

Bhakta Kavi Narsinh Mehta University



Syllabus on the bases of Choice Based Credit System (CBCS)

For

Semester III & IV

(S.Y.B.Sc.)

FORENSIC SCIENCE

SEMESTER – III

**Paper No.-I BASIC CONCEPTS AND PRINCIPLES OF PHYSICAL, CHEMICAL
AND BIOLOGICAL ANALYTICAL TECHNIQUES-1**

SEMESTER – IV

**Paper No.-II : FS-401 BASIC CONCEPTS AND PRINCIPLES OF PHYSICAL,
CHEMICAL AND BIOLOGICAL ANALYTICAL TECHNIQUES-2**

INFORCE FROM JUNE – 2017

SKELETON OF THEORY EXAMINATION
(EXTERNAL)

QUESTION 1 – UNIT 1		
Q 1 A	Objective type questions	4 Marks
Q 1 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 1 C	Write a note on (Any 1 out of 2)	7 Marks
QUESTION 2 – UNIT 2		
Q 2 A	Objective type questions	4 Marks
Q 2 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 2 C	Write a note on (Any 1 out of 2)	7 Marks
QUESTION 3– UNIT 3		
Q 3 A	Objective type questions	4 Marks
Q 3 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 3 C	Write a note on (Any 1 out of 2)	7 Marks
QUESTION 4 – UNIT 4		
Q 4 A	Objective type questions	4 Marks
Q 4 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 4 C	Write a note on (Any 1 out of 2)	7 Marks
QUESTION 5 – UNIT 5		
Q 5 A	Objective type questions	4 Marks
Q 5 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 5 C	Write a note on (Any 1 out of 2)	7 Marks
TOTAL MARKS : 70 TOTAL TIME : 2½ HOURS		

**FS-301: BASIC CONCEPTS AND PRINCIPLES OF PHYSICAL, CHEMICAL
AND BIOLOGICAL ANALYTICAL TECHNIQUES-1**

Unit – I Basic Concepts - Atomic & Molecular Spectroscopy-II

- II.1 Molecular spectra: qualitative discussions of molecular binding, molecular orbital, types of molecular energies
- II.2 qualitative discussions of rotational, vibrational and electronic spectra, spectra of polyatomic molecules
- II.3 IR spectroscopy- correlation of infra red spectra with molecular structure, Fourier Transform, infrared and Raman spectroscopy, fluorescence and phosphorescence spectrophotometer.

Unit - II Principles of Genetics

- II.1 Principles of Mendelian genetics
- II.2 DNA and Histons
- II.3 Structure and function of chromosomes
- II.4 Modern concept of gene
- II.5 DNA replication and protein synthesis

Unit - III Immunology

- III.1 Concept of immunity, classification
- III.2 Hormonal and Cellular immunity
- III.3 Immunoglobulin: Structure, Function, Types
- III.4 Antigen: Nature
- III.5 Antigen - Antibody reaction (In-vitro & In-vivo)
- III.6 Hypersensitivity, Allergy, Auto-Immune Diseases

Unit – IV Different types of separation techniques

IV.1 Chemical separation techniques

IV.2 Chromatographic techniques: General principles and function of following chromatography

- Paper chromatography
- Column chromatography
- TLC
- Adsorption chromatography
- Partition chromatography
- Gas chromatography
- Gas- liquid chromatography
- Ion-exchange chromatography
- Exclusion (permeation) chromatography
- Affinity chromatography, HPLC

IV.3 Electrophoresis Technique:

IV.3.1 General Principles

IV.3.2 Factors affecting electrophoresis

IV.3.3 Low voltage thin sheet electrophoresis & High voltage electrophoresis

IV.3.4 Sodium dodecylsulphate (SDS) polyacrylamide gel electrophoresis, Isoelectric focusing (IEF), Isoelectrophoresis

IV.3.5 Preparative electrophoresis, Horizontal and Vertical Electrophoresis

Unit – V

V.1 Examination of Hair and Fibers : morphology of human hair, its microscopic examination, determination of origin, race, sex, site.

V.2 Type of fibers (with one example each), forensic aspects of fiber.

V.3 Microscopic examination of diatoms and its forensic importance in drowning cases.

V.4 Introduction to body fluids, Identification and examination of stains of body fluids like saliva and urine

Suggested Experiments:

- 1.** Experiments on UV absorption of drug
- 2.** Experiments on UV absorption of dyes
- 3.** Experiments on UV absorption of Chemicals.
- 4.** Experiments on IR spectroscopy of Paints
- 5.** Experiments on IR spectroscopy of Drugs
- 6.** Experiments on IR spectroscopy of Organic compounds.
- 7.** Comparison of polythene films by IR spectrophotometer.
- 8.** Experiments on Gas chromatography of mixture of organic compound.
- 9.** Examination of saliva and its stains - biochemical test.
- 10.** Examination of Urine - biochemical and microscopically examination.
- 11.** Morphological and microscopic examination of hairs.
- 12.** Morphological and microscopic examination of fibers.
- 13.** Identification, classification and microscopic examination of Diatoms.
- 14.** Separation of given mixture by ascending paper chromatography.
- 15.** Separation of given mixture by thin layer chromatography

**FS-401: BASIC CONCEPTS AND PRINCIPLES OF PHYSICAL, CHEMICAL
AND BIOLOGICAL ANALYTICAL TECHNIQUES-2**

Unit – I Different types of Spectroscopy

- I.1 Atomic absorption spectrometry: Instrumentation and techniques, interference in AAS, background correction methods, quantitative analysis
- I.2 Thermal analysis methods, Basic principles and theory, differential scanning calorimetric and differential analysis, thermalgravimetry
- I.3 Nuclear Magnetic Resonance spectroscopy: Basic principles, theory and Instrumentation

Unit – II Immuno-chemical Technique

- II.1 General Principles and properties of antigen antibody
- II.2 Production of antibodies
- II.3 Precipitin reaction, Gel immuno-diffusion, Immuno-electrophoresis, complement fixation, Radio Immuno Assay (RIA), ELISA, Fluorescence immuno assay.

Unit – III Forensic analysis of petroleum products, arson residue and phenolphthalein

- IV.1 Petrol, Kerosene, Diesel, ATF, Lubricating Oil, Furnace oil, Grease and Solvents and Bio diesel as per IS Standard methods.
- IV.2 Fire: Causes, Chemistry and Behavior of fire, Analysis of Fire Evidence by Chemical and Instrumental methods.
- IV.3 Examination of Chemicals used in trap cases.

Unit – IV Forged Documents

- V.1 Examination of counterfeit currency notes, passport, credit card, and visa card
- V.2 Examination of seal and counterfeit coins.
- V.3 Examination of alterations, erasers, overwriting, addition and obliterations in documents

Unit –V Introduction of Cyber crime

V.1 Introduction to digital forensic , Use of digitalization in banking sector

V.2 Digital payments (cashless payment)

V.3 Advantage and disadvantage of digital payments

V.4 Risks in digital payment transaction

V.5 Prevention of risks in digital payment transaction (security tips)

V. 6 Types of other cyber crimes

Suggested Experiments:

1. To perform the antigen antibody reaction.
2. Examination of additions, alterations, and obliterations in the documents.
3. Examination of indented handwriting
4. Analysis of phenolphthalein in bribe cases
5. Examinations of petroleum products by using TLC.
6. Examinations of petroleum products by using UV spectrophotometer.
7. Experiments on Gas Chromatography / Gas Chromatography –Atomic Thermal Desorption analysis of Arson evidence and Organic volatile substances.
8. Examination of security documents (currency notes and passports)
9. Examination of security features of debit card, visa card and credit card.
10. Imaging of hard disc, restoration of deleted files, password cracking, e-mails.
Tracking

References Books

1. *Richard Saferstein; Forensic Science hand Book; Ed.; Prentice-Hall, Englewood Cliff, New Jersey;(1982)*
2. *Biology Methods manual; Metropolitan Police Forensic Science laboratory, London; (1978)*
3. *Herbert R. Mauersberger; Mathews Textile Fibres-their physical, Microscopic ad chemical properties; John Wiley, New York; (1954)*
4. *Working Procedure Manual; Biology BPR & D Publication; (2000)*
5. *Working Procedure Manual; serology BPR & D Publication; (2000)*
6. *Roitt Essential Immunology. Blackwell Publication. Oxford, UK*
7. *'Fire investigation'; Niamh nic daeid,2004*
8. *'Spot test in organic analysis'; Fritz feigl,2005*
9. *'Essential forensic biology'; Alan gunn,2009*
10. *'Cyber crime'; Amit acharya,2008*
11. *'Forensic document examination'; Katherine M.koppenhaver,CDE,2007*
12. *'Handbook of analytical separation'; M.J.Bogusz',2008*
13. *'Roitts Essential Immunology, 11th'; Peter J.delves,seamus J.martin,Dennis R.burton and L.van M.roott,2006*
14. *'Forensic Examination of fibers 2nd edition'; James Roberson,Michael grieve,2009*
15. *'Immunology,3rd edition'; Roitt H.Brostoff,1993*
16. *'Digital Forensic'; Angus M.Marshal,2008*
17. *'Spectrometric Identification of organic Compound,6th edition'; Robert M.silverstein,Francis X.webster,2009*
18. *'Fundamental of Forensic science'; Max M.Houck'2006*
19. *'Basic gas Chromatography,2nd edition'; Harold M.mcnair,James M.miller,2010*
20. *'Instrumental method of chemical analysis'; Gurdeep R.chatwal,sham K.anand,2008*
21. *'Forensic science,2nd edition'; Stuart H.james,jon J.norahy,2000*
22. *Manual for the analysis of petroleum product, Bureau of Indian Standards.*