

GOVERNMENT OF KARNATAKA
KARNATAKA STATE PRE-UNIVERSITY EDUCATION EXAMINATION BOARD

II YEAR P U C EXAMINATION- MARCH- 2012

SCHEME OF VALUATION

Subject code- 34

Subject – CHEMISTRY

Q.NO	PART- A	Marks allotted
1.	What is the gas liberated at anode during the manufacture of Caustic Soda Using Nelson's cell? Chlorine or Cl_2	1
2.	Atomic size of 3d series elements from chromium to copper is almost the same. Give reason. Increase in screening effect or shielding effect of 3d electrons compensates <u>or</u> balances <u>or</u> neutralizes the increase in nuclear charge	
3.	Give the IUPAC name of $\text{Zn}_2[\text{Fe}(\text{CN})_6]$. zinc hexacyanoferrate (II)	
4.	Write the mathematical form of Rault's law of relative lowering of vapour pressure. $\frac{P^\circ - P}{P^\circ} = \frac{n_2}{n_1 + n_2} \quad \text{OR} \quad \frac{P^\circ - P}{P^\circ} = X_B$ or mole fraction of solute $\frac{P_A^\circ - P_s}{P_A^\circ} = \frac{n_2}{n_1 + n_2}$	
5.	Hpw many faradays of electric current is required to liberate 5600cm ³ of oxygen at STP by the electrolysis of acidified water? One OR 1 OR IF OR I faraday	

6. What type of crystalline solid is graphite?

Covalent / Atomic / network of atoms

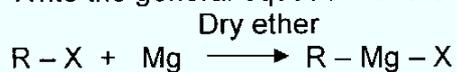
7. What is 'electromeric effect' ?

Temporary polar effect by the shift of π electrons of a multiple bond to one of the atom at the multiple bond in presence of an attacking agent.

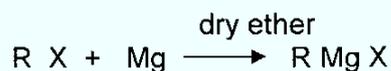
OR

Complete transfer of shared pair of π electrons of the multiple Bond to one of the atom at the multiple bond in presence of an attacking reagent.

8. Write the general equation for the formation of Grignard reagent.



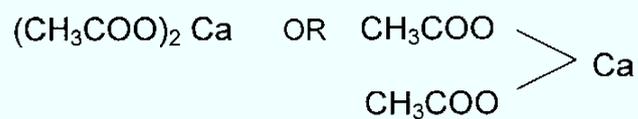
OR



(dry ether / ether should be mentioned)

9. A $\xrightarrow{\text{dry distil}}$ acetone + calcium carbonate. Identify 'A'

Calcium acetate OR Calcium ethanoate OR



10. Is Lysine acidic or basic ?

Basic

PART- B

- 11 Name the element in the 3d series that ~~shows~~ ^{shows}
 i) shows maximum oxidation state
 ii) is diamagnetic

i) Manganese OR Mn

ii) Zinc OR Zn

- 12 How are helium and Neon gases separated from one another from a mixture of noble gases from Dewar's process?

Mixture of noble gases brought in contact with coconut charcoal at 173K (-100°C). He and Ne comes out unadsorbed.

Mixture of He Ne brought in contact with charcoal at 93K (-180°C). Ne gets adsorbed. He gas separates out.

OR

Flow chart with temperatures.

- 13 Based on 'electron gas theory' explain why metals are malleable.

When force (stress) is applied to a metal Kernel (positive ions or lattice points) layers slide over one another. The shape of the metal gets deformed.

Freely moving electrons also move around the deformed layers and the environment around the metal ions remains unchanged.

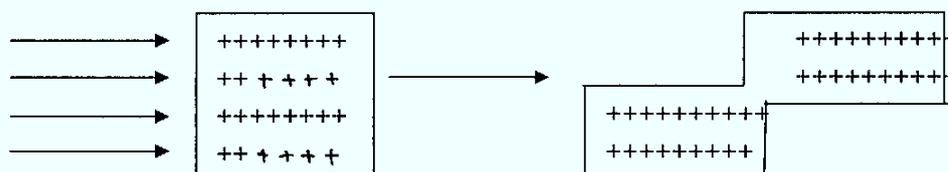
OR

According to electron gas theory a metal contains an array of positively charged metal ions in a Sea of mobile valence electrons and the bonding is non-directional.

When force(stress) is applied to a metal the Kernel layers slide one over the other. The shape of the metal gets deformed.

OR

Force



Explanation

- 14 What is a spontaneous process ? What happens to the entropy of the universe during a spontaneous process?
 A process that takes place by itself, without any external aid.
 OR
 A process that takes place by itself, without any external aid, under the given conditions.
 OR
 A process that takes place by itself, without any external aid, but with proper initiation.
 OR
 A process that has a natural tendency to occur on its own, under the given conditions. 1
- Increases OR ΔS is positive OR $\Delta S = +ve$ 1
- 15 Define half life period for a reaction. How is it related to the order of a reaction.
 Time required for the concentration of the reactant to get reduced to half of its initial value.
 OR
 Time required for a reaction to be half completed.
 OR
 Time during which half of the reactants are converted into products
 OR
 Time during which 50% of the reaction is completed / reactants are converted into products.
- $t_{1/2} \propto \frac{1}{a^{n-1}}$ OR $t_{1/2} \propto a^{1-n}$ 1
- 16 Calculate the pH of 0.1 M formic acid. Degree of dissociation of formic acid is 4×10^{-2} .
- $[H^+] = C \alpha$
 $= 4 \times 10^{-2} \times 10^{-1} = 4 \times 10^{-3} \text{ M}$ 1
- $pH = -\log[H^+]$
 $= -\log 4 \times 10^{-3}$
 $= 2.3979$ 1

OR

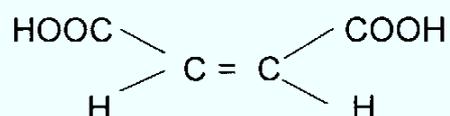
Any other alternative correct method.

- 17 Name the type of colloid obtained when
 i) a liquid is dispersed in a solid
 ii) a liquid is dispersed in a liquid

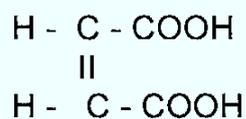
- i) gel
 ii) emulsion

1
 1

- 18 i) write the structure of maleic acid



OR



1

- ii) what is optical activity ?

Property of a compound by which it rotates the plane polarized light.

OR

Some compounds have the ability to rotate the plane polarized light. This phenomenon is called optical activity

1

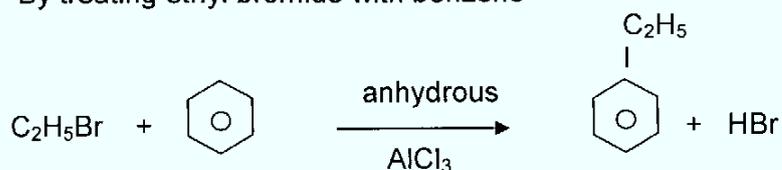
- 19 How is ethyl bromide converted into ethyl benzene by Friedel-Crafts reaction? Give the equation.

By treating ethylbromide with benzene in presence of anhydrous AlCl_3 .

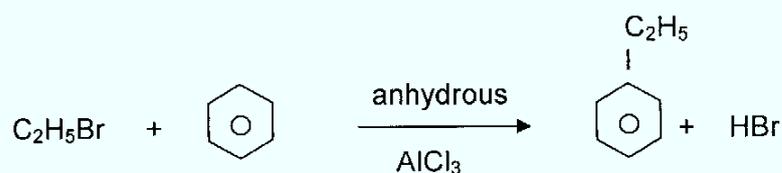


OR

By treating ethyl bromide with benzene



OR



benzene

ethyl benzene

2

(Anhydrous AlCl_3 or Anhy FeCl_3 or any other lewis acid) must be mentioned either in the equation or statement. If not deduct 1 mark

- 20 Acetic acid is a weaker acid than formic acid and chloroacetic acid is a stronger acid than formic acid. Give reasons.

Due to +I effect of $-\text{CH}_3$ group, the carboxylate ion gets stabilized

Due to -I effect of $-\text{Cl}$ group, the carboxylate ion gets stabilized

OR

$-\text{CH}_3$ group is an electron releasing group

$-\text{Cl}$ is an electron withdrawing

OR

-due to +I effect of $-\text{CH}_3$ group

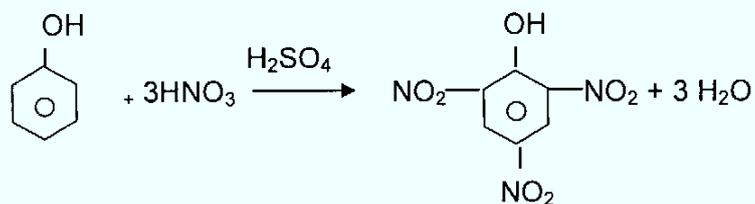
-due to -I effect of $-\text{Cl}$

1
1

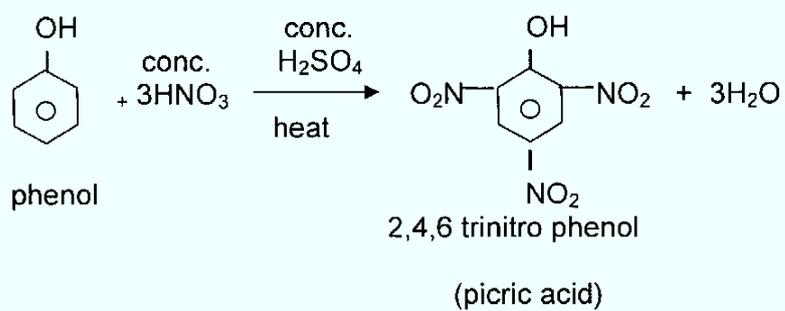
(2nd part of the question grace one mark)

- 21 How is phenol converted into picric acid ? Give the equation for the reaction.

By heating phenol with conc. HNO_3 and conc. H_2SO_4 / Nitrating mixture.



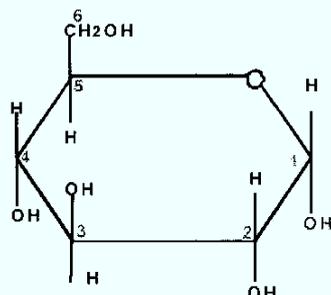
OR



22 i) What is a monosaccharide ?

Simplest carbohydrate that cannot be hydrolysed.

ii) Write the Haworth's structure of α -D glucose.



α -D (+) Glucopyranose

PART C

I Answer any two of the following questions :

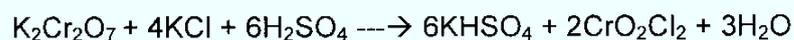
23 a) Describe Parke's process for the desilverisation of argentiferous lead.

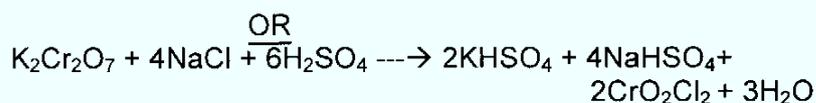
Argentiferous lead is melted by heating it to 800°C . Zinc is added to it. Silver is 300 hundred times more soluble in molten Zinc than in molten lead at 800°C . Much of the silver passes in to Zinc layer. Upon cooling, Zn-Ag alloy (mixture) solidifies first, it is separated Zn and Ag are separated by distillation.

b) Name the reaction that takes place when a mixture of potassium dichromate and potassium chloride (or sodium chloride) crystals is warmed with conc. sulphuric acid. Give the equation for the reaction.

Chromyl chloride

EQUATION :





1

24 a) Write three salient features of 'Molecular orbital theory'.

1. When atomic orbitals combine (by LCAO) molecular orbitals are formed.
 2. When two atomic orbitals combine two molecular orbitals are formed, one is bonding and another is anti bonding.
 3. Bonding molecular orbitals have lower energy than anti bonding molecular orbitals.
 4. Molecular orbitals are poly centric.
 5. Shape of the molecular orbitals depends on the shape of the combining atomic orbitals.
 6. Filling up of molecular orbitals with electron follow Aufbau principle, Pauli's exclusion principle and Hund's rule.
 7. The total energy of the molecule is the sum of the energies of the filled molecular orbitals.
- (Any other relevant feature) Each point one mark, any three.

3

b) i) A noble gas is used in radiotherapy. Name the noble gas.

1

Radon or Rn

ii) How many cyanide ions in $\text{K}^4[\text{Fe}(\text{CN})_6]$ are involved in satisfying the primary valency of the central metal ion also ?

1

Two or 2

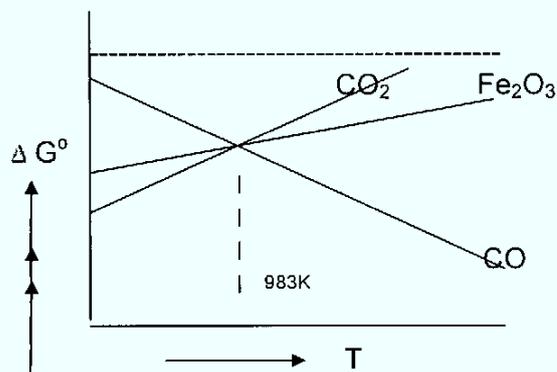
- 25 a) Draw Ellingham diagram [ΔG° Vs T] for the oxidation of carbon monoxide and for the formation of Fe_2O_3 and CO . Suggest suitable reducing agents for the reduction of Fe_2O_3 at a temperature below 983 K (710°C) and at a temperature above 983 K.

Ellingham diagram for CO

Ellingham diagram for CO_2 and Fe_2O_3

Below 983K – CO

Above 983K – C



1

1

1/2

½

- b) State EAN rule for coordination compounds.

A central metal atom/ion in a coordination compound goes on accepting electron phase from the ligands until the total number of electrons around it becomes equal to the atomic number of next nearest noble gas.

2

- II Answer any three of the following :

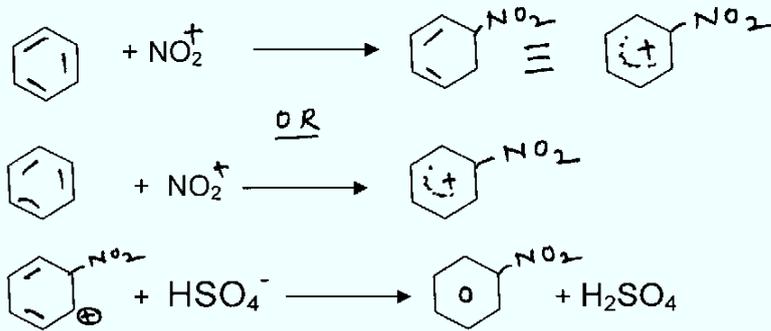
- 26 a) Write the equations for the steps involved in the mechanism proposed for the nitration of benzene.



OR



1



(Reversible symbol has no value point)

b) i) How is a peptide bond formed between two α - amino acids?

When $-\text{NH}_2$ group one α -Amino acid reacts with $-\text{COOH}$ group of another with elimination of a molecule of water.

OR

By a condensation reaction between two α -Amino acids with elimination a molecule of water.

OR

When the basic group of one α -Amino acid reacts with acidic group of the other, by eliminating a molecule of water.

ii) Mention the biological importance of insulin.

Regulates/ maintains blood sugar level

OR

Controls the metabolism of carbohydrates

OR

Hormone

OR

Any other relevant answer

- 27 a) i) What happens when a triglyceride is boiled under pressure with dilute sulphuric acid?
b) What are the products formed?

1

Hydrolysis

Glycerol -----1/2 mark

Fatty acids-----1/2 mark

- ii) Rancidity is more in oils than in fats. Why?

Oils have higher % age of unsaturated glycerides

OR

Oils have higher % age of unsaturated fatty acid residues

OR

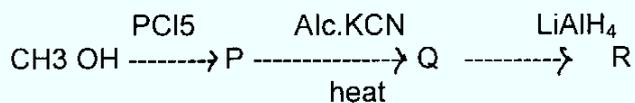
Oils have higher % age of unsaturation

OR

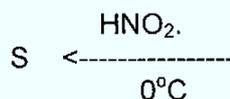
Iodine value of oil is higher than that of fats.

1

- b) Identify P, Q, R and S in the following conversions:



2

P ---- CH_3Cl Q ---- CH_3CN R ---- $\text{CH}_3\text{CH}_2\text{NH}_2$ S ---- $\text{CH}_3\text{CH}_2\text{OH}$ $\frac{1}{2}$ MARK EACH

- 28 a) How is phenol isolated from the middle oil fraction of coal tar?

Middle oil contains (170-230°C) mainly phenols, naphthalene, traces of pyridine

1

Middle oil fraction is cooled, naphthalene crystallizes. It is removed
crude phenol is washed with dilute H₂SO₄ and then treated with NaOH
solution.

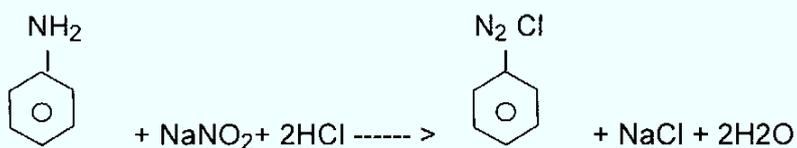
Sodium phenate formed, in the aqueous layer is separated, acidified to
regenerate (get) phenol



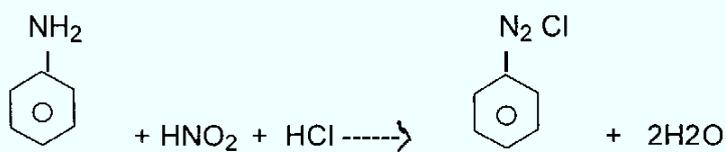
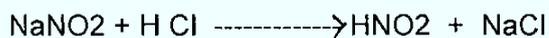
(For acidification CO₂ or H₂SO₄ can be used)

b) Name the organic compound obtained when aniline is treated
with sodium nitrite and dilute HCL at 0^o C. Give the equation for the reaction.

Benzene diazonium chloride



OR



29 a) Name the products obtained when benzaldehyde is made to undergo
Cannizzaro's reaction using a concentrated solution of
potassium hydroxide.

Give the equation of the reaction.

1

~~1~~
2~~1~~
2

1

4

1

1

1

Benzyl alcohol -----1/2 M
 Potassium benzoate-----1/2 M



1

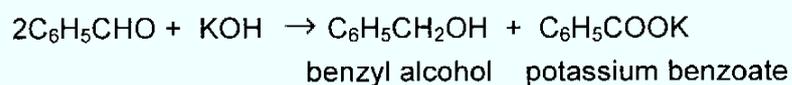
OR



2

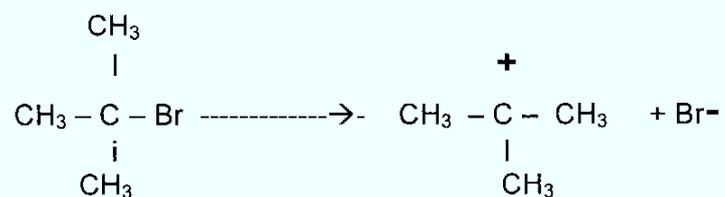
(Equation + names) benzyl alcohol potassium benzoate

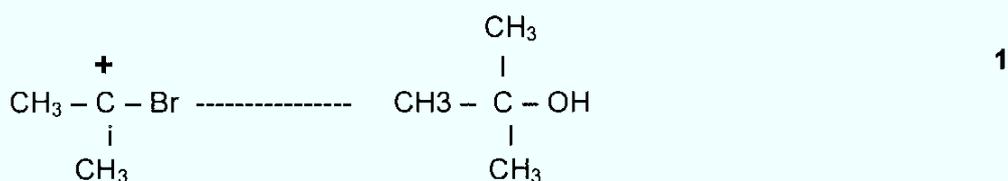
OR



2

b) Write equations for the steps involved in the mechanism proposed for the hydrolysis of tertiary butyl bromide.





c) What is the hybridization of carbon atoms in benzene ?

sp^2 1

III Answer any three of the following of the questions :

30 a) Write three postulates of Arrhenius theory of electrolytic dissociation.

1. When an electrolyte is dissolved in water its molecule splits up into electrically charged particles called ions.
2. Total charge on cation is equal to total charge on anions.
3. Ionisation is a reversible process.
4. Ions are responsible for passage of electric current through the solution.
5. Degree of ionisation increases with dilution.
6. The property of the electrolyte in the solution is the properties of the ion present in the solution.

3

(Any other relevant postulate) each point carries one mark-any three

b) Calculate the standard free energy change for a reaction at 273 K, if the equilibrium constant of the reaction at 273 K is 20 ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

$$G^\circ = -2.303 R T \log k$$

$$G^\circ = -2.303 \times 8.314 \times 273 \times \log 20$$

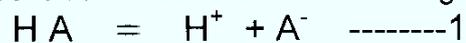
$$G^\circ = -6800.54 \text{ J}$$

1

1

31 a) Derive Henderson's equation for an acidic buffer.

Consider an acidic buffer containing



Applying the law of mass action to eq. 1

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$[H^+] = \frac{K_a [HA]}{[A^-]}$$

due to common ion effect ; $[HA] = [\text{Acid}]$
 $[A^-] = [\text{Salt}]$

$$[H^+] = K_a \frac{[\text{Acid}]}{[\text{Salt}]}$$

taking \log_{10} on both sides and then multiplying by negative sign , we get,

$$-\log_{10}[H^+] = -\log_{10} K_a - \log_{10} \frac{[\text{Acid}]}{[\text{Salt}]}$$

$$\text{pH} = \text{p}K_a + \log_{10} \frac{[\text{Salt}]}{[\text{Acid}]}$$

OR

Derivation using a weak acid and its salt.

Eg : $\text{CH}_3\text{COOH} / \text{CH}_3\text{COONa}$

b) Classify the following into Lewis acid and Lewis base.

- i) NH_3
- ii) BF_3
- iii) H^+
- iv) H_2O

- i) NH_3 -----Lewis base
- ii) BF_3 -----Lewis acid
- iii) H^+ -----Lewis acid
- iv) H_2O -----Lewis base

½ mark each

32 a) With respect to a sol (a colloid) what is

- i) dialysis
- ii) electrophoresis
- iii) coagulation ?

i) The process of removal of particles of true solution (crystalloids) from a sol(colloid) using a semi permeable membrane/ animal membrane/ parchment paper. 1

OR

The process of removal of particles of true solution by their diffusion through semi permeable membrane.

ii) Movement of colloidal particles towards the oppositely charged electrode under the influence of an electric field. 1

OR

Movement of colloidal particles towards cathode or anode in an electric field.

iii) The phenomenon of precipitation of a colloidal solution (sol) 1

OR

The phenomenon by which colloidal particles aggregate (grow bigger) to form a precipitate.

b) Give reasons :

i) Copper displaces silver from silver nitrate solution.

Copper is more electro positive than silver.

OR

Copper is a stronger reducing agent than silver.

OR

SRP of copper is less than that for silver

1

OR

1

Copper is above silver in electro chemical series.

ii) Iron pipes are usually coated with zinc.

To prevent rusting/ corrosion of iron.

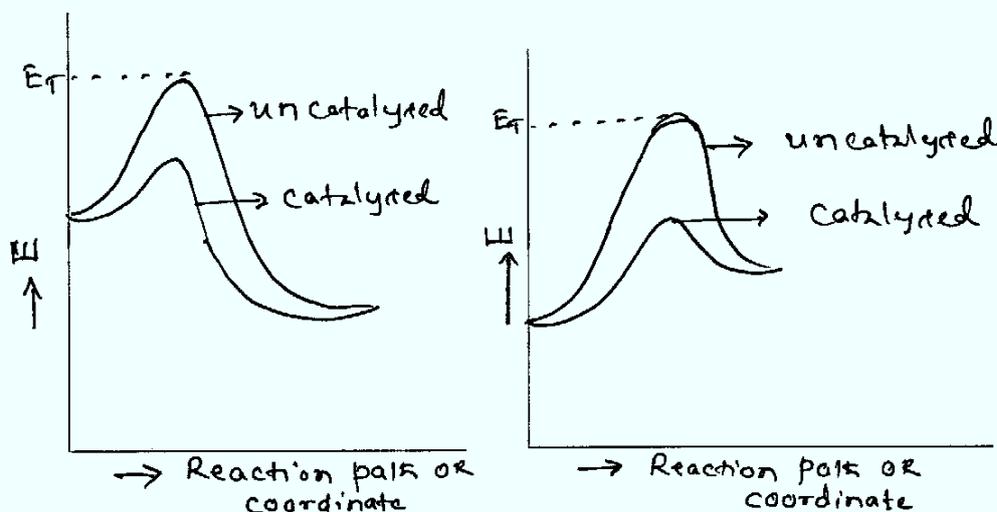
- 33 a) Define energy of activation. Draw a diagram of energy profile to show the influence of a positive catalyst on the energy of activation of a reaction.

Minimum extra energy that the reacting molecule should acquire to reach threshold energy / enter into effective collision and to form products.

OR

It is the difference between threshold energy and normal average energy of the reacting molecule.

1



2

- b) Using the principles of common ion effect and solubility product explain why NH_4Cl and NH_4OH are used for the selective precipitation of III group basic radicals as their hydroxides.

K_{sp} value of III group metal hydroxide is very low.

1

Due to Common ion effect, the degree of dissociation of ammonium hydroxide is suppressed with low concentration of OH^- ions, the ionic

1

product of III group metal hydroxides alone exceeds its K_{sp} value.

34 a) i) what is osmotic pressure ?

Extra pressure that must be applied to a solution just to prevent osmosis.

OR

Extra pressure that must be applied to a solution just to prevent the flow of solvent into it, through a semi permeable membrane.

OR

The excess hydrostatic pressure that develop on the solution due to osmosis.

ii) State Van't Hoff's-Boyle's law.

At constant temperature, the osmotic pressure of a solution is directly proportional to (molar) concentration of the solution.

iii) What is an ideal solution ?

A solution which obeys Raoult's law of liquid mixture for all values of concentration and temperature.

OR

A liquid mixture in which both the components Raoult's law for all values of concentration and temperature.

b) i) Define co ordination number for a particle in a crystal.

Number of nearest neighbouring particles for a particle in a crystal.

ii) How many particles are present in a unit cell of FCC ?

Four OR 4.

D1

PART D

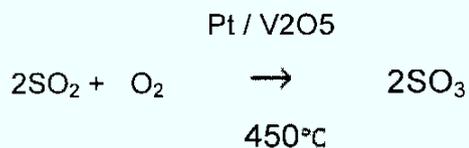
35 a) i) Starting from purified sulphur dioxide (SO_2) and air mixture mention the steps involved in the manufacture of sulphuric acid by contact process. Give the equations for the reactions occurring in these steps. (flow chart/ diagram not expected)

i) SO_2 is oxidizes to SO_3 in presence of platinised asbestos or V_2O_5 catalyst, heated to $450^\circ C$



1

OR

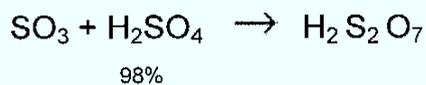


SO_3 is dissolved in 98% H_2SO_4 to form oleum

1



OR

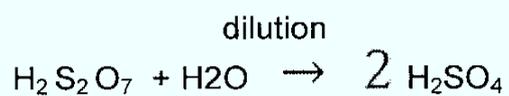


1

Oleum is diluted to get H_2SO_4 of desired concentration.



OR



1

ii) Write the electronic configuration of Lithium molecule (Li_2)



OR



1

1

b) i) What causes angle strain in a ring of cycloalkane? Name the

cycloalkane that has maximum angle strain.

Deviation of angle in the ring of the cycloalkane from the normal tetrahedral angle/ $109^{\circ} 28'$.

OR

Deviation from the normal tetrahedral angle / $109^{\circ} 28'$.

Cyclopropane.

ii) Give one reaction to indicate the presence of a carbonyl group in glucose.

Glucose reacts with hydroxyl amine to form an oxime

OR

Glucose reacts with hydrogen cyanide to form a cyanohydrin.

c) Calculate the electrode potential developed when a silver electrode is dipped in 0.025 M silver nitrate solution at 289 K ($E^{\circ}_{Ag} = +0.8$ V).

$$E = E^{\circ} + \frac{0.0591}{n} \log [M^{+n}]$$

$$E = +0.8 + \frac{0.0591}{1} \log(0.025)$$

$$E = +0.8 + \frac{0.0591}{1} \log 2.5 \times 10^{-2}$$

$$E = + 0.7529 \text{ V}$$

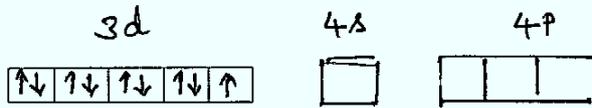
OR

$$E = E^{\circ} + \frac{2.303 R T}{n F} \log [M^{+n}]$$

36 a) On the basis of Valence bond theory account for the hybridization, shape and magnetic property of cuprammonium ion.



Box diagram:

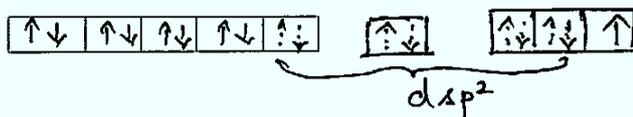


under the influence of approaching NH_3 ligand an e^- from 3d gets excited to 4p



The four empty orbitals undergo dsp^2 hybridisation to form four hybrid orbitals of equal energy

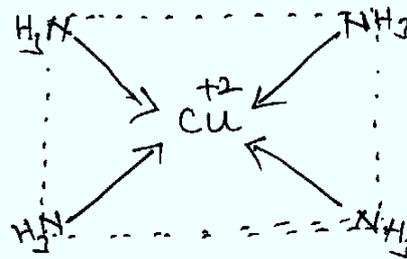
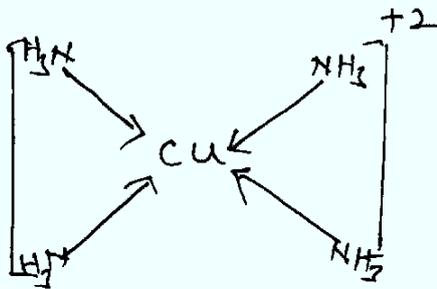
The orbitals of the ligand which contain lone pair of electrons overlap with hybrid orbitals of Cu^{+2} ion to form coordinate bond



shape --- squar planar

OR

STRUCTURE



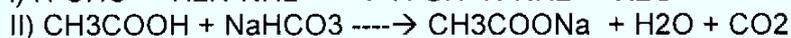
Magnetic property : Paramagnetic

b) Give equations for the reactions that occur when :

i) Formaldehyde reacts with hydrazine

ii) acetic acid reacts with sodium bi carbonate solution

iii) methyl amine reacts with acetyl chloride



OR



c) Rate constant of a first order reaction A products is 0.016 min^{-1} . Calculate the time required for 80% of the reaction to be completed.

$$K = \frac{2.303}{t} \log \frac{a}{a-x} \quad 1$$

$$t = \frac{2.303}{0.016} \log \frac{100}{100-80} \quad 1$$

$$t = \frac{2.303}{0.016} \log 5 \quad 1$$

$$t = 100.6 \text{ min}$$

D2 Answer any two of the following :

37 a) In the preparation of p-bromoacetanilide from acetanilide :

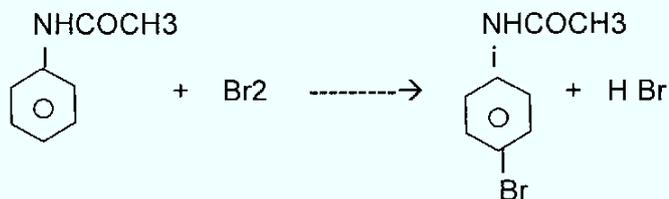
i) Name the reagents used.

ii) Write the equation for the reaction involved.

iii) What is the color of the product obtained.

i) Bromine , glacial acetic acid

ii)



iii) White

1

b) How is Xanthoproteic test for a protein performed ? What is the observation made ?

By treating the protein with conc. HNO₃
yellow colour / yellow precipitate

1

1

- 38 Describe the experiment the determine the effect of temperature on the rate of the reaction between potassium persulphate and potassium iodide. What is the conclusion drawn from the experiment ?

1



Procedure : Prepare the reaction mixture by mixing 0.1 N K₂S₂O₈ + 0.1N K I kept at t₁^o C. and start the stop clock. at regular intervals of time a sample of the mixture is pipetted into a conical flask containing ice cold water (containing K I).

It is then titrated against 0.1 Na₂S₂O₃ using starch as indicator near the end point. End point is disappearance of blue color. Volume of Na₂S₂O₃ consumed is recorded. Repeat the above procedure by keeping the reagent at t₂^oC. (t₂ > t₁)

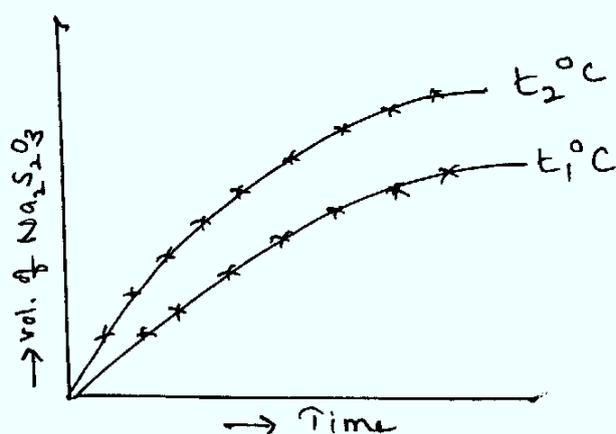
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1

Tabulation

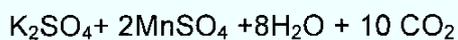
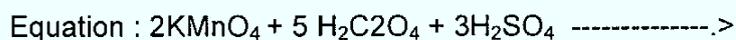
$\frac{1}{2}$

Time	Burette Readings		volume of Na ₂ S ₂ O ₃
	Final	Initial	
5			
10			
15			
20			
25			

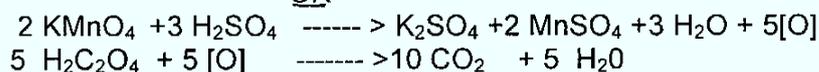


CONCLUSION: The rate of chemical reaction increases with increase in temperature

- 39 Describe the experimental procedure and give the calculations involved in the estimation of potassium permanganate present in one dm³ of its solution using standard oxalic acid solution. Give the equation for the redox reaction.



OR



Procedure : 10 cm³ of oxalic acid solution is pipetted into a clean conical flask. Add one test tube full of dilute H₂SO₄.

Warm the reaction mixture nearly to boiling (nearly 80° C)

The hot solution is titrated against KMnO₄ taken in the burette.

End point is colour change from colourless to pale pink. Titrations to repeated to get agreeing values Results are tabulated.

Calculation:

$(N_1 V_1)_{\text{KMnO}_4} = (N_2 V_2)_{\text{H}_2\text{C}_2\text{O}_4}$

$$N_{\text{KMnO}_4} = \frac{N_2 \times 10}{V_{\text{KMnO}_4}} \quad 1$$

$$= \text{-----}N$$

Mass of KMnO_4 / $\text{dm}^3 = N_{\text{KMnO}_4} \times \text{g. equivalent mass}$

$$= \text{-----} \times 31.6 \text{ g}$$

$$= \text{-----} \text{ g} \quad 1$$

(if equivalent mass of KMnO_4 is not mentioned or wrong deduct $\frac{1}{2}$ mark)

— — x — —