R7324	Sub. Code
	538301

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

Third Semester

Chemistry (Spl. in Nanoscience and Tech.)

INORGANIC CHEMISTRY – III

(CBCS – 2019 onwards)

Time : 3 Hours   Maximum : 75 Marks

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

Answer **all** the questions.

1. How many normal modes are possible in linear and non-linear molecules?

2. What is the sign of isomeric shift values for $S_n(\text{II})$ and $S_n(\text{IV})$?

3. Define charge transfer spectra.

4. Define Neels temperature.

5. Define spin-spin coupling.

6. What is meant by fluxinal molecules? Give one example.

7. Why the energy transfer is greater in cyno chromium complexes than fluoro substituted complexes?

8. What is meant by photosensitizer?

9. What is meant by blue protein?

10. What is meant by co-operative and non-cooperative?

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

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

11. (a) Account for the variation in the carbonyl stretching bands of the following compounds $CO(2143 \text{ cm}^{-1})$:

$[M_n(CO)_6]^+ \ (2090 \text{ cm}^{-1})$; $Cr(CO)_6 \ (200 \text{ cm}^{-1})$; $[V(CO)_6]^{-1}(1860 \text{ cm}^{-1})$.

Or

(b) Assign the various types of sulphate coordination to the metal ion using IR and Raman spectroscopies.

12. (a) Explain d orbital splitting pattern of CO (III) complexes in cubic, tetrahedral and rhombic.

Or

(b) The ground state Russel-Saunders symbols of d^7 configuration of free metal ions.

13. (a) Discuss the possible structures on reaction between AsF₃ and SO₃.

Or

(b) Explain the NMR studies of exchange reaction between $[CO(NH_3)_5 H_2 O]F_3$ and $[CO(NH_3)_5 H_2 O]^{+2}$.

14. (a) Detail study of quenching of the 3MLCT excited state.

Or

(b) What is meant by photoaquation? Discuss the photoaquation of Cobalt (III) complexes.

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15. (a) Write a short note on metal ions catalysed decarboxylation.

Or

(b) Describe the role of Mg^{+2} in chlorophyll.

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

Answer any **three** questions.

16. (a) Short notes on spin crossover in the complex $[Fe(phen)_2(NCS)_2]$. (5)

(b) How do you account for the following observation? The $^{119}S_n$ mossbauer spectrum of black S_nO shows a quadrupole splitting of 1.45 mm s^{-1} whereas the spectrum of S_nTe shows a sharp line with no quadrupole splitting. (5)

17. How do you determine magnetic susceptility moment by Gauy balance method.

18. Describe the chemical exchange on NMR spectra and evaluation of reaction rates for the past reaction.

19. (a) Detail mechanism of photo substitution of $[Ru(bpy)_3]^{+3}$ complex. (5)

(b) Explain the photoisomerisation of cobalt (III) complexes with suitable examples. (5)

20. Discuss the role of $Z_n(II)$ is enzymatic and nucleic acid activities.

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R7325		Sub. Code
		538302

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

Third Semester

Chemistry (Spl. In Nanoscience and Technology)

ORGANIC CHEMISTRY — III

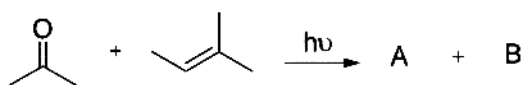### (CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** questions.

1. State Franck-Condon principle.

2. Predict 'A' and 'B' in the following photochemical reaction:

3. What is a metastable ion?

4. Define Beer-Lamberts law.

5. Define coupling constant.

6. What is the significance of deuterium exchange experiment?

7. Write down the Skraup synthesis of quinolone.

8. What are the major classes of heterocycles?

9. Give one example involving umpolung.
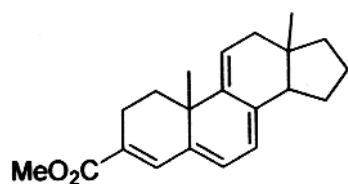
10. Define FGI. Give example.

Part B (5 × 5 = 25)

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

11. (a) Elaborate the photochemistry of benzophenone.

Or

(b) Explain Norrish type I reaction with suitable examples.

12. (a) Calculate the λ max for the following compound.

Or

(b) Explain the factors that influence carbonyl vibration frequency in IR spectroscopy.

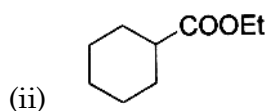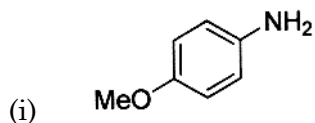13. (a) Explain spin-lattice and spin-spin relaxation in NMR.

Or

(b) Discuss the uses of CIDNP technique in NMR.

14. (a) Discuss the mechanism of Knorr method to synthesize pyrrole.

Or

(b) Comment on the mechanism of Fischer indole synthesis.

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15. (a) Perform retrosyntheses of the following molecules. Identify the respective synthons and synthetic equivalents.

(i)

(ii)

Or

(b) Give two examples each for chemoselective protection and regioselective protection.

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

Answer any **three** questions.

16. (a) Explain the mechanism of Paterno-Buchi reaction.

(5+5)

(b) Write notes on cycloaddition reactions. Give examples.

17. (a) Comment on the retro Diels-Alder reaction in mass spectroscopy. (5+5)

(b) How will you distinguish inter- and intra-molecular hydrogen bond in IR spectroscopy?

18. What are the factors that influence ^{1}H and ^{13}C NMR chemical shift? Explain in detail.

19. How will you prepare isoquinoline and pyridine? Give the mechanisms.

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20. (a) What are the methods to protect and de-protect carbonyl and amino groups? (5+5)

    (b) What do you mean by functional group transposition in retrosynthesis? Explain with examples.

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M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

Third Semester

Chemistry (Spl. in Nanoscience and Technology)

PHYSICAL CHEMISTRY – III

(CBCS – 2019 onwards)

Time : 3 Hours   Maximum : 75 Marks

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

Answer **all** questions.

1.   Give a short note on spin-orbit coupling.

2.   Write a short note on spectroscopic transitions.

3.   Discuss the classification of polyatomic rotors and the non-rigid rotors.

4.   What are the symmetry and spin selection rules in electronic spectroscopy?

5.   Write any three importance of corrosion studies.

6.   Differentiate primary and secondary cell with examples.

7.   Write any two equations of Maxwell relations.

8.   Explain the Sackur- Tetrode equation.

9.   Define Bragg's law and list any two of its applications.

10.   What are the types of defects in crystal lattices?

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

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

11. (a) Explain briefly about the structure of hydrogen molecule.

Or

(b) Discuss about atomic orbitals and their energies.

12. (a) Describe broadly about the Franck-Condon principle.

Or

(b) The spectrum of HCl shows a very intense absorption band at 2886 cm^{-1}, a weaker one at 5778 cm^{-1} and a very weak one at 8347cm^{-1}. Find the oscillation frequency (ϖ_e) and anharmonicity constant (x_e).

13. (a) Give a brief note on Leclanche cell.

Or

(b) Explain broadly about the cathodic and anodic protection.

14. (a) Explain about the canonical ensembles and grand canonical ensembles.

Or

(b) Describe about the emf and galvanic cells with examples.

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15. (a) Write a brief note on Le Chatelier principle with suitable examples.

Or

(b) Write in detail about

(i) Partition function

(ii) Classical partition function

(iii) Translational partition functions. (2+1.5+1.5)

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Write elaborately about the applications of perturbation theory.

17. Explain the determination of anharmonicity constant, fundamental, overtones and normal modes of vibrations in vibrational spectroscopy.

18. Explain the principle, working and applications of any two types of fuel cells.

19. Describe about the Bose-Einstein and Fermi-Dirac distribution in statistical thermodynamics.

20. Discuss about Meissner effect and BCS theory of superconductors.

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R7327	Sub. Code
	538506

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

Third Semester

Chemistry (Spl. in Nanoscience and Technology)

APPLICATION OF NANOTECHNOLOGY

(CBCS – 2019 onwards)

Time : 3 Hours   Maximum : 75 Marks

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

Answer **all** questions.

1. Write short notes on Ion Beam Techniques.

2. What is Chemical Nanosensor?

3. Define Nanodiagnostics.

4. Give the short notes on impact of nanotechnology in medicine.

5. Define Vaccination.

6. Write short notes on Non-Targeted Delivery.

7. What is Thermoelectric effect?

8. What is Piezoelectric effect?

9. Write about Molecular Electronics.

10. Write about the uses of carbon nanotube.

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

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

11. (a) Briefly note on Deep UV/E beam Lithography.

Or

(b) Write short notes on Polymers in Microsystems.

12. (a) Write about the Bioactive nanomaterials in medicine.

Or

(b) Write a short note on DNA biosensor.

13. (a) Discuss about the Protein and peptides based compounds for cancer and diabetes.

Or

(b) Write about the nanoparticles drug delivery in Cardiology.

14. (a) Give the notes on Antimalarial activity using nanomaterials.

Or

(b) Write about the removal of bacteria and microbes by using nanomaterials.

15. (a) Describe the short notes on Photolithography.

Or

(b) Explain the Physical concepts of nanoelectronics.

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Answer any **three** questions.

16. Give short notes on Silicon MEMS fabrication technology.

17. Give short notes on Self-assembled protein nanoarrays.

18. Give the accounts on Gene therapy.

19. Write the details about Antiviral and Anticancer activities using nanomaterials.

20. Write about the short notes on Dye Sensitized Solar Cells.

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