

10. (a) (i) Give an account of FT-IR and FT-Raman spectroscopy and their applications. (10)
- (ii) Discuss the role of computer averaging in spectroscopic techniques. (5)

Or

- (b) (i) Explain the principle of FT spectroscopy. Discuss various types of FT spectrographs. (6)
- (ii) What are the requirements of solvents used in UV-visible spectroscopy? (4)
- (iii) Explain the following :
- (1) Photometric precision
- (2) Difference spectroscopy. (5)

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Paper I — RESEARCH METHODOLOGY
(Held in April 2010)

Time : Three hours

Maximum : 100 marks

PART A — (5 × 5 = 25 marks)

Answer ALL questions.

1. Distinguish between basic research and applied research.
2. Explain the terms histogram, dispersion and range.
3. What are the postulates of a group?
4. TLC is superior over other chromatographic techniques. Explain.
5. Explain the factors affecting photometric accuracy.

PART B — (5 × 15 = 75 marks)

Answer ALL questions.

6. (a) (i) What is an optimum data? How are the collected data analysed? (8)
- (ii) Explain the following :
- (1) Literature survey
- (2) Bibliography. (3 + 4)

Or

- (b) (i) Discuss various components of a research paper. (10)
- (ii) Discuss the importance of scientific seminars in research. (5)

7. (a) (i) Give an account of systematic errors. How are they minimised or eliminated? (10)
- (ii) Write briefly on Gaussian curve of errors. (5)

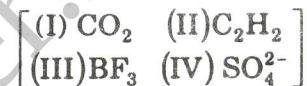
Or

- (b) (i) Explain the methods followed for the rejection of data. (6)
- (ii) Obtain equations for variance and standard deviation of combination of components. (4)
- (iii) Write a note on polynomial regression. (5)

8. (a) (i) Taking CH_3Cl molecule as an example, explain how the fundamental vibrations are distributed among the symmetry species of point groups. (6)
- (ii) Discuss the matrix representation of point groups. (6)

- (iii) Which of the following molecules/ions have

- (1) A centre of inversion and
(2) an S_4 axis. (3)



Or

- (b) (i) Discuss the solid state effects on molecular symmetry. (5)
- (ii) Write the character table for C_{3v} point group and explain its format. (5)
- (iii) Explain the distribution of fundamentals among the symmetry species with an example. (5)

9. (a) (i) Explain the principle and experimental details of column chromatography. (12)
- (ii) Write briefly on the pumping systems and detector systems used in HPLC. (3)

Or

- (b) (i) Explain the principle of ion exchange chromatography. (5)
- (ii) Discuss the types of ion exchangers used. (5)
- (iii) List the applications of GC. (5)

Paper II— COURSE WORK — I
(Held in April 2010)

Time : Three hours

Maximum : 100 marks

PART A — (5 × 5 = 25 marks)

Answer ALL questions.

1. Discuss the electromagnetic enhancement mechanism of SERS.
2. Explain various techniques for the characterization of nanomaterials and nanostructures.
3. Explain transform with two examples.
4. What are the advantages of using Technetium in radio – pharmaceuticals?
5. Discuss the use of clay materials in green chemistry with two examples.

PART B — (5 × 15 = 75 marks)

Answer ALL questions.

6. (a) (i) What is resonance Raman effect? Explain its principle and theory. (7)
(ii) Discuss inverse Raman effect and its instrumentation. (8)
Or
(b) Write notes on :
(i) NMR imaging. (7)
(ii) Reflection absorption infra-red spectroscopy. (8)
7. (a) (i) How are nanoparticles prepared by evaporation and sputtering methods? Mention the differences between these two methods. (11)
(ii) How are Rh and Ni nanoparticles prepared? (4)

Or

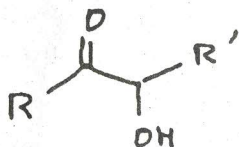
(b) (i) Describe the sol-gel synthesis of nanoscale metal oxide powders with an example. (8)

(ii) Discuss the magnetic properties of nanomaterials. (7)

(a) (i) What is total synthesis? Explain with an examples. (5)

(ii) Explain the terms synthons, synthetic equivalent, retron, supra retron, partial retron and chiron. (6)

(iii) Carry out retrosynthesis on the following compound and suggest a suitable synthetic route. (4)



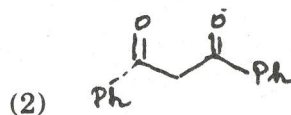
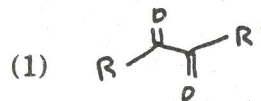
Or

(b) (i) How will you effect the following conversions?



(6)

(ii) Explain the retrosynthesis of the following :



Suggest a probable synthetic route to each of them. (9)

9. (a) Discuss the medicinal activities and uses of platinum complexes. (15)

Or

- (b) (i) Explain the principle involved in MW assisted synthesis. What are the advantages of MW technique? (6)
(ii) What is meant by SCF? Discuss the applications of SCF's with examples. (9)

(b) Write short notes on :

- (i) Lithium and manic – depression.
(ii) Gallium and indium radio-pharmaceuticals.
(iii) Ligands for forming stable Ga(III) and In(III) complexes. (5 + 5 + 5)

10. (a) (i) Discuss the principles of green chemistry. (10)
(ii) Explain any two solvent – free thermal reactions. (5)

Or

9. (a) (i) Discuss the uses of rhodium (I) catalyst. (10)
(ii) Explain the asymmetric synthesis of D-alanine. (5)

Or

- (b) (i) What is meant by Proximity effect? Explain with two examples. (6)
(ii) Explain the function of enzyme-activated irreversible inhibitors with an example. (5)
(iii) Discuss the inhibitory action of 2-amino-4-methoxy-trans-3-butanoate. (4)
10. (a) (i) Discuss the factors that affect the selectivity of cation complexation. (7)
(ii) Discuss various CD catalysed reactions with examples. (8)

Or

- (b) (i) With a suitable example discuss the ion-dipole interaction. (4)
(ii) Discuss the structure and shapes of cyclodextrins. (6)
(iii) Explain a method of preparation of C_{60} and C_{70} . (5)

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Paper III — COURSE WORK – 2
(Held in April 2010)

Time : Three hours Maximum : 100 marks

PART A — ($5 \times 5 = 25$ marks)

Answer ALL questions.

1. Explain the method of specifying nuclear spin systems with suitable examples.
2. What are the characteristics of a good protecting group? How is a carbonyl group protected?
3. What is a J state? How is it determined? Explain with an example.
4. Explain Ogston effect with an example.
5. Discuss Emil-Fisher's model of enzymes.

PART B — ($5 \times 15 = 75$ marks)

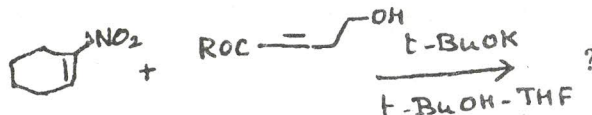
Answer ALL questions.

6. (a) (i) Distinguish between Overhauser effect and nuclear Overhauser effect (NOE). Explain these effects with the help of Solomon diagram. (10)
(ii) Explain (INEPT) pulse sequence with an example. (5)

Or

- (b) (i) Explain the theory of dynamic NMR and its application. (5)
- (ii) Discuss INDOR spectroscopy with the help of AMX system. (5)
- (iii) Write briefly on spin echo experiment. (5)

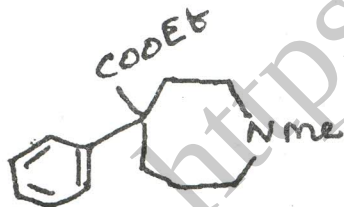
7. (a) (i) Predict the product and discuss the mechanism of the reaction. (7)



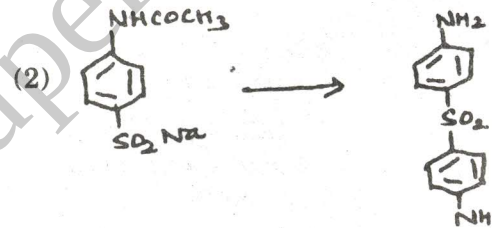
- (ii) Discuss chemoselectivity in organic synthesis. (6)
- (iii) How is an acetylenic compound used for the synthesis of a ketone? (2)

Or

- (b) (i) Perform retrosynthesis on the following compound and suggest a method for its synthesis. (10)



- (ii) How are the following conversions effected? (5)



8. (a) Explain how group theoretical terms are obtained in weak and strong field limits in Oh points group? For $3d^2$ system, how the energies of transitions obtained? Also explain the calculation of $10Dq$, B' and β . (15)

Or

- (b) (i) Show that carbon atom has 15 micro states. (4)
- (ii) Discuss the charge transfer spectrum of MX_6 . (6)
- (iii) Discuss the crystal field spectrum of $3d^1$ system in a tetrahedral environment. (5)