Rajiv Gandhi Proudyogiki Vishwavidalaya, Bhopal (M.P.)
B.Pharma- I Semester

REMEDIAL MATHEMATICS – PY 101(A)

UNIT I

UNIT II
Menstruation and its pharmaceutical applications. Measures of Central Value objectives and pre-requisites of an ideal measure, Mean, Mode and median.

UNIT III

UNIT IV
Analytical plane Geometry: Certain Co-ordinates, Distance between two points, area of triangle, a locus of points, straight line, slope and intercept form, double-intercept form, normal (perpendicular form), slope-point and two point form, general equation of first degree.

UNIT V
Calculus:
Differential: 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.
Integral: Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, substitution and partial fractions, formal evaluation of definite integrals.

Books & References Recommended:
1. Loney S.L., Plane Trigonometry.
Remedial Biology – PY 101(B)

1. Plant Anatomy and Physiology:
   i. Morphology and Anatomy of flowering plant and its parts like root, stem, bark, wood, leaf, flower, fruit and seed.
      Modification of root and stem.
   ii. Transportation, photosynthesis and respiration in plants,
      Plant growth and development.
   iii. Structure of plant cell, Different types of plant tissues and their functions.

2. Structure and functions:
   i. Cell- the unit of life.
   iii. Cell cycle and cell division, stages of mitosis and meiosis, and their significance.

3. Living systems
   ii. Animal kingdom - Classification and its basis

4. Genetics and Evolution:
   i. Principles of inheritance and variation – Mendals laws, inheritance of one gene and two gene, sex determination, mutation and genetic disorders.
   ii. Molecular basis of inheritance – DNA, RNA, Replication, Transcription, Genetic code, Translation, regulation of gene expression, DNA fingerprinting, Human Genome Project.

List of Experiments

1. To study the simple and compound microscope.
2. To study the microscopic section of the Monocot and Dicot plant.
3. To identify the part of the plant by given section (root).
4. To identify the part of the plant by given section (stem).
5. To identify the part of the plant by given section (bark).
6. To identify the part of the plant by given section (leaf).
7. To identify the part of the plant by given section (seed).
8. To identify and differentiate the parts of the given plant sample morphologically.
Books Recommended

COMPUTER APPLICATIONS - PY102

Interlocution to Computer- Its Types and uses, Computer Generations, Hardware, software, Elements of computer system, Number Systems:- Decimal, Binary, Octal, hexadecimal, Storage Devices- primary memory, Secondary Memory, Input and output devices.

Operating system- Basic Concepts, Organization, functions, operations and types, Features of DOS, Windows and Unix operating systems. Dos Commands.


Programming Language ‘C’ – Data types, Constants, variables, Operators, symbolic constants, input and output, increment and decrement operators. Control Structures: while, do-while, for, if, if-else, and switch statement. Functions, header files, recursion, pointers and arrays, structures.

Application software- Word processing, formatting, printing setups, mail merge. Table Handling, picture handling, spreadsheet programs, workbooks/ worksheets, formatting of sheets, formulae and functions, graphs, Import and export of files / data. Presentation Packages, Slide designing.

Practicals:

Introduction to various components of computer, Use of External & Internal DOS Commands, MS- Office – MS Word, MS, Excel, Powerpoint. A simple documentation preparation & printing. Usage of printer & other components. Simple programs in C.

Book Recommended:

2. E. Balaguruseamy: Programming In C, TMH Pub
5. Computer Architecture (Schaum’s outline) CARTER, TMH
PHARMACEUTICS –I (Introduction to pharmaceutics) -PY 103

2. Routes of administration and classification of pharmaceutical dosage form.
3. Definition, general formulation, principles and procedures adopted for dispensing and official products of the following:
   - Aromatic waters, Solutions, Syrups, Mixtures, Spirits, Elixers, Linctuses, lotions, liniments, Mixtures, Glycerites, Gargles, Mouth washes, Inhalations powders, Capsules, Tablet triturates, Ointments, Creams, pastes, Suppositories and ophthalmics, Emulsions, Suspension, Milk and Magmas, Mucilages, Jellies, Infusion, Decoctions, Tinctures and Extracts.
5. Detailed methods employed in the preparation of plant extractives.

LIST OF PRACTICALS

1. Study Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia and Extra Pharmacopoeia.
2. Prepare and submit Camphor Water I.P.
3. Prepare and submit Chloroform Water I.P.
4. Prepare and submit Conc. Dill Water I.P.
5. Prepare and submit Aqueous Iodine Solution I.P.
6. Prepare and submit Weak Iodine Solution I.P.
7. Prepare and submit Strong Iodine Solution I.P.
8. Prepare and submit Cresol with Soap Solution I.P.
9. Prepare and submit chloroxylenol Solution I.P.
10. Prepare and submit Simple Syrup I.P.
11. Prepare and submit Simple syrup U.S.P.
12. Prepare and submit Chloroform Spirit I.P.
13. Prepare and submit Simple elixir I.P.
14. Prepare and submit Calamine Lotion I.P.
15. Prepare and submit Calamine Lotion USP, oily.
16. Prepare and submit Turpentine Liniment I.P.
17. Prepare and submit Liquid Paraffin Emulsion I.P.
18. Prepare and submit Tragacanth Mucilage I.P.
19. Prepare and submit Milk of Magnesia I.P.
20. Prepare and submit Bentonite Magma U.S.P.
21. Prepare and submit Borax Glycerin I.P.
22. Prepare and submit Tannic acid Glycerin I.P.
23. Prepare and submit Mandle’s Paint. B.P.
24. Prepare and submit Simple Linctuses I.P.
25. Prepare and submit Menthol and Eucalyptus Inhalation B.P.C
26. Prepare and submit orange / lemon Tincture I.P.
27. Prepare and submit compound benzoin Tincture I.P.
28. To prepare & submit codeine linctuses NFI, BNF.
29. To prepare & submit zinc sulphate & zinc chloride mouthwash IP.
31. To prepare & submit salicylic acid lotion BPC.
32. To prepare magnesium trisilicate mixture BPC.
33. To prepare & submit Chalk mixture pediatric BPC.
34. To prepare & submit magnesium hydroxide mixture BP.
35. To prepare & submit castor oil emulsion NFI.
36. To prepare & submit liquid paraffin & magnesium hydroxide emulsion BPC.
37. To prepare & submit lubricating gel.
38. To prepare & submit Peppermint water IP.
39. To prepare & submit sodium chloride solution IP.
40. To prepare & submit sodium chloride mouthwash.
41. To prepare & submit oral rehydration salt BP.
42. To prepare & submit soap liniment.
43. To prepare & submit sodium alginate jelly.
44. To prepare & submit lubricating jelly with cellulose ether base.
45. To prepare & submit compound syrup of ferrous phosphate IP 55 (Parrish's Food) by chemical interaction.
Books Recommended
1. Indian Pharmacopoeia.
2. British Pharmacopoeia.
7. Banker and Rhodes, Modern Pharmaceutics. Marcel Dekker Inc. NY.
14. Textbook of Pharmaceutics, Bentley, E.A. Rawlins
Pharmaceutical Chemistry I -PY 104 (Physical Chemistry)

1. Atomic, Molecular Structure and Chemical Bonding

Atomic Structure
Origin of the elements, valency, the mole concept, molar mass, compounds, chemical formulae. Introduction to atomic structure. Electronic configuration of atoms and relationship to structure of the Periodic Table. Properties of atoms, size, ionization potential, electronegativities etc. Quantum numbers, orbitals and the Aufbau process. Rydberg formula, Bohr atom, dual wave/particle nature of light and electrons. Angular and radial wavefunctions of atomic orbitals. H atom spectrum.

Molecular structure and chemical bonding:


2. Physico-chemical properties of substances

Polarity of substances, dipole moment, dielectric constant, refractive index, optical rotation, density, specific gravity, viscosity, molar refraction, parachor relative permittivity, Bonding and non-bonding interactions, roentgen diffraction, polymorphism, isomorphism, isotropy, anisotropy, liquid crystals.

3. Thermodynamics

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes. spontaneity of chemical change; Free Energy. Equilibrium; Enthalpy and Entropy and spontaneous change

First law of thermodynamics: Concept of work, heat internal energy and enthalpy, standard state, thermochemistry, thermochemical laws, heat capacity, molar heat capacity, Hess's law of constant heat summation; Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ioniz-ation and solution.

Second law of thermodynamics: Spontaneity of processes; ΔS of the universe and ΔG
of the system as criteria for spontaneity, $\Delta Go$ (Standard Gibbs energy change) and equilibrium constant.

**Third Law of Thermodynamics:** calculation of absolute entropies; specific heat; variation in enthalpy with temperature.

Helmholtz and Gibbs energies, chemical potential, conception of absolute entropy. Calculations involving entropy and enthalpy; dealing with ions etc. Variation of $\Delta G$ and $K$ with temperature: Ellingham Diagrams, Giauque Function.

**4. Chemical equilibrium**

- Law of chemical equilibrium, Equilibrium constant, equilibrium degree of conversion and its control by reaction, conditions, LeChatelier principle, standard change of Gibbs energy during reaction, Equilibrium constants and their significance, Factors affecting equilibrium concentration, pressure, temperature, effect of catalyst.
- Acid-base catalysis, decomposition of medicinal compounds, accelerated stability analysis, kinetics of enzyme catalysed reactions.

Integrated rate equations for simple reaction types. Use of integrated rate equations to determine order. Fractional lives. Molecularity vs. order


Further applications of the steady state approximation - radical chain reactions. General definitions. Stoichiometry vs mechanism. Dependence of rate on concentration: rate constant and order of reaction. Experimental determination of rates of reaction. Determination of orders from rate measurements.

**5. Phase equilibrium**

Gibbs phase rule, types of systems, one component equilibrium, Clapeyron and Clausius-Clapeyron equations, two component systems, Henry’s law, sparingly miscible liquids, solubility of solid substances, system solid substance - solvent, melts, Raoult’s law and its application, cryoscopy and ebullioscopy, osmotic pressure, three component systems, Nernst distribution law, extraction, ternary
diagram, system of three liquids, interfacial phenomena, adsorption on solid surfaces. Phase diagram of mixture fractional distillation, eutectic mixtures.

6. Surface Chemistry

**Adsorption**: Physisorption and chemisorption and their characteristics, factors affecting adsorption of gases on solids - Freundlich and Langmuir adsorption isotherms, adsorption from solutions.

**Catalysis**: Homogeneous and heterogeneous, activity and selectivity of solid catalysts, enzyme catalysis and its mechanism. acid base catalysis, theories of catalysis, catalytic poisoning and Pharmaceutical application of catalysis.

7. States of Matter

**Gaseous State**: Measurable properties of gases; Gas laws - Boyle's law, Charle's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure; Concept of Absolute scale of temperature; Ideal gas equation, Kinetic theory of gases; Concept of average, root mean square and most probable velocities; Real gases, deviation from Ideal behaviour, compressibility factor, van der Waals equation, liquefaction of gases, critical constants.

**Liquid State**: Solutions, Lowering of vapour pressure and Raoults Law, osmosis and osmotic pressure, measurement of osmotic pressure, isotonic solutions, pharmaceutical applications of osmosis, theories of semipermeable membranes, colligative properties, elevation of boiling point and its experimental determination, depression of freezing point and its determination, distribution law and solvent extraction method, electrolyte and non electrolytes, Debye-Huckel theory, ionic equilibria in blood, characterization of acid base functional groups.

**Solid State**: Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea); Bragg's Law and its applications. Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, imperfection in solids; electrical, magnetic and dielectric properties.

List of Practicals

1. Determination of specific gravity of liquids using pycnometer and density bottle.
2. To study the effect of salt/Sugar in different concentration on density of water.
3. To study the effect of temperature on density of given liquid.
4. Determination of the viscosity of a liquid by Ostwald viscometer.
5. To study the effect of concentration on viscosity.
6. To study the effect of temperature on viscosity
7. Determination of the percent composition of a mixture of ethanol and water by viscometric method.
8. Determination of the surface tension of a pure liquid by the capillary rise method.
9. To determine the surface tension of liquid using stalagmometer.
10. To study the effect of temperature on surface tension.
11. To study the effect of surfactant on surface tension.
12. Determination of the percentage composition of mixture of ethanol and water by surface tension method.
13. Determination of interfacial tension between benzene and water by the drop size method.
15. Determination of solubility of benzoic acid over a range of temperatures and calculation of its heat of solution.
16. Determination of the mutual solubility curve of phenol and water.
17. Preparation of buffer solutions and measurement of pH.
18. Distillation of a mixture.
19. Determination of phase diagram in ternary system containing a single pair of sparingly miscible liquids.
20. Determination of distribution coefficient of substance between two immiscible liquids. (succinic acid between ether and distilled water).

Recommended Reading:

1. P W Atkins, the Elements of Physical Chemistry, 2nd Ed., OUP, 1996
5. K.J. Laidler: Physical Chemistry with Biological Applications, Benjamin.
17. Yadav J.B. Advanced Practical Physical Chemistry, Geol Publisher House, Meenet, India.
1. Elements and periodicity
Modem periodic law and present form of the periodic table, s, p, d and f block elements, periodic trends in properties of elements- atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

2. Sources of impurities in pharmaceutical substances
Importance of limit test and general principles and procedure for limit tests of chloride, sulphate, iron, arsenic, lead and heavy metals.

3. Essential and Trace Elements
Study the role of essential and trace elements in biological systems and their toxicity.

**Major Intra and extra cellular electrolytes:** Major physiological ions, electrolytes used in replacement therapy, physiological acids-base balance, electrolytes used in acid-base therapy, electrolyte combination therapy.

4. Inorganic Agents
Occurrence, preparation, physical characteristics, chemical properties, purity test, incompatibilities, assay and pharmaceutical uses of inorganic official compounds of the following elements;

Aluminum, Sodium, Magnesium, Lithium, Calcium, Iron, Copper, Silver, Antimony, Iodine, Boron, Potassium, Zinc, Nitrogen

**Reagents:** Preparation, properties and uses of the following reagents; Nesslers reagent, boron trifluoride, Grignard reagent, Potassium permanganate, potassium dichromate, Hydrogen peroxide, Iodine solution.

5. Radiopharmaceuticals
Basic properties, production, quality control, stability, clinical and medicinal applications of radioisotopes used in pharmacy and medicine preparations of diagnostic and therapeutic agents.

**List of Practicals**

1. Limit test for Lead.
2. Limit test for Arsenic.
3. Limit test for Chloride.
4. Limit test for Sulfate.
5. Limit test for Heavy metals.
6. Standardization of sulphuric acid.
7. Standardization of hydrochloric acid.
8. Standardization of sodium hydroxide.
9. Standardization of potassium permanganate.
10. Standardization of sodium thiosulphate.
11. Determination of strength of solution of ammonia.
12. Quantitative determination of boric acid.
17. Preparation of Alum (potassium and ammonium).
18. Preparation of Ferrous sulfate.
20. Preparation of ferric ammonium citrate.
21. Preparation of light and heavy magnesium oxide and
22. Preparation of magnesium carbonate.
23. Preparation of calcium carbonate.
24. Preparation of magnesium trisilicate.
25. Preparation of zinc sulphate.
26. Purification of Copper sulfate.

Books Recommended
2. Pharmacopoeia of India, Govt. of India, Ministry of Health, Delhi.
4. Roger’s Inorganic Pharmaceutical Chemistry of Lea and Febiger, Philadelphia, USA.
9. Beckett & Stenlake, Practical Pharmaceutical Chemistry
10. Liptrot G.F. Modern Inorganic Chemistry, Blantyre Printing