

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW**



Study & Evaluation Scheme with Syllabus

For

B.Pharm. Second Year

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	Th/Lab ESE	Sessional		Total	Credit
					CT	TA		
1	RCA305	Cyber Security	3-0-0	70	20	10	100	3
2	RPH301	Pharmaceutical Chemistry-IV (Heterocyclic & Bioorganic Chemistry)	3-0-0	70	20	10	100	3
3	RPH302/ RPH307	Pharmaceutics-II (Unit Operations)/ Pharmaceutics-IV (Physical Pharmacy)	3-0-0	70	20	10	100	3
4	RPH304/ RPH309	Anatomy, Physiology & Pathophysiology-III/ Pharmaceutical Jurisprudence	3-0-0	70	20	10	100	3
5	RPH305/ RPH310	Pharmacognosy-II/ Pharmaceutical Analysis-II	3-0-0	70	20	10	100	3
6	RPH301P	Pharmaceutical Chemistry-IV (Heterocyclic & Bioorganic Chemistry) Practical	0-0-4	50	30	20	100	2
7	RPH302P/ RPH307P	Pharmaceutics-II (Unit Operations) Practical/ Pharmaceutics-IV (Physical Pharmacy) Practical	0-0-4	50	30	20	100	2
8	RPH303P	Pharmaceutics-III (Hospital & Community Pharmacy) Practical	0-0-4	50	30	20	100	2
9	RPH304P/ RPH309P	Anatomy, Physiology & Pathophysiology-III Project/ Pharmaceutical Jurisprudence Project	0-0-4	50	30	20	100	1
10	RPH305P/ RPH310P	Pharmacognosy-II Practical/ Pharmaceutical Analysis-II Practical	0-0-4	50	30	20	100	2
TOTAL							1000	24

CT: Class Test

TA: Teacher Assessment

L/T/P: Lecture/ Tutorial/ Practical

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	Th/Lab ESE	Sessional		Total	Credit
					CT	TA		
1	RVE401	Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
2	RPH407/ RPH402	Pharmaceutics-IV (Physical Pharmacy)/ Pharmaceutics-II (Unit Operations)	3-0-0	70	20	10	100	3
3	RPH408	Pharmaceutics-V (Cosmetic Technology)	3-0-0	70	20	10	100	3
4	RPH409/ RPH404	Pharmaceutical Jurisprudence/ Anatomy, Physiology & Pathophysiology-III	3-0-0	70	20	10	100	3
5	RPH410/ RPH405	Pharmaceutical Analysis-II/ Pharmacognosy-II	3-0-0	70	20	10	100	3
6	RPH406P	Pharmaceutical Chemistry-V (Molecular Biology & Biochemistry) Practical	0-0-4	50	30	20	100	2
7	RPH407P/ RPH402P	Pharmaceutics-IV (Physical Pharmacy) Practical/ Pharmaceutics-II (Unit Operations) Practical	0-0-4	50	30	20	100	2
8	RPH408P	Pharmaceutics-V (Cosmetic Technology) Practical	0-0-4	50	30	20	100	2
9	RPH409P/ RPH404P	Pharmaceutical Jurisprudence Project (Case studies)/ Anatomy, Physiology & Pathophysiology-III Project	0-0-4	50	30	20	100	1
10	RPH410P/ RPH405P	Pharmaceutical Analysis-II Practical/ Pharmacognosy-II Practical	0-0-4	50	30	20	100	2
TOTAL							1000	24

CT: Class Test

TA: Teacher Assessment

L/T/P: Lecture/ Tutorial/ Practical

RPH301: PHARMACEUTICAL CHEMISTRY-IV (HETEROCYCLIC & BIOORGANIC CHEMISTRY)

Unit I

Heterocyclic compounds: Nomenclature, chemistry, preparation, properties and pharmaceutical importance of pyrrole, furan, thiophene, pyridine, pyrimidine, imidazole, pyrazole, thiazole, benzimidazole, indole, phenothiazines.

Unit II

Carbohydrates: Classification, reactions, structure elucidation, identification of- Monosaccharides- Glucose, fructose.

Disaccharides- Sucrose, lactose, maltose. Polysaccharides- Starch.

Unit III

Amino acids and proteins: Classification, identification, general methods of preparation and reactions, isoelectric point, peptide bond, types of protein structure, protein separation and purification, end group analysis, introduction to solid phase peptide synthesis.

Unit IV

Nucleic acids: Classification, structures (primary, secondary, tertiary and quaternary) and functions of DNA and RNA, genetic codes.

Oils, fats and waxes: Structure and properties, analysis (acid value, iodine value, saponification value, Reichert-Meissl value).

Unit V

Vitamins: Classification, structure elucidation (only individually mentioned compounds) and physiological functions of water and fat soluble vitamins: Thiamine, niacin, ascorbic acid and retinol.

Polymers and polymerization: Classification, synthesis, reactions and pharmaceutical applications.

RPH301P: PHARMACEUTICAL CHEMISTRY-IV (HETEROCYCLIC & BIOORGANIC CHEMISTRY) PRACTICAL

Practicals:

1. Synthesis of heterocyclic nuclei such as Pyrazole, Imidazole, Thiazole, Indole, Benzimidazole, Phenothiazines.
2. Synthesis of compounds involving name reactions such as; Mannich reaction, Claisen-Schmidt condensation, Schiff's base formation.
3. Identification of carbohydrates by derivative preparation.
4. Identification of proteins by different color reactions.
5. Analysis of oils, fats and waxes (such as; acid value, saponification value, iodine value).
6. Stereomodels of proteins (primary, secondary and tertiary).
7. Determination of molecular weight of compounds (Rast's Camphor Method) polymers (Ostwald's Viscometer Method).

BOOKS RECOMMENDED

1. Morrison R.T. and Boyd R.N., Bhattacharjee S.K. Organic Chemistry, 7th Edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar I.L., Organic Chemistry, 6th Edition, Vol.-I, Dorling Kindersley (India) Pvt. Ltd (Pearson Education).
3. Acheson R.M., An Introduction to the Chemistry of Heterocyclic Compounds, 3rd Edition, Wiley (India) Pvt. Ltd.
4. Gilchrist T.L., Heterocyclic Chemistry, Pearson Education (Singapore) Ltd.
5. Bansal R.K., Heterocyclic Chemistry, New Age International Publishers.
6. Jain M.K. and Sharma S.C., A Textbook of Organic Chemistry, Shoban Lal and Co. Educational Publishers.
7. Allcock H.R., Lampe F.W. and Mark J.E., Contemporary Polymer Chemistry, Pearson Education (Singapore) Pvt. Ltd.
8. Odian G., Principles of Polymerization, John Wiley and Sons Inc.
9. Mann F.G. and Saunders B.C., Practical Organic Chemistry, 4th Edition, Dorling Kindersley (India) Pvt. Ltd.
10. Furniss B.S., Hannaford A.J., Smith P.W.G. and Tatchell A. R., Vogel's Textbook of Practical Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
11. Plummer, David J., An Introduction to Practical Biochemistry, Mc Graw Hill, New Delhi.
12. Ghosh S. K., Advanced General Organic Chemistry- A Modern Approach, Part-I & II, 3rd Edition, New Central Book Agency (P) Ltd.
13. Bruice P.Y., Organic Chemistry, 3rd Edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
14. Jenkins G.L., Hartung W.H., Hamlin K.E. and Data J.B., The Chemistry of Organic Medicinal Products, 4th Edition, Pharma Med Press, Hyderabad.

RPH302/RPH402: PHARMACEUTICS-II (UNIT OPERATIONS)

Unit I

Stoichiometry: Introduction, unit processes, material and energy balance, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, basic laws.

Automated process control systems: Process variables, temperature, pressure, flow level and their measurements. Elements of automatic process control and introduction to reactors.

Unit II

Water systems: Raw water, soft water, purified water, water for injection, quality requirement and treatment of water. Washing, cleaning and standardization of cleaning.

Filtration and centrifugation: Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter. Factors affecting filtration. Principles of centrifugation, industrial centrifugal filters and centrifugal sedimenters.

Unit III

Drying: Moisture content and mechanism of drying , rate of drying and time of drying calculations, classification and type of dryers , dryers used in pharmaceutical industries: tray dryer, fluidized bed dryer, spray dryer and special drying methods.

Unit IV

Heating, ventilation and AC systems: Basic concepts and definition, wet bulb and adiabatic saturation temperatures, psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipment for dehumidification operations. Principles and applications of refrigeration and air conditioning.

Unit V

Material of construction: General study of composition, corrosion, resistance, properties and applications of the materials of construction with special reference to stainless steel and glass.

Industrial hazards and safety precautions: Mechanical, chemical, electrical, fire and dust hazards. Industrial dermatitis, accident records.

RPH302P/RPH402P: PHARMACEUTICS-II (UNIT OPERATIONS) PRACTICAL

Practicals:

1. Study of factors affecting rate of filtration
 - a) Effect of different filter media.
 - b) Effect of viscosity of filtrate. c) Effect of pressure.
 - d) Effect of thickness of cake. e) Effect of filter aids.
2. Study of factors affecting rate of drying
 - a) Surface area.
 - b) Temperature.
3. Determination of rate of drying, free moisture content and bound moisture content.
4. Study of principle of centrifugation for
 - a) Liquid–liquid separation and stability of emulsions. b) Solid–liquid separation and stability of suspension.
5. Determination of dry bulb and wet bulb temperatures and use of psychrometric charts.

BOOKS RECOMMENDED

1. Badger W.L. and Banchero J.T. Introduction to Chemical Engineering, Mc Graw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, Mc Graw Kogakusha Ltd.
3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill International Book Co., London.
4. Sambhamurthy K., Pharmaceutical Engineering, New Age Publishers.
5. Brown G. G., Unit Operations, CBS Publishers, New Delhi.
6. Leon Lachman, Herbert A. Liebermann, Joseph Louis Kanig, The Theory and Practice of Industrial Pharmacy, Varghese Publishing House, New Delhi.
7. Carter S.J., Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, New Delhi.
8. Levin M. (Ed), Pharmaceutical Process Scale-Up, 2nd Edition(Special Indian Edition), Taylor & Francis Group, London.
9. Sharma A.M., Safety and Health in Industry A Handbook, BS Publications, Hyderabad.

RPH303P: PHARMACEUTICS-III (HOSPITAL & COMMUNITY PHARMACY) PRACTICAL

- 1) To study the organization and structure of hospital.
- 2) To study the layout of community pharmacy and its legal requirements.
- 3) To study the drug distribution systems in hospitals.
- 4) To study the dispensing of drugs to in-patient and ambulatory patients in hospital.
- 5) To study the significance of sterilization and packing of material prior to sterilization.
- 6) To study the OTC medication with suitable examples.
- 7) To study the importance of patient counseling.
- 8) To study the drug information sources.
- 9) Validation of sterilizing equipments.
- 10) Designing of patient information leaflet.
- 11) Preparation of Master Formula Record.
- 12) Sterilization and evaluation of surgical materials.
- 13) Sterilization of parenteral and ophthalmic preparations.
- 14) Categorization and storage of pharmaceutical products based on legal requirements of labeling and storage.
- 15) Study of various pathological reports of blood and urine.

BOOKS RECOMMENDED

1. Hasan, Hospital Pharmacy, Lea & Febiger, Philadelphia.
2. Merchant H.S. and Qadry J.S. Text Book of Hospital Pharmacy, B.S. Shah Prakashan, Ahmedabad.
3. Carter S.J. Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.
4. Ansel H.C., Introduction to Pharmaceutical Dosage Forms, K.M. Varghese & Co., Bombay.
5. Aulton M.E. Pharmaceutics – The Science of Dosage Form Design, ELBS/ Churchill Livingstone.
6. Remington Pharmaceutical Sciences, Mack Publishing Co., Pennsylvania.
7. Indian Pharmacopoeia, Ministry of Health and Family Welfare, Published by Govt. of India.
8. British Pharmacopoeia, Her Majesty's Stationary Office, Cambridge.
9. Thompson J. E., Contemporary Pharmacy Practice, Lippincott Williams & Wilkins.
10. Parmar N.S. Community Pharmacy & Health Education, CBS Publishers.
11. Parthasarathi G., Nyfort-Hansen K. Nahata M. C. A Text Book of Clinical Pharmacy Practice, Orient Longman Pvt Ltd, Chennai.

RPH304/ RPH404: ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY-III

Unit I

Respiratory system: Anatomy & function of respiratory structures, mechanism of respiration, regulation of respiration, pathophysiology of asthma, pneumonia, bronchitis, emphysema, tuberculosis.

Unit II

Cardiovascular system: Functional anatomy of heart, conducting system of heart, cardiac cycle, ECG (Electrocardiogram). Pathophysiology of hypertension, angina, CHF, myocardial infarction, cardiac arrhythmias, ischaemic heart disease, arteriosclerosis.

Unit III

Reproductive system: Male & Female reproductive systems. Menstruation, pathophysiology of sexually transmitted diseases, spermatogenesis, oogenesis, pregnancy.

Unit IV

Endocrine system: Anatomy & Physiology of pituitary, thyroid, parathyroid, adrenal, pancreas. Control of hormone secretion, pathophysiology of hypo & hyper secretion of endocrine glands & their disorders, e.g.- Diabetes mellitus.

Unit V

Cell injury: Causes of cell injury, pathogenesis & morphology of cell injury. Cellular Adaptation- atrophy, hypertrophy, aplasia, metaplasia & dysplasia, pathophysiology of neoplasm.

Inflammation: Basic mechanisms involved in the process of inflammation and repair: Alterations in vascular permeability and blood flow, migration of WBCs, mediators of inflammation. Brief outline of the process of repair.

RPH304P/RPH404P: ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY-III PROJECT

Suggested Practicals

1. The preparation of charts/ models of following:
 - a. Various parts of respiratory system- nose, pharynx, trachea, lungs
 - b. Parts of cardiovascular system, heart, conducting system of heart etc.
 - c. Cardiac cycle, ECG.
 - d. Male reproductive system.
 - e. Female reproductive system.
 - f. Spermatogenesis.
 - g. Oogenesis.
 - h. Phases of pregnancy.
 - i. Different types of endocrine glands.

BOOKS RECOMMENDED

1. Dipiro J.L., Pharmacotherapy: A Pathophysiological Approach, Elsevier.
2. Robbins S.L., Kumar V., Basic Pathology, WB Saunders Company.
3. Ross and Wilson, Anatomy & Physiology in Health and Illness, Churchill Livingstone.
4. Tortora GJ & Anagnostoukos NP, Principles of Anatomy and Physiology, Harper & Row Publishers, New Delhi.
5. Difore S.H., Atlas of Normal Histology, Lea and Febiger, Philadelphia.
6. Chaurasia B.D., Human Anatomy, Regional and Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
7. Guyton A.C., Hall J.E., Text book of Medical Physiology, WB Saunders Company.
8. Chatterjee C.C., Human Physiology, Medical Allied Agency, Calcutta.
9. Keele, C.A., Niel, E. and Joels N., Samson Wright's Applied Physiology, Oxford University Press.
10. McCorry L.K., Essentials of Human Physiology for Pharmacy, 2nd Special Indian Edition, CRC Press (Taylor & Francis Group).

RPH305/RPH405: PHARMACOGNOSY-II

Unit I

Introduction to different systems of medicine: Brief introduction and principles of Ayurvedic, Unani, Siddha and Homeopathic systems of medicine. Introduction to Herbal Pharmacopoeia with special reference to arishtas, asavas, gutikas, tailas, churnas, lehyas and bhasmas.

Unit II

Medicinal plants: Introduction to medicinal plants with biological source, macro and microscopy, chemical constituents and uses of Kalmegh, Aswagandha, Bael, Guggulipid, Ginseng, Tulsi, Neem.
Pharmaceutical aids: Study of Pharmaceutical aids like talc, diatomite, kaolin, bentonite, fullers earth, gelatin and natural colours.

Unit III

Resins: Study of drugs containing Resins and Resin Combination like Podophyllum, Cannabis, Capsicum, Shellac, Asafoetida, Balsam of tolu, Balsam of peru, Benzoin, Turmeric, Ginger.
Enzymes: Biological sources, preparation, Identification tests and uses of following enzymes– Diastase, Papain, Penicillinase, Hyalluronidase, Streptokinase.

Unit IV

Aromatic plants: Introduction to aromatic plants with biological source, macro and microscopy, chemical constituents and uses of Mentha, Coriander, Clove, Fennel, Geranium oil, Lemon grass, Citronella, Cumin, Eucalyptus, Nutmeg, Cardamom.
Fibres: Study of fibers used in pharmacy such as cotton, silk, wool, jute, asbestos.

Unit V

Classification of pesticides, methods for determination of pesticide residues, maximum limit of pesticide residues for medicinal plant materials. Determination of microorganisms in plant drugs. Study of radioactive contamination in medicinal plant materials.

RPH305P/RPH405P: PHARMACOGNOSY– II PRACTICAL

Practicals:

1. Microscopic study of plant epidermal trichomes, stomata, veins, endodermis, sclereids, fibers, xylem, phloem. Measurement of Trichomes, Fibres and Stomata using camera lucida.
2. Identification & morphology of Mentha, Lemongrass, Nutmeg, Turmeric, Ginger, Cannabis.
3. Morphology & microscopy of Coriander, Cinnamon, Fennel, Clove.
4. Chemical evaluation of enzymes.
5. Study of Cotton, Silk and Wool along with their chemical tests.
6. Utilization of Aromatic plants ((Monograph).

BOOKS RECOMMENDED

1. Trease G.E. & Evans W.C., Pharmacognosy, Elsevier India Pvt. Ltd.
2. Tyler V.E., Brady L.R. and Robbers J.E. Pharmacognosy, 9th Edition, Wolter Kluwer (India) Pvt. Ltd., New Delhi.
3. Bruneton J., Pharmacognosy Phytochemistry Medicinal Plants, Lavoisier Publishing Inc.
4. Indian Herbal Pharmacopoeia, Vol. I and II, Indian Drug Manufacturers Association.
5. Wallis, T.E., Text Book of Pharmacognosy, J&A Churchill Ltd, London.
6. Atal C.K. and Kapur B.M., Cultivation & Utilization of Medicinal Plant, RRL, Jammu.
7. Pharmacopoeia of India, The Controller of Publications, Vol. III, Delhi.
8. Dutta A.C., Botany, Oxford University Press.
9. Wallis T.E., Practical Pharmacognosy, PharmaMed Press, Hyderabad.
10. Kokate, C.K., Practical Pharmacognosy, Vallabh Prakashan, Delhi.
11. Purohit S.S. and Prajapati N.D., A Handbook of Indian Medicinal Plants, Agro Bios (India).
12. Sukh Dev, A Selection of Prime Ayurvedic Plants Drugs, Anamaya Publishers.

**RPH406P: PHARMACEUTICAL CHEMISTRY-IV
(MOLECULAR BIOLOGY & BIOCHEMISTRY) PRACTICAL**

1. To study the central dogma of molecular biology.
2. To study the enzyme kinetics and its mechanism of action.
3. To study various isoenzymes in chemical diagnosis.
4. To study the oxidative pathway of fatty acids.
5. To draw and study pathway of glycolysis, gluconeogenesis and glycogenolysis.
6. To draw and study citric acid cycle.
7. To draw and study biosynthesis of purine and pyrimidine nucleotides (de Novo and Salvage pathway).
8. Separation of amino acids by chromatography (paper and thin layer chromatography).
9. Separation of lipids by TLC.
10. Titration curve for amino acids.
11. Quantitative estimation of proteins using UV-Visible spectrophotometer.
12. Enzymatic hydrolysis of glycogen by α and β amylases.
13. Qualitative analysis of inorganic as well as organic constituents of urine.
14. Estimation of glucose in blood and urine samples.
15. Estimation of cholesterol in blood samples.
16. Estimation of various components using semi-autoanalyzer.

BOOKS RECOMMENDED

1. Murray R.K. and Granner D.K., Harper's Illustrated Biochemistry, Lange Medical Publication.
2. Nelson D.L. and Cox M.M., Lehninger Principles of Biochemistry, Macmillan Worth Publishers.
3. Voet D., Voet J.G., Pratt C.W. Fundamentals of Biochemistry, John Wiley and Sons Inc.
4. Champe P.C., Harvey R.A., Ferrier D.R. Lippincott's Illustrative Reviews: Biochemistry, Lippincott Williams and Wilkins.
5. Wilson K. and Walker J. Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press.
6. Dugas H., Bioorganic Chemistry: A Chemical Approach to Enzyme Action, 3rd Edition, Springer (India) Private Limited, New Delhi.
7. Lodish H., Berk A., Matsudaira P., Kaiser C.A., Krieger M. and Scott M.P. Molecular Cell Biology, W. H. Freeman and Company, New York.
8. Becker W.M., Kleinsmith L.J. and Hardin J. The World of the Cell, Pearson Education.

9. Conn E.E. and Stumph P.K., Outline of Biochemistry, John Wiley & Sons, New York.
10. Stryer L. and Berg J.M., Biochemistry, W.H. Freeman and Company, New York.
11. Harrow B. and Mazur A., Text book of Biochemistry, W.B. Saunders Co., Philadelphia.
12. Plummer D.J., An Introduction to Practical Biochemistry, Mc Graw Hill, New Delhi.
13. Jayaraman J., Laboratory Manual in Biochemistry, Wiley Eastern Limited.
14. Singh S.P., Practical Manual to Biochemistry, CBS Publisher, New Delhi.
15. Boyer R.F. Modern Experimental Biochemistry, Dorling Kindersley (India) Pvt. Ltd.
16. Verley H. Practical Clinical Biochemistry, CBS Publishers and Distributors. New Delhi.
17. Deb A.C. Comprehensive Viva and Practical Biochemistry, New Central Book Agency (P.) Ltd. London.
18. Vyas S.P. and Kohli D.V., Pharmaceutical Biochemistry, 1st Edition, CBS Publishers & Distributors, New Delhi.

RPH307/RPH407: PHARMACEUTICS-IV (PHYSICAL PHARMACY)

Unit I

Drug stability: Degradative pathways, influence of temperature, light, solvent, catalytic species and other factors on drug stability, accelerated stability study, expiration dating.

Buffers: Buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

Unit II

Micromeritics and powder rheology: Particle size and distribution, average particle size, number and weight distribution, methods for determining particle volume, optical microscopy, sieving, sedimentation, measurement, particle shape, specific surface, methods for determining surface area (air permeability and adsorption method), derived properties of powders, porosity, packing arrangement, densities, bulkiness and flow properties.

Unit III

Surface and interfacial phenomenon: Liquid interface, surface and interfacial tension, surface free energy, measurement of surface and interfacial tension, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, adsorption at solid-liquid interfaces, complex films, electrical properties of interface and applications.

Unit IV

Viscosity and rheology: Newtonian systems, law of flow, kinematic viscosity, factors affecting viscosity of formulations, non-Newtonian systems: Pseudoplastic, dilatant, plastic and thixotropy, determination of viscosity by falling sphere, rotational viscometers.

Unit V

Dispersion systems: Colloidal dispersions: Brief introduction to colloids: types and application in pharmacy.

Suspensions: Settling in suspensions, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations.

Emulsions: Theories and physical stability.

RPH307P/RPH407P: PHARMACEUTICS-IV (PHYSICAL PHARMACY)

Practicals:

1. Determination of particle size, Particle size distribution and surface area using various methods of particle size analysis.
2. Determination of derived properties of powders like density, porosity, compressibility, angle of repose etc.
3. Determination of surface/ interfacial tension, HLB value and critical micellar concentration of surfactants.
4. Study of rheological properties of various types of systems using different Viscometers.
5. Studies of different types of colloids and their properties.
6. Preparation of various types of suspensions and determination of their sedimentation parameters.
7. Preparation and stability studies of emulsions.
8. To study the influence of various factors on the rate of reaction.
9. Accelerated stability testing, shelf-life determination and expiration dating of pharmaceuticals.
10. Experiments involving tonicity adjustments.

BOOKS RECOMMENDED:

1. Martin A, Bustamante P. & Chun A.H.C- Physical Pharmacy, Lea & Febiger, Philadelphia.
2. Shotten E & Ridgeway K, Physical Pharmaceutics, Oxford University Press, London.
3. D.V. Derle , Essentials of Physical Pharmacy.
4. Modern Pharmaceutics, Banker and Rhodes.
5. Aulton, M.E, Pharmaceutics, The Design and Manufacture Of Medicines, Churchill Livingstone.
6. Hajare, A. Physical pharmacy, New Central Book Agency Pvt. Ltd., Kolkata.

RPH408: PHARMACEUTICS-V (COSMETIC TECHNOLOGY)

Unit I

Introduction to cosmetics, classification of cosmetics.

Functional excipients: Colorants, plasticizers, humectants, thickeners, perfumes. Brief study of skin structure, dermal/ percutaneous absorption.

Unit II

Toxicity studies on cosmetic products; corrosiveness, skin irritation, repeated dose toxicity, carcinogenicity, photo-induced toxicity.

Formulation and evaluation of following cosmetics: Cold cream, vanishing cream, lotions, cleansing lotion, moisturizers, powders, face wash, face pack. Role of exfoliating agents, anti ageing and SPF.

Baby care products: Soaps, shampoo, creams, lotion, powder.

Unit III

Formulation development of cosmetic products: Shampoo, conditioners, hair colors, depilatories, nail lacquers, kohl, mascara, eye liner, eye shadow, toothpowder, toothpaste, lipstick, lip balm.

Shaving preparations: Skin conditioners, beard softeners, lather preparations, aerosol foams, after shave lotions, balms and creams.

Unit IV

Safety evaluation of finished cosmetic product: Stability, physical and chemical characteristics, microbial quality.

Anti perspirants and deodorants: Introduction and types.

Unit V

Herbal cosmetics: Brief study of natural depigmentation agents and antioxidants. Formulations of herbal creams, powders, gel, shampoo, hair color, conditioners, face pack, face wash, lip balm, hair oils, soaps for cosmetic use.

RPH408P: PHARMACEUTICS- V (COSMETIC TECHNOLOGY) PRACTICAL

Practicals:

To prepare and evaluate the following cosmetics-

- | | |
|-------------------|------------------------|
| 1. Cold cream | 2. Vanishing cream |
| 3. Body lotion | 4. Face powder |
| 5. Body Powder | 6. Liquid shampoo |
| 7. Tooth powder | 8. Tooth paste |
| 9. Shaving cream | 10. After shave lotion |
| 11. Nail lacquers | 12. Lipstick |

Preparation of the following herbal products-

1. Shampoo
2. Cream
3. Face pack
4. Lip balm
5. Soap

BOOKS RECOMMENDED

1. Harry R.G., Reiger M.M., Harry's Cosmetology, Chemical publishing company. Newyork
2. Balsam M.S., Sagarin E., Cosmetics: Science and Technology. Wiley Interscience. New York.
3. Rao Y.M., Shayeda, Cosmeceuticals, Pharma Med Press. Hyderabad
4. Paye M., Basel A.O., Maibach H.I., Handbook of Cosmetic Science & Technology, Informa Healthcare. New York.
5. Sharma P.P., Cosmetics Formulation, Manufacturing and Quality control, Vandana Publication Pvt. Ltd. Delhi
6. Poucher W.A., Butler H., Poucher's Perfumes, Cosmetic & Soaps, Springer India Pvt. Ltd. New Delhi.
7. Nanda S., Nanda A., Cosmetic Technology, Birla Publication, Delhi.
8. SCCS's Notes of Guidance for the Testing of Cosmetic Ingredients and their Safety Evaluation, 7th Revision. European Commission.
9. Indian Pharmacopoeia 2014 (7th edition), Ministry of Health and Family Welfare, Published by Govt. of India.

RPH309/RPH409: PHARMACEUTICAL JURISPRUDENCE

Unit I

Introduction to pharmaceutical jurisprudence. Pharmaceutical legislations- a brief review. Drugs and pharmaceutical industry- a brief review. Pharmaceutical education-a brief review. Pharmaceutical Ethics. Poisons Act 1919. Drugs Price Control Order 1995.

Unit II

An elaborate study of the following: Pharmacy Act 1948. Drugs and Cosmetics Act 1940 and Rules 1945.

Unit III

Narcotic Drugs and Psychotropic Substances Act 1985 and Rules. Medicinal and Toilet Preparations (Excise Duties Act 1955). Prevention of Cruelty to Animals Act 1961. Drugs and Magic Remedies (objectionable advertisements) Act 1954.

Unit IV

A brief study of the following with special reference to the main provisions. Patents act 1970. Indian Copyright Act 1957

Unit V

A brief study of: The Trademarks Act 1999. The Designs Act 2000. The Geographical Indication of Goods (registration and protection) Act 1999.

Note : The teaching of all the above Acts should cover the latest amendments.

RPH309P/RPH409P: PHARMACEUTICAL JURISPRUDENCE PROJECT (CASE STUDIES)

The students shall study cases based on the acts mentioned in theory syllabus.(for example-cases of revoked patents in India; cases of evergreening ; patent of basmati, haldi, neem; schedule M and revised schedule M, trademark infringement and so on). Further, different cases shall be assigned to the students, based on the acts mentioned in the theory syllabus, on which the projects shall be prepared.

BOOKS RECOMMENDED

1. Mittal B.M., Textbook of Forensic Pharmacy, National Book Centre, Calcutta.
2. Relevant Acts and Rules Published by the Govt. of India.
3. Jain N.K., A Textbook of Forensic Pharmacy, Vallabh Prakashan, New Delhi.
4. Singh, H., History of Pharmacy in India-Vol.-I, II & III, Vallabh Prakashan.
5. Bare Acts, Published by The Government of India, New Delhi.

RPH310/RPH410: PHARMACEUTICAL ANALYSIS- II

Theoretical considerations and application in drug analysis and quality control by the following analytical techniques (assays included in the Indian Pharmacopoeia)-

Unit I

Non-aqueous titrations: Basic concepts, types of solvents, leveling and differentiating solvents, titrations of weakly acidic and weakly basic compounds (assay of drugs like nitrazepam, chlorpromazine and ethosuccimide).

Complexometric titrations: Principle, complexing agents, indicators, masking and demasking, types of complexometric titrations, assay of some drugs like alum, calcium gluconate injection and determination of hardness of water.

Unit II

Introduction, dielectric cell, electrode potential, Nernst equation, salt bridge, standard potential, reference and indicator electrodes.

Potentiometry: General principles, instrumentation, types of potentiometric titrations, advantages and applications.

Conductometry: General principles, effect of dilution, conductance measurement, types of conductometric titrations, merits, demerits, instrumentation and applications.

Unit III

General principles (adsorption and partition), classification and theories (plate and rate) of chromatography. Retardation factor, selection of stationary and mobile phase, development of chromatogram and its visualization.

Paper chromatography: Introduction, types (ascending, descending, ascending-descending, radial and two dimensional), applications.

Thin layer chromatography (TLC): Introduction, types and techniques of TLC, applications. Introduction to high performance thin layer chromatography (HPTLC).

Unit IV

Column chromatography: Introduction, selection and preparation of column, flash chromatography, applications.

High performance thin layer chromatography (HPLC): Introduction, instrumentation (sample injection system, pumps, columns and guard columns, detectors) and applications. Reverse Phase-High Performance Liquid Chromatography (RP-HPLC).

Introduction to gas liquid chromatography (GLC).

Unit V

Miscellaneous methods of analysis: Diazotization titrations, Kjeldahl method of nitrogen estimation, Karl- Fischer titration. Radioassays (RIA, ELISA, Autoradiography).

Polarography: Principles, instrumentation and applications.

Amperometry: Principles, instrumentation and applications including amperometric titrations.

RPH310P/RPH410P: PHARMACEUTICAL ANALYSIS- II PRACTICAL

Practicals:

1. Preparation and standardization of perchloric acid by non-aqueous titration.
2. Preparation and standardization of sodium/potassium methoxide solutions by non-aqueous titration.
3. Preparation and standardization of EDTA/Dimethylglyoxime solution.
4. Assay of magnesium hydroxide/ magnesium sulfate by complexometric titrations.
5. Determination of hardness of water by complexometric titration.
6. Preparation and standardization of sodium nitrite by diazotization titration method.
7. Assay of sulfa drugs by diazotization titration method.
8. To determine moisture content in drug by Karl Fischer method.
9. Determination of end point in acid base titration and oxidation reduction titration by potentiometric technique.
10. Determination of end point in acid base titration by conductometric methods.
11. Exercises based on paper, column and thin layer chromatography.
12. Demonstration of HPLC.

BOOKS RECOMMENDED:

1. Beckett A. H. and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol, I & II, CBS Publishers, New Delhi.
2. Pharmacopoeia of India, Published by The Controller of Publications, Delhi.
3. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
4. Mendham J., Denny R.C., Barnes, J.D. Thomas M.J.K., Vogel's Text Book of Quantitative Chemical Analysis, Pearson Education Asia.
5. Connors K.A., A Textbook of Pharmaceutical Analysis, Wiley Intescience, New York.
6. Synder L. R., Joseph. J., K., Dolan J. W. Introduction to Modern Liquid Chromatography, 3rd Edition, Wiley Publications.
7. Sethi P.D., HPLC-Quantitative Analysis of Pharmaceutical Formulations, CBS Publishers, New Delhi.
8. Sethi P.D., HPTLC-Quantitative Analysis of Pharmaceutical Formulations, CBS Publishers, New Delhi.
9. Stahl E., Thin Layer Chromatography- A Laboratory Handbook, Springer-Verlag.
10. Braun R.D., Introduction to Instrumental Analysis, PharmaMed Press, Hyderabad.