 (1)

30. ultra filtration.

* The separation of sol particles from electrolyte by filtration through ultrafilter is called ultrafiltration [12]

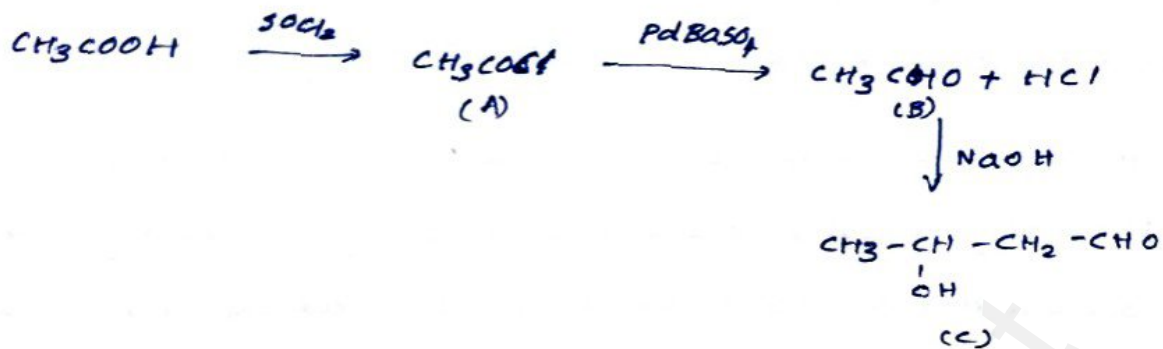
In ultrafiltration, the membranes are made by using collodion cellphane or visking when a colloidal solution is filtered using such a filter colloidal particles are separated on filter and the impurities are removed as washing. [12]

31. Victor Meyer test.

(3)

1° alcohol	2° alcohol	3° alcohol.
$\text{CH}_3 - \text{CH}_2 - \text{OH}$ ethanol	$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_3 \\ \\ \text{OH} \end{array}$ propan 2-ol	$\begin{array}{c} \text{CH}_3 \\ \\ \text{OH} - \text{C} - \text{CH}_3 \\ \\ \text{CH}_3 \end{array}$ 2-methyl propan 2-ol.
$\downarrow \text{P/I}_2$	$\downarrow \text{P/I}_2$	$\downarrow \text{P/I}_2$
$\text{CH}_3 - \text{CH}_2 - \text{I}$ Iodo ethane	$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_3 \\ \\ \text{I} \end{array}$ 2-Iodo propane	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{C} - \text{I} \\ \\ \text{CH}_3 \end{array}$ 2-Iodo 2-methyl propan
$\downarrow \text{AgNO}_2$	$\downarrow \text{AgNO}_2$	$\downarrow \text{AgNO}_2$
$\text{CH}_3 - \text{CH}_2 - \text{NO}_2$ Nitro ethane	$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_3 \\ \\ \text{NO}_2 \end{array}$ 2-Nitro etha propane	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{C} - \text{NO}_2 \\ \\ \text{CH}_3 \end{array}$ 2-methyl 2-nitro prop
$\downarrow \text{HONO}$	$\downarrow \text{HONO}$	$\downarrow \text{HONO}$
$\begin{array}{c} \text{CH}_3 - \text{C} - \text{NO}_2 \\ \\ \text{N} \\ \\ \text{OH} \end{array}$	$\begin{array}{c} \text{NO} \\ \\ \text{CH}_3 - \text{C} - \text{CH}_3 \\ \\ \text{NO}_2 \end{array}$ 2-nitro 2-nitroso propane	No reaction.
$\downarrow \text{KOH}$	$\downarrow \text{KOH}$	
Red colour	Blue colour	

32.



	Molecular Form	Name	
A	CH_3COCl	Acetyl chloride	(1)
B	CH_3CHO	Acetaldehyde	(1)
C	$\text{CH}_3 - \underset{\text{OH}}{\text{CH}} - \text{CH}_2 - \text{CHO}$	3-hydroxybutanal.	(1)

33. Bio degradable polymers

* The materials that are readily decomposed by microorganism in environment are called bio degradable polymers. (1)

Examples: * poly hydroxy butyrate (PHB) (2)

* poly lactic acid (PLA)

* poly glycolic acid (PGA)

(2)

SECTION - IV

34) A) ①

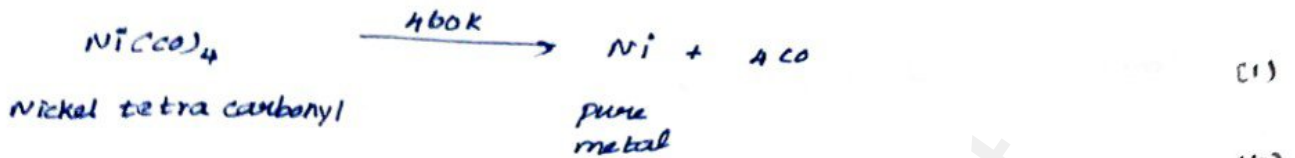
(2)

Minerals	Ore
* The naturally occurring substance obtained by mining which contain metal in pure state or compound Ex: clay	* An ore is a mineral which contain high percentage of metal which it can be easily and economically extracted Ex: Bauxite

A (ii) Mond process (refining Nickel)



Impure Ni Nickel tetra carbonyl (2)



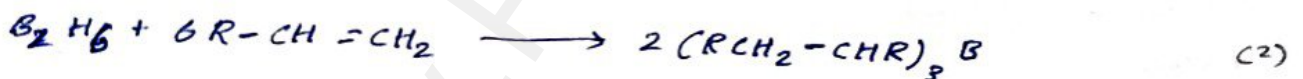
34) B) i) Fischer Tropsch synthesis:

Carbon monoxide + Hydrogen $\xrightarrow{500\text{K}/50\text{atp}}$ hydrocarbons



ii) hydroboration

* Addition of diborane with alkenes and alkynes in presence of ether at room temperature is called hydroboration (1)



35) A) i) uses of helium

Any 2
(2)

- * Helium and oxygen mixture prevent bends
- * Helium is used in low temperature science (cryopreservation)
- * It is used in filling Air balloons
- * It is used in electric arc welding of metal



Reaction between chlorine with cold NaOH and hot NaOH

chlorine + hot NaOH \rightarrow sodiumchlorate



[1/2]

chlorine + cold NaOH \rightarrow sodium hypochloride



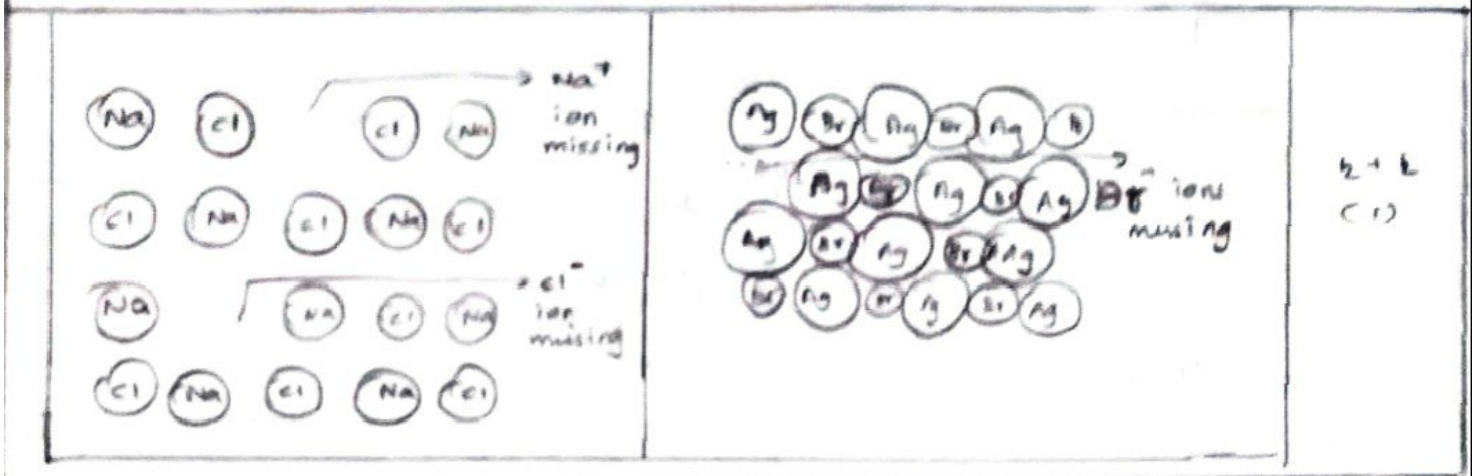
[1/2]

Property	$[\text{Ni}(\text{CN})_4]^{2-}$
central metal atom & its outer electronic configuration	$\text{Ni}: 3d^8 4s^2$ $\text{Ni}^{+2}: 3d^8 4s^0$
outer orbital diagram	
Nature of ligand	CN \rightarrow strong field ligand it causes pairing of electron.
outer orbital in presence of ligand	
Hybridisation	coordination number - 4 hybridization - sp^3
Magnetic property	No. of unpaired electrons = 0 No unpaired electron hence it is diamagnetic.

Property	$[Cr(NH_3)_6]^{3+}$	
central metal atom & its outer e^- configuration	Cr: $3d^4 4s^2$ Cr ³⁺ : $3d^3 4s^0$	(2)
outer orbital diagram	<p>Diagram showing 3d orbitals with 3 electrons (↑, ↑, ↑) and empty 4s and 4p orbitals.</p>	(2)
Nature of ligand	$NH_3 \rightarrow$ weak ligand No pairing takes place.	(2)
outer orbital in presence of ligand.	<p>Diagram showing 3d orbitals with 3 electrons (↑, ↑, ↑), empty 4s orbital, and empty 4p orbitals.</p>	(2)
magnetic property	no of un-pair electron = 3 \therefore it is paramagnetic.	(2)

36. A) Schottky defect.

Schottky Defect	Frenkel defect	
Schottky defect takes place due to the missing of equal number of Anion and cation from crystal lattice Ex: NaCl	Frenkel defect due to dislocation of ions from the crystal lattice Ex: AgBr	1+1 (2)
cation and anion should be smaller similar in size	cation and anion is dissimilar in size	2+2 (1)
It decrease density of crystal	does not decrease density of crystal.	2+2 (1)



B) ; Common ion effect :-

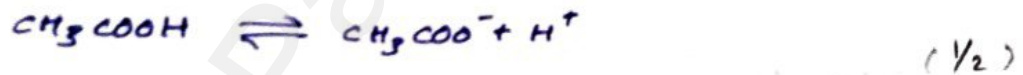
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* When a salt of weak acid is added to acid, the dissociation of weak acid decreases. This is known as common ion effect.

ii) Ostwald's dilution law :-

* It relates dissociation of weak acid (K_a) with degree of dissociation (α) and concentration (c)

$$\alpha = \frac{\text{no. of moles dissociated}}{\text{total no. of moles}} \quad (1/2)$$



concent	CH_3COOH	CH_3COO^-	H^+
initial no. of moles	1	-	-
no. of moles ionized	α	-	-
no. of moles remaining	$1-\alpha$	α	α
Equilibrium concentration	$(1-\alpha)c$	αc	αc

$$K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]} = \frac{(\alpha c)(\alpha c)}{(1-\alpha)c} \quad (1/2)$$

$$K_a = \frac{\alpha^2 c}{1-\alpha} \quad (1/2)$$

since $(1-\alpha)$ is very small

$$1 \gg \alpha$$

$$K_a = \frac{c\alpha^2}{1-\alpha}$$

$$\alpha^2 = \frac{K_a}{c}$$

$$\alpha = \sqrt{\frac{K_a}{c}}$$

(1/2)

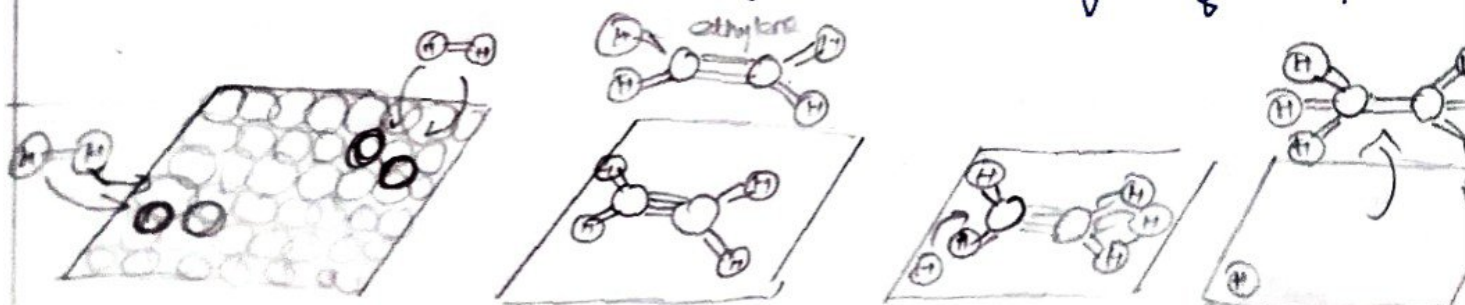
37 B. i)

sol	gel
* sol is colloidal solution of solid in liquid	* Gel is colloidal solution of liquid in solid
eg: Ink, Paint	eg: Butter, cheese

(2m)

ii) Theory of catalyst:-

- 1) The reactant molecule diffuse from bulk to catalyst surface
- 2) The reactant are absorbed on the surface of catalyst (1)
- 3) The absorbed reactant molecules are activated to form activated complex which is decomposed to form the product. (2)
- 4) The product molecules are absorbed (2)
- 5) The product diffuse away from the surface of catalyst (1)



Q 10

7) A) Nernst equation:

* It relates the cell potential and concentration of species involved in an electrochemical reaction



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

$$\Delta G = \Delta G^\circ + RT \ln Q \quad \longrightarrow \text{ (2) }$$

$$\left. \begin{aligned} \Delta G &= -nF E_{\text{cell}} \\ \Delta G^\circ &= -nF E_{\text{cell}}^\circ \end{aligned} \right\} \quad \longrightarrow \text{ (3) }$$

1, 3 \rightarrow (2)

$$\Delta G^\circ$$

$$-nF E_{\text{cell}} = -nF E_{\text{cell}}^\circ + RT \ln \frac{[\text{C}]^l [\text{D}]^m}{[\text{A}]^x [\text{B}]^y}$$

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{RT}{nF} \ln \frac{[\text{C}]^l [\text{D}]^m}{[\text{A}]^x [\text{B}]^y}$$

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{2.303}{nF} \log \frac{[\text{C}]^l [\text{D}]^m}{[\text{A}]^x [\text{B}]^y} \quad \longrightarrow \text{ (4) }$$

By applying known value

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{0.0591}{n} \log \frac{[\text{C}]^l [\text{D}]^m}{[\text{A}]^x [\text{B}]^y} \quad \longrightarrow \text{ (5) }$$

38) A)

Any 3 difference
(5M)

Reagent	1° amine	2° amine	3° amine
1) Nitrous acid (HONO)	Forms alcohol	Forms N-nitroso amine	Forms salt
2) Chloroform and KOH	forms carbamine	No reaction	No reaction
3) Acetyl chloride	forms N-alkyl acetamide	form N,N-dialkyl acetamide	No reaction
4) CS_2 and $HgCl_2$	forms alkyl isothiocyanate	No reaction	No reaction
5) Alkyl halide	with 3 moles of alkyl halide quaternary ammonium salt is formed	with 2 moles of alkyl halide quaternary ammonium salt formed	with 1 mole of alkyl halide quaternary ammonium salt formed

B) i)

antiseptics	disinfectant.
<ul style="list-style-type: none"> * stop or slow down the growth of micro organism * Applied to living tissue 	<ul style="list-style-type: none"> * stop or slow down the growth of micro organism * Generally used on inanimate object
eg: hydrogen peroxide	eg: Alcohol, chlorine compound

ii) peptide Bond:-

• carboxyl group of first amino acid react with the amino group of the second amino acid to give an amide linkage between those amino acids.

