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Subject Title: Chemistry IV			Prepared by: Arsheya Jabeen
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Unit - I: INORGANIC CHEMISTRY

1. Write the names of the following coordination compounds

a) $[Co(NH_3)_4Cl_2]Cl$ b) $K_3[Fe(CN)_6]$ C) $[Pt(en)_2Cl_2](NO_3)_2$ d) $[Pt(NH_3)_4Cl_2]$

- 2. Discuss the classification of organometallic compounds with examples?
- Discuss the formation of [NiCl₄]²⁻, [Cu(NH₃)₄]²⁺ and [Fe(CN)₆]³⁻ on the basis of valence bond theory (VBT) ?
- 4. i) Write the structure of Ferrocene ? Explain any three preparative methods of ferrocene and its properties?

ii)What is 18 valence electron rule ? Explain with two examples ?

- 5. Explain the postulates of Werner's co-ordination theory taking suitable examples?
- 6. Describe Sidgwick electronic interpretation of coordination compound and EAN rule and their limitations?
- What is effective atomic numbe. Calculate EAN of the central ion in the following:
 i)K₄[Fe(CN)₆ ii)K₂[TiCl₆] iii)[Pd(NH₃)₆]²⁺ iv)[Pt(NH₃)₂Cl₂] v)[Ag(NH₃)₂]⁺
- 8. i)Write about the postulates of Valence Bond Theory (VBT) and its drawbacks?ii) Explain the limitations of Valence Bond Theory (VBT)?
- 9. Explain Inner and Outer Orbital Complexes with suitable examples?
- 10. Explain structural isomerism with suitable examples?
- 11. How does valence bond theory account for the fact that [NiCl₄]²⁻ is paramagnetic while Ni(CO)₄ is diamagnetic?
- 12. What is meant by stereoisomerism in co-ordination compounds? Explain with suitable examples?
- 13. a) Why square planar complexes do not exhibit optical isomerism ?
 - b) Draw all possible isomers of each of the following:

i) $[Co(NH_3)_2Cl_2]^+$ ii) $[Cr(en)_2Cl_2]^+$ iii) $[Pt(H_2O)_2Br_2]$ iv) $[Pt(en)Br_2Cl_2]$ v) $[Co(en)_3]Cl_3$



- 14. Write the preparation of Lithium Organometallic Compounds and its properties?
- 15. Write the preparation of Mg organometallic compounds ang explain its properties?
- 16. What are aluminium organometallic compounds? Write the preparation of alkyl aluminium organometallic compounds and its properties?
- 17. Write the preparation of aryl aluminium organometallic compounds with suitable examples and its properties?
- 18. How does the structure of $Fe_2(CO)_9$ differ from that of $Mn_2(CO)_{10}$?
- 19. What are metal carbonyls? Give the classification of metal carbonyls?
- 20. Describe the structure and shape of metal carbonyls with suitable examples ?
- 21. Explain the preparation and properties of nickel carbonyl [Ni(CO)₄] ?
- 22. Explain and draw the structure of $Fe_3(CO)_{12}$ and $Fe_2(CO)_9$?

Unit - II: ORGANIC CHEMISTRY

- 23. Why are carboxylic acids stronger acids than phenols ? Explain.
- 24. Give any two methods for the preparation of nitroalkanes ?
- 25. Write a note on :
 - i) Huns Diecker reaction ii) Smidt reaction (iii) Hell-Volhard-Zelensky reaction
- 26. i) How will you obtain methyl ethyl ketone from acetoacetic ester?
 - ii) Write the reduction reactions of nitrobenzene in alkaline and acidic medium?
- 27. Explain why benzoic acid is stronger than acetic acid?
- 28. Write a note on Hoffmann bromamide reaction?
- 29. Explain the preparation of carboxylic acids with mechanism by using following methods:

a) Hydrolysis of nitriles b) Hydrolysis of acid chlorides or amides c) Hydrolysis of esters d) Carbonation of Grignard's reagent e) Basic catalysed hudrolysis

- 30. Write the mechanism involved in the esterification of carboxylic acids with alcohols?
- 31. Explain the preparation of aromatic acids by using following special methods,a)Oxidation of side chain (From alkyl benzenes) b)Hydrolysis by benzotrichlorid c)Kolbe's reaction
- 32. i)What are active methylene compounds? Give two examples ?ii)Write any two synthetic reactions of aceto acetic ester ?
- 33. i)Write a note on NEF reaction ?ii) Write the synthetic applications of (AAE) Aceto Acetic Ester ?



- 34. Explain the reactivity of nitroalkanes in case of a) Halogenation b) Reaction with HNO2
- 35. Explain the mechanism of Arndt Eistert synthesis with suitable example ?
- 36. Give a brief account on the following chemical reactions :
 - (a) Reduction (b) HVZ (c) Friedal crafts reaction.
- 37. Write the synthesis of the following by using Aceto Acetic Ester (AAE):
 - (a) Butanone (b) 3-Methyl 2- butanone
- 38. Give the preparation of the following acids by using malonic ester:a)Substituted monocarboxylic acids (b) substituted dicarboxylic acids
- 39. Nitroalkanes yields products when reduced with the following reducing agents.

a) Ni/LiAlH₄ b) Zn/NH₄Cl

- 40. Write the products obtained in the following reactions:
 - a) Nitrobenzene + Sncl₂ + HCl \rightarrow
 - b) 2 Nitrobenzene + SnCl₂ + NaOH \rightarrow
- 41. i) Write a note on Michael addition reaction. Explain its mechanism?

ii) Write a note on Mannich reaction. Explain its mechanism?

- 42. Explain in detail about electrophilic substitution reaction of Nitrobenzene?
- 43. i) Explain degradation of carboxylic acid?
 - ii) Write a short note on Inductive Effect?
- 44. Write a note on rosenmund's reduction with suitable example?
- 45. Write the preparation of acetic anhydride and describe its important properties?
- 46. i) Explain Claisen Condensation with mechanism ?
 - ii) Discuss with mechanism of Malonic Ester synthesis ?

Unit - III: PHYSICAL CHEMISTRY

- 47. Describe Hydrogen electrode?
- 48. i) How will you determine the transport number of an ion by Hittorf's method?

ii) A solution of silver nitrate containing 12.14g of silver in 50ml of solution was electrolysed between platinum electrodes. After electrolysis, 50ml of the anode solution was found to contain 11.55g of silver, while 1.25g of metallic silver was deposited on the cathode. Calculate the transport number of Ag^+ and NO_3^- ions?

- 49. The conductivity of a solution containing 1g of anhydrous $BaCl_2$ in 200ml of water has been found to be 0.0058 mho cm⁻¹. What are the molar conductivity and equivalent conductivity of the solution? (mol.wt of $BaCl_2 = 208$).
- 50. State Kohlrausch law of independent migration of ions. Explain its applications?
- 51. Explain ohm's law?

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- 52. Define equivalent conductance and specific conductance. Explain relation between equivalent conductance and specific conductance?
- 53. Define conductivity. Explain the measurement of conductivity?
- 54. i) Explain the determination of specific conductance and cell constant?
 - ii) The specific conductance of 0.02 N KCl at 25°C using conductivity water was

0.002765 ohm⁻¹ cm⁻¹. If the resistance of the solution is 400 ohm. Calculate the cell constant.

- 55. Discuss about Debye-Huckel-Onsagar's equation for strong electrolytes?
- 56. Explain Ostwald's dilution law and write its limitations?
- 57. Define transport number. Determine the transport number by Hittorf's method.
- 58. i)Explain the construction and working of galvanic cell?

ii) Differentiate between galvanic cell and electrolytic cell. Give one example for each?

- 59. What are the postulates of Arrhenius theory of electrolytic dissociation?
- 60. Explain with examples reversible and irreversible cells?
- 61. Write a note on migration of ions and discharge of ions during electrolysis?
- 62. i) Discuss about potentiometric titrations?
 - ii) Explain Nernst equation?
- 63. i)Discuss the construction and working of standard hydrogen electrode and calomel electrode?
 - ii) Discuss about the quinhydrone electrode and glass electrode?
- 64. i)Explain E.M.F of a cell and its measurement ?
 - ii) Explain solubility product of AgCI?

Unit - IV: GENERAL CHEMISTRY

- 65. Write about concerted reactions and discuss molecular orbitals with suitable examples?
- 66. i) Write about cycloaddition reactions with suitable examples?
 - ii) Explain symmetry properties with suitable examples?

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67. Write the molecular orbitals and symmetry properties of the following:

a) Ethene b) 1,3 butadiene

c) Allyl system

- 68. i)Explain about electrocyclic reactions with suitable examples ?ii) What is stereospecific reaction? Explain with one example ?
- 69. i)Write retrosynthetic analysis of acetophenone , Phenylethylbromide and cyclohexene ?ii) Write a note on disconnection approach ?
- i)What is diastereo selective reaction ? Explain with one example ?ii) Explain asymmetric synthesis with examples ?
- 71. i)Define Synthon and synthetic equivalent with an example ?ii) What is enantioselective reaction? Give an example ?
- 72. Define and explain Enantiomeric excess and diastereomeric excess ?

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