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Roll Number ----- (Total Number of Questions 13) (Total number of Printed Pages 01)

Programme	B. Pharmacy
Semester	8 th
Subject	Advanced Instrumentation Techniques
Subject Code	BP811ET
Paper ID	79774
Time	3Hours
Maximum Marks	75

Instructions to Candidates: No supplementary/continuation sheet will be issued to the candidates. Answer the questions precisely.

*Section A consists of Ten parts of 2 marks each (Objective Type); Attempt **ALL**.

Section B consists of Three questions carrying 10 marks each (Long Answer); attempt any **TWO.

*** Section C consists of Nine questions carrying 5 marks each (Short Answer); attempt any **SEVEN**.

Section A

(10 X 2 = 20)

1. Write very short answers of the followings (2 marks each):

i.	What is Processional frequency?
ii.	Which Standard solvents are used for NMR Spectrophotometer?
iii.	What do you mean by Base peak and parent peak?
iv.	Explain ELISA.
v.	What is DTA?
vi.	Define Coupling constant.
vii.	Explain FAB and where it is used?
viii.	Write various types of thermo balances.
ix.	What is HPTLC-MS?
x.	Define Maceration.

Section B

(2 X 10 = 20)

2.	Give a detailed account of principles, instrumentation and application of ¹ H-NMR.
3.	Explain in brief principle, instrumentation and applications of Thermogravimetric Analysis (TGA).
4.	Give a detailed account of principles and application of liquid- liquid extraction.

Section C

(7 X 5 = 35)

5.	Define Chemical shift and write factors affecting chemical shift.
6.	Write in detail about mass fragmentation and its rule.
7.	Explain in brief about analyzers-Time of flight and Quadrupole.
8.	Describe the origin of X-rays, basic aspects of crystals.
9.	Write about limitation and applications of Radio Immuno Assay.
10.	Write short note on IR spectrophotometer.
11.	Write short note on solid phase extraction.
12.	Write short note on structural elucidation and applications of X- Ray diffraction methods.
13.	Write short note on GC-MS/MS.

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Section- A

(10 X 2 = 20)

1.	Give very short answers to the followings
i.	Briefly explain RIA.
ii.	Define chemical shift.
iii.	Mention applications of differential scanning calorimetry.
iv.	What do you mean by spin-spin coupling?
v.	Define calibration and process validation of UV-visible spectrophotometer.
vi.	What is MALDI?
vii.	Mention the principle of NMR spectroscopy.
viii.	Define maceration.
ix.	Name different analyzers used in mass spectrometry.
x.	Define the term extraction.

Section- B

(2 X 10 = 20)

2.	Give the principle, instrumentation and application of Mass spectrometry.
3.	Write a note on factor affecting chemical shift.
4.	Write a note on- (a) General principle and procedure involved in liquid-liquid extraction. (b) GC-MS/MS hyphenated technique

Section- C

(7 X 5 = 35)

5.	Differentiate between thermogravimetric analysis and differential thermal analysis (DTA)
6.	Write a note on calibration of UV-visible spectrophotometer.
7.	Write a note on applications of X-ray crystallography technique.
8.	How we can elucidate a structure of compound using ^1H NMR and ^{13}C NMR?
9.	Give the application of solid phase extraction.
10.	Write a note on LC-MS.
11.	Give the schematic diagram for instrumentation of NMR spectroscopy.
12.	Give the limitations and application of radioimmuno assay.
13.	Write a note on time of flight.

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*** Section C consists of Nine questions carrying 5 marks each (Short Answer); attempt any **SEVEN**.

Section- A (10 X 2 = 20)

1.	Give a very short answers to the followings:
i.	Define the nitrogen rule.
ii.	What do you mean by hyphenated techniques? Give two examples.
iii.	Enlist the sources of X-rays.
iv.	Define process validation.
v.	Name the standards and solvents used in Nuclear Magnetic Resonance (NMR) spectrometry.
vi.	Enlist the factors affecting the Differential Thermal Analysis (DTA) curve.
vii.	Name the radioactive counters used in Radioimmunoassay (RIA).
viii.	What is a decoction?
ix.	What are the reference materials used in Differential Scanning Calorimetry (DSC)?
x.	Enlist the parameters for the calibration of an Infrared (IR) Spectrophotometer.

Section- B (2 X 10 = 20)

2.	What is the definition of chemical shift, and how do various factors influence it?
3.	Discuss the operational principles and instrumentation involved in High Performance Liquid Chromatography-Mass Spectrometry (HPLC-MS).
4.	Describe the principle underlying X-ray Diffraction (XRD) and elaborate on the Powder X-Ray Diffraction method.

Section- C (7 X 5 = 35)

5.	What are the various types of ionization methods used in mass spectrometry? Explain Matrix-assisted laser desorption/ionization (MALDI).
6.	Give a comparison between Differential Thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC).
7.	Enlist the parameters for analytical method validation.
8.	Define calibration as per ICH guidelines and describe the standards used in calibration.
9.	How will you calibrate a UV-Visible spectrophotometer?
10.	Draw a well-labelled diagram illustrating the process used in Radioimmunoassay (RIA).
11.	Explain the hot extraction method for solids in detail.
12.	Write briefly about liquid-liquid extraction.
13.	What is the principle of mass spectrometry? Draw a block diagram showing various components of a mass spectrometer.

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**Section- B consists of three questions, each carrying 10 marks (Long Answer Type); Attempt any two.

***Section- C consists of nine questions, each carrying 5 marks (Short Answer Type); Attempt any seven.

Section- A (10X2=20)

1.	Give very short answers to the followings:
i.	Name the counters used in RIA.
ii.	What do you mean by molecular ion peak and base peak in MS?
iii.	Name the standards and solvents used in NMR spectroscopy.
iv.	Enumerate the types of thermobalances used in TGA.
v.	What is the difference between maceration and decoction?
vi.	Define calibration and process validation.
vii.	Enlist the sources of X-rays.
viii.	Write the parameters for calibration of an electronic balance.
ix.	What are hyphenated techniques? Give two examples.
x.	Name the interfaces of HPTLC-MS/MS.

Section- B (2X10=20)

2.	Give a detailed account of the principle and instrumentation of a mass spectrometer.
3.	Discuss the general principle and procedure involved in liquid-liquid extraction.
4.	Write a note on- (a) Powder X-Ray diffraction method (b) Calibration of HPLC

Section- C (7X5=35)

5.	Give the schematic diagram of an NMR spectrometer.
6.	Define chemical shift. How do various factors influence it?
7.	Write down the parameters for analytical method validation as per ICH guidelines.
8.	Write the principle and applications of the X-ray diffraction technique.
9.	Draw a well-labelled diagram of the process of RIA.
10.	Write a short note on GC-MS/MS.
11.	Name the thermal methods of analysis. Write a note on DTA.
12.	How will you calibrate a UV spectrophotometer?
13.	Write a note on continuous solid-liquid extraction using a Soxhlet apparatus.

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Section- A (10X2=20)

1.	Give very short answers to the followings:
i.	Define base peak.
ii.	What is NMR spectroscopy?
iii.	What do you understand by matrix assisted laser desorption/ionization (MALDI)?
iv.	Define chemical shift.
v.	Define coupling constant.
vi.	What is the role of mass spectrometry in hyphenated techniques GC/MS/MS?
vii.	Define validation as per ICH guideline.
viii.	Which compound is used for calibration of UV- vis spectrophotometer?
ix.	Define accuracy.
x.	Define molecular ion peak.

Section- B (2X10=20)

2.	Briefly explain principle, fragmentation rules and applications of mass spectrometry.
3.	Explain principle and application of NMR spectroscopy.
4.	Describe analytical method validation as per ICH guideline.

Section- C (7X5=35)

5.	Briefly explain principle and procedure involved in the liquid-liquid extraction.
6.	Briefly explain differential scanning calorimetry (DSC).
7.	What is principle of RIA?
8.	What is spin - spin coupling?
9.	Explain the production and application of X-rays.
10.	Write a note on FAB.
11.	Write a note on Quadrupole analyser.
12.	Write a note on LC-MS/MS.
13.	Describe the instrumentation of NMR.

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