R6751	Sub. Code
	538201

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Chemistry (Spl.in Nanoscience and Tech)

INORGANIC CHEMISTRY – II

(CBCS – 2019 onwards)

Time : 3 Hours   Maximum : 75 Marks

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

Answer **all** questions.

1.   Compare MO theory and Crystal field theory.

2.   Calculate octahedral site stabilization energy for Fe^{2+}.

3.   The rate constant for hydrolysis in basic solution is often a million times that found for acidic – solutions comment.

4.   Distinguish between trans effect' and trans influence'.

5.   In which of the following metal carbonyls, 18-electron rule is not obeyed? Explain.

   (a) $Cr(CO)_6$

   (b) $V(CO)_6$

   (c) $Fe(CO)_5$

   (d) $Ni(CO)_4$

6.   How will you prepare dibenzenechromium and give its structure?

7. What is hydroformylation reaction? Give example.

8. Write one example of CO migration reaction.

9. What is the role of metal ions in biological processes?

10. What are toxic metals? Why Cr is an essential toxic metal?

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

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

11. (a) Explain Jahn Teller distortion with examples.

Or

(b) With a MO diagram, explain the bonding in a T_d complex that has only sigma bonding.

12. (a) Compare outer sphere and inner sphere electron transfer reaction mechanisms in metal complexes.

Or

(b) Describe the kinetics and mechanisms of aquation reactions in the substitution of octahedral Co(III) complexes in aqueous medium.

13. (a) Discuss on bridging and terminal nitrosyl complexes.

Or

(b) Explain the structure and bonding of mononuclear metal carbonyls.

14. (a) Explain the mechanism of carbonylation of methanol by cis-$[Rh(CO)_2 I_2]^-$ catalyst.

Or

(b) Discuss the mechanism of hydrosilation reactions catalyzed by cationic palladium complexes.

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15. (a) Discuss oxygen-evolving complex in photosystem II.

Or

(b) Explain the structure of *cis*-platin and discuss the mechanism of its action in cancer therapy.

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

Answer any **three** questions.

16. Explain the crystal field theory for O_h and T_d coordination complexes.

17. Discuss theories and mechanisms of trans-effect in synthesis of coordination compounds.

18. (a) Discuss on the ionic versus covalent character in metallocenes. (5)

(b) Write a note on dinitrogen complexes of transition metals. (5)

19. Elaborate the oxidative addition and reductive elimination reactions of organometallic complexes.

20. Discuss the role and functioning of Na^+/K^+ ion pump.

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M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Chemistry
(Spl. In Nano Science and Technology)

ORGANIC CHEMISTRY – II

(CBCS – 2019 onwards)

Time : 3 Hours   Maximum : 75 Marks

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

Answer **all** the questions.

1.   What is Wilkinson catalyst?

2.   What is the product obtained when cyclohexene is treated with OsO_4?

3.   What is the reaction that involves the condensation of a carbonyl compound with an α-halo ester in the presence of a base to form an α, β-epoxy ester?

4.   Identify the products A and B from the below given Fries rearrangement reaction.
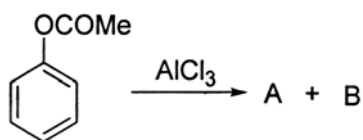
5.   What is benzyne mechanism?

6. Predict the major product of the following reaction.
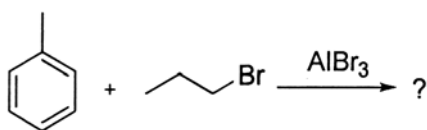
7. What are the consequences of vitamin B12 and K deficiency in human?

8. Write down the structure of the four types of nitrogen bases of DNA.

9. What are the applications of TLC?

10. What are the types of stationary phases used in chromatography?

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

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

11. (a) Explain the mechanism of Sharpless asymmetric epoxidation.

Or

(b) Elaborate the mechanism of Meerwein-Pondorf-Verley reduction.

12. (a) Write down the mechanism of Cannizaro reaction.

Or

(b) Explain Sommelet-Hauser rearrangement with mechanism.

13. (a) Give the mechanism of Gattermann-Koch formylation.

Or

(b) Discuss the significances of Hammett equation.

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14. (a) Write down the synthesis of equilenin.

Or

(b) Explain the structural features of retinol and ascorbic acid.

15. (a) Write a note on ion-exchange chromatography. What are the applications?

Or

(b) Discuss the basic principle and applications of GC.

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

Answer any **three** questions.

16. Comment on the mechanism of Woodward-Prevost oxidation and Birch reduction. (5+5)

17. Discuss the following reactions with mechanism: (5+5)

(a) Mainnch

(b) Favorskii

18. Explain the mechanisms of the following reactions: (5+5)

(a) Chichibabin

(b) Vilsmeyer-Haack

19. Elaborate the total synthesis of cholesterol.

20. Discuss the principle, working, instrumentation and applications of HPLC.

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R6753		Sub. Code
		538203

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Chemistry (Spl. in Nanoscience and Tech.)

PHYSICAL CHEMISTRY – II

(CBCS – 2019 onwards)

Time : 3 Hours   Maximum : 75 Marks

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

Answer **all** questions.

1.   What is meant by zero point energy?

2.   Define rigid rotator.

3.   Define symmetry elements and symmetry operations.

4.   Find the point group for the following molecules :

     BF_3, Cis-Platin, HCN and BrF_5.

5.   Explain the mutual exclusion principle for molecules with a center of symmetry.

6.   Calculate the number of vibrational modes for CH_4, CO_2, C_6H_6 and BeH_2.

7.   List out any three salient features of acid- base catalysis.

8.   Explain a short note on the catalytic efficiency of enzymes.

9.   Write any three differences between physisorption and chemisorptions.

10. State any two applications of semiconductor catalysis.

Part B (5 × 5 = 25)

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

11. (a) Explain about Jahn- Teller effect.

Or

(b) Discuss the shape of orbitals using wave mechanics.

12. (a) Write about the matrix representation of symmetry operations.

Or

(b) Give a brief note on great orthogonality theorem and its consequences.

13. (a) Write a short note on the symmetry selection rule for IR and Raman spectra.

Or

(b) Discuss in detail about the selection rules for $n - \pi^*$ and $\pi - \pi^*$ transitions in formaldehyde.

14. (a) Explain the mechanism of chain polymerization.

Or

(b) Describe the mechanism of enzyme inhibition in enzyme catalysis.

15. (a) Define Adsorption isotherm. Write about the Gibbs and Langmuir adsorption isotherm.

Or

(b) Write about the basic aspects of semiconductor catalysis and its applications.

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Part C (3 × 10 = 30)

Answer any **three** questions.

16. Derive an expression for three-dimensional particle in a box by potential well diagram.

17. What are character tables? Construct the character table for C_{2v} point group. Discuss the significance of each area of the table.

18. Write down the SALC procedure and its application to ethylene molecule.

19. Derive Michaeli's Menton constant for the mechanism of enzyme catalysis.

20. Describe in detail about the Langmuir-Rideal mechanism of heterogeneous catalysis.

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	538503

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Chemistry – (Spl. in Nanoscience and Tech.)

SYNTHESIS AND CHARACTERISATION TECHNIQUES OF NANOMATERIALS

(CBCS – 2019 onwards)

Time : 3 Hours   Maximum : 75 Marks

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

Answer **all** the questions

1. Write a short notes on CVD.

2. Give the application of sol-gel process.

3. Write the principle of UV.

4. Define FTIR.

5. Explain the fundamental principle of XRD.

6. Write the application of DSC.

7. What is Backscattered electron?

8. What is Dislocation?

9. Define Interaction force from AFM.

10. Difference between contact and noncontact mode.

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

11. (a) Briefly note on Spin coating.

    Or

    (b) Explain the use of bacteria for synthesis of nanoparticles.

12. (a) Explain the theory of UV – Visible spectroscopy.

    Or

    (b) Explain the instrumentation of NMR Spectroscopy.

13. (a) Define heating rate principle and their applications.

    Or

    (b) Write the principles of DTA.

14. (a) Write short notes on HR-SEM.

    Or

    (b) Write the application of HR-TEM.

15. (a) Explain in detail about AFM.

    Or

    (b) Discuss about the AFM tip on nanometer scale structures.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain in detail about :

    (a) Solvothermal process

    (b) Sonochemical method.

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17. Explain the Raman Spectroscopy.

18. Discuss about the X ray Diffraction.

19. Discuss about the basic design of the high resolution
     Scanning Electron Microscopy.

20. Explain about the different modes of operation.

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M.Sc. DEGREE EXAMINATION, APRIL – 2022

Fourth Semester

Chemistry (Spl. in Nanoscience and Tech.)

NANOCOMPOSITES

(CBCS – 2019 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A   (10 × 2 = 20)

Answer **all** questions.

1.   Distinguish microcomposite and nanocomposite.

2.   Write the nomenclature of nanocomposites?

3.   Distinguish Ceramic and Metal matrix nanocomposites.

4.   State fractal based glass metal nanocomposites.

5.   State the advantages of reinforced polymer composites.

6.   Write advantages and limitations of in-situ intercalative polymerization.

7.   Which nanocomposites are present in Shell?

8.   Which nanocomposites are better for teeth replacement?

9.   How polymer nanocomposites are used in textiles?

10.   State energy application of nanocomposites.

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

11. (a) Explain in detail about the physicochemical analysis of nanocomposites.

Or

(b) Discuss in detail about the surface mechanical properties of nanocomposites.

12. (a) Explain electrical property of fractal based nanocomposites.

Or

(b) Write short notes on core-shell structured nanocomposites.

13. (a) Discuss in detail about the preparation procedures of polymer nanocomposites with suitable experimental design.

Or

(b) Discuss polymer clay nanocomposites and its industrial possibilities.

14. (a) Write short notes on spider silk nanocomposites.

Or

(b) Describe in detail about bio-mimetic synthesis of nanocomposite material.

15. (a) Discuss in detail about pharmaceutical applications of nanocomposites.

Or

(b) Write short notes on polymer metal based nanocomposites.

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Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain in detail about the role of statistics in materials and how transitions affect the properties of nanocomposites.

17. Explain in detail about Metal matrix nanocomposites.

18. Explain in detail about Polymer matrix nanocomposites.

19. Explain in detail about organic-inorganic nanocomposite formation through self assembly.

20. Explain in detail how nanocomposites are suitable for electric and electronic components and its applications.

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