B.PHARM. SEMESTER-I
101(A) T: REMEDIAL MATHEMATICS

1. Algebra: Equation reducible to quadratics, Simultaneous equations (linear and quadratic), determinants, solution of simultaneous equations by Cramer's rule, Matrices, Definition of special kinds of matrices, arithmetic operations on matrices, inverse of a matrix, solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices, Evaluation on En1, En2 and En3, menstruation and its pharmaceutical applications, Measures of central value, objectives and pre-requisites of an ideal measure, mean, mode and median.
2. Trigonometry: Measurement of angle, t-ratios, addition, subtraction and transformation formulae, T-ratios of multiple, submultiples, allied and certain angles. Application of logarithms in pharmaceutical computations.
3. Analytical plane geometry: Cartesian co-ordinates, distance between two points, area of triangle, a locus of point, slope and intercept form of straight line, double-intercept form, normal (perpendicular form), slope-point and two point form, general equation of first degree.
4. Differential calculus: Limits and functions, definition of differential coefficient, differentiation of standard functions including function of a function (Chain rule), differentiation of implicit functions, logarithmic differentiation, parametric differentiation, successive differentiation.
5. Integral calculus: Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, substitution and partial fractions, formal evaluation of definite integrals.

BOOKS RECOMMENDED

1. Loney, S.L., Plane Trigonometry, AITBS Publishers and Distributors, New Delhi.
2. Mittal, P.K. and Narayan, S., A Textbook of Vector Algebra, S. Chand and Company, New Delhi.
3. Knight, S.R. and Hall, H.S., Higher Algebra: A Sequel to Elementary Algebra, S. Chand and Company, New Delhi.
4. Paria, G., Co-ordinate Geometry for two dimensions, Scholar's Publishing House, Indore.

5. Loney, S.L., The Elements of Co-ordinate Geometry, AITBS Publishers and Distributors, New Delhi.
6. Paria,G., Differential Calculus, Scholar's Publishing House, Indore.
7. Paria, G., Integral Calculus, Scholar's Publishing House, Indore.
8. Prasad, G., A Text Book on Differential Calculus, Pothishala Pvt. Ltd., Allahabad.
9. Prasad, G., Integral Calculus and Differential Equations, Pothishala Pvt. Ltd., Allahabad.

101(B) T: REMEDIAL BIOLOGY

1. Simple and compound microscopes used in biology.
2. Plant anatomy and physiology: Structure of plant cell, mitosis and meiosis, classification of plants, different types of plant tissues and their functions, transportation, photosynthesis and respiration in plants, plant growth and development.
3. Morphology and histology of root, stem, bark, wood, leaf, fruit and seed, modifications of root and stem.
4. Study of the following families with special reference to medicinally important plants - *Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Labiatae, Cruciferae and Papaveraceae.*
5. General survey of animal kingdom: Classification of animal kingdom, structure and life history of parasites like amoeba, entamoeba, trypanosoma, plasmodium, taenia, ascaris, schistosoma, oxyris and ancylostoma.
6. General structure and life history of insects like mosquito, housefly, cockroach, mites and silkworm.

101(B) P: REMEDIAL BIOLOGY

1. Care, use and types of microscope.
2. Morphology of plant parts indicated in theory.
3. Preparation and microscopic examination of monocot and dicot stem.
4. Preparation and microscopic examination of monocot and dicot root.
5. Preparation and microscopic examination of monocot and dicot leaf.
6. Gross identification of slides of structure and life cycle of lower plants / animals mentioned in theory.
7. Structure of human parasites and insects mentioned in theory with the help of specimens.
8. Identify and differentiate the parts of the given plant sample morphologically.

BOOKS RECOMMENDED

1. Datta, A.C., Botany, Oxford University Press, Calcutta.
2. Kaushik , M.P., Modern Botany, Prakash Publications, Muzaffarnagar.
3. Gupta, R., Modern Zoology, Prakash Publications, Muzaffarnagar.
4. Bhatia, K.N., Tyagi, M.P., Elementary Biology, Trueman Book Company, Jalandhar.

102 T: COMPUTER APPLICATIONS

1. Introduction to computer: Definition, characteristics, generation of computers, capabilities and limitations, introduction to operating system, concept of bios, booting files, basic components of a computer system-control unit, ALU, input/output functions and characteristics, memory introduction, classification-volatile memory and non volatile flash memory, ROM, RAM, EPROM, PROM, EEROM other types of memory.
2. Input, output and storage units: Computer key board pointing devices: mouse, trackball, touch panel and joystick, light pen, scanners, various types of monitors, touch sensitive screens, optical recognition system, pen based systems, digitizers, MICR, OCR, OMR, bar-code reader, digital camera.
3. High level language and low level language, software and its different types, system software, application software, hardware, firmware, compiler, interpreter and assembler, file allocation table (FAT, FAT32 & NTFS), introduction to algorithm and flow chart, representation of an algorithm, flowchart symbols and levels of flow chart, rules, advantage and limitation of flow chart and pseudo code.
4. Computer fundamentals and programming**:** Data types, variables, constants, operators, (including bitewise operations), expressions, assignment, statement, arrays, function, pointers, structures union and enumerated data type, binary search.
5. Office tools**:** Word, excel softwares, MS-power point

   Word: Structure of document, common commands, styles, cross-reference.

   Excel: Concept of spreadsheet, use of financial and statistical functions, sorting and searching database, linking workbooks, formula between work books.

   Power Point: Creating, formatting and addition of special effects to a presentation, viewing a presentation and managing slide shows.
6. Computer network: Introduction, types of computer network, LAN, MAN, WAN, OSI reference model.

Communication media: Types of communication media, guided and unguided internet application.

7. Computer applications in Pharmacy and clinical studies.

102 P: COMPUTER APPLICATIONS

1. Introduction to various components of computers, commands, MS-office-MS Word, excel, power point, a simple documentation preparation and printing, usage of printer and components, simple program in C.

BOOKS RECOMMENDED

1. Kanetkar, Y., Working with "C", BPB Publication, New Delhi.
2. Rajaraman, V., Fundamentals of Computers, Prentice-Hall of India, New Delhi.
3. Jain, A. and Chandwani, Elements of Computer Science, Jain Brothers, New Delhi.
4. Rajaraman, V. Computers programming in C, Prentice Hall of India, New Delhi.
5. Thakur, P.S., Manchanda, R. and Nand P., Computers in Pharmacy, Birla Publications, Delhi.
6. Sinha, P.K. and Sinha, P., Computer fundamentals, BPB Publications, New Delhi.
7. Shah, Y.I., Paradkar A.R. and Dhayagade M.G., Biostatistics and Computer science, Nirali Prakashan, Pune.

103 T: PHARMACEUTICS-I (INTRODUCTION TO PHARMACEUTICS)

1. History of pharmaceutical practice through ages, pharmacy as a career.
2. Pharmacopoeias with special reference to Indian, British, United States, International and Extra Pharmacopoeias and various systems of medicines.
3. Routes of administration and classification of pharmaceutical dosage forms.
4. Definition, general formulation, manufacturing procedures and official products of following categories: Aromatic waters, solutions, syrups, spirits, elixirs, linctuses, lotions, liniments, glycerites, gargles, mouth washes, inhalations, milk and magmas, mucilages, jellies, infusion, decoctions, tinctures and extracts.
5. Methods employed in the preparation of plant extracts.
6. Coarse dispersion: Suspension, interfacial properties of suspended particles, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles,

sedimentation parameters, formulation of suspensions, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheologic considerations, methods of preparation, physical stability of suspensions.

7. Emulsions: Types of emulsion, theories of emulsification (monomolecular adsorption, multi-molecular adsorption and film formation and solid-particle adsorption), physical stability of emulsions, creaming and Stoke's law, coalescence and breaking, phase inversion, evaluation of emulsion and pharmaceutical applications.

103 P: PHARMACEUTICS-I (INTRODUCTION TO PHARMACEUTICS)

1. Prepare and submit camphor water I.P.
2. Prepare and submit chloroform water I.P.
3. Prepare and submit conc. dill water I.P.
4. Prepare and submit aqueous iodine solution I.P.
5. Prepare and submit weak iodine solution I.P.
6. Prepare and submit strong iodine solution I.P.
7. Prepare and submit cresol with soap solution I.P.
8. Prepare and submit simple syrup I.P.
9. Prepare and submit simple syrup U.S.P.
10. Prepare and submit chloroform spirit I.P.
11. Prepare and submit simple elixir I.P.
12. Prepare and submit calamine lotion I.P.
13. Prepare and submit turpentine liniment I.P.
14. Prepare and submit orange tincture I.P.
15. Prepare and submit lemon tincture I.P.
16. Prepare and submit milk of magnesia I.P.
17. Prepare and submit bentonite magma U.S.P.
18. Prepare and submit tragacanth mucilage B.P.C.
19. Prepare and submit borax glycerin I.P.
20. Prepare and submit potassium permanganate gargle.
21. Prepare and submit menthol and eucalyptus inhalation.
22. Prepare and submit castor oil emulsion B.P.C.

23. Prepare and submit liquid paraffin emulsion I.P.
24. Determine the optimum concentration of tragacanth required for maximum physical stability of calcium carbonate suspension.
25. Prepare flocculated and deflocculated suspension and evaluate the sedimentation behavior of suspension using sedimentation volume.
26. Identify emulsion and evaluate the physical stability of an emulsion.

BOOKS RECOMMENDED

1. Arnold-Foster, Tallis, Tallis, N., Pharmacy History Pictorial Record, Pharmaceutical Press, London.
2. Pharmacopoeia of India, Ministry of Health & Family Welfare, Govt of India, New Delhi.
3. British Pharmacopoeia, Stationary Press, Royal Society of Pharmaceutical Press, London.
4. United State Pharmacopoeia, United State Pharmacopoeial Convention, Inc., 12601. Twinbrook Parkway, Rockyville M.D. 20852, USA.
5. Lachman, L., Lieberman, H.A. and Kanig, J.L., The Theory and Practice of Industrial Pharmacy, Varghese Publishing House, Mumbai.
6. Gennaro, A.R., Remington's The Science and practice of Pharmacy, Lippincott, Williams & Wilkins, Philadelphia.
7. Aulton, M.E., Pharmaceutics: The Science of Dosage Form Design, Churchill Livingstone, London.
8. Banker G.S. and Rhodes C.T., Modern Pharmaceutics, Marcell Decker Inc., New York.
9. Jain, N. K. and Sharma, S.N., Theory and Practice of Professional Pharmacy, Vallabh Prakshan, New Delhi.
10. Mithal, B. M., Text Book of Pharmaceutical Formulation, Vallabh Prakashan, Delhi.
11. Allen, L.V., Popovich, N.G., Ansel, H.C., Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems, Lippincott Williams and Wilkins, Philadelphia.
12. Rawlins, E.A. (Ed.), Bentley's Textbook of Pharmaceutics, Bailliere Tindall, London.

104 T: PHARMACEUTICAL CHEMISTRY-I (ORGANIC-I)

1. Fundamentals of organic reaction mechanism: Classification of organic reactions, bond-

breaking and bond-making processes, concerted and stepwise reactions, reactivity and orientation, electrophiles and nucleophiles, aromatic, role of solvent, polarity of solvent.

2. Reaction intermediates: Transition states, rearrangement, carbanions, carbocations, carbon radicals, carbenes, nitriles and benzyne.

3. Stereochemistry**:** Stereoisomerism, enantiomers, elements of symmetry, chirality, racemic modification, configuration, specification of configuration, sequence rule, conformational isomers, reactions involving stereoisomer's, asymmetric synthesis.

4. Study of reaction mechanism, reactivity and orientation, effect of substituent groups of following categories of reactions:

4.1 Addition reactions:

(a) Nucleophilic addition reactions: Nucleophilic addition to C=O, addition of cyanides, derivatives of ammonia, alcohols, Grignard's reagent, Aldol condensation, nucleophilic addition to C=C, C≡C.

(b) Electrophilic addition reactions: Addition of hydrogen, halogen, hydrogen halide, sulphuric acid, water, halohydrin formation, dimerisation, alkanes, oxymercuration-demercuration, hydroboration-oxidation, stereoselective and stereospecific reactions, comparison of nucleophilic and electrophilic addition in alpha-beta unsaturated carbonyl compounds.

(c) Free radical addition reactions: Peroxide initiated addition of HBr (anti-markonikov orientation)

4.2 Elimination reactions: 1, 2 Elimination reactions, dehydrohalogenation of alkyl halides, E1, E2, $E1_{cb}$, E1 *vs* E2, elimination *vs* substitution.

4.3 Substitution reactions:

(a) Free radical substitution: Halogenation of alkanes

(b) Nucleophilic Aliphatic: S_N1, S_N2, S_N1 *vs* S_N2, neighboring group effect

(c) Nucleophilic Acyl substitution: Esterification reactions, conversion to acids, acid chlorides, amides, esters, nucleophilic substitution alkyl *vs* acyl.

(d) Electrophilic aromatic substitution: Nitration, sulphonation, halogenation, Friedal Craft's alkylation, electrophilic substitution in naphthalene.

(e) Nucleophilic aromatic substitution: Bimolecular displacement, benzyne, and aliphatic vs aromatic substitution.

4.4 Condensation and rearrangement reactions: Claisen condensation, Reimer Tieman reaction, Hoffmans degradation of amides, Kolbe's reaction, Fries rearrangement, Cannizaro's reaction and coupling reaction.

104 P: PHARMACEUTICAL CHEMISTRY-I (ORGANIC-I)

1. Study of laboratory safety techniques, hazards in laboratory and first aid.
2. Study of simple laboratory techniques and apparatus for organic reactions, filtration, distillation, crystallization.
3. Purification of common organic solvents.
4. Identification of organic compounds and their derivatisation.
5. Introduction to stereoisomers.
6. Synthesis of para-nitroacetanilide.
7. Synthesis of parabromoacetanilide.
8. Synthesis of acetylsalicylic acid from salicylic acid.
9. Synthesis of 2, 4, 6, trinitrophenol from phenol.
10. Synthesis of benzil from benzoin.
11. Synthesis of benzilic acid.
12. Synthesis of phenylhydrazones from phenyl hydrazine and acetaldehyde.
13. Hydrolysis of para-nitroacetanilide to para-nitro aniline.
14. Synthesis of phenyl- azo-beta-naphthol.
15. Synthesis of methyl orange.

BOOKS RECOMMENDED

1. Morrison, R.T. and Boyd, R.N. Organic Chemistry, Prentice Hall of India, New Delhi.
2. Finar, I. L. Organic Chemistry Volume 1 and 2, Pearson Education Ltd., New Delhi.
3. Eliel, E. L. Stereochemistry of Organic Compounds, Tata McGraw Hill, New York.
4. Bruice, Y. A Organic Chemistry, Pearson Education Ltd., New Delhi.
5. John Mc Murry's, Organic Chemistry, Thomson Asia, Singapore.
6. Mann, F. G. and Saunders, B. C. Practical Organic Chemistry, Orient Longman Ltd., New Delhi.
7. Furniss, B.S., Hammford, A.J., Elementary Practical Organic Chemistry Small Scale preparations, CBS Publishers, New Delhi.
8. Vogel's Practical Organic Chemistry, Pearson Education Ltd., New Delhi.

105 T: PHARMACEUTICAL CHEMISTRY-II (INORGANIC)

1. The occurrence of impurities in pharmaceutical preparations: Types of impurities and limit test for chlorides, sulphate, arsenate, lead, heavy metals and iron.
2. A systematic study of the following pharmaceutical inorganic compounds with reference to their preparations, properties, tests for identity and purity, pharmaceutical uses and assay methods as given in Indian Pharmacopeia (IP).
3. Group IA: Sodium and potassium compounds: Sodium benzoate, sodium bicarbonate, sodium borate, sodium chloride, sodium citrate, sodium fluoride, sodium metabisulphate, sodium phosphate, sodium potassium tartarate, potassium permanganate, potassium dichromate, potassium chloride, potassium bromide and potassium iodide.

   Group-IB: Copper, silver and gold compounds: Copper sulphate, silver nitrate, strong silver proteins, and mild silver proteins.

   Group-IIA: Magnesium, calcium and barium compounds: Light and heavy magnesium carbonate, light and heavy magnesium oxide, magnesium hydroxide, magnesium sulphate, magnesium trisilicate, magnesium strearate, calcium gluconate, calcium acetate, calcium carbonate, calcium chloride, calcium lactate, and barium sulphate.

   Group IIB: Zinc and mercury compounds: Zinc oxide, zinc sulphate, zinc stearate, zinc chloride, mercury, yellow mercuric oxide, mercurous chloride and ammoniated mercury.
4. Group IIIA and IIIB: Boron and aluminium compounds: Boric acid, aluminium hydroxide gel, aluminium magnesium trisilicate and alum.

   Group IVA and IVB: Bentonite, light and heavy kaolins and kaolin poultice.

   Group VA and VB: Nitrogen, antimony, and bismuth compounds: Strong and diluted ammonia solutions, strong ammonium acetate solutions, ammonium chloride, sodium antimony gluconate and bismuth subcarbonate.
5. Group VIB: Sulphur, selenium compounds: Sublimated sulphur, precipitated sulphur and selenium sulphide.

   Group VIIA and VIIB: Hydrogen, oxygen and halogen compounds: Purified water, water for injection, hydrogen peroxide, chlorinated lime, aqueous iodine solution and strong iodine solution.

   Group VIII: Iron compounds: Ferrous sulphate, ferrous gluconate, ferric ammonium citrate, and iron-dextran inj.

6. A study of major intra and extra cellular electrolytes, essential and trace elements and their physiological role.
7. Selected case studies in medicinal inorganic chemistry from the following topics:
   a. Biomedical uses of lithium
   b. Application of platinum compounds in medicine
   c. Gold (I) compounds as therapeutic agents
   d. Ruthenium, titanium and gallium compounds in medicine
8. Metal compounds as contrast agents for MRI and medicinal applications of radio-active compounds.

105 P: PHARMACEUTICAL CHEMISTRY-II (INORGANIC)

1. Study of laboratory safety techniques, hazards in laboratory and first aid.
2. Perform limit test for Chloride in the given sample.
3. Perform limit test for Sulphate in the given sample.
4. Perform limit test for Lead in the given sample.
5. Perform limit test for Arsenic in the given sample.
6. Perform limit test for heavy metals in the given sample.
7. Perform preparation and standardization of Hydrochloric acid.
8. Perform preparation and standardization of Sodium Hydroxide.
9. Perform preparation and standardization of Potassium permanganate.
10. Prepare and submit Ferrous sulphate.
11. Prepare and submit Ferric ammonium citrate.
12. Prepare and submit light and heavy Magnesium oxide.
13. Prepare and submit Magnesium carbonate.
14. Prepare and submit Calcium Carbonate.
15. Prepare and submit Zinc sulphate
16. Prepare and submit Alum (potassium and Ammonium).

BOOKS RECOMMENDED

1. Pharmacopoeia of India, Ministry of Health & Family Welfare, Govt. of India, New Delhi.
2. Atherden, L.M., Bentley and driver's Textbook of Pharmaceutical chemistry, Oxford University Press, New Delhi.
3. Block, J.H., Roche, E., Soine, T.O., Wilson, C. O., Inorganic Medicinal and

Pharmaceutical Chemistry, Lee Febiger, Philadelphia.

4. Svelha, G.,Vogel's Text Book of Inorganic Chemistry, Pearson Education Asia, New Delhi.
5. Chatwal, G.R. Pharmaceutical Chemistry Inorganic, Himalaya Publishing House, New Delhi.
6. Pandya, S.N. Inorganic Medicinal Chemistry, SG Publishers, Varanasi.
7. Rayner-Canham, G., Descriptive Inorganic Chemistry Freeman.
8. Shriver, D.F., Atkins, P.W. Inorganic Chemistry, Oxford University Press.
9. Beckett, A.H. and Stenlake, J.B. Practical Pharmaceutical Chemistry, Vol. I, CBS Publishers and Distributors, New Delhi, India.
10. Bassett, R.C., Denney, G.H., Mendham, J. Vogel's Textbook of Quantitative Inorganic Analysis, The ELBS and Longman, London.
11. Gennaro, A.R., Remington's The Science and practice of Pharmacy, Lippincot, Wiliams & Wilkins, Philadelphia.
12. Lovis F., Fiesev D.C., Experiments in Inorganic Chemistry, Health and Company, Boston.
13. Roger's Inorganic Pharmaceutical Chemistry, Lea and Febiger, Philadelphia, USA.

106 P: COMMUNICATION SKILLS & PERSONALITY DEVELOPMENT-I

1. English for communication: The most commonly used grammatical items in technical English, major tense distinctions, articles, modal verbs: connectives, relative clauses, noun/nominal compounds.

   Vocabulary extension: Word usage, related forms, foreign roots, prefixes and suffixes that form technical words, conversational expressions, formal and informal expressions for scientific and technical communication, antonyms and synonyms, frequently confused, misused and misspelled words, transitional words and phrases, choosing appropriate words that communicate.

   Mechanics and punctuation: Abbreviations, capitalisation, number usage, sentence punctuation, word and phrase punctuation.

   Common grammatical and stylistic errors in professional communication: Structural ambiguity, agreement between subject and verb: agreement between pronoun and

antecedent, faulty or vague pronoun reference, sentence fragments, fused sentences and comma splices, misplaced/dangling modifiers, parallelism, embedding sentences within sentences, wordiness, inappropriate jargon.

2. Reading comprehension: Reading for facts, guessing meanings from context, scanning, skimming, inferring meaning and critical reading. Reading styles for technical professionals, skimming a passage to abstract relevant ideas and information, rewriting a 'receptive passage' as a 'skim passage', scanning a passage for specific information, inferential comprehension, understanding logical relationships (cause-effect, rule-illustration, data-conclusion), inferring meanings of words, phrases, and sentences in context, precise writing/reformulating/summarizing: restating in a shortened form the main ideas of a given passage, summarizing a passage for various purposes and for particulars audienães, reducing or selectively rewriting a passage for a specific purpose, functional English, starting a conversation, responding appropriately and relevantly using the right body language, role play in different situations.

BOOKS RECOMMENDED

1. Leech, G. and Svartvik,J., A Communicative Grammar of English, Longman Group UK Ltd, Pearson Education Asia, Hong Kong.
2. Gerson, S.J. and Gerson, S.M., Technical Writing, Pearson Education Asia, Hong Kong.
3. Esenberg, A., A Beginner's Guide to Technical Communication, McGraw-Hill, New Delhi.
4. Rutherford, A.J. Basic Communication Skills for Technology, Pearson Education Asia, Hong Kong.
5. Lesikar, R.V. Perrit, J.D. and Flately, M.E., Lesikar's Basic Business Communication, McGraw-Hill, New Delhi.
6. Bovee, C.L., Thill, J.V. and Schatzman, B., Business Communication Today, Pearson Education Asia, Hong Kong.
7. Ober, S., Contemporary Business Communication, Houghton Mifflin Company, Wiley-Dreamtech, New York.