

[SCA – S 311]

M.Sc. DEGREE EXAMINATION.

Third Semester

Chemistry

Specialisation : Analytical Chemistry

Paper IV — INSTRUMENTAL METHODS OF
ANALYSIS – I

(Effective from the admitted batch of 2009–10)

Time : Three hours

Maximum : 80 marks

SECTION A — ($4 \times 5 = 20$ marks)

Answer ALL questions.

1. (a) What are laws of absorption?

Or

(b) Explain the terms — Fluorescence and phosphorescence.

2. (a) Give the principle of FTIR.

Or

(b) How does Raman spectroscopy differ from fluorescence spectroscopy?

3. (a) What do you understand by spin-spin splitting?

Or

- (b) What is g-value in ESR spectroscopy?

4. (a) Give the principle of mass spectroscopy.

Or

- (b) What are the evaluation methods used in X-ray fluorescence spectroscopy?

SECTION B — (4 × 15 = 60 marks)

Answer ALL questions.

5. (a) (i) How do you determine Fe^{3+} , Cr^{3+} and Co^{3+} quantitatively using spectrophotometric methods?

- (ii) Write notes on spectrophotometric titrations.

Or

- (b) Explain the relation between intensity of fluorescence and concentration. How is this technique useful for the determination of Al^{3+} and chromium salts?

6. (a) Give a detailed account of the use of IR-spectroscopy for the qualitative and quantitative determinations with reference to petroleum refinery and polymer industry.

Or

- (b) What are the advantages and disadvantages of Raman spectroscopy as compared to IR spectroscopy?

7. (a) Write notes on :

- (i) double resonance
- (ii) spin-tickling and
- (iii) shift reagents in NMR spectroscopy.

Or

- (b) Explain the difference between hyperfine splitting and fine splitting in ESR spectroscopy. How is its technique useful for free radical determination?

8. (a) Give the basic instrumentation and applications of mass spectroscopy.

Or

- (b) Explain how X-ray spectroscopy is useful for chemical analysis. What are matrix effects and applications of X-ray fluorescence spectroscopy?

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M.Sc. DEGREE EXAMINATIONS

CHEMISTRY

SPECIALIZATION : ANALYTICAL CHEMISTRY

THIRD SEMESTER

PAPER - IV : INSTRUMENTAL METHODS OF ANALYSIS - I

(W.E.F. 2016-17 Admitted Batch)

Time : 3 Hours

Maximum : 75 Marks

PART - A

Answer **ALL** the questions. All questions carry **equal** marks.
(4 × 15 = 60)

- a) Write about single beam and double beam spectrophotometers.
- b) Explain about spectrophotometric titrations.

OR

- c) What is Phosphorescence? Explain and give its applications.
- d) Write a brief note on 'Quenching'.
- a) Explain the instrumentation of IR spectroscopy with a neat block diagram.
- b) Give a detailed account on Fourier transformation IR.

(2)

OR

- c) What is Raman effect? Explain about Raman Spectra.
- d) Give the Raman spectra of CO, N₂O molecules.
3. a) What is Chemical shift in NMR? Explain the various factors effecting it.
- b) Explain about:
- Spin tickling
 - Shift reagents

OR

- c) Give a detailed account on the principle involved in ESR spectroscopy.
- d) Write the differences between ESR and NMR spectra.
4. a) Write about different types of peaks in Mass spectroscopy.
- b) How do you determine the molecular weight of a compound using Mass spectroscopy.

OR

- c) Write a brief note on Chemical analysis by using X-ray spectrometers.
- d) What are the different evaluation methods used in X-ray spectroscopy?

(3)

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PART - B

Answer any **Five** of the following. (5 × 3 = 15)

- Write about diode array spectrophotometers.
- Write the applications of Fluorescence with reference to thiamine(B₁).
- How IR spectroscopy is useful in qualitative analysis with reference to polymer industry.
- Write about differences between Raman and IR spectra.
- Write a brief note on 'spin-spin coupling'.
- Write about 'Krammers degeneracy'.
- What are the advantages of Mass spectroscopy?
- Write about wavelength dispersive techniques used in X-ray spectroscopy.

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M.Sc. DEGREE EXAMINATIONS

CHEMISTRY

SPECIALIZATION: ANALYTICAL CHEMISTRY

THIRD SEMESTER

Paper - IV : INSTRUMENTAL METHODS OF
ANALYSIS-I

(W.E.F. 2016-17 Admitted Batch)

Time : 3 Hours

Maximum Marks : 75

PART - A

Answer **ALL** the questions. All questions carry equal marks. (4×15=60)

1. a) Write about 'sources of radiation' and 'detectors' used in UV-VIS spectroscopy.
- b) Write about simultaneous determination of dichromate and permanganate using UV-VIS spectroscopy.

(OR)

- c) Write about the relation between intensity of fluorescence and concentration.
- d) Give a detailed account on Instrumentation in spectrofluorimetry.

(2)

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2. a) Explain about characteristic frequencies of various organic molecules in IR spectroscopy.
b) Write about sampling techniques and instrumentation in IR spectroscopy.

(OR)

- c) Explain the Raman spectra of CO, CO₂, N₂O and H₂O molecules.
3. a) Write about the origin of NMR spectroscopy.
b) Write about instrumentation of NMR spectroscopy.

(OR)

- c) How ESR spectroscopy is useful in the study of free radicals.
d) Write about hyperfine splitting in ESR spectroscopy.
4. a) Explain about principle involved in Mass spectroscopy.
b) How Mass spectroscopy is useful in the determination of molecular weights compounds.

(OR)

- c) Give a detailed account on the applications of X-ray spectroscopy.

(3)

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- d) Explain about energy dispersive techniques of X-ray spectroscopy

PART - B

Answer any FIVE of the following. (5×3=15)

5. Write about colorimetric determination of Fe (III).
6. Write about 'quenching'.
7. Give a brief note on the factors which effect the vibrational frequencies of molecules.
8. Give the major differences between Raman and IR spectra.
9. Write about mechanism of 'spin-spin coupling' in NMR.
10. Write about 'g' value in ESR spectroscopy.
11. What are the advantages of Mass spectroscopy?
12. How Mass spectroscopy is useful in the quantitative analysis

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M.Sc. DEGREE EXAMINATION.

Third Semester

Chemistry

Specialisation: Analytical Chemistry

Paper IV – INSTRUMENTAL METHODS OF
ANALYSIS – I

(Effective from the admitted batch of 2009–10)

Time : Three hours

Maximum : 80 marks

Answer ALL questions.

SECTION A — ($4 \times 5 = 20$ marks)

1. (a) Write applications of spectrofluorimetry with reference to Al^{3+} and chromium salts.

Or

- (b) Explain Beer-Lambert's law.

2. (a) Write short note on non-destructive IR method for the analysis of CO and other organic compounds.

Or

- (b) Explain Raman spectra of CO and H_2O .

3. (a) Explain the mechanism of spin-spin coupling.

Or

- (b) Explain the difference between ESR and NMR.

4. (a) What is the principle of mass spectrometry?

Or

- (b) Write short note on energy dispersive and wavelength dispersive techniques.

SECTION B — ($4 \times 15 = 60$ marks)

5. (a) Explain the theory and instrumentation of spectrofluorimetry.

Or

- (b) Describe the simultaneous determinations of dichromate and permanganate ions in a solution mixture by using UV-vis spectrophotometer.

6. (a) Write short note on molecular vibrations. Explain the theory and instrumentation of IR spectroscopy.

Or

- (b) Explain the principle, theory and the instrumentation of Raman spectroscopy.

7. (a) Write short note on each of the following:

- (i) Chemical shift
- (ii) Factors affecting chemical shift
- (iii) Spin-spin coupling.

Or

- (b) Describe the principle, theory and applications of ESR spectroscopy.

8. (a) Write short note on the following:

- (i) Types of peaks in mass spectrometry
- (ii) Molecular weight determination
- (iii) Basic instrumentation of mass spectrometer.

Or

- (b) Explain principle, theory, instrumentation and applications of XRF.

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M.Sc. DEGREE EXAMINATION.

Third Semester

Chemistry

Specialisation : Analytical Chemistry

Paper IV — INSTRUMENTAL METHODS OF
ANALYSIS – I

(With effect from the admitted batch of 2009–2010)

Time : Three hours

Maximum : 80 marks

SECTION A — ($4 \times 5 = 20$ marks)

Answer ALL questions.

1. (a) Explain laws of absorption.

Or

- (b) Explain the relation between intensity of fluorescence and concentration.

2. (a) Write short note on molecular vibrations.

Or

- (b) Write the differences between Raman and IR spectra.

3. (a) What is spin-spin splitting?

Or

(b) Write short note on Krammer's degeneracy.

4. (a) What is the principle of X-ray spectroscopy?

Or

(b) What are the different peaks observed in mass spectrum?

SECTION B — (4 × 15 = 60 marks)

Answer ALL questions.

5. (a) Explain the following :

(i) Spectrophotometric titrations

(ii) Determination of dichromate and permanganate in a mixture by colorimetry.

Or

(b) Explain the applications of spectrofluorimetry with reference to Al^{3+} , chromium salts, thiamin.

(a) Explain the instrumentation of IR spectroscopy.

Or

(b) Explain the following :

(i) Raman effect

(ii) Instrumentation of Raman spectroscopy.

(a) Explain FT-NMR.

Or

(b) What is 'g' value? Explain the factors affecting 'g' value.

8. (a) Explain the application of mass spectrometry in

(i) Qualitative analysis and

(ii) Quantitative analysis.

Or

(b) Explain the instrumentation of XRF.

3. (a) Write the basic theory of NMR spectroscopy.

Or

(b) Explain the NMR spectrum of ethanol.

4. (a) Discuss the significance of base and molecular ion peaks.

Or

(b) Write a short note on resolution in Mass spectroscopy.

SECTION B — (4 × 15 = 60 marks)

Answer ALL questions.

5. (a) Give an account on the following

- (i) Laws of absorption
- (ii) Deviations from Beer's law
- (iii) Detectors in UV spectroscopy.

Or

(b) Write the principle and procedure for the determination of the following spectro-photometrically.

- (i) Cr^{+6}
- (ii) Ni^{+2}
- (iii) PO_4^{-3}

(a) Write an essay on non destructive IR method for the analysis of CO and organic compounds.

Or

(b) Explain classical and quantum theories of Raman effect.

(a) Write a note on the following in ESR.

- (i) Factors effecting g-value
- (ii) Hyperfine splitting.

Or

(b) Give an account on the following in NMR.

- (i) Double resonance
- (ii) Spin tickling.

(a) Discuss about the following in X-ray spectroscopy.

- (i) Energy dispersive technique
- (ii) Wave length dispersive technique.

Or

(b) Give an account on the following in Mass spectroscopy.

- (i) Qualitative analysis
- (ii) Quantitative analysis.

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M.Sc. DEGREE EXAMINATION.

Third Semester

Chemistry

Specialisation - Analytical Chemistry

Paper IV — INSTRUMENTAL METHODS OF
ANALYSIS — I

(Effective from the admitted batch of 2005–2006)

Time : Three hours

Maximum : 60 marks

SECTION A — ($4 \times 5 = 20$ marks)

Answer ALL questions.

1. (a) Write notes on detectors used in spectrophotometers.

Or

- (b) Write the theory involved in fluorescence.

2. (a) Explain briefly the factors affecting NMR spectra.

Or

- (b) Write the differences between ESR and NMR.

3. (a) Draw and explain the instrumentation of flame photometer.

Or

- (b) Give the application of AAS in trace metal analysis of oil samples.

4. (a) Write the advantages of AC polarography over pulse polarography.

Or

- (b) Explain the principle involved in the coulometric analysis.

SECTION B — ($4 \times 10 = 40$ marks)

Answer ALL questions.

5. (a) Give the procedure for the colorimetric determinations of Fe^{3+} , Al^{3+} and Cr^{3+} using chelating ligands.

Or

- (b) Explain the theory involved in fluorescence and phosphorescence with factors affecting them.

6. (a) What is chemical shift? Explain. Write the factors affecting the chemical shift.

Or

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- (b) Explain :

- (i) Zero field splitting
- (ii) Hyperfine splitting and
- (iii) Superhyperfine splitting in ESR spectroscopy.

- (a) Write the applications of AAS in trace metal analysis of alloys and water samples.

Or

- (b) Explain in detail :

- (i) Instrumentation involved in ICP-AES
- (ii) Quadrupole mass spectrometers.

- (a) Write notes on :

- (i) Principle involved in polarography
- (ii) Ilkovic equation
- (iii) DME

Or

- (b) Write the applications of HMDE in the analysis of Pb^{2+} and Cd^{2+} .

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