M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

First Semester

Chemistry

ORGANIC CHEMISTRY — I

(CBCS – 2022 onwards)

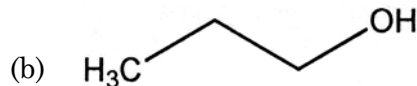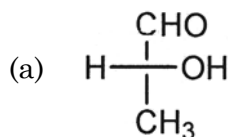Time : 3 Hours   Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1.   Classify the inductive effects with suitable examples.

2.   Write Taft equation and explain the terms in it?

3.   Indicate (if any) prochiral groups/faces in the following molecules.

(a)   (b)

4.   Write the structures of the following:

     (a)   E-1-chloro11, 2-dibromoethene

     (b)   Z-pent-2-ene-3, 2-dioic acid

5.   What is meant for anti aromaticity?

6.   State and explain Craig's rule.

7. What does the Hammond postulate state for?

8. Distinguish the SNi mechanism from the SNi'
    mechanism.

9. What is Cope reaction?

10. State the order of reactivity of halogens in halogenation
    reactions.

Part B $(5 \times 5 = 25)$

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

11. (a) Explain the limitations and modifications of
         Hammett equation.

                        Or

    (b) Distinguish the cross conjugation from hyper
         conjugation.

12. (a) Which of the following compounds are chiral. Give
         reasons for your explanation.

         (i)   trans-cyclopentane 1, 2 di carboxylic acid

         (ii) cis-cyclopentane 1, 2 di carboxylic acid

                        Or

    (b) How is the Cahn-Ingold-Prelog system used to
         assign priorities to substituents?

13. (a) Distinguish alternant hydrocarbons from
         non-alternant hydrocarbons.

                        Or

    (b) Why is adamantane considered to be a cage
         compound? Explain it in detail.

2   **S–5324**

14. (a) How can kinetic isotopic study be used to determine the mechanism of a reaction that involves a carbocation intermediate?

Or

(b) Give some examples of aryl and halogen compounds where neighbouring groups participated.

15. (a) Justify how ortho-para ratio be used to control the regiochemistry of a reaction?

Or

(b) How does pyrolytic elimination differ from other types of elimination reactions?

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss the significance of reaction and substitution constants in Hammett relationship.

17. Illustrate the stereoisomerism of monocyclic compounds in 3 and 4 membered rings. (5+5)

18. Elucidate the aromatic character in seven and eight membered rings. (5+5)

19. Explain the role of cross over experiments in determining the mechanism of organic reactions and provide the significances of trapping intermediates. (7+3)

20. Illustrate the conditions that favor S_Ei mechanism in an electrophilic substitution reaction with the appropriate examples.

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3

S–5324

S–5326	Sub. Code 22MCH1C3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

First Semester

Chemistry

PHYSICAL CHEMISTRY – I

(CBCS – 2022 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. What is the need for third law of thermodynamics?

2. Define chemical potential with the physical meaning.

3. How will you relate partition function with equilibrium constant?

4. Define an ensemble.

5. Briefly mention the classification of colloids.

6. Indicate the structure of a reverse middle.

7. Define activity coefficient of an electrolyte.

8. Write down Nernst equation and point out its significance.

9. What is phase rule?

10. State and explain Le Chatelier's principle.

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

11. (a) What is meant by fugacity? How does it change with pressure?

Or

(b) Explain the apparent exceptions to third law of thermodynamics.

12. (a) Point out the features of micro and macro states.

Or

(b) Describe how the thermodynamic properties E, H and S may be related to partition functions.

13. (a) Indicate the different models of electrical double layer.

Or

(b) Write notes on : Reverse micelles and micro emulsion.

14. (a) Define transport numbers and mention a method of its determination.

Or

(b) What are the various types of electrochemical cells?

15. (a) Describe the factors affecting chemical equilibrium.

Or

(b) Sketch and explain the behaviour of $KI-H_2O$ system obeying phase rule.

S–5326

Answer any **three** questions.

16. What is meant by partial molar quantities? How are they expressed for systems of two components?

17. Derive the Boltzman distribution law and comment on its significance.

18. For a surface catalysed reaction, discuss how Langmuir-Hinshelwood, Langmuir-Rideal and Rideal-Eley mechanisms differ?

19. Describe how equilibrium constant and solubility product are determined based on cell emf measurements.

20. Derive Gibb's phase rule and mention its applications.

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S–5328		**Sub. Code**
		22MCH2C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Second Semester

Chemistry

INORGANIC CHEMISTRY — II

(CBCS – 2022 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1. All Tetrahedral complexes are high spin. Why?

2. Write the formulae for the following:

    (a) diamminebis (ethylenediamine) rhodium (III) ion and

    (b) μ-hydroxo-bis [pentammineiron (III)] chloride

3. What is the principle of XPES?

4. What are the photochemical reactions of transition metal complexes?

5. Give the structures any two synthetic oxygen carriers.

6. How does Bohr Effect explain the oxygen binding affinity of hemoglobin?

7. Write down the function of vitamin B_{12}.

8. How are elements classified in biological system?

9. Write down the common oxidation states of lanthanides and actinides.

10. Write the general electronic configuration of f-block elements.

Part B $(5 \times 5 = 25)$

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

11. (a) Calculate CFSE of high and low spin d^4 complexes.

Or

(b) Derive the relationship between stepwise stability constant and overall stability Constant.

12. (a) Draw and explain XPES of HCl.

Or

(b) Explain the thorny and applications of XPES.

13. (a) Write short notes on metalloporphyrin.

Or

(b) Illustrate Perutz mechanism of the intake of oxygen by myoglobin and haemoglobin.

14. (a) Explain the mechanism of sodium ion pump.

Or

(b) Explain the toxicity and detoxification of following metals of Cd and Pb.

S–5328

15. (a) Compare lanthanides with Actinides.

Or

(b) Explain the extraction of lanthanides from monazite ores.

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) State and explain Jahn-Teller distortion.

(b) What is meant by CFSE? Calculate CFSE of d^6 low spin octahedral complex. (5+5)

17. (a) Discuss the Photochemistry of metallocenes.

(b) Draw and explain XPES of nitrogen. (5+5)

18. Write the structure of myoglobin. Describe the Perutz mechanism of low spin and high spin "trigger" in hemoglobin system.

19. Explain the toxicity and detoxification of following metals (a) Cu (b) Pb (c) Hg.

20. (a) Discuss the position of actinides in the periodic table.

(b) Distinguish between lanthanides and actinides. (5+5)

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3 **S–5328**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Second Semester

Chemistry

PHYSICAL CHEMISTRY – II

(CBCS – 2022 onwards)

Time : 3 Hours　　　　　　　　　　Maximum : 75 Marks

Part A　　　　　　　　$(10 \times 2 = 20)$

Answer **all** questions.

1. Indicate the requirement for a compound to be microwave active.

2. What is stark effect?

3. Briefly explain mutual exclusion principle.

4. Mention the selection rule for Raman spectra.

5. Point out the significance of the symbol B_2 occurring in character table.

6. Enumerate the different types of symmetry elements and briefly explain them.

7. Write down the selection rules for electronic spectra.

8. What do you understand by delocalisation energy?

9. How will you identify the occurrence of chain reactions in a system.

10. Point out the important assumption involved in steady state approximation.

Part B   (5× 5= 25)

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

11. (a) Briefly discuss the rotational spectrum of a diatomic molecule considering the selection rule.

    Or

    (b) Describe Fermi resonance.

12. (a) Explain the variation in the intensity of vibrational lines in electronic spectra.

    Or

    (b) What do you understand by Predissociation spectra?

13. (a) Differentiate between reducide and irreducible representations with an examples.

    Or

    (b) How will you systematically identify point group of a molecule? Explain with an example.

14. (a) Describe the electronic transitions in formaldehyde molecule.

    Or

    (b) What is triple product principle?

15. (a) Mention the condition for the occurrence of explosion in a chain reaction.

    Or

    (b) Briefly discuss the features of Lindemann – Himshelwood unimolecular reaction theory.

S–5329

Answer any **three** questions.

16. Discuss the origin of P,Q,R branch spectral lines in rotational fine structure of a diatomic molecule.

17. Describe the Fortrat diagram and its importance.

18. Construct the character table for $C_{3\vartheta}$ point group.

19. Explain the Hybridisation in CH_4 and BF_3.

20. Briefly out the salient features of RRKM theory in kinetics.

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S–5329

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Second Semester

Chemistry

Elective – PHARMACEUTICAL CHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is QSAR study?

2. Define prodrugs with suitable example.

3. Write the general characteristics of tetracycline.

4. Write down the structure and chemical name of erythromycin.

5. What are CNS depressants? Give examples.

6. How do you synthesize 6-mercaptopurine?

7. What are sympathomimetic drugs?

8. Write the characteristics of cardiovascular drugs.

9. Compare general and local anaesthetics.

10. Define analgecis and their utility.

Part B $(5 \times 5 = 25)$

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

11. (a) Explain occupancy and induced fit theory.

Or

(b) (i) What is lipophlicity? (2)

(ii) Give the significance of lead compounds in drug designing. (3)

12. (a) Write a note on SAR of cephalosphorin.

Or

(b) Outline the synthesis of chloramphenicol.

13. (a) Explain the role of alkylating agents in cancer treatment.

Or

(b) Give a synthetic route for

(i) Cyclophosphamide and

(ii) 6-mercaptopurine.

14. (a) Discuss drug inhibitors of peripheral sympathetic function.

Or

(b) Briefly explain about local anti-infective drugs.

15. (a) Give the preparation and uses of methylsalicylate and phenacetin.

Or

(b) Discuss the analgesic action of morphine.

2 S–5330

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Give notes on the following

    (a) Induced fit theory,

    (b) Lead compounds. (5+5)

17. (a) Discuss the structural feature and SAR of erythromycin. (6)

    (b) Give the synthesis of penicillin – V (4)

18. (a) Discuss the mode of action of hypnotics and sedatives. (7)

    (b) Write the synthesis for chlorambucil. (3)

19. (a) Give an account on central intervention of cardiovascular output. (6)

    (b) Outline the synthesis of methyldopa. (4)

20. (a) Give a brief account on volatile and non-volatile anaesthetics.

    (b) Explain the analgesic action of morphine. (5+5)

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3 **S–5330**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Second Semester

Chemistry

NME – CHEMISTRY IN EVERY DAY LIFE

(CBCS – 2022 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1. List out the composition of talcum powder.

2. What is meant by perfume? How many types of perfume are there?

3. What is meant by balanced diet?

4. Mention the sources of vitamin A and E.

5. How is PVC prepared?

6. What are sedatives?

7. What is Gobar gas? Give its composition.

8. How are fertilizers classified?

9. Define saponification.

10. What is the main component of oil and fat?

Part B $(5 \times 5 = 25)$

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

11. (a) Distinguish between soap and detergents.

Or

(b) Give the preparation and uses of nail polish and tooth paste.

12. (a) Discuss the classification and sources of protein.

Or

(b) Explain the terms sources and physiological importance of carbohydrate.

13. (a) Write a note on sedatives.

Or

(b) Explain the preparation and application of PVC.

14. (a) What are the advantages and disadvantages of bio gas?

Or

(b) What is meant by insecticide? Mention any three common insecticides used in agriculture. Give their hazards.

15. (a) Write a note on hydrogenation of oils.

Or

(b) Distinguish between oils and fats.

S–5331

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. What are soaps and detergents? How are they prepared? Differentiate soaps and detergents.

17. Discuss the sources and physiological importance of

    (a) Protein

    (b) Vitamin   (5+5)

18. Write short notes on

    (a) Vulcanization of rubber

    (b) Antipyretics

19. Describe the following

    (a) Gasoline

    (b) NPK

    (c) Pesticides   (3+3+4)

20. Explain the role and physiological changes of oil and fats in cooking of food items.

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S–5331

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Third Semester

Chemistry

ORGANIC CHEMISTRY – III

(CBCS – 2022 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A   (10 × 2 = 20)

Answer **all** the questions.

1.   What is Wolff rearrangement? Give an examples.

2.   Write Baeyer-Villeger rearrangement with a suitable example.

3.   How does HBr react with 1, 3-Butadiene?

4.   What is Mannich reaction? Give an example.

5.   Write the synthesis of Camphor.

6.   Outline the biosynthesis of alkaloids.

7.   Explain C-X disconnection with a suitable example.

8.   Write the use of activating group in organic group.

9.   What is Paterno-Buchi reaction? Give an example.

10.   Explain Ene reaction with an example.

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

11. (a) Discuss the reaction mechanism of Dienone-Phenol rearrangement.

Or

(b) Explain the mechanism of Favorski rearrangement with a suitable example.

12. (a) How does propene react with the following reagent?

(i) Br_2

(ii) HBr

(iii) H_2O (1+2+2)

Or

(b) Explain the reaction mechanism of Diekmann condensation reaction.

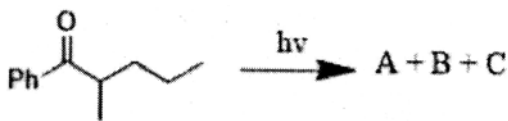13. (a) Discuss the structural elucidation of Zingiberene.

Or

(b) Write the structural elucidation of Morphine.

14. (a) Write Umpolung synthesis with a suitable example.

Or

(b) What is homogeneous hydrogenation reaction? Write its mechanism.

S–5332

15. (a) Write the products and mechanism for the following photochemical reaction.

Or

(b) What is cycloaddition reaction? Give any two examples.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Write the mechanism for the following rearrangement reactions.

   (a) Tiffeneau-Demjanov rearrangement

   (b) Wagner-Meervin rearrangement. (5+5)

17. Explain the mechanism for the following reactions.

   (a) 1,2 and 1,4 Michael addition reaction

   (b) Wittig reaction. (5+5)

18. Discuss the structural elucidation and synthesis of Abietic acid. (6+4)

19. (a) Write the total synthesis of trans-9-methyl-1-decalone.

   (b) Discuss the role of blocking groups in organic synthesis. (5+5)

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S–5332

20. (a) Discuss the photo oxidation and reduction reaction of Benzophenone.

   (b) Draw the correlation diagram for the disrotatory ring closure reaction of 1,3,5-Hexatriene. (5+5)

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4   **S–5332**

S–5333	Sub. Code
	22MCH3C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Third Semester

Chemistry

INORGANIC CHEMISTRY - III

(CBCS – 2022 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions

1.   How the inorganic complex classified based on kinetic stability? Write a note on labile complex.

2.   What is electron transfer reaction? Write done the classification with suitable examples.

3.   Write a short note on Para-magnetism and Ferromagnetism

4.   Brief about the spectrochemical and Nephelauxetic series.

5.   Write a short note on Doppler shift

6.   Give any two examples for shift reagent in NMR technique.

7.   Why the coordinated unsaturated hydrocarbon is susceptible for nucleophilic attack than the free unsaturated hydrocarbons?

8. Justify the Isolabal analogy

9. Write a short note on oxidative addition and reductive elimination of Vaska's complex

10. Write short note on hapticity of ligand with example.

Part B $(5 \times 5 = 25)$

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

11. (a) Give detail argument against the S_N^2 mechanism for the base hydrolysis of octahedral amine complexes of Co (III).

Or

(b) Write the reaction mechanism of acid hydrolysis when the ligand is a pi donor.

12. (a) Draw and discuss the qualitative correlation diagram of the following systems.

(i) d^2 octahedral and d^8 tetrahedral

(ii) d^1 octahedral and d^9 tetrahedral

Or

(b) Discuss the electronic spectra of the Ti^{3+} and Cr^{3+} in their aqueous solution.

13. (a) Discuss the detail note on $Fe_3[Fe(CN)_6]^{3-}$ and $K_3[Fe (CN)_6]^{3-}$ complex Mossbauer spectroscopy.

Or

(b) Calculate and explain the number of lines exhibited by EPR Spectrum of $[Cu(en)_2]^{2+}$ and CD_3.

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S–5333

14. (a) Describe the details notes on two possible structural arrangements of dinitrogen ligand metal complexes.

Or

(b) Elucidate the nucleophilic substitution reaction of metal aryl complexes.

15. (a) Write the reaction mechanism of cobalt catalyzed hyroformaylation of alkene by *oxo* process.

Or

(b) Discuses and draw the reaction mechanism of oxidation of olefin Wacker process.

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. What is trans effect? Discuss the theories of trans effect. Which theory explains better the trans effect of PR_3 ligand?

17. (a) State and explain Jahn- Teller effect;

(b) Why are Jahn-Teller distrotions automatic for octahedral geomety of some metal ions?

18. (a) Discuss the application IR spectroscopy in studying the metal carbonyls and other inorganic moieties.

(b) Fluorine and proton influences the NMR spectra of HPF_2. Justify.

19. Comment the structure and effect of substituent in the bond length and bond order of Zeise's salt.

20. Write a detail note on Wilkinson's catalyst and Tolman catalytic loops.

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S–5333

S–5334	Sub. Code
	22MCH3C3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Third Semester

Chemistry

PHYSICAL CHEMISTRY – III

(CBCS – 2022 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions

1. Why phosphorescence is slower than fluorescence?

2. Is inter system crossing in Jablonski diagram radiative or non radiative transition? Give reason.

3. How do you prove an operator is linear?

4. What does orthogonal mean in waves? Give its significance.

5. Give the importance of radial wave function.

6. State the main principle of tunneling effect.

7. Mention any four differences between NMR and NQR spectroscopy.

8. TMS is used as reference in NMR spectroscopy. Explain why?

9. Give the effect of temperature on enzyme catalysis.

10. What is acid-base catalysis? Give an example for each.

Part B $(5 \times 5 = 25)$

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

11. (a) Brief about the effect of temperature on emission process.

Or

(b) Write the principle of solar energy conversion.

12. (a) Briefly explain eigen function and eigen value of an operators.

Or

(b) Apply Shrodinger wave equation for a rigid rotator.

13. (a) Discuss the variation method of hydrogen atom.

Or

(b) Explain (i) Secular equation (ii) Secular determinant.

14. (a) Examine the following terms in NMR spectroscopy (i) Chemical shift (ii) Spin-spin splitting.

Or

(b) Explain the term 'zero field splitting' in ESR spectroscopy and Krammer's degeneracy.

15. (a) Give the significances of Michalis-Menton constant.

Or

(b) Brief about any one heterogeneous catalysis and its surface kinetics.

S–5334

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the followings

    (a) Chemiluminescence

    (b) Photosensitization.

17. Derive Schrodinger wave equation.

18. Discuss the molecular orbital theory of bonding taking H_2 molecule as an example.

19. Summarize the basic principle and applications of ESR spectroscopy.

20. Describe the following flow techniques in detail with neat diagram.

    (a) Temperature and Pressure jump method.

    (b) Flash photolysis.

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3   **S–5334**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Fourth Semester

Chemistry

INSTRUMENTAL METHODS OF ANALYSIS

(CBCS – 2022 onwards)

Time : 3 Hours　　　　　　　　　　　Maximum : 75 Marks

Part A　　　　　　　$(10 \times 2 = 20)$

Answer **all** questions.

1. Define any two types of errors.

2. Define accuracy with example.

3. Give the significant figure for the following.

   (a)　0.22

   (b)　4000

   (c)　00.1

   (d)　0.3000

4. Name any four precipitating agents.

5. What is the role of working electrode and give the name two working electrodes?

6. Write the principle of DTA.

7. Give any three Applications of TGA.

8. Write the limitations of Beer-lamberts law.

9. State the principle of Turbidimetry using a diagram.

10. Write the colour of the flame produced by Na, Cu, Mn and Ni in the flame photometry.

Part B $(5 \times 5 = 25)$

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

11. (a) (i) Differentiate between accuracy and precision with suitable examples. For an analytical chemist what should be practised. (3)

    (ii) Write note on standard deviation. (2)

Or

    (b) (i) Give a brief note on mean and median with examples. (2)

    (ii) What is f-test and t-test? (3)

12. (a) (i) Bring out the difference between Co- precipitation and Post-precipitation. (3)

    (ii) What is surface adsorption explain with example? (2)

Or

    (b) (i) How can we obtain a precipitate by dry precipitate method? (2)

    (ii) What are the ideal properties expected out of a precipitate? (3)

2 S–5338

13. (a) (i) Draw and explain the electrolytic cell. (2)

   (ii) Draw and give the half cell reactions for any two reference electrodes. (3)

Or

   (b) (i) Give the principle of Coulometry titration and represent its curves. (2)

   (ii) What are types of voltammetry techniques? (1)

   (iii) What is the role auxiliary electrode? (2)

14. (a) Principle and Instrumentation of TGA. (5)

Or

   (b) Difference between TGA and DTA. (5)

15. (a) (i) Give the methods available to measure colour. (1)

   (ii) Difference between turbidimetry and fluorimetry with a schematic of its instrumentation. (4)

Or

   (b) Illustrate the principle and instrumentation of Colorimetry. (5)

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Explain in detail about Correlation, regression and linear regression with appropriate example. (8)

   (b) How to minimize the errors? (2)

3 | **S–5338**

17. (a) Write a brief note on precipitates from homogenesis solution. (3)

    (b) Illustrate the principle of gravimetric analysis. (2)

    (c) Write the advantages and disadvantages of gravimetric analysis. (3)

    (d) How many types of gravimetric analysis exist? (2)

18. (a) What is electro gravimetric analysis and how to determine the metal ion by electro gravimetric analysis? (7)

    (b) Brief note on Amperometric technique. (3)

19. (a) Discuss the principle, Instrumentation and applications of DSC. (8)

    (b) Determination of degree of conversion of high alumina cement. (2)

20. (a) Derive Beer lamberts law. (5)

    (b) Elaborate on the principle, instrumentation Advantages and disadvantages of flame photometry. (5)

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S–5338

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Fourth Semester

Chemistry

NANOCHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1. Define nanomaterials. Name some nanomaterials around you.

2. What is quantum confinement how it affects the properties of nanomaterials?

3. What are the allotropes of carbon other than diamond and graphite? Give example.

4. Comment on the structure of C_{60}. Why C_{59} does not exist?

5. Illustrate example for organic nanoparticles. How it differs from inorganic nanoparticles.

6. How TiO_2 and ZnO are important in photocatalysis?

7. Differentiate SEM and TEM, in the context of their two and three dimensional characterizing ability.

8. Write Sherrer equation and explain the terms in it. How it is useful in determine the crystallite size?

9. Explain knots and junctions in DNA.

10. What is patterning in self-assembly?

Part B $(5 \times 5 = 25)$

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

11. (a) Explain the sot-gel synthesis of nanomaterials with the advantages. How crosslinking has been effected in sol gel network?

Or

(b) How sono chemical method is used in nanosynthesis? Compare it with microwave synthesis.

12. (a) Give the bonding and structure of fullerenes.

Or

(b) Write the applications of nanomaterial in textile technology.

13. (a) Describe the super conductivity of fullerenes with its current application.

Or

(b) Draw the structure and critically examine the applications of rotaxane.

14. (a) Give the principle of SEM.

Or

(b) Briefly explain about ESCA.

S–5339

15. (a) Write a short note on bionanomaterials with example. Is bionanotechnolgy will lead the future justify your answer?

Or

(b) What are nanosensors? Enumerate the construction and detection of analytes with examples.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Describe CVD method briefly with principle, instrumentation and applications.

17. Write a detailed note on graphenes with applications.

18. Elaborate an essay on inorganic nanomaterials. In the light of Metal oxide and composites.

19. Formulate the principle and applications of SPM techniques. How this differ from other electron microscopes?

20. What are nano arrays pipettes and transistors explain in detail.

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S–5339