III Semester B.Sc, Model question paper I
CBCS Syllabus ChemistryPaper−III

Time:3hours **Max marks: 70**

Instructions: 1. The question paper has **two** parts.
2. Answer **both** the parts.
3. Write diagrams and chemical equations wherever necessary.

PartA

Answer **any eight** of the following questions. Each question carries **two** marks. (8x2=16)

1. Define the term Energy of activation of a reaction
2. State any two forms of II law of thermoldynamics.
3. Calculate the entropy change involvedwhen one mole of Sulphurchanges from its rhombic state to monoclinic state. Heat of transition of the process carried out reversibly is 322.17 J/mole at transition temperature 95.6^{o} C.
4. How lithium dimethyl cuprate is synthesised from methyl iodide.
5. Write the mathematical form of Freundlich adsorption isotherm and indicate the terms.
6. Give any two differences between organic and inorganic polymers.
7. Show that $C_p - C_v = R$.
8. Give any two salient features of Ellingham diagrams.
9. What are thios? Write the structure of 2-propanethiol.
10. Explain PinacolPinacolone rearrangement with an example.
11. How phenol is converted to salol ?
12. Give any two functions of nitrogen as plant nutrient.

PartB

Answer **any nine** of the following questions. Each question carries six marks. 6×9=54

13. a) Define half life period of a II order reaction. Derive an expression for half-life period of a second order reaction, where a=b.
b) Decomposition of gas is of II order. When the initial concentration of the gas is $5x10^{-4}$M, it is 40% decomposed in 50 mins. Calculate the velocity constant. (4+2)

14. a) How monohydric alcohols are prepared from: Carbonyl compounds. Give examples.
b) Explain the structure of diborane. (3+3)

15. a) How Thorium is extracted from Monazite ?
b) Aluminium metal is used to reduce oxide of chromium during its metallurgy, give reasons.
(4+2)

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16. a) Explain Williamson's synthesis with diethylether as an example.
b) Explain Darzen's reaction? Give an example. (4+2)

17. a) Derive an expression for Langmuir adsorption isotherm.
b) What are adsorption indicators? Give an example.(4+2)

18. a) Derive Kirchhoff's equation.
b) What are Organo metallic compounds? How methyl magnesium iodide Converted in to acetone? (3+3)

19. a) How Urea is manufactured?
b) What is super phosphate of lime? Mention any one of its advantage as a Phosphate fertilizer. (4+2)

20. a) Explain hydroboration reaction with an example.
b) What is the action of $LiAlH_4$ on epoxides? (4+2)

21. a) Derive Clausius-clapeyron equation.
b) State Nernst heat theorem. (4+2)

22. a) Explain the effect of i) electron withdrawing group ii) electron donating group on the acidity of phenol.
b) Discuss umpolung character in carbonyl compounds with an example (4+2)

23. a) How Nickel is extracted from pentlandite ore.
b) What is PEDT polymer? Give an example. (4+2)

24. a) 2 moles of an ideal is allowed to expand isothermally and reversibly from $2dm^3$ to 12 dm^3 at 300K. Calculate the maximum work done in the process (R=8.314J/K/mol).
b) Define Entropy. Mention its significance. (4+2)

25.a) Explain the determination of rate constant of the reaction between Potassium per-sulphate and potassium iodide by spectrophotometric method.
b) How the order of a reaction determined by Ostwald's isolation method? (4+2)

III Semester B.Sc(CBCS)- Question paper I-Model answers

ChemistryPaper–III

Time:3hoursMax marks: 70

Instructions: 1. The question paper has **two** parts.
2. Answer **both** the parts.
3. Write diagrams and chemical equations wherever necessary.

Key answers

PartA

1. Define Energy of activation of a reaction: The minimum extra amount of energy acquired by the reactant molecules to undergo effective collisions

2. State any two ways of stating II law of thermodynamics.(any two)1) All spontaneous processes are irreversible in nature tending towards a state of equilibrium. 2. The completeconversion of heat into work is impossible without leaving some effects elsewhere. 100%efficiency in thermal engines is impossible 4. Entropy of the system and surroundings taken together increases continuously for an irreversible process where as it remainsconstant for a reversible process.-each 1m.

3. Ans: Given: ΔH= 322.17 /mole. T= 95.6ºC+273=368.6K; $\Delta S=\Delta H / T$ ---1m
ΔS = 322.17 /368.6 = 0.874J /K/mol …….1m

4. How lithium dimethylcuprate is synthesised from methyl iodide.
Ans: Methyl iodide reacts with Li to form methyllithium which on reacting with cuprous-iodide gives lithium dimethyl cuprate in ether medium ---1m
$CH_3I + 2Li \xrightarrow{ether} CH_3\text{-}Li + Li I$; $CH_3\text{-}Li + CuI \xrightarrow{ether} Li(CH_3)_2Cu + Li I$ ----1m

5. Write the mathematical form of Freundlich adsorption isotherm and indicate the terms.
Ans: $x/m = kP^{1/n}$ - 1m, where x= amount of the gas adsorbed , m= mass of the adsorbent. P=equilibriumpressure.K and n are constants.—1m.

6. Give any two differences between organic organicand inorganic polymers.-any two—2m

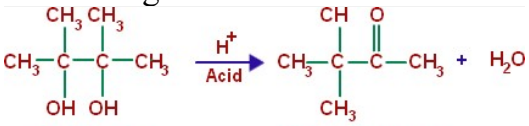
Organic Polymers	Inorganic Polymers
1. They have c-c linkage in their backbone-generally homopolymer net work	1. They are having generally hetero type that is metal as the back bone-heteropolymer network.
2) They are having high degree of Polymerization.	2) They are having low degree of Polymerization.
3) These are three dimensional polymer may lose their structure on heating.	3) They exit in highly stable crystallineform & maintain regularity even on heating.
4) They are less resistant to acid, alkalies	4) They are comparatively more stable.& other organic solvents.

7. Show that $C_p - C_v = R$;
Ans: By definition: H=U+PV, where H =enthalpy,U= internal energy and P and V arepressure and volume of the system. -1m; Since PV = RT for 1 mole; Differentiating both sides we get
$dH/dT = dU/dT + R\ dT/dT$; using the basic definitions of heat capacities;
$C_p = C_v + R$ or $C_p - C_v = R$

8. Give any two salient features of Ellingham diagrams. -any two each… 1m
Ans: a) The graphs represent free energy change for consumption of one mole of oxygen in the formation of their respective oxides.
b) The graphs of most of the elements are inclines upwards.It indicates the instability of their oxides at high temperatures.
c) When there is a phase transition of the elements during oxide formation, the slope of the straight line appears to change.

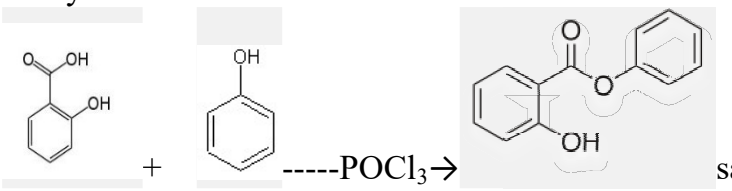
9.What are thiols? Write the structure of 2-propanethiol.
Ans: Thiols are sulphur analogs of alcohols in which the oxygen has been replaced by sulphur atom.
$CH_3\text{-}CH_2\text{-}CH_2\text{-}SH$

10. Explain pinacolpinacolonerearrangement with an example.
Ans:: When pinacols(vicinol glycols) are treated with Con.H_2SO_4, it undergoes dehydrationfollowed by molecular rearrangement to form a ketone. i.e, pinacolone.



Reaction: Pinacol Pinacolone 1+1 marks

11.How phenol is converted to Salol? 2marks
Ans: Salol is produced by heating phenol with salicylic acid in presence of $POCl_3$to form phenyl-salicylate called salol.



Salicylic acid Phenol salol+ H_2O

12. Give any two functions of nitrogen as a plant nutrient. Each.1m
Ans: a) nitrogen is a special constituent of chlorophyll pigment without which photosynthesis is not possible.b) Nitrogen in plant tissues is very essential for the synthesis of aminoacids,proteins andenzymes.
c) The proteins thus synthesised from a part of protoplasm & enzymes are needed for bio-chemical reactions in plant cells.

PartB

Answer any nine of the following questions. Each question carries six marks. 6×9=54

13. a) Define half life period of a II order reaction. Derive an expression for half period of a second order reaction, where a=b.

Ans: a)The half life period of a II order reaction is defined as the time taken for both the reactants to reduce their concentrations to half their initial value, that is when x=a/2; t=$t_{1/2}$ ----- 2m

The rate constant expression when a=b is k= x/at(a-x); at half life period it follows the condition x=a/2 ; t=$t_{1/2}$; substituting we get k= a/2/a$t_{1/2}$ (a - a/2); = a/2/a$t_{1/2}$ a/2 = 1/a$t_{1/2}$

Hence, $t_{1/2}$ = 1/ka ---------2m

b) Decomposition of gas is of II order. When the initial concentration of the gas is $5x10^{-4}$M, it is 40% decomposed in 50 mins. Calculate the velocity constant.

k= x/at(a-x);--1m, k = 0.4 x $5x10^{-4}$ / ($5x10^{-4}$– 0.4x$5x10^{-4}$) $5x10^{-4}$ x50 ---- 1m

k = 0.4/ 0.6x$5x10^{-4}$ x50 = 26.66 M^{-1}.min. –1m

14 a) How monohydric alcohols are prepared from Carbonylcompounds

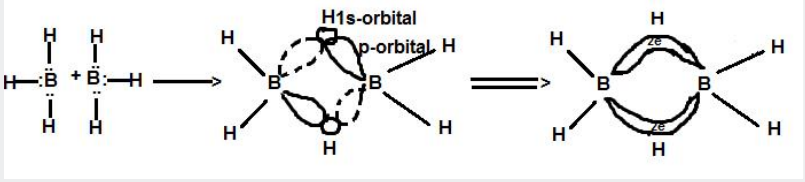
Ans: i) Carbonyl compounds such as aldehydes and ketones undergo reduction with the help of reducing agents such as hydrogen gas in presence of Ni, Pt,Pd, or $LiAlH_4$.—1m

Example: i) CH_3 CHO(ethanol) + 2[H] ---$LiAlH_4$---→ CH_3CH_2OH(ethanol)

ii) CH_3 CO CH_3(acetone) + H_2 ---Ni/Pd--→ CH_3.CH(OH)-CH_3(2-propanol) -2m

b) Explain the structure of diborane.

Diborane four terminal B-H bonds are two centre - two electron bonds. Two bridge B ? H ? B bonds (or banana bonds) are three centre - two electron bonds (shown in figure).



2 boron and 4 terminal hydrogen atoms (Ht) lie in one plane, while the other two bridging hydrogen atoms (Hb) lie in a plane perpendicular to the plane of boron atoms. Again, of the two bridging hydrogen atoms, one H atom lies above the plane and the other lies below the plane. The terminal bonds are regular two-centre two-electron (2c-2e) bonds, while the two bridging (B-H-B) bonds are three-centre two-electron (3c-2e) –3m.

15. a) How Thorium is extracted from Monazite ?

Ans: Monozite sand is a mixture of phosphates of thorium and a number of lanthanides like La, Ce, Nd, Y etc. It is radioactive due to presence of radioactive Th.

I step: Monozite sand is subjected to acid treatment. Powdered ore is treated with Conc.H_2SO_4 at 500K. Th and other lanthanides are convertedto soluble sulphates. The mass is treated with Water. The residue of silica is filtered off. The filterate containing the sulphates is neutralized NH_4OH.

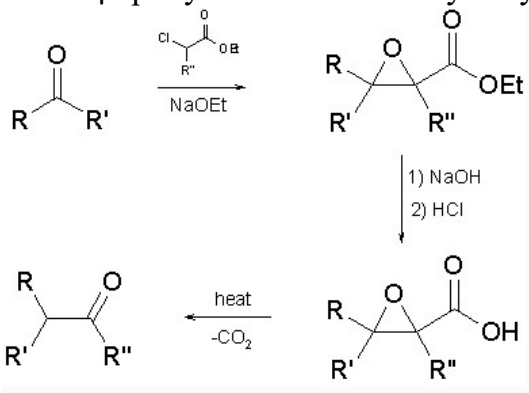
II Step:Thand lanthanides are converted to their respective hydroxides. The lanthanides remains in solution. The precipitate of hydroxides is dissolved in HCl. $ThCl_4$is extracted with tributylphosphate through solvent extraction method.

III Step:Whenthe solvent is evaporated, thorium chloride is obtained. This on heating with Calcium metal in presence of an inert atmosphere of argon, ThCl4 is reduced to thorium.

$ThCl_4 + 2Ca \rightarrow Th + 2CaCl_2$ (3m+1m)

b) Aluminium metal is used to reduce oxide of chromium during its metallurgy, give reasons.
Ans: Aluminium can reduce chromic oxide. This is because free energy of formation of Al_2O_3 is more negative than that of Cr_2O_3,therefore Al_2O_3 is a stable oxide than Cr_2O_3.The plot of Al lies below Cr in the Ellingham diagram, indicating that Al can act as a good reducing agent for Chromic oxide. --- 2m

16. a) Explain Williamson's synthesis with diethyl ether as an example.
Ans: a) An alkyl halide is heated with sodium alkoxide in alcoholic medium, an ether is obtained—1m
R′ONa + RX→R′–O–R + NaX—1m
Ex: Sodium ethoxide is heated with ethyl bromide in alcoholic medium diethyl ether is obtained –1m
$C_2H_5ONa + C_2H_5 Br \rightarrow C_2H_5–O–C_2H_5 + NaBr$–1m
b) Explain Darzen's reaction? Give an example. 2m.
Ans: A reaction in which a ketone or an aldehyde reacts with a α-haloester in presence of a base to form αβepoxy ester. which on hydrolysis yields epoxide.



where R= C_6H_5, R' = CH_3, R''= C_2H_5

17. a) Derive an expression for Langmuir adsoption isotherm.
Derivation: Langmuir Equation which depicts a relationship between the number of active sites of the surface undergoing adsorption (i.e. extent of adsorption) and pressure.

Let θ the number of sites of the surface which are covered with gaseous molecules. Therefore, the fraction of surface which are unoccupied by gaseous molecules will be (1 – θ).

Rate of forward direction depends upon two factors: Number of sited available on the surface of adsorbent, (1 – θ) and Pressure, P. Therefore rate of forward reaction is directly proportional to both mentioned factors.

$$\text{Rate of forward reaction} \propto P(1-\theta)$$

$$\text{Rate of adsorption} \propto P(1-\theta)$$

$$\text{Or, Rate of adsorption} = K_a P(1-\theta)$$

Similarly, Rate of backward reaction or Rate of Desorption depends upon number of sites occupied by the gaseous molecules on the surface of adsorbent.

$$\text{Rate of desorption} \propto \theta$$

$$\text{Or, Rate of desorption} = K_d \theta$$

At equilibrium, rate of adsorption is equal to rate of desorption.

$$K_a P(1-\theta) = K_d \theta$$

solving the above equation to write it in terms of θ.

$$K_aP - K_aP\,\theta = K_d\,\theta$$
$$K_aP = K_aP\,\theta + K_d\,\theta$$
$$K_aP = (K_d + K_aP)\,\theta$$
$$\theta = \frac{K_aP}{K_d + K_aP}$$

Divide numerator and denominator on RHS by K_d, we get

$$\theta = \frac{\frac{K_a}{K_d}P}{\frac{K_d}{K_d} + \frac{K_a}{K_d}P}$$

Now put

$$K = \frac{K_a}{K_d}$$

Substituting in above equation we get

$$\theta = \frac{KP}{1+KP}$$

This is known as Langmuir Adsorption Equation.----4 marks

b) What are adsorption indiators? Give an example. --1m+1m

An indicator used in solutions to detect slight excess of a substance or ion; precipitate becomes colour-ed when theindicator is adsorbed. Example is fluorescein.

18. a) Derive Kirchoff's equation.

Ans: Consider the reaction, A→B, where A is the reactant giving the product B.

The enthalpy change of the reaction, $\Delta H = H_p - H_r = H_A - H_B$

Differntiating the above equation with respect to temperature, keeping pressure constant we have,

$d(\Delta H)/dT = dH_p/dT - dH_r/dT$; since $dH_p/dT = \Delta C_P$ (where C_P is the molar heat capacity at constant pressure) Hence $d(\Delta H)/dT = C_{products} - C_{reactants}$; $d(\Delta H) = (C_{products} - C_{reactants})dT$

during smaller ranges of temperature, on integrating the above equation between the limits T_1 and T_2 and $\Delta H_2$and ΔH_1; we get $\Delta H_2 - \Delta H_1 = \Delta Cp(T_2 - T_1)$ is known as kirchoff"s equation—3m

b) What are Organo metallic compounds? How methyl magnesium iodide is converted in to acetone.

Ans: Organic compounds in which there is a carbon -metal bond, is known as organometallic Compounds.—1m

Methyl magnesium iodide is treated with methyl cyanide followed by acid hydrolysis yields acetone: $CH_3MgI + CH_3\,CN \rightarrow (CH_3)_2\text{-}C{=}NMgI$

$(CH_3)_2C{=}NMgI \xrightarrow{2H_2O/H^+} CH_3\text{-}CO\text{-}CH_3 + NH_3 + Mg(I)OH$ 2m

Δ

19. a) How Urea is manufactured?---4m

Ans: Step 1: Crude naphtha obtained from oil refineries is subjected to partial combustion in specially designed burners to get a mixture of H_2 and CO.

Step 2: This mixture is made to react with steam in presence of Fe, Cr, Co catalyst.

$CO+H_2 + H_2O \rightarrow CO_2 + H_2$

Step 3: CO_2 is separated from H_2 by washing with water under pressure or by treatment with $KHCO_3$.

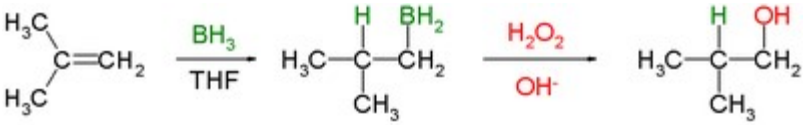
Step4: $H_2$is separated from mixture is mixed with Nitrogen and passed over heated Fe_2O_3 with Cr_2O_3 as promoter at 450– 500^o C, and 200 atm. Pressure, Ammonia thus formed is mixed with gaseous CO_2, at 200atm pressure when unstable forming Ammonium carbamate.Ammonium carbamate further decomposes to produceUrea.$2NH_3 + CO_2 \rightarrow NH_2COONH_4 \rightarrow$heat--$\rightarrow NH_2CO\ NH_2$

b) What is super phosphate of lime. Mention any one of its advantage as a phosphate fertilizer.

Ans: It is a compound produced by reacting rock phosphate with sulphuric acid or phosphoric acid or a mixture of two.The super phosphate of lime contains high phosphorous of about 20% in the form of available P_2O_5. It is fairly soluble in water.---2m

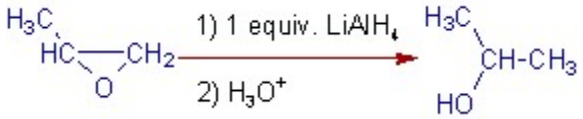
20. a) Explain hydroboration reaction with an example. 4m

In this method of alcohols are prepared from alkenes. When diborane is treated with alkenes to get alkyl boranes which on oxidation with alkaline hydrogen peroxide yield alcohols.-1m



b) What is the action of $LiAlH_4$on epoxides. 2m

Lithium aluminium hydride reduces the **oxiranes (epoxides)** to alcohols. The hydride attack occurs at less hindered side of the epoxide.E.g. 2-methyloxirane gives 2-propanol predominantly



21. a) Derive Clausius-clapeyron equation.—4m

Consider a chemical reaction involving the change in two physical transformations A to B,

then $G_A + dG_A = G_B + dG_B$ …….. (1)

According to thermodynamics, $dG = VdP – SdT$ …….. (2)

The above equation gives the change of free energy when a system undergoes a change of temperature dT and a change of pressure dP. For phase A the equation (2) can be written as: $dG_A = V_A\ dP – S_A\ dT$

And For phase B can be written as: $dG_B = V_B\ dP – S_B\ dT$as $G_A = G_B$, hence, from equation (1), $dG_A = dG_B$therefore,

$V_A\ dP – S_A\ dT = V_B\ dP – S_B\ dT$; $dP / dT = (S_B – S_A) / (V_B – V_A)$

as V_A and V_B are molar volumes of the pure substance in the two phases A and B respectively. Hence difference between them i.e. $(V_B – V_A)$ represents the change in volume when one mole of the substance passes from initial phase A to final phase B.It can be represented as $\Delta V = V_B – V_A$.

Similarly entropy change would be given as

$\Delta S = S_B - S_A$. Hence, $dP / dT = \Delta S / \Delta V$; if the heat exchanged reversibly per mole of the substance during phase transformation be q at temperature T , then the change in entropy i.e. ΔS will be given as: $\Delta S = q / T$ Hence, $dP / dT = q / T \Delta V$

Thus, $dP / dT = q / T (V_B - V_A)$ or its integrated form: $\log (P_2/P_1) = \Delta H_v^{\circ}/2.303R(T_2 - T_1/T_1T_2)$

This equation is known as Clapeyron-Clausius Equation.

b) State Nernst heat theorem.—2m

'ΔG and ΔH tends to approach each other more and more closely as the temperature is lowered. Nernst stated that $\partial (\Delta G)/\partial T$ tends to approach to zero as the temperature is lowered to absolute zero. This is known as Nernst Heat Theorem. Mathematically, The Nernst Heat Theorem can be expressed as: $Lt_{(T \to 0)} [\partial (\Delta G) / \partial T]_P = Lt_{(T \to 0)} [\partial (\Delta H) / \partial T]_P = 0$

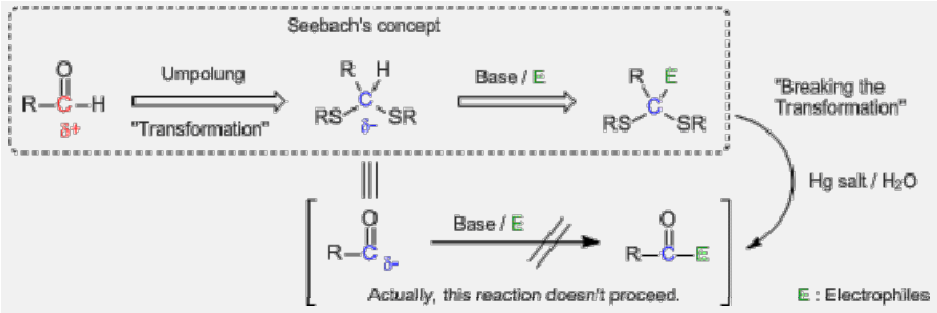
22. a) Explain the effect of i) electron withdrawing group ii) electron donating groupon the acidity of phenol.(2+2)m

Ans: i) Electron withdrawing group groups such as -CN, -CHO, -COOH, $-NO_2$, etc. have a tendency to withdraw electrons from benzene ring of phenol molecule. The negative charge of phenoxide ion is delocalised so that the phenoxide is stabilised by resonance. As a result the acidity of the phenol, increases.

ii) Electron releasing groups such as $-CH_3$, -OH, -OR etc., tend to destabilize the phenoxide ion by adding electrons increases its negative charge. the phenoxide is less stabilized due to resonance. There by, the acidic nature of phenol decreases.

b) Discuss umpolung character in carbonyl compounds with an example (2m)

Umpolung character of any fuctional group is defined as the process of donor and acceptor reactivity of an atom in the interchange or reversal of polarity of the group.



23. a) How Nickel is extracted from pentlandite ore. 4m

Pentlandite is the ore of Ni,Cu and Fe. Nickel is extracted from pentlandite as follows:

i) Concentration of the ore: By froth flotation process, the heavier gangue partcles are removed.

ii) Roasting: The concentrated ore is roasted in a current of air when iron sulphide is converted into its oxide but sulphides of nickel and copper are not effected.

iii) Smelting: The roasted ore is mixed with coke and quartz and smelted in a blast furnace. Most of the iron is removed as iron silicate as slag. The heavier lower layer contains sulphides of Ni, Cu with a little of Co and Fe. This is called matte.

iv) Bessemerization: Ths matte is heated in a Bessemer converter where the matte is heated in a blast of air, any unoxidised Fes is converted into Fe which forms a slag with SiO_2. $FeO + SiO_2 \rightarrow FeSiO_3$

The molten slag is skimmed off. The bessemerized matte contains 56% Ni.

The bessemerized matte is roasted to get Nickel oxide.

v) Reduction: NiO is separated and reduced by passing a current of water gas-$CO+H_2$

$2NiO + (H_2 + CO) \rightarrow 2Ni + H_2O + CO_2$. The crude nickel is further refined by Mond's process.

b) What are PET and PEDT polymers?1+1m

PET polymer is Polyethyene terephthalate and PEDT polymer is 3,4-polyethylenedioxythiophene (PEDT. It finds its importance in antistatic use, capacitor design, and printed circuit boards.

24. a) 2 moles of an ideal is allowed to expand isothermally and reversibly from 2dm^{3}to 12 dm^3 at 300K. Calculate the maximum work done in the process (R=8.314J/K/mol).

Ans: The expression for work done is given by $W = -2.303nRT \log V_2/V_1$

$W= -2.303 \times 2\times 8.314 \times 300 \times \log 12/2 = -2.303 \times 2\times 8.314 \times 300 \times \log 6$

$W = -38.294 \times (0.3010 + 0.4771) = -29.796$kJ/mol. ------4m

b) Define Entropy. Mention its significance. ----- (1+1)m

Ans: Ratio of enthalpy change involved in a process to temperature. $\Delta S = \Delta H/T$.

It is the measure of randomness or the measure of the probability of the system to be more disordered.

25. a) Explain the determination of rate constant of the reaction between Potassium per-sulphate and potassium iodide by spectrophotometric method. 4m

The reaction $2KI + K_2S_2O_8 \rightarrow K_2SO_4 + I_2$, Rate of this reaction is followed spectrophoto-metrically as the product iodine liberated absorbs at 420 nm. A graph of absorbance Vs time gives a straight line, the slope of which gives the rate constant of the reaction.

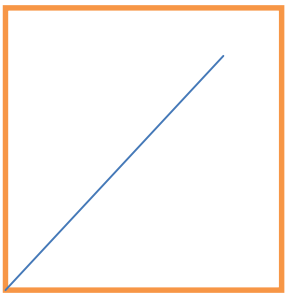
Procedure: 1. 0.02M solution of potassium persulphate and 0.02M potassium iodide are prepared' 10ml of persulphate and 10ml of potassium iodide solutions are mixed well and a stop clock is started. 2. The reaction mixture is immediately transferred into a cuvette. 3. The absorbance(A) of iodine liberated is measured as a function of time up to 45 minutes at 5mintes intervals at a wavelength of 420nm against the blank. Let A_0 is the absorbance at zero time and A_t after a time interval of 't' min-utes. 4.The absorbance of the solution is measured after completion of the reaction by carefully heating the reaction mixture on a water bath at 60^0C for 10 minutes and cooling, which is later transferred into a cuvette and measured.(A_∞)

Observations:

Time(mins)	Absorbance	log $\left[\frac{(A_\infty - A_0)}{(A_\infty - A_t)}\right]$
0	A_o =	
5	A_5 (A_t)	
10		

$_\infty$ = end of threaction	(A_∞)	

log $\left[\frac{(A_\infty - A_0)}{(A_\infty - A_t)}\right]$



time(mins)

A graphical plot of log $[A_\infty - A_o]/ [A_\infty - A_t]$ Vs time is plotted, the slope of which gives the rate constant of the reaction.

b) How the order of a reaction determined by Ostwald's isolation method? 2m

Ans: This method is applicable to reactions involving more than tworeactants. The principle of the method is based on the fact that the except one reactant all the other reactants are taken in large excess such that their concentration remains almost constant.

Consider the chemical reaction: A+ B+ C → Products.B and Care taken in large excess and order is determined by any one of the suitable methods. This gives the order with respect to reactantA. Similarly the order of the reaction with respect to the other reactants is also determined. Ifn_1,n_2,n_3 are the order of the reaction corresponding to A, B, C, then the overall order of the reaction is given by $n = n_1+n_2+n_3$.

III Semester B.Sc, Model question paper-II
CBCS Syllabus
Chemistry- Paper –III

Time:3hours **Max marks: 70**

Instructions: 1. The question paper has **two** parts.
2. Answer **both** the parts.
3.Write diagrams and chemical equations wherever necessary.

Part-A

Answer **any eight** of the following questions. Each question carries **two** marks. (8×2=16)

1. Define auto catalysis? Give an example.
2. How Borazole is synthesised?
3. Calculate the workdone, when 2 moles of an edeal gas undergoes isothermal reversible expansion From $10dm^{-3}$ to $100dm^{-3}$.
4. What are Ellingham's diagrams? Mention its significance in metallurgy?
5. Give an example each for i) Nitrogeneousfertilizer ii) mixed fertilizer.
6. Explain Zeisel method with an example.
7. What is the action of Con.H_2SO_4 on Glycerol? Give equation ?
8. State III law of thermodynamics.
9. Mention any two limitations of collision theory.
10. Write the mathematical form of BET equation and explain the terms.
11. How thiols are synthesised from alkyl halides?
12. Phenol is more acidic than alcohols. give reasons.

Part-B

Answer any nine of the following questions. Each question carries six marks. 6×9=54

13. a) Derive an expression for the rate constant of a II order reaction when a=b.
b) Give any two applications of Diborane. 4+2

14. a) Give the reaction of epoxide with respect to i) carbon nucleophile
ii) nitrogen nucleophile.
b) Define mean life period of a reaction. 4+2

15. a) Derive : PV^{γ} = constant for reversible adiabatic expansion of an ideal gas.
b) How polyacrylonitrile is synthesised? 4+2

16. a) How Uranium is extracted from Pitchblende ore?
b) Mention any two applications of Clausius-Clapeyron equation. 4+2

17.a) Discuss the classification of fertilizers with suitable examples.
b) How phenol is converted to salicylic acid? 4+2

18. a) Explain Lindemann's hypothesis of unimolecular reactions.
b) Calculate the half life of II order reaction with 0.05mol/dm^{-3} of the initial concentration of the reactants & the rate constant $3.33\times10^{-2}dm^{-3}$ mol^{-1} min^{-1} .4+2

19. a) The enthalpy change of reaction is -148.05kj, at 25ºC. If the entropy change of the reaction is 0.209kj mol^{-1} , calculate the free energy of the reaction.
b) Draw Ellingham's diagrams for formation of oxides of Carbon and explain the curves. 3+3

20. a) How are the following synthesized.
i) Acetone from methyl magnesium iodide
ii) ethanoic acid from methyl lithium
b) Give any two applications of Neoprene. 4+2

21 .a) Compare the reactivities of 1^o, 2^o alcohols with respect to their reaction with acidified potassium dichromate solution. Give equations.
b) Give the mechanism of Reimer Tiemann reaction. 3+3

22. a) How Glycerol is manufactured from oils and fats.
b) Explain the significance of entropy with respect to thermodynamic probability of a process. 4+2

23.a) Explain Carnot's cycle by deriving efficiency of the thermal engine based on entropy concept .
b) Write the partial structure of Nylon66. 4+2

24.a) Write a note on surface reactions.
b) Explain Meerwin-pondorffverley reaction with an example. 4+2

25.a) Give the mechanism of oxidation of glycols by lead tetra acetate.
b) Ethers act as Lewis bases. Give reasons. 3+3

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