NIPER JEE (M.Pharma) Syllabus

Organic Chemistry and Bulk Drugs (Pharmaceutical Technology)

1. IUPAC nomenclature, R and S nomenclature, E and Z isomerism, atropisomerism, Conformations laws.
2. Hybridization, aromaticity, Huckel's rule reaction mechanisms – Electrophilic, Nucleophilic, SN1, SN2, SNi, Elimination E1, E2 etc
3. Ester hydrolysis, Aac1 Aac2... all eight mechanisms (Jerry march) Markovnikov's rule with examples, Bredts rule, Stereoselectivity, stereospecificity, regioselectivity, chemoselectivity, chirality, stereochemistry, conformations, rearrangements, acids and bases.
4. Imine-enamine Tautomerism, keto-enol tautomerism, pericyclic reactions, racemic mixture, resolution methods.
5. Amino acids, proteins, various methods for amino acid detection, Ninhydrin test, peptide sequencing, structures of amino acids, essential and nonessential amino acids.
6. Introduction to thermal methods of analysis like, TGA, DSC, DTA etc.
7. Carbohydrates, osazone test, mutarotation, etc.
8. Various Heterocycles, Heterocycle synthesis, reactions.
9. Introduction to Redox reactions.
10. Spectroscopy: (basics specially) NMR, and C-NMR ranges from Morrison & Boyd or Pavia Mass-Basic concepts about various peaks M+1, molecular ion, base peak etc. (Silverstein) IR- Frequencies of various groups specially carbonyls. UV.
11. Chromatography: Details of every chromatographic method.
12. Reaction kinetics, first second third, and pseudo-first order reactions, radio labeling for determination of mechanism.
13. Common condensation reactions like Aldol, Claisen, Perkin, Dickmann, Darzen etc.
14. Other reactions like Cannizarro's reaction, Prins reaction, and especially reactions of carbonyl compounds.
15. Oxidizing & reducing agents like sodium borohydride, chromic acid & their use in named reactions
16. Stereochemistry chiefly
17. UV ranges, IR delta values, NMR peaks, Numericals

Natural Products

In natural products more stress should be given on phytochemistry part rather than biological aspects.
1. Methods of extraction, isolation and characterization of natural products. Various separation techniques used for isolation of natural products.
2. Biosynthetic pathways.
3. Primary metabolites, their examples.

4. Secondary metabolites, various classes of secondary metabolites (e.g. Alkaloids, glycosides, tannins, lignans, saponins, lipids, flavonoids, coumarins, anthocyanidines etc.).
5. Important therapeutic classes: antidiabetics, hepatoprotectives, immunomodulators, neutraceuticals, natural products for gynecological disorders, anti-cancer, anti-viral (mainly anti-HIV), adaptogens etc.
6. Dietary antioxidants, Marine natural products, Plant growth regulators.
7. Spectroscopy: Basic concepts of UV, NMR, IR and Mass spectroscopy. Give more stress on IR and NMR.
8. Stereochemistry: Basic concepts.
9. Fischer, sawhorse and newmon projection formulaes.
10. Biological sources of important classes of natural products. (Selected ones only)
11. Standardization of natural products.
12. What is difference between natural products and pharmacognosy?
13. Natural products as anti viral & anti cancer agents with examples.

Pharmacology and toxicology

1. Pharmacokinetics, pharmacodynamics, pharmacological effect, desired, undesired, toxic, adverse effects.
2. Bioavailability, bioequivalence, various factors of ADME. (From Bramhankar)
3. Drug metabolism: various pathways and other details.
4. Drug interactions, agonist, antagonist, partial agonist, protein binding, drug distribution, distribution volume, excretion pathways etc.
5. Pharmacological screening: general principles, various screening models, screening methodologies (in vitro and in vivo tests).
6. Mechanism of drug action, drug-receptor interaction.
7. Various adrenergic, cholinergic and other receptors
8. Detailed study of CNS pharmacology
9. Study of basis of threshold areas of work in NIPER in pharmacology dept. mentioned in brochure.
10. Diseases: study of the pharmacology of the diseases and drugs used with mode of action especially of diabetes, malaria, leishmaniasis, TB, hypertension, myocardial ischemia, inflammation, and immunomodualtion.
11. Chemotherapy and pathophysiology- knowledge of antibiotics, their mode of action and the microorganisms responsible for various common diseases.
12. Bioassay methods, various requirements. Brief knowledge of the statistical tests.
13. Basic mechanism of all drugs with major side effects & classification.
14. Receptors classification with examples.

Pharmaceutics and formulation (Pharmaceutical Technology)

1. Drug delivery systems (DDS): NDDS models, osmotic pumps, various release patterns eg. Controlled release, delayed release. Sustained release etc. order of release. Oral controlled DDS, factors affecting controlled release.
2. Carriers in DDS: polymers and their classification, types, carbohydrates, surfactants, proteins, lipids, prodrugs etc.
3. Transdermal drug delivery systems (TDDS): principles, absorption enhancers, evaluation of TDDS.
4. Parenterals: requirements, advantages, disadvantages, release pattern, route of drug delivery.
5. Drug targeting: microspheres, nanoparticles, liposomes, monoclonal antibodies, etc.
6. detailed preformulation.
7. Complexation, solubilization, polymerization, viscosity measurements.
8. Dosage form development- stages, implications of dosage form.
9. Additives of formulation, types, examples, advantages, disadvantages, drug excipient interaction, incompatibility, various types of incompatibilities.
10. Dosage forms: solid (tablets, capsules, pills etc), liquid (emulsion, suspension etc), sterile (injectables), aerosols. Principles, advantages, disadvantages and problems.
11. Coating- in detail.
12. Packaging: materials, labeling etc. Types of containers (Tamper-proof containers)
13. In process controls, Product specification, documentation.
14. Compartmental modeling. (From Bramhankar)
15. Bioavailability, bioequivalence studies. Methods of improvement of oral bioavailability.
16. Evaluation of formulation, principles and methods of release control in oral formulations.

Pharmaceutical analysis

1. Stability testing of pharmaceuticals, various stability tests, kinetic studies, shelf life determination, thermal stability, formulation stability.
2. Various analytical techniques
3. Tests: physical and chemical tests, limit tests, microbiological tests, biological tests, disintegration and dissolution tests.
4. Spectroscopic methods; UV, NMR, IR, MS, GCMS, FT-IR, FT-NMR, ATR (Attenuated Total Reflectance), FT-Raman- basics and applications.
5. Thermal techniques: DSC, DTA, TGA, etc.
6. Particle sizing: law of diffraction.
7. Electrophoresis: capillary electrophoresis.
8. Chromatography- detailed.
9. QA and QC: GLP, TQM, ISO system.
10. Preformulation, cyclodextrin inclusion compounds
11. Solubility: pH, pka, surfactant HLB values, Rheology.

12. Crystallinity, polymorphism, solvates and hydrates, crystal habits, porosity, surface area flow properties.
13. Dosage forms, Stages of dosage form development
14. Osmolality, osmolarity, osmotic pressure, conductivity, Preservatives, Media for bioassay.

Pharmaceutical Biotechnology

1. Protein: Structure, Allosteric proteins, Amino acid analysis & Protein sequencing (Sanger's, etc from zubey), peptide synthesis. (Lehninger)
2. Enzyme: Active site, Functional groups, Enz-Sub complex, Co-factors, Michaelis-menten eqn , Enzyme inhibition, Isoenzymes, Allosterism, Mechanism of action of some selected enzyme (Chymotrypsin, Trypsin). (Read from Zubey)
3. DNA replication, Transcription and Translation
4. Recombinant DNA technology: Bacterial transformation, transduction, etc. PCR, Southern, Northern blotting, Plasmid-Vector concept. (Read Microbiology-Tortora chapter on r-DNA technology).
5. Immunology: Concepts of Innate/ Adaptive/ immunity, epitope. Hypersensitivity reactions. ELISA, Immunofluorescence tests.
6. Microorganism for amino acids, baker's yeast, ethanol, aceton-butanol, citric acid, lactic acid.