



**VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST**

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

**M.Sc. Chemistry** Degree (Semester) Examinations, April 2019

Part – III : Core Subject : Second Semester : Paper – I

**ORGANIC CHEMISTRY – II**

Under CBCS – Credit 4

Time: **3** Hours

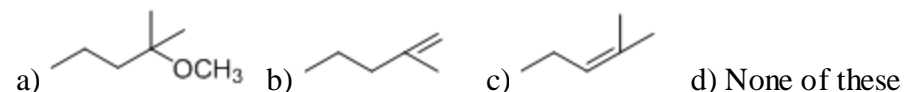
Max. Marks: **75**

**SECTION – A**

**Answer ALL Questions :**

**(5 × 1 = 5)**

1. 2-Chloro-2methylpentane On Reaction With Sodium Methoxide In Methanol Yields



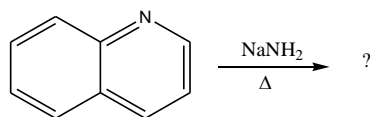
2. The repulsion between the bonding electrons of one substituent and the bonding electrons of a nearby substituent is known as \_\_\_\_\_  
 a) Angle strain    b) Steric strain    c) Gauche strain    d) Torsional strain
3. Which one of the following undergoes aldol condensation?  
 a) HCHO    b) C<sub>6</sub>H<sub>5</sub>CHO    c) Cl<sub>3</sub>CCHO    d) CH<sub>3</sub>COCH<sub>3</sub>
4. In which condition indole is formed?  
 a) acidic    b) basic    c) neutral    d) both a&b
5. Lithium diisopropyl amide is also called as  
 a) Harpoon base    b) Non-Nucleophilic base  
 c) Nucleophilic base    d) Both a & b

## SECTION – B

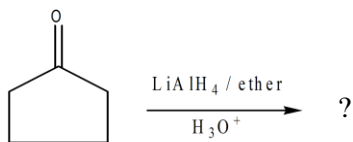
Answer any FIVE Questions :

(5 × 2 = 10)

6. What do you understand by the term nucleophilic substitution reaction?  
Give one example.
7. In the halogenation of alkyl halides with alk. KOH more stable alkene is obtained. It is according to which rule?
8. Bring out the differences between conformation and configuration by giving example.
9. How will you synthesize cinnamic acid from benzaldehyde?
10. Give the product and name of the following reaction



11. What is Baker's yeast? Where is it used?
12. Identify the product of the following reaction.



## SECTION – C

Answer ALL Questions :

(5 × 6 = 30)

13. a) Compare the elimination and substitution reactions.

(OR)

- b) What are Non-classical carbocations? Explain the generation and its stability.

14. a) Explain the relative stabilities of chair and boat conformations of cyclohexane.

(OR)

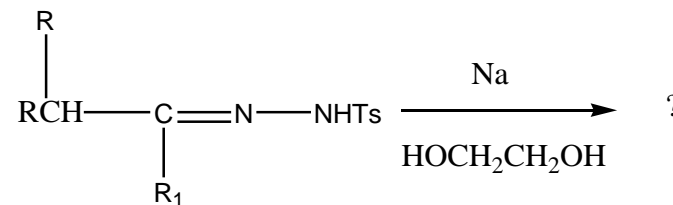
- b) Discuss the conformational analysis of decalin.

15. a) What is cannizzaro reaction? Give its mechanism.

(OR)

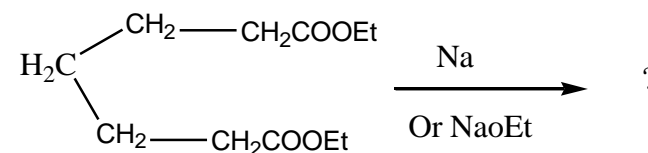
- b) Discuss the mechanism of Diels-Alder reaction.

16. a) Identify the product and give its mechanism.



(OR)

- b) Predict the product and name of the following reaction. Give its mechanism.



17. a) Write the preparation and applications of Na(CN)BH<sub>3</sub>.

(OR)

- b) What are phase transfer catalysts? Discuss their applications.

### SECTION – D

Answer any THREE Questions :

**(3 × 10 = 30)**

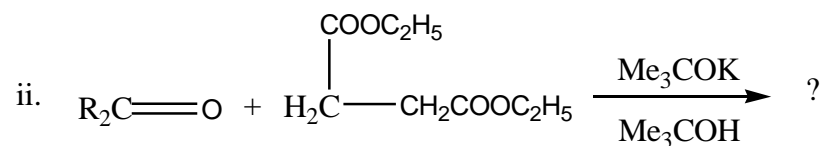
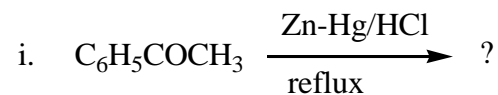
18. Illustrate the orientation of double bond according to Hoffmann and Saytzeff rules.

19. Explain the Curtin-Hammett principle.

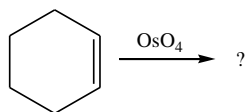
20. Explain the mechanism of the following reactions

i) Wittig reaction                  ii) Michael addition

21. Identify the product and suggest the mechanism of the following reactions



22. a) Predict the product of the following reaction and give its mechanism.



b) Discuss the synthetic applications of  $\text{LiAlH}_4$ .





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**M.Sc. Chemistry** Degree (Semester) Examinations, April 2019

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 :**

**(5 × 1 = 5)**

- The number of possible isomers for  $[\text{Ru}(\text{bpy})_2\text{Cl}_2]$  is  
(bpy = 2,2'-bipyridine)  
a) 2                      b) 3                      c) 4                      d) 5
- Which one of the following configuration will show Jahn-Teller distortion in the octahedral field  
a) high spin  $d^8$     b) high spin  $d^4$     c) high spin  $d^5$     d) low spin  $d^6$
- The complex which exhibits lowest energy electronic absorption band is:  
a)  $[\text{NiCl}_4]^{2-}$     b)  $[\text{Ni}(\text{CN})_4]^{2-}$     c)  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$     d)  $\text{Ni}(\text{CO})_4$
- Electron transfer from  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$  to  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$  is likely to occur via:  
a) d-d transition                      b)  $S_N1$   
c) inner sphere electron transfer    d) outer sphere electron transfer
- Which of the following lanthanide is not paramagnetic in nature?  
a) Ce                      b) Ho                      c) Lu                      d) Tb

### SECTION – B

**Answer any FIVE Questions :**

**(5 × 2 = 10)**

6. Explain the term Chelate effect.
7. Which complex  $[\text{Co}(\text{H}_2\text{O})]^{3+}$  (or)  $[\text{Rh}(\text{H}_2\text{O})_6]^{3+}$  has the larger value  $\Delta_0$ ? Why?
8. Tetrahedral Ni (II) complexes have greater magnetic moment than octahedral Ni (II) complexes though both contain two unpaired electrons. Explain.
9.  $[\text{Mn}(\text{NCS})_6]^{4-}$  is a low spin complex. Why?
10. Why are CT transitions always intense than d-d transitions?
11. Distinguish between trans effect and trans influence.
12. What is the effect of lanthanide contraction?

### SECTION – C

**Answer ALL Questions :**

**(5 × 6 = 30)**

13. a) Explain the optical isomerism in octahedral complexes.

**(OR)**

- b) Discuss the factors affecting the stability of coordination compounds.

14. a) Discuss the MO diagram of  $[\text{Co}(\text{NH}_3)_6]^{3+}$ .

**(OR)**

- b) Explain the postulates of Crystal Field Theory. Sketch the splitting of 'd'-orbitals in regular octahedral field.

15. a) Draw and sketch the Orgel Diagram of  $d^2$  configuration with example.

**(OR)**

- b) Electronic spectra of  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  complex is expected to give three bands, but irrespective of its intensity the complex gives five distinct bands. Account for this observation.

16. a) Discuss the factors affecting acid hydrolysis.

**(OR)**

- b) How is magnetic moment determined by Gouy balance method?

17. a) How are lanthanides separated?

**(OR)**

- b) Explain the complexes of lanthanides and actinides.

### SECTION – D

**Answer any THREE Questions :**

**(3 × 10 = 30)**

18. Discuss the determination of stability constant by Job's method.

19. a) Explain the Jahn-teller theorem.

- b) Explain any two applications of CFT.

20. a) How is Tanabe-Sugano diagram superior to Orgel diagram.

- b) Explain the Nephelauxetic effect with example.

21. a) Discuss the mechanism of inner sphere electron transfer reactions.

- b) Explain polarisation theory.

22. Discuss the magnetic properties, colour and electronic spectra of lanthanides.





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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 :** (5 × 1 = 5)

- The energy levels for cyclobutadiene are  $\alpha + 2\beta$ ,  $\alpha$ ,  $\alpha$  and  $\alpha - 2\beta$ , the delocalization energy in this molecule is  
a) 0                      b)  $-4\beta$                       c)  $-8\beta$                       d)  $4\alpha$
- Which of the following transitions between rotational energy levels is *not* allowed?  
a)  $J = 0 \leftarrow J = 1$     b)  $J = 1 \leftarrow J = 3$     c)  $J = 1 \rightarrow J = 0$     d)  $J = 1 \leftarrow J = 2$
- The selection rule of the translational energy levels in the Raman spectrum is  
a)  $\Delta J = \pm 1$               b)  $\pm 2$                       c)  $\pm 1$                       d)  $\pm 2$
- According to the adsorption theory of catalysis, the speed of the reaction increases because  
a) Adsorption produces heat which increases the speed of the reaction  
b) Adsorption lowers the activation energy of the reaction  
c) The concentration of reactant molecules at the active centres of the catalyst becomes high due to adsorption  
d) In the process of adsorption, the activation energy of the molecules become large
- \_\_\_\_\_ stops as soon as incident light is cut off:  
a) fluorescence                      b) phosphorescence  
c) chemiluminescence              d) none of these

### SECTION – B

**Answer any FIVE Questions :**

**(5 × 2 = 10)**

6. What is called Hartree – Fock self consistent field method?
7. Calculate the number of modes of vibration possible for a linear and bent triatomic molecule.
8. State the mutual exclusion principle.
9. Give the principle of ESCA.
10. Distinguish chemisorptions from physisorption.
11. What is force constant? How does it related to frequency?
12. What is acidity function?

### SECTION – C

**Answer ALL Questions :**

**(5 × 6 = 30)**

13. a) Account on Slater determinants.

**(OR)**

b) Determine the hybridization of sigma bonding in CH<sub>4</sub> molecule.

14. a) What is the effect of isotopic substitution on microwave spectra?

Discuss.

**(OR)**

b) What are hot bands and overtones? Distinguish them.

15. a) Discuss the vibrational rotational Raman spectra.

**(OR)**

b) State and explain the Koopman's theorem.

16. a) How can BET isotherm equation be used for the determination of surface area of an adsorbent?

**(OR)**

b) Write a note on micellar chemistry.

17. a) Derive Stern-Volmer equation. Mention its application.

**(OR)**

b) Explain the flash photolysis technique for studying the photochemical fast reactions.

### SECTION – D

**Answer any THREE Questions :**

**(3 × 10 = 30)**

18. Using the variation method, solve the Schrodinger wave equation for the ground state energy of helium atom.

19. i) Illustrate the IR spectrum of anharmonic oscillator. **(5)**

ii) What is Fortrat parabola? Explain. **(5)**

20. i) Explain the Resonance Raman spectroscopy. **(4)**

ii) Describe the principle of Auger emission spectroscopy. Give its applications. **(6)**

21. i) Derive Michaelis-Menten equation for enzyme catalysis. **(5)**

ii) How relaxation methods used for studying the kinetics of fast reactions? Explain. **(5)**

22. Enumerate the various photo physical process involved in Jablonski diagram.





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**M.Sc. Chemistry** Degree (Semester) Examinations, April 2019

Part – III : Core Subject : Fourth Semester : Paper – I

**ORGANIC CHEMISTRY – IV**

Under CBCS – Credit 4

Time: **3** Hours

Max. Marks: **75**

**SECTION – A**

**Answer ALL Questions :**

**(5 × 1 = 5)**

- The conversion of benzoic acid to amine is effected by using
  - Schmidt rearrangement
  - Curtius rearrangement
  - Lossen rearrangement
  - Hoffmann rearrangement
- On treatment of indole with pyridine-SO<sub>3</sub> at 50° C gives
  - Indole-2-sulphonic acid
  - Indole-3-sulphonic acid
  - Indole-6-sulphonic acid
  - Indole-8-sulphonic acid
- Which one is not correct with regard to cholesterol
  - it has one five membered ring and three six membered rings
  - two angular methyl groups are present at positions 10 and 13
  - cholesterol is distilled with selenium to give Diels hydrocarbon and chrysene
  - OH group is present at position 4
- Which of the following amino acids would be most prone to a reaction with an irreversible inhibitor?
  - Tyrosine
  - Threonine
  - Histidine
  - lysine
- The first intermediate formed from a neutral substrate in anodic oxidation is
  - anion radical
  - cation radical
  - free radical
  - carbocation

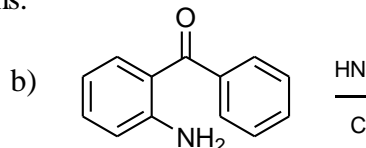
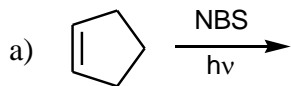


### SECTION – B

**Answer any FIVE Questions :**

**(5 × 2 = 10)**

6. Complete the following reactions.



7. Distinguish between DNA and RNA..

8. Enumerate the medicinal applications of benzopyrroles.

9. What happens when oestriol is heated with KHSO<sub>4</sub>?

10. Establish the functional nature of oxygen in androsterone.

11. Distinguish between reversible and irreversible inhibition.

12. What is orientation effect in electroorganic synthesis?

### SECTION – C

**Answer ALL Questions :**

**(5 × 6 = 30)**

13. a) Outline the methods of formation of free radicals. Comment on their stability.

**(OR)**

b) Explain the following reactions with an example.

i) Barton reaction

ii) Ullmann reaction

14. a) Describe any one synthesis of vitamin C.

**(OR)**

b) Outline the steps involved in the synthesis of vitamin A.

15. a) Adduce chemical evidences for the nature and position of side chain in cholesterol.

**(OR)**

b) Establish the position of –OH group and double bond in cholesterol.

16. a) Describe enzyme catalyzed carboxylation and decarboxylation reactions.

**(OR)**

b) Write short notes on cyclodextrin based enzyme modules.

17. a) Outline the various reactions of intermediates formed in electrode process.

**(OR)**

b) Describe the influence of solvent and temperature in electroorganic synthesis.

### SECTION – D

**Answer any THREE Questions :**

**(3 × 10 = 30)**

18. Discuss the mechanism of the following rearrangements

a) Favorski rearrangement

b) Curtius rearrangement.

19. Elucidate the structure of chloroamphenicol. Outline its synthesis.

20. Explain the structural elucidation of progesterone. Give its synthesis from cholesterol.

21. Discuss any two methods of identifying active site of an enzyme.

22. Describe the following electrolytic conversions

a) oxidation of glycerol

b) Reduction of ketoxime and nitro compounds





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**M.Sc. Chemistry** Degree (Semester) Examinations, April 2019

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 :**

**(5 × 1 = 5)**

- Adamson's rule deals with
  - labelization of ligand
  - inner sphere
  - outer sphere
  - photophysical
- \_\_\_\_\_ technique is measure of mass of sample as the temperature changes
  - Thermo gravimetric analysis
  - differential thermal analysis
  - Diferentialscaningcalorimetry
  - Raman
- In the know interhalogen compounds, the maximum number of atoms are
  - 4
  - 5
  - 8
  - 7
- Mean deviation computed from a set of data is always:
  - Negative
  - Equal to standard deviation
  - More than standard deviation
  - Less than standard deviation
- The point at which the total emission of a sample doesn't change for a given wavelength is called as
  - Isobestic
  - Isothermal
  - Isoemissive
  - both a & c

### **SECTION – B**

#### **Answer any FIVE Questions :**

**(5 × 2 = 10)**

6. What is meant by Adamson's rule.
7. Give the principle of Solvent extraction.
8. What information can be obtained by DTA? Outline the principle of DTA.
9. Give the preparation of Caro's acid?
10. What are significant numbers?
11. What is meant by the term standard deviation?
12. Explain energy transfer mechanism.

### **SECTION – C**

#### **Answer ALL Questions :**

**(5 × 6 = 30)**

13. a) Describe photoredox and photo isomerisation reactions.

**(OR)**

b) Write a short note on photochemistry of Organometallic complexes.

14. a) Outline the Principle of DSC. Explain the application of DSC.

**(OR)**

b) Discuss the Craig extraction method.

15. a) Discuss the synthesis and structure of xenon fluorides.

**(OR)**

b) Give the preparation of percarbonic acid and peroxoborates.

16. a) Explain the difference between

- i) Accuracy and Precision
- ii) Poisson and Normal distribution

**(OR)**

b) What is meant by confidence limit? How is it determined? What is its significance?

17. a) Write a short note on metal containing fluorosensors for amino acids.

**(OR)**

b) Describe Fluorescence quenching and Anion sensing.

### **SECTION – D**

#### **Answer any THREE Questions :**

**(3 × 10 = 30)**

18. i) Explain briefly oxidative and reductive quenching reactions of excited state in tris (2-2'-bi pyridine) Ruthenium (II) complexes.

ii) Explain phot equation.

19. i) Sketch the TGA and DTA curves and explain the thermal behaviours.

ii) Explain the following

a) Nephelometry

b) Turbidimetry

20. Explain briefly structure and reactivity of oxyacids of Nitrogen, Phosphorus, Sulphur and Halogens.

21. Explain the following :

i) Gaussian distribution

ii) Least square analysis

22. Explain briefly transition metal recognition and sensing of  $\text{Ni}^{\text{II}}$ ,  $\text{Cu}^{\text{II}}$ ,  $\text{Fe}^{\text{III}}$ .



**SECTION – A****Answer ALL Questions :****(5 × 1 = 5)**

- The current for electrode polarisation is  
 a)  $i_c = i_a$       b)  $i_c \neq i_a$       c)  $i_c = i_a = 0$       d)  $i_c = i_a = i$
- In cathode, if the potential is reduced below the reverse value, then the process is  
 a) Dissolution      b) Deposition      c) Oxidation      d) Decomposition
- The translational entropy of a molecule increases with \_\_\_\_\_ mass of the molecule  
 a) Increasing      b) decreasing      c) same      d) zero
- Which of the following atoms cannot exhibit Bose-Einstein condensation, even in principle?  
 a)  ${}_1\text{H}^1$       b)  ${}_4\text{H}^2$       c)  ${}_{23}\text{Na}^{11}$       d)  ${}_{39}\text{K}^{19}$
- The catalyst used for olefin polymerization is  
 a) Ziegler-Natta catalyst      b) Wilkinson catalyst  
 c) Raney nickel catalyst      d) Merrifield resin.

**SECTION – B****Answer any FIVE Questions :****(5 × 2 = 10)**

- What is zeta potential?

7. Write the Nernst equation for  $H_2$  gas electrode.
8. Why does  $N_2$  gas is bubbled through polarographic cell?
9. What happens when Pb metal is placed inside a dil.  $H_2SO_4$  solution?  
(Given :  $E^\circ_{Pb^{2+}/Pb}$  is less than  $E^\circ_{H^+/H_2}$ )
10. Explain the term absolute negative temperature.
11. Distinguish between bosons and fermions.
12. What are conducting polymers? Give example.

### SECTION – C

**Answer ALL Questions :**

**(5 × 6 = 30)**

13. a) Explain the salient features of Stern model of electrical double layer.

**(OR)**

- b) Derive and explain the equation for the zeta potential of electro-osmosis process.

14. a) Describe the principle of polarography.

**(OR)**

- b) Explain the working principle of  $H_2$ - $O_2$  fuel cell.

15. a) Explain the term ensembles and their types.

**(OR)**

- b) Derive and explain Maxwell-Boltzmann distribution law.

16. a) Deduce the Plank's blackbody equation from Bose-Einstein statistics.

**(OR)**

- b) Discuss Fermi-Dirac statistics in detail.

17. a) Discuss the rate of free radical polymerization.

**(OR)**

- b) A polydisperse solution has the following distribution:

| Number of molecules | Molar Mass / $g \cdot mol^{-1}$ |
|---------------------|---------------------------------|
| 10                  | 25,000                          |
| 07                  | 17,000                          |
| 24                  | 31,000                          |
| 16                  | 49,000                          |

Calculate the values of both number average molecular weight ( $\bar{M}_n$ ) and weight average molecular weight ( $\bar{M}_w$ ).

### SECTION – D

**Answer any THREE Questions :**

**(3 × 10 = 30)**

18. Derive and explain the Butler-Volmer equation for a single step one electron transfer electrode reaction and what happens to the equation under low field approximation.

19. Discuss the cyclic voltammograms of one electron reversible process and one electron irreversible process.

20. a) What is the translational partition function for Argon confined to a volume of 1L at 298 K ?

- b) Derive the expression that relate partition function and equilibrium constant.

21. a) Describe the Einstein's heat capacity of solids and give its limitation.

- b) The heat capacity of Al at 25 K is  $0.13 \text{ Cal mol}^{-1} \text{ deg}^{-1}$ . Calculate Debye's characteristic temperature and also calculate heat capacity ( $C_v$ ) at 200 K.

22. a) Discuss the light scattering method of determination of molecular weight of polymers.

- b) Explain the term emulsion polymerization.





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**M.Sc. Chemistry** Degree (Semester) Examinations, April 2019

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 :

(5 × 1 = 5)

- The pathogen of the typhoid is directly transmitted through  
a) urine      b) water      c) blood      d) cerebrospinal fluid
- The main bitter alkaloid present in neem oil is  
a) Nimbinin      b) Margosine      c) Sulfur      d) Opium
- Functional group present in the antibiotic penicillin G is  
a) Lactam      b) Lactone      c) Acetal      d) Nitro
- The main cause of blood pressure is:  
a) resistance of walls of arterioles      b) blood viscosity  
c) contraction of cardiac muscles      d) total blood volume
- Dietary allowance of Copper for an adult is  
a) 2.2 mg/day      b) 2.4 mg/day      c) 2.8 mg/day      d) 2.5 mg/day

#### SECTION – B

##### Answer any FIVE Questions :

(5 × 2 = 10)

- Write note on factors affecting absorption?
- Give an account on the various sources of drugs.
- How would you distinguish between Analgesics and Anesthetics?
- What is meant by Cardiovascular drugs?
- Define the role and applications of Fe.
- Give an account on the uses of Streptomycin.
- Define Pharmacokinetics.

#### SECTION – C

##### Answer ALL Questions :

(5 × 6 = 30)

13. a) Give an account on Pharmacodynamics and their classification.

(OR)

b) Discuss the Assay of drugs.

14. a) Explain the mechanism of drug action.

(OR)

b) Give an account on the importance of Medicinal Plants.

15. a) Write about      i) Antipyretics      ii) Antibiotics

(OR)

b) Discuss about Anti inflammatory agents.

16. a) Give an account on Hyper and Hypoglycemic drugs with example.

(OR)

b) Explain about the CNS depressant and Stimulant drugs.

17. a) Briefly explain about Micronutrients Na, K and Ca.

(OR)

b) Write notes on      i) Aminohippuric acid      ii) Metirapone

#### SECTION – D

##### Answer any THREE Questions :

(3 × 10 = 30)

18. Explain about Design of drugs.

19. Give an account on metabolism of drugs.

20. Explain about antibiotics.      i) Penicillin      ii) chloramphenicol

21. Briefly explain about Systolic and Diastolic Hypertensive drugs.

22. What are Antioxidants? Describe their role and uses.





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**M.Sc. Chemistry** Degree (Semester) Examinations, April 2019

Part – III : Elective Subject : Fourth Semester : Paper – II

**CHEMISTRY FOR NATIONAL ELIGIBILITY TEST**

Under CBCS – Credit 5

Time: **3** Hours

Max. Marks: **75**

### SECTION – A

**Answer ALL Questions :**

**(75 × 1 = 75)**

- The selection rule of vibrational Raman spectroscopy is  
 a)  $\Delta v = \pm 1$       b)  $\Delta v = \pm 2$       c)  $\Delta v = 0$       d)  $\Delta v = +1$
- The order of repulsions between electron pairs is  
 a) l.p-l.p > b.p-b.p > l.p-b.p      b) b.p-b.p > l.p-b.p > l.p-l.p  
 c) l.p-l.p > l.p-b.p > b.p-b.p      d) l.p-b.p > l.p-l.p > b.p-b.p
- If the shape of the geometry is square planar, then its geometry is  
 a)  $dsp^2$       b)  $sp^3$       c)  $sp^3d$       d)  $sp^3d^2$
- The unit of rate constant for a second order reaction is  
 a)  $s^{-1}$       b)  $mol\ L^{-1}\ s^{-1}$       c)  $mol\ L^{-1}\ s^{-1}$       d)  $mol^2\ L^{-2}\ s^{-1}$
- The compound that is aromatic  
 a) I      b) II      c) III      d) IV
- Which of the following is a soft base?  
 a) SH      b)  $Ag^+$       c)  $NH_3$       d)  $F^-$
- According to Lewis, acid is an  
 a) Electron pair donor      b) Oxide donor  
 c) Oxide acceptor      d) Electron pair acceptor
- The molecule  $CO_2$  belong to the point group  
 a)  $C_{2v}$       b)  $C_2$       c)  $D_{\infty h}$       d)  $D_{\infty v}$

9. The ground state term symbol for  $p^1$  configuration is  
 a)  $^2S$                       b)  $^2D$                       c)  $^2P$                       d)  $^3P$
10. The NMR spectrum is observed in \_\_\_\_\_ region.  
 a) UV                      b) X-ray                      c) IR                      d) radiofrequency
11. The compound shows highest chemical shift values in  $^1H$  NMR  
 a)  $CH_3Cl$                       b)  $CH_3F$                       c)  $CH_3Br$                       d)  $CH_3I$
12. Which of the following is true regarding the stability of compounds?  
 a) aromatic < non-aromatic = anti-aromatic  
 b) aromatic > anti-aromatic > non-aromatic  
 c) aromatic > non-aromatic > anti-aromatic  
 d) anti-aromatic > non-aromatic > aromatic
13. Vitamin  $B_{12}$  is the coordination compound of  
 a) Fe                      b) Mn                      c) Mg                      d) Mo
14. The bond order of  $N_2^+$  is  
 a) 3                      b) 3.5                      c) 2                      d) 2.5
15. Which of the following is used in internal standard in NMR spectroscopy?  
 a) NBS                      b) DMSO                      c) TMS                      d) THF
16. Which of the following is the correct order of stability of carbon free radical?  
 a)  $3^\circ > 2^\circ > 1^\circ$     b)  $1^\circ > 3^\circ > 2^\circ$     c)  $2^\circ > 1^\circ > 3^\circ$     d)  $1^\circ > 2^\circ > 3^\circ$
17. Boron in  $BCl_3$  has  
 a) sp hybridization                      b)  $sp^2$  hybridization  
 c)  $sp^3$  hybridization                      d) no hybridization
18. Which one will dissociate fast when reacted with water?  
 a)  $LiAlH_4$                       b)  $NaBH_4$                       c)  $Zn(BH_4)_2$                       d)  $(CH_3)_2CuLi$
19. The correct order of the size of  $S$ ,  $S^{2-}$ ,  $S^{2+}$  and  $S^{4+}$  species is  
 a)  $S > S^{2+} > S^{4+} > S^{2-}$                       b)  $S^{2+} > S^{4+} > S^{2-} > S$   
 c)  $S^{2-} > S > S^{2+} > S^{4+}$                       d)  $S^{4+} > S^{2-} > S > S^{2+}$

20. The number of Bravais lattices are  
 a) 14                      b) 32                      c) 7                      d) 10
21. Lithium diisopropyl amide is also called as  
 a) Harpoon base                      b) Non-Nucleophilic Base  
 c) Nucleophilic base                      d) Both a & b
22. When  $NaBH_4$  is treated with Ce(III) salt, that selectively reduces  
 a) Aldehyde                      b)  $\alpha,\beta$ - unsaturation                      c) both a & d                      d) Ketone
23. Inversion of carbonyl carbon polarity is  
 a) Umpolung rule                      b) Zaitzeff rule  
 c) Retro rule                      d) Markovnikov's rule
24. In conductometric titrations, the electrical conductance depends on \_\_\_\_\_ of ions:  
 a) number                      b) mobility                      c) both a & b                      d) charge
25. The main function of myoglobin is:  
 a) carry  $O_2$  from lungs to tissues                      b) to store dioxygen  
 c) absorbing of iron                      d) electron carrier
26. A photochemical reaction takes place by the absorption of  
 a) UV-Visible                      b) IR radiation                      c) microwaves                      d) heat energy
27. Which type of electronic transitions can be seen in saturated aldehydes and ketones?  
 a)  $\sigma \rightarrow \sigma^*$                       b)  $n \rightarrow \sigma^*$                       c)  $n \rightarrow \pi^*$  and  $\pi \rightarrow \pi^*$                       d) only  $\pi \rightarrow \pi^*$
28. \_\_\_\_\_ stops as soon as incident light is cut off:  
 a) fluorescence                      b) phosphorescence  
 c) chemiluminescence                      d) bioluminescence
29. Collision theory is applicable to  
 a) unimolecular reactions                      b) bimolecular reactions  
 c) intramolecular reactions                      d) intermolecular reactions



30. Among which one is NOT used to prepare cis 1,2-diols  
a)  $\text{OsO}_4$    b)  $\text{KMnO}_4$    c) Woodward's reagent   d) Prevost Reagent

31. Formylation of phenolic compounds with chloroform and alkali is

- a) Riemer-Teimann reaction      b) Wurtz reaction  
c) Suzuki coupling                  d) Wittig reaction

32. Triplet carbenes are \_\_\_\_\_ in nature.

- a) Diamagnetic                      b) Paramagnetic  
c) Partially paramagnetic        d) Partially diamagnetic

33. The point group of  $[\text{TiCl}_6]^{3-}$

- a)  $D_{4d}$                       b)  $D_{3d}$                       c)  $D_{4h}$                       d)  $D_{3h}$

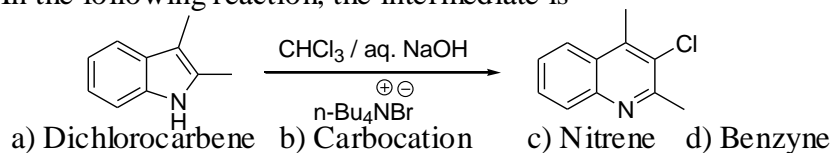
34. The geometry of  $\text{I}_3^-$  is

- a) Linear                                  b) Trigonal  
c) Trigonal pyramidal                d) Square planar

35. The molecule  $\text{C}_3\text{O}_2$  has a linear structure. The compound has

- a)  $4\sigma$  and  $4\pi$  bonds                  b)  $3\sigma$  and  $2\pi$  bonds  
c)  $2\sigma$  and  $3\pi$  bonds                  d)  $3\sigma$  and  $4\pi$  bonds

36. In the following reaction, the intermediate is



37. A process is carried out at constant volume and at constant entropy.

It will be spontaneous if

- a)  $\Delta G < 0$               b)  $\Delta H < 0$               c)  $\Delta U < 0$               d)  $\Delta A < 0$

38. How many atoms are there in an element packed in an fcc structure?

- a) 1                      b) 2                      c) 4                      d) 8

39. The number of lone pairs are identical in the pairs

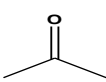
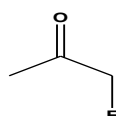
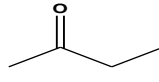
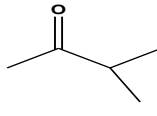
- a)  $\text{XeF}_4$ ,  $\text{ClF}_3$       b)  $\text{XeO}_4$ ,  $\text{ICl}_4$       c)  $\text{XeO}_2\text{F}_2$ ,  $\text{ICl}_4^-$       d)  $\text{XeO}_4$ ,  $\text{ClF}_3$

40. The oxidation state of iron in met-haemoglobin is

- a) three                      b) two                      c) four                      d) zero

41. The metal ion present in carboxypeptidase  
 a) Mg (II)      b) Fe (II)      c) Zn (II)      d) Mn (II)
42. The kinetic theory of gases proves  
 a) Boyle's law      b) Avogadro's law  
 c) Charle's law      d) All of the above
43. The neutral complex which obeys 18-electron rule is  
 a)  $(\eta^5\text{-C}_5\text{H}_5)\text{Fe}(\text{CO})_2$       b)  $(\eta^5\text{-C}_5\text{H}_5)\text{Re}(\eta^6\text{-C}_6\text{H}_6)$   
 c)  $(\eta^5\text{-C}_5\text{H}_5)\text{Mo}(\text{CO})_3$       d)  $(\eta^5\text{-C}_5\text{H}_5)_2\text{Co}$
44. The molecule that has an  $S_6$  symmetry element  
 a)  $\text{B}_2\text{H}_6$       b)  $\text{CH}_4$       c)  $\text{PH}_5$       d)  $\text{SF}_6$
45. Which of the following exhibits rotational spectra?  
 a) CO      b)  $\text{N}_2$       c)  $\text{CO}_2$       d)  $\text{H}_2$
46. Addition of  $\text{BH}_3$  to a carbon-carbon double bond is  
 a) anti-Markovnikov syn addition      b) anti-Markovnikov anti addition  
 c) Markovnikov syn addition      d) Markovnikov anti addition
47. The major product formed in the following reaction
48. Phosphorescence is represented as  
 a)  $T_1 \rightarrow S_0 + h\nu$       b)  $T_1 \rightarrow S_0 + \Delta$       c)  $S_1 \rightarrow S_0 + h\nu$       d)  $S_1 \rightarrow T_1 + \Delta$
49. Among the isomers of  $\text{C}_4\text{H}_6$  given below, the compound which exhibits an absorption band at  $3300\text{ cm}^{-1}$  in the IR spectrum is  
 a) 1,3-butadiene      b) 1-butyne      c) 2-butyne      d) cyclobutene
50. The electric dipole allowed transition among the following is  
 a)  $^3\text{S} \rightarrow ^3\text{D}$       b)  $^3\text{S} \rightarrow ^3\text{P}$       c)  $^3\text{S} \rightarrow ^1\text{D}$       d)  $^3\text{S} \rightarrow ^1\text{F}$

51. The most stable conformation of n-butane is  
 a) fully eclipsed b) eclipsed c) anti-staggered d) gauche
52. The calculated value of magnetic moment of  $V^{3+}$  is  
 a) 1.73 BM b) 2.83 BM c) 3.87 BM d) 4.90 BM
53. TGA can be used to evaluate the ..... of a material.  
 a) thermal stability b) change of entropy  
 c) change of enthalpy d) none
54. The following molecule has  
 a) plane of symmetry b) S configuration  
 c) R configuration d) centre of symmetry
55. Among the following which one is chemoselective reagent  
 a)  $LiAlH_4$  b)  $Zn(BH_4)_2$  c)  $NaBH_4$  d)  $NaBH_4/Ce(III)$
56. Primary carbanions are more stable due to lesser  
 a) +I effect b) -I effect c) + M effect d) - M effect
57. The Debye Huckel Onsager equation is:  
 a)  $\Lambda_m^c = \Lambda_m^0 - A\sqrt{C}$  b)  $\Lambda_m^c = \Lambda_m^0 + A\sqrt{C}$   
 c)  $\Lambda_m^0 = \Lambda_m^c - A\sqrt{C}$  d)  $\Lambda_m^0 = \Lambda_m^c + A\sqrt{C}$
58. LADH is a \_\_\_\_\_ type of enzyme.  
 a) isomerise b) oxido-reductase c) hydrolases d) catalyses
59. The substance which initiate a photochemical reaction but itself doesn't undergo any chemical change is called:  
 a) catalysis b) fluorescence c) sensitizer d) inhibitor
60. In a group of a periodic table, from top to bottom, ionization energy  
 a) increases b) decreases  
 c) remains same d) first increases and then decreases

61. Shapiro reaction is example for \_\_\_\_\_  
 a) Kinetically controlled b) Thermodynamically controlled  
 c) Radical reaction d) both b & c
62. Tributyl tin hydride reagent is used for  
 a) Displacement of nitro compound b) Reduction of carbonyl group  
 c) Oxidation of alcohol d) All the above
63. In Michael addition reaction, acceptors having \_\_\_\_\_ group.  
 a) Withdrawing b) Donating c) Both a & b d) Resonating
64. Benzene is an example of \_\_\_\_\_ solvent.  
 a) Protic b) Polar c) Non-polar d) Amphoteric
65. The overall order of a reaction that has the rate expression,  
 $Rate = k[A]^{1/2}[B]^{3/2}$  is  
 a) 1 b) 1.5 c) 2 d) 2.5
66. The geometry of  $CH_4$  is  
 a) trigonal pyramidal b) trigonal planar  
 c) tetrahedral d) pentagonal pyramidal
67. Which one of the following will undergo  $S_N2$  type reactions fastly in presence of base?  
 a)  b)  c)  d) 
68. The order of carbonyl stretching frequency in the IR spectra of ketone, amide and anhydride is  
 a) Anhydride > Amide > Ketone b) Ketone > Amide > Anhydride  
 c) Amide > Anhydride > Ketone d) Anhydride > Ketone > Amide
69. In the IR spectrum, the absorption band due to carbonyl group in phenyl acetate appears at  
 a)  $1800\text{ cm}^{-1}$  b)  $1760\text{ cm}^{-1}$  c)  $1710\text{ cm}^{-1}$  d)  $1660\text{ cm}^{-1}$

70. In the mass spectrum of 1,2-dichloroethane, approximate ratio of peaks at  $m/z$  values 98, 100, 102 will be  
a) 3 : 1 : 1      b) 9 : 6 : 1      c) 1 : 1 : 2      d) 1 : 2 : 1
71. In the  $^1\text{H}$  NMR spectrum of toluene, the resonance due to  $\text{CH}_3$  group is expected at  
a)  $\delta$  0.5      b)  $\delta$  1.25      c)  $\delta$  2.5      d)  $\delta$  3.5
72. The source of ultra-violet radiation used in UV-visible spectrophotometer is  
a) mercury vapour lamp      b) sodium vapour lamp  
c) halogen vapour lamp      d) hydrogen vapour lamp
73. Which among the following electronic transitions will have the lowest energy  
a)  $n \rightarrow \sigma^*$       b)  $n \rightarrow \pi^*$       c)  $\sigma \rightarrow \sigma^*$       d)  $\pi \rightarrow \pi^*$
74. In comparison to the frequency of the EPR transition, the NMR transition frequency is  
a) much higher    b) much lower    c) almost same    d) none of these
75. The compound that gives precipitate on warming with aq.  $\text{AgNO}_3$  is

