VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
(Autonomous & Residential)
[Affiliated to Madurai Kamaraj University]
M.Sc. Chemistry Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Second Semester : Paper – I
ORGANIC CHEMISTRY
Under CBCS – Credit 4

Time: **3** Hours   Max. Marks: **75**

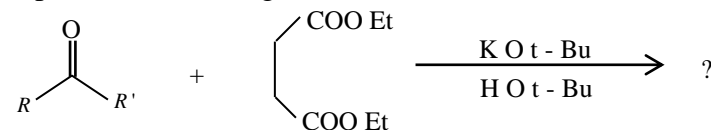## SECTION – A

Answer ALL Questions :   **(10 × 2 = 20)**

1. S_N1 *and* S_N2 reactions do not occur at bridge head positions. Why?

2. Allylic chloride reacts faster than n – propyl chloride in S_N1 reaction. Explain.

3. Why neomenthyl chloride undergoes rapid E2 elimination while in menthyl chloride this elimination is much slower?

4. State Bredt's rule. Give an example.

5. What is Sharpless asymmetric epoxidation? Give an example.

6. Identify the name of the reaction and complete the product

$$C_6H_5CHO + Br\ CH_2 - COOC_2H_5 \xrightarrow[\ (ii)\ H_2O/NH_4Cl\ ]{(i)\ Zn} \ ?$$
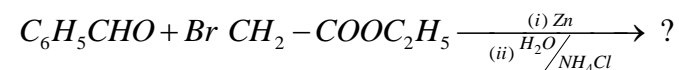
7. What is Ene reaction? Give an example.

8. Complete the following reaction

9. Give any two applications of Baker yeast.

10. What are Gilman's reagent? Give an example.

SECTION – B

<u>Answer ALL Questions :</u>   **(5 × 5 = 25)**

11. a) Explain the effect of solvents on S_N1 and S_N2 reactions.

(OR)

b) Discuss benzyne mechanism and give evidences for the same.

12. a) Narrate the $E1_C B$ mechanism with evidences to support it.

(OR)

b) Write a short note on $artho/para$ ratio.

13. a) Explain the mechanism of acid catalysed Mannich reaction.

(OR)

b) Give an example for Michael addition reaction and discuss its

   mechanism.

14. a) Discuss in detail Fischer indole synthesis.

(OR)

b) Taking suitable example prove that MPV reduction is the reverse

   of Oppenauer oxidation.

15. a) Give an account of Wilkinson's catalyst.

(OR)

b) Write a brief account on Merrifield resin.

SECTION – C

<u>Answer any THREE Questions :</u>   **(3 × 10 = 30)**

16. a) Write an account of nucleophilic substitution reaction at an

    aliphatic trigonal carbon.   **(5 + 5)**

    b) Discuss the neighbouring group participation involving non –

    bonded electrons and π electrons.

17. a) Illustrate Hofmann and Saytzeff rules with suitable example.

    b) Explain the effect of leaving group and the solvent polarity on

    electrophilic substitution reactions.   **(5 + 5)**

18. a) Explain the following reactions :   **(3 + 3 + 4)**

       (i) Hydroboration   (ii) Enamine reaction

    b) What is Wittig reaction? Discuss its mechanism.

19. Describe the following reactions with suitable mechanism. **(3½+3½+3)**

    a) Shapiro reaction   b) Robinson annulations   c) Birch reduction

20. Discuss the synthetic applications of the following reagents in

    organic synthesis.   **(4 × 2½ = 10)**

    a) $Zn\left(BH_4\right)_2$ b) LDA c) DDQ d) Trimethylsilyl iodide

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M.Sc. Chemistry Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Second Semester : Paper – II

INORGANIC CHEMISTRY – II
Under CBCS – Credit 4

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions :   **(10 × 2 = 20)**

1. Identify the ground term for each set of terms

    (i) ^1S, ^3P, ^3D (ii) ^1S, ^3P, ^1D ^1S, ^3F, ^1G

2. State spin and Laporaet orbital selection rules.

3. What is paramagnetism?

4. What is trans effect?

5. What is hydroformylation?

6. Write inert gas rule.

7. How will you prepare nickel tetracarbonyl?

8. Write the formula for Wilkinson's catalyst?

9. What do you know about induced radioactivity?

10. Give any two important applications of radioactivity.

SECTION – B

Answer ALL Questions :   **(5 × 5 = 25)**

11. a) Draw combined Orgel diagram for d^2, d^3, d^7 & d^8 ions in

    octahedral and tetrahedral fields.

(OR)

b) Discuss charge transfer spectra.

12. a) Discuss the substitution reaction in square planar complexes.

(OR)

b) State and explain Marcus theory of electron transfer.

13. a) What is Wacker process? Explain.

(OR)

b) How will you synthesis gasoline from natural gas?

14. a) Give any two method of preparation and three properties of
    nitrosyl complexes.

(OR)

b) Give a method of preparation and properties of dinitrogen
    complexes.

15. a) Explain nuclear fusion and fission with two examples each.

(OR)

b) Describe any two methods for detection and measurement of
    radioactivity.

SECTION – C

Answer any THREE Questions :   **(3 × 10 = 30)**

16. Construct Tanabe – Sugano diagram for d^6 system for low and high
    spin complexes.

17. Explain inner and outer sphere mechanisms with examples.

18. a) Write a note on metal carbenes and carbines.
     b) Explain Tolman catalytic loops.

19. What do you mean by magic number? What is their importance in
    the stability of the nuclei?

20. How vibrational spectral technique is useful in the structural
    elucidation of metal carbonyls? Explain with any four examples.

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M.Sc. Chemistry Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Second Semester : Paper – III

PHYSICAL CHEMISTRY – II
Under CBCS – Credit 4

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions :   **(10 × 2 = 20)**

1. Define – Slater orbital.

2. State – Born – Oppenheimer approximation.

3. What is microwave spectroscopy?

4. Define – Anharmonicity.

5. State mutual exclusion principle.

6. Define – Photo electric effect.

7. Write any two examples of acid catalysts.

8. What is Zeta potential?

9. Define – Fluorescence.

10. What is photosynthesis reaction? Give its significance.

SECTION – B

Answer ALL Questions :   **(5 × 5 = 25)**

11. a) What are terms and symbols? Explain.

(OR)

b) State and explain Huckel-pi electron theory.

12. a) What is stark effect? Explain its applications.

(OR)

b) Explain the force constant in IR spectra and its applications.

13. a) Discuss the selection rules in Raman spectroscopy.

(OR)

b) State and explain Koopmans theorem.

14. a) What is homogeneous catalysis? Explain with examples.

(OR)

b) Distinguish between physisorption and chemisorption.

15. a) What is Stern-Volmer equation? Give its significance.

(OR)

b) Write a short note on state acidity constant.

SECTION – C

Answer any THREE Questions :   **(3 × 10 = 30)**

16. Explain the perturbation theory and its application to helium atom.

17. Discuss the various vibrational energies of diatomic molecules.

18. State and explain Frank- Condon principle in molecular spectroscopy.

19. Derive Langmuir adsorption isotherm equation from theoretical considerations.

20. Draw and explain the Jablonski diagram of photochemical processes.

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M.Sc. Chemistry Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Fourth Semester : Paper – I
ORGANIC CHEMISTRY – IV
Under CBCS – Credit 5

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions : $(10 \times 2 = 20)$

1. What are long lived and short lived free radicals?

2. What is Bayer – Villiger rearrangement?

3. Complete the following reaction

   Chloramphenicol $\xrightarrow{H_3O^+}$ A $\xrightarrow{HIO_4}$ Product (s)

4. Give two differences between globular proteins and fibrous proteins.

5. Give an example each for A/B cis fused and A/B trans fused steroids.

6. What happens when cholesterol is distilled with selenium?

7. What do you understand by the term catalytic power of enzymes?

8. How enzymes are differ from catalysts?

9. What is the need for electro organic synthesis?

10. What do you understand by the term electrode potential?

SECTION – B

Answer ALL Questions : $(5 \times 5 = 25)$

11. a) Discuss Sandmeyer reaction.

    (OR)

    b) Describe any three methods of generation of free radicals.

12. a) Give a method of synthesis for $(2\frac{1}{2} + 2\frac{1}{2})$

       i) Penicillin V   ii) Ascorbic acid

(OR)

b) Explain any three medicinal applications of benzofurans.

13. a) How will you effect the following conversions : $(3 + 2)$

        i) Cholesterol to testosterone   ii) Oestrone to oestriol

(OR)

b) Write briefly on bio synthesis of steroids.

14. a) Write an account of Fischer's lock and key hypothesis.

(OR)

b) Write briefly on cyclodextrins based enzyme modules.

15. a) Discuss briefly on cathodic conversions with suitable examples.

(OR)

b) Write a short account of anodic conversions with suitable examples.

SECTION – C

Answer any THREE Questions : $(3 \times 10 = 30)$

16. a) Discuss the mechanism of the following rearrangements

        i) Fries rearrangement   ii) Lossen rearrangement $(3\frac{1}{2} + 3\frac{1}{2})$

    b) Explain how allylic bromination can be brought out by bromination with NBS.

17. a) Describe briefly about the biological importance of RNA and DNA.

    b) Give the synthesis of vitamin E. $(6 + 4)$

18. a) How will you establish the following in cholesterol? $(2 + 3)$

        i) Position of – OH group   ii) Position and nature of side chain

    b) Give the synthesis of equilenin (5)

19. Write briefly on :   a) Molecular recognition $(3 + 3 + 4)$

      b) Chiral recognition   c) Enzyme catalyzed carboxylation

20. Discuss in detail the following $(6 + 4)$

      a) Reactions of intermediates formed in electrode process.

      b) Nature of the solvents used in electroorganic synthesis.

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M.Sc. Chemistry Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Fourth Semester : Paper – II
INORGANIC CHEMISTRY – IV
Under CBCS – Credit 4

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions :   **(10 × 2 = 20)**

1. Write the significance of Stern – Volmer plot.

2. What is Reineck's salt actinometer?

3. State distribution law.

4. Define the Craig extraction.

5. Write short note on the preparation of Caro's acid.

6. What are pseudohalogens? Give example.

7. Define the significant figures and find the number of significant figure in 0.05900.

8. What are rounding down and rounding up in computation rules?

9. Write short note on fluorescence quenching.

10. Give any two metals containing fluorosensors.

SECTION – B

Answer ALL Questions :   **(5 × 5 = 25)**

11. a) Explain the photo isomerisation of dichloro-bis-(pyridine) platinum (II) complex, and show the suitable pathway for phenomenon.

(OR)

b) Explain the photolysis rules for Cr (III) complex.

12. a) i) Define extraction constant.
    ii) Write the advantages of solvent extraction.

(OR)

b) Write and discuss the theory of nephelometry and turbidimetry.

13. a) Write the preparation and reactivity of oxo-acid of nitrogen.

(OR)

b) Describe the structure and synthesis of Xenon fluorides.

14. a) Define the terms of   i) mean deviation   ii) relative mean deviation

(OR)

b) Calculate the standard deviation for an elements whose percentage in the sample have been calculated as the following

   i) 25.8%   ii) 26.6%   iii) 27.1%   iv) 27.0%

   v) 28.2%   vi) 26.9%   vii) 27.8

15. a) Explain electron and energy transfer mechanism in fluorescent sensors.

(OR)

b) Write note on the transition metal recognition and sensing of Ni^{II}, Cu^{II}, Fe^{III}.

SECTION – C

Answer any THREE Questions :   **(3 × 10 = 30)**

16. Explain the mechanism of water splitting and oxidative reductive quenching reaction of the tris 2, 2 – (bipyridine) ruthenium (II) complex for water splitting.

17. a) Write the principles of DTA and TGA.   **(5 + 5)**

b) Discuss the important applications of TGA and DTA.

18. a) Compare phosphorous and sulphur in terms of structure and reactivity.

b) Write a method of preparation and two properties of peroxoborates and percarbonic acid.   **(5 + 5)**

19. a) Write a note on confidence interval test of significance.   **(5 + 5)**

b) Write the criteria for rejection of data.

20. Explain recognition and sensing of Zn (II) and metal containing fluorosensors for amino acids.

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M.Sc. Chemistry Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Fourth Semester : Paper – III
PHYSICAL CHEMISTRY – IV
Under CBCS – Credit 4

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions :   **(10 × 2 = 20)**

1. What is electrode?

2. Define electro catalysis.

3. Write any two applications of over voltage.

4. State the principle of polarography.

5. What is meant by ensemble?

6. Write any two characteristics in Boltzmann distribution law.

7. Define photon gas.

8. Write a short note on specific heat capacity of solids.

9. Define polymerization reaction.

10. Name the four additives in polymer processing.

SECTION – B

Answer ALL Questions :   **(5 × 5 = 25)**

11. a) Explain the polarisable and non polarisable electrodes.

(OR)

b) Write a short note on charge transfer resistance.

12. a) Discuss the applications of polarography.

(OR)

b) Write a note on hydrogen- oxygen fuel cell.

13. a) Explain the micro canonical and canonical ensembles.

(OR)

b) Derive Boltzmann – Planck equation.

14. a) Derive Fermi – Dirac statistics.

(OR)

b) Describe the Einstein theory of specific heat capacity of solids.

15. a) Write short notes on Ziegler – Natta catalysis.

(OR)

b) Explain the bulk polymerisation.
Write the advantages and disadvantages of it.

SECTION – C

Answer any THREE Questions :   **(3 × 10 = 30)**

16. Derive the Butler – Volmer equation. Write any two applications of it.

17. Define over voltage with suitable examples.
Discuss the theories of over voltage.

18. Derive the statistical expression for equilibrium constant from partition function.

19. Discuss the comparison between Bose - Einstein and Fermi – Dirac statistics.

20. How is molecular weight determined by light scattering method?

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M.Sc. Chemistry Degree (Semester) Examinations, April 2017
Part – III : Elective Subject : Second Semester : Paper – I

MEDICINAL AND PHARMACEUTICAL CHEMISTRY
Under CBCS – Credit 5

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions :   **(10 × 2 = 20)**

1. What is pharmacognesy? Give an example.

2. What is meant by drug dosage?

3. What are the factors affecting metabolism of drug?

4. Define drug acceptor.

5. What is anaesthetic? Give an example.

6. Give the structure and use of penicillin.

7. Write a short note on hypnotics.

8. Give the definition for the lipid lowering drugs.

9. Explain in briefly vitamin K.

10. What are antioxidants?

SECTION – B

Answer ALL Questions :   **(5 × 5 = 25)**

11. a) Explain in briefly the common diseases.

(OR)

b) Write note on the pharmacodynamics and pharmacokinetics.

12. a) Illustrate the various sources of drugs.

(OR)

b) Explain about the classification of drugs.

13. a) Write about the analgesics.

(OR)

b) Give a brief account of antipyretics.

14. a) Illustrate the cardiovascular drugs.

(OR)

b) Explain the following   i) HDL   ii) LDL

15. a) Explain about the organic pharmaceutical acids.

(OR)

b) Discuss the treatment of ulcer and skin diseases.

SECTION – C

Answer any THREE Questions :   **(3 × 10 = 30)**

16. Discuss in detail the assay of drugs.

17. Describe the importances of Indian medicinal plants.

18. Discuss the symptoms, prevention and treatment of AIDS and cancer.

19. Explain about causes and control the diabetes and blood pressure.

20. Discuss the role and applications of medicinal important inorganic compounds.

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M.Sc. Chemistry Degree (Semester) Examinations, April 2017
Part – III : Elective Subject : Fourth Semester : Paper – II
CHEMISTRY FOR NATIONAL ELIGIBILITY TEST
Under CBCS – Credit 2

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions :   **(50 × ½ = 25)**

1. The most stable conformation of n-butane is
   a) Skew boat   b) gauche   c) staggered-anti   d) eclipsed

2. Which of the following is the most acidic in water?
   a) HF   b) NH_3 c) CH_4 d) H_2O

3. Kinetic theory of gases proves
   a) only Boyle's law   b) only Charle's law
   c) only Avogadro's law   d) All of these

4. How many chain isomers could be obtained from the alkane C_6H_{14}?
   a) 4   b) 5   c) 6   d) 7

5. Which of the following compounds reacts slower in electrophilic substitution?
   a) $C_6H_5CH_3$ b) C_6H_5OH c) $C_6H_5NO_2$ d) $C_6H_5NH_2$

6. How many nodes are in a 2s orbital?
   a) 1   b) 3   c) 4   d) 5

7. Which orbital cannot exist?
   a) 1s   b) 2s   c) 2p   d) 2d

8. The liquid which has the highest rate of evaporation
   a) Petrol   b) nail-polish remover   c) water   d) alcohol

9. Which one of the following cannot be prepared by Wurtz reaction?
   a) CH_4 b) C_2H_6 c) C_3H_8 d) C_4H_{10}

10. Which of the following is the most stable alkene?
    a) $CH_2=CH_2$ b) $RCH=CH_2$ c) $R_2C=CR_2$ d) $RCH=CHR$

11. Which molecule has the largest dipole moment?
    a) HF   b) HCl   c) HBr   d) HI

12. The number of microstate for d^3 configuration is
    a) 60　　　　　　　b) 120　　　　　　c) 240　　　　　　d) 45

13. According to Schrodinger a particle is equivalent to a
    a) wave packet　　b) single wave　c) light wave　d) none of these

14. Among the following pHs which solution contains a weak acid
    a) 1.72　　　　　　b) 2.0　　　　　　c) 3.7　　　　　　d) 6.27

15. The thermodynamic property that may be utilized for specifying the direction of time is
    a) E　　　　　　　b) H　　　　　　　c) S　　　　　　　d) G

16. Deoxy-hemocyanin is
    a) heme protein and paramagnetic　　b) colorless and diamagnetic
    c) O_2 transfer and paramagnetic　　　d) blue colored and diamagnetic

17. The number of microstates for d^2 state is
    a) 45　　　　　　　b) 210　　　　　　c) 15　　　　　　d) 60

18. Compton Effect explains the _____ nature of electron.
    a) wave　　　　　b) particle　　　c) dual　　　　d) none of these

19. One of the modern methods of studying free radicals is:
    a) I.R. Spectra　　　　　　　　　b) U.V.spectra
    c) CIDNP　　　　　　　　　　　d) Microwave spectra

20. The electromagnetic radiation used in NMR spectroscopy is
    a) UV　　　b) Radiofrquency　　　c) infra red　　　d) X ray

21. How many bravais lattices can exist in nature
    a) 7　　　　　　　b) 17　　　　　　c) 14　　　　　　d) 32

22. Aufbau principle is not correct for
    a) Cu and Ar　　b) Cu and Cr　　c) Cr and Ar　　d) Co and Zn

23. According to Wade's rule, anion $C_2B_9H_{12}^-$ adopts
    a) closo structure　　　　　　b) nido structure
    c) arachno struture　　　　　d) hypho struture

24. Vitamin B_{12} is the coordination compound of
    a) Mg　　　　　　b) Fe　　　　　　c) Co　　　　　　d) Zn

25. The shape of $XeOF_4$ is
    a) octahedral　　b) square pyramidal　c) pyramidal　d) T-Shaped

26. Bond order in CO is
    a) 2　　　　　　　b) 2.5　　　　　　c) 1.5　　　　　　d) 3

27. Which has the largest size?
    a) Sc^{3+}　　　　b) Y^{3+}　　　　c) La^{3+}　　　　d) Ac^{3+}

28. The splitting of spectral lines, when the source is placed in a magnetic field is known as:
    a) Compton effect　b) Zeemen effect　c) Kerr effect　d) Stark effect

29. The 3s orbital has:
    a) no nodes　　　b) 1 nodes　　　c) 2 nodes　　　d) 3 nodes

30. Which one of the following is microwave inactive?
    a) HCl　　　　　b) Cl_2　　　　c) NO　　　　d) CO

31. de Broglie equation is
    a) h/v　　　　　b) h/m　　　　c) h/p　　　　d) h/k

32. The term symbol for d^3 state is
    a) ^3F　　　　　b) ^4F　　　　c) ^2D　　　　d) ^3D

33. The shape of p orbital
    a) Spherical　　b) dump bell　　c) dump leaf　　d) tetrahedron

34. Which is more acidic?
    a) Cyclobutene　b) Cyclopentene　c) Cyclopentadiene　d) Ethylene

35. The number of unpaired electrons in tetrahedral $[Ni(CO)_4]$ complex is:
    a) 2　　　　　　b) 4　　　　　　c) 0　　　　　　d) 3

36. Recently discovered element with atomic number 115 is
    a) Unb　　　　b) Unn　　　　c) Unp　　　　d) Uus

37. The number of microstate for d^5 configuration is
    a) 49×6^3　　b) 7×6^3　　c) 7×6^2　　d) 14×6^5

38. The lowest energy term for d^2 ion is
    a) ^3F　　　　　b) ^3P　　　　c) ^4P　　　　d) ^1S

39. Which complex has square planar structure?
    a) $Ni(CO)_4$　　b) $[Ni\,Cl_4]^{2-}$　　c) $[Ni(CN)_4]^{2-}$　　d) $[Cu(NH_3)_4]^{2+}$

40. An example of colligative property is:
    a) boiling point　　　　　　b) freezing point
    c) osmatic pressure　　　　d) vapour pressure

41. Ag^+ is isoelectronic with:
    a) Cu^+　　　　b) Au^{3+}　　　　c) Cd^{2+}　　　　d) Zn^{2+}

42. Which of the following is called Adam's catalyst?
    a) PtO_2　　　　b) $HgCl_4$　　　　c) $PtCl_4^{2-}$　　　　d) None of these

43. Which of the following has high force constant value?
    a) HCl   b) HBr   c) HI   d) HF

44. The number of NMR signals expected for methyl cyclo-propane is
    a) 2   b) 3   c) 4   d) 6

45. The compound which shows high δ value in PMR is
    a) CH_3Br b) CH_3I c) CH_3Cl d) CH_3F

46. Which one of the following acts as a π-acid ligand?
    a) F^- b) O^{2-} c) NH_3 d) CO

47. The most metallic of the following elements is that of
    a) Li   b) Mg   c) K   d) Ca

48. The non-metallic cation is in
    a) PCl_3 b) VOCl   c) NH_4Cl d) CrO_2Cl_2

49. The angle stain in cyclohexane is nearly
    a) 20° b) 10° c) 15° d) 13.28°

50. For the term D, the number of components are
    a) 2   b) 3   c) 4   d) 5

SECTION – B

Answer ALL Questions :   **(10 × 5 = 50)**

51. a) Write the various postulates of quantum mechanics.

(OR)
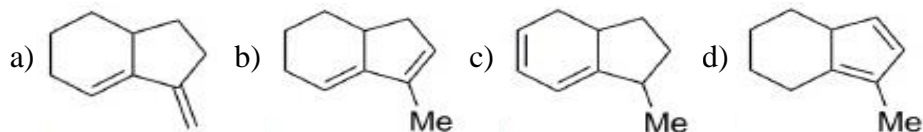
   b) Discuss Wacker process in organometallic catalysis.

52. a) Give the sketch of Jablonski diagram (Explanation is not necessary).

(OR)

   b) The number of metal-metal bonds in $Ir_4(CO)_{12}$ is –
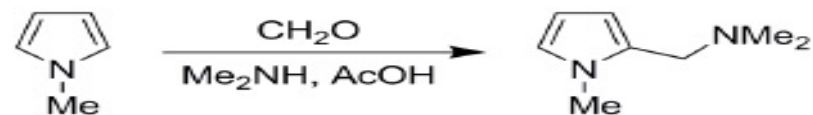
53. a) Which of the following compound does not act as a diene in
    Diels-Alder reaction? Explain why?

(OR)

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b) Name the following reaction.

54. a) Explain the role of $LiAlH_4$, $NaBH_4$ and DIBAL in organic transformations.

(OR)

b) According to polyhedral electron count rule, the structure of $Rh_6(CO)_{16}$ and $Ir_4(CO)_{12}$

55. a) Discuss the functions of proteins.

(OR)

b) Explain the chemistry of Nucleic acids.

56. a) Write the mechanism of Sandmayer reaction.

(OR)

b) Discuss the mechanism of Hoffmann rearrangement.

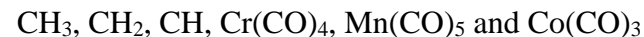57. a) Discuss the catalytic cycle of Mansanto acetic acid process.

(OR)

b) Discuss the catalytic cycle of Wilkinson hydrogenation catalyst.

58. a) Discuss the types of polymerization reactions.

(OR)

b) Compare electroanalytical technique Vs. spectroanalytical technique.

59. a) Identify isolobal pairs from the following

CH_3, CH_2, CH, $Cr(CO)_4$, $Mn(CO)_5$ and $Co(CO)_3$

(OR)

b) The number of lone-pairs are identical in the pairs and draw structure the same
i) XeF_4, ClF_3
ii) XeO_4, ICl_4^-
iii) XeO_2F_2, ICl_4^-
iv) XeO_4, ClF_3

60. a) Write the mechanism of Fries rearrangement

(OR)

b) Discuss the electrocyclic reactions.

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