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## (R9201) PHARMACEUTICAL UNIT OPERATIONS- I

**UNIT-I**

**Stoichiometry:** Unit processes, material and energy balance, molecular units, mole fractions, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation, mathematical problems.

**UNIT II**

**Fluid Flow:** Types of flow, Reynold's number, viscosity, concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure.

**UNIT-III**



**Material handling systems:**

a. Liquid handling - Study of different types of pumps such as Reciprocating pumps, Turbine pumps and centrifugal pumps.
b. Gas handling - Various types of fans, blowers and compressors.
c. Solid handling - Conveyors

**UNIT-IV**

**Filtration and Centrifugation:** Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration, mathematical problems of filtration, optimum-cleaning cycle in batch filters.

Principles of centrifugation, industrial centrifugal filters, centrifugal filters, and centrifugal sedimeters.

**UNIT-V**

**Crystalization:** Characteristics of crystals like; purity, size, shape, geometry, habit, forms, size and factors affecting it. Solubility curves and calculation of yields. Supersaturation theory and its limitations. Nucleation mechanisms, crystal growth. Study of various types of crystallizers such as Swenson walker crystalizer, vacuum crystalizer, crystal crystallizer. Caking of crystals and its prevention. Numerical problems on yields.

**UNIT-VI**

**Dehumidification and Humidity control**

Basic concepts and definition, wet bulb and adiabatic saturation temperature.



Psychrometric chart and measurement of humidity, application of humid measurement in pharmacy, equipments for dehumidification operations.

**UNIT-VII**

**Materials of Construction:** General study of composition, corrosion, resistan properties and applications of the materials of construction with special referer to stainless steel and glass.

**UNIT-VIII**

**Industrial hazards and safety precautions:** Mechanical, Chemical, Electrical, f and dust hazards. Industrial dermatities, accident records etc.

**TEXT BOOKS**

1. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy 6th ed CBS publish Delhi.
2. C.V.S. Subramanayam, Pharmaceutial Unit Operation, Vallabh Prakashan
3. Prof. K. Samba Murthy, Pharmaceutical Engineering.
4. Badzer & Banchero, Introduction to Chemical Engineering.
5. Pharmaceutical Engineering By DERLE

**REFERENCES**

1. Perry's Handbook of Chemical Engineering.
2. Unit Operations by Mc Cabe & Smith.
3. Mc Cabe & Smith, Elements of Chemical Engineering.
4. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences.
5. EA Rawlins, Bently's Text Book of Pharmaceutics, 8th edition, ELBS

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## (R9202) PHARMACEUTICAL ORGANIC CHEMISTRY - II

*Note: Definition, nomenclature, structure, aromaticity, reactivity, acidity-basicity and characteristic reactions of the following heterocyclic compounds.of Unit I and II*

*Few Examples of Drugs which contain the cited ring system.*

UNIT I

**Five membered and six membered ring systems with one hetero atom:** Furan, pyrrole, thiophene and pyridine.

Fused ring systems with one hetero atom: Indole, quinoline, iso-quinoline, and acridine.



UNIT II

**Five membered and six membered ring systems with two heteroatoms:** Pyrazole, imidazole, oxazole, isoxazole, thiazole, pyrazine, pyrimidine and pyridazine.

**Fused ring systems with two heteroatoms:** Benzimidazole and phenothiazine, Cinnoline, Quinazoline and Quinoxaline.

UNIT - III

**Stereochemistry of Carbon compounds:** Optical rotation, plane polarized light, optical activity, chirality, notations (assignment of configuration), relative configuration (Fischer DL configuration), absolute configuration (R & S), sequence rules (with examples), enantiomers, meso compounds, racemic mixture, resolution.

**Stereochemistry of alkenes:** Concept of E & Z configurations.Elements of symmetry.

UNIT - IV

**Carbohydrates:** Definition, classification, nomenclature, relative configuration of some important monosaccharides, study of glucose structure, mutarotation, ring structure, oxidation-reduction reactions, osazone formation, epimerization, Lobry De Bruyn Van Ekenstein reaction, structure of the disaccharide sucrose, glycosidic linkage, non-reducing nature; structural components of starch and cellulose. A brief account on pharmaceutical importance of various carbohydrates.

UNIT - V

**a) Amino acids:** Definition, classification, essential amino acids, configuration, three important methods of preparation of amino acids, physical properties. Zwitter ionic nature, isoelectric point, peptide synthesis and important reactions of amino acids.

**b) Polypeptides and proteins:** Definition, classification of proteins, denaturation, C-



terminal and N-terminal concept. Brief account of primary, secondary and tertiary structure. A brief account of the pharmaceutical importance of amino acids polypeptides and proteins.

UNIT VI

**a. Glycosides:** Definition and , glycosidic linkages, enzymatic hydrolysis, physiological importance.

**b. Lipids (oils and fats):** Definition, fatty acids, characterization of lipids (Saponification value, acid value and Iodine value), hydrogenation and rancidity of oils and fats.

UNIT - VII

a) **Purine derivatives (xanthine bases):** Chemical structures of uric acid and methylated xanthines (caffeine, theophylline and theobromine) of physiological/ pharmaceutical significance.

b) Definitions of nucleic Acids, nucleotides, nucleosides. A brief account of structure of DNA & RNA.

UNIT VIII

**A study of the mechanism and application in synthesis of the following named reactions:**

A. Beckmann rearrangement
B. Birch reduction
C. Mannich reaction
D. Michael addition reaction
E. Wittig reaction
F. Lossen rearrangement
G Curtius rearrangement
H. Schmidt reaction



TEXT BOOKS

1. R Morrison and R. Boyd, organic chemistry, Pub by Printice Hall of India New Delhi.
2. I L Finar, Organic Chemistry, Vol. I. & II, 6th Pearson education
3. O.P Agarwal, A Textbook of Organic Chemistry
4. Eliel, Stereochemistry of Organic compounds.
5. Arun Bahl & S:S Bahl, Advanced Organic Chemistry
6. Oraganic reactions,Stereo chemistry&mechanizam by PS Kalsi

REFERENCES

1. Jerry March, Advanced Organic Chemistry 4th Ed.
2 Cram & Hammond.Organic Chemistry.
3. A.I. Vogal, A textbook of practical organic chemistry
4. Solomons, Organic Chemistry

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### R9203) STATISTICAL METHODS AND COMPUTER APPLICATIONS

**Section - A: Bio-statistics**

**JNIT-I**

**)ata collection and treatment:** Significant digits and rounding of numbers, data ollection, random and non-random sampling methods, sample size, data rganization, diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, tandard deviation and standard error of means, co-efficient of variation, confidence fiducial) limits, probability and events.

**'robability and Distributions:** Bayer's theorem, probability theorem, probability istribution, elements of binomial and poison distribution, normal distribution curve nd properties, kurtosis and skewness.

**'NIT - II**

**:egression:** Correlation and regression analysis, method of least squares and non-near regression.

**NIT - III**



**:atistical inference:** Common parametric and non-parametric tests employed in sting of significance in biological/pharmaceutical experiments and elements of NOVA (One way and two way).

**NIT - IV**

**esign of experiments:** Basic concepts of CRD, RBD and Latin square designs.

mpling and Quality Control: Concept of random sampling, statistical QC charts. plications of statistical concepts in pharmaceutical sciences.

**Section - B: Computer Applications**

**NIT - V**

**erview of Computer with general applications:** components of computers., nputer languages useage of computers.Interrdutions of Operations system

**IIT - VI**

**TRODUCTION TO MS OFFICE:** MS-Word: Basics, working with files, working th text, formatting paragraphs, stayles, lists, tables, graphics, spellings and grammer l page formatting macros, table of contents.



**MS-Excel:** Basics, spreadsheets, data types, fformulas, formatting, charts, graphs.

**MS-Power Point:** Power point Basics, views, slide controls, applied design, page setup, templates, back ground control, colour screens, transitions, and animations, working with texts, and working with graphics.

**MS- Access:** Database concepts, screen layouts, creating tables, data sheet records, table relationships, sorting and filtering, queries forms, form controls, sub forms, reports, importing, experoting, linking.

**UNIT - VII**

**Information Technology today:** internet and world Wide Web (WWW): structure and organization of the www, browsers, information search in www, search engines, pharmaceutical resources in www types of indexing tools & search strategies, Hyper Text Manuscripts Language (HTML) and E-mail.

**Database Management:** Concepts and Objectives of database management systems, advantages of the database management systems and examples of DBMS packes (like DBASE III)

**Introduction to structured Query language (SQL):** over view of SQL, Reserved words, SQL Commands.

**UNIT - VIII**

Computer Applications in pharmaceutical and clinical studies, computer validation introduction.



**TEXT BOOKS**


1. Pranab Kumar Benarjee, Introduction to Biostatistics
2. Bio Statistics and Computer applications By GN Rao
3. Text book of STATISTICAL Methods and computer applications by Dr. A. Ramakrishna Prasad.
4. Ron Mansfiled, Working In Microsoft Office.
5. Ivan Bayross, SQL, PL/SQL The Programming Language of oracle.


**REFERENCES**


1. Dona E. Knath, The Art Of Computer Programming by Pearson Education (Singapore) Pvt. Ltd Delhi, 110 092.
2. Remez Elmasi, Shankar. B. Navathe, Fundamentals Of Database System, Pearson Education (Singapore) Pvt. Ltd Delhi, 110 092.
3. Collins, Dictionary Of Computers and IT by Ian Sinclair, Harper Collins Publishers Glasgow, UK.
4. Y. Raja Raman, Computer Programming in C.
5. Khan and Khanum, Fundamentals of Biostatistics

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## (R9204) PHYSICAL PHARMACY I



**UNIT I**

**Intermolecular forces and states of matter:** Binding forces between molecules, the states of matter, the gaseous state, the liquid state, solids and the crystalline state. Phase equilibria and the phase rule.

**UNIT II**

**Thermodynamics:** The first law of thermodynamics. Thermochemistry. The second law of thermodynamics. The third law of thermodynamics, Free energy functions and applications.

**UNIT III**

**Physical properties of Drug Molecules:** Dielectric constant, induced polarization, dipole moment, refractive index and molar refraction and optical rotatory dispersion.

**UNIT IV**

**Solutions of Non electrolytes:** Concentration expressions, ideal and real solutions, colligative properties, molecular weight determinations.

**UNIT V**

**Solutions of Electrolytes:** Properties of solutions of electrolytes. The Arrhenius theory of electrolyte dissociation. The modern theory of strong electrolytes and other coefficients for expressing colligative properties.

**UNIT VI**

**Ionic equilibria:** Modern theories of acids, bases and salts, Sorensen's pH scale, species concentration as a function of pH, calculation of pH and acidity constants.

**UNIT VII**

**Buffers and buffered isotonic systems:** The buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions, methods of adjusting tonicity and pH (relevant numerical problems).

**UNIT VIII**

**Electromotive force and oxidation-Reduction systems:** Electrochemical cells. Electrometric determination of pH and redox.



**TEXT BOOKS**

2. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences Fifth Edition.
3. C.V.S.Subramanyam, Essentials of Physical Pharmacy. Vallabh Prakashan.
4. B.S Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry.
5. Derle D.V., Essentials of Physical Pharmacy

**REFERENCES**

1. Pharmacopoeia, (I.P., B.P., U.S.P. and European.)
2. Martindale, The Extra Pharmacopoeia; latest edition, the Royal Pharmaceutical Society.
3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
4. Robin. J. Haiwan, Hand Book of Pharmacy & Health Care ED, The Pharma Press UK.

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## (R9205) ANTOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY



**UNIT-I**

**Central Nervous System:** Functions of different parts of brain and spinal cord. Neurochemical transmission in the central nervous system, reflex action, electroencephalogram, specialized functions of the brain, cranial nerves and their functions. epilepsy, psychosis, depression, mania.

**Unit-II**

**Autonomic Nervous System:** Physiology and functions of autonomic nervous system. Mechanism of neurohumoral transmission in the A.N.S.

**UNIT-III**

**Urinary System:** Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance, urinary tract infections. acute and chronic renal failure.

**UNIT-IV**

**Reproductive Systems:** Male and Female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization. Sex differentiation, spermatogenesis & ogeneisis. Pregnancy its maintenance and parturition.

**UNIT-V**

**Digestive System:** Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food. , peptic ulcer, ulcerative colitis, hepatic disorders

**UNIT - VI**

**Respiratory System:** Anatomy of respiratory organs. Functions of respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity. Asthma, tuberculosis.

**UNIT-VII**

**Endocrine System:** Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, pancreas, testes and ovary, their hormones and functions. Diabetes, thyroid.

**UNIT-VIII**

**Basic Principles of Cell Injury , Adaptation & process of inflammation:** Causes of



cellular injury, pathogenesis, morphology of cell injury. Cellular adaptations, atrophy, hypertrophy. acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair.

**TEXT BOOKS**


1. Tortora, G.J and Anagnodokas, Principles of Anatomy and Physiology, N.P Harper & Row Publishers N.Y
2. Elaine N. Marieb. Essential of Human Anatomy & Physiology
3. Robbins, SL & Kumar, Basic Pathology.
4. Sherword- Princeples of Human PhysioSlogy.
5. Ross & Willson, Principles of anatomy and physiology


**REFERENCE BOOKS**


1. A.C Guyton, Textbook of medicinal physiology by by W.B.Prism books Pvt. Ltd., Delhi.
2. Joseph Dipiro. Patho Physiology and applied therapeutics.
3. M.P. Rang, M.N.Dale, J.M Riter Anotamy & Physiology
4. Zolanouricz, Essentials of Pathophysiology for pharmacy

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## (R9206) PHARMACEUTICAL ORGANIC CHEMISTRY-II LAB

**I. Synthesis of some simple heterocyclic compounds.**

a. 3, 5-Dimethylpyrazole from Acetylacetone.

b. 3, 5-Dimethylisooxazole from Acetylacetone.

c. 4, 5-Diphenylimidazole from Benzil.

d. Benzoxazole from o-Aminophenol.

e. 2, 5-Dioxopiperazine from Glycine.

f. Oxazolone from Benzoylglycine.



**II. Molecular rearrangements and named reactions**

a. Benzimidazole from o-phenylenediamine (Phillip's Reaction).

b. O-hydroxyacetophenone from phenyl acetate (Fries migration)

c. Benzanilide from benzophenone oxime (Beckmann's rearrangement)
(To be avoided from End Examination)

d. Preparation of 2-phenylindole from Phenylhydrazine by Fischer's method.

**III. Systematic analysis of organic binary mixtures**

**IV Analysis of oils & fats**

a. Determination of Acid value of fixed oils.

b. Determination of Saponification value of a fixed oil.

c. Determination of Iodine value of a fixed oil.

d. Determination of Acetyl value of a fixed oil.

REFERENCES

1. Indian Pharmacopoeia. 1996.

2. A.I. Vogel's Practical Organic Chemistry



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## (R9207) STATISTICAL METHODS AND COMPUTER APPLICATIONS LAB

1. **Solving biostatistics problems** related to inference, sampling, graphical representation of data etc.. with the help of calculators & software programs like Graph-pad.

2. **Sample programs in C:** Program to calculate simple and complex arithmetic expressions, program using structures, program using loops and nested loops, program using functions and simple programs using arrays.

3. **Operating systems** like WINDOWS, UNIX, etc.

4. **Software packages** like MS-WORD, EXCEL, ACCESS, and POWER POINT.

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## (R9208) PHYSICAL PHARMACY I LAB

1. Percent composition Capillary Flow method
2. Percent composition polarimeter & refractometer
3. Molecular weight Landsberger method.
4. Molecular weight Rast camphor method.
5. Calibration of pH Meter
6. pH Estimation pH meter
7. pH Estimation colourimetric method.
8. pH Estimation by Half Neturalization Method
9. Refractive index of liquids.
10. Phenol water system CST
11. Lower consolute temperature Tea and Water
12. Heat of neutralization
13. Phase diagram - Phenol Water, Effect of Impurities.
14. Ternary phase diagram.
15. Preparation of Buffers and Buffer Capacity Determination.





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## (R9209) HEALTH EDUCATION & PATHOPHYSIOLOGY LAB

### (14 Experiments)

1. Study of reproductive system with the help of charts and models 2 Experiments.
2. Various devices used in Famliy planning like Copper T, Lippers loop, Pills, Diaphram and Condom.
3. Microscopic studies of abnormal tissue sections 4 Experiments.
4. Simple experiments involved in the analysis of normal and abnormal urine; collection of specimen, appearance, determination of pH, sugars, proteins, urea and creatinine 4 Experiments.
5. Physiological experiments on nerve-muscle preparations 4 Experiments.

**REFERENCES**

1. Plummer, Practical Biochemistry
2. Chatterjee, Human Physiology

www.engineershub.in