

A-10202

Sub. Code

4MCH1C1

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary / Improvement / Arrear Examinations**

First Semester

Chemistry

ORGANIC CHEMISTRY – I

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. What are 'non-classical carbocations'? Give one example.
2. Define 'singlet carbene'. Give its structure.
3. State and explain 'Bredts rule'.
4. What are ambident nucleophiles? Give one suitable example.
5. Explain alterant hydrocarbon with example.
6. Is pyridine aromatic? Justify.
7. Illustrate the prefixes 'erythro' and 'threo' with suitable examples.
8. How will you distinguish asymmetric and disymmetric molecules?
9. Mention any two functions of nucleotide.
10. Mention the four bases present in RNA and comment on their pairing nature.

Part B

(5 × 5 = 25)

Answer **all** questions.

11. (a) Briefly explain :

(i) Hammond's postulate

(ii) Principle of microscopic reversibility. (2.5+2.5)

Or

(b) Write a short note on hyperconjugation.

12. (a) Briefly discuss the factors affecting E/S_N ratio.

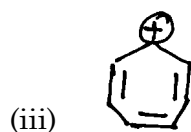
Or

(b) How would you distinguish between S_N1 and S_N2 mechanisms on the basis of stereochemical studies?

13. (a) Write short notes on the chemistry of cyclopentadienyl anion.

Or

(b) Discuss the aromaticity of the following compounds.



(1+2+2)

14. (a) Comment on the role of symmetry elements and their operation in determining the chirality of compounds.

Or

- (b) Taking (-) erythrose as an example, illustrate fisher, sawhorse and newmann projection formulae.
15. (a) Write a note on the functions of Nucleic acids.

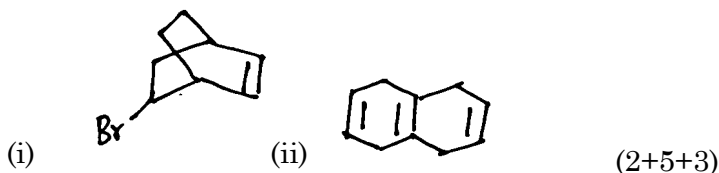
Or

- (b) Describe the structure of nucleotide and nucleoside.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Write down the rules for drawing resonance structure.
- (b) Describe the formation and stability of carbanions. (5+5)
17. (a) Briefly describe the orientation effects in elimination reaction. (5+5)
- (b) Comment on the nucleophilic substitution reactions at allylic carbon.
18. (a) What are non-alterant hydrocarbons? Explain with suitable examples.
- (b) Write a note on annulenes.
- (c) Give the IUPAC name for the following:



19. (a) Briefly discuss the physical and chemical methods for determining the geometrical isomerism in stereomers.
- (b) Construct the two enantiomers of bromochlorofluoromethane. (5+5)
20. (a) Comment on the structure of Vitamin B_{12} .
- (b) Draw the structure of RNA. (6+4)
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A-9786

Sub. Code

4MCH1C2

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

First Semester

Chemistry

INORGANIC CHEMISTRY-I

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. How is bond energy related to bond strength?
2. Compare the bond order of O_2^- and O_2^+ .
3. Li_2 molecule exists whereas He_2 molecule does not. Why?
4. Give any two examples of soft acid and soft base
5. How are semiconductors classified?
6. Speculate on reason that transition metal oxides are more frequently nonstoichiometric as compared to non-transition metal oxide
7. What is Asbestos? Mention its limitations
8. How are boranes classified?
9. How are $Fe(CO)_5$ and $Co_2(CO)_8$ prepared?
10. Give any two uses of thoria.

Part B

(5 × 5 = 25)

Answer **all** questions.

11. (a) What is bond energy? How does it relate the bond length and bond order?

Or

- (b) Explain the concept of Levelling effect.

12. (a) Using Hybridization theory, deduce the geometry of XeF₄.

Or

- (b) Discuss the Postulates of Valence bond theory.

13. (a) Write a note on Band theory of Solids.

Or

- (b) What is Super conductor? Explain their conductivity at different temperatures.

14. (a) Discuss the structure of poly tungstate ion

Or

- (b) Distinguish between inorganic benzene and benzene molecule

15. (a) How is beryllium extracted from its ore?

Or

- (b) Describe the synthesis and structure of iron carbonyls.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Explain HSAB principle and mention their applications
- (b) Discuss the periodic variations of electron affinity and electro negativity. (6+4)
17. Explain the LCAO of MO theory and deduce the bond order of carbonate ion
18. (a) Explain the role of semiconductors in Solar energy conversion
- (b) What types of defects are observed in solids? Discuss any one in detail. (4+6)
19. (a) Discuss the preparation and structure of dicarbadodecaborane.
- (b) Write a note on Silicones. (6+4)
20. (a) Explain the bonding and structure of ferrocene.
- (b) Describe isolation and purification of Thorium. (5+5)

A-9787

Sub. Code

4MCH1C3

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

First Semester

Chemistry

PHYSICAL CHEMISTRY - I

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. Define electro phoretic effect.
2. What is wien effect?
3. Explain hydrogen over voltage.
4. Define half wave potential.
5. What do you mean by partial molar volume?
6. Give the statement of second law of thermodynamics.
7. Define the terms: Microcanonical and grand canonical ensembles.
8. Explain partition function.
9. Mention any two characteristics of physisorption.
10. Define surface tension.

Part B

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain Debye-Huckel effect on electrolytic conductivity.

Or

- (b) Derive Debye-Huckel limiting law.

12. (a) Discuss the applications of polarography.

Or

- (b) Explain the Gouy-Chapman model for the theory of electrical double layer.

13. (a) Derive Maxwell relations.

Or

- (b) Derive Butler-Volmer equation

14. (a) Derive Boltzmann-Planck equation

Or

- (b) Derive the relationship between partition function and equilibrium constant.

15. (a) What is Langmuir adsorption isotherm? Show that Freundlich isotherm is a special case of Langmuir isotherm.

Or

- (b) Derive BET equation.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Derive Debye-Huckel onsagar equation and how it is verified experimentally?
 17. Discuss the determination of hydrogen over voltage experimentally. Give the advantages of this method.
 18. Explain the experimental determination of fugacity of real gases.
 19. Derive an expression for Fermi-Dirac statistics.
 20. How is surface area of solid adsorbents determined from adsorption studies.
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A-9788

Sub. Code

4MCH1C4

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

First Semester

Chemistry

INSTRUMENTAL METHODS OF ANALYSIS

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. Define: Precision.
2. Calculate mean and median for the following data.
values: 2.3, 3.2, 5.4, 8.1, 11.5, 5.0
3. What is meant by post-precipitation?
4. Give the ideal properties of precipitating agents.
5. List the basic qualities of a reference electrode.
6. Give the principles of chronopotentiometry.
7. Name the uses DSC methods in forensic laboratory.
8. Mention the chemical changes during thermo gravimetric analysis of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

9. State Beer and Lambert's law.
10. Give the principles of Nephelometry.

Part B

(5 × 5 = 25)

Answer **all** questions.

11. (a) Give a brief account of minimization of errors.
- Or
- (b) Distinguish determinate errors from indeterminate errors.
12. (a) Write notes on precipitation from homogeneous solution.
- Or
- (b) Discuss the drying and ignition of precipitates.
13. (a) Give the principles and applications of coulometry.
- Or
- (b) Explain the principles and uses of amperometric titrations.
14. (a) Draw and explain the TGA curve of calcium acetate monohydrate.
- Or
- (b) Write notes on the factors affecting the position of TG/DTA curves.
15. (a) Describe the principles and applications of fluorimetry.
- Or
- (b) Give an account of simultaneous spectrometric determination of Cr and Mn.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Give the differences between constant and proportional errors.
- (b) Describe a methods of least square curve fitting methods to obtain a best straight line. (4+6)
17. (a) Give the procedures to minimize surface adsorption during precipitation.
- (b) Write notes on co-precipitation. (5+5)
18. Describe the principles and applications of electrogravimetric methods.
19. Explain the principles and applications of DSC analysis.
20. (a) Discuss the theory and principles of AAS.
- (b) Explain the applications of AAS in the determination of Mg^{2+} in tap water. (6+4)
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A-9789

Sub. Code

4MCH1E1

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

First Semester

Chemistry

ELECTIVE- INDUSTRIAL CHEMISTRY

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. Define: Cetane number.
2. How are fuels classified?
3. Give the chemistry of setting of cement.
4. List the compositions of optical glass.
5. Name the four fertilizers industries in India.
6. Write the manufacture of potassium chlorate.
7. Give the preparation of warfarin.
8. Write the mode of action of parathion.
9. Mention the modes of pollutions caused by thermal power plants.
10. Give the bio-chemical effects of arsenic.

Part B

(5 × 5 = 25)

Answer **all** questions.

11. (a) Write notes on composition and uses of coal gas.

Or

- (b) Give an account of methods of raw materials concentration.

12. (a) Explain the composition and uses of feldspar and glazing.

Or

- (b) How coloured glasses are manufactured? Explain.

13. (a) Discuss the applications of electroplating in industries.

Or

- (b) Explain the manufacture of a metal powders used in match industries.

14. (a) Name a fungicide and explain its mode of action.

Or

- (b) Describe the recovery of sugar from molasses.

15. (a) Write notes on pollution caused by nuclear power reactors.

Or

- (b) Discuss the biochemical effects of cadmium and cyanide.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) What is meant by petroleum cracking? Explain.
(b) Discuss the composition and uses of oil gas. (5+5)
17. (a) Describe the dry and wet process of cement manufacture.
(b) What is meant by reinforced concrete? Explain.(6+4)
18. (a) Give the manufacture and industrial importance of red phosphorus.
(b) Write notes on soaps and detergents industries.(6+4)
19. Discuss the synthesis and mode of action of
(a) DDT
(b) DDVP and
(c) Baygon. (3+3+4)
20. Write notes on the biochemical effects of
(a) Mercury and
(b) Lead. (5+5)
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A-10203

Sub. Code

4MCH2C1

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Second Semester

Chemistry

ORGANIC CHEMISTRY-II

(CBCS – 2014 onwards)

Time : 3 Hours

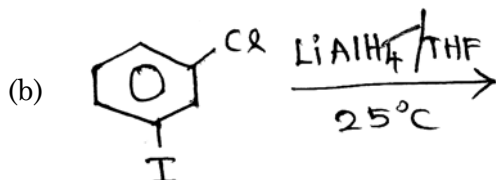
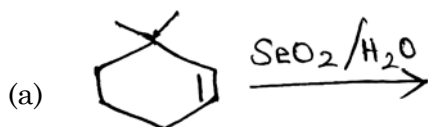
Maximum : 75 Marks

Part A

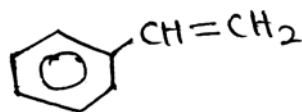
(10 × 2 = 20)

Answer all questions.

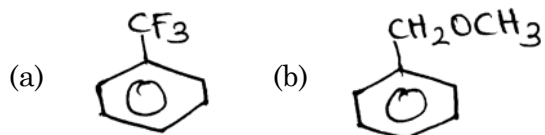
1. Predict the product(s)



2. Give any two applications of NBS.
3. Give a method for preparing the following compound using Wittig reaction.



- Comment on the migratory aptitude of p-chlorophenyl, phenyl and p-anisyl groups in Beckmann rearrangement.
- Predict qualitatively the isomer ratio for the nitration of each of the following compounds.



- What is Gattermann-Koch formylation?
- Define Cram's rule.
- What are diastereotopic ligands? Give examples.
- Draw the stable conformation of trans-1,3-di-t-butyl cyclohexane why it is more stable?
- Draw the Sawhorse representation of different conformations of ethane.

Part B (5 × 5 = 25)

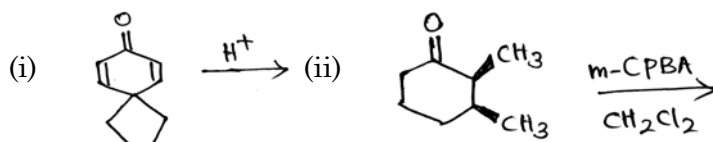
Answer **all** questions, choosing either (a) or (b).

- (a) What is Meerwein-Ponndorf-Verley reduction? Write its mechanism.

Or

- (b) Discuss the selectivity in oxidation and reduction by taking suitable examples.

- (a) Write the product(s) with mechanism.



Or

- (i) What is meant by Grignard reactions? (2)
- (ii) Give the mechanism of Aldol condensation. (3)

13. (a) Discuss benzyne mechanism and give its evidence.

Or

(b) Explain the significance of reaction and substituents constants in Hammett equation.

14. (a) Explain the optical isomerism exhibited by Spirane molecules.

Or

(b) Write notes on prochirality and prostereo isomerism.

15. (a) Discuss the conformation of monosubstituted cyclohexanes.

Or

(b) Account for the conformation and stability of (1, 2) and (1, 3) dimethyl cyclohexane.

Part C

(3 × 10 = 30)

Answer any **THREE** questions.

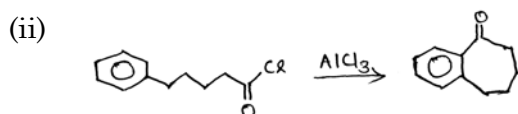
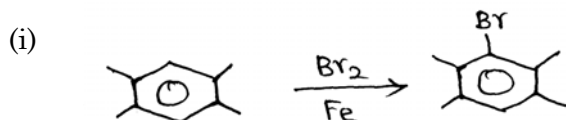
16. (a) Reduction of cyclobutanone is much easy as compared to cyclo-octanone by NaBH₄. Explain. (3)

(b) Write short notes on (i) OsO₄ (ii) Birch reduction (7)

17. (a) N-methyl propanamide does not undergo Hofmann rearrangement when treated with aqueous NaOBr. Comment. (3)

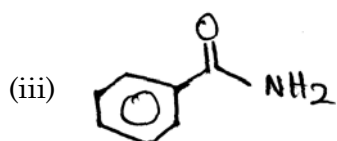
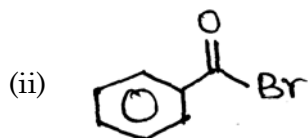
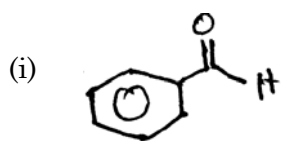
(b) Give a brief note on (i) Perkin reaction (ii) di-pi methane rearrangement. (7)

18. (a) Draw mechanism for the following reactions. (5)



(b) Give a detailed discussion on SN¹ mechanism. (5)

19. (a) Assign Si and Re faces in the following compounds.(3)



(b) Explain the following : (3 + 4)

(i) Asymmetric synthesis

(ii) Stereospecific and stereoselective reactions.

20. (a) Discuss the correlation of the conformation of acyclic with their physical and chemical properties. (7)

(b) Write short note on Eliel equation. (3)

A-10204

Sub. Code

4MCH2C2

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Second Semester

Chemistry

INORGANIC CHEMISTRY — II

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all the** questions.

1. Draw the structures of any two macrocyclic ligands
2. Distinguish between primary valency and secondary valency.
3. What is meant by labile complex? Give an example.
4. Distinguish between the trans influence and the trans effect.
5. How would you compare essential/beneficial metals to toxic metals?
6. Define Bohr's effect.
7. What are the conditions to be satisfied by a metal to act as a catalyst?
8. What is Wilkinson's catalyst?

9. Write down the criteria for a spontaneous nuclear reaction to occur.
10. How are nuclear reactors classified?

Part B

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) A solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green but solution of $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless. Explain.

Or

- (b) Discuss the factors affecting the CFSE.

12. (a) Discuss the mechanism of acid hydrolysis reaction.

Or

- (b) What are complementary and non-complementary reactions? Explain.

13. (a) Explain the structure of chlorophyll.

Or

- (b) Discuss the functions of iron sulphur proteins.

14. (a) What is oxo process? Discuss its mechanism using cobalt complex as catalyst.

Or

- (b) Explain the role of copper (II) salt in Wacker's process.

15. (a) What is Carbon Dating? A prehistoric site is found to contain charcoal remains with only 6.25 % Carbon-14 compared to fresh wood (100 %). What is the approximate age of the site?

Or

- (b) Write a note theory of nuclear fission.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Draw the MO diagram of high spin $[\text{Co}(\text{NH}_3)_6]^{3+}$ complex and explain the magnetic behaviour. (5+5)
(b) Determine the stability constant by Job's method.
17. How are substitution reactions and electron transfer reactions used in synthesis of coordination compounds?
18. Compare and contrast the structure and functions of haemoglobin and myoglobin.
19. What is Ziegler-Natta catalyst? How is it used in the polymerisation of olefins? Compare this catalytic polymerisation with free radical polymerisation.
20. Discuss the applications of radioactive isotopes in
 - (a) Medical field
 - (b) Agriculture
 - (c) Chemical investigations. (3+4+3)

A-10205

Sub. Code

4MCH2C3

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary / Improvement / Arrear Examinations

Second Semester

Chemistry

PHYSICAL CHEMISTRY – II

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. What are linear and non-linear chain reactions?
2. Draw the potential energy versus reaction coordinate profile for a complex reaction.
3. State the factors which affect the width of rotational spectral lines.
4. A radioactive isotope has an excited state where the lifetime is 10^{-16} sec. Find the spectral width.
5. Define mutual exclusion principle.
6. What are the selection rules for IR and Raman spectroscopy?
7. What type of electrons contribute electric field gradient? Give an example.
8. What is g value? Give the g value for free electron.

9. What is inversion centre? Give example.
10. Write down the associative operation of S_3 axis.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) What are the general characteristics of chain reaction?

Or

- (b) Describe kinetics of H_2-O_2 explosive reaction.

12. (a) The rotational constant of NH_3 is equivalent to 298 GHz. Compute the separation of the pure rotational spectrum lines in GHz, show that the value of B is consistent with an N-H bond length of 101.4 pm and a bond angle of 106.78° .

Or

- (b) Explain the different types of molecular energies.

13. (a) Calculate the value of I and r of CO. Given that $B = 1.92118 \text{ cm}^{-1}$.

Or

- (b) Explain stoke, antistoke and Rayleigh phenomenon in Raman Spectroscopy.

14. (a) Discuss the applications of NQR in identifying hybridization in molecules.

Or

- (b) Discuss the hyperfine splitting pattern in ESR spectroscopy.

15. (a) What are reducible and irreducible representations? Explain them.

Or

- (b) Give the point group for following molecules.

CH₄, HF, NH₃, C₂H₄, C₆H₆.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss in detail the Marcus theory of unimolecular reactions.
17. (a) Explain the isotope effect in pure rotational spectra.
(b) Discuss briefly Born-Oppenheimer approximations. (5+5)
18. (a) Write a note on dissociation and pre-dissociation spectra.
(b) Distinguish between IR and Raman spectroscopy. (5+5)
19. (a) Explain the following terms:
(i) Kramer's degeneracy
(ii) Zeeman effect.
(b) Discuss the applications of NQR spectroscopy. (5+5)
20. Write short note on great orthogonality theorem and its consequences and derive the Character table for C_{2h} using great orthogonality theorem.

A-9790

Sub. Code

4MCH2E1

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
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Second Semester

Chemistry

Elective — POLYMER CHEMISTRY

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. What are the polymers? Give an example.
2. What are block polymers? Give any one example.
3. List out the use of polystyrene.
4. Give the preparation of polyethylene.
5. What are syndiotactic polymers?
6. What is degree of polymerization?
7. Explain the term interfacial polycondensation polymerization.
8. Define hydrolytic degradation.
9. Define the term fibres.
10. What are Plasticizers?

Part B

(5 × 5 = 25)

Answer **all** questions.

11. (a) Write the mechanisms of anionic chain polymerization.

Or

- (b) Explain the polyaddition and poly condensation polymerizations.

12. (a) Give the preparation and uses of poly acrylonitrile and polytetra-fluoroethylene.

Or

- (b) Discuss the preparation and uses of
(i) Polyimides. (ii) Polyurethanes.

13. (a) Explain the relationship between glass transition temperature and molecular weight.

Or

- (b) Describe the molecular weight distribution in Polymers.

14. (a) Explain with suitable examples of solution and suspension polymerization techniques.

Or

- (b) Write a note on oxidative degradation.

15. (a) How will you distinguish between thermo and thermosetting plastics?

Or

- (b) Explain the thermoplastic materials are processed using injection moulding.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Explain the classification of polymers.
(b) Describe the bimetallic mechanics of coordination polymerisation (5+5)
17. Write the preparation and uses of
(a) Phenol-formaldehyde.
(b) Urea- formaldehyde.
(c) Polybutadienes. (3+4+3)
18. (a) What is glass transition temperature? Explain the factors affecting glass transition temperature.
(b) List out the importance of glass transition temperature. (5+5)
19. Discuss the following with suitable example.
(a) Photo stabilizers
(b) Antioxidants. (5+5)
20. Explain the following polymers processing
(a) Rotational casting
(b) Thermo foaming. (5+5)

A-10206

Sub. Code

4MCH2E3

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

Second Semester

Chemistry

Elective – GREEN CHEMISTRY

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. What is green chemistry?
2. Write any two challenges in controlling the pollution.
3. What is the importance in controlling the pollution?
4. Write the importance of catalysts in green chemistry.
5. Write any two advantages of microwave assisted synthesis.
6. Give an example for reactions without catalyst.
7. Provide the two advantages of biocatalysts.
8. Write the synthesis of paracetamol.
9. Provide the ill-effects of mercury.
10. Write the health impact of manganese.

Part B

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Write a note on the environmental protection laws.

Or

- (b) What is green washing? Explain in detail.

12. (a) Write a growth of green chemistry.

Or

- (b) Provide a list and details of awards for green chemistry.

13. (a) Describe the solvent free ester saponification.

Or

- (b) Explain the oxidation of toluene to benzoic acid by microwave synthesis.

14. (a) Discuss the choice materials and reagents in green synthesis.

Or

- (b) Explain the synthesis of adipic acid by green synthesis.

15. (a) Discuss the health impacts of thallium and tellurium.

Or

- (b) Write the ill-effects of uranium and selenium.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Write a note on the challenges in pollution control and pollution prevention.
- (b) Explain the green cleaning. (5 + 5)
17. Write twelve principles of green chemistry.
18. (a) Explain the phase transfer catalysts. Provide examples.
- (b) Write the advantages of microwave assisted synthesis. (5 + 5)
19. (a) Discuss the choice of catalysts in green synthesis.
- (b) Write a synthesis of methyl methacrylate by green chemistry. (5 + 5)
20. (a) Write the method of removing arsenic from water.
- (b) Write a note on environmental toxins. (5 + 5)
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A-10207

Sub. Code

4MCH3C1

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary / Improvement / Arrear Examinations**

Third Semester

Chemistry

ORGANIC CHEMISTRY – III

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. State octant rule.
2. Illustrate fluorescence with an example.
3. Mention the products of Retro-Diels-Alder reaction.
4. Define Hypsochromic effect (shift).
5. Mention the role of shift reagents in proton NMR spectra.
6. Define relaxation time. Mention their types.
7. Mention the use of Merrifield resin.
8. Give the merits of using 1,3-dithiane.
9. Mention two applications of HPLC.
10. Explain R_f factor in TLC.

Part B

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe Jablonskii diagram with a neat sketch.

Or

- (b) State and explain α – haloketone rule.

12. (a) Describe Wood-Ward-Fieser rules for α, β unsaturated carbonyl compounds in UV spectroscopy.

Or

- (b) Briefly describe the principle of mass spectrometry.

13. (a) Write short notes on off-resonance decoupling in ^{13}C NMR spectroscopy.

Or

- (b) Define coupling constant. Describe the factors influencing coupling constant.

14. (a) Write short notes on:

(i) Lithium di isopropylamide (LDA)

(ii) Stability of free radicals. (5+2)

Or

- (b) Briefly discuss:

(i) Barton reaction

(ii) Gomberg reaction. (3.5+3.5)

15. (a) Discuss the chemistry of cholesterol.

Or

(b) Describe the principle and uses of column chromatography.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Write a short note on:

(a) Norish-I and Norish-II type reactions.

(b) Photosensitization.

(c) Photoreduction. (6+2+2)

17. (a) State and explain Mclafferty rearrangement reaction. (4)

(b) Define and give examples for the following:

(i) Metastable peak

(ii) Isotopic peak

(iii) Parent ion

(iv) Bathochromic shift. (4 × 1½ = 6)

18. (a) Define chemical shift. Briefly discuss the factors that influence chemical shift in ¹H-NMR spectroscopy. (4)

(b) Explain:

(i) Double resonance technique.

(ii) Nuclear overhauser effect. (3+3)

19. (a) Briefly discuss the mechanism of Wood-Ward-Prevost hydroxylation reaction. (5)
- (b) Discuss:
- (i) Gilman's reagent.
- (ii) Phase transfer catalysts. (3+2)
20. Discuss the chemistry and stereochemical outcome of:
- (a) Androsterone
- (b) Oestrone. (5+5)
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A-10208

Sub. Code

4MCH3C2

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary / Improvement / Arrear Examinations

Third Semester

Chemistry

INORGANIC CHEMISTRY – III

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. What is Orgel diagram? In what ways it differs from Tanabe-Sugano diagram?
2. How many d-d bands would be expected in the electronic spectrum of an octahedral Cr(III) complex?
3. What do you mean by recoilless nuclear transition?
4. Quadrupole splitting pattern is observed in SnCl₄. Why?
5. Predict the ³¹P-NMR spectrum of P₄S₃.
6. Write any two differences between NMR and ESR transitions.
7. What are the difficulties encountered in the separation of lanthanides from one another?
8. Mention the uses of actinides.

9. Define template effect.
10. Classify the metal ion catalysis of organic reactions.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) What is Jahn – Teller effect? Explain its consequences in electronic spectroscopy.

Or

- (b) Explain the origin of electronic spectra of molecules and give the electronic spectra $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ complex.
12. (a) Explain the application of Mossbauer spectroscopy in the study of Fe(II) and Fe(III) cyanides.

Or

- (b) Explain how the *cis*- and *trans* isomers are distinguished by IR spectroscopy.
13. (a) Discuss the NMR of fluxional molecules.

Or

- (b) What is contact shift? How does it occur? Explain its use in the structural elucidation of inorganic molecules.
14. (a) Describe the extraction of lanthanides from solvent extraction method.

Or

- (b) Explain the separation of Pu from fission products.

15. (a) Describe the chemical reactions due to metal ion polarization of coordinated ligands.

Or

- (b) Discuss the role of metal ions catalysed hydrolysis of peptide complexes.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Write a note on charge transfer transition.
(b) Calculate the 10 Dq and β value of tetrahedral complex of d^3 configuration. (5+5)
17. Outline the principle of Mossbauer spectroscopy. What are the conditions for a compound to show signals in MB spectroscopy? Explain the Magnetic and quadrupole interactions in MB spectroscopy.
18. (a) How is the rate constant evaluated from the line-width of the NMR signals?
(b) Explain the terms Kramer's degeneracy and Zero field splitting. (5+5)
19. Discuss the position of actinides in the periodic table.
20. Discuss the isomerism exhibited by four and six coordinated complexes.

A-10209

Sub. Code

4MCH3C3

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

Third Semester

Chemistry

PHYSICAL CHEMISTRY – III

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. What are the differences between singlet and triplet excited states?
2. What is photosensitization? Give examples.
3. Write the quantum mechanical operators for
 - (a) Kinetic energy
 - (b) Angular momentum
4. State Heisenberg's uncertainty principle.
5. What are eigen functions and eigen values?
6. Explain vanishing and non-vanishing commutators.

7. What is the need for approximate methods for many electron systems?
8. What are the characteristics of the wave function ψ ?
9. What are thermoplastic polymers? Give examples.
10. Define coordination polymerization.

Part B

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the photo physical processes of electronically excited molecules.

Or

- (b) Write briefly the elementary aspects of photosynthesis.

12. (a) Describe de Broglie's concept of matter waves.

Or

- (b) How is the operator for linear momentum derived?

13. (a) What are Hermitian operators? Show that P_x is Hermitian.

Or

- (b) Explain

- (i) orthogonal functions

- (ii) normalization of wave functions with an example for each

14. (a) Explain the shapes of various atomic orbitals with the help of wave functions.

Or

- (b) Give the Schrodinger wave equation for rigid rotor and obtain its solution.

15. (a) Discuss the emulsion polymerization technique.

Or

- (b) Give the mechanism of cationic polymerization.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Explain the following
- (i) fluorescence
 - (ii) phosphorescence.
- (b) Discuss photosensitization by taking an example. (5+5)
17. How are the following obtained by quantum mechanical operator
- (a) potential energy
 - (b) total energy
 - (c) position
 - (d) momentum. (2+2+3+3)
18. (a) Deduce the Schrodinger wave equation for particle in one dimensional box.
- (b) State the postulates of quantum mechanics. (5+5)

19. (a) Solve the Schrodinger wave equation for many electron systems.
- (b) What is Hermite polynomial? How is this polynomial method used in solving Schrodinger wave equation for harmonic oscillator. (5+5)
20. Discuss the mechanism and kinetics of free radical polymerisation.
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A-9791

Sub. Code

4MCH3E1

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

Third Semester

Chemistry

Elective: CORROSION CHEMISTRY

(CBCS – 2014 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. What is meant by corrosion?
2. Define erosion corrosion.
3. What is atmospheric corrosion?
4. Define biological corrosion.
5. What are electro chemical energy conversion?
6. What is polarization?
7. List out the any two performance characteristics of aluminium / air cells.
8. What are separators?
9. Define fuel cells.
10. What are porous electrodes?

Part B

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) What is passivity? Write down the criteria for selecting metals exhibiting passivity.

Or

- (b) Discuss the mechanism of stress corrosion and fretting corrosion.

12. (a) Explain the factors influencing atmospheric corrosion.

Or

- (b) Define marine corrosion. Explain the control methods of marine corrosion.

13. (a) List out the applications of primary and secondary cells.

Or

- (b) Explain the following electrolytes:
(i) Aqueous and non-aqueous electrolytes.
(ii) Solid electrolytes.

14. (a) Discuss the construction and working of the Ni-metal hydride storage device.

Or

- (b) Write a note on lithium-ion battery.

15. (a) Write a note on mercury porosimetry.

Or

- (b) Explain the construction of alkaline fuel cell.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Discuss the mechanism and control methods of film form corrosion.
- (b) Write a note on high temperature corrosion.
17. (a) Derive the relation between free energy and E_{cell} .
- (b) Discuss the different types of primary and secondary cells.
18. (a) Explain the following factors affect the rate of corrosion.
- (i) salts
- (ii) pH
- (iii) temperature.
- (b) Discuss the factors influencing soil corrosion.
19. (a) Explain the types of chemicals and metals inside the battery that are used to store and release energy.
- (b) Write a note on solid electrolyte cells.
20. (a) Explain the limiting current density.
- (b) Discuss the construction and working of solid polymer fuel cell.

A-10369

Sub. Code

4MCH3E2

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

Third Semester

Chemistry

Elective- MOLECULAR PHOTOCHEMISTRY

(CBCS – 2014 onwards)

Time : Three Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** questions.

1. State and Explain Phosphorescence.
2. What do you know about singlet state and triplet state?
3. Give an example of photo reduction reaction.
4. Comment on nature of product in Paterno-Buchi reaction.
5. Why transition metal complexes are suitable for photochemical studies? Give reason.
6. Comment on the nature of product in photo redox reactions.
7. Explain photo cleavage reaction with suitable example.
8. State and explain Barton reaction.
9. Define Laser. Give any one of its applications.
10. What do you mean by chemical actinometry?

Part B

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Compare and contrast internal conversion with inter-system crossing.

Or

- (b) Compare and contrast Fluorescence and Phosphorescence emission.

12. (a) Write a short note on Chemiluminescence.

Or

- (b) Briefly describe photo dimerisation reaction with suitable examples.

13. (a) Comment on the photochemistry of metallocenes.

Or

- (b) Write a short note on photo substitution reactions.

14. (a) Describe the role of singlet molecular oxygen in photochemical reactions.

Or

- (b) Write a short note on Hoffmann-Loefer-Freytag reactions.

15. (a) Discuss the principle and working of Ferri-oxlate actinometry.

Or

- (b) Discuss Reinecke's salt actinometers.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Compare and contrast:
 - (a) Fluorescence with Phosphorescence
 - (b) Internal conversion with Inter system crossing (5+5)
 17. Briefly describe the Woodward-Hofmann rules for cyclo addition reaction.
 18. Describe the implications of photo rearrangement reactions in inorganic chemistry.
 19. Briefly discuss in detail the following:
 - (a) Photochemical isomerisation reactions
 - (b) Photo fries rearrangement in anilides (5+5)
 20. Briefly describe the principle of uranyl oxalate and photochroic actinometers respectively.
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A-10370

Sub. Code

4MCH3E3

**M.Sc. DEGREE EXAMINATION, APRIL 2021 &
Supplementary/Improvement/Arrear Examinations**

Third Semester

Chemistry

Elective: PHARMACEUTICAL CHEMISTRY

(CBCS – 2014 onwards)

Time : Three Hours

Maximum : 75 Marks

Part A

(10 × 2 = 20)

Answer **all** the questions.

1. Explain soft drugs with examples.
2. What is lead compound in drug discovery?
3. Mention the implications of SAR studies.
4. Write the structure of chloramphenicol.
5. What are antineoplastic agents?
6. How are antitubercular drugs classified?
7. What is the action of antihypertensive drugs?
8. What are Alpha blockers drugs?
9. Write about the principle of Mass spectroscopy.
10. What is retardation factor (Rf)?

Part B

(5 × 5 = 25)

Answer all questions, choosing either (a) or (b).

11. (a) Write a detailed account on de novo drug design.

Or

- (b) Discuss the development of SAR studies in drug discovery.

12. (a) Explain the synthesis of penicillin G.

Or

- (b) Explain SAR of terramycin.

13. (a) Explain the synthetic route of azathioprine.

Or

- (b) Discuss the synthetic route of pyrimethamine.

14. (a) Describe the synthesis and therapeutic action of Nifedipine.

Or

- (b) Discuss the synthesis and SAR of sodium nitroprusside.

15. (a) Discuss the principle and applications of NMR spectroscopy.

Or

- (b) Write a note on Thin layer Chromatography.

Part C

(3 × 10 = 30)

Answer any THREE questions.

16. (a) Write short notes on isoterism and bio-isoterism.
(b) Explain the rate theory of drug activity. (5+5)
 17. Discuss the structural features and SAR of Erythromycin.
 18. Describe the synthetic route, assay of (a) methotrexate
(b) amadodiaquine.
 19. Discuss the synthesis, therapeutic action and SAR of guanothidine.
 20. Explain the principle, instrumentation and applications of IR spectroscopy.
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