Government of Karnataka

Department of Pre University Education

Subject : Chemistry

Class : II PUC

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Question Paper
BLUE PRINT
II PUC CHEMISTRY (34)

TIME : 3 hours 15 minute **Max Marks : 70**

Group	**Unit**	**Topic**	**Number of Teaching hours**	**Marks Allotted**	**Part A I 10x1 mark**	**Part B II 8x2 marks**	**Part C III 8 x 3 marks**	**Part D IV & V 11 x 5 marks**	**Total**
Group-I Physical	1	The Solid state	**8**	**7**					**7**
	2	Solution	**9**	**8**					**7**
	3	Electrochemistry	**9**	**8**					**8**
	4	Chemical kinetics	**9**	**8**					**8**
	5	Surface chemistry	**6**	**5**					**6**
		Total of Group-I	**41**	**36**					**36**
Group-II Inorganic	6	General principles and processes of isolation of elements	**5**	**4**					**4**
	7	The p-block elements	**11**	**10**					**10**
	8	The d-block elements	**9**	**8**					**8**
	9	Coordination compounds	**7**	**6**					**6**
		Total of Group-II	**32**	**28**					**28**
Group-III Organic	10	Haloalkanes and haloarenes	**7**	**6**					**6**
	11	Alcohols, phenols and ethers	**8**	**7**					**7**
	12	Aldehydes, ketones and carboxylic acids	**9**	**8**					**8**
	13	Amines	**6**	**5**					**5**
	14	Biomolecules	**7**	**6**					**6**
	15	Polymers	**5**	**5**					**5**
	16	Chemistry in everyday life	**5**	**4**					**4**
		Total of Group-III	**47**	**41**					**41**
		Total	**120**	**105**	**10**	**10**	**15**	**35**	**105**

BLUE PRINT FOR MODEL QUESTION PAPER-1
II PUC CHEMISTRY (34)

TIME : 3 hours 15 min **Max Marks : 70**

Group	Unit	Topic	Number of Teaching hours	Marks Allotted	Part A I 10x1 mark	Part B II 8x2 marks	Part C III 8 x 3 marks	Part D IV & V 11 x 5 marks	Total
Group-I Physical	1	The Solid state	**8**	**7**		✓		✓	**7**
	2	Solution	**9**	**8**	✓✓			✓	**7**
	3	Electrochemistry	**9**	**8**	✓	✓		✓	**8**
	4	Chemical kinetics	**9**	**8**	✓	✓		✓	**8**
	5	Surface chemistry	**6**	**5**	✓			✓	**6**
		Total of Group-I	**41**	**36**					**36**
Group-II Inorganic	6	General principles and processes of isolation of elements	**5**	**4**	✓		✓		**4**
	7	The p-block elements	**11**	**10**	✓		✓✓✓		**10**
	8	The d-block elements	**9**	**8**		✓	✓✓		**8**
	9	Coordination compounds	**7**	**6**			✓✓		**6**
		Total of Group-II	**32**	**28**					**28**
Group-III Organic	10	Haloalkanes and haloarenes	**7**	**6**	✓			✓	**6**
	11	Alcohols, phenols and ethers	**8**	**7**		✓		✓	**7**
	12	Aldehydes, ketones and carboxylic acids	**9**	**8**	✓	✓		✓	**8**
	13	Amines	**6**	**5**				✓	**5**
	14	Biomolecules	**7**	**6**	✓			✓	**6**
	15	Polymers	**5**	**5**				✓	**5**
	16	Chemistry in everyday life	**5**	**4**		✓✓			**4**
		Total of Group-III	**47**	**41**					**41**
		Total	**120**	**105**	**10**	**10**	**15**	**35**	**105**

MODEL QUESTION PAPER-1

Time: 3.15 Hrs. Max. Marks: 70

Instructions:

1. The question paper has four parts: A, B, C and D. All parts are compulsory.
2. Write balanced chemical equations and draw diagrams wherever required.
3. Use log tables and simple calculator if necessary. (Use of scientific calculator not allowed).

PART – A

I. Answer all the following questions. 1 x 10 = 10

1. The experimental value for the molar mass of a non-volatile solute is twice the theoretical value. What is the Van't Hoff factor for the solute?
2. Define ppm.
3. Which of the following has a higher value for molar conductivity under similar conditions? 0.1M KCl or 0.01 M KCl.
4. The rate equation for the reaction $A + B \rightarrow P$ is rate = $K [A]^1 \ [B]^2$. By how many times does the rate of reaction increase when concentrations of A & B are doubled?
5. Name the biocatalyst involved in the conversion of glucose into ethanol and carbon dioxide.
6. Write the formula of the volatile compound formed during the purification of nickel by Mond's process.
7. What is geometry of the oxide of xenon formed when XeF_6 is hydrolysed?
8. Between chlorobenzene and chloroethane, which is more reactive towards nucleophilic substitution reaction?
9. Pentan-3- one does not undergo iodoform reaction. Give reason.
10. Name the nitrogenous base present in DNA but not in RNA.

PART – B

II. Answer any five of the following questions. 5 x 2 = 10

11. i) What type of vacancy defect is shown by a crystal of sodium chloride?
    ii) Which of the following is an example of a molecular solid?
    Diamond, ZnS, Solid Iodine, gold
12. i) According to the equation $Cu^{2+}+2e^{-} \longrightarrow Cu$, how many moles of copper are deposited when 965C of electricity is passed through a solution of Cu^{2+} ions? (1F=96500 C).
    ii) Mention any one application of Kohlrausch law.

13. Derive the relation between half life and initial concentration of a zero order reaction; $R \longrightarrow P$.

14. What is the common oxidation state shown by Lanthanoids? Mention any one consequence of Lanthanoid contraction.

15. $C_2H_5OH + Na(Metal) \longrightarrow X$: $X + C_2H_5Br \xrightarrow{\text{Williamson reaction}} Y$. What are X and Y?

16. Explain the Wolff-Kischner reduction of acetone and write the equation for the same.

17. i) Give an example of ‘a narcotic’ analgesic.
    ii) Based on theraupatic action, to which class of drug does ranitidine belong to?

18. i) What is the role of aspartame in the food industry?
    ii) What is saponification?

PART – C

III. Answer any five of the following **5x3= 15**

19. Write the equations for the reactions involved in the leaching of alumina from bauxite ore.

20. In the manufacture of ammonia by Haber’s process:
    i) Mention the optimum temperature and optimum pressure employed. 2
    ii) What is the role played by potassium oxide (K_2O)? 1

21. a) Complete the following equations:
    i) $PbS_{(s)} + 4\ O_{3\ (g)} \longrightarrow$ 1
    ii) $2\ NaOH + SO_2 \longrightarrow$ 1
    b) Write the structure of oleum ($H_2S_2O_7$) 1

22. a) Give reason:
    i) Fluorine exhibits only one oxidation state whereas other halogens exhibit multiple oxidation states. 1
    ii) Most of the reactions with fluorine are exothermic. 1
    b) Write the missing product:
    $NH_3 + 3\ Cl_{2\ (excess)} \longrightarrow\ ?\ + 3\ HCl$. 1

23. Explain the preparation of potassium permanganate from MnO_2. Write the balanced chemical equations for the reactions involved.

24. a) Give reasons:
    i) Generally there is increase in density along 3d series of transition metals.
    ii) Third ionisation enthalpy of manganese is unusually high. 2
    b) Which of the following ions is coloured in aqueous solution?
    i) Sc^{3+} ii) Co^{3+} iii) Cu^{+} 1

25. Using valence bond theory account for the geometry and magnetic nature of $[NiCl_4]^{2-}$ ion. (Atomic number of Ni = 28).

26. a) In the complex compound represented by $CoCl_3.4NH_3$, how many ammonia molecules satisfy the secondary valence of cobalt if one mole of the compound upon treatment with excess $AgNO_3$ produces one mole of $AgCl_{(s)}$? 1

b) What type of structural isomerism is exhibited by the complex $[Co\ (NH_3)_5\ NO_2]^{2+}$?1

c) Between t_{2g} and e_g sets of d-orbitals of a central metal in an octahedral complex, which set has higher energy? 1

PART – D

IV. Answer any three of the following questions. 3x5=15

27. a) Calculate the packing efficiency in a simple cubic lattice. 3

b) An element crystallizes in a fcc lattice. The edge length of the unit cell is 400 pm. Calculate the density of the unit cell. (molar mass=60 g mol^{-1})

(Avogadro number = 6.02×10^{23}) 2

28. a) 24 g of a non–volatile, non–electrolyte solute is added to 600 g of water. The boiling point of the resulting solution is 373.35K. Calculate the molar mass of the solute (Given boiling point of pure water = 373 K and K_b for water = 0.52 K kg mol^{-1}). 3

b) i) A non ideal solution has $\Delta H_{mixing} > 0$. What type of deviation does it show from Raoult's law?

ii) What is an azeotrope? 2

29. a) Calculate the e.m.f. of the cell represented below:

$Ni_{(s)}\ |\ Ni^{2+}_{0.1M}\ ||\ Ag^{+}_{0.01M}\ |\ Ag_{(s)}$ at 298 Given, $E^0_{cell} = 1.05$ V; 3

b) i) What is the composition of the cathode in the lead storage battery?

ii) Name the product discharged at the anode during the electrolysis of an aqueous solution of sodium chloride. 2

30. a) Derive the integrated rate equation for expressing the rate constant of a first order reaction $R \longrightarrow P$. 3

b) In the equation; rate = $Z_{AB} \times e^{-\frac{E_a}{RT}}$, what does the term $e^{-\frac{E_a}{RT}}$ represent? 1

c) What is the effect of a catalyst on ΔG of a reaction? 1

31. a) i) What type of adsorption involves Van der Waal's forces of attraction?

ii) Give an example for homogeneous catalysis. 2

b) i) What is peptization?

ii) What is the dispersed phase in a gel?

iii) Which one of the following electrolyte is required in the smallest quantity to precipitate a negative sol.? $MgCl_2$. $AlCl_3$, NaCl. 3

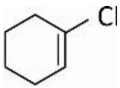
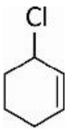
V. Answer any four of the following : 4x5=20

32. a) Discuss the mechanism of the hydrolysis of tert-butyl bromide. 2

b) Identify the missing reactant / product in each of the following:

i) 2-Bromopentane + alc. KOH $\longrightarrow$ A + KBr (where A is the major product)

ii) 2 'B' + 2 Na $\xrightarrow{\text{dry ether}}$ C_4H_{10} + 2NaBr. 2

c) Between  and  which is an allylic chloride?

33. a) Write the equations involved in the preparation of phenol from cumene. 2

b) i) Give the IUPAC name of the product formed when tertiary butyl alcohol is passed over copper heated to 573 K. 1

ii) Arrange the following in the increasing order of acidity and justify the same:

$(CH_3)_3$ COH, CH_3OH, $(CH_3)_2CHOH$ 2

34. a) Explain Stephen's reduction with an example. 2

b) Complete the following equations: 3

i) 2 HCHO + conc. KOH $\longrightarrow$

ii) $CH_3CHO + NH_2OH \longrightarrow$

iii) $CH_3COOH + PCl_5 \longrightarrow$

35. a) Explain Hoffmann bromamide degradation reaction and write the general equation for the reaction involved. 2

b) i) Give reason: Aniline is a weaker base than ammonia.

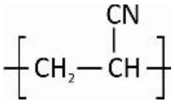
ii) $C_6H_5\,NH_2 \xrightarrow[\text{HCl,273K}]{NaNO_2} X \xrightarrow[\text{HCl}]{Cu_2Cl_2} Y$. Write the formula of X & Y. 3

36. a) Write the Haworth structure of D-sucrose. Why is it a non-reducing sugar? 2

b) i) How many peptide bonds are in a hexapeptide?

ii) Write the general structure of the Zwiter ionic form of an α-amino acid.

iii) Deficiency of which vitamin causes pernicious anemia? 3

37. a) i) Name the polymer whose partial structure is represented by 

$\left[CH_2 - \overset{CN}{\overset{|}{CH}} \right]$

ii) What are the monomers of Nylon 6,6? 3

b) i) Name the catalyst used in the manufacture of high density polythene. 2

ii) What is the configuration at the carbon- carbon double bonds in natural rubber?

BLUE PRINT FOR MODEL QUESTION PAPER-2
II PUC CHEMISTRY (34)

TIME : 3 hours 15 minute **Max Marks : 70**

Group	Unit	Topic	Number of Teaching hours	Marks Allotted	Part A I 10x1 mark	Part B II 8x2 marks	Part C III 8 x 3 marks	Part D IV & V 11 x 5 marks	Total
Group-I Physical	1	The Solid state	**8**	**7**		✓		✓	**7**
	2	Solution	**9**	**8**	✓✓			✓	**7**
	3	Electrochemistry	**9**	**8**	✓	✓		✓	**8**
	4	Chemical kinetics	**9**	**8**	✓	✓		✓	**8**
	5	Surface chemistry	**6**	**5**	✓			✓	**6**
		Total of Group-I	**41**	**36**					**36**
Group-II Inorganic	6	General principles and processes of isolation of elements	**5**	**4**	✓		✓		**4**
	7	The p-block elements	**11**	**10**	✓		✓✓✓		**10**
	8	The d-block elements	**9**	**8**		✓	✓✓		**8**
	9	Coordination compounds	**7**	**6**			✓✓		**6**
		Total of Group-II	**32**	**28**					**28**
Group-III Organic	10	Haloalkanes and haloarenes	**7**	**6**	✓			✓	**6**
	11	Alcohols, phenols and ethers	**8**	**7**		✓		✓	**7**
	12	Aldehydes, ketones and carboxylic acids	**9**	**8**	✓	✓		✓	**8**
	13	Amines	**6**	**5**				✓	**5**
	14	Biomolecules	**7**	**6**	✓			✓	**6**
	15	Polymers	**5**	**5**				✓	**5**
	16	Chemistry in everyday life	**5**	**4**		✓✓			**4**
		Total of Group-III	**47**	**41**					**41**
		Total	**120**	**105**	**10**	**10**	**15**	**35**	**105**

MODEL QUESTION PAPER – 2

Time: 3.15hrs Max Marks: 70

Instructions:

1. The question paper has four parts: A, B, C and D. All parts are compulsory.
2. Write balanced chemical equations and draw diagrams wherever required.
3. Use log tables and simple calculator if necessary. (Use of scientific calculator not allowed).

PART-A

Answer each question in one word or in one sentence: 1x10=10

1. 68% aqueous nitric acid cannot be concentrated by further fractional distillation. Give reason.
2. The cryoscopic constant and freezing point of benzene is 5.12 K kg mol^{-1} and 278.6 K respectively. At what temperature will one molal solution of benzene containing a non-electrolyte (i=1) freeze?
3. E° of three metals A, B, C are +0.44 V, +1.37 V and –1.35 V. Arrange the metals in increasing order of their reducing power.
4. Mention one difference between a catalyst and a inhibitor.
5. Write the mathematical expression for Freundlich adsorption isotherm.
6. Name the purest form of commercial iron.
7. A noble gas has the property to diffuse through rubber. Name the noble gas.
8. Write an equation for Swartz reaction.
9. $CH_3CHO \xrightarrow[2)\ \Delta]{1)\ \text{dil.NaOH}}$ X. Give the IUPAC name of X.
10. Name the sugar moiety present in RNA molecule.

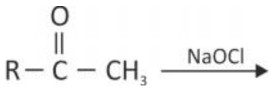
PART-B

Answer any five questions: 5 × 2 = 10

11. a) What do you mean by anisotropic solid?
    b) When is ferrimagnetism observed in a substance?
12. $\wedge_m$ of 0.05 M weak electrolyte is 50 $Sm^2\ mol^{-1}$, $\wedge_m^0$ of it is 440 $Sm^2\ mol^{-1}$. Calculate α (degree of dissociation) of the electrolyte.
13. Draw a plot of ln[R] versus t for a first order reaction. What is slope of the line equal to?
14. Give reason: i) Actinoid contraction is greater from element to element.
    ii) Actinoids show variable oxidation states.

15. $H{-}CHO \xrightarrow[2.\ H_2O]{1.\ RMgX,\ ether} X \xrightarrow[H^+]{+R'{-}COOH} Y$. What are the structures of X and Y?

16. Complete the equation and name the reaction:



$R-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3 \xrightarrow{NaOCl}$

17. Give reasons: i) Aspirin finds use in prevention of heart attacks.

ii) Sodium laurylsulphate is a anionic detergent

18. What is a broad spectrum antibiotic? Is penicillin a broad spectrum or a narrow spectrum antibiotic?

PART-C

Answer any five questions: **$5 \times 3 = 15$**

19. Complete the following equations:

a) $2Cu_2O + Cu_2S \longrightarrow$

b) $ZrI_4 \xrightarrow[Tungsten]{heat\ on}$

c) $ZnO + C \xrightarrow[1673K]{coke}$

20. Give reasons: i) Nitrogen exists as a diatomic molecule

ii) Nitrogen cannot form a pentahalide

iii) Aluminium does not dissolve in conc. HNO_3

21. Write the three steps (with conditions) involved in the manufacture of sulphuric acid by contact process.

22. Complete the following equations:

i) $Cl_2 + 2F^- \longrightarrow$

ii) $6NaOH$ (hot and conc.) $+ 3Cl_2 \longrightarrow$

iii) $XX' + H_2O \longrightarrow$

23. Give reasons:

i) Cu^{+2} (aq) is more stable than Cu^+

ii) Ionisation enthalpy increases along transition elements from left to right

iii) Zn has highest value for E° (M^{3+} / M^{2+}) among 3d series elements

24. a) Write the two steps involved in the commercial process of converting MnO_2 to potassium permanganate. 2

b) Write the structure of chromate ion. 1

25. Explain the hybridisation, geometry and magnetic property of $[Ni(CN)_4]^{2-}$ using VBT.

26. a) What type of isomerism is exhibited by the square planar complex of type M_{ABXY}? How many of these isomers are possible? 2

b) How is a metal-carbon π bond formed in metal carbonyls? 1

PART-D

IV. Answer any five of the following questions: 5 × 5 = 25

27. a) Calculate packing efficiency in CCP unit cell. 3

b) Explain with an example how impurity defect develops in NaCl crystal. 2

28. a) Calculate the mole fraction of CO_2 in one litre of soda water sealed under a pressure of 3.5 bar at 298 K. $K_H = 1.67 \times 10^3$ bar. 2

b) What are these? 3

i) solid solutions ii) colligative properties iii) isotonic solution

29. a) i) Name the product liberated at anode when dil. H_2SO_4 is electrolysed. 2

ii) What Faraday of current is required to electrolyse one mole of water?

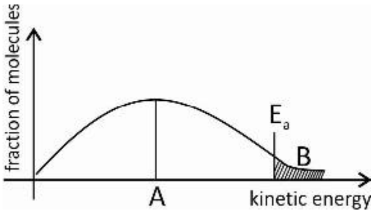
b) i) Between mercury cell and nickel-cadmium cell, which is a secondary cell? 2

ii) Mention one advantage of H_2–O_2 fuel cell.

c) Write Nernst equation for the cell represented as : $Mg_{(s)} \mid Mg^{+2}_{(aq)} \mid\mid Al^{3+}_{(aq)} \mid Al_{(S)}$ 1

30. a) Show that for a first order reaction, $t_{99.9\%} = 10\ t_{½}$. 3

b) In the graph drawn what does A and the shaded region B represent? 2



31. a) Name the phenomenon / process involved 3

i) mixing of hydrated ferric oxide (+ve sol) and arsenious sulphide (–ve sol)

ii) An impure sol is purified by removing dissolved particles using suitable membrane

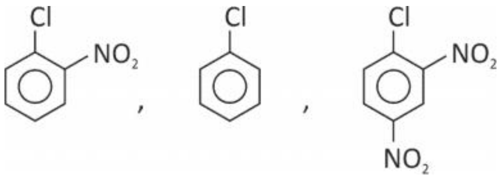
iii) Movement of dispersion medium is observed in an electric field.

b) Mention any two characteristic of enzyme catalysis. 2

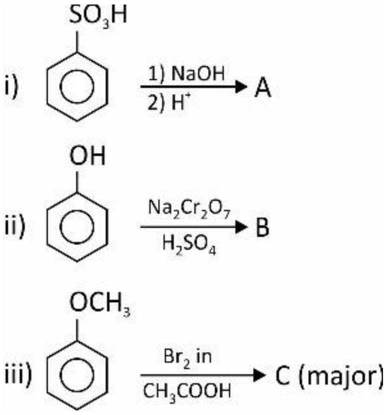
32. a) Write the equation for S_N2 mechanism between CH_3Cl and ^-OH. What is the stereochemical aspect of S_N2 reaction? 2

b) i) Aryl halide with sodium in dry ether undergoes Fittig reaction. Write the equation and name the product. 2

ii) Arrange the following in the increasing order of their reactivity towards nucleophilic substitution reaction. 1



33. a) What is the organic compound formed in the following: 3

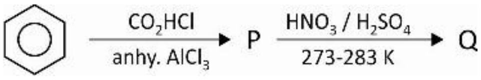


b) Give reason: 2

i) o-nitrophenol and p-nitrophenol can be separated by steam distillation.

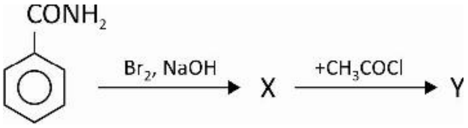
ii) There is a large difference in boiling points of alcohols and ethers.

34. a) Write the structure of P and Q? Name the reaction that gives the product P. 3



b) Explain decarboxylation with an example. 2

35. a) Name the products X and Y? 2



b) Between methyl amine and ammonia which has lower pK_b value and why? 2

c) Name the final product of ammonolysis of an alkyl halide. 1

36. a) Write the Haworth structure of β-D(–) fructofuranose. 1

b) i) Pentaacetate of glucose does not react with hydroxyl amine. What does this indicate about the structure of glucose. 3

ii) Which is the most abundant polysaccharide in plants?

iii) Name the neutral α-amino acid that is not optically active.

c) What major molecular shape does the tertiary structure of protein lead to? 1

37. a) What is a homopolymer? Give an example. 2

b) Write the equation for the formation of the polymer by the interaction of ethylene glycol and terephthalic acid. Name the polymer. 2

c) Molecular mass of polymers are expressed as an average. Give reason. 1

BLUE PRINT FOR MODEL QUESTION PAPER-3
II PUC CHEMISTRY (34)

TIME : 3 hours 15 minute **Max Marks : 70**

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Group-I Physical	1	The Solid state	**8**	**7**		✓		✓	**7**
	2	Solution	**9**	**8**	✓✓			✓	**7**
	3	Electrochemistry	**9**	**8**	✓	✓		✓	**8**
	4	Chemical kinetics	**9**	**8**	✓	✓		✓	**8**
	5	Surface chemistry	**6**	**5**	✓			✓	**6**
		Total of Group-I	**41**	**36**					**36**
Group-II Inorganic	6	General principles and processes of isolation of elements	**5**	**4**	✓		✓		**4**
	7	The p-block elements	**11**	**10**	✓		✓✓✓		**10**
	8	The d-block elements	**9**	**8**		✓	✓✓		**8**
	9	Coordination compounds	**7**	**6**			✓✓		**6**
		Total of Group-II	**32**	**28**					**28**
Group-III Organic	10	Haloalkanes and haloarenes	**7**	**6**	✓			✓	**6**
	11	Alcohols, phenols and ethers	**8**	**7**		✓		✓	**7**
	12	Aldehydes, ketones and carboxylic acids	**9**	**8**	✓	✓		✓	**8**
	13	Amines	**6**	**5**				✓	**5**
	14	Biomolecules	**7**	**6**	✓			✓	**6**
	15	Polymers	**5**	**5**				✓	**5**
	16	Chemistry in everyday life	**5**	**4**		✓✓			**4**
		Total of Group-III	**47**	**41**					**41**
		Total	**120**	**105**	**10**	**10**	**15**	**35**	**105**

MODEL QUESTION PAPER-3

Time: 3.15 Hrs. Max. Marks: 70

Instructions:

1. The question paper has four parts: A, B, C and D. All parts are compulsory.
2. Write balanced chemical equations and draw diagrams wherever required.
3. Use log tables and simple calculator if necessary. (Use of scientific calculator not allowed).

Part-A

I. Answer ALL of the following. 1 x 10 = 10

1. Name the phenomenon involved: A raw mango in a concentrated salt solution loses water and shrinks.
2. How does the solubility of a solute vary with increase in temperature if the dissolution process is exothermic?
3. What is the oxidising agent in mercury cell?
4. Half life period of a reaction is directly proportional to initial concentration of the reactant. What is the order of this reaction?
5. What should be the value of 1/n in the Freundlich adsorption isotherm, to show that adsorption can be independent of pressure ?
6. An ore contains PbS and ZnS. Sodium cyanide is used as depressant. Which of these sulphide comes with the froth?
7. Which noble gas has lowest boiling point?
8. What is retention of configuration?
9. Name the type of carbonyl compound which on oxidation gives a carboxylic acid with lesser number of carbon atoms.
10. Name the element of group 17 present in Thyroxine hormone.

Part-B

II. Answer any FIVE of the following. 5x2=10

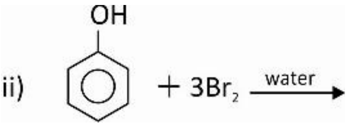
11. Mention the two crystal systems in which all edge lengths in their unit cell are the same.
12. A fuel cell generates a standard electrode potential of 0.7 V, involving 2 electrons in its cell reaction. Calculate the standard free energy change for the reaction. Given F = 96487 C mol^{-1}.
13. The ratio of rate constants of a reaction at 300K and 291K is 2. Calculate the energy of activation. (Given R = $8.314JK^{-1}mol^{-1}$).
14. i) Write the general electronic configuration of tripositive lanthanoid ion.

ii) Name the element of lanthanide with maximum paramagnetic property.

15. Complete the following:

i) $CH_3 -CH = CH- CH_2OH \xrightarrow{PCC}$

ii)



16. Write the chemical equation to convert acetic acid to monochloro acetic acid. Name this reaction.

17. a) What do we call a drug that binds to the receptor site and inhibit its natural function

b) What is the therapeutic use of iodoform ?

18. Classify the following into cationic and anionic detergents: Sodium dodecylbenzenesulphonate and Cetyltrimethyammonium bromide.

Part-C

III. Answer any FIVE of the following. **5x3=15**

19. a) Name the reducing agent used in the extraction of zinc from zinc oxide. Write the chemical equation for this reaction. 2

b) Write the composition of copper matte. 1

20. In the manufacture of nitric acid by Ostwald's process, Write

a) the catalyst for the oxidation of ammonia by atmospheric oxygen. 1

b) the chemical equation for the dissolution of NO_2 in water. 1

c) the dehydrating agent used to convert 68% by mass of HNO_3 to 98%. 1

21. Complete the following equations: 3

i) $NO + O_3 \longrightarrow$

ii) $5SO_2 + 2MnO_4^- + 2H_2O \longrightarrow$

iii) $C + 2H_2SO_{4\,(conc.)} \longrightarrow$

22. a) Write the balanced chemical equation for the oxidation of acidified ferrous sulphate solution by chlorine. 1

b) Give the composition of carnallite. 1

c) Fluorine does not exhibit positive oxidation state. Why? 1

23. a) Why VO_2^+ has lesser oxidizing power than $Cr_2O_7^{2-}$? 1

b) What is the oxidation state of nickel in $Ni(CO)_4$? 1

c) Write the unit for magnetic moment. 1

24. Write the chemical equations involved in the manufacture of potassium dichromate from chromite ore. 3

25. With the help of VBT, explain the type of hybridization, geometry and magnetic property of $[Co(NH_3)_6]^{3+}$. 3

26. a) Explain synergic effect in the formation of metal carbonyls. 2

b) Give one example for a heteroleptic complex. 1

Part-D

IV. Answer any THREE of the following. 3x5=15

27. a) Calculate the packing efficiency of particles in a body centred cube. 3

b) Atoms of element B form hcp lattice and those of element A occupies 2/3rd of tetrahedral voids. Calculate the formula of the compound formed by A and B. 2

28. a) 18g of glucose is dissolved in 1000g of water at 300K. At what temperature does this solution boil? (K_b for water is 0.52 K kg mol^{-1}. Molar mass of glucose is 180 g mol^{-1}, boiling point of water = 273.15 K) 3

b) What are the conditions of pressure and temperature under which solubility of carbon dioxide in water can be increased? 2

29. a) For the electrochemical cell represented as: $Cu_{(s)}\ |Cu^{2+}_{(aq)}\ ||Ag^{+}_{(aq)}\ |Ag_{(s)}$, write the half cell reaction that occurs at (i) anode (ii) cathode 1+1

b) Write the relationship between equilibrium constant of the reaction and standard potential of the cell. 1

c) Resistance of a conductivity cell containing 0.1M KCl solution is 100 Ω. Cell constant of the cell is 1.29 /cm. Calculate the conductivity of the solution at the same temperature. 2

30. a) Derive an expression for half life period of a first order reaction. 2

b) Explain the influence of a catalyst on rate of a reaction. 2

c) For the reaction, $H_2 + I_2 \longrightarrow 2HI$, the rate of disappearance of H_2 is 1×10^{-4} Ms^{-1}. What is the rate of appearance of HI. 1

31. a) What is Brownian movement? How is it caused? 2

b) Write the difference between physisorption and chemisorption with respect to

i) type of attractive forces between adsorbate and adsorbent

ii) number of layers of adsorption. 2

c) Name the enzyme that catalyses the reaction: $H_2NCONH_2 + H_2O \longrightarrow 2NH_3 + CO_2$. 1

V. Answer any FOUR of the following questions. **4x5=20**

32. a) Write S_N1 mechanism for the hydrolysis of 2-Bromo-2-methyl propane. Why are S_N1 reactions generally carried in polar protic solvents? 3

b) In the preparation of aryl halides by Sandmeyer's reaction, name the

i) catalyst used ii) gas liberated. 2

33. a) Write the chemical equation for the conversion of,

i) phenol to salicylaldehyde ii) Salicylic acid to aspirin. 2

b) Explain Williamson's ether synthesis. 2

c) Which class of alcohols do not readily form turbidity with Lucas reagent? 1

34. a) Explain Clemmensen reduction with an example. 2

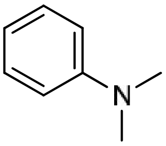
b) Name the reaction to obtain benzaldehyde from:

i) toluene ii) benzene iii) benzoyl chloride. 3

35. a) How are primary amines prepared from nitro compounds? Write the equation. 2

b) How does Hinsberg' s reagent react with ethyl amine? Write the equation. 2

c) Write the IUPAC name of 1

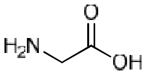
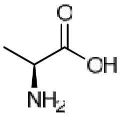


36. a) Name the water insoluble component of starch. 1

b) Name the type of linkage between two nucleotides in nucleic acid. 1

c) With respect to proteins, what do you mean by

i) primary structure ii) denaturation 2

d) Write an equation for the formation of a dipeptide between  (glycine) and  (alanine) . 1

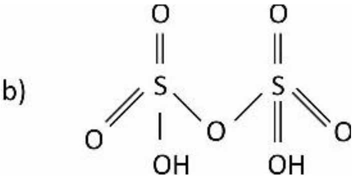
37. a) What is addition polymerization? Give one example for a copolymer. 2

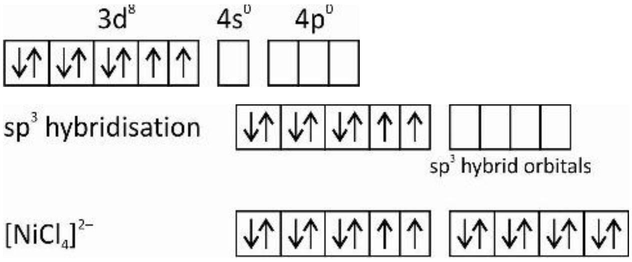
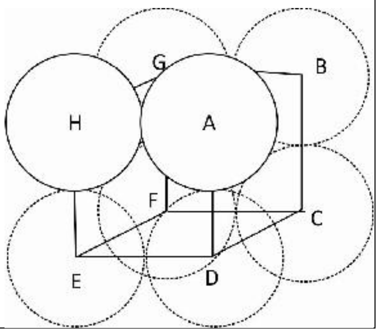
b) Write the name of monomers required to manufacture Buna-N rubber. Write the polymerization reaction for the same. 2

c) What is Zeigler-Natta catalyst? 1

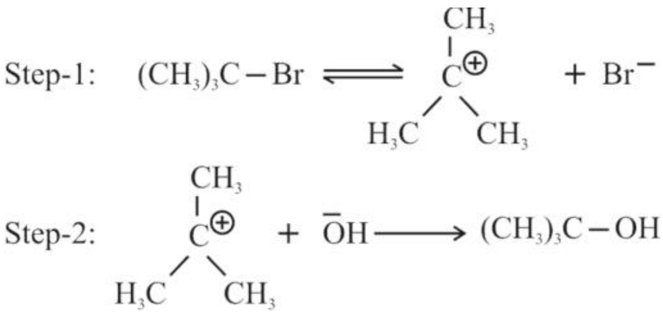
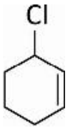
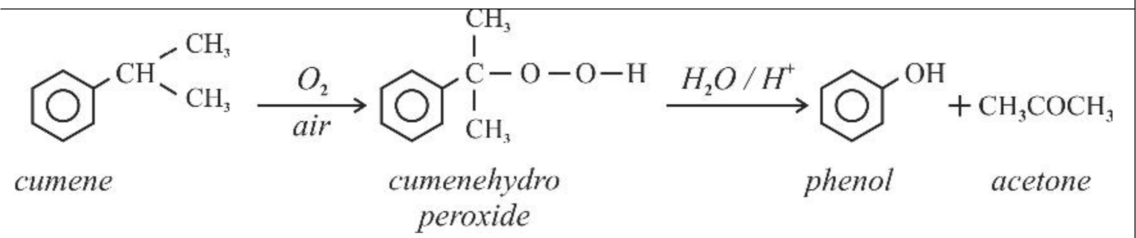
MODEL ANSWER WITH VALUE POINTS FOR QUESTION PAPER-1

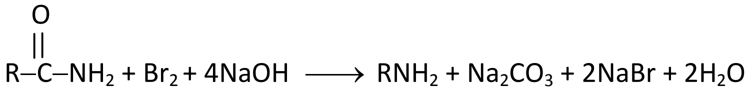
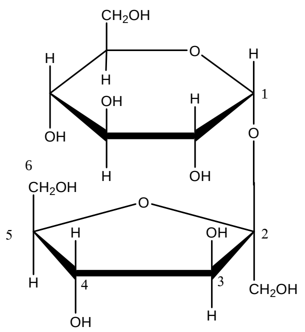
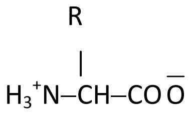
Q.No	PART-A	Marks
1	Half or ½	1
2	ppm = $\frac{\text{Number of parts of the component}}{\text{Total number of pats of all components}} \times 10^6$	1
3	0.01M KCl	1
4	8 times (or rate increases 8 times)	1
5	Zymase	1
6	$[Ni(CO)_4]$	1
7	Pyramidal geometry	1
8	Chloroethane	1
9	It is not a methyl ketone	1
10	Thymine	1
	PART-B	
11	(i) Schotty defect (ii) solid iodine	2
12	i) 0.005 mol ii) any one of the following: in determination of limiting molar conductivity (Λ_m^0) of a weak electrolyte, in determination / calculation of degree of dissociation (α) OR / acid dissociation constant (K_a) of a weak electrolyte.	1 1
13	For a zero order reaction k = $\frac{[R_0]-[R]}{t}$ At t = $t_{½}$, [R] = $\frac{1}{2}[R_0]$ k = $\frac{[R_0]-\frac{1}{2}[R_0]}{t_{1/2}}$ $\Rightarrow t_{½} = \frac{[R_0]}{2k}$	 1 1
14	+3 : Consequence : 4d and 5 d series transition elements have almost identical size / radii OR Zr – Hf / M_0 – W occur together in nature / difficult to separate.	1 1
15	X = C_2H_5ONa (sodium ethoxide) Y = $C_2H_5–O–C_2H_5$ (ethoxy ethane)	1 1

16	Acetone is reduced to propane using NH_2-NH_2 followed by heating with KOH $CH_3COCH_3 \xrightarrow[2)KOH/ethylene\ glycol,heat]{1)NH_2\ NH_2} CH_3CH_2CH_3$ OR self explanatory equation	2
17	i) Morphine / codeine ii) antacid	1 1
18	i) Artificial sweetner / sweetening agent ii) Formation of sodium salts of fatty acid upon heating a fat with sodium hydroxide.	1 1
	PART - C	
19	$Al_2O_{3(s)} + 2NaoH_{(aq)} + 3H_2O \longrightarrow 2\ Na\ [Al(OH)_4]_{(aq)}$ $2\ Na\ [Al(OH)_4]_{(aq)} + CO_{2(g)} \longrightarrow Al_2O_3\ x\ H_2O_{(s)} + 2NaHCO_{3(aq)}$ $Al_2O_3\ x\ H_2O_{(s)} \xrightarrow{1470K} Al_2O_3 + x\ H_2O_{(s)}$ each equation - 1M	1 1 1
20	i) Optimum temperature - ~ 700 K OR 427°C Optimum pressure - 200 x 10^5 Pa OR ~200 atm ii) increase the rate of attainment of equilibrium / promoter / increase the activity of the catalyst	1 1 1
21	a) (i) Pb $S_{(s)} + 4O_{3(g)} \longrightarrow PbSO_{4(s)} + 4O_{2(g)}$ ii) $2NaOH + SO_2 \longrightarrow Na_2SO_3 + H_2O$ b) 	1 1 1
22	a) (i) absence of d orbital in the valence shell ii) Due to small size and strong bond formed by fluorine with other elements iii) $NH_3 + 3Cl_{2(excess)} \longrightarrow NCl_3 + 3HCl$ OR NCl_3 OR nitrogen trichloride	1 1 1
23	$KMnO_4$ is prepared by the fusion of MnO_2 with an alkali metal hydroxide / KOH, followed by disproportionation $2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4 + 2H_2O$ $3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO_4^- + MnO_2 + 2H_2O$ OR Self explanatory equations	1 1 1

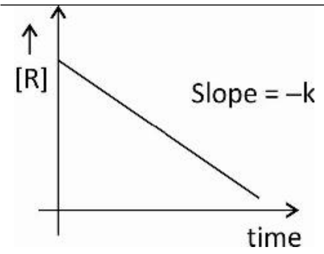
24	a) (i) Decrease in metallic radius coupled with increase in atomic mass causes increase in density	1
	ii) since d^5 configuration in Mn^{2+} is disturbed	1
	iii) Co^{3+}	1
25	Orbitals of Ni^{2+} ion :	
		1
	Geometry : Tetrahedral	1
	Magnetic property : Paramagnetic due to unpaired electrons	1
26	i) 4	1
	ii) linkage isomerism	1
	iii) e_g	1
	PART-D	
27	a) In a simple cubic edge length a = 2r	1
	Packing efficiency = $\frac{\text{Volume of one atom in unit cell of simple cube}}{\text{Volume of unit cell}} \times 100\%$	1
	$= \frac{\frac{4}{3}\pi r^3}{(2r)^3}$ = 52.4% 	1
	b) d = $\frac{zM}{a^3N_A}$ =	1
	d = $\frac{4 \times 60}{(400 \times 10^{-10} cm)^3 \times 6.022 \times 10^{23}}$ d = 6.22 g cm^{-3}	1

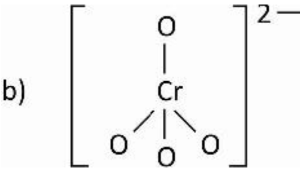
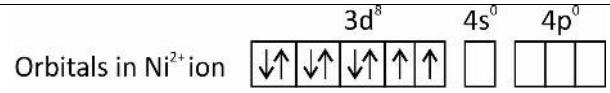
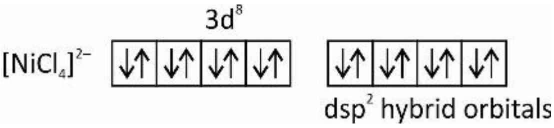
28	a) Molar mass of solute $M_2 = \frac{1000K_b w_2}{\Delta T_b \times w_1} = \frac{1000 \times 0.52 \times 24}{0.35 \times 600}$ $M_2 = 59.42$ g mol^{-1} b) i) positive deviation ii) binary mixture having same composition in both liquid and vapour phase and boils at constant temperature	2 1 1 1
29	a) $E_{cell} = E^{o}_{cell} - \frac{0.059}{2} \log \frac{[Ni^{2+}]}{[Ag^{+}]^2}$ $= 1.05 - \frac{0.059}{2} \log \frac{0.1}{(0.01)^2}$ $E_{cell} = 0.96$ V b) i) Pb, PbO_2 ii) chlorine or Cl_2	1 1 1 1 1
30	a) Consider a first order reaction: $R \longrightarrow P$. Let $[R_0]$ be the initial concentration and [R] be the concentration of the reactant at time t. For the first order reaction, $\boxed{\frac{-d[R]}{dt} = k[R]^1}$ We have $\frac{d[R]}{[R]^1} = -k\,dt$ Integrating on both sides: $\int \frac{d[R]}{[R]} = -\int k\ dt$ $\ln [R] = -kt + I$ --- (1) where I is constant of integration When t = 0 $[R] = [R_0]$; $I = \ln [R_0]$ $\therefore$ Equation 1 becomes $\ln[R] = -kt + \ln[R_0]$ $kt = \ln \frac{[R_0]}{[R]}$ $\boxed{k = \frac{1}{t} \ln \frac{[R_0]}{[R]}}$ [R] = concentration of R at time t, $[R_0]$ = initial concentration of R (b) $e^{-\varepsilon a/RT}$ represents the fraction of molecules having energy equal to or greater than E_a. (c) Catalyst has no effect on ΔG of a reaction.	1 1 1 1 1

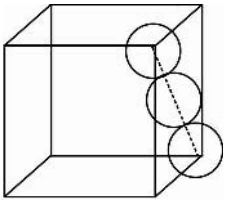
31	a) (i) physisorption / physical adsorption (ii) $2SO_{2(g)} + O_{2(g)} \xrightarrow{NO_{(g)}} 2SO_{3(g)}$ OR $CH_3COOCH_{3(l)} + H_2O_{(l)} \xrightarrow{HCl_{(l)}} CH_3COOH_{(aq)} + CH_3OH_{(aq)}$ OR $C_{12}H_{22}O_{11(aq)} + H_2O_{(l)} \xrightarrow{H_2SO_{4(l)}} C_6H_{12O6(aq)} + C_6H_{12O6(aq)}$ (b) (i) process of converting a precipitate into colloidal sol by shaking it with small amount of an electrolyte (ii) liquid (iii) $AlCl_3$	1 1 1 1 1
32	a) Formation of t-butyl carbocation – step -1 followed by attack of nucleophile – step 2  b) (i) A = Pent -2-ene OR $CH_3\text{-}CH{=}CH\text{-}CH_2CH_3$ (ii) B = C_2H_5Br c)  is allylic chloride	1 1 2 1
33	 (b) i) 2-methylpropene ii) $(CH_3)_3C\text{-}OH < (CH_3)_2CH\text{-}OH < CH_3OH$ As number of CH_3 groups increases Polarity of O-H bond decreases	2 1 1 1

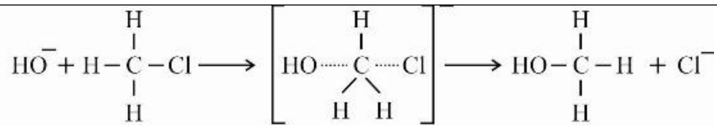
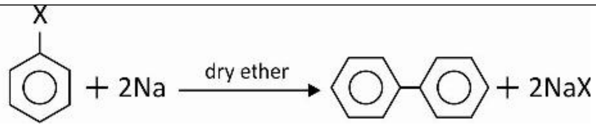
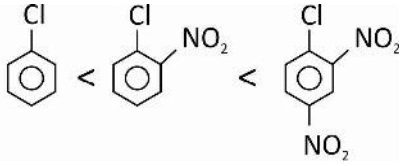
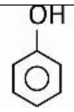
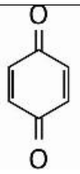
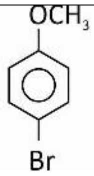
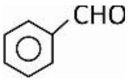
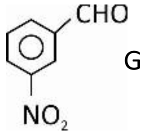
34	a) Reduction of nitriles to aldehydes using $SnCl_2$ / HCl $CH_3CN + SnCl_2 \longrightarrow CH_3CHO$ (b) i) $2HCHO \xrightarrow{conc\ KOH} HCOOK + CH_3OH$ - ii) $CH_3CHO + NH_2OH \longrightarrow CH_3\text{-}CH{=}N\text{-}OH$ iii) $CH_3COOH + PCl_5 \longrightarrow CH_3COCl + POCl_3 + HCl$	2 1 1 1
35	 $R{-}\overset{\overset{O}{\parallel}}{C}{-}NH_2 + Br_2 + 4NaOH \longrightarrow RNH_2 + Na_2CO_3 + 2NaBr + 2H_2O$ Conversion of amide to amine upon treatment with Br_2 / NaOH (b) (i) Lone pair density on nitrogen is less available than in aniline / due to +R effect / resonance / delocalization ii) X = $C_6H_5 - N \equiv NCl$ (o r $C_6H_5N_2Cl$) Y = C_6H_5Cl	2 1 1 1
36	 SUCROSE Both the reducing groups of glucose and fructose are involved in glycoside bond formation b) (i) five (5) ii)  $H_3{}^{+}N{-}\overset{\overset{R}{\vert}}{CH}{-}CO\overline{O}$ iii) vitamin B_{12}	1 1 1 1 1
37	a) i) Polyacrylonitrile ii) hexamethylene diamine and adipic acid OR $H_2N-(CH_2)_6-NH_2$ and $COOH-(CH_2)_4\text{-}COOH$ b) i) Zeigler – Natta catalyst ii) Cis configuration	1 2 1 1

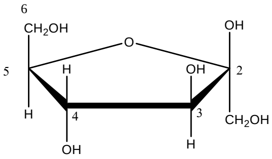
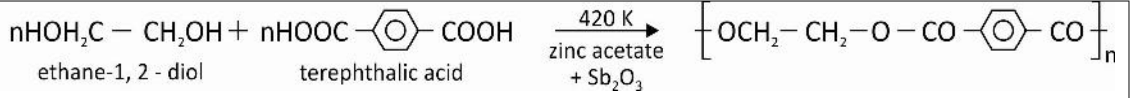
MODEL ANSWER WITH VALUE POINTS FOR QUESTION PAPER - 2

QNo	PART-A	Marks
1	It is an azeotrope.	1
2	273.48 K	1
3	B < A < C	1
4	A catalyst increases the rate of a reaction but a inhibitor reduces the rate of a reaction.	1
5	$\frac{x}{m} = kp^{\frac{1}{n}}$	1
6	Wrought or malleable iron	1
7	Helium or He.	1
8	$CH_3\,Br + AgF \longrightarrow CH_3F + AgBr$	1
9	but-2-enal	1
10	β – D – ribose	1
	PART-B	
11	a) These are solids for which some physical properties have different values in different directions.	1
	b) When magnetic moments of the domains are aligned parallel and in anti parallel directions in unequal numbers.	1
12	$\alpha = \frac{\wedge_m}{\wedge_m^0} = \frac{50}{440} = 0.1136$	2
13		2
14	i) Due to poor shielding by 5f electrons ii) 5f, 4d, 6s have nearly same energy.	1 1
15	$X = R - CH_2OH$ $Y = R^{I}\text{-}COOCH_2R$	1 1
16	$RCOONa + CHCl_3$ Haloform reaction	2
17	i) It has anti blood clotting action ii) The anion of it has cleansing action	1 1
18	An antibiotic that kills or inhibits a wide range of Gram-positive and negative bacteria. Penicillin is a narrow spectrum antibiotic.	1 1

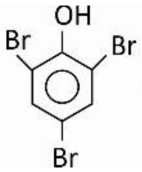
	PART-C	
19	i) 6Cu + SO_2 ii) Zr + $2I_2$ iii) Zn + CO	1 1 1
20	i) It forms stable pπ – pπ multiple bond with itself. ii) Due to non availability of ‘d’ orbitals in its valence shell. iii) Due to the formation of passive film of oxide on the surface.	1 1 1
21	Burning of sulphur or sulphide ore in air to generate SO_2 Conversion of SO_2 to SO_3 by its reaction with O_2 in presence of V_2O_5 at 2 bar pressure and 720K Absorption of SO_3 in conc. H_2SO_4 to get oleum, which is diluted with water to get H_2SO_4	1 1 1
22	i) $2Cl^- + F_2$ ii) $NaClO_3 + 5NaCl + 3\ H_2O$ iii) HX' + HOX	1 1 1
23	i) Due to much more negative ΔH^0_{hyd} of Cu^{2+} ii) Due to increase in nuclear charge as electron fill the inner ‘d’ orbitals. iii) Due to the removal of the electron from stable d^{10} configuration of Zn^{2+}	1 1 1
24	a) $MnO_2 \xrightarrow[\text{oxidised by air or KNO}_3]{\text{fuse with KOH}} MnO_4^{2-}$ $MnO_4^{2-} \xrightarrow[\text{alkaline solution}]{\text{Electrolytic oxidation in}} Mn\ O_4^-$ b) 	1 1 1
25	 Spin pairing and dsp^2 hybridization  Geometry : tetrahedral, Magnetic property : diamagnetic	1 2
26	a) Geometric or cis – trans isomerism 3 isomers	1 1
	b) M-C π bond is due to the donation of electron pair from filled ‘d’ orbital of the metal into vacant antibonding π* orbital of CO.	1

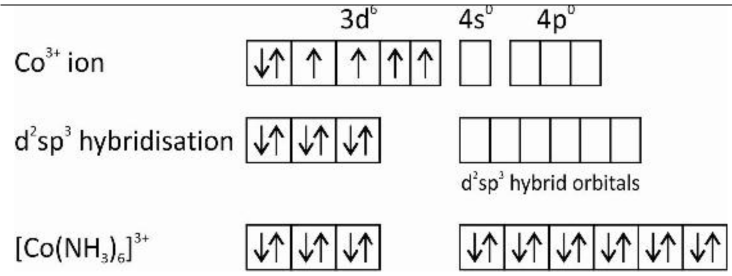
	PART D	
27	a) Packing efficiency = $\frac{\text{Volume of 4 spheres in a unit cell}}{\text{Total volume of unit cell}}\times 100\%$ In CCP, a = $\frac{4r}{\sqrt{2}}$ or $2\sqrt{2}$ r, volume = a^3 Packing efficiency = $\frac{4\times\frac{4}{3}\pi r^3}{\left(2\sqrt{2}r\right)^3}\times 100\%$ = 74% 	1 1 1
	b) $SrCl_2$ is added to molten NaCl and crystallized. Some Na^+ sites will be occupied by Sr^{2+}. Each Sr^{2+} replaces two Na^+ ions and thus cationic vacancy is produced for every Sr^{2+} ion added.	2
28	a) $x_{CO_2} = \frac{p_{CO_2}}{K_H}$ $x_{CO_2} = \frac{3.5}{1.67\times 10^3}$ = 2.095×10^{-3}	1 1
	b) i) A binary solution in which the solvent is a solid. ii) Property of the solution that depends only on the number of solute particles and not on their nature relative to the total number of particles in solution. iii) Two solutions that have same osmotic pressure at same temperature.	1 1 1
29	a) i) Oxygen gas ii) 2 or TWO	1 1
	b) i) Nickel – cadmium ii) Efficiency is more than in thermal power plants	1 1
	c) E_{cell} = $E^0_{cell} - \frac{0.059}{6}\log\frac{\left[Mg^{2+}\right]^3}{\left[Al^{3+}\right]^2}$	1
30	a) $\frac{2.303}{t_{99\%}}$ log $\frac{100}{1}$ = k ; $\frac{2.303}{t_{1/2}}$ log $\frac{100}{50}$ = k Equating both $\frac{2.303}{t_{99\%}}$ log 100 = $\frac{2.303}{t_{1/2}}$ log 2 $\frac{2}{t_{99\%}} = \frac{0.3010}{t_{1/2}}$ $t_{99\%} = 10\ t_{1/2}$	1 1 1
	b) A is most probable kinetic energy B is fraction of molecules having kinetic energy ≥ E_a.	1 1

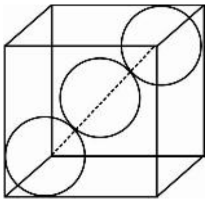
31	a) i) Mutual coagulation ii) dialysis iii) electro osmosis	1 1 1
	b) Highly efficient, highly specific in action, highly active under optimum temperature or pH (any two)	2
32	a)  inversion of configuration	1 1
	b) i)  diphenyl or biphenyl ii) 	1 1 1
33	a) i)  or phenol	1
	ii)  or benzoquinone	1
	iii)  or 4-bromoanisole	1
	b) i) o-nitrophenol is steam volatile but p-nitrophenol is not. ii) molecules of alcohol are associated through H-bonding.	1 1
34	a) P =  Q =  Gattermann Koch reaction	3
	b) Carboxylic acid lose CO_2 to form hydrocarbon when their sodium salts are heated with sodalime. $CH_3COONa \xrightarrow[heat]{NaOH+CaO} CH_4 + Na_2CO_3$	1 1

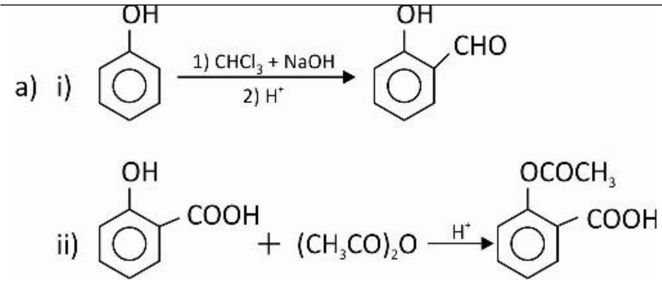
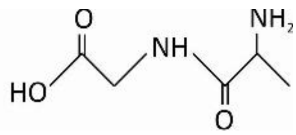
35	a) X = aniline or benzenamine	1
	Y = acetanilide or N-phenylethanamide	1
	b) Methylamine – It is a stronger base than ammonia	2
	c) Quarternary ammonium salt	1
36		1
	b) i) Glucose does not have a free aldehydic group	1
	ii) Cellulose	1
	iii) Glycine	1
	iv) Fibrous or globular	1
37	a) Polymer made up of only one type of monomer.	1
	Teflon, PVC, Polythene, Polystyrene, Nylon6, Natural rubber	1
	b) 	1
	Terylene or dacron or PETP	1
	c) A polymer contains chains of different lengths.	1

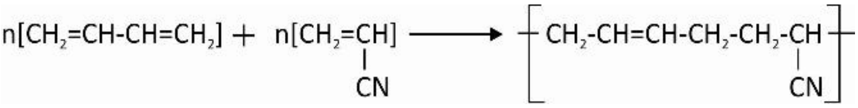
MODEL ANSWER WITH VALUE POINTS FOR QUESTION PAPER - 3

Q.No	PART-A	Marks
1	Osmosis	1
2	It decreases	1
3	Mercury (II) oxide or HgO	1
4	Zero order	1
5	Zero or 0	1
6	PbS	1
7	Helium or He	1
8	No change in the configuration at asymmetric carbon during a chemical reaction	1
9	Ketones	1
10	Iodine	1
	PART-B	
11	Cubic and rhombohedral (or trigonal)	2
12	$\Delta G° = -nFE^0 = -2 \times 96487 \times 0.7 = -135$ kJ	2
13	$E_a = 2.303 \times 8.314 \times \log\frac{k_2}{k_1} \times \frac{T_1T_2}{T_2 - T_1}$ $E_a = \frac{2.303 \times 8.314 \times \log 2 \times 300 \times 291}{9} = 55.9$ kJ	1 1
14	i) $4f^n$ where n = 1 to 14 ii) Neodynium	1 1
15	i) $CH_3\text{–}CH = CH - CHO$ ii)  + 3HBr	1 1
16	$CH_3\text{–}COOH \xrightarrow[\text{ii) } H_2O]{\text{i) } Cl_2\text{ , red P}} Cl - CH_2 - COOH$ Hell-Volhard -Zelinsky	1 1
17	a) Antagonists b) Antiseptic	1 1
18	Sodium dodecylbenzene sulphonate - anionic Cetyltrimethulammonium bromide - cationic	1 1

	PART-C	
19	a) Carbon (coke) : $ZnO + C \longrightarrow Zn + CO$ b) $Cu_2S + FeS$	2 1
20	a) Pt / Rh gauze b) $3NO_{2\,(g)} + H_2O_{\,(l)} \longrightarrow 2HNO_{3\,(aq)} + NO_{\,(g)}$ c) conc. H_2SO_4	1 1 1
21	i) $NO + O_3 \longrightarrow NO_2 + O_2$ ii) $5SO_2 + 2MnO_4^- + 2H_2O \longrightarrow 5SO_4^{2-} + 4H^+ + 2Mn^{2+}$ iii) $C + 2H_2SO_4 \longrightarrow CO_2 + 2SO_2 + 2H_2O$	1 1 1
22	a) $Cl_2 + H_2SO_4 + 2FeSO_4 \longrightarrow Fe_2(SO_4)_3 + 2HCl$ b) $KCl\ MgCl_2\ 6\ H_2O$ c) It is the most electronegative element	1 1 1
23	a) Cr is more stable in lower oxidation state b) Zero or 0 c) Bohr magneton or BM	1 1 1
24	$4FeCrO_4 + 8Na_2CO_3 + 7O_2 \longrightarrow 2Fe_2O_3 + 8Na_2CrO_4 + 8CO_2$ $2Na_2CrO_4 + 2Cl^+ \longrightarrow Na_2Cr_2O_7 + 2Na^+ + H_2O$ $Na_2Cr_2O_7 + 2KCl \longrightarrow K_2Cr_2O_7 + 2NaCl$	1 1 1
25	 Geometry : Octahedral Magnetic property : Diamagnetic	1 1 1
26	a) Metal-carbon has both σ and π bond between them. M–C σ bond by donating electron pair from C to metal M–C π bond by donating electron pair from filled d of metal to π* of carbon Thus M–C bond is strengthened. This is synergic effect. b) $[Pt(NH_3)_2Cl_2]$ or any other.	1 1 1
	PART-D	
27	a) Packing efficiency = $\frac{\text{volume occupied by two spheres in the unit cell}}{\text{Total volume of the unit cell}} \times 100\%$	1

<table>
<tr>
<td></td>
<td>Volume of the unit cell = a^3 ; a = $\frac{4r}{\sqrt{3}}$

Packing efficiency = $\frac{2\times\left(4/3\right)\pi r^3}{\left[\left(4/\sqrt{3}\right)r\right]^3}\times 100\%$ = 68%
b) $B_1\ A_{2x2/3}$ = B_3A_4</td>
<td>2
2</td>
</tr>
<tr>
<td>28</td>
<td>a) $\Delta T_b = K_b \times m$
$\Delta T_b = 0.52 + \frac{18}{180}\times\frac{1000}{1000}$ $\Delta T_b = 0.052$ K
Boiling point = 273.15 + 0.052 = 273.202 K
b) High pressure, low temperature</td>
<td>1
1
1
2</td>
</tr>
<tr>
<td>29</td>
<td>a) anode : $Cu_{(s)} \rightleftharpoons Cu^{2+}_{aq} + 2e^-$; cathode $2Ag^+_{aq} + 2e- \rightleftharpoons 2Ag_{(s)}$
b) $E^0_{cell} = \frac{0.059}{n}\log K$
c) k = $\frac{\text{cell constant}}{\text{resistance}}$ k = $\frac{1.29}{100}$ = 1.29×10^{-2} S cm^{-1}</td>
<td>2
1
2</td>
</tr>
<tr>
<td>30</td>
<td>a) $k = \frac{2.303}{t}\log\frac{\left[R_0\right]}{\left[R\right]}$; when t = $t_{½}$ $[R] = \frac{\left[R_0\right]}{2}$
$k = \frac{2.303}{t_{1/2}}\log\frac{\left[R_0\right]}{\left[R_0\right]/2}$
$k = \frac{0.693}{t_{1/2}}$
b) A catalyst provides an alternate path of low activation energy. Lowering of activation energy, increases the rate of the reaction.
c) rate of appearance of HI = $2\times 10^{-4}\ Ms^{-1}$</td>
<td>1
1
2
1</td>
</tr>
<tr>
<td>31</td>
<td>a) Zig zag movement of colloidal particles in a medium.
Unbalanced bombardment of colloidal particles by particles of the dispersion medium.
b)
<table>
<tr><th>Physisorption</th><th>Chemisorption</th></tr>
<tr><td>i) Van der Waal's forces</td><td>Chemical bond formation</td></tr>
<tr><td>ii) Multi molecular layers</td><td>Unimolecular layer.</td></tr>
</table>
c) Urease</td>
<td>1
1
2
1</td>
</tr>
<tr>
<td>32</td>
<td>a) $(CH_3)_3C{-}Br \rightleftharpoons (CH_3)_3\ C^+ + Br^-$</td>
<td></td>
</tr>
</table>

	$(CH_3)_3 C^+ + {}^-OH \longrightarrow (CH_3)_3 C-OH$	2
	Protic solvents solvate halide ion and provide energy	1
	b) i) $Cu_2 X_2$ ii) Nitrogen	2
33		1 1
	b) Alkyl halide react with alkoxide to form ether $R–X + NaOR' \longrightarrow R–O–R' + NaX$	2
	c) Primary alcohols	1
34	a) Reduction of carbonyl group with Zn-Hg / conc. HCl to methylene group $CH_3COCH_3 \xrightarrow[\text{conc.HCl}]{\text{Zn–Hg}} CH_3CH_2CH_3$ Acetone propane	2
	b) i) Etard reaction ii) Gatterman Koch iii) Rosenmund's	3
35	a) $R–NO_2 \xrightarrow{H_2/Ni} R–NH_2$	2
	b) $C_2H_5NH_2 + C_6H_5SO_2Cl \longrightarrow C_2H_5NH - SO_2 C_6H_5 + HCl$ N-ethylbenzenesulphonamide	2
	c) N, N - dimethylbenzenamine	1
36	a) Amylopectin	1
	b) Phosphodiester bond	1
	c) i) It refers to the sequence of α-amino acids in its polypeptide chain.	1
	ii) Loss in biological activity due to uncoiling of its globular or helical structure is denaturation.	1
	d) 	1

37	a) Linking large number of monomers by addition reaction	1
	Nylon 6, 6	1
	b) 1, 3 - butadiene and acrylonitrite	1
	 $n[CH_2=CH-CH=CH_2] + n[CH_2=\underset{CN}{\underset{\vert}{CH}}] \longrightarrow \left[CH_2-CH=CH-CH_2-CH_2-\underset{CN}{\underset{\vert}{CH}} \right]$	1
	c) $TiCl_4$ and triethyl aluminium.	1

The committee sincerely thanks the director and the personnel in the academic section Pre-University Education, Karnataka, for giving us all an opportunity to work towards preparing a question bank on chemistry subject for II PUC.

The president, reviewer and members considered the following points while finalising the question bank for each chapter.

1. Questions were framed to cover almost all the concepts in a chapter.
2. Members were asked to go through the 12th board exam papers of CBSE to get an idea as to how simple and intelligent questions are framed. Members have tried to set some questions on these lines.
3. Many types / variety of questions than could be suitable set (reasoning, thinking, application, matching type, fill in the blanks) for a chapter has been designed.
4. Questions carrying one, two and three marks has been framed for all the chapters. Questions carrying five marks (split in many ways) has been done for few chapters.
5. Considering this task as only an initial step, as there is more scope in future for improving and enriching the question bank by the department, we have sincerely tried to keep the number of questions to a minimum without compromising with the quality and the concepts.

We humbly admit that the question bank is not exhaustive and comprehensive. We have definitely not included all the intext and chapter end questions given in prescribed text book.

In spite of this we do believe that this question bank prompts a teacher to go through the text keenly and get salient points to teach and question the students at all levels. The question bank definitely helps the student to learn and practice all the concepts thoroughly and boosts his confidence to face any type or variety of questions in the board as well as in the competitive examinations.

The letters K, U, A, S against each question indicate the level or standard of the question. However this classification is not foolproof as it is very subjective based on one's intelligence.

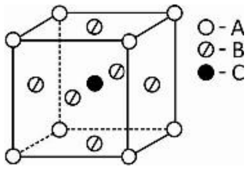
We take full responsibility for any factual or typing errors that may have crept in. Opinion/ suggestions for improving the question bank are welcome from all those concerned.

II PU CHEMISTRY QUESTION BANK

Subject Code: 34

Contents

UNIT-1: THE SOLID STATE

One mark questions:	
1. What is anisotropy?	K
2. Between glass and copper, which one is isotropic in nature?	U
3. Arrange these solids in their increasing order of inter molecular attractions: ice, I_2, solid ammonia	A
4. Ionic solids conduct electricity in molten state but not in solid state. Give reason	U
5. Is diamond a network or a metallic solid?	K
6. What type of crystalline solid is AlN?	K
7. Which type of crystalline solids have very high melting point?	K
8. Define coordination number	K
9. How many 3 dimensional crystal lattices are possible?	K
10. What is the coordination number of a particle in hcp?	U
11. How many octahedral voids are in ccp unit cell?	U
12. What is an end centred unit cell?	K
13. What is the formula of the compound if the unit cell of it contains atoms A, B and C and occupy the lattice points as shown?  	A
14. Nickel crystallizes as FCC. How many unit cells are required to accommodate one mole of nickel atoms?	U
15. Define packing efficiency.	K
16. Write the relationship between density and edge length of a unit cell.	K
17. What type of defect is exhibited by the solid solution of $CdCl_2$ and AgCl?	U
18. What are F-centres?	K
19. What is the colour imparted to/by KCl due to anionic vacancies?	K
20. ZnO turns yellow on heating. Name the type of defect created?	K
21. What are non stoichiometric defects?	K
22. A sample of nickel oxide has the formula $Ni_{0.98}O$. Name the type of non stoichiometric defect it exhibits.	U
23. What are intrinsic semiconductors?	K
24. How does electrical conductivity of an electrolyte vary with temperature?	U

25. Name the type of semiconductor obtained when Ge is doped with indium.	U
26. How are the domains arranged in MnO if it is a anti-ferromagnetic material?	U
27. Give an example for the substance that exhibits ferrimagnetism.	K
28. A metal has bcc system. What is the relationship between length of the body diagonal and radius of the metal atom?	U
Two mark questions	
1. Distinguish crystalline and amorphous solids with respect to: i) melting point ii) heat of fusion	K
2. What type of attractive force exists between constituent particles in: i) solid CO_2 ii) SiO_2	U
3. Write the differences between metallic and ionic crystalline solids	K
4. Write the differences between metallic and molecular crystalline solids	K
5. Name two types of 2 dimensional close packing arrangement.	U
6. Name the two parameters that characterise a unit cell.	K
7. Define unit cell and crystal lattice.	K
8. How many possible variations are in a cubic crystal system? Which one of these has 4 particles / unit cell?	U
9. What portion of the atom (or particle) belongs to a unit cell if it is located i) in the body of the unit cell ii) at the centre of an edge of the unit cell?	U
10. How many lattice points in unit cell of i) FCC ii) end centred	U
11. Write one similarity and one difference between hcp and ccp	U
12. Calculate the number of atoms in face centred cubic unit cell.	U
13. Calculate the number of atoms in body centred cubic unit cell.	U
14. In a compound, atoms A form ccp, atoms of B occupy all the tetrahedral voids and atom C occupy all the octahedral voids. What is the formula of the compound?	A
15. A metal oxide crystallises in hcp arrangement for its oxide ions. 2/3rds of octahedral voids are occupied by metal ions. What is the formula of the metal oxide?	S
16. Aluminium crystallizes in ccp structure. Its metallic radius is 125 pm. Calculate the length of the face diagonal of the unit cell.	S
17. A metal crystallizes in bcc structure. Edge length of the unit cell is 300 pm. How many unit cells are in 5 cm^3 of the metal?	S
18. What are point defects and line defects?	K

19. Distinguish between Frenkel and Schottky defects. K

20. Explain metal excess defect due to anionic vacancy. K

21. Explain metal deficiency defect using ZnO as an example. U

22. Electrical conductivity of a semiconductor (i) increases with temperature (ii) increases on doping with a suitable material. Give reasons. K

23. Write the differences between n-type and p-type semiconductors. U

24. What type of semiconductor is obtained when:
    i) silicon is doped with phosphorus ii) silicon is doped with boron? A

25. Mention the factors responsible for the magnetic moment of an electron. K

26. Write the differences between ferrimagnetic and ferromagnetic substances U

Three mark questions:

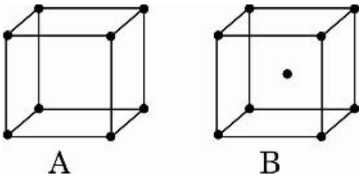
1. Based on intermolecular forces, name the three types of molecular solids. Mention the forces of attraction in them. K

2. Differentiate covalent and polar molecular solids based on
   i) constituent particles ii) bonding iii) melting point U

3. Match the type of packing in column-I to column-II: U

Column-I	Column-II
i) Square close packing in 3 dimensions	a) The first layer and the fourth layer are identical
ii) Hexagonal close packing in 3 dimensions	b) All layers are identical
iii) Cubic close packing in 3 dimensions	c) The first layer and the third layer are identical

4. What type of unit cells are A and B? How many particles per unit cell in B? U



5. Calculate the packing efficiency in cubic close packing (ccp) structure . K

6. Calculate the packing efficiency in bcc structure. K

7. Calculate the packing efficiency in simple cubic lattice. K

8. An element crystalises in fcc and has edge length 0.56 nm. Calculate the density of the element. Molar mass of the element is 40 $\mathrm{gmol^{-1}}$. S

9. An element X has a density of 6.23 g $\mathrm{cm^{-3}}$. If the edge length of the unit cell is

4×10^{-8} cm, identify the type of cubic unit cell. Given : molar mass of the element = 60 $gmol^{-1}$.	S
10. A metal crystallizes in bcc unit cell. The atomic mass of the metal is 55.8 g mol^{-1}, density = 7.9 g cm^{-3}. Calculate the edge length of the unit cell?	S
11. What type i) of defect is introduced when molten NaCl is crystallised with $SrCl_2$? ii) of vacancy is produced? How many moles of these vacancies are created if the crystal obtained has 10^{-3} mole of Sr^{+2} ions?	
12. Account for the following: i) Silicon doped with Al is p type semiconductor ii) Frenkel defect does not change the density of ionic crystals iii) non-polar molecular solids have very low melting and boiling points.	U
13. Differentiate metals, insulators and semiconductors in terms of band theory.	U
14. Arrangement of magnetic domains are as given: i) ↑↓↑↓↑↓ ii) ↑↑↓↓↓↑↑↑ What type of magnetic property is in (i) and (ii)? Which one of this becomes paramagnetic on heating?	K U
Five mark questions:	
1. a) A cubic solid has elements P and Q. Atoms of Q at the corners and atom P at the body centre. i) what is the formula of the solid? ii) What is the coordination number of P & Q? b) A compound forms hcp structure. What is the total number of voids in 0.4 mol of it? How many of these are tetrahedral voids? Given $N_A = 6.022 \times 10^{23}$.	A
2. With respect to Frenkel and Schottky defects: i) In which type of crystalline solids are these found? ii) When is Frenkel defect possible? iii) What type of defect does these show? i) ZnS ii) NaCl iii) AgBr	U
3. a) In FeO solid, some Fe^{2+} ions are missing, but the charge is balanced by the presence of Fe^{3+} ions. i) If Fe^{2+} ions missing are 15, how many Fe^{3+} ions balance the charge? ii) What type of defect does this lead to? iii) If for 100 O^{-2} ions the number of Fe^{2+} and Fe^{3+} are 85 and 10 respectively, what is the composition of the non-stoichiometric FeO solid formed? b) i) How many types of primitive unit cells are known? ii) Name any one crystal system for which only primitive unit cells are possible.	S

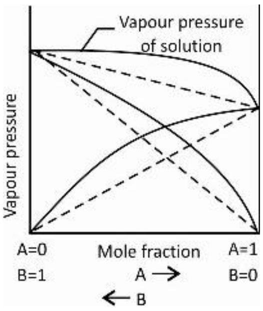
UNIT-2: SOLUTIONS

One mark questions:	
1. What is a binary solution?	K
2. Give an example for a solution of a solid in a gas.	U
3. 5 g of glucose is dissolved in 95g of water. What is the mass percentage of glucose?	S
4. Write the expression to calculate volume percentage of solute.	K
5. In a binary solution, mole fraction of a component is 0.85. What is the mole fraction of the other component?	U
6. What is the mass of sodium hydroxide present in 500mL of 1M NaOH solution? (Molar mass of NaOH is 40 $gmol^{-1}$).	S
7. Name a concentration term which is independent of temperature.	U
8. How does the solubility of a solid solute in a liquid vary with increase in temperature if the dissolution process is endothermic?	U
9. Write the mathematical expression for Henry's law.	K
10. K_H values for the gases argon and methane in water at 298K are 40.3 /k bar and 0.413 / k bar respectively. Which gas is more soluble at this temperature?	U
11. Cylinders used by Scuba divers is diluted with helium gas. Why?	A
12. State Raoult's law.	K
13. Vapour pressures of chloroform and dichloromethane are 200mm of Hg and 415mm of Hg at 298K respectively. Which one is more volatile?	U
14. What are ideal solutions?	K
15. Give an example for a non ideal solution showing negative deviation from Raoult's law.	U
16. Based on inter molecular interactions, give the reason for a solution of A and B to show positive deviation from Raoult's law.	U
17. Arrange the following aqueous solutions in decreasing order of their relative lowering of vapour pressure: i) 0.1M sucrose ii) 0.1 M NaCl iii) 0.05 M glucose iv) 0.1 M acetic acid	A
18. Molal elevation constant for water is 0.52 Kkg mol^{-1}. What is the elevation in boiling point produced for one molal aqueous solution of a solute for which i=1?	A
19. Write the SI unit for Ebullioscopic constant.	K
20. Write the relationship between K_b and enthalpy of vapourisation of the solvent.	K

21. Which of the following aqueous solutions should have higher boiling point? 0.01M NaCl or 0.01M Na_2SO_4 (assume both undergo almost complete ionisation)	U
22. Sea water freezes at a temperature lower than that of pure water. Why?	U
23. Ethylene glycol is added as antifreeze to petrol in cold countries. Why?	U
24. Which solution would exhibit lower osmotic pressure? Aqueous solution of urea or aqueous solution of common salt, both of same concentration.	U
25. Give a definition for van't Hoff factor 'i'.	K
26. Write the modified equation to calculate ΔT_b for $i \neq 1$.	K
Two mark questions.	
1. Differentiate molarity and molality of a solution. Which one of these varies with temperature?	U
2. Concentration of urea in an aqueous solution is 45% by mass. Calculate the mass of urea in 100g of water.	S
3. 10mL of ethanol is mixed with 250 mL of water. Calculate the volume percent of ethanol.	S
4. 20g of glucose is present in 500mL of its solution. Calculate the mass by volume percentage of glucose.	S
5. 20g of HCl is present in $2dm^3$ of its solution. Calculate the molarity of HCl solution. Given molar mass of HCl =36.5g/ mol	S
6. 30g of urea is dissolved in 500g of water. Calculate the molality of this solution. Given molar mass of urea =60 g/mol.	S
7. One kg of a sample of hard water contains 3mg of calcium carbonate. Express the concentration of calcium carbonate in ppm.	S
8. State Henry's law. Aquatic species are more comfortable towards respiration in cold water than in warm water. Why?	U
9. Draw the graph of partial pressure of a gas in vapour phase versus mole fraction of the gas in solution. What is the slope of a line equal to?	S
10. Mention any two factors affecting solubility of a gas in a liquid.	K
11. Draw the graph for, the plot of vapour pressure versus mole fraction of an ideal solution.	S
12. Write any two differences between ideal and non ideal solutions.	K
13. What are azeotropes? What type of solutions form minimum boiling azeotropes?	K

14. What are colligative properties? Molal cryoscopic constant of acetic acid is 3.9 Kkgmol^{-1}. What does this mean?	K
15. 3 moles of a non-volatile solute is dissolved in 15 mol of a solvent. Calculate the relative lowering of vapour pressure.	S
16. Vapour pressure of pure benzene at some temperature is 0.95 bar. Calculate the vapour pressure of 1 molal solution of a non-volatile solute (i=1) in it. Given molar mass of benzene = 78 gmol^{-1}.	S
17. Vapour pressure of water at 295 K is 18.5 mm of Hg. Calculate the vapour pressure of the solution containing 25 g urea dissolved in 400 g of water at the same temperature. Given molar mass of urea = 60 g mol^{-1}.	S
18. How does boiling point and freezing point of a solvent vary when a non volatile solute is added to it?	U
19. What is the effect on the i) vapour pressure ii) boiling point of a solvent, when a non-volatile solute is dissolved in it?	U
20. The molal depression constant of water is 1.86 K/m. Calculate the depression in freezing point of 0.1 molal aqueous urea solution.	S
21. Molal elevation constant for benzene is 2.52K/m. A solution of benzene containing a solute (i=1) boils at 0.126°C higher than benzene. Calculate the molality of the solution.	S
22. i) Define osmotic pressure. ii) What are isotonic solutions?	K
23. Molecular mass of polymers or proteins are more often determined by measuring osmotic pressure rather than by any other colligative property. Give two reasons.	A
24. What is the observation made when blood cells are placed in saturated salt solution? What are such solutions called?	A
25. What does the value of Van't-Hoff factor indicate? What is the value i for a solute that dissociates in a solvent?	U
26. The value of i for acetic acid is i) > 1 in water ii) < 1 in benzene What inference can be drawn regarding acetic acid in these solvents?	A
27. Normal molar mass of a solute is 246 g mol^{-1} and molar mass of the same in a solvent is 346 gmol^{-1}. What is the value of i? Comment on the state of the solute in the solvent.	S
28. Explain the desalination of sea water using reverse osmosis technique.	K

29. Name the phenomenon involved: i) a piece of raw mango in salt solution shrinks. ii) when pressure greater than osmotic pressure is applied on the solution side	A
Three mark questions:	
1. 3 moles of sodium chloride is dissolved in 250 moles of water. What is the mole fraction of NaCl and water in the solution?	S
2. Give reasons: i) solubility of a gas in a solvent is always exothermic ii) there is volume expansion when ethanol is added to water iii) elevation in boiling point is observed when sea water is boiled at 1 bar pressure	A
3. Give reasons: i) Liquids A and B on mixing produce a warmer solution ii) Freezing point depression of 0.1 M aqueous NaCl is nearly twice that of 0.1 M aqueous sucrose solution iii) Blood cells when placed in water swells.	A
4. Give reasons: i) there is no osmosis when 0.1 M urea solution is separated from 0.1 M sucrose solution by a semi-permeable membrane. ii) molar mass of an electrolyte in a polar solvent determined by any colligative property is less than its theoretical molar mass. iii) 95% aq. ethanol by volume cannot be concentrated by fractional distillation	A
5. The vapour pressure of pure water at 50°C is 12260Pa. 18.2g of solute was dissolved in 100g of water at the same temperature. The lowering of vapour pressure produced is 660Pa. Calculate the molar mass of the solute. [A: 60.85 gmol^{-1}]	S
6. The vapour pressure of pure water at 298K is 3.3kPa. Calculate the relative lowering of vapour pressure of an aqueous solution containing 20g of glucose dissolved in 90g of water at the same temperature. (Molar mass of glucose = 180gmol^{-1}, molar mass of water = 18 gmol^{-1}). [A : 0.02173]	S
7. At 100° C, benzene and toluene have vapour pressure of 1375 torr and 558 torr, respectively. Assuming these two form an ideal binary solution, calculate the mole fraction of benzene in vapour phase at 1 atm and 100° C. [A : 0.247]	S
8. The vapour pressure of pure benzene at a certain temperature is 200mm of Hg. At	

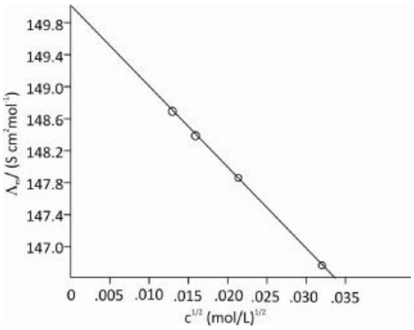
the same temperature, the vapour pressure of solution containing 2g of a non volatile, non electrolytic solute in 78g of benzene is 195mm of Hg. Calculate the molar mass of the solute. [A : 80 g mol^{-1}]	S
9. 12.6g of a non electrolyte is dissolved in 75g of water. The freezing point of this solution is 271.9K. If molar depression constant is 1.86 $Kkgmol^{-1}$, calculate the molar mass of the solute. (Freezing point of pure water = 273.15 K) [A: 250 g mol^{-1}]	S
10. Using the graph answer the following: i) What type of non-ideal solution shows such a behaviour? ii) What can you infer about the molecular interactions before & after mixing A and B? iii) What type of azeotrope will the mixture of A and B form?  	S
11. The boiling point of benzene is 353.23K. When 1.8g of a non volatile solute was dissolved in 90g of benzene, the boiling point is raised to 354.11K. Calculate the molar mass of solute. (K_b = 2.52 K kg mol^{-1}) [A : 57.2 g mol^{-1}]	S
12. 20 g of an organic acid is dissolved in 500 g of water. The depression in freezing point of water was by 1°. Calculate the Van't Hoff factor and degree of dissociation of the acid. (Molar mass of acid = 79 $gmol^{-1}$, K_f =1.86 K $kgmol^{-1}$). [A: i = 1.06 ; 0.06]	S
13. Acetic acid exists in benzene solution in the dimeric form. In an actual experiment the Van't Hoff factor was found to be 0.52. Calculate the degree of association of acetic acid. [A : 0.96]	S
14. Calculate the boiling point of the solution which has 15 g of $MgSO_4$ dissolved in 550 g of water. Assume i = 2 for the solute. Boiling point of pure water = 373.15 K. (Molar mass of $MgSO_4$ = 120 g mol^{-1}, K_b = 0.52 K $kgmol^{-1}$) [A : 373.38 K]	S
15. Calculate the osmotic pressure of 5% (m/V) solution of urea at 300K. (The value of R is 0.0821 L atm K^{-1}, Molar mass of urea = 60 g mol^{-1}). [A : 20.5 atm]	S
16. A 1.46% solution of a compound has an osmotic pressure of 783 mm of Hg at 300K. Calculate the molar mass of the compound. R = 62.36 L mm Hg K^{-1} mol^{-1}. [A : 348.8 g mol^{-1}]	S
17. Normal saline is 0.9% mass/volume sodium chloride solution. Calculate the osmotic pressure of normal saline at 300 K. Given molar mass of NaCl=58.5 $gmol^{-1}$, R=0.083 Lbar mol^{-1} K^{-1}. [A : 3.8 bar]	S

UNIT-3 : ELECTROCHEMISTRY

One mark questions:	
1. When can a Galvanic cell become an electrolytic cell?	U
2. What is limiting molar conductivity?	K
3. Why does the molar conductivity increase on decreasing the concentration of the weak electrolyte?	U
4. The value of $\wedge^{0}_{m(NaBr)} - \wedge^{0}_{m(NaCl)} \cong 1.8$ Scm^{2}mol^{-1}, then calculate the value of $\wedge^{0}_{m(KBr)} - \wedge^{0}_{m(KCl)}$.	U
5. $\lambda^{0}_{H^{+}}$ and $\lambda^{0}_{OH^{-}}$ are 349.6 Scm^{2}mol^{-1} and 199.1 Scm^{2}mol^{-1} at 298 K respectively. Calculate $\wedge^{0}_{m}$ of water.	S
6. When 1F of charge is passed through 1M HCl, volume of hydrogen liberated was 11.35L at STP. What is the volume of hydrogen liberated when same quantity of electricity is passed through 1M H_2SO_4.	A
7. Differentiate between reactive and inert electrodes.	U
8. What is the role of platinum in SHE?	U
9. What is the value assigned to the electrode potential of SHE at 300K?	U
10. A galvanic cell is constructed using SHE and silver electrode . [Ag^{+}] = 1M and $E^{o}Ag^{+}/Ag = +0.8V$. What is the cell potential?	S
11. Given $E^{0}_{Ni} < E^{0}_{H_2}$, then between nickel and hydrogen which is more stable in reduced form?	S
12. Mention an observation made when an iron rod is dipped into 0.1M $CuSO_4$ solution?	U
13. Following are the values of E^{0}_{red} values of certain elements. Arrange them in the descending order of their oxidizing power. $E^{0}_{Mg^{+2}/Mg} = -2.36V$, $E^{0}_{Ni^{+2}/Ni} = -0.25V$, $E^{0}_{Fe^{+3}/Fe^{+2}} = 0.77V$, $E^{0}_{Ag^{+}/Ag} = +0.8V$, $E^{0}_{F_2/F^{-}} = 2.87V$	A
14. What is the electrode potential of a Daniell cell when the concentrations of copper and zinc ions are 1M each. $E^{0}_{Cu^{+2}/Cu} = 0.34V$, $E^{0}_{Zn^{+2}/Zn} = -0.76V$?	A
15. ΔG for the reaction $2X^{+} + 2e^{-} \longrightarrow X_2$ is –84.92 kJ. What is the value of ΔG for the reaction: $X^{+} + e^{-} \longrightarrow ½ X_2$? [A:–42.46kJ]	A
16. Write the relationship between E^{o}_{cell} and equilibrium constant.	K
17. What is the major difference between a primary battery and a secondary battery?	U

18. Name one metal which can be used as sacrificial electrode to prevent rusting of iron.	A
Two mark questions:	
1. Differentiate between strong and weak electrolytes.	U
2. Define conductivity of a solution. Write its SI unit.	K
3. How does (i) conductivity (ii) molar conductivity of an electrolyte change with dilution?	U
4. The cell constant of a given cell is 0.47 cm^{-1}. The resistance of a solution taken in the cell was found to be 31.6Ω. Calculate the conductivity of the solution. [A : 0.0148S cm^{-1}]	S
5. The conductivity of 0.025 M solution of methanoic acid is 1.1525 S cm^{-1}. Calculate its molar conductivity. [A:46100 S cm^2 mol^{-1}]	S
6. State (i) Faraday's II law of electrolysis (ii) Kohlrausch law	K
7. A solution of $Ni(NO_3)_2$ is electrolysed between Pt electrodes using current of 5 amps for 20 mins. What mass of nickel is deposited at the cathode? (Molar mass of Ni=58.7 g mol^{-1}. 1F = 96487 C)	S
8. 96487C of charge is passed through both $CuSO_4$ solution and $AgNO_3$ solution. The mass of copper deposited is 32g. What would be the mass of silver deposited? (Molar mass of copper = 64gmol^{-1} and silver =108g mol^{-1}) (1F=96487C)	S
9. In electrolysis, lower the electrode potential, higher is the tendency for oxidation reaction to occur. When aqueous NaCl is electrolysed, following two reactions are possible. Which of these two is preferred and why? $Cl^-_{(aq)} \longrightarrow \frac{1}{2} Cl_{2\,(g)} + e^-$ E^0_{cell} = 1.36 V $2H_2O_{(l)} \longrightarrow O_{2\,(g)} + 4H^+_{(aq)} + 4e^-$ E^0_{cell} = 1.23 V	A
10. A total of 49750C of charge was required to reduce 9.5g of M^{+3} ion to metal. Calculate the molar mass of the metal. 1F = 96500C. [A:55.28]	S
11. Calculate $\wedge^0_m$ for $CaCl_2$ given $\lambda^0_{Ca^{2+}}$ = 119.0 Scm^2mol^{-1} and $\lambda^0_{Cl^-}$ = 76.3 Scm^2mol^{-1}. [A: 271.6 Scm^2 mol^{-1}]	S
12. Write the anodic reaction occurring during the electrolysis of dilute H_2SO_4. What would be the product if higher concentration of sulphuric acid is electrolysed?	K
13. What are the conditions under which a hydrogen electrode is considered a standard hydrogen electrode?	U
14. Draw a neat labeled diagram of SHE and write its symbolic representation.	S

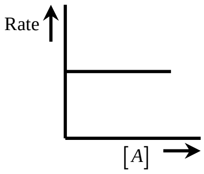
15. Given $E^0_{Ni^{2+}/Ni}$ = –0.25V, $E^0_{Cr^{3+}/Cr}$ = – 0.74V. Identify a stronger redox couple. Give reason.	S
16. In a cell, the reaction $Fe + 2H^+ \longrightarrow Fe^{+2} + H_2$, takes place. What happens to the emf of the cell when sulphuric acid is poured at the cathode. Give reason.	A
17. The reduction potential of Mg^{+2} and Al^{+3} are –2.37 and –1.66 volts respectively. Constructing a Galvanic cell using these electrodes, give the cell representation, and write the Nernst equation .	S
18. At which electrode will oxidation occur in a (i) Galvanic cell (ii) electrolytic cell	U
19. E^0_{Cu} = +0.3V. Copper does not dissolve in HCl but dissolves in HNO_3. Explain.	U
20. EMF of a galvanic cell is 1.05V and 193000 Coulomb of charge is passed. Calculate the reversible work done by the cell. [A: 202650J]	S
21. Write the overall cell reaction occurring in a mercury-cell. Its cell potential remains a constant value of approximately 1.35V during its life. Why?	U
22. Write the reactions occurring during discharging of lead storage battery.	K
23. What are the advantages of fuel cell over other conventional power plants in producing energy?	A
24. i) Chemically "what is rust"? ii) Write anodic reaction occurring during the rusting of iron	K
25. Give two methods for the prevention of corrosion.	A
Three mark questions	
1. What do we mean by cell constant in conductivity measurements. If the resistance of a conductivity cell filled with 0.02 M KCl solution is 520 Ω, calculate its cell constant, given $\kappa = 0.248\ Sm^{-1}$. [A: $128.96\ m^{-1}$]	S
2. Molar conductivity of 0.05M acetic acid solution at 298K is 7.36 Sm^2mol^{-1}. Calculate the degree of dissociation of acetic acid and also Ka. [$\lambda^0_{CH_3COOH}$ = 390.7 Sm^2mol^{-1}]. [A: 0.0188, 1.8×10^{-5}]	S
3. Predict the products of electrolysis for the following i) aqueous solution of NaCl with graphite electrodes ii) aqueous solution of $CuSO_4$ with platinum electrodes iii) aqueous solution of $AgNO_3$ with silver electrodes	A

4. Electrolysis of aqueous sodium chloride solution was carried out by passing 5 A current for 3 hours. Calculate the volume of hydrogen liberated at STP, at the cathode. [1F = 96500C, molar volume of hydrogen at STP = 22,400 cm^3]. [A: 2089 cm^3]	S
5. In the electrolysis of copper sulphate solution using current of 5.3A, the mass of cathode increased by 4.6g. Calculate the time taken in min for the electrolysis (molar mass of copper = $64 gmol^{-1}$, 1F = 96500C) [A: 43.6 mins]	S
6. Given is the plot of Λ_m Vs $C^{½}$ for a electrolyte 'X'. What type of electrolyte is X? What does the intercept refer to? What is its value?  	S
7. Name the following: i) The difference between the electrode potentials of two electrodes when no current is drawn through the cell ii) the quantity length/area of the electrode in a conductivity cell iii) M^{n+}/M	S
8. Using Nernst equation calculate the concentration of Sn^{+2} ions at which the single electrode potential becomes zero. Given : $E^0_{Sn^{2+}/Sn} = -0.14$ V. [A: 5.55×10^6 M]	S
9. Using the Nernst equation for the following cell at 298K and calculate the EMF. $Al_{(S)} \mid Al^{+3}_{0.001M} \| Cu^{+2}_{0.0001M} \mid Cu_{(s)}$. Given $E^0_{Al^{3+}/Al} = -1.66$ V and $E^0_{Cu^{+2}/Cu} = +0.34$V [A:1.941V]	S
10. Give the cell diagram of a galvanic cell made of zinc and nickel showing the direction of flow of electrons. Write the half cell reactions. $E^0_{Ni^{2+}/Ni} = -0.25$V, $E^0_{Zn^{2+}/Zn} = -0.76$V.	S

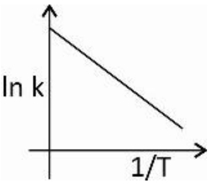
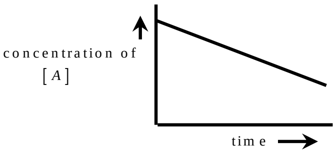
11. For the cell $Mg_{(s)} \mid Mg^{+2}_{(aq)} \parallel Ag^{+}_{(aq)} \mid Ag_{(s)}$, calculate the EMF of the cell when the concentration of Ag^{+} ions is 5 times that of concentration of Mg^{+2} ions. Given $E^{0}_{cell} = 3.17V$. [A : 3.211V]	S
12. Consider the following reaction; $2Fe_{(s)} + O_{2(g)} + 4H^{+}_{(aq)} \longrightarrow 2Fe^{+2}_{(aq)} + 2H_2O_{(l)}$ $E^{0}_{cell} = 1.67V$. If $[Fe^{+2}] = 10^{-3}$ M, $p_{O_2} = 0.1$ bar and pH = 3, Calculate the cell potential at 25°C. [A:1.56V]	S
13. Calculate the value of E^{0}_{cell} for the reaction $Fe + Cu^{+2} \longrightarrow Fe^{+2} + Cu$, if the equilibrium constant for the reaction is 2.18×10^{26}. [A : 0.7769V]	S
14. E^{0}_{cell} for the reaction $Sn + Cu^{+2}_{(aq)} \longrightarrow Sn^{+2}_{(aq)} + Cu$ is 0.48 V. Write the value of E^{0}_{cell} and calculate ΔG for the reaction $2Sn + 2Cu^{+2}_{(aq)} \longrightarrow 2Sn^{+2}_{(aq)} + 2Cu$. Given: 1F = 96500C. [A : 0.48V, –185280J]	S
Five mark questions:	
1. a) Name the anode, cathode and the electrolyte used in dry cell. b) $\wedge^{0}_{m}$ of sodium benzoate, hydrochloric acid, sodium chloride are 82.4, 426.2, 26.53 $Sm^{2}mol^{-1}$. Calculate $\wedge^{0}_{m}$ for benzoic acid. [A: 482.07 $Sm^{2}\ mol^{-1}$]	S
2. a) What are fuel cells? Write the schematic diagram of H_2–O_2 fuel cell and give the electrode reactions. b) How is molar conductivity related to conductivity?	S
3. a) Depict the galvanic cell, in which the reaction $Zn + 2Ag^{+}_{(aq)} \longrightarrow Zn^{+2}_{(aq)} + 2Ag$ takes place. Which of the electrode is negatively charged? Give the reaction at anode. b) How much charge in coulombs is required to reduce 1 mole of $Cr_2O_7^{-2}$ to Cr_2O_3? Given: 1F = 96500C [A: 579000 C]	S
4. Given $E^{0}_{Ag^{+}/Ag} = 0.8$ V, $E^{0}_{Cl_2/Cl^{-}} = 1.36$ V, $E^{0}_{Mg^{+2}/Mg} = -2.36$ V, $E^{0}_{Fe^{+2}/Fe} = -0.44$ V i) Identify the couple which is the a) strongest reducing agent b) strongest oxidising agent ii) Will iron displace Mg^{+2} or Ag^{+} from their salt solution? iii) Calculate E^{0}_{cell} for : $Fe \parallel Cl_2, Pt$ [A : 1.8 V]	S

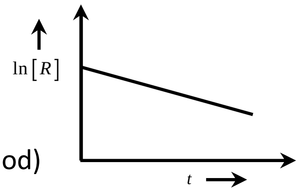
5. a) $3Fe^{+2} + 2Ag^{+}_{(aq)} \longrightarrow 2Fe^{+3}_{(aq)} + 2Ag$ is the reaction occurring in a galvanic cell. Calculate its E^{0}_{cell} and ΔG^{0}. $E^{0}_{Fe^{+3}/Fe^{+2}} = 0.77V$, $E^{0}_{Ag^{+}/Ag} = +0.8V$ [A: 1.57V, −303010J] b) Mention any two factors which can influence the products formed at the electrodes during electrolysis?	S
6. a) For Daniell cell Zn ll Cu, E = 1.1V, when $[Zn^{+2}]$ and $[Cu^{+2}]$ are equal to 1M ; i) When does the cell potential become zero, if the cell in a circuit is closed. ii) What is observed when an external potential applied to the cell a) is equal to 1.1V b) is greater than 1.1V? b) Between cell potential and free energy change ,which one is an intensive property? ΔG^{0} for the reaction $Cu^{+2} + H_2 \rightleftharpoons Cu + 2H^{+}$, is -65.6×10^{3} J. Calculate the work done if the hydrogen consumed is 0.5 mole. [A: 32.8×10^{3}J]	U

UNIT-4: CHEMICAL KINETICS

One mark questions:	
1. Differentiate between average and instantaneous rate of a reaction.	U
2. Express the rate of the reaction in terms of different reactants and products for; $2N_2O_{5(g)} \longrightarrow 4NO_{2(g)} + O_{2(g)}$	U
3. Define order of a reaction.	K
4. What is an elementary reaction?	K
5. Define molecularity of reaction.	K
6. What is the slowest step in a complex reaction also called?	K
7. For what type of reactions is molecularity and order the same?	U
8. What is the order of the reaction for which the rate law is; Rate $= k[A]^{1/2}[B]^{3/2}$	S
9. Unit of rate constant of a reaction is same as the unit of rate of reaction. What is the order of the reaction?	U
10. Mention any one condition under which a second order reaction of rate law: rate = $k[A]^1[B]^1$ can be made a pseudo first order reaction.	U
11. For a reaction, the graph of rate of the reaction against molar concentration of the reactant is as shown. What is the order of the reaction? 	A
12. Rate law of a reaction is : rate = k $[NO]^2$ $[O_2]$. By how many times does the rate of the reaction increase if the volume of the reaction vessel is halved?	S
13. By how many times does the $t_{½}$ of zero order reaction increase if the initial concentration of the reactant is doubled.	S
14. $t_{½}$ of a reaction is 10 minutes, for a first order reaction. What percent of the reactant remains unreacted at the end of 50 minutes? [A:3.125%]	S
15. If $t_{½}$ for a first order reaction is 25 s, what is the time required for 10 g of a reactant to get reduced to 1.25 g? [A: 75 s]	S
16. Oxygen is available in air, yet fuels do not burn spontaneously at room temperature. Why?	A
17. In the Arrhenius equation $k = Ae^{-Ea/RT}$, What does $e^{-Ea/RT}$ represent?	K
18. What is the relationship between the rate constant and activation energy of a reaction?	K
19. Differentiate between activation energy and threshold energy of a reaction.	U

20. For many reactions, it is found that a large number of colliding molecules have energy more than threshold value, yet the rate of the reaction is slow. What might be the reason?	U
21. What is collision frequency?	K
Two mark questions	
1. Mention the factors which affect the rate of a reaction.	U
2. In a reaction $2A \longrightarrow$ products, the concentration of A decreases from 0.5 to 0.4 mol L^{-1} in 10 minutes. Calculate the rate of reaction during this interval. [A: 5×10^{-3} $Mmin^{-1}$]	S
3. Identify the order of the reaction from the unit of rate constants. i) L mol^{-1} s^{-1} ii) M^{-2} min^{-1}	U
4. Write the order of the reaction and unit of the rate constant for the reaction: $CH_3CHO_{(g)} \longrightarrow CH_{4(g)} + CO_{(g)}$. Rate = k $[CH_3CHO]^{3/2}$	U
5. $2A \longrightarrow P$; is second order reaction. How is the rate of the reaction affected if the concentration of A is (a) doubled (b) reduced to half?	S
6. Define half-life period of a reaction. Give an expression for $t_{½}$ for a zero order reaction.	K
7. Show that half-life period for a zero order reaction $R \longrightarrow P$, is directly proportional to initial concentration of the reactant.	K
8. Show that the half-life period of a first order reaction $R \longrightarrow P$ is independent of initial concentration of the reactant.	K
9. For a zero order reaction: $2NH_{3(g)} \xrightarrow[\Delta]{Pt} N_{2(g)} + 3H_{2(g)}$, the rate constant k = 2 × 10^{-4} mol L^{-1} s^{-1}. What are the rates of production of N_2 and H_2?	S
10. Time required to decompose SO_2Cl_2 to half of its initial amount in 55 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.	S
11. What happens to half life time of a first order reaction when temperature is increased? Give reason.	A
12. Draw a graph of concentration of R versus time for a zero order reaction $R \longrightarrow P$. What is the intercept of the line equal to?	S
13. The decomposition of a hydrocarbon follows the equation: $k = 4.5 \times 10^{11} e^{-28000/T}$. Calculate E_a. Given R = 8.314 J K^{-1} mol^{-1}. [A: 232.79 kJ]	S

14. The activation energy for a reaction at the temperature T was found to be 2.303RT J mol^{-1}. Calculate the ratio of the rate constant to Arrhenius factor. [A: 1.25×10^{-2}]	S
15. Draw the plot of the distribution curves showing the temperature dependence on the rate of the reaction at two temperatures t and (t+10). Mark E_a and shade the relevant regions to show that fraction of molecules having energy greater than E_a doubles when temperature is increased by 10°.	S
16. In the graph, what is the intercept and slope of the line equal to?  	S
17. What does P and Z_{AB} represent in the equation : rate = P Z_{AB} $e^{-Ea/RT}$?	K
Three mark questions	
1. A reaction is first order in X and second order in Y: i) Write the differential rate law of the reaction. ii) How is the rate affected on increasing the concentration of Y three times? iii) Write the SI unit for the rate constant.	S
2. For a general reaction $A \rightarrow B$, plot of concentration of A vs. time is given. Answer the following questions: i) What is the order of the reaction? ii) What is the slope of the line equal to? iii) What is the unit of the rate constant?  	S
3. Derive an integrated rate equation for the rate constant of a zero order reaction.	K
4. Derive an integrated rate equation for the rate constant of a first order reaction.	K
5. The initial concentration of N_2O_5 in the following first order reaction $N_2O_5 \longrightarrow 2NO_{2(g)} + \frac{1}{2} O_{2(g)}$ was 1.24 $\times 10^{-2}$ M at 318 K. The concentration of N_2O_5 after 60 minutes was 0.2×10^{-2} M. Calculate the rate constant of the reaction at 318K. [A: k = 0.304]	S
6. A first order reaction takes 40 minutes for 30% completion. Calculate the rate constant. [A: k = 0.0089 min^{-1}]	S
7. The rate constant of a first order reaction is 3×10^{-3} s^{-1}. Calculate the concentration of the reactant after 30 minutes if the initial concentration is 0.5 M. [A: 0.00228 M]	S

8. A first order reaction takes 69.3 minutes for 50% completion. How much time will be needed for 80% completion? [A:160.9 min]	S
9. The rate constant of a first order reactions 3×10^{-4} s^{-1}. What percentage of the reactant will decompose in one hour? [A:66%]	S
10. Show that the time required for 99% completion of a first order reaction is twice the time required for completion of 90% of the reaction.	S
11. The rate constant of a first order reaction is 60 s^{-1}. How much time will it take for the reaction to reduce the initial concentration of the reactant to 1/16th of its initial value? [A: 4.62×10^{-2} s]	S
12. The first order rate constant for the decomposition of ethyl iodide at 600K is 1.6×10^{-5} s^{-1}. Its activation energy is 209 kJ/mol. Calculate the rate constant of the reaction at 700K. [A: 6.353×10^{-3} s^{-1}]	S
13. What is the effect of catalyst on a reaction with respect to its i) energy of activation ii) ΔG of the reaction iii) time required for 50% of the reaction to be completed?	A
Five mark questions:	
1. a) The rate constants of a reaction at 500K and 700K are 0.02 s^{-1} and 0.07 s^{-1} respectively. Calculate the energy of activation of the reaction. [A:18.23 kJ mol^{-1}] b) What is pseudo first order reaction? Give an example.	S
2. a) The graph of log k vs. 1/T for a reaction is linear with intercept of 10 and slope of -5.1×10^3. Calculate the frequency factor and E_a of the reaction. R = 8.314 $JK^{-1}mol^{-1}$ [A: Frequency factor : 10^{10}, E_a = 97.65 kJ] b) A reaction is 50% complete in 2 hours and 75% complete in 4 hours. What is the order of the reaction? Explain.	S
3. For a certain chemical reaction, variation in the concentration ***l*n[R] vs time** plot is given: For this reaction write/draw  i) order of the reaction? ii) the units of rate constant k? iii) Give the relationship between k and $t_{1/2}$ (half-life period) iv) What does the slope of the line indicate? v) Draw the plot of $\left\{\log\frac{[R_0]}{R}\right\}$ vs. time	S

4. a) Explain collision theory of reaction rate.

   b) Draw a graph of potential energy vs. reaction co-ordinate to show the effect of catalyst on the activation energy. S

5. a) Hydrogen peroxide ($H_2O_{2\,(aq)}$) decomposes to $H_2O_{\,(l)}$ and $O_{2\,(g)}$ in a reaction that is of first order in H_2O_2 and has a rate constant $k = 1.06 \times 10^{-3}$ min. How long will it take for 15% of a sample of H_2O_2 to decompose? [A: $t_{15\%}$ =153.4 min]

   b) Mention two criteria for effective collision. S

6. a) Distinguish between molecularity and order of a reaction.

   b) The activation energy for the reaction $2HI_{\,(g)} \longrightarrow H_{2(g)} + I_{2\,(g)}$ is 209.5 kJ/mol at 581 K. Calculate the fraction of molecules having energy equal to or greater than activation energy ($R = 8.314\ Jk^{-1}\ mol^{-1}$) [A: 1.471×10^{-19}] S

7. In a pseudo first order hydrolysis of ester in water the following results are obtained.

t in seconds	0	30	60	90
Ester (M)	0.55	0.31	0.17	0.085

   i) Calculate the average rate of reaction between the time interval 30 to 60 seconds.

   ii) Calculate the pseudo first order rate constant for the hydrolysis of ester.

   [A: (i) $4.67 \times 10^{-3}\ mol\ L^{-1}\ s^{-1}$ (ii) $1.91 \times 10^{-2}\ s^{-1}$] S

8. a) Rate constant k of a reaction varies with temperature T according to the equation $\log k = \log A - \frac{E_a}{2.303R}\left[\frac{1}{T}\right]$

   When a graph is plotted for log k vs. $\frac{1}{T}$ a straight line with slope -4250 is obtained. Calculate E_a for the reaction ($R = 8.314\ Jk^{-1}\ mol^{-1}$) [A: 813.75 $kJmol^{-1}$]

   b) For the reaction $2A + B \longrightarrow$ Products, rate = $k[A]^2[B]$, the rate constant is $4x10^{-5}\ mol^{-2}\ L^2s^{-1}$. Calculate the initial rate of the reaction when [A] = 0.5 M and [B]=0.3 M. [A: $3 \times 10^{-6}\ M\ sec^{-1}$] S

9. a) Sucrose decomposes in an acid solution, following first order kinetics. Half – life for the reaction is 3 hrs. Calculate the fraction of sucrose that remains after 8 hrs. [A: 0.1576]

   b) What is the effect of temperature on the (i) rate constant and (ii) $t_{1/2}$ of a reaction. S

10. Following data was obtained for the reaction : $A + B \longrightarrow P$.

Experiment	**[A]M**	**[B]M**	**Initial rate [R_o] for appearance of product P**
1	0.2	0.3	2×10^{-3} mol $L^{-1}s^{-1}$
2	0.2	0.1	2×10^{-3} mol $L^{-1}s^{-1}$
3	0.4	0.3	4×10^{-3} mol $L^{-1}s^{-1}$

i) What is the order of the reaction with respect to A and B?

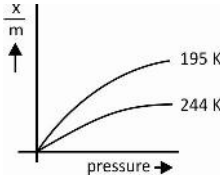
ii) Write the rate law. iii) What is the rate constant.

iv) What is the half-life of the reaction.

S

UNIT - 5 : SURFACE CHEMISTRY

One mark questions:	
1. What is term sorption?	K
2. Adsorption is always exothermic. Why?	U
3. Give reason: A finely divided substance is more effective as an adsorbent.	U
4. Out of physisorption and chemisorption which one leads to multimolecular adsorption?	U
5. Write the expression for Freundlich adsorption isotherm.	K
6. Activated charcoal is used in gas masks. Why?	U
7. Hydrogen free from CO is preferred in the manufacture of ammonia by Haber's process. Give reason.	U
8. Which property of the catalysts is illustrated in the example given $CO_{(g)} + 3H_{2\,(g)} \xrightarrow{Ni} CH_{4\,(g)} + H_2O_{(g)}$ and $CO_{(g)} + 3H_{2\,(g)} \xrightarrow{Cu} HCHO$	U
9. Give an example for shape selective catalyst which converts alcohols into gasoline.	K
10. What is shape-selective catalysis?	K
11. Name the colloidal system in which gas is a dispersed phase and liquid is a dispersion medium.	K
12. What is the dispersed phase in emulsion.	K
13. Name the dispersion medium in aerosol.	K
14. Lyophilic sols are more stable than lyophobic sols. Give reason.	U
15. What is peptization?	K
16. What is the principle of dialysis?	K
17. What is Tyndall effect?	K
18. What is electro kinetic potential or zeta potential?	K
19. What is electro-osmosis?	K
20. State Hardy-Schulze Rule.	K
21. In the coagulation of negative sol, arrange the following ions in ascending order of their flocculating power: Ba^{2+}, Na^{+}, Al^{3+}	U
22. What are protective colloids?	K
23. What happens when an emulsion is centrifuged?	U
24. Mention the role of alum in the purification of drinking water.	U
Two mark questions:	
1. Distinguish between adsorption and absorption.	U
2. Hydrogen is adsorbed on nickel. Which is the adsorbent and adsorbate?	U

3. How does (i) enthalpy (ii) entropy change during adsorption of gas on a solid?	U
4. Between sulphur dioxide (critical temperature 630 K) and methane (critical temperature 190 K), which gas is adsorbed more on 1 g of activated charcoal. Give reason.	U
5. Two isotherms drawn for physical adsorption is shown. Comment on the effect of temperature and pressure on the extent of adsorption of a gas. 	A
6. $\frac{x}{m} = kp^{\frac{1}{n}}$ is the expression for Freundlich isotherm. For what value of $\frac{1}{n}$ will the expression show that i) adsorption become independent of pressure ii) adsorption vary directly with pressure.	A
7. What are promoters? Give an example.	K
8. What is homogeneous catalysis? Give an example.	K
9. What is heterogeneous catalysis? Give an example.	K
10. Explain the mechanism of enzyme catalysis.	U
11. For enzyme catalysis, between vitamin and metal ions which one of these will be an example for : i) a coenzyme ii) an activator.	U
12. Give two differences between lyophilic and lyophobic colloids?	K
13. What are the two conditions required for the formation of micelles.	U
14. Name the chemical reaction that leads to the formation of i) Gold sol from $AuCl_{3(aq)}$ and H-CHO. ii) $Fe(OH)_3$ sol from $FeCl_3$ and H_2O.	U
15. Explain the preparation of colloids by using Bredig's arc method.	U
16. Explain how a precipitate gets converted into a sol during peptization.	K
17. What is ultrafiltration? Explain how a filter paper is converted into an ultrafilter paper using an example?	U
18. Explain dialysis.	K
19. Write two conditions which must be satisfied to observe Tyndall effect.	U
20. Name the phenomenon in which colloidal particles are in zig – zag motion. Give reason for the zig-zag motion.	K
21. i) What is coagulation or flocculation value?	K
ii) Between Na_3PO_4 and Na_2SO_4, which one of the electrolyte will have maximum coagulating value for AgI / Ag^+ sol?	U
22. What is electrophoresis?	K
23. How are delta regions formed?	A

Three mark questions:	
1. Mention any three factors affecting adsorption of gases on solids.	K
2. Write three characteristics of physisorption.	K
3. Write three characteristics of chemisorption.	K
4. Distinguish between physisorption and chemisorptions based on i) reversibility ii) enthalpy of adsorption iii) specificity.	U
5. Write three applications of adsorption.	A
6. Explain the mechanism of heterogeneous catalysis starting from adsorption to desorption on the basis of adsorption theory.	U
7. Distinguish macromoleular and multimoleular colloids based on type of particles of dispersed phase. Give one example for each.	U
8. Based on the type of particles of dispersed phase, how are these classified? i) Sulphur sol. ii) Soap in water iii) starch sol.	U
9. Explain the cleansing action of soaps.	U
10. Write three characteristics of enzyme catalysis.	K
11. What is the enzyme for the following biochemical processes? i) Starch into maltose ii) Proteins into peptides (in stomach) iii) Milk into curds	U
12. a) Give reason: i) When $AgNO_3$ solution is added to KI solution a negative charged AgI sol is obtained. ii) When $FeCl_3$ is added to excess of hot water positively charged sol is obtained. b) Name the experiment which confirms the presence of charge on colloidal particles.	U
13. What is coagulation of a sol? Name the two methods by which a lyophobic sol can be coagulated.	K
14. Name the two types of emulsions? What type of emulsion is milk?	K
15. How do emulsifiers stabilize emulsion? Name two emulsifiers.	K
16. What is the role of i) the charcoal in production of high vacuum ii) the silica gel in controlling humidity in a closed system iii) eosin in detecting end point in precipitation titrations?	A
17. Give reason: i) Medicines in colloidal state are more effective. ii) Alum stops bleeding from a small cut.	

iii) Colloidal solutions give lower values for colligative properties than a true solution of same concentration.	A
18. Name the process / method involved in i) Purification of sol by placing it suitably in an electric field. ii) Animal hide (skin) containing positively charged colloidal particles is dipped in tannin which has negatively charged colloidal particles. iii) A freshly prepared precipitate is shaken with small quantity of electrolyte to get a sol.	A
19. What is observed ? (i) when a beam of light is passed through a colloidal sol. (ii) an electrolyte, NaCl is added to hydrated ferric oxide sol (iii) electric current is passed through a colloidal sol.	U

UNIT-6: GENERAL PRINCIPLES AND PROCESSES OF ISOLATION OF ELEMENTS

One mark questions:	
1. Name a carbonate ore of iron.	K
2. Name an ore that contains both iron and Cu.	U
3. Which type of ore is concentrated by froth flotation?	K
4. Name the depressant used in the separation of an ore containing ZnS and PbS?	K
5. Name the chemical reagent used in the leaching of bauxite.	K
6. What is the flux used in the extraction of iron from concentrated heamatite ore.	K
7. What is the role of silica in the metallurgy of copper?	K
8. Give the composition of copper matte.	K
9. Name the flux used to remove iron impurity from molten copper matte.	K
10. Name the reducing agent used for the extraction of iron below 1073K.	K
11. Give reason : CO becomes thermodynamically more stable as the temperature increases.	U
12. Which one of these metal is not extracted by using coke as a reducing agent? Zn, Al, Fe	U
13. What is the role of Na_3AlF_6 or CaF_2 in Hall-Heroult process?	K
14. Name the process by which copper is extracted from its low grade ores?	K
15. Complete the overall equation for the extraction of chlorine by the electrolysis of sea water (Brine): $2Cl^-_{aq} + 2\ H_2O_{(l)} \longrightarrow$	K
16. Metals having low melting point are refined by ___________.	K
17. Name the method by which titanium is refined.	K
18. Is Al_2O_3 used as stationary phase or mobile phase in column chromatography?	K
Two mark questions	
1. Name the metal that is most abundant on earth's crust. Mention the principal ore from which it is extracted.	K
2. Mention the role of i) pine oil ii) cresol in froth flotation method.	K
3. The reduction of a metal oxide is easier if the metal formed is in the liquid state at the temperature of reduction. Give reason.	U
4. How is cast iron different from pig iron? How is pig iron converted into cast iron?	K
5. In Hall-Heroult process, what is the electrode at anode? It gets burnt up. Why?	U
6. Write the formula of the slag formed. i) in the extraction of iron from haematite ore ii) copper from sulphide ore	K

7. Name the two by-products obtained during the electrolysis of sea water (brine) to extract chlorine from it.	U
8. Give reason: i) Tin can be purified by liquation ii) Zinc can be purified by distillation	U
9. Name the method and principle involved in producing semiconductor of high purity.	U
10. Explain the procedure of zone refining of an element.	K
11. Nickel is purified by Mond’s process. Write the equations for the reactions involved.	K
Three mark questions:	
1. Draw a labelled diagram for the extraction of aluminium from purified bauxite by Hall-Heroult process. Write the overall reaction taking place in the cell.	S
2. If iron is extracted from siderite ore, the ore is calcined, but if zinc is extracted from zinc blende, the ore is roasted. Give reasons and equation for the reaction involved in any one of the processes.	S
3. What is the significance of the following in the froth flotation process 1) Collectors 2) Stabilisers 3) Depressants?	K
4. How is pure alumina obtained from bauxite by leaching process?	K
5. Draw the Ellingham diagram for the formation of FeO from Fe, CO from C and CO_2 from CO. Suggest a suitable reducing agent for the reduction of Fe_2O_3 below 1073K and above 1073K temperature.	S
6. Draw a neat labelled diagram of blast furnace. Mark the different zones. Write the reaction taking place at slag zone.	S
7. During the conversion of cast iron into wrought iron; i) What is the lining of the reverberatory furnace made of and what is its role in the process? ii) What is the flux added?	U
8. How is copper extracted from low grade ore of it?	K
9. How is blister copper extracted from copper matte?	K
10. In the extraction of aluminium by Hall-Heroult process: i) Give the composition of the electrolyte used. ii) Write the equations for the electrolytic reactions occurring at anode and cathode.	K

<table>
<tr><td>11. How is gold extracted by cyanide process? Write equations.</td><td>K</td></tr>
<tr><td>12. What are the two criteria required for the 'vapour phase refining' of a metal? Name a metal purified by this technique.</td><td>K</td></tr>
<tr><td>13. Give equations for the reactions involved in the purification of zirconium by Van-Arkel process. What are the impurities associated with zirconium?</td><td>K</td></tr>
<tr><td>14. What is the principle involved in
i) Hydraulic washing ii) Magnetic separation iii) Chromatography?</td><td>K</td></tr>
<tr><td>Five mark questions</td><td></td></tr>
<tr><td>1. a) Match the following:
<table>
<tr><td>A. Copper</td><td>Clay</td></tr>
<tr><td>B. Zinc</td><td>Malachite</td></tr>
<tr><td>C. Aluminium</td><td>Calamine</td></tr>
</table>
b) Complete the following equations:
i) Roasting of sulphide ore : $2Cu_2S + 3O_2 \longrightarrow$
ii) Auto reduction of Cu_2O : $2Cu_2O + Cu_2S \longrightarrow$</td><td>K</td></tr>
<tr><td>2. For the extraction of zinc from zinc blende mention / write:
i. The composition of the ore
ii. The method used for concentration of ore
iii. The equation for the reaction involved in roasting of concentrated ore
iv. Equation for the reduction of ore with coke at 1673 K
v. The method used for purification of the metal.</td><td>U</td></tr>
<tr><td>3. $Au_{(in\ ore)} \xrightarrow[O_2]{NaCN_{(aq)}} X$ [complex of Au] $\xrightarrow{Zn}$ Y + Z [complex of Zn]
Write the formula of X, Y, Z
Identify the i) leaching agent ii) reducing agent</td><td>U</td></tr>
<tr><td>4. For the electrolytic refining of copper, a) what is the i) anode ii) cathode iii) electrolyte?
b) i) What is anode mud? ii) Mention an element in it.</td><td>K</td></tr>
</table>

UNIT-7: p - BLOCK ELEMENTS

Group-15 elements	
Give reasons for the following (one mark each):	
1. In group 15 elements, there is considerable increase in covalent radius from N to P but small increase from As to Bi. Why?	U
2. The ionization enthalpies of group 15 elements are higher than those of corresponding members of group 14 and 16 elements.	U
3. Bi (V) is a strong oxidizing agent.	U
4. $(CH_3)_3P=O$ exists but $(CH_3)_3N=O$ does not.	U
5. The boiling point of PH_3 is lesser than NH_3.	U
6. Metallic character increases down the 15th group elements.	U
7. NO_2 dimerises to form N_2O_4.	U
8. Cr, Al do not dissolve in concentrated HNO_3.	U
9. White phosphorus is the most reactive allotrope of the element.	U
10. PCl_3 fumes in moist air.	U
11. The five bonds in $PCl_{5(g)}$ are not equivalent.	U
12. The basicity of H_3PO_3 is 1.	U
13. H_3PO_2 is a stronger reducing agent than H_3PO_3	U
One mark questions	
1. Name the 15th group element that does not exhibit allotropy.	K
2. Complete the equation: $3HNO_2 \xrightarrow{\text{disproportionation}}$	K
3. Write the formula of the halide of nitrogen that is known to be stable.	K
4. Give an example for a neutral oxide of nitrogen.	K
5. Complete the equation: $PCl_3 + 3H_2O \longrightarrow$	K
6. Which oxyacid of phosphorus on disproportionation gives H_3PO_4 and PH_3?	K
Two mark questions	
1. N_2 molecule is chemically inert while white phosphorus is more reactive. Give reasons.	U
2. How is nitrogen prepared in the laboratory? Write the equation for the reaction involved.	K
3. Ammonium salt $\xrightarrow[\Delta]{+\text{caustic soda}}$ X (g) $\xrightarrow{Cu^{2+}_{aq}}$ Y. What are X and Y?	K
4. Complete the following equations : i) $(NH_4)_2Cr_2O_7 \xrightarrow{\text{heat}}$ ii) $Ca_3P_2 + 6H_2O_{(l)} \longrightarrow$	K

5. Complete the following equations : i) $Ba(N_3)_2 \xrightarrow{\text{heat}}$ ii) $PH_4I + KOH \longrightarrow$	K
6. Complete the following equations : i) $Cu + 4HNO_{3\ (conc.)} \longrightarrow$ ii) $I_2 + 10HNO_3(conc.) \longrightarrow$	K
7. Complete the following equations : i) $4Zn + 10HNO_{3(dil)} \longrightarrow$ ii) $P_4 + 20HNO_{3(conc)} \longrightarrow$	K
8. Complete the following equation and name the gas liberated: $P_4 + 3NaOH + 3H_2O \longrightarrow$	K
9. i) What is the shape of PCl_5 in gaseous and liquid state? ii) In the solid state PCl_5 exists as an ionic solid. Write the cation and anion in it.	K
10. Draw the structures of: a) Nitric acid b) Hypophosphorous acid	S
11. Draw the structure of $H_4P_2O_7$. What is its basicity?	S
12. What is the formula of cyclotrimetaphosphoric acid? How many P–O–P bonds are in it?	S
Three mark questions:	
1. Arrange: NH_3, PH_3, AsH_3, SbH_3, BiH_3 as directed. i) increasing order of base strength ii) decreasing order of stability iii) decreasing order of reducing character	U
2. For the preparation of ammonia by Haber's process, i) Write the balanced chemical equation ii) mention the reaction conditions iii) Draw the flow chart	K
3. How is HNO_3 prepared commercially by Ostwald process? Write chemical equations for the reactions involved.	K
4. Give differences between white phosphorus and red phosphorus based on i) structure ii) solubility in CS_2 iii) reaction with air.	U
5. $P_4 + 10Cl_2 \longrightarrow X \xrightarrow{1\text{ mol } H_2O} Y \xrightarrow{3\text{ mol } H_2O} Z$. What are X, Y, Z? (All are compounds of phosphorus)	A
Five mark questions:	
1. a) Give appropriate reason for the following anomalous behaviour of nitrogen: i) it is a diatomic gas ii) it has least catenation property iii) it does not form a pentahalide b) Complete the following equations: i) $4H_3PO_3 \xrightarrow{\text{heat}}$ ii) $3HgCl_2 + 2PH_3 \longrightarrow$	U

2. An unknown salt 'X' reacts with hot conc. H_2SO_4 to produce a reddish brown gas 'Y' which intensifies on adding on copper turnings. On adding dilute ferrous sulphate solution to an aqueous solution of X and then carefully adding conc. H_2SO_4 along the sides of the test tube, a brown complex 'Z' is formed at the interface between the solution and H_2SO_4. Identify X, Y and Z and write the chemical equations involved in the reaction.	A
3. a) How is PH_3 prepared in the laboratory? How is it purified? Write the chemical equations for the reactions involved.	
b) Name the gas liberated when a solution of PH_3 in water is exposed to light.	K
4. A white waxy, translucent solid, X, insoluble in water but soluble in CS_2, glows in dark. X dissolves in NaOH in an inert atmosphere giving a poisonous gas (Y). X catches fire in air to give dense white fumes of Z.	
i) Identify X, Y and Z and write the chemical equations of the reactions involved.	A
Group-16 elements	
Give reasons for the following (one mark each):	
1. There is large difference between the melting and boiling points of oxygen and sulphur.	U
2. Oxygen has less negative electron gain enthalpy than sulphur.	U
3. In group 16, +4 oxidation state becomes more stable than +6 oxidation state on going down the group.	U
4. Oxygen can show a maximum covalency of 4 and it cannot form hexavalent compound.	U
5. Boiling point of H_2O is higher than that of H_2S.	U
6. H_2S is more acidic than H_2O	U
7. O_3 is thermodynamically unstable than O_2	U
8. Ozone is a powerful oxidising agent.	U
9. Sugar chars in concentrated sulphuric acid.	U
10. SF_6 is exceptionally stable.	U
11. The bond lengths O–O in ozone are identical.	U
One mark questions:	
1. Name the radioactive element in the 16th group.	K
2. What is the oxidation number of oxygen in OF_2?	K
3. Write the structure of oleum.	S

Two mark questions:	
1. Write the chemical formula of : a) Gypsum salt b) Epsom salt	K
2. Complete the equations: i) $2Pb_3O_{4\,(s)} \xrightarrow{heat}$ ii) $4Al + 3O_2 \xrightarrow{heat}$	K
3. Which among these is (i) basic oxide ii) mixed oxide? a) Al_2O_3 b) Na_2O c) Cl_2O_7 d) Fe_3O_4	U
4. How is ozone prepared? Mention the conditions required and write an equation.	K
5. How is ozone estimated quantitatively?	K
6. Complete the following equations : i) $C_{12}H_{22}O_{11} \xrightarrow{conc.H_2SO_4}$ ii) $2KClO_3 \xrightarrow[heat]{MnO_2}$	K
7. How do you prepare β-sulphur from α-sulphur?	K
8. Above 1000°C which species of sulphur is dominant? What is its magnetic property?	K
9. $SO_3^{2-} + 2H^+ \longrightarrow$ A(gas) $\xrightarrow[charcoal]{+Cl_2}$ B. What are A and B?	K
10. High pressure and low temperature favours maximum yield of sulphur trioxide in contact process. Give reasons.	U
11. Complete the equation: i) $Cu + 2H_2SO_{4\,(conc.)} \longrightarrow$ ii) $CaF_2 + H_2SO_{4\,(conc)} \longrightarrow$	K
12. Write the formula of any two oxoacids of Sulphur.	K
13. Draw the structure of $H_2S_2O_8$ and name the acid.	S
14. Complete the following equations : i) $3S + 2H_2SO_4 \xrightarrow{conc}$ ii) $PbS + 4O_3 \longrightarrow$	K
15. Complete the following equations : i) $2KI + H_2O + O_3 \longrightarrow$ ii) $NaNO_3 + H_2SO_4 \longrightarrow$	K
Three mark questions:	
1. Give any three reasons for the anomalous behaviour of oxygen.	K
2. Arrange: H_2O, H_2S, H_2Se, H_2Te as directed: i) decreasing acidity ii) increasing reducing property iii) increasing thermal stability	U
3. Out of the following hydrides : H_2S , H_2O , H_2Te which one will have : i) lowest boiling point ii) highest bond angle iii) highest electropositive hydrogen.	U
4. Write chemical equations involved during the manufacture of sulphuric acid by contact process mentioning the reaction conditions.	K

Group-17 elements	
Give reasons for the following (one mark each):	
1. The negative value of electron gain enthalpy of fluorine is less than that of chlorine.	U
2. Bond dissociation enthalpy of F_2 is less than that of Cl_2.	U
3. Most of the reactions of fluorine are exothermic.	U
4. HF is the weakest acid among hydrogen halides.	U
5. Thermal stability of hydrogen halides decreases from fluoride to iodide.	U
6. HF is a liquid while other hydrogen halides are gases.	U
7. Halogens have maximum negative electron gain enthalpy in their corresponding periods.	U
8. Halogens are coloured.	U
9. Halogens are strong oxidizing agent.	U
10. Interhalogen compound is more reactive than the halogens from which it is formed.	U
11. HCl reacts with finely powdered iron to form ferrous chloride, but not ferric chloride.	U
One mark questions:	
1. Name the gas liberated when fluorine reacts with water.	K
2. Name the only oxyacid of fluorine.	K
3. Arrange these in the decreasing order of their stability: I_2O_4, ClO_2, BrO_2.	U
4. Name the iodine oxide that is used in estimation of carbon monoxide.	K
5. Complete the equation: $I_2 + 6H_2O + 5Cl_2 \longrightarrow$	K
6. Write the composition of bleaching powder.	K
7. What is the composition of aqua regia?	K
8. Write the structure of perchloric acid.	S
9. Which one of the interhalogen compound is not known: ICl_3 or ICl_2?	U
Two mark questions	
1. Fluorine exhibits only –1 oxidation state whereas other halogens exhibit positive oxidation states also.	U
2. Compare the reaction of fluorine and chlorine with water. Give equations.	K
3. Describe how chlorine is manufactured by Deacon's process. Give the equation.	K
4. $KMnO_4 + HCl \longrightarrow P_{(g)} \xrightarrow{+H_2S} Q$ (yellow solid). What are P and Q?	A

5. Complete the following equations :

i) $SO_2 + 2H_2O + Cl_2 \longrightarrow$ ii) $2Ca(OH)_2 + 2Cl_2 \longrightarrow$ K

6. Complete the following equations :

i) $8NH_{3(Excess)} + 3\ Cl_2 \longrightarrow$ ii) $Cl_2 + 2NaOH_{\ (cold\ and\ dil)} \longrightarrow$ K

7. Complete the following equations :

i) $NH_3 + 3Cl_{2(Excess)} \longrightarrow$ ii) $Cl_2 + 6NaOH_{\ (hot\ \&\ conc)} \longrightarrow$ K

8. Complete the following equations :

i) $Fe + 2HCl \longrightarrow$ ii) $Cl_2 + 3F_{2(Excess)} \xrightarrow{573K}$ K

9. What is the cause for bleaching action of chlorine water? Explain it with equations. K

10. How are interhalogen compounds formed? IF_7 is possible but not ICl_7. Why? K

11. What is the shape of: i) ClF_3 ii) IF_7 ? S

Three mark questions:

1. Arrange the following in the order of the property indicated for each set.

i) F_2, Cl_2, Br_2, I_2 (Increasing bond dissociation energy).

ii) HF, HCl, HBr, HI (decreasing acid strength)

iii) Cl_2O, Cl_2O_6, ClO_2, Cl_2O_7 (increasing oxidation state of chlorine). U

2. Match the following:

Formula	**Property**	**Use**
i) O_2F_2	Bleaching	Estimation of CO
ii) ClO_2	Fluorinating	Pu from spent fuel
iii) I_2O_5	Oxidising	Water treatment

A

3. X_2 is a greenish yellow gas with pungent smell used in purification of water. It partially dissolves in H_2O to give a solution which turns blue litmus red. When X_2 is passed through NaBr solution, Y_2 is liberated. Identify X_2 and Y_2. What is the colour of Y_2? A

4. What is aqua regia? How does it dissolve noble metals like Au? Write the ionic equations for the reactions involved. K

Five mark questions:

1. a) Name two properties each that have exceptionally high and exceptionally low values for fluorine.

b) Complete the equation: $XX' + H_2O \longrightarrow$ K

2. a) Identify A, B and C: $MnO_2 + HCl \xrightarrow{heat} A_{(g)} \xrightarrow{NaI_{(aq)}} B \xrightarrow{A_{(excess)}} C$

b) i) Between $PbCl_2$ and $PbCl_4$ which is more covalent?

ii) Arrange MF, MCl, MBr, MI in decreasing order of their ionic character. U

Group-18 elements	
Give reasons for the following (one mark each):	
1. Group 18 elements have very high ionisation enthalpy.	U
2. Noble gases have large positive value for electron gain enthalpy.	U
3. Group 18 elements have very low boiling and melting point.	U
One mark questions:	
1. Name the main commercial source of helium.	K
2. Radon is obtained by radioactive decay of the isotope __________	K
3. Name the most abundant noble gas present in dry air.	K
4. The first ionisation enthalpy of which molecule is almost similar to ionisation enthalpy of xenon?	K
5. Arrange the following in the increasing number of lone pair of electrons on xenon: XeF_4, XeF_6, XeF_2	U
6. Name the noble gas that has lowest boiling point known and also diffuses through rubber.	K
7. Complete the equation: $2XeF_{2\,(s)} + 2H_2O_{\,(l)} \longrightarrow$	K
8. Complete the equation: $XeF_6 + NaF \longrightarrow$	K
Two mark questions:	
1. Noble gases are chemically inert. Give two reasons.	K
2. Complete the following equations: i) $XeF_6 + 3H_2O \xrightarrow{\text{Complete hydrolysis}}$ ii) $PtF_6 + Xe \longrightarrow$	K
3. Draw the structures of : i) XeF_2 ii) XeO_3.	S
4. What is the geometry of i) XeF_4 ii) XeF_6.	S
5. How many lone pair of electrons in: i) $XeOF_4$ ii) XeO_3?	K

UNIT-8: d-and f-Block elements

One mark questions:	
1. What are transition elements?	K
2. Write the general electronic configuration of d-block elements.	K
3. Elements of which groups in the periodic table form the d-block?	K
4. Zinc, Cadmium and Mercury are d-block elements but not regarded as transition elements. Why?	K
5. Why are Cu, Ag and Au included under transition elements even though they contain completely filled d orbitals in their ground state?	K
6. On what ground can you say that Sc (Z=21) is a transition elements but Zn (Z=30) is not?	K
7. Generally, how does the melting points of the transition metals vary in a series?	K
8. Transition metals exhibit variable oxidation states in their compounds. Why?	U
9. Name one 3d-series element that does not show variable oxidation state.	U
10. Name the 3d series metal which shows highest oxidation state.	U
11. Name a metal in 3d-series which exhibits +1 oxidation state most frequently.	U
12. 3d-series transition metals exhibit +2 as the most common oxidation state (except Sc) why?	U
13. Complete the disproportionation reaction: $2Cu^{+}_{(aq)} \longrightarrow$	U
14. Copper (II) compounds are more stable in aqueous solution than copper (I) compounds. Give reasons.	U
15. The E^0 (M^{2+}/M) value for copper is positive (+0.34V) What is the possible reason for this?	U
16. Which of the following ion is coloured? Sc^{3+}, Zn^{2+} and Cr^{3+}	U
17. Arrange the following in their increasing value for E^0 (M^{3+}/ M^{2+}) values: Sc, Zn, Mn, Fe	A
18. Transition metals and their compounds show paramagnetic behavior. Why?	U
19. Vanadium has relatively low $E^0(M^{3+}/M^{2+})$ value. Give reason.	U
20. Write the formula of the oxidised product obtained when I^- ions are treated with MnO_4^- in fairly alkaline medium.	U
21. Between MnO and Mn_2O_7 which one of these has more covalent character?	U
22. Mention an important oxoacid of manganese.	K
23. Arrange Cr_2O_3, CrO_3 CrO in increasing order of their acid character.	U

24. Between $KMnO_4$ and $K_2Cr_2O_7$ which one of these is used as primary standard in volumetric analysis?	U
25. What are f-block elements?	K
26. Name the two series of f-block elements?	K
27. What are lanthanoids?	K
28. What are actinoids?	K
29. What is actinoid contraction?	K
30. What is the composition of Mischmetall?	K
31. What is the most common oxidation state of lanthanoids and actinoids?	K
32. Give reason: Cerium shows +4 oxidation state.	U
33. Actinoids contraction is more than lanthanoid contraction. Give reason?	U
34. Actinoids shows larger number of oxidation state than lanthanoids, Why?	U
35. Name an element that shows highest oxidation number among actinoids.	K
Two mark questions	
1. Name two characteristic properties exhibited by d-block elements due to their partially filled d-orbitals?	K
2. Transition elements exhibits higher enthalpies of atomization. Give reasons.	U
3. Compare the variability and stability in the oxidation state of transition metals and non transition (p- block) elements.	U
4. Second ionisation enthalpy is unusually high for chromium (atomic number 24) but for zinc (atomic number 30) it is unusually low. Give reasons.	U
5. Give reason: Transition metals and their many compounds act as good catalysts.	U
6. Write equations to show the catalytic activity of Fe (III) in the reaction: $2I^{-} + S_2O_8^{2-} \longrightarrow I_2 + 2SO_4^{2-}$	K
7. The transition metals generally form coloured compounds. Why?	U
8. Transition metals form large number of complex compounds. Give reason.	U
9. The second ionization enthalpy is unusually higher for Cr and Cu. Give reasons.	U
10. Which is a stronger reducing agent between Cr^{2+} and Fe^{2+} and why ?	U
11. E^0 (Mn^{3+} / Mn^{2+}) for manganese is comparatively high, but the same for Fe is low. Give reasons.	U
12. Among Mn^{3+}, Cr^{3+}, V^{3+}, Ti^{3+} which one of these is most stable in aqueous solution? Give reason.	U
13. Mn^{3+} is a good oxidizing agent but Cr^{2+} is a good reducing agent even though both have d^4 configuration. Give reason.	U

14. As the oxidation number of a metal in an oxide increases what happens to the i) ionic character of the oxide ii) chemical nature of the oxide?	K
15. What are diamagnetic substances? Between Ti^{3+} and Ti^{4+}, which is diamagnetic?	K
16. Sc^{3+} is diamagnetic and colourless in aqueous medium. Give reasons.	U
17. Cu^+ is diamagnetic and Cu^{2+} is paramagnetic. Why?	U
18. Calculate the magnetic moment of Fe^{2+}. (At no:26)	S
19. What are interstitial compounds? Give an example.	K
20. Give any two characteristics of interstitial compounds.	K
21. Give two characteristics of transition metal alloys.	K
22. Transition metals readily form alloys. Give reason. Name an alloy with a transition and a non-transition element.	U
23. Give the laboratory preparation of potassium permanganate, with an equation.	K
24. What is the action of heat on potassium permanganate at 513K? Give the equation.	K
25. What is the gas liberated When i) Crystals of potassium permanganate is heated to 513K. ii) Acidified potassium permanganate is treated with oxalate ion at 333K?	K
26. i) Complete the following equation: $2MnO_4^- + 3Mn^{2+} + 2H_2O \longrightarrow$ ii) Write the structure of MnO_4^{2-} ion.	K
27. How do MnO_4^- and MnO_4^{2-} ions differ with respect to : i) oxidation state of Mn ii) Magnetic property ?	U
28. What is disproportionation of an oxidation state. Give an equation to show the disproportionation of MnO_4^{2-} in acidic solution.	U
29. Show the inter conversion of chromate and dichromate ions?	K
30. An aqueous solution contains CrO_4^{2-} and $Cr_2O_7^{2-}$ ions. When the pH of this solution is increased, concentration of which of these ion increases? Give an equation to justify your answer.	U
31. Write the full ionic equation for the oxidation of i) H_2S ii) Sn^{2+} by acidified potassium dichromate solution	K
32. Give the structure of chromate ions and dichromate ions.	S
33. What is lanthanoid contraction? Why is it caused?	K
34. Write the two consequences of lanthanoid contraction.	U
35. La^{3+} is colourless and diamagnetic. Give reasons.	U

36. What are the product/s formed when a lanthanoid reacts with i) Nitrogen gas ii) water?	K
37. What is the common oxidation state of f-block elements. What is the maximum oxidation state shown by uranium?	K
38. Study of actinoids is difficult. Give reasons.	U
39. Eu and Yb show +2 oxidation state. Give reasons.	U
Three mark questions:	
1. Name the metal of the 1st row transition series that has (i) highest value for magnetic moment (ii) zero spin only magnetic moment in its +2 oxidation state (iii) zero spin only magnetic moment in its +1 oxidation state	U
2. Give reasons: i) Transition metals have high melting points ii) Metal ions of same charge in a row of 'd' block elements show decrease in radius iii) Density of metals in a row of d-block increases.	U
3. Between scandium (atomic number 21) and zinc (atomic number 30) which has higher and lower value for E^0 (M^{3+} / M^{2+}) values. Justify your answer.	U
4. i) Oxygen is better than fluorine in stabilizing higher oxidation states of transition metals. Give reason. ii) Write the formula of the fluoride and oxide of manganese in which it exhibits highest oxidation state.	U
5. Name the cupric halide that does not exist. Give reason with an equation.	U
6. a) Write the steps involves in the commercial preparation of potassium permanganate. b) Permanganate titrations in presence of hydrochloric acid are unsatisfactory. Why?	K
7. How is potassium dichromate prepared from chromite ore? Give equations.	K
8. Write ionic equations for the oxidation of : i) thiosulphate ions in fairly alkaline $KMnO_4$ solution ii) iodide ions in acidified $K_2Cr_2O_7$ solution iii) Fe^{+2} ions by acidified $K_2Cr_2O_7$ solution.	K
9. Give three characteristics of lanthanoids.	K
10. Give three chemical properties of lanthanoids.	K

11. Give three characteristics of actinoids.	K
12. Compare the chemistry of actinoids with that of lanthanoids with respect to	
i) Electronic configuration ii) Oxidation state iii) Chemical reactivity	U
13. Match the following:	
i) Ferrous alloy — bullets	
ii) Mischmetall + Mg — polymerisation	
iii) Nickel complex — steel	U

UNIT-9: COORDINATION COMPOUNDS

One mark questions:	
1. What is a coordination entity?	K
2. Identify the Lewis acid in : $[CoCl(NH_3)_5]^{2+}$.	U
3. Give an example for didentate ligand.	K
4. Which type of ligands form chelates?	U
5. Give an example for homoleptic complex.	U
6. Write the IUPAC name of the following (1 mark each)	K

Sl.No	Co-ordination compound
1	$K[Au(CN)_2]$
2	$[Fe(en)_3]Cl_3$
3	$[Co(NH_3)_6]Cl_3$
4	$[Co(NO_2)_3(NH_3)_3]$
5	$[Ag(CN)_2]^-$
6	$K_3[Fe(CN)_5(CO)]$
7	$K_3[Co(C_2O_4)_2Cl_2]$
8	$[Cr(NH_3)_3(H_2O)_3]Br_3$
9	$[Cr(C_2O_4)_3]^{3-}$
10	$[Ag(NH_3)_2]$ $[Ag(CN)_2]$

7. Using IUPAC names write the formulae for the following: (1 mark each) i) Tetrahydroxidozincate (II) ii) Tris(ethane-1,2-diamine)platinum(II) nitrate iii) Potassium trioxalatochromate (III) iv) Dichloridobis(ethane -1,2-diamine)platinum (IV) nitrate. v) Potassium tetracyanatonickelate (II) vi) Pentaamminenitrito-O-cobalt (III)	K
8. What type of ligand can give rise to linkage isomerism?	U
9. How many isomers can the complex $[CoCl_2\ (NH_3)_4]$ Cl form?	U
10. Which isomer of $[CoCl_2\ (en)_2]^+$ cannot show optical isomerism?	U
11. What is linkage isomerism?	K
12. Indicate the type of isomerism in the following set of complex compound $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]$ Cl	U
13. What is the geometry of a complex if the hybridisation of the central metal is dsp^2.	U
14. What is crystal field splitting?	K

15. How is the energy separation Δ_t and Δ_0 related when the metal, ligand and metal ligand distances are the same?	U
16. What is spectrochemical series?	K
17. Is $[Co\ (NH_3)_6]^{3+}$ an inner orbital or outer orbital octahedral complex?	U
18. Why are different colours observed in octahedral and tetrahedral complexes when the metal and ligands are same?	U
19. Many tetrahedral complexes are high spin complexes. Why?	U
20. A six coordinated high spin complex is bonded to weak ligands. What would be the hybridisation of the central metal?	U
21. Complete the following definition: The dissociation constant of a coordination compound is defined as _____________	K
22. Which coordination complex is used in treatment of lead poisoning?	A
Two mark questions:	
1. What is a double salt? Give an example.	K
2. What is ambidentate ligand? Give an example.	K
3. What are heteroleptic complexes? Give an example.	K
4. What are primary and secondary valencies?	K
5. What type of isomerism is exhibited by the following pairs of complexes? i) $[Co(NH_3)_6]\ [Cr(CN)_6]$ and $[Co(CN)_6]\ [Cr(NH_3)_6]$ ii) $[Cr(H_2O)_6]\ Cl_3$ and $[Cr(H_2O)_5\ Cl]\ Cl_2\ H_2O$	A
6. Draw the structures of cis -trans isomers for $[Pt\ (NH_3)_2\ Cl_2]$	S
7. Draw Fac-mer isomers of $[Co(NH_3)_3Cl_3]$	S
8. Explain geometrical isomerism in coordination compounds with an example.	K
9. Explain optical isomerism in a coordination compounds with a suitable example?	K
10. Write d and l isomers of cis $[Pt\ (en)_2\ Cl_2]^{2+}$	S
11. Which is the most stable complex among the following and why? $[Fe(H_2O)_6]^{3+}$, $[Fe(NH_3)_6]^{3+}$, $[Fe(C_2O_4)_3]^{3-}$, $[FeCl_6]^{3-}$	A
12. $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic whereas $[Fe(CN)_6]^{3-}$ is weakly paramagnetic. Explain.	A
13. Mention the two factors on which the magnitude of crystal field splitting Δ_0 depends on?	K
14. Give any two differences between crystal filed splitting in tetrahedral and octahedral field.	U

15. Explain why $[Co(NH_3)_6]^{3+}$ is an inner orbital complex where as $[CoF_6]^{3-}$ is an outer orbital complex?	A
16. Write the energy level diagram for the crystal field splitting in octahedral complex.	K
17. Explain crystal field splitting in tetrahedral co-ordination entities with a neat labelled diagram.	K
18. Give the limitations of crystal field theory.	K
19. How are M-C σ and M-C π bond formed in metal carbonyls ?	U
Three mark questions:	
1. Give the postulates of Werner theory of coordination compounds.	K
2. Match the coordination compounds given in column I with type of isomerism exhibited by them in column II:	U

Column I (Coordination compound)	Column II (Isomerism)
A) $[Co(en)_3]\ Cl_3$	1. Linkage isomerism
B) $[Co(NH_3)_6]\ [Cr(CN)_6]$	2. Optical isomerism
C) $[Co(NH_3)_5\ (SCN)]^{+2}$	3. Coordination isomerism

3. Using valence bond theory account for hybridization, geometry and magnetic property of $[Ni(CN)_4]^{2-}$.	K
4. Using valence bond theory account for hybridization, geometry and magnetic property of $[Co(NH_3)_6]^{3+}$.	K
5. Write the name, structure and magnetic behaviour of the complex $K_2[Ni(CN)_4]$, which is a low spin complex.	A
6. Applying VBT, predict the number of unpaired electrons in the square planar $[Pt(CN)_4]^{-2}$ ion. (Given outer EC of Pt = $5d^9 6s^1$)	A
7. The spin only magnetic moment of $[MnBr_4]^{-2}$ is 5.9 B.M. predict the geometry of the complex.	A
8. Compare the following high spin complexes with respect to the shape, hybridization and number of unpaired electrons: i) $[NiCl_4]^{-2}$ ii) $[CoF_6]^{-3}$	A
9. Give the oxidation state, hybridization and coordination number of the central metal ion in the complex: $(NH_4)_2\ [CoF_4]$	U
10. Mention any three limitations of VBT that can be accounted for in CFT.	K
11. Which d-orbitals form the e_g set in a tetrahedral field? Between t_{2g} and e_g which set has lower energy in octahedral complex? Give reason.	K

12. Explain colour in coordination compounds using CFT taking $[Ti(H_2O)_6]^{3+}$ as an example. K

13. Complex ions $[Co(NH_3)_5\ H_2O]^{3+}$, $[Co(NH_3)_6]^{3+}$ and $[Co(CN)_6]^{3-}$ in aqueous medium exhibit colour. Wavelengths of light absorbed was 475 nm, 310 nm and 500 nm. Match the complexes with their absorbing wavelengths correctly. U

14. Mention any three applications of co-ordination compounds A

15. Give one example each for the applications of coordination compounds in

a) Extraction of metals b) Analytical chemistry c) Biological systems A

16. Match the coordination compounds given in column I with central metal atoms given in column II:

Column I (Coordination compound)	**Column II (Central metal atom)**
A. Chlorophyll	1. Rhodium
B. Blood	2. Cobalt
C. Wilkinson catalyst	3. Calcium
D. Vitamin B_{12}	4. Iron
	5. Magnesium

A

Five mark questions:

1. For the complex $[Fe(en)_2\ Cl_2]\ Cl$ (At.No. Fe : 26)
   - i) What is the oxidation state of metal ion?
   - ii) Mention the geometry of hybrid orbitals.
   - iii) What is its magnetic behaviour?
   - iv) Give the IUPAC name
   - v) How many moles of $AgNO_3$ is required to react with one mole of the complex? A

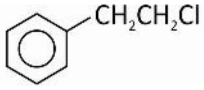
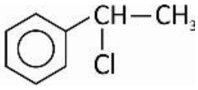
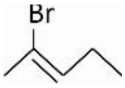
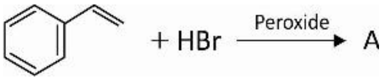
2. a) A complex M_{XYAB} has square planar geometry. How many geometrical isomers are possible? Write their structures.

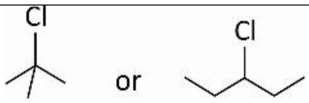
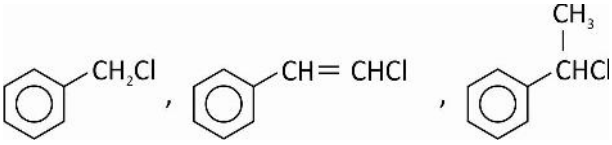
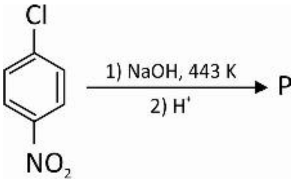
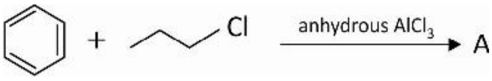
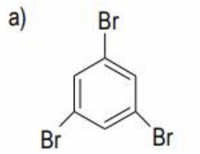
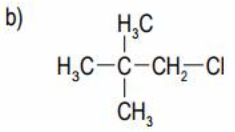
   b) Between $[Ni(CN)_4]^{2-}$ and $[Ni(CO)_4]$ in which one of these does the metal-carbon bond has both σ and π character? A

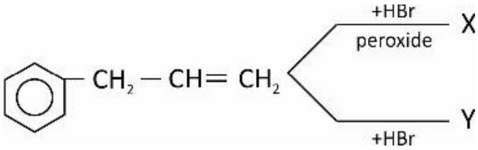
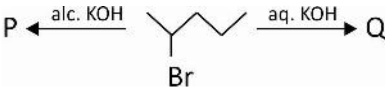
3. $CoSO_4Cl.5NH_3$ exists in two isomeric forms ‘A’ and ‘B’. Isomer ‘A’ reacts with $AgNO_3$ to give a white precipitate, but does not react with $BaCl_2$. Isomer ‘B’ gives white precipitate with $BaCl_2$ but does not react with $AgNO_3$. Answer the following questions.
   - i) Identify ‘A’ and ‘B’ and write their structural formulas.
   - ii) Name the type of isomerism involved.
   - iii) Give the IUPAC name of ‘A’ and ‘B’. A

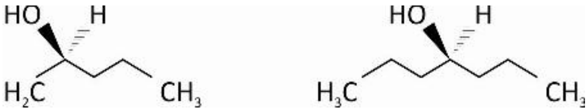
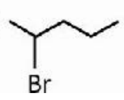
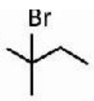
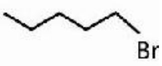
4.	a)	Differentiate $[Fe\ (CO)_5]$ and $K[Fe(NH_3)_2\ (CN)_4]$ with respect to i) oxidation state of metal ii) shape	
	b)	Assuming complete ionisation, how many ions per molecule are formed by $K_4[Mn(CN)_6]$ in its aqueous solution?	
	c)	Between $[Fe(C_2O_4)_3]^{3-}$ and $[Fe(NH_3)_6]^{3+}$ which one is more stable and why?	A
5.	a)	On basis of crystal field theory, write the electronic configuration of d^4 in terms of t_{2g} and e_g in octahedral complex when i) $\Delta_0 > P$ ii) $\Delta_0 < P$	
	b)	How many metal-metal bonds and bridged CO groups are in $[Co(CO)_8]$ complex?	
	c)	Geometrical isomerism is not possible in tetrahedral complexes. Give reason.	A

UNIT-10: HALOALKANES AND HALOARENES

One mark questions:	
1. Write the IUPAC name of $(CH_3)_3CCl$.	K
2. Give an example for geminal dihalide.	K
3. Which one of the following is a benzylic halide? i)  ii) 	U
4. Give the IUPAC name of 	K
5. Identify A in the following reaction 	U
6. How many isomeric (structural) monochlorides can be obtained from 2-methylbutane?	A
7. Identify A : ROH + HCl $\xrightarrow{A}$ RCl + H_2O	K
8. Write the general equation for the preparation of alkyl chlorides from alcohol using $SOCl_2$.	K
9. Why is sulphuric acid not used during the reaction of alcohol with KI?	U
10. Name the reagent that brings about the conversion of benzene diazonium chloride to iodobenzene.	K
11. Name the reaction: $CH_3Br + NaI \xrightarrow{\text{dry acetone}} CH_3I + NaBr$	K
12. What is the major product formed when n- propyl bromide is treated with alcoholic KOH?	K
13. Ethyl chloride on heating with AgCN forms a compound X. Mention the functional isomer of X.	U
14. What is the major product formed in the following reaction: RX + NaOR' $\longrightarrow$	K
15. What is optical activity?	K
16. Write the IUPAC name of the first member of optically active chloroalkane.	U
17. A haloalkane when boiled with aqueous KOH gives alcohol having inverted configuration. Name the mechanism involved in this reaction.	U
18. Out of CH_2=CH–CH_2Cl and CH_3–CH_2–CH_2Cl which is more reactive towards S_N1 reaction?	U
19. In the following pair of halogen compounds, which compound undergoes S_N1 reaction faster?	U

	
20. Why are allylic and benzylic halides highly reactive towards S_N1 reaction?	U
21. Tertiary alkyl halide undergoes S_N1 reaction very fast. Why?	U
22. Arrange the following in decreasing order towards S_N1 reaction: 	U
23. Which of the following is most reactive towards S_N2 reaction $(CH_3)_3CBr$, CH_3Br, $(CH_3)_2CHBr$?	U
24. Tertiary alkyl halides are practically inert to S_N2 substitution reaction? Give reason.	U
25. Identify the product P: 	U
26. Arrange the following compounds in increasing order of their reactivity with sodium hydroxide solution: o-nitro chlorobenzene, chlorobenzene, benzylchloride	U
27. What is the major product formed when chlorobenzene is treated with acetyl chloride + anhy. $AlCl_3$?	K
28. Complete the equation : $R–Mg–X + H_2O \longrightarrow$	K
29. Mention the product formed when 2 molecules of isopropyl chloride is treated with metallic sodium in dry ether.	K
30. Identify the major product A in the following reaction: 	K
31. Name the synthetic halogen compound used for the treatment of malaria.	A
32. What are freons?	K
Two mark questions:	
1. Write the structure and IUPAC name for neo – pentyl bromide.	U
2. Write the IUPAC name of the following compounds:  	K

3. How many structural isomers are possible for C_4H_9Cl? Name the isomer that is optically active.	A
4. What are X and Y?  	A
5. Explain Finkelstein reaction with an example.	K
6. i) Boiling points of alkyl halides are higher than hydrocarbons of comparable molecular mass. Give reason ii) What happens to the boiling point of isomeric haloalkanes with increase in branching?	U
7. Arrange R – Cl, R – I, R – Br, R – F as directed : (i) increasing order of density (ii) increasing order of boiling points	U
8. Name the class (family) of the main product formed when R–X reacts with i) $LiAlH_4$ ii) RNH_2.	K
9. Write the differences between S_N1 and S_N2 mechanism with respect to i) order of reaction ii) Solvent used.	K
10. i) How do polar protic solvents help the first step in S_N1 reaction? ii) Iodination of arenes by electrophilic substitution requires an oxidizing agent. Why?	U
11. Write the mechanism (S_N2) involved in the reaction between methylchloride and hydroxyl ion. What is the order of the reaction?	K
12. Which compound in the following couple will react faster in S_N2 displacement and why? 1 - bromopropane or 2 - bromopropane	U
13. Arrange the following compounds in decreasing order of reactivity towards S_N2 displacement reaction: i) C_2H_5Br, C_2H_5I, C_2H_5Cl ii) $(CH_3)_3CBr$, $CH_3CH_2CHBrCH_3$, $CH_3CH_2CH_2CH_2Br$	U
14. Write the structures of the compounds formed when an aromatic compound A (C_7H_8) is treated with Cl_2 in the presence of $FeCl_3$.	S
15. Identify A and B: $C_2H_5OH \xrightarrow{HCl + anhydrous ZnCl_2} A \xrightarrow{Na/Ether} B$	U
16. Identify P and Q (major products):  	U

17. State Zaitsev rule.	K
18. i) What is a chiral carbon or asymmetric carbon? ii) How many asymmetric carbon atoms are in 2, 3-dichlorobutane?	K
19. a) What is chirality? b) Identify chiral and achiral molecule in the following pair of compounds.  	K
20. i) What is racemisation? ii) A racemic mixture is optically inactive. Give reason.	K
21. i) Write the general formula of Grignard reagent. ii) Why is it necessary to avoid even traces of moisture during the preparation and use of Grignard reagent?	K
22. i) Write the general equation of Wurtz reaction. ii) How many alkanes are formed if CH_3I and C_2H_5I are mixed in equal proportions and the mixture is treated with metallic sodium in dry ether?	K
23. Give reasons: halogen atom in haloarene is ring deactivating and also ortho-para directions.	U
24. Out of ortho and para dibromobenzene which one has higher melting point? Why?	U
25. Aryl halides are less reactive towards nucleophilic substitution compared to alkyl halides. Give two reasons.	U
26. What are polyhalogen compounds? Give one example.	K
27. Give reasons : i) chloroform stored in dark coloured bottles. ii) ortho and para halotoluenes can be separated easily.	U
Three mark questions:	
1. Complete the following reaction by identifying X, Y and Z. $C_2H_5OH \xrightarrow[443K]{H_2SO_4} X \xrightarrow[CCl_4]{Br_2} Y \xrightarrow{\text{alcoholic KOH}} Z$	U
2. Write the mechanism involved in the reaction between tertiary butyl bromide and aqueous KOH. Mention its order.	K
3. Following compounds are given to you: i)  ii)  iii)  Identify the compound which is	

i) most reactive towards S_N2 reaction.

ii) optically active

iii) most reactive towards β - elimination reaction. A

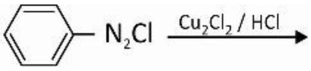
4. a) What are ambident nucleophiles?

b) Name the compounds formed when ethyl bromide reacts with the following compounds: i) alcoholic KNO_2 ii) alcoholic $AgNO_2$ K

5. Complete the following:

i) $C_2H_5Br + KCN \longrightarrow$ -------- + ---------

ii)



K

iii) $3\ R - OH + PX_3 \longrightarrow$ ---------- + ------------

6. Match the columns P, Q and R

	P	Q	R
a)	$R - X + NH_3$	$R - NC$	Nitroalkane
b)	$R - X + KCN$	$R - NH_2$	alkyl nitrile
c)	$R - X + AgNO_2$	$R - CN$	alkyl isonitrile
		$R - NO_2$	Primary amine

A

Five mark questions:

1. Name the reagent used to convert

a) 1 – chloropropane to 1 – nitropropane b) Bromoethane to ethoxyethane

c) Chloroethane to butane d) Bromoethane to ethyl acetate

e) ethene to iodoethane A

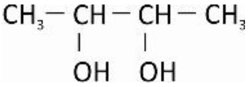
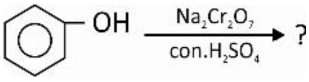
2. a) Primary alkyl halide C_4H_9Br (A) reacted with alcoholic KOH to give compound (B). Compound (B) reacts with HBr to give (C) which is an isomer of (A). When (A) is treated with sodium metal it gives compound (D), C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formulae of A, B, C and D.

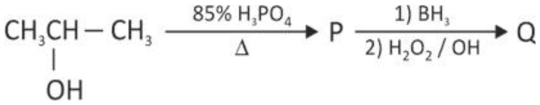
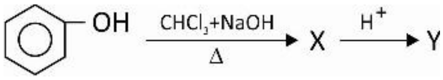
b) Between chlorobenzene and chloromethane which is more reactive towards nucleophilic substitution reaction? A

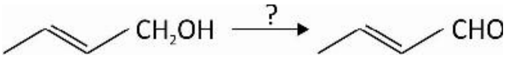
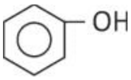
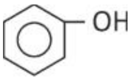
3. a) How do you prepare the following compounds from chlorobenzene. Write the equations and name the reactions: i) diphenyl ii) toluene

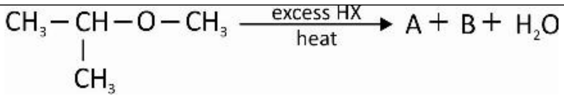
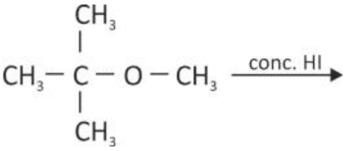
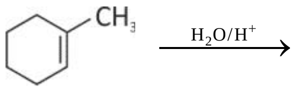
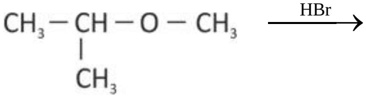
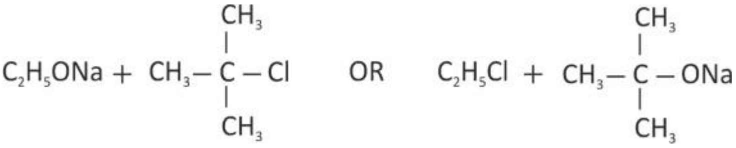
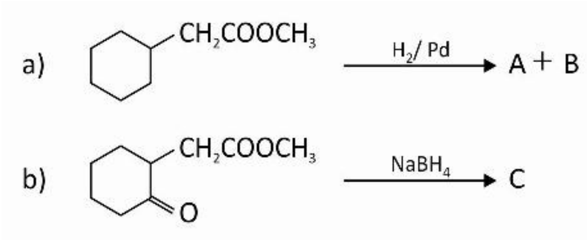
b) What are enantiomers? U

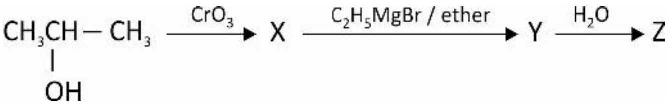
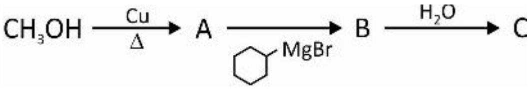
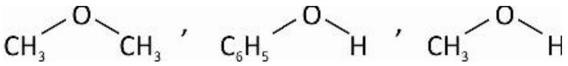
UNIT-11: ALCOHOLS, PHENOLS AND ETHERS

One mark questions:	
1. Write the IUPAC name of  $CH_3-\underset{OH}{CH}-\underset{OH}{CH}-CH_3$	K
2. Write the structure of 2, 3 - diethyl phenol.	K
3. Which of the following is allyl alcohol? $CH_2 = CH–CH_2–CH_2OH$, $CH_2=CH–OH$, $HO–CH_2–CH=CH_2$.	U
4. C-O-H bond angle in alcohols is less than 109°28'. Give reason.	U
5. Identify 'X' : $CH_3COOH \xrightarrow[2)\ H_2O]{1)\ LiAlH_4} X$	U
6. Write equation for the conversion of ethanal into propan-2-ol using a Grignard reagent.	K
7. Ethanol and methoxymethane have same molar mass. But ethanol has higher B.P than methoxymethane. Give reason.	U
8. Give a reaction to show the acidic nature of alcohols.	K
9. Arrange the following in the increasing order of acid strength: CH_3CH_2OH, $CH_3CH(OH)CH_3$, $(CH_3)_3C–OH$.	U
10. What type of alcohols do not give turbidity at room temperature when treated with Lucas reagent?	K
11. Dehydration of 2° or 3° alcohols fails to give ethers. Why?	U
12. Name a metal which is used as catalyst for dehydrogenation of alcohols.	K
13. Write the IUPAC name of the organic product obtained if t-butyl alcohol is heated with copper at 573 K.	U
14. Mention the reagent used to prepare benzene from phenol.	K
15. Which alcohol is known as 'wood spirit'?	K
16. What is denaturation of alcohol?	K
17. Consumption which alcohol causes blindness?	K
18. Name the alcohol obtained by destructive distillation of wood.	K
19. Name the enzyme involved in the following reaction: $C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$.	K
20. Name the product obtained in the following reaction: 	K
21. Write the general equation for Williamson synthesis.	K

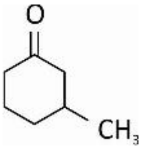
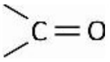
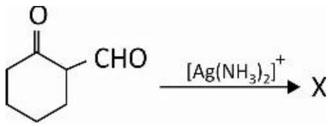
22. What is P in the following reaction? $C_6H_5–O–R + P \xrightarrow{\Delta} C_6H_5OH + R–X$.	K
Two mark questions:	
1. O–H bond length in phenol is slightly less than the same in methanol. Give two reasons.	U
2. Give an example for the preparation of 3° alcohol from a Grignard reagent.	A
3. Write the equation for the preparation of phenol from cumene.	K
4. Complete the following equations: a) $HCHO + R\text{-}MgX \xrightarrow{ether}$ ___________ $\xrightarrow{H_2O}$ __________ b)  $\xrightarrow{oleum}$ ___________ $\xrightarrow[2)\ H^+]{1)\ NaOH}$ _________	U
5. Write the structures of P and Q  $CH_3\underset{\underset{OH}{\vert}}{CH}-CH_3 \xrightarrow[\Delta]{85\%\ H_3PO_4} P \xrightarrow[2)\ H_2O_2\ /\ OH]{1)\ BH_3} Q$	A
6. How is aniline converted into phenol? Write the equation.	K
7. Write the equations for the conversion of chlorobenzene to phenol.	K
8. How does b.p of alcohols change a) With increase in number of carbon atoms b) With increase in branching	U
9. i) Propanol has a higher boiling point than butane even though they have nearly the same molar mass. Give reason. ii) o-nitrophenol is steam volatile but not p-nitrophenol	U
10. a) Alkoxide ion is stronger base than hydroxide ion, why? b) Phenoxide ion is more stable then alkoxide ion. Give reason.	U
11. Arrange 3°, 2°, 1° alcohols in a) decreasing order of acid strength b) relative order of ease of dehydration	U
12. Explain Kolbe's reaction.	K
13. Write the structure of the final product and name the reaction:  $\xrightarrow[\Delta]{CHCl_3+NaOH} X \xrightarrow{H^+} Y$	U
14. What is the effect of EWG on acid strength of phenol?	U
15. Give reasons: Phenol is a stronger acid than an alcohol.	U
16. Cresols are less acidic than phenol. Why?	U
17. i) What is the composition of Lucas reagent? ii) What happens if a 3° alcohol is treated with Lucas reagent?	K

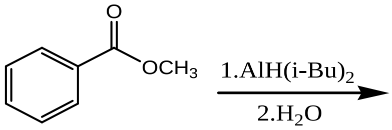
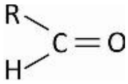
18. Name a reagent for the following conversion. $KMnO_4$ cannot used for this, explain 	U
19. How is aspirin prepared from salicylic acid?	K
20. What is the role of pyridine in the following reaction? Identify the product obtained. $ArOH + CH_3COCl \xrightarrow{pyridine}$ ___________ + HCl	K
21. Give reasons for the following: i) Fermentation of glucose takes place under anaerobic conditions. ii) Electrophilic substitution of phenol and anisole takes place at ortho and para positions.	U
22. Give the structures of the major products in the following: a) $CH_3–CH = CH_2 + H_2O \xrightarrow{H^+}$ b)  $+ Br_2 \xrightarrow{CS_2}$	K
23. Bring out the following conversions: a) phenol into sodium phenoxide b) anisole into 4-methoxy acetophenone	K
24. Draw the structure of the product in the following reactions. a) Phenol treated with bromine water b) 2-propanol treated with PCC or CrO_3 in anhydrous medium	K
25. How will you convert phenol into picric acid?	K
26. Identify the major product in i.  $\xrightarrow{dil.HNO_3}$ ii. $CH_3CH_2OH \xrightarrow[413K]{conc.H_2SO_4}$	K
27. How is methanol manufactured commercially?	K
28. Write the equations along with enzymes involved in the manufacture of ethanol from molasses.	K
29. Explain Williamson synthesis with an example.	K
30. How is anisole prepared by Williamson synthesis?	K
31. Write the IUPAC names of the products in a) $CH_3–I + NaOC_2H_5 \longrightarrow$ b) $CH_3CH_2OH + CH_3COOH \xrightarrow{conc.H_2SO_4}$	K
32. Complete the equation :	

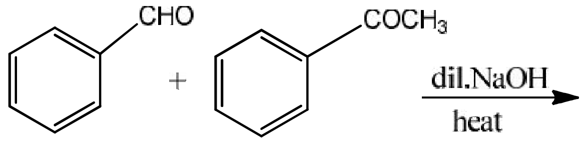
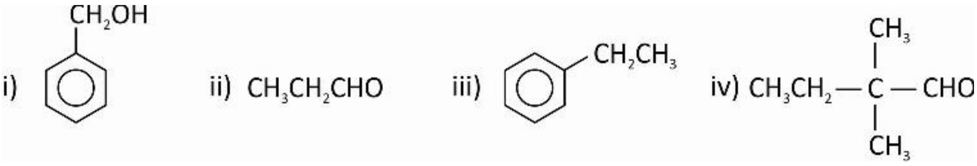
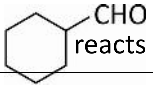
<table>
<tr><td>
$CH_3-\underset{\displaystyle CH_3}{\underset{\vert}{CH}}-O-CH_3 \xrightarrow[\text{heat}]{\text{excess HX}} A + B + H_2O$
What is the order of reactivity of HBr, HI and HCl in this reaction?</td><td>A</td></tr>
<tr><td>33. Complete the following equation. Mention whether the reaction is S_N1 or S_N2.

$CH_3-\overset{\displaystyle CH_3}{\overset{\vert}{\underset{\displaystyle CH_3}{\underset{\vert}{C}}}}-O-CH_3 \xrightarrow{\text{conc. HI}}$</td><td>A</td></tr>
<tr><td>34. Write structures of the products formed in the given reactions.
a) 
b) 
$CH_3-\underset{\displaystyle CH_3}{\underset{\vert}{CH}}-O-CH_3 \xrightarrow{HBr}$</td><td>A</td></tr>
<tr><td>35. Which of the following is better method for the preparation of t-butyl ethyl ether?
Give reason.

$C_2H_5ONa + CH_3-\overset{\displaystyle CH_3}{\overset{\vert}{\underset{\displaystyle CH_3}{\underset{\vert}{C}}}}-Cl$ OR $C_2H_5Cl + CH_3-\overset{\displaystyle CH_3}{\overset{\vert}{\underset{\displaystyle CH_3}{\underset{\vert}{C}}}}-ONa$</td><td>A</td></tr>
<tr><td>36. How does anisole react with a mixture of conc. HNO_3 and conc. H_2SO_4?</td><td>K</td></tr>
<tr><td>37. Write equations for
a) Friedel-Craft's methylation of anisole.
b) Bromination of anisole in acetic acid medium</td><td>K</td></tr>
<tr><td>Three mark questions:</td><td></td></tr>
<tr><td>1. Give the mechanism for acid catalysed dehydration of ethanol to ethene.</td><td>K</td></tr>
<tr><td>2. Write equations for the mechanism of acid dehydration of ethanol to diethyl ether.</td><td>K</td></tr>
<tr><td>3. Write the structures of A, B and C

Hint: A, B are primary alcohols and C is secondary alcohol.</td><td>A</td></tr>
<tr><td>4. $CH_3CH = CH_2 \xrightarrow{BH_3} P \xrightarrow{H_2O_2/^{-}OH} Q$. Identify P and Q.
Is the final product obtained as per Markownikov's rule or opposite to it?</td><td>A</td></tr>
<tr><td>5. $CH_3–O–CH_2CH_3 \xrightarrow{H^+} ? \xrightarrow{I^-}$ [Intermediate] $\longrightarrow$ final products</td><td></td></tr>
</table>

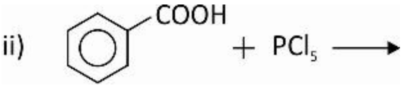
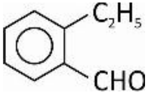
<table>
<tr><td>Write the structures of protonated product, intermediate and its final products.</td><td>U</td></tr>
<tr><td>Five mark questions:</td><td></td></tr>
<tr><td>1. Write the structures of any two alcohol and three ethers with the formula $C_4H_{10}O$.</td><td>U</td></tr>
<tr><td>2. a) Give the structures of X, Y, Z and write the IUPAC name of Z.

b) Name the alcohol that is used as solvent in varnishes.</td><td>A</td></tr>
<tr><td>3. a) Identify A, B, C. Write the IUPAC name of C.

b) Carbolic acid is usually called _____________</td><td>A</td></tr>
<tr><td>4. a) Identify the missing compounds, P, Q, R, S:
$CH_3CH_2OH \xrightarrow{PCC} P \xrightarrow{HCN} Q \xrightarrow{H_2O/H^+} R \xrightarrow{LiAlH_4} S$
b) What is the IUPAC name of $CH_3–O–CH_2–CH_2–OCH_3$?</td><td>A</td></tr>
<tr><td>5. Write all the possible structures which are aromatic compounds with the formula C_7H_8O.</td><td>A</td></tr>
<tr><td>6. a) Match the following acids with their pk_a values:
<table>
<tr><th>A</th><th>B</th></tr>
<tr><td>a) p-cresol</td><td>i) 15.9</td></tr>
<tr><td>b) phenol</td><td>ii) 10.2</td></tr>
<tr><td>c) p-nitrophenol</td><td>iii) 9.98</td></tr>
<tr><td>d) ethanol</td><td>iv) 7.1</td></tr>
</table>
(Hint: Greater the pK_a value, weaker is the acid)
b) Arrange the following in the increasing order of bond angle around oxygen atom.
</td><td>U</td></tr>
</table>

UNIT-12: ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

One mark questions:	
1. Give the IUPAC name of $C_6H_5CH{=}CH{-}CHO$	K
2. Give the IUPAC name of : 	K
3. $CH \equiv CH + H_2O \xrightarrow[HgSO_4]{H_2SO_4}$ X. Give the IUPAC name of X.	U
4. A (nitrile) + $C_6H_5MgBr \xrightarrow[2)\ H_3O^+]{1)\ Ether} C_6H_5COCH_3$. Write the structure of A.	U
5. Complete the following equation: $CH_3{-}CH = CH - CH_2 - CN \xrightarrow[H_2O]{DIBAL-H}$	K
6. Name the oxidizing agent used in Etard reaction.	K
7. Complete the following equation: $2R'COCl + R_2Cd \longrightarrow$	K
8. Name the family of carbonyl compound formed by Friedel-Craft acylation reaction.	U
9. What type of attractive forces are there between molecules of aldehydes or ketones?	U
10. Why is there a large difference in the boiling points of Butanal (b.p. 348K) and Butan-1-ol (391K)?	U
11. Arrange the following compounds in increasing order of their boiling points: Propanal, acetone methoxyethane, n-butane and propan-1-ol	U
12. Lower members of aldehydes and ketones are miscible with water? Give reason.	U
13. Give reasons: Aldehydes are more reactive than ketones in nucleophilic addition reaction.	U
14. Arrange the following compounds in the increasing order of their reactivity in nucleophilic addition reaction: Ethanal, propanal , propanone, butanone.	U
15. What is the reducing agent used in Clemmensen reduction?	K
16. Write the equation to illustrate Wolff-Kishner reduction, for 	K
17. What is X? 	U
18. Between benzaldehyde and acetaldehyde, which one of these does not answer Fehling's test?	K
19. Write the general equation for haloform reaction.	K

20. Name a reaction given by carbonyl compounds due to the acidic nature of α- hydrogen atom.	K
21. Write the IUPAC name of : HOOC – COOH	K
22. Arrange the following in the decreasing order of their acid strength: CH_3COOH, FCH_2COOH, $ClCH_2COOH$.	U
Two mark questions:	
1. How is benzaldehyde prepared by Rosenmund reduction? Give the equation.	K
2. Explain Stephen reaction with the general equation.	K
3. Give the structure and the IUPAC name of the product (an aldehyde) in the following reaction: 	U
4. In the following reaction identify A and B: $C_6H_5CN + SnCl_2 + HCl \longrightarrow A \xrightarrow{H_3O^+} B$	K
5. What is DIBAL-H? Give one specific use of it.	K
6. Identify A and B: $A + CrO_2Cl_2 \xrightarrow{CS_2} B \xrightarrow{H_3O^+}$ Benzaldehyde.	K
7. Benzene is converted into acetophenone using acetylchloride in presence of anhy $AlCl_3$. Give the equation. Name the reaction.	K
8. Write the two steps involved in the manufacture of benzaldehyde from toluene.	K
9. How do you preapare benzaldehyde by Gatterman Koch reaction? Write the equation.	K
10. What is the i) geometry of the intermediate ii) change in the hybridisation state of carbon, when a nucleophile attacks the carbonyl carbon of an aldehyde.	U
11. Between benzaldehyde and propanal which is more reactive in nucleophilic addition reaction? Justify your answer.	U
12.  + $NaHSO_3$ $\underset{H^+}{\rightleftharpoons}$ X (final product). Write the structure of X. Mention one application of the reaction.	K
13. Name the reagents used to convert as directed: i) Aldehyde into an hemiacetal ii) ketone into a phenylhydrazone	K
14. Which of the following do not answer iodoform test? i) $CH_3CHOH\ CH_3$ ii) $CH_3CH_2CH_2OH$ iii) $C_6H_5COCH_3$ iv) $CH_3CH_2COCH_2CH_3$ v) CH_3CHO	U
15. Illustrate Clemmensen reduction with a general equation.	K
16. What is Tollens reagent? What observation is made in Tollens test?	K

17. What is Fehling's reagent? What observation is made in Fehling's test?	K
18. α- hydrogen atoms of carbonyl compounds are acidic. Give reasons.	U
19. Write the Aldol condensation reaction by taking ethanal as an example.	K
20. Complete the equation and name the product: 	K
21. H–CHO + H–CHO + conc. KOH $\longrightarrow$ A + B. Name the compounds A and B.	K
22. Which one of the following compounds would undergo aldol condensation and which one Cannizzaro's reaction? 	U
23. Carboxylic acids are more acidic than phenols. Give reasons.	U
24. What is the effect of an electron releasing group on the acidity of acids? Give reason.	U
25. Illustrate Hell-volhard-Zelinsky reaction with a general equation?	K
26. Benzoic acid is less reactive towards electrophilic substitution reaction. Why? Name the product obtained when benzoic acid is brominated.	U
Three mark questions:	
1. What are A and B in the following reaction? Write the IUPAC name of B. $C_6H_5MgBr + CH_3CH_2CN \xrightarrow{\text{ether}} A \xrightarrow{H_3O^+} B$	K
2. Write the equations for the steps involved in the mechanism of base catalysed addition of HCN to a carbonyl compound.	K
3. Write equations for the reactions: i) acetaldehyde with HCN ii) Benzaldehyde with Sodium hydrogen sulphite iii) Acetone with barium hydroxide and heat (an aldol).	K
4. Write the structure of any three cross aldol condensation products A, B, C: $CH_3CHO + CH_3CH_2CHO \xrightarrow[\text{heat}]{\text{dil.NaOH}} A + B + C$	K
5. Benzaldehyde undergoes self oxidation- reduction on heating with concentrated alkali. What are the products formed and what is the name of the reaction?	K
6. Predict the main product formed when cyclohexanecarbaldehyde  reacts with	

i) Tollen's reagent ii) NH_2OH iii) Zn-Hg HCl	A
7. Show how each of the following compounds can be converted to Benzoic acid: a) Ethyl Benzene b) benzamide c) benzoyl chloride?	A
8. Benzoic acid can be prepared starting from bromobenzene. Show this conversion using only inorganic reagents in the correct order (neglect organic solvent used in any step)	A
9. Complete the following equations: i) $CH_3COOH + NaHCO_3 \longrightarrow$ ii)  iii) $(C_6H_5CO)_2O + H_2O \longrightarrow$	K
10. An aromatic acid X on reduction using diborane gives Benzyl alcohol. The sodium salt of X on heating with soda lime gives Y, and on electrolysis gives Z. Identify X,Y and Z?	A
11. Give one simple chemical test to distinguish between the following pairs of compounds. i) acetic acid and acetaldehyde ii) Pentan-2-one and Pentan-3-one iii) Benzaldehyde and Benzophenone	U
Five mark questions:	
1. Give the equations for the conversions of a) Ethanoic acid to Ethanoic anhydride b) phthalic acid to phthalimide	K
2. a) Name simple chemical tests to distinguish i) propanal and ethanal ii) benzoic acid and ethyl benzoate b) $CH_3Br \xrightarrow{Mg,\ ether} A \xrightarrow[2)\ H_2O]{1)\ CO_2} B \xrightarrow[\Delta]{CH_3OH/H^+} C$. Identify the compounds A, B and C	U
3. a) Given A = . Write the structures of the product formed when A reacts with i) $NH_2–NH_2$ ii) boiled with acidified $KMnO_4$. b) Name the reaction by which i) sodium benzoate is converted into benzene ii) Propanoic acid is converted into 2-bromopropanoic acid c) Arrange the following in increasing order of their acid strength: benzoic acid, 4-nitrobenzoic acid, 4-methoxybenzoic acid	A

4. a) Give reasons:

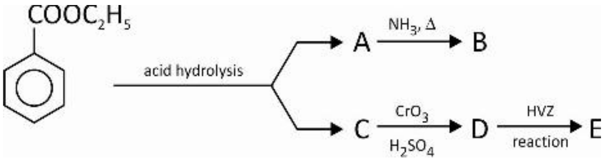
i) oxidation of toluene by CrO_2Cl_2 in CS_2 does not yield benzoic acid

ii) benzoic acid does not undergo Friedel-Craft reaction

iii) In $\overset{*}{N}H_2CONHNH_2$ (semicarbazide) the $\overset{*}{N}H_2$ group is not involved in formation of semicarbazone

b) Write a self explanatory equation for Clemmensen reduction of propanone.

5. Identify A. B, C, D and E in the following and write their names: U

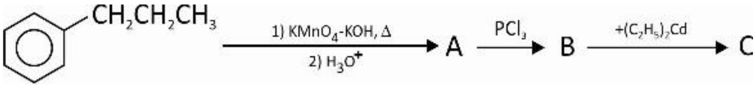


6. a) $CH_3CHO + CH_3OH \underset{\Delta}{\overset{\text{dry HCl}}{\rightleftharpoons}} A \overset{+CH_3OH}{\rightleftharpoons}$ B. Write the structures of A and B. A

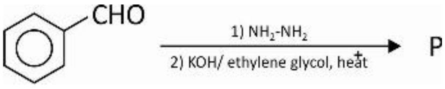
b) Write the general equation for the conversion of Grignard reagent into carboxylic acid

c) Arrange the following in increasing order of their reactivity towards HCN: acetone, acetaldehyde, methyl tert - butyl ketone, propanaldehyde

7. a) Identify the compounds A, B and C: K



b) Give the IUPAC name of P. Name the reaction.



A

8. $C_6H_6 \xrightarrow[\text{anhy } AlCl_3]{CH_3COCl} A \xrightarrow{\text{Zn–Hg conc. HCl}} B \xrightarrow[2)\ H_3O^+]{1)\ KMnO_4\ \ KOH,\ \Delta} C.$

'A' reacts with NaOI to form D and E. Write the structures of A, B, C, D and E. A

9. $C_7H_6O_2$ (A) $\xrightarrow{PCl_5} P \xrightarrow{H_2,Pd,BaSO_4} Q \xrightarrow{NaBH_4} R.$

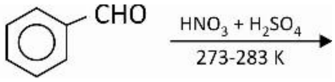
(aromatic acid)

i) Identify P, Q, R

ii) Write the equation for the reaction between 'A' and 'R' in presence of H^+ and name the reaction. A

10. a) Complete the following equations:

i)

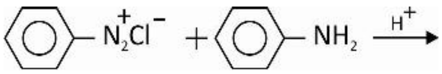


ii) $R–CH_2OH \xrightarrow[2)H_3O^+]{1)\ \text{Alk. } KMnO_4}$

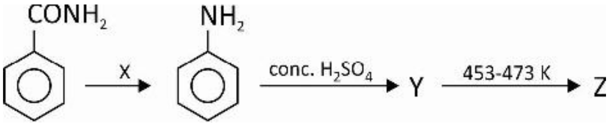
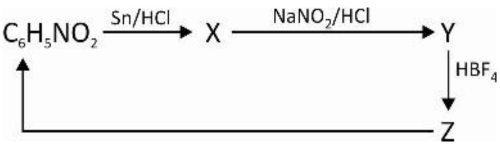
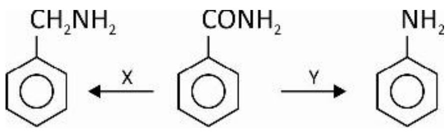
b) Mention one use each of : i) formaldehyde ii) acetone iii) ethanoic acid K

UNIT-13: AMINES

One mark questions:	
1. What is the shape of trimethyl amine?	K
2. Write the IUPAC name of $(CH_3)_3$ N.	K
3. Write the structure of ethane-1,2 - diamine	K
4. Write the IUPAC name of simplest arylamine.	K
5. The bond angle C–N–C in an aliphatic amine is less than 109.5°. Give reason.	U
6. What is the product obtained when a nitro compound is reduced using H_2 / Pd?	K
7. Scrap iron and hydrochloric acid is preferred as reducing agent during the preparation of primary amines from nitrocompounds. Give reason.	U
8. Identify the major product X in the following reaction: RCN $\xrightarrow{H_2/Ni}$ X.	K
9. $CH_2{=}CHCH_2Cl + NH_3 \longrightarrow$ X. X is a primary amine. Give its IUPAC name.	K
10. Write the general formula of Quartenary ammonium salt.	K
11. Write the structure of an amide which gives propanamine by Hoffmann bromamide reaction.	U
12. Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis. Why?	U
13. Why is aniline soluble in aqueous HCl?	U
14. Between NH_3 and CH_3NH_2, which has higher pK_b value?	U
15. Why are amines less acidic than alcohols of comparable molecular mass?	U
16. Why is pyridine used during the acylation of primary amines by acid chloride?	U
17. $C_6H_5COCl + CH_3NH_2 \longrightarrow CH_3NHCOC_6H_5 + HCl$. Name the reaction.	K
18. What is the gas liberated when methanamine is treated with nitrous acid.	K
19. Primary aliphatic amines quantitatively evolves nitrogen gas with nitrous acid. Mention one application of this reaction.	A
20. Write the chemical name of Hinsberg's reagent.	K
21. Which one of the following reacts with $C_6H_5SO_2Cl$ to give a product insoluble in aqueous alkali? $C_6H_5CH_2NH_2$, $C_2H_5NHCH_3$, $(C_2H_5)_3$ N	U
22. A foul smelling gas is liberated when aniline is heated with chloroform and ethanolic potassium hydroxide solution. Name the gas.	K
23. $C_6H_5CH_2NH_2 \xrightarrow{NaNO_2/HCl\ at\ 0°C}$ X. Write the structure of X.	K
24. Diazonium salts are not stored. Why ?	U

25. Name the diazonium salt that is insoluble in water and stable at room temperature.	K
26. Give reason: Although amino group is ortho and p-directing in aromatic electrophillic substitution reactions, aniline on nitration gives a substantial amount of m-nitroaniline.	U
27. Write the structure of the product obtained when aniline reacts with bromine water at room temperature.	K
28. Aniline does not undergo Friedel-Craft reaction. Why?	U
29. Write the zwitter ion form of sulphanilic acid.	K
30. Complete the coupling reaction : 	K
Two mark questions:	
1. What are A and B in: RX $\xrightarrow{\text{alc.KCN}}$ A $\xrightarrow{H_2/Ni}$ B?	K
2. RCOOH $\xrightarrow{NH_3,\Delta}$ A $\xrightarrow{\text{(i) } LiAlH_4 \text{ ii) } H_2O}$ B. Write the structures of A and B.	K
3. C_6H_6 $\xrightarrow{\text{conc.}H_4SO_4 + HNO_3 \text{ and heat}}$ A $\xrightarrow{Sn/HCl}$ B. Give the IUPAC names of A and B.	K
4. How is nitrobenzene converted to N - methylaniline? Write the equation.	K
5. Benzyl chloride $\xrightarrow{\text{ammonolysis}}$ A (1° amine) $\xrightarrow[\text{chloromethane}]{\text{2 moles of}}$ B. Name the products A and B.	K
6. Complete the following acid–base reaction and name the product: $(C_2H_5)_3N + HCl \longrightarrow$	K
7. Name any two effects that decide the basic strength of alkylamine in aqueous solution.	K
8. Arrange the following as directed: i) $C_6H_5NH_2$, $(C_2H_5)_2$ NH, $C_2H_5NH_2$ (increasing order in their solubility in water) ii) $C_2H_5NH_2$, $(C_2H_5)_3N$, $(C_2H_5)_2$ NH (decreasing order in base strength in aqueous medium)	U
9. Explain carbylamine reaction for methanamine with an equation.	K
10. Write the IUPAC names of A and B: $C_6H_5N_2Cl$ $\xrightarrow[\text{alc.KCN}]{CuCN}$ A $\xrightarrow{LiAlH_4}$ B	K
11. Complete the following equation and name the reaction: $C_6H_5N_2Cl$ $\xrightarrow{Cu_2Cl_2/HCl}$ A +B	K
12. If : $C_6H_5N_2X$ $\xrightarrow{R}$ $C_6H_5Cl + N_2 +$ CuX is an example for Gatterman reaction, what should be the reagents R?	K K

13. How is aniline converted into phenol? Write the equation.	U
14. Write the name of the main products A and B . $C_6H_5NH_2 \xrightarrow{NaNO_2/HCl\ at\ 0°C} A \xrightarrow{H_3PO_2/H_2O} B$	U
15. Between aniline and acetanilide which is more reactive towards electrophilic substitution reaction. Give reason.	
Three mark questions	
1. Write the equations for the reactions involved in the conversion of Primary amine to quaternary ammonium salt. (General equation).	K
2. Explain Gabriel phthalimide synthesis reaction for the preparation of methanamine. Write the equations.	K
3. Give reasons: i) Lower aliphatic amines are soluble in water. ii) Methanamine is a stronger base than ammonia. iii) pk_b of aniline is much higher than that of ammonia.	U
4. Arrange : $(CH_3)_3N$, $CH_3CH_2CH_2NH_2$, $CH_3NHCH_2CH_3$, as directed i) Increasing order in their base strength in gas phase. ii) Decreasing order in their base strength in aqueous medium. iii) Increasing order in their solvation in aqueous medium.	U
5. Arrange the following in the increasing order of their base strength. Give reason: Aniline, p-nitoraniline, p-toluidine.	U
6. Discuss briefly the separation of primary, secondary and tertiary amines using Hinsberg reagent.	K
7. An isocyanide on reduction gives a secondary amine. Using this as hint, name X, Y and Z: $C_6H_5CN \xrightarrow{H_2/Ni} X \xrightarrow[\Delta]{CHCl_3+alc.KOH} Y \xrightarrow[2)\ H_2O]{1)\ LiAlH_4} Z$	A
8. What do you mean by acylation for an amine? Write the equation for the acylation of ethanamine with acetylchloride. Name the product formed.	K
9. Among the different isomers corresponding to molecular formula C_3H_9N write the structure of the isomer, i) that reacts with Hinsberg reagent to form a product insoluble in an alkali ii) (any one) that forms a quaternary ammonium salt with 3 moles of R-X? iii) that does not undergo acylation	A
10. What is diazotization? Give an example for a diazonium salt. Mention one aromatic compound synthesized from a diazonium salt.	U

11. Aniline is nitrated in 3 steps to get p-nitroaniline as a major product. Name the reactions involved in three steps in the correct sequence.	U
12. What is the reagent/s (X) and products Y and Z in the following sequence of reaction: 	A
13. An aromatic compound "A" on treatment with aqueous ammonia and heating forms compound "B". B on heating with Br_2 and KOH forms a compound "C" of molecular formula C_6H_7N. The compound C can form a diazonium salt. Give the IUPAC names of the compounds A,B and C.	A
14. Give the structures of A, B and C in the following reactions: $C_6H_5N_2X \xrightarrow{CuCN/KCN} A \xrightarrow{H_2O/H^+} B \xrightarrow{NH_3/heat} C$	U
15. Aniline is converted to Fluorobenzene. Write the equations for the reaction involved.	U
Five mark questions	
1. Identify A,B and C in the following conversion. $C_6H_5NO_2 \xrightarrow{Fe/HCl} A \xrightarrow{NaNO_2/HCl\ at\ 0°C} B \xrightarrow{CuCN/KCN} C.$ Name the reaction involved in the conversion of A to B and B to C.	A
2. a) $CH_3CONH_2 \xrightarrow{Br_2/KOH} X \xrightarrow{HNO_2} Y$. Write the IUPAC names of X and Y. b) Name the inorganic reagent that helps to convert : i) $ArN_2^+Cl^-$ into ArI ii) $ArN_2^+Cl^-$ into ArOH c) Arrange these in the increasing order of their boiling points: $(CH_3)_3N$, $CH_3CH_2CH_2NH_2$, $CH_3NHCH_2CH_3$	A
3. What are X, Y and Z? Name the two inorganic reagents that are used to convert Z into nitrobenzene. 	A
4. a) Between N-methylethanamine and propan-2-amine, which will liberate N_2 gas on treatment with nitrous acid. Write the equation for the reaction. b) What should be the reagents X and Y to bring about the following conversions? 	

c) Phenols or aryl amines + A $\xrightarrow{H^+ \text{ or } OH^-}$ azo dyes. What should be A?

A

5. a) Give reason :

   i) Aryl diazonium salts are more stable than aliphatic diazonium salts.

   ii) Tertiary amine cannot form intermolecular hydrogen bond.

   b) $C_6H_5CONH_2 \xrightarrow{\text{i) } LiAlH_4 \text{ ii) } H_2O} P \xrightarrow{C_6H_5SO_2Cl} Q$. Write the structure of P and Q.

   c) Arrange the following in the deceasing order of their pK_b value.

   $C_6H_5NH_2$, $(C_2H_5)_2NH$, NH_3

U

6. a) Give the general equation for Hoffmann bromamide degradation reaction. Why is this called degradation reaction? Explain the migration involved in the reaction.

   b) Benzenediazonium chloride reacts with phenol in presence of OH^- to form an orange dye. Write the structure of the dye.

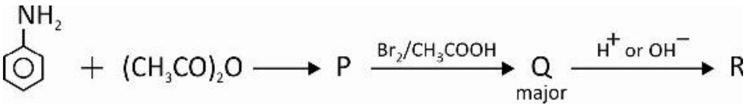
   c) pK_b values of amines A, B, C are 3.25, 9.3, 4.7 respectively. Arrange the amines A, B, C in increasing order of their basic strength.

U

7. An aromatic amide 'A' with the formula C_7H_7ON on reaction with NaOBr forms a compound 'B'. 'B' reacts with HNO_2 at 0° C to form 'C'. C is reduced using ethanol. The products formed contains two organic compounds D and E, one of which is an aromatic compound. What are A,B,C,D and E?

A

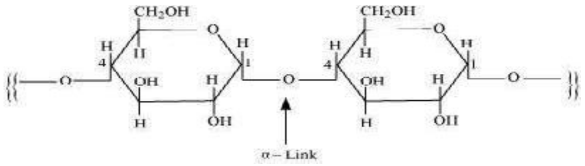
8. a) Write the structure of P,Q,R.



   b) Name the family of compounds that gives carbylamine reaction.Give the general equation for the reaction.

K

UNIT-14 : BIOMOLECULES

One mark questions:	
1. What are monosaccharides?	K
2. What are oligosaccharides ?	K
3. Is galactose an aldose or ketose sugar ?	U
4. What are reducing sugars?	K
5. What is the product obtained when glucose is oxidised by bromine water?	K
6. Glucose $\xrightarrow{\text{oxidation with nitric acid}}$ X. What is X?	K
7. Identify the monomer for the polysaccharide :  	U
7. How do you account for the absence of free aldehyde group in the pentaacetate of D-glucose?	K
8. What is an anomeric carbon?	K
9. Write the Haworth's structure for β-D (–) fructofuranose.	K
10. What do you mean by glycosidic linkage?	K
11. During curdling of milk, what happens to sugar present in it?	K
12. Name the water soluble component of starch.	K
13. Give the general representation for α-L- amino acid.	K
14. The solubility of amino acids in water are generally higher than that of the corresponding halo acids. Explain.	U
15. How many peptide bonds are present in a pentapeptide?	K
16. Maya is suffering from Pernicious anaemia . Name the vitamin deficient in her.	U
17. Name the vitamin whose deficiency in our body results in impaired clotting of blood.	K
18. Name a hormone which controls the level of excretion of water and salt from kidneys.	K
19. Vitamins are classified into two groups depending upon their solubility in water or fat. In which class will you place vitamin D ?	U
20. Name the sugar moiety present in DNA molecule.	K
21. What is the difference between a nucleoside and a nucleotide?	U

Two mark questions:	
1. What are disaccharides? Give an example.	K
2. What are polysaccharides ? Give an example.	K
3. What reactions of glucose support to show that : i) it has a carbonyl group ii) it has a chain of six carbon atoms?	K
4. Mention two reactions and facts that cannot be explained by the open chain structure of glucose.	K
5. How do the two cyclic hemiacetal forms of glucose differ? What are these two forms called?	K
6. What are the hydrolytic products of maltose? Why is it a reducing sugar?	K
7. What is the composition of invert sugar? How is it obtained?	U
8. Give two differences between amylose and amylopectin units of starch.	U
9. What is the basic structural difference between starch and cellulose?	U
10. Write two main functions of carbohydrates in plants.	K
11. Write the zwitter ion form of α-amino acid. In this form amino acids are amphoteric. Give reason.	K
12. Give the name and structure of the simplest α- amino acid which is optically inactive .	K
13. Draw the structure of Glycylalanine. Mark the peptide linkage in it.	K
14. Vitamin C cannot be stored in our body. Why?	U
15. Name the hormone which contains iodine. What is the function of this hormone?	K
16. What are the common types of secondary structures of proteins?	K
17. The two strands in DNA are not identical but are complementary. Explain.	K
Three mark questions:	
1. With respect to the sugar in milk: i) name the sugar ii) name the hydrolytic products of the sugar iii) which carbon atoms are involved in the formation of glycoside bond in it?	U
2. What does α, D, (+) in the name α – D (+) glucose signify?	U
3. i) Write the Haworth's structure of D(+) sucrose: ii) Sucrose is a non-reducing sugar. Why? iii) What is the main source of sucrose?	U
4. From the following polysaccharides : glycogen, cellulose, amylose, answer the followings: i) Which one is a linear polymer of α- glucose ?	

ii) Which one is a polymer of β – glucose ?

iii) Which one is a polymer present in liver and muscle ? U

5. What is glycogen? How is it different from starch? U

6. What type of linkages are responsible for the formation of

i) Primary structure of proteins

ii) Cross linking of polypeptide chains

iii) α-helix formation? U

7. Match the items in A, B and C correctly

A	B	C
a) Valine	Non essential amino acid	Basic amino acid
b) Aspartic acid	Essential amino acid	Neutral amino acid
c) Lysine	Essential amino acid	Acidic amino acid

K

8. What are essential and non-essential amino acids? Is glycine an essential or non-essential amino acid? K

9. What are these with respect to proteins

(i) Peptide linkage (ii) Primary structure (iii) Denaturation. K

10. Explain the terms primary and secondary structure of proteins. What is the difference between α-helix and β-pleated sheet structure of proteins? U

11. Differentiate between globular and fibrous proteins with one example for each. U

12. What is a native protein? Explain how it gets denatured? U

13. What are the forces that stabilises the 2° and 3° structures of proteins? K

14. How are vitamins classified? Name the vitamin deficiency of which leads to convulsions? K

15. Why are vitamin A and vitamin C essential to us? Mention one source for vitamin C. K

16. Name:

i) a water soluble vitamin.

ii) a fat soluble vitamin.

iii) the disease caused by deficiency of vitamin D. K

17. Match the items in A, B and C correctly:

A	B	C
a) Vitamin A	Green vegetables	Scurvy
b) Vitamin C	Carrot	Beri beri
c) Vitamin B_1	Citrus fruit	Night blindness

K

18. Match the items in A, B and C correctly:

A	B	C
a) Glucagon	pancreas	Decreases blood glucose
b) Thyroxin	Pancreas	Increases blood glucose
c) Insulin	Thyroid	Stimulates metabolism

K

19. What are nucleic acids? Mention their two important functions. K

20. Write the important functional differences between DNA and RNA. K

21. Name the products that would be formed when a nucleotide is completely hydrolysed? K

22. Name the linkage that joins:

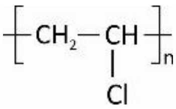
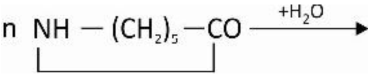
    i) two monosaccharides ii) two α-amino acids iii) two nucleotides K

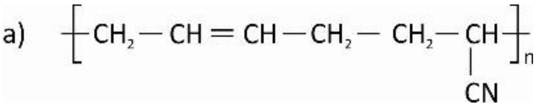
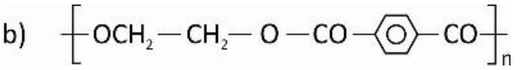
23. What information can you get from 1° and 2° structure of DNA? How is the 2° structure of DNA stabilised? K

24. Give differences between RNA and DNA with respect to :

    i) sugar moiety ii) N-base iii) structure K

UNIT-15: POLYMERS

One mark questions:	
1. Based on the source, what type of polymer is rayon?	K
2. Arrange the following in the decreasing order of their intermolecular forces: Buna N, Polystyrene, Polyester	U
3. Mention one difference between thermoplastic and thermosetting polymer.	U
4. What must be the criteria for a monomer to form an addition polymer?	U
5. What is the most common mechanism suggested for addition polymerization?	U
6. What is the role of benzoyl peroxide in the polymerization of ethene?	K
7. Complete the chain propagation step: C_6H_5 $CH_2–CH_2$• + $CH_2 = CH_2 \longrightarrow$	K
8. Give reason : Polythene prepared under high pressure and temperature has low density.	U
9. Give the composition of Zeigler Natta catalyst?	K
10. Name the polymer that is resistant to attack by corrosive reagents and used in making non stick utensils.	A
11. Name the monomer for the polymer with a partial structure  $\left[CH_2 - \underset{Cl}{\underset{\mid}{CH}} \right]_n$	K
12. A saturated monomer has two different functional groups. What type of polymer is obtained from it?	U
13. What type of fibre can be formed by the polycondensation of dicarboxylic acids and diols?	U
14. Ethylene glycol is polymerised with terephthalic acid. Name the type of polymerization involved.	U
15.  $n\ NH - (CH_2)_5 - CO \xrightarrow{+H_2O}$ a polymer. Name the polymer.	K
16. Unbreakable crockery is a copolymer of formaldehyde and nitrogen containing monomer. Name the monomer.	A
17. Is melamine polymer a cross linked or a branched polymer?	K
18. Rubber has elastic properties. Give reason.	U
19. What is the configuration at the carbon carbon double bond in natural rubber?	K
20. Name the element that helps cross linking of rubber molecules during Vulcanization.	K
21. Molecular mass of polymers are expressed as an average. Give reason.	U

22. Write the structure of the biodegradable co-polymer obtained using $NH_2–CH_2–COOH$ and $NH_2–(CH_2)_5–COOH$	K
23. Synthetic aliphatic polyesters are preferred over synthetic aromatic polyesters. Why?	U
Two mark questions:	
1. Name two semi synthetic polymers derived from cellulose.	K
2. Based on molecular forces polymers are classified. Name any two such class.	K
3. Based on structure what type of polymer is : a) urea - formaldehyde resin b) LDPE	K
4. How is an addition polymer formed? Write the structure of the addition polymer from styrene.	K
5. Asha uses a synthetic polymer which is a substitute for wool. What is the monomer used for such a polymer? Write the structure of the polymer.	A
6. Name the monomer for the polymers a) $\left[CH_2-C=CH-CH_2 \right]_n$ b) $\left[CF_2-CF_2 \right]_n$	U
7. What are the monomers required for the preparation of nylon 6,6?	K
8. Mention the type of polymerization reaction that occurs when these monomers are polymerized. a) $CF_2 = CF_2$ b) Caprolactum	K
9. Write an equation for the preparation of nylon 6.	K
10. Name a a) polyester b) polyamide fibre	K
11. Handles of utensils are made by a thermosetting polymer. Name the polymer, write its structure.	K
12. Identify the monomers for these polymeric structures. a)  $\left[CH_2-CH=CH-CH_2-CH_2-\underset{CN}{\underset{\vert}{CH}} \right]_n$ b) 	U
13. Give two differences between natural rubber and Buna – S.	U
14. Give one example each for a synthetic biodegradable polymer that is a a) polyester b) polyamide	K
Three mark questions:	
1) Based on various types of classification of polymers, mention any three class that polyvinylchloride belongs to.	U

2) Write the steps involved in the free radical mechanism of the polymerization of ethene. U

3) Classify the given polymers as ; a) addition b) condensation c) network polymers

i) Dacron ii) Bakelite iii) Neoprene K

4) Distinguish LDPE & HDPE based on

i) method of preparation ii) structure iii) toughness/use K

5) With one example for each, distinguish chain-growth and step-growth polymerization. U

6) Match the items in A, B and C correctly

A	B	C
a) Bakelite	x) Condensation	p) Elastomer
b) Nylon – 6	y) Addition	q) Thermosetting
c) Buna – N	z) Homopolymer	r) Fibre

U

7) Give one example each of a synthetic polymer that is used as:

a) fibre b) elastomer c) plastic A

Five mark questions:

1) With respect to the monomer styrene :

i) Write the structure of its homo polymer.

ii) Name the polymer obtained when it is polymerized with 1,3 – butadiene.

iii) What characteristic property will the polymer in (ii) get? Mention one use of it

iv) If the homo polymer has 60% chains of molar mass 10000 each, 30% chains of molar mass 12000 each and 10% chains of molar mass 16000 each, what will be the molar mass of the polymer? U

2) a) Correct the underlined part in the following statements suitably:

i) Terylene is a polyamide fibre

ii) Cellulose nitrate is rayon.

iii) Many synthetic polymers are biodegradable.

b) Write the structures of the monomer for the polymers

i) Nylon-6 ii) Polystyrene

3) a) Which of the following is an elastomer, polyamide, thermosetting polymer? K

i) Urea – formaldehyde ii) Neoprene iii) Nylon – 6

b) Write any two advantages in the Vulcanization of rubber.

4) a) How is a homopolymer different from a copolymer? K

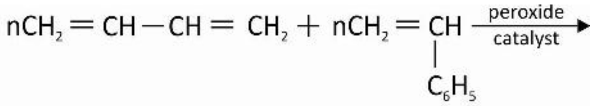
b) Write the names of the polymer obtained from

i) $CH_2 = CHCN$ ii) Ethylene glycol and terephthalic acid

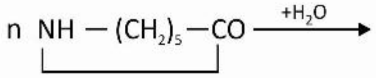
c) Write the equation for the polymerization of chloroprene to get neoprene.

5) a) Write any two differences between Nylon 6 and Nylon 2 - Nylon 6. K

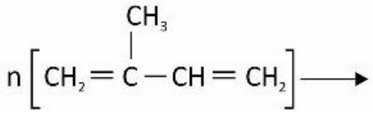
b) Complete the following polymerization reactions:

i) 

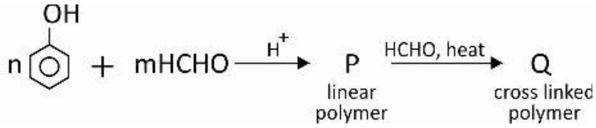
$nCH_2=CH-CH=CH_2+nCH_2=\underset{C_6H_5}{\underset{|}{CH}}\xrightarrow[\text{catalyst}]{\text{peroxide}}$

ii) 

$n\ \underbrace{NH-(CH_2)_5-CO}\xrightarrow{+H_2O}$

iii) 

$n\left[CH_2=\overset{CH_3}{\overset{|}{C}}-CH=CH_2\right]\longrightarrow$ K

6) a) 

Name P and Q. Give one use of P.

b) Give reason : i) Fibre has close packing of chains and crystalline nature.

ii) Polythene prepared using Zeigler Natta catalyst has high density. U

7) a) A polymer is as shown below:

Based on the structure what type of polymer is it? Give one example for such a polymer.

b) Name a polymer each with the following characteristic and use :

i) crease resistant hence used to blend with cotton & wool.

ii) resistant to attack by petrol and other organic solvents and used for tank lining.

iii) Resistant to chemicals, insects and fungi and used in making fibers such as orlon. A

UNIT-16 : CHEMISTRY IN EVERYDAY LIFE

One mark questions:	
1. Define Chemotherapy.	K
2. What are Drugs?	K
3. Name any one force that holds the drugs to the active site of enzymes.	K
4. Drugs that are classified on the basis of Pharmacological effect is useful for doctors. Why?	K
5. Name a macromolecule that is chosen as a drug target.	K
6. Some proteins are important to body's communication. What are they called?	K
7. Name the chemical which stimulates the secretion of HCl and Pepsin in stomach.	K
8. Prostaglandins in our body stimulates inflammation and cause pain. Name a drug effective against it.	K
9. Name the chemical synthesised in the body which acts as a potent vasodilator.	K
10. Why do anti allergics not act as antacids?	U
11. The drug cimetidine is an antacid. Why?	U
12. What are hypnotics?	K
13. What is the role of noradrenaline in the body?	K
14. If a person is suffering from tension suggest a drug that may be given to that person.	U
15. What are analgesics?	K
16. Name the drug that could be used in the prevention of heart attack.	U
17. What types of analgesics are mainly used for the relief of pain of terminal cancer?	K
18. What are antipyretic drugs?	K
19. What are antimicrobials?	K
20. To which class of antimicrobials does sulpha drugs belong to?	K
21. What are artificial sweetening agents?	K
22. Why are artificial sweetening agents preferred over natural sweeteners?	U
23. Chemically what are 'soaps'?	K
24. What is saponification?	K
25. Sodium salts of alkylbenzenesulphonates are classified as anionic detergents. Give reason.	U
26. After saponification, the sodium salt of fatty acid (soap) in colloidal form is precipitated by adding _____.	U

Two mark questions	
1. Name any two criteria by which the drugs are classified.	K
2. What are the two major functions by which an enzyme catalyses a reaction.	K
3. What are antagonists and what are agonists?	K
4. Where are receptors found? What is their role in the body?	K
5. What are antihistamines? Give an example.	K
6. Low level of noradrenaline is the cause of depression. What type of drugs are needed to control depression? Give one example.	K
7. Name two classes of analgesics.	K
8. Following drugs are analgesics. One of them is different from the others. Identify it and give reason: Morphine, heroin, aspirin, codeine	K
9. What are antibiotics? Give an example.	U
10. Name any two classes of antimicrobial drugs.	K
11. What are bactericidal antibiotics? Give an example	K
12. What are bacteriostatic antibiotics? Give one example.	K
13. What are broad spectrum antibiotics? Give Example	K
14. What are narrow spectrum antibiotics? Give example.	K
15. Name a disease that can be cured by giving chloramphenicol antibiotic. Why it is given orally?	U
16. What are antiseptics? Give an example.	K
17. What is the composition of dettol?	K
18. What is tincture iodine? What is its therapeutic use?	K
19. What are antifertility drugs? Give an example.	K
20. What are disinfectants? Give an example.	K
21. Name two gases (inorganic) which in very low concentrations act as disinfectants.	K
22. Chemicals are added to food. Mention any two advantages.	K
23. Name any two antioxidants which are used in wine and beer	K
24. What are food preservatives? How do they help in the perseveration of food?	K
25. What is the role of aspartame as food additive? Why is its use limited to cold food and drinks?	K
26. Write an equation for saponification of $(C_{17}H_{32}COO)_3\ C_3H_5$ by sodium hydroxide. Name the byproduct.	K U
27. Detergents are preferred over soap. Give reasons	K
28. Explain the cleansing action of soap?	K

29. What is meant by the term non ionic detergent and where are they used?	U
30. Mention one advantage and one disadvantage of synthetic detergents.	
31. Distinguish between anionic and cationic detergents by giving one example for each.	U
32. Which is a better synthetic detergent? One with branched chains or one without branched chains. Give reason for the choice made.	U
Three mark questions:	
1. a) What are receptors? b) What are these known as: i) drugs that bind to receptor site and inhibit its function ii) drugs that act like natural messengers and hence activate the receptors?	K
2. Classify these as: i) tranquilisers ii) anti-allergic iii) antacid a) seldane b) ranitidine c) barbituates	K
3. What is the role of these as food additives: i) sodium benzoate ii) BHA iii) sucralose?	A
4. Give reasons: i) Bithional is added to soap ii) Metal hydroxides are better than sodium bicarbonate, ranitidine is better than metal hydroxides to treat acidity.	U
5. Name the therapeutic action of the following drugs on human body: i) Luminal ii) Streptomycin iii) Morphine	K

ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ಬೆಂಗಳೂರು

ದ್ವಿತೀಯ ಪಿಯುಸಿ, ರಸಾಯನಶಾಸ್ತ್ರ ಪ್ರಶ್ನೆ ಕೋಠಿ ತಯಾರಿ ಸಮಿತಿ –2017–18

ಕ್ರ.ಸಂ	ಹೆಸರು ಮತ್ತು ವಿಳಾಸ	ಸಮಿತಿಯಲ್ಲಿ ಪದನಾಮ (ಅಧ್ಯಕ್ಷರು / ಪರಿಶೀಲಕರು/ ಸದಸ್ಯರು)	ಮೊಬೈಲ್ / ದೂರವಾಣಿ ಸಂಖ್ಯೆ	ಇ–ಮೇಲ್ ಐಡಿ	ಪ್ರಶ್ನೆಕೋಠಿ ಸಿದ್ಧಪಡಿಸಲು ಅಧ್ಯಾಯದ ಹೆಸರು
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12	VANI KUMARI GOVT. PU COLLEGE, KATIPALLA, KRISHNAPURA, D.K.	ಸದಸ್ಯರು	8105026138	holla.vani@gmail.com	HALO ALKANES AND HALOARENES
13	B A HARISH SARVODAYA PU COLLEGE, TUMKUR	ಸದಸ್ಯರು	9448648538	ba.harish1@gmail.com	ALCOHOLS, PHENOLS & ETHERS
14	RAJESH GOVT. PU COLLEGE, B H ROAD, SAGAR, SHIMOGA DIST.	ಸದಸ್ಯರು	9986486842	raj_ayanur@rediffmail.com	ALDEHYDES, KETONES & CARBOXYLIC ACIDS
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16	MANJUNATH BHAT PRINCIPAL, GOVT. PU COLLEGE, HIRIYADKA, UDUPI DIST.	ಸದಸ್ಯರು	9448416987	manjunathbhat1@gmail.com	BIOMOLECULES
17	NASEEMUDDIN FAROOQIA PU COLLEGE, UMMER KHAYAM ROAD, MYSORE	ಸದಸ್ಯರು	9845699587	naseemuddin2001@yahoo.com	CHEMISTRY IN EVERY DAY LIFE