VEER NARMAD SOUTH GUJARAT UNIVERSITY

M.Sc. – PHARMACEUTICAL CHEMISTRY

SEMESTER-4

TO COME IN FORCE FROM JUNE-2008

PAPER- (I) INTERACTUAL PROPERTY RIGHT, PHARMA REGULATORY AFFAIRS AND ANALYSIS

COURSE NO. - CPC- 401

Max. Marks: 70 Total Periods: 60

SECTION -1

UNIT-I : INTERACTUAL PROPERTY RIGHT: (10 Periods)

- Introduction
- Scope and Objective
- Basic terms and concepts of law (India legal system)
- Common law principles.
- Concepts of IPR, Scope and nature of patents, Copyright, Trademarks,
- Concepts related to patents- novelty, non- obviousness, utility, anticipation, prior art etc.
- Types of Patents.
- Role of international organization, WTO, WIPO, EPO in patent practice.
- Indian Patent Act.
- Patentability.
- Patent Application

UNIT-II : PHARMA REGULATORY AFFAIRS (10 Periods)

- Product Registration and their requirement looking to WHO-GMP.
- European DMF
- US-FDA regulations
- ICH guidelines
- Pharmacopael and extra Pharmacopaeal entry
- Chemical physical biological (Clinical), data documentation

UNIT-III : COMPUTER IN PHARMACEUTICAL CHEMISTRY:(10 Periods)

Introduction to DOS and Windows

- Ms-Word
- Ms-Power Point
- Ms-Excel
- Introduction to Internet
- Introduction of various software use of internet in chemistry
    - Chemwin, Isisdraw, Chem structure etc.
    - Structure functions, Structure activity relations
    - Rational Drug design- Identification and Structure analysis of Protein as potential drug targets.
    - Computer aided molecular modeling (Learning of software packages such as MOPAC, ALCHEMY- 2000)
- MODELYN and ANALYN software packages.

SECTION –2

UNIT-IV : COMPUTATIONAL CHEMISTRY: (10 Periods)

Basic idea on structure activity relation, drug and catalysis design,

- Introduction to Computational chemistry
- Standard computational methods
- Molecular modeling

Computational techniques in Drug design process.

UNIT-V : CLINICAL CHEMISTRY: (10 Periods)

Composition of Blood-collection and preservation of samples, Clinical analysis, Serum electrolytes, Blood glucose, Blood urea nitrogen, Uric acid, Albumin, Globulins, Barbiturates, acid and alkaline phosphates, Immunoassay: Principles of radio immunoassay (RIA) and applications. The blood gas analysis-trace elements in the blood.

UNIT-VI : ANALYSIS OF DRUGS : (10 Periods)

Analysis of following Class of drugs:

- Sulphadrugs
- Analgesics
- Antipyretics
- Antimalarial
- Antiallergic (Anti-histamines)
- Antibiotics (Emphasis should be given on the methods given in pharmacoepia)
- Narcotics.

REFERENCE BOOKS:

1. Patent Law by P. Narayanan, 2nd edition- Calcutta: Eastern law House, 1985.
2. A practical guide to patent Law, by Brain C. Reid, 2nd edition: London: Sweet and Maxwell, 1993.
3. The New World Trade Organization Agreement: Globalizing Law through services and Intellectual property by Christopher Arup- Cambridge: Cambridge University Press, 2000.
4. International Intellectual Property Law and policy. Voulume- I, by Hugh C. Haiser- Landon: Sweet and Maxwell, 1996.
5. A Course Book in International Intellectual Property by Doris Estelle Long and Anthony D'mato, St. Paul, Minn- West publishing Co. 2000.
6. International Intellectual Property and the common Law World, by Charles E.F. Rickett and W. Austin Graeme- Oxford: hart Publishing, 2000.
7. Intellectual Property Right under WTO: Tasks Before India by T. Rammappa- New Delhi, Wheeler Publishing, 2000.
8. What every one should know about patent- by Subbaram and Ganguly.

9. Current's- The patent Act, 1970 and the patent Rules, 2003 wuth Model Forms- Current Publication.
10. The Patent Act, 1970 (Act No. 39 of 1970)- Commercial Law Publishers, India.
11. Intellectual Property Right- Ganuli Prabuddaha.
12. Gearing Up for Patent- Ganuli Prabuddaha.
13. Analytical Chemistry G.D Christan, J. Wiley.
14. Fundamental of Analytical Chemistry, D.A. Skoog, D.M west and F.J. Holler, W.B. Saunders.
15. Analytical Chemistry-Principles, J.H. Kennedy, W.B. Saunders.
16. Analytical Chemistry-Principles and techniques, L.G. Hargis, Prentice Hall.
17. Basic concept of Analytical Chemistry, S.M. Khopkar, Wiley Eastern.
18.Computational Chemistry, A.C. Norris, John Wiley.
19. PC Software for Windows by R.K.Taxal, Tata Mcgraw-Hill Publishing Company Limited.
20. Working in Microsoft office by Ron Mansfierd, Tata Mcgraw-Hill Publishing Company limited.
21. How to use the Internet by Roger Cadenhead, Techmedia.
22. Guidelines on GMP/GLP by S. Lyer.

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PAPER- (II) BIOCHEMISTRY

COURSE NO. - CPC- 402

Max. Marks: 70 Total Periods: 60

SECTION -1

UNIT-I : (A) ENZYMES (10 Periods)

Introduction and historical perspective, Chemical and biological catalysis, Remarkable properties of enzymes like catalytic power, Specificity and Regulation, Nomenclature and Classification, Extraction and Purification, Fischer's lock and key and Khoshland's induced fit hypothesis, Concept and identification of active site

(B) CO-ENZYMES CHEMISTRY

Cofactor as derived from vitamins, Coenzymes, Prosthetic groups, Apoenzymes, Structure and biological Functions of coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, NAD^+, $NADP^+$, FMN, FAD, Lipoic acid, Vitamin B_{12}.

UNIT-II : (A) BIOTECHNOLOGICAL APPLICATION OF ENZYMES (10 Periods)

Large-scale production and purification of enzymes, techniques and methods of immobilization of enzymes, Effect of immobilization on enzyme activity, Application of immobilized enzymes,

(B) ENZYME MODELS

Host-guest chemistry, Chiral recognition and Catalysis, Molecular recognition, Molecular asymmetry and Prochirality. Biomimetic chemistry, Crown ethers, Cryptates, Cyclodextrins, Cyclodextrin base enzyme models, calixarenes, Ionophores, Micelles, Synthetic enzymes or synzymes.

UNIT-III : (A) AMINO ACIDS AND POLYPEPTIDES (10 Periods)

Nature of Amino acids, Essential Amino acids, Determination of primary structure of Polypeptides, Synthesis of Peptides and Proteins.

(B) LIPIDS

Classification of lipids, Simple lipids, Compound lipids (Excluding Steroids), Biological membranes.

SECTION -2

UNIT-IV : PROTEINS (10 Periods)

Structure and nomenclature of Peptide and Proteins, Classification of Protein, Peptide structure determination, End group analysis, Selective hydrolysis of Peptides, Classical peptides synthesis, Solid phase peptide synthesis, Structures of peptides and proteins, Levels of protein structure, Protein denaturation\ renaturation.

UNIT-V : SEX HORMONES : (10 Periods)

Androgens, Oestrogens and Gestogens, their structure and synthesis and biochemical role – Adrenocortical hormones, Partial synthesis of cortisone.

UNIT-VI : NUCLEIC ACID (10 Periods)

Purine and pyrimidine bases of nucleic acids, base pairing via H-bonding. Chemical and enzymatic hydrolysis of nucleic acids, structure of nucleosides, nucleotides, chemical synthesis of nucleosides. Structure of Ribonucleic acid (RNA) and deoxyribonucleic acid (DNA). The chemical basis for heredity, an overview of replication of DNA, transcription, translation and genetic code - Chemical synthesis of ADP, ATP.

Reference Books:

1. Understanding Enzymes, Trevor Palmer, Prentice Hall
2. Enzyme Chemistry: Impact and Applications, Ed. Collin J Suckling, Chapman and Hall.
3. Fundamentals of Enzymology, N.C. Price, and L. Stevens, Oxford University Press.
4. Bioinorganic Chemistry: A Chemical Approach To Enzyme Action, Hermann Dugas and C. Penny, Springer Verlag.
5. Enzymatic Reaction Mechanisms, C. Walsh, W. H. Freeman.
6. Biochemistry: The Chemical Reactions of living Cells, D. E. Metzler, Academic Press.
7. Organic Chemistry, Morrison and Boyd, Prentice Hall.
8. Organic Chemistry, L. G. Wade Jr, Prentice Hall.
9. Fundamentals Of Organic Chemistry, Solomons, John Wiley.

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PAPER- (III) MEDICINAL CHEMISTRY-II

COURSE NO. - CPC- 403

Max. Marks: 70 Total Periods: 60

SECTION -1

UNIT-I : Antituberculosis and Anti-leprotic agents

- Introduction
- Synthesis of following :
  - Isoniazide (INH)
  - Ethionamide
  - Ethambutol
  - DDS (Dapsone)
  - Pyrazinamide
  - Morphazinamide
  - Various alkaloidal drugs viz. Rifampcin

UNIT-II : Sulphonamides

Synthesis of following :

- Sulphacetamide
- Sulfadiazine
- Sulphadoxine (Sulfamethoxine)
- Sulphamethoxy pyrazine (Sulfalene)
- Sulphathiazole
- Succinyl sulphathiazole

- SAR and Mode of action of Sulphonamides.

UNIT-III : Antimalarials

- Introduction
- Synthesis of following :
  - Mefloquine
  - Chloroquine
  - Primaquine
  - Daraprim (Pyrimethamine)
  - Quinacrin
- SAR and Mode of action of Antimalarials.

SECTION -2

UNIT-IV : Anti-Neoplastic Agents (Cancer Therapy)

- Introduction
- Synthesis of following :
  - Mechlorethamine
  - Cyclophosphamide
  - Melphalan
  - 6-Mercaptopyrine
  - Methotrexate

- Thiotepa
- Hydroxy urea
- Chlorambucil

UNIT-V : Antibiotics

- Antibiotics that interference with biosynthesis of bacterial cell-walls.

1. Lactam antibiotics

- Penicillin
- Cephalosporin

- SAR among penicillin.
- Synthesis of following:
  - Penicillin V
  - Ampicillin
  - Cephalosphorin

2. Non-lactam antibiotics

- Bacitracin
- Vancomycin
- Cyoloserine

UNIT-VI : Antibiotics that interfere with protein biosynthesis in micro organism.

Non lactam antibiotics

- Macrolide antibiotics: Erythromycin
- Tetracyclines
- Chloramphenicol
- Lincomycin

- Structural formula and therapeutic uses of following non-lactam antibiotics.
  - Amino glycoside antibiotics
  - Non-classifiable antibiotics
    - Novobiocin
    - Nalidixic acid
    - Norfloxacin
    - Ciprofloxacine
  - SAR among Tretracyclines.
  - Synthesis of following:
    - Chloramphenicol.

Recommended Books:

1. Burger's Medicinal Chemistry and Drug Discovery (5/e), 1997, Vol. 1, 2, 3, 4,5, Edited by ManFred E. Wolff (John Wiley & Sons, inc., New York).
2. Principles of Medicinal Chemistry, Vol. I & II (5/e), by S. S. Kadam, K. R. Mahadik, K. G. Bothra (Nirali Prakashan).
3. Principles of Medicinal Chemistry by William O. Foye (ed.), Lea and Febiyer, Philadelphia.
4. Wilson and Gisvold's Text-book of Organic Medicinal and Pharmaceutical Chemistry (5/e, 1982) by Robert F. Doerge (J. B. Lippincott Company, Philadelphia/Toppan Co. Ltd., Tokyo).

5. Essential of Medicinal Chemistry (2/e) by Andrejus Korolkovas (A Wiley Interscience Publication, 1988, John Wiley & Sons, Canada).
6. Medicinal Chemistry by Ashutoshkar (Wiley Eastern Ltd., 1993).
7. The Pharmaceutical Basis of Therapeutics by Goodman and Gilman (The Macmillan Co.).
8. The Organic Chemistry of Drug Synthesis, Vol. I, II & III (1980), Ed. By D. Lednicer and L. A. Mitscher (John Wiley and Sons, New York).
9. Topics in Medicinal Chemistry, Vol. I & II by Rabinowitz and Myerson (Editor) (Interscience, 1968).
10. Adhunik Sanshleshit Aushodhonu Rasayanvighyan, Dr. Anamik Shah, University Granth Nirman Board, Ahmedabad, Price Rs. 135/-.

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PRACTICALS

COURSE NO. - CPC- 406

Practical pertaining to theory should be divided into following heads:

Group-A: Qualitative Analysis
Group-A: Quantitative Analysis

Books Recommended for Practicals :

1. Practical Pharmaceutical Chemistry by A. H. Bakett, Volume I & II.
2. Indian Pharmacopia
3. Inorganic Qualitative Analysis by Vogel's (ELBS).
4. Inorganic Quantitative Analysis by Vogel's (ELBS).

Practicals: Biochemistry and Physical Chemistry 407

Practical pertaining to theory should be divided into following heads:
Biochemistry :

Group-A: Qualitative Analysis of Biomolecule.
Group-A: Quantitative Analysis of Biomolecule.

Physical :
Practical Pertaining to theory

Recommended for the Practicals:

1. Practicals Biochemistry by Plummer.
2. Concept of Biochemistry by A. C. Deb.
3. Practical Physical Chemistry by J. B. Yadav.