

<b>DE-4067</b>
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<b>Sub. Code</b>
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<b>11</b>
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## DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2018.

## ORGANIC CHEMISTRY – I

(2008 onwards)

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

(5 × 20 = 100)

1. (a) (i) What are the criteria for aromaticity? (2)
- (ii) Explain why *p*-nitro benzoic acid is stronger than *m*-nitro benzoic acid? (2)
- (iii) What are the products obtained when nitro benzene and toluene are nitrated? (2)
- (iv) Give an example for alternant and non-alternant hydrocarbon. (2)
- (b) Account the following:
  - (i) Cyclo octatetraene fails to exhibit aromatic character.
  - (ii) Tropolone does not form an oxime. (2+2)
- (c) Discuss the effect of hydrogen bonding on the dissociation constant of acids. (4)
- (d) Explain any two non-kinetic methods of determination of reaction mechanism. (4)

2. (a) What is the electrophilic attacking reagent in aromatic nitration? Give the mechanism of nitration of benzene. (4)
- (b) (i) What are hard and soft acids? Give one example for each. (2)
- (ii) What is the catalyst used in the Friedel – Craft alkylation and acylation reaction? Explain its role in the above reaction. (2)
- (c) Write down  $SN_1$  mechanism and discuss the solvent and substrate effects. (12)
3. (a) Hydroboration is a regiospecific reaction – Explain. (4)
- (b) What are the methods employed to detect hydrogen bonding? (4)
- (c) Write short note on competition between elimination and substitution reactions. (4)
- (d) (i) What is the stereochemistry of pyrolytic elimination? Explain. (2)
- (ii) Benzaldehyde undergoes Cannizaro's reaction whereas acetaldehyde undergoes aldol condensation reaction – Explain. (2)
- (e) Write a note on Benzyne mechanism. (4)
4. How would you elucidate the structure of  $\alpha$ -pinene. (20)
5. (a) Elucidate the structure of oxytocin. (10)
- (b) What are enzymes? What are their characteristics? (6)
- (c) Distinguish between  $\alpha$ -amylase and amylopectine. (4)
6. (a) How would you synthesis the following compounds  
(i) Anthocyanin (ii) Oxazole (6)
- (b) Outline the synthesis of atropine. (6)
- (c) Discuss the end group analysis of peptides. (8)

7. (a) Write any two annulenes and comment on their aromaticity. (4)
- (b) How can the stereochemistry of the products be used to predict the mechanism of aliphatic nucleophilic substitution reaction? Give any two examples. (4)
- (c) Explain the stability of carbonium ions. (4)
- (d) Discuss the mechanism of the following reactions (i) Knoevenagel reaction (ii) Michael addition. (8)
8. (a) Discuss the primary, secondary and tertiary structure of proteins. (10)
- (b) Distinguish between DNA and RNA. (6)
- (c) Write down the functions of oxytocin. (4)
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**DE-4068****Sub. Code****12**

## DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2018.

## INORGANIC CHEMISTRY — I

(2008 onwards)

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

Each question carries 20 marks.

(5 × 20 = 100)

1. (a) Discuss the type of hybridisation which exists in the tetrahedral and octahedral geometrical shapes of molecules. (8)
- (b) What is lattice energy? How is it determined by Born-Haber cycle? (7)
- (c) Use the MO theory to predict the bond order in  $O_2$ ,  $O_2^-$ ,  $O_2^{2-}$ ,  $O_2^+$  and NO. (5)
2. (a) Write down the Kapustinski equation. What is its importance? (4)
- (b) Explain briefly the Pearson's concept of acids and bases. (8)
- (c) Discuss briefly the Schottky and Frenkel defects with neat diagrams. (8)
3. (a) Discuss the crystal structure of NaCl in detail. (5)
- (b) Describe briefly the photovoltaic cell. (4)
- (c) Explain briefly the 'F' centers with one example. (5)
- (d) Describe briefly the crystal structures of CsCl and fluorite. (6)

4. (a) What is meson field theory? Explain. (6)  
(b) Distinguish between nuclear fusion and nuclear fission. (7)  
(c) Discuss the principle of isotopic dilution analysis. Explain its applications. (7)
5. (a) What is lanthanide contraction? Explain briefly its various consequences. (8)  
(b) What are actinides? Explain briefly the spectral and magnetic properties of actinides. (8)  
(c) How are lanthanides separated by fractional crystallization method? (4)
6. (a) What are isopoly and heteropoly acids? Explain them with suitable examples. (8)  
(b) Discuss briefly the structures of ortho and metasilicated. (7)  
(c) What are molecular sieves? Explain them in detail. (5)
7. (a) Discuss the structure of polymolybdates. (8)  
(b) What are pyroxenes and amphiboles? Explain them in detail. (7)  
(c) Discuss the position of lanthanides in the periodic table. (5)
8. (a) Discuss briefly the liquid drop model. (7)  
(b) What is meant by nuclear reactor? Give the two types of nuclear reactors. Explain them in detail. (7)  
(c) Describe briefly the structure of 12-heteropolyanion. (6)

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## DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2018.

## PHYSICAL CHEMISTRY — I

(2008 Onwards)

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

Each question carries 20 marks.

 $(5 \times 20 = 100)$ 

1. (a) State the second law of thermodynamics. Discuss the need of II law. (6)
- (b) Define entropy. Explain the entropy change in reversible process. (6)
- (c) Derive Gibbs-Helmholtz equation. (8)
2. (a) Derive Debye-Huckel Onsagar equation. (10)
- (b) Explain Butler-Volmer equation in detail. (5)
- (c) Write a note on electrochemical cells. (5)
3. (a) Discuss the postulates of quantum mechanics in detail. (10)
- (b) Give the application of quantum chemistry to particle in a one-dimensional box. (10)
4. (a) Explain the chemical kinetics of reversible reactions. (6)
- (b) Write a note on kinetic isotopic effect. (6)
- (c) Discuss the Lindmann theory of unimolecular reaction in detail. (8)

5. (a) State and explain fluorescence and phosphorescence. (8)  
(b) What is quantum yield? How will you determine quantum yield experimentally? (8)  
(c) Explain the photochemical decomposition of HI. (4)
6. (a) Discuss the Nernst heat theorem in detail. (8)  
(b) What is fugacity? How will you determine it? (6)  
(c) Explain the activity and activity coefficient. (3+3)
7. (a) Explain the terms transport number and ionic mobilities. (5)  
(b) Give the applications of conductivity measurement. (5)  
(c) Derive Debye-Huckel limiting law. (10)
8. (a) Derive the Schrodinger wave equation. (10)  
(b) Discuss the solar energy conversion. (5)  
(c) Write a note on Flash Photolysis. (5)
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**DE-4070****Sub. Code****14**

## DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2018.

## INSTRUMENTAL METHODS OF ANALYSIS

(2008 onwards)

Time : Three hours

Maximum : 100 marks

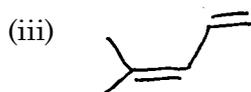
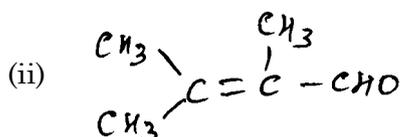
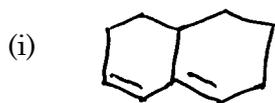
Answer any FIVE questions.

Each question carries 20 marks.

(5 × 20 = 100)

1. (a) Explain the terms chromophore and auxochrome with example. (5)
- (b) Name the different possible transitions. Occurring in the uv region. (6)
- (c) Define and explain Hook's law. (5)
- (d) Write a note on : Fermi Resonance. (4)
2. (a) Draw and explain the block diagram of an infrared spectrophotometer. (9)
- (b) Discuss McLafferty rearrangement with an example. (6)
- (c) How will you differentiate inter and intramolecular hydrogen bonding using IR spectroscopy? (5)
3. (a) Compare the basic principles of ESR and NMR spectroscopic techniques. (7)
- (b) Define and explain isotropic and anisotropic 'g' value. (8)
- (c) Write a note on lanthanide shift reagents. (5)

4. (a) Using Woodward-Fieser rule, calculate the  $\lambda_{\max}$  for the following compounds. (6)



- (b) What is Cotton effect? Give its applications. (7)
- (c) Describe the classification of chromatographic methods. (7)
5. (a) What is chemical shift? What are the factors affecting chemical shift value? (8)
- (b) Discuss the presentation of EPR spectra. (5)
- (c) Give the basic principle and applications of HPLC. (7)
6. (a) Distinguish between nephelometry and turbidimetry. (7)
- (b) Discuss the principle of flame photometry. (5)
- (c) Write the principle and applications of TGA. (8)

7. (a) What are the advantages of dropping mercury electrode? (5)
- (b) Discuss the instrumentation principle and applications of cyclic voltammetry. (10)
- (c) Write a note on : Null hypothesis. (5)
8. (a) What are thermometric titrations? Explain. (7)
- (b) Discuss the significance of TGA curve. (5)
- (c) Define the term error. Give its classification. (8)
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**DE-4071****Sub. Code****21**

## DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2018.

## ORGANIC CHEMISTRY — II

(2008 onwards)

Time : Three hours

Maximum : 100 marks

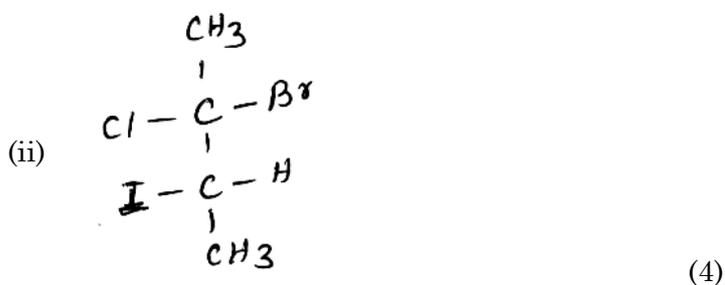
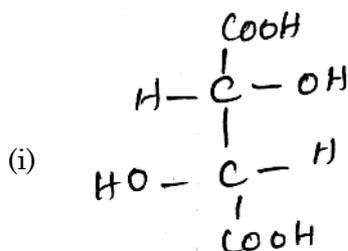
Answer any FIVE questions.

All questions carry equal marks.

 $(5 \times 20 = 100)$ 

1. (a) Write down the schematic analysis of total synthesis of 2, 4 -dimethyl - 2- hydroxy pentanoic acid. (8)
- (b) Write note on the following reactions:
  - (i) Periodic acid oxidation
  - (ii) Clemmensen reduction. (4 + 4)
- (c) Discuss the mechanism of Wagner-Meerwein rearrangement. (4)
2. (a) How would you determine the configuration of geometrical isomer by physical method? (8)
- (b) Explain relay approach with suitable example. (8)
- (c) Explain the optical activity of biphenyl. (4)

3. (a) What are stereo specific reaction? Explain with suitable example. (8)
- (b) Write a note on asymmetric synthesis. (8)
- (c) Assign R, S – Configuration for the following compounds:



4. (a) Explain the stability of free radicals. (6)
- (b) Discuss elaborately neighbouring group participation with four examples. (8)
- (c) Explain the following reactions with suitable example.
- (i) Hunsdiecker reaction
- (ii) Barton reaction. (6)

5. (a) (i) Give an example for cycloaddition reaction. (2)  
(ii) Phosphorescence lasts even after the source of light is cut -off-. Explain. (2)
- (b) Explain Norrish type I Photochemical reaction with two examples. (6)
- (c) Explain the stereo-chemistry of electrocyclic reaction by FMO approach. (10)
6. (a) Explain the various conformation and reactivity of 1, 2-dichloro ethane. (6)
- (b) What is the role of free radical in chain reaction? (6)
- (c) Discuss elaborately the photo chemical reactions of Olefins. (8)
7. (a) Explain Barbier-Wieland degradation with an example and mention its use. (6)
- (b) How is androsterone prepared from cholesterol? (6)
- (c) Give the structure of Vitamin B<sub>1</sub> and explain the ring structure present in it. (6)
- (d) Give the structure of Vitamin D. What happens when it is heated? (2)
8. (a) Elucidate the structure of androsterone. (10)
- (b) Discuss the following reactions with suitable example.
- (i) Electrocyclic reaction
- (ii) Diel's – Alder reaction
- (iii) Sigmatropic rearrangement. (10)
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**DE-4072****Sub. Code****22**

## DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2018.

## INORGANIC CHEMISTRY – II

(2008 onwards)

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

Each question carries 20 marks.

(5 × 20 = 100)

1. (a) Name the following co-ordination compounds :
    - (i)  $\text{Na}[\text{Pt Cl}_3(\text{NH}_3)]$
    - (ii)  $\text{trans} - [\text{Co}(\text{en})_2 \text{Cl H}_2\text{O}](\text{NO}_3)_2$
    - (iii)  $[\text{Co}(\text{NH}_3)_5 \text{Cl}]\text{Cl}$
    - (iv)  $\text{K}_3 [\text{Fe}(\text{CN})_5 \text{NO}] \cdot 2 \text{H}_2\text{O}$ . (4 × 1 = 4)
  - (b) Discuss briefly the splitting of d-orbitals in octahedral and tetrahedral fields. (8)
  - (c) Explain briefly the molecular orbital theory for tetrahedral and square planar complexes. (8)
2. (a) What is stability constant? How is it determined by pH metric and polarographic methods? (10)
  - (b) What are inner sphere and outer sphere complexes? Explain them with suitable mechanisms. (10)

3. (a) Discuss the basic principles of EPR in detail. Mention the selection rules. Explain briefly the hyperfine splitting in bis(salicylaldehyde) copper (II) complex. (10)
- (b) Calculate the magnetic moment for  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ . (7)
- (c) Construct the Orgel diagram for a  $d^9$  configuration and explain the concept of hole formalisation. (7)
4. (a) Discuss the bonding in olefins and acetylene complexes with suitable examples. (10)
- (b) Discuss briefly the hydrogenation of olefins with mechanisms. (7)
- (c) What is hydroformylation reactions? (3)
5. (a) Discuss briefly the structure and functions of hemoglobin and myoglobin. (8)
- (b) What are copper proteins? How are they classified? Explain them in detail. (8)
- (c) Distinguish between hemoglobin and cytochromes. (4)
6. (a) Discuss briefly the working of sodium ion pump. (6)
- (b) Discuss in detail the structure of Vitamin B<sub>12</sub>. (8)
- (c) Write a note on synthetic oxygen carriers. (6)
7. (a) With the help of Orgel diagram calculate the values of  $\beta$ ,  $B^1$  and  $10 Dq$ . The electronic spectrum of octahedral nickel (II) complex  $[\text{Ni}(\text{NH}_3)_6]^{2+}$  shows bands at 10750 and 17500  $\text{cm}^{-1}$ . Also calculate the frequency of the third transition. (8)

- (b) What are macro cyclic ligands? Give an example.  
How is it prepared? (5)
- (c) Discuss briefly the para, dia, ferro and antiferro  
magnetisms with suitable examples. (7)
8. (a) What are anation and base hydrolysis reactions?  
Explain them in octahedral complexes with suitable  
mechanisms. (8)
- (b) Discuss in detail the effect of isotopic substitution  
on the vibrational spectra of molecules. (8)
- (c) What are fluxional molecules? Explain them in  
detail with suitable example. (4)
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## DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2018.

## PHYSICAL CHEMISTRY – II

(2008 onwards)

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

Each question carries 20 marks.

 $(5 \times 20 = 100)$ 

1. (a) Explain Fermi-Dirac distribution law. (8)  
(b) Give the application of Bose-Einstein distribution law to photon gas. (6)  
(c) State and explain the statistical interpretation of third law. (6)
2. (a) Write the application of HMO method to the construction of molecular orbital of butadiene. (8)  
(b) Write a note on :  
(i) Pauli's exclusion principle  
(ii) Slater determinant. (6 + 6)
3. (a) Identify fundamental modes of vibration of H<sub>2</sub>O and NH<sub>3</sub> molecules. (10)  
(b) With the help of group theory discuss the electronic spectrum of HCHO molecule. (10)

4. (a) What is primary and secondary salt effect? Explain in detail. (10)
- (b) What is enzyme catalysis? Derive Michaelis-Menton equation and discuss the salient features. (10)
5. (a) Derive Freundlich adsorption isotherm and explain the terms in it. Explain the verification of Freundlich adsorption isotherm. (8)
- (b) How is BET isotherm used in determination of surface area of adsorbent? (7)
- (c) What are the factors that affect the adsorption of gases on solids? (5)
6. (a) Explain the following :
- (i) Surfactants
- (ii) Ion-Dipole reaction
- (iii) Acidity functions. (5 + 5 + 5)
- (b) Give the matrix representations for the symmetry elements plane of symmetry, inversion centre and axis of symmetry. (5)
7. (a) Solve the Schrodinger wave equation for hydrogen atom. (10)
- (b) Derive Bose – Einstein Statistics. (10)
8. (a) Describe the classification of point group. (8)
- (b) Construct the group multiplication table for  $C_{2v}$  point group. (8)
- (c) Write a note on direct product representation. (4)
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<b>24</b>
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## DISTANCE EDUCATION

M.Sc (Chemistry) DEGREE EXAMINATION, MAY 2018.

## APPLIED CHEMISTRY

(2008 onwards)

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

Each questions carries 20 marks.

(5 × 20 = 100)

1. (a) What is radio active pollution? Write their sources?  
Discuss their effects. (8)
- (b) How is acid rain formed? List out their ill-effects. (6)
- (c) Discuss the biological methods of treatment of  
waste water. (6)
2. (a) Name some physical tests which are carried out in  
water analysis. Discuss any two physical tests. (8)
- (b) What are the main operations of preliminary  
treatment method of waste water. Explain. (8)
- (c) Write down the main sources of land pollution. (4)
3. (a) Discuss briefly the anodic and cathodic electro  
chemical protection methods. (8)
- (b) Give an account of electro plating of nickel and  
copper. (6)
- (c) Write down the principle of
  - (i) electroless plating and
  - (ii) composite coating (6)

4. (a) Discuss the principle and applications of electro forming. (8)
- (b) Draw the pourbaix diagram for Fe-H<sub>2</sub>O system. (6)
- (c) What is meant by corrosion of metals? How does it occur? (6)
5. (a) What are solution polymerizations and bulk polymerizations? Discuss their techniques briefly. (8)
- (b) Write short notes on
- (i) bio degradable polymers and
- (ii) conducting polymers (6)
- (c) Write down the mechanism of free radical polymerization? Give examples. (6)
6. (a) What is addition polymerization and Give any two examples. (6)
- (b) Describe to synthesize nanoparticles by sol-gel method. (6)
- (c) How can nanomaterials be characterised by SEM and TEM methods? (8)
7. (a) Discuss any two physical methods to synthesize the nanoparticles. (8)
- (b) Using XRO and XPS, how can you characterize the nanoparticles. (8)
- (c) What is spray pyrolysis deposition method? (4)

8. (a) Write a Basic A or C programme to calculate bond energy using Born-Lande equation. (8)
- (b) Explain the following terms used in internet. (6)
- (i) www
  - (ii) http
  - (iii) html
  - (iv) ure
- (c) Write down the sources for list of journals. (6)
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