

**ADMISSION
&
EXAMINATION RULES
&
SYLLABUS**

FOR

**BACHELOR IN PHARMACY
(Semester System)**

Effective from 2010-2011

**FACULTY OF PHARMACY
JAMIA HAMDARD
(Deemed University)**

Hamdard Nagar, New Delhi – 110062

ADMISSION & EXAMINATION RULES
FOR
BACHELOR IN PHARMACY
(Semester System)
Effective from 2010-2011

JAMIA HAMDARD

FACULTY OF PHARMACY

ADMISSION & EXAMINATION RULES

BACHELOR IN PHARMACY

1. Program: Bachelor in Pharmacy (B. Pharm)

It shall be a fulltime regular course. Duration in an academic year, a candidate shall be enrolled only for one program of study and shall not appear in any other examination of this or any other University.

2. Duration: Four years (Eight Semester)

3. Medium of Instruction and Examination: English

4. Eligibility for admission: A candidate seeking admission to this course must have:

- a) Passed 10+2 examination from Central Board of Secondary Education, or any other examination recognized by Jamia Hamdard as equivalent thereto, with at least 50% marks in the aggregate of Physics, Chemistry and Biology subjects, and must have passed in each of these subjects.
- b) Qualified the admission test/interview conducted by Jamia Hamdard.
- c) Completed the age of 17 years on or before the 31 December of the year of admission.

5. Course structure with credits:

The numbers of hours of teaching in theory as well as practical in the various subjects of this course are listed below. The course contents are given in the syllabus.

Semester-I

| S.no | Subject | Course code | Min teaching Hrs. per week | | | | Total | |
|------|-------------------------------------------------|-------------|----------------------------|--------|-----------|--------|-------|---------|
| | | | Theory | | Practical | | Hrs | Credits |
| | | | Hrs | Credit | Hrs | Credit | | |
| 1 | Pharmaceutics – I (Introduction to Pharmacy) | BPH-101 | 04 | 04 | 04 | 02 | 08 | 06 |
| 2 | Pharmaceutics – II (Unit Operation) | BPH-102 | 04 | 04 | 04 | 02 | 08 | 06 |

| | | | | | | | | |
|----------------------|-------------------------------------------------------------|---------|----|----|-----|-----|-----------|----|
| 3 | Pharmaceutical Chemistry-I (Inorganic Med. & Pharm Chem) | BPH-103 | 04 | 04 | 04 | 02 | 08 | 06 |
| 4 | Pharmacognosy-I (Pharmaceutical Biology-I) | BPH-104 | 03 | 03 | 03 | 02 | 06 | 05 |
| 5 | Human Anatomy & Physiology-I | BPH-105 | 03 | 03 | 03 | 02 | 06 | 05 |
| 6 | Environmental Sciences | ES-01 | 02 | 02 | --- | --- | 02 | 02 |
| Total credits | | | | | | | 30 | |

Semester-II

| S.no | Subject | Course code | Min teaching Hrs. per week | | | | Total | |
|----------------------|----------------------------------------------------|-------------|----------------------------|--------|-----------|--------|-----------|---------|
| | | | Theory | | Practical | | Hrs | Credits |
| | | | Hrs | Credit | Hrs | Credit | | |
| | Semester –II | | | | | | | |
| 1 | Pharmaceutics – III (Dispensing Pharmacy) | BPH-201 | 04 | 04 | 04 | 02 | 08 | 06 |
| 2 | Pharmaceutical Chemistry-II (Organic Chemistry) | BPH-202 | 04 | 04 | 04 | 02 | 08 | 06 |
| 3 | Pharmacognosy-II (Pharmaceutical Biology-II) | BPH-203 | 03 | 03 | 03 | 02 | 06 | 05 |
| 4 | Human Anatomy & Physiology-II | BPH-204 | 03 | 03 | 03 | 02 | 06 | 05 |
| Total credits | | | | | | | 22 | |

Semester-III

| S.no | Subject | Course code | Min teaching Hrs. per week | | | | Total | |
|----------------------|-----------------------------------------------------------------------------------------|-------------|----------------------------|--------|-----------|--------|-----------|---------|
| | | | Theory | | Practical | | Hrs | Credits |
| | | | Hrs | Credit | Hrs | Credit | | |
| | Semester –III | | | | | | | |
| 1 | Pharmaceutical maths & Biostatistics (Statistics & calculus) | BPH-301 | 04 | 04 | --- | --- | 04 | 04 |
| 2 | Pharmaceutics-IV (Pharmaceutical Microbiology including Biological Pharmacy) | BPH-302 | 04 | 04 | 04 | 02 | 08 | 06 |
| 3 | Pharmaceutical chemistry III (Organic & Medicinal Chemistry including Heterocyclics) | BPH-303 | 04 | 04 | 04 | 02 | 08 | 06 |
| 4 | Pharmacognosy-III (General Pharmacognosy) | BPH-304 | 04 | 04 | 04 | 02 | 08 | 06 |
| 5 | Pathophysiology, Toxicology & Health Education | BPH-305 | 02 | 02 | --- | --- | 02 | 02 |
| 6 | Disaster management | DM-01 | 03 | 03 | --- | --- | 03 | 03 |
| Total credits | | | | | | | 27 | |

Semester-IV

| S.no | Subject | Course code | Min teaching Hrs. per week | | | | Total | | |
|----------------------|---------------------------------------------------------------------|-------------|----------------------------|--------|-----------|--------|-----------|---------|--|
| | | | Theory | | Practical | | Hrs | Credits | |
| | | | Hrs | Credit | Hrs | Credit | | | |
| 1 | Pharmaceutics- V (Physical pharmacy) | BPH-401 | 04 | 04 | 04 | 02 | 08 | 06 | |
| 2 | Pharmaceutical Chemistry IV (Pharm. Analysis & Inorganic Chemistry) | BPH-402 | 04 | 04 | 04 | 02 | 08 | 06 | |
| 3 | Pharmacology-I | BPH-403 | 04 | 04 | 04 | 02 | 08 | 06 | |
| 4 | Computer Application | BPH-404 | 03 | 03 | 03 | 02 | 06 | 05 | |
| Total credits | | | | | | | 23 | | |

Semester -V

| S.no | Subject | Course code | Min teaching Hrs. per week | | | | Total | | |
|----------------------|--------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|--------|-----------|--------|-----------|---------|--|
| | | | Theory | | Practical | | Hrs | Credits | |
| | | | Hrs | Credit | Hrs | Credit | | | |
| 1 | Pharmaceutics-VI (Pharm formulation & Cosmetology) | BPH-501 | 04 | 04 | 04 | 02 | 08 | 06 | |
| 2 | Pharmaceutical Chemistry-V Pharmaceutical Analysis-II (Physical Chem. & Principals of Instrumental Analysis) | BPH-502 | 04 | 04 | 04 | 02 | 08 | 06 | |
| 3 | Pharmaceutical Chemistry-VI (Chemistry of Natural Products) | BPH-503 | 04 | 04 | 04 | 02 | 08 | 06 | |
| 4 | Pharmacognosy-IV (Pharmacognosy & Phytochemistry-I) | BPH-504 | 02 | 02 | 03 | 02 | 05 | 04 | |
| 5 | Biochemistry-I | BPH-505 | 02 | 02 | 03 | 02 | 05 | 04 | |
| 6 | Pharmacognosy Tour (Collection of medicinal plants & preparation of herbarium) | | *T | 02 | *P | 02 | | 04 | |
| Total credits | | | | | | | 30 | | |

*T = Tour, *P= Project

Semester-VI

| S.no | Subject | Course code | Min teaching Hrs. per week | | | | Total | |
|----------------------|------------------------------------------------------|-------------|----------------------------|--------|-----------|--------|-----------|---------|
| | | | Theory | | Practical | | Hrs | Credits |
| | | | Hrs | Credit | Hrs | Credit | | |
| 1 | Pharmaceutics-VII (Hospital & Clinical Pharmacy) | BPH-601 | 04 | 04 | --- | --- | 04 | 04 |
| 2 | Pharmaceutics-VIII (Forensic Pharmacy & Ethics) | BPH-602 | 04 | 04 | --- | --- | 04 | 04 |
| 3 | Pharmaceutical Chemistry-VII (Medicinal Chemistry-I) | BPH-603 | 04 | 04 | 04 | 02 | 08 | 06 |
| 4 | Pharmacognosy-V (Pharmacognosy & Phytochemistry-II) | BPH-604 | 02 | 02 | 03 | 02 | 05 | 04 |
| 5 | Pharmacology-II | BPH-605 | 04 | 04 | 04 | 02 | 08 | 06 |
| 5 | Biochemistry-II | BPH-606 | 02 | 02 | 03 | 02 | 05 | 04 |
| Total credits | | | | | | | 28 | |

Semester-VII

| S.no | Subject | Course code | Min teaching Hrs. per week | | | | Total | |
|----------------------|--------------------------------------------------------|-------------|----------------------------|--------|-----------|--------|-----------|---------|
| | | | Theory | | Practical | | Hrs | Credits |
| | | | Hrs | Credit | Hrs | Credit | | |
| 1 | Pharmaceutics-IX (Pharm Management) | BPH-701 | 03+ 1P* | 04 | --- | --- | 04 | 04 |
| 2 | Pharmaceutics-X (Pharmaceutical Technology) | BPH-702 | 04 | 04 | 04 | 02 | 08 | 06 |
| 3 | Pharmaceutical Chemistry-VIII (Medicinal Chemistry-II) | BPH-703 | 04 | 04 | 04 | 02 | 08 | 06 |
| 4 | Pharmacognosy-VI (Industrial Pharmacognosy-I) | BPH-704 | 02 | 02 | 04 | 02 | 06 | 04 |
| 5 | Pharmacology-III | BPH-705 | 02 | 02 | 04 | 02 | 06 | 04 |
| Total credits | | | | | | | 24 | |

Semester-VIII

| S.no | Subject | Course code | Min teaching Hrs. per week | | Total |
|------|----------------------|-------------|----------------------------|-----------|-------|
| | | | Theory | Practical | |
| | Semester-VIII | | | | |

| | | | Hrs | Credit | Hrs | Credit | Hrs | Credits |
|---------------------|--------------------------------------------------------------|---------|-----|--------|-----|--------|-----------|---------|
| 1 | Pharmaceutical Biotechnology | BPH-801 | 03 | 03 | 03 | 02 | 06 | 05 |
| 2 | Pharmaceutics-XI (Biopharmaceutics & Pharmacokinetics) | BPH-802 | 04 | 04 | 04 | 02 | 08 | 06 |
| 3 | Pharmaceutical Chemistry-IX (Medicinal Chemistry-II) | BPH-803 | 04 | 04 | 04 | 02 | 08 | 06 |
| 4 | Pharmacognosy-VII (Industrial Pharmacognosy-II) | BPH-804 | 02 | 02 | 04 | 02 | 06 | 04 |
| 5 | Pharmacology-IV | BPH-805 | 02 | 02 | 04 | 02 | 06 | 04 |
| 6 | Industrial Visit-Pharmaceutics Tour | --- | *T | 02 | *P | 02 | --- | 04 |
| Total credit | | | | | | | 29 | |

***T = Tour**

Total credits in B Pharm (30+22+27+23+30+28+24+29)= 213

6. Internal Assessment:

- a) For the purpose of awarding sessional marks, the performance of students shall be evaluated continuously on the basis of written tests/seminars/viva voce, etc. in each course. The respective teachers will give these.
- b) Each theory test will be of two hours duration. These will be conducted as per a schedule notified by the Dean, Faculty of pharmacy. The respective teachers will hold practical sessional tests in regular classes. Two tests (theory and practical) will be properly spaced in the two terms of the academic semester session.
- c) The marks obtained shall be notified in time by the respective teachers and answer books shown to the students, if they wish so. The sessional test answer books shall be retained in the Department till the end of the academic semester term.
- d) There shall be **two tests** for each course and **best one shall be taken to award the sessional marks**. There will be no provision for special or additional internal assessment tests.
- e) A regular record of the marks for sessional tests conducted in an academic semester session shall be maintained by the teacher concerned/Head of Department for each student.
- f) The students shall maintained tour reports for assessment by the teachers conducting the tour.
- g) The final sessional marks shall be submitted by the teachers to the Head of the Department who shall forward the same to the Controller of Examinations, within ten days of the last sessional test held. These shall also be displayed on the Notice Board of the Department/Faculty.

7. Attendance:

- a) All students must attend every lecture and practical class. However, to account for late joining or other such contingencies, the attendance requirement for appearing in the examinations shall be a minimum of 75% of the classes actually held.
- b) In order to maintain the attendance record of a particular course a roll call will be taken by the teacher in every scheduled lecture and practical class. For the purpose of attendance, every scheduled practical class will be counted as one attendance unit, irrespective of the number or contact hours.
- c) The teacher in charge will consolidate the attendance record for the lectures and practicals for each term. Attendance on account of participation in the prescribed function of NCC, NSS, Inter university sports, educational tours/field work shall be credited to aggregate, provided the attendance record, duly countersigned by the Officer in-charge, is sent to the Dean of Faculty within two weeks of the function/activity, etc.
- d) The statements of attendance of students shall be displayed on Department Notice Board at the close of each term as given in the University Calendar. A copy of the same shall be sent to the Head of Department/Office of Dean of Faculty for record. Notice displayed on Notice Board shall be deemed to be proper notification, and no individual notice shall be sent to students.
- e) If a student is found to be continuously absent from the classes without information for a period of 30 days, the teacher in charge shall report it to the Head of Department/Dean for striking off the name of such a student from rolls. Such a student may, however, apply for readmission within 15 days from the date of issue of the Notice of striking off the name. The request may be considered by the Dean for readmission. Such a student shall not be readmitted after the prescribed period. The readmission shall be effected on payment of prescribed readmission fees.
- f) A student with less than 75% attendance of the lectures and practicals separately in each subject/course in an academic semester shall be detained from appearing in the Semester end term examination. The Dean of Faculty concerned may consider application for the condonation of attendance upto 5% on account of sickness, provided the application for condonation of attendance, duly certified by a Registered Medical Practitioner/Public Hospital had been submitted within 5 days from the recovery from illness. Condonation of attendance on account of any other extenuating circumstances may also be considered, provided the request is duly supported by documentary evidence.
- g) A student detained on account of attendance will be readmitted to the same semester on payments of current fees except Enrollment fee, Identity card fee and Security deposits.

8. Eligibility for admission to examination:

A student seeking admission to the examination to be held at the end of each semester term must have pursued a regular course of study for the semester session, and must have completed the prescribed attendance requirements. Further, a student admitted to any course must pass the first year (Semester I and II) examination within two academic years, and must complete the full course of study within prescribed span period of seven years.

9. Semester end term examinations and Promotion to next class:

- a) The Semester end term examinations shall be held as per schedule given in the Academic Calendar of Jamia Hamdard. The **Theory and Practicals will form separate heads.**
- b) There shall be a full examination at the end of each semester. There will be **no supplementary** examination
- c) A candidate who has been admitted in B. Pharm. Ist semester will be promoted to the higher class in accordance with the following sub-rules:
 - (i) A candidate shall not be promoted to the Third semester/higher semester if he/she carries a backlog of **more than Five papers/subjects.**
 - (ii) No candidate will be awarded degree of Bachelor of Pharmacy unless he/she has passed all the eight semester examinations. If any previous semesters, paper/practical remain as backlog to be cleared by him/her, the result will be withheld till he/she passes the backlog.
 - (iii) **A candidate shall not be admitted in the fifth or higher semester classes unless he/she has fully passed/cleared the first and second semester examinations. Likewise candidate shall not be admitted to seventh or higher semester classes unless he/she has fully passed/cleared the first four semester examinations. For promotion to the higher semester the sequence shall be adhered to.**
 - (iv) Further, a student admitted to B. Pharm. course must pass the first year (Semester I and II) examination within two academic years, and must complete the full course of study within prescribed span period of seven years.
- d) The Dean of the Faculty will examine application for mercy chance if any with proper justification and a written undertaking given by the student, and specific recommendations will be forwarded to the Registrar for getting approval of the competent authority. The undertaking would be to the effect that in case he/she does not clear the backlog in this final attempt, he/she will not have any further claim to continue the studies and that his/her name may be struck off the rolls.
- e) The duration of Semester end term examination in theory as well as practical papers will be **3 hours, unless specified otherwise.**
- f) Examiners shall examine students orally during the Practical examination and take cognizance of their performance when marking their papers.
- g) A student shall not be declared to have passed the examination unless he/she secures at least 50% marks in each of the subjects separately in the theory as well as practical examinations, including sessional marks. Each theory paper or practical examination shall be construed as a separate paper.
- h) The candidates will retain the Internal Assessment of the previous examination, wherever applicable.
- i) Promotion to the next higher class will be considered subject to rules relating to the maximum period of stay at the University, viz. passing the Semester I and II (first year) examination within two academic year, and successfully completing all the requirements of the programme of study within seven years from admission.

10. Classification of successful candidates:

- a) The result of the successful candidate shall be classified at the end of the final semester examination on the basis of the aggregate of all subjects, theory and practicals, secured by the candidate in the III to VIII semester examinations, as indicated below.

Ist Division: 60% and above
2nd Division: 50%-59%

- b) Candidate securing 75% or above marks in any subject(s) and have passed in all the subjects in a semester in first attempt shall be declared to have obtained Distinction in that subject(s).
- c) A student shall be eligible for award of Gold Medal as per the University rules from time to time.

13. Span Period:

Students must pass the first year (Semester I and II) examination within two academic years, and must complete the full course of study within seven years from their admission to the first semester of the course. However, exceptions to the 7 years rule may be made in the following cases:

A candidate who fails in only one subject in B. Pharm. Semester VIII end term examination but has completed the maximum span period of 7 years, may be allowed to avail one more chance in the subject concerned, as a special case.

A candidate who qualifies all papers but fails in half the number of subjects of B. Pharm. Semester VIII examination, but has completed the span period of 7 years, may be allowed readmission in B. Pharm. Semester VIII in the concerned subjects as a hard case. Such a student shall have to appear in sessional tests, practicals internal assessments in the concerned subject, and will be required to clear the backlog in the end term examination.

20th January 2011

OFFICE-ORDER

To streamline the examination system keeping in view the problem faced by the students, Hon'ble Vice-chancellor has taken following decisions. This will be applicable from this academic session to all undergraduate courses offered in Jamia Hamdard.

1. A candidate who has been admitted in the 1st Semester in any course offered in Jamia Hamdard will be promoted to the higher class in accordance with the following conditions:
 - (i) No candidate of 1st Semester will be promoted to 2nd Semester if he/she failed/detained in more than 5 papers. Such candidates will have to seek re-admission in the 1st Semester in the next academic session as a regular student. Same rules will apply in other semesters.
 - (ii) A candidate shall not be promoted to the 3rd semester if he/she carries a backlog of more than 5 papers. The same restriction will also be applicable for promotion to higher semester.
2. Detained papers on account of attendance will be counted as the uncleared papers for promotion to the next semester.
3. There will be no change in the sessional marks.
4. The above decision will be applicable only in the undergraduate classes.

This has been issued with the approval of Hon'ble Vice-Chancellor.



(Prof. Ehsan Ahmad Khan)
Controller of Examinations
& Admissions

Copy to:

1. All Deans of Faculties
2. All Heads of Departments
3. Secretary to Vice-Chancellor for information please

SYLLABUS
BACHELOR IN PHARMACY
(Semester -I)
Effective from 2010-2011

Semester-I

Paper BPH-101

PHARMACEUTICS-I

INTRODUCTION TO PHARMACY (THEORY)

Teaching Hours: 4 h/week

1. Pharmacy Profession

Pharmacy as a career-scope and avenues, evolution of pharmacy profession, Code of pharmacy ethics

2. Pharmaceutical Compendias

Introduction to Pharmacopoeias with special reference to Indian Pharmacopoeia, B.P. and U.S.P., Monograph study

3. Galenicals and Tinctures

Definition, merits, demerits and Preparation of tinctures and extracts, Study of percolation and maceration and their modifications.

4. Introduction to Conventional Dosage forms

Definition, Classification, Advantages and disadvantages of

- i) Solid dosage forms- Powders, Tablets, Capsules
- ii) Semi-solid dosage forms- Ointment and Creams
- iii) Liquid dosage forms- Monophasic and biphasic
- iv) Aerosols

5. Introduction to Novel drug delivery systems

Definition, Advantages and Limitations of sustained and controlled release tablets, transdermal patches, microparticles and nanoparticles.

6. Drug properties

Study of physico-chemical properties of drugs like particle size, shape, density, polymorphism, lipophilicity, solubility and dissolution rate.

7. Pharmaceutical Additives

Solid dosage form excipients, liquid vehicles, semisolid bases, organoleptic additives, stabilizers, preservatives. Surfactants- its classification and medicinal and pharmaceutical applications. Detergency, emulsification, wetting agent, foaming agent, antifoaming agent, suspending and emulsifying agents. Polymers, its classification and application.

8. Packaging of Pharmaceutical Products:

Packaging component types, specifications and methods of evaluation, stability aspects of packaging equipments, factors influence choice of containers, legal and other official requirements for containers, package testing.

9. Labeling instructions and precautions while dispensing various dosage forms.

PRACTICALS

Teaching Hours : 4 h/week

1. Preparation of following classes of products involving the use of calculations in metrology (at least 1 products from each category wherever applicable): Aromatic waters, solutions, spirits, glycerine, syrups, elixirs, lotions, liniments, Suppositories, Capsules, Creams, Emulsions, Suspension etc.
2. Determination of bulk and tap density of pharmaceutical solids.
3. Sealing of ampoules

Books Recommended:

1. Remington's Pharmaceutical Sciences (Latest Edition).
2. The Extra Pharmacopoeia-Martindale (Latest Edition).
3. S.J Carter: Tutorial Pharmacy
4. Cooper and Gunn's: Dispensing Pharmacy
5. N.K.Jain and S.N.Sharma: The theory and practice of Professional Pharmacy
6. Indian Pharmacopoeia (Latest Edition).

Paper BPH-102

PHARMACEUTICS-II UNIT OPERATIONS- (THEORY)

Teaching Hours: 4 h/week

1. Introduction

Introduction to unit operation and pharmaceutical engineering. Concept and requirement, basic laws, materials and energy balances.

2. Conveying of Solids

Belt conveyors, chain conveyors, screw conveyors and pneumatic conveyors.

3. Pharmaceutical Plant Construction

Selection of materials for pharmaceutical plants, study of factors like physical, chemical, mechanical and economical. Suitability of different materials for different plants i.e. Ferrous metals -Cast iron, steel, stainless steel; Non-ferrous metals - copper and alloys, aluminum and alloys, lead, tin, silver, nickel and alloys, chromium, zinc; Non-metals- glass, stoneware, slate brick, concrete, asbestos, plastics, rubber, timber, ceramics and enamel.

4. Flow of fluids

Fluid static and dynamics, basic equations, laws of conservation in fluid flow.

Measurement of pressure: Manometers, Types of flow, Reynold's number and its significance; distribution of velocities in a pipe; friction losses; pipe fittings and joints.

Measurement of fluid flow: Principle, and construction of venturimeter, orifice meter, pitot tube, weirs, Rota meter, and positive displacement meter - current meter and disc meter.

Flow controls: Plug cock, globe valves, gate valves, and water hammer, unidirectional valves, automatic regulating valve.

Pumps: Reciprocating pumps, positive displacement pumps, rotary pumps - volute and centrifugal pumps.

5. Heat Processes

Modes of heat transfer; heat transfer coefficient; OHTC. Fuels - solid, liquid, gases. Steam as heating medium - properties and uses of steam.

Evaporation: Factors affecting evaporation, study of evaporating stills and evaporating pans, heat transferring evaporators, vapor compression evaporators and evaporation under reduced pressure.

Distillation: Importance of distillation in Pharmacy, methods of distillation. Theory of distillation, Azeotropic and zeotropic mixture, phase diagrams. Rectification and types of columns; molecular distillation; steam distillation;; HETP. Freeze drying.

6. Refrigeration and Air Conditioning

Refrigeration: Theory of refrigeration, refrigeration current cycle and equipments employed for refrigeration.

Air conditioning: Theory of air conditioning, application and types, humidification and dehumidification, cooling towers.

7. Humidity, Ventilation & AC Systems

Humidity, Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipment for dehumidification operations.

8. Drying

Theory of drying - principles, equilibrium moisture content, rate of drying; drying of dilute solutions and suspensions - drum dryer, spray dryer; drying of solids - convection type, tray dryer, tunnel dryer, rotary dryer, fluidized bed dryer, vacuum dryer, oven dryer, freeze dryer, radiant heat dryers.

9. Clarification and Filtration

Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter. Factors affecting filtration

10. Crystallization

Characterization of crystals and factors affecting them, supersaturation theory and its limitations, nucleation mechanisms, crystal growth, study of various types of crystallizer

11. Water Systems

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

PRACTICALS

Teaching Hours: 4 h/week

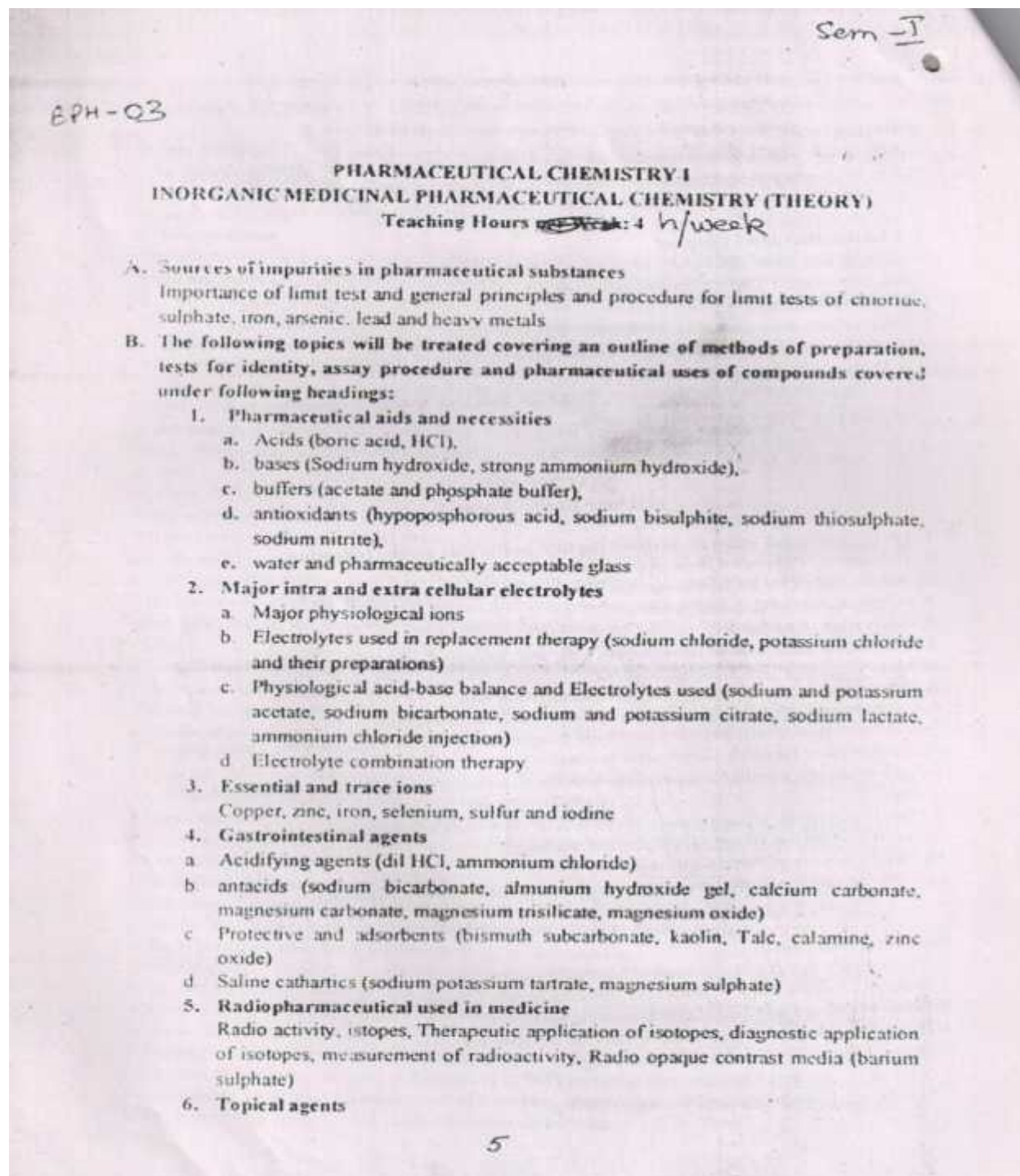
Experiments based upon theoretical portion preferably on the following

1. Measurement of rate of flow of fluids and pressure by:
(i) Simple and differential manometers (ii) Venturimeter. (iii) Orificemeter.
2. Determination of Reynold Number.
3. Calibration of rotameters.
4. Efficiency of a simple distillation unit and effect of insulating materials on the efficiency.
5. Determination of efficiency of a steam distillation unit.
6. Estimation of overall heat transfer coefficient in distillation unit.
7. Determination of dry bulb and wet bulb temperatures, use of Psychometric charts and determination of humidity by physical method.
8. Rate of drying, equilibrium moisture content, determination of factors affecting rate of drying.
9. Study of factors affecting rate of filtration: (i) Effect of different filter media. (ii) Effect of viscosity of filtrate. (iii) Effect of pressure.
10. Determination of hardness of water.
11. Other experiments related to theoretical background(Theory Syllabus)

Books Recommended:

1. J.F.Richardson and J.M. Coulron: Chemical Engineering
2. Walter L. Badger and J.T. Banchero: Introduction to Chemical Engineering
3. Perry: Handbook of Chemical Engineering
4. Lauer & Heckmann: Chemical Engineering Techniques
5. Peters: Elementary Chemical Engineering
6. S.J. Carter: Tutorial Pharmacy
7. N.D.Bhatt: Elementary Engineering Drawing.

PHARMACEUTICAL CHEMISTRY I



- a. Antimicrobials (hydrogen peroxide, potassium permanganate, chlorinated lime, iodine, boric acid, silver nitrate, sublimed sulphur, precipitated sulphur)
- b. Astringents (Alum, zinc sulphate)
7. **Dental products**
Anticaries agents and dentifrice (Sodium fluoride, stannous fluoride, calcium carbonate, dicalcium phosphate, zinc chloride)
8. **Miscellaneous Inorganic Pharmaceutical agents**
- a. Inhalants (Oxygen, carbon dioxide),
- b. respiratory stimulants (ammonium carbonate).
- c. expectorants and emetics (ammonium chloride, potassium iodide, antimony potassium tartrate)
- d. antidotes (sodium nitrite)

PRACTICAL

Teaching ~~Total Hours~~ ~~per week~~: 4 hr/week

1. Limit tests for impurities in pharmacopial compounds (chloride, sulphate, iron)
2. Standardisation of sulphuric acid, hydrochloric acid, sodium hydroxide, potassium permanganate, sodium thiosulphate
3. Quantitative analysis-assay of the following compounds will be done: solution of ammonia, boric acid, sodium bicarbonate, sodium carbonate, ferrous sulphate, strong and weak iodine solutions, copper sulphate, chlorinated lime, sodium chloride, ammonium chloride.

Books Recommended

1. L.M. Atherdon, Bentley and Drivers, Textbook of pharmaceutical chemistry, Oxford, University press, Delhi.
2. Pharmacopoeia of India, Govt. of India, Ministry of Health, Delhi.
3. J.H. Block, E. Roche, T.O. Soine and C. O. Wilson, Inorganic Medicinal and Pharmaceutical chemistry, Lee Febiger, Philadelphia. PA.
4. S.N. Pandeya, A Textbook of inorganic medicinal chemistry, S G Publishers, Varanasi.
5. M. Ali : Text book of Pharmaceutical Inorganic Chemistry, CBS, New Delhi

PHARMACOGNOSY I
(PHARMACEUTICAL BIOLOGY-1) (THEORY)
Teaching Hours: 3 h/week

1. Introductory Pharmacognosy

Historical development, modern concept and scope of Pharmacognosy. Significance of Pharmacognosy in various systems of medicine practiced in India viz; Ayurveda, Unani, Homeopathic and Siddha. Introduction to the Indian Herbal Pharmacoeopia and Pharmacoeopia related to Indian Traditional Systems of Medicine.

2. Classification of crude drugs

Based on alphabetical, morphological, pharmacological, chemical, taxonomical and chemotaxonomical methods; organized and unorganized drugs; official and unofficial drugs.

3. Sources of crude drugs

Plants, Animals and minerals; marine products; plant tissue culture.

4. Factors influencing Quality of crude drugs

Exogenous factors: temperature, rainfall, daylight, altitude and soil; Endogenous factors: mutation, polyploidy and hybridization in medicinal plants. Production factors including collection, drying, storage and transport methods.

6. Study of morphological and histological characters of crude drugs

Ergastic cell inclusions, anatomical structures of both monocot and dicot stems, leaves and roots; barks, fruits and seeds.

7. Techniques in microscopy

Details of mountants, clearing agents, chemomicroscopic (microchemical) reagents.

PRACTICAL

Teaching Hours: 3 h/week

1. Microscopic preparation. Staining and surface preparation.
2. Microscopical studies of basic tissues, both monocot and dicot stems, leaves and roots; bark, seed, fruits; trichomes, stomata, calcium oxalate crystals, starch, fibres, oil glands and pollen grains.

Books Recommended

1. Trease and Evans, Textbook of Pharmacognosy.
2. T.E. Wallis: Textbook of Pharmacognosy C.B.S. Publishers, Delhi.
3. AC. Dutta: Botany for Degree students, Oxford University Press, New Delhi.
4. Mohd. Ali: Text Book of Pharmacognosy, CBS, New Delhi.
5. C.K. Kokate, A.P. Purohit and S.B. Gokhle: Pharmacognosy
6. V.E., Tylor, L.R. Brady and S.B., Robbers: Pharmacognosy, K.M. Varghese Co. Bombay.
7. Saroja Joshi and Vidhu Aeri: Practical Pharmacognosy, Frank Bros, New Delhi.

HUMAN ANATOMY & PHYSIOLOGY –I (THEORY)

Teaching Hours: 3 h/week

1. Introduction

- i) Definition and scope of anatomy, physiology and related sciences. Anatomical terms in relation to parts of the body, system and organs, body positions, planes & sections, body cavities.
- ii) Study of human skeleton, joints and their classification.

2. Cell

- i) Structures and their functions.
- ii) Genetic control of cell function, defining human genome and its scope.

3. Tissues of the Body

- i) Types of tissues and their functions.
- ii) Structure of skeletal muscle fiber, cardiac muscle and smooth muscle.
- iii) Physiology of muscle contraction.
- iv) Neuromuscular transmission.

4. Membrane

- i) General principles of membrane permeability transport.
- ii) Mechanisms and electrophysiology of membrane.
- iii) Signaling at the cell surface.

5. Nervous System

- i) General anatomy and physiology of neurons, synapses, neurohumoral transmission, principal neurotransmitters.
- ii) Central nervous system, its various parts and their functions.
- iii) Cerebral cortex, intellectual functions of the brain, learning and memory.
- iv) Limbic system & Hypothalamus, behavioural and motivational mechanisms, regulation of body temperature.

- v) Cerebellum, basal ganglia, control of posture and movement.
- vi) RAS, Physiology of sleep, CSF, Sensory and motor pathway.
- vii) Autonomic nervous system.
- viii) Reflex arc, conditioned and unconditioned reflexes.

6. Respiratory System

- i) Gross anatomy of respiratory passages.
- ii) Regulation and mechanism of breathing and pulmonary function test.
- iii) Transportation of gases.
- iv) Hypoxia, Anoxia, Dyspnoea, artificial respiration.

7. Muscular System

- i) Muscle attachment sites; origin & insertion
- ii) Principal skeletal muscles; Muscles of face, neck, back, abdominal wall and pelvic floor.

PRACTICAL

Teaching Hours: 3 h/week

1. Human Anatomy & Physiology

- i) Study of human skeleton and bones.
- ii) Study of models of organs of various body systems.
- iii) Study of surgical instruments.

2. Histology

- i) Handling of microscope.
- ii) Identification of various tissues.

3. Respiration

Pulmonary function test using spirometer.

4. Nervous System

Study of reflex action.

Recording of body temperature by various techniques.

Recording and interpretation of EEG.

Books Recommended:

Theory

1. Sujit K. Chaudhuri: Concise Medical Physiology.
2. C.C. Chatterjee: Human Physiology.
3. Kathleen J.W. Wilson Ross and Wilson: Anatomy and Physiology in Health and Illness
4. T.W.A. Glenister and Jean R.W. Ross: Anatomy and Physiology for Nurses
5. Arthur C. Guyton: Textbook of Medical Physiology.
6. Cyril A. Keele, Erie Neil, Norman Joels and Samson Wrights: Applied Physiology.

Practical

1. Shukant R. Apte: Experimental Physiology.
2. Ramesh K. Goyal, Natyar M. Patel and Shailesh A. Shah: Practical Anatomy, Physiology and Biochemistry.
3. Sir John Y. Dacie and S. M. Lewis: Practical Haematology.

CORE MODEL SYLLABUS FOR ENVIRONMENTAL STUDIES
FOR UNDER GRADUATE COURSES OF ALL BRANCHES
OF HIGHER EDUCATION

✓ **Unit 1: The multidisciplinary nature of environmental studies**

Definition, scope and importance

(2 lectures)

Need for public awareness

✓ **Unit 2: Natural Resources:**

Renewable and non-renewable resources:

Natural resources and associated problems.

- (a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

(8 Lectures)

✓ **Unit 3: Ecosystems**

- Concept of an ecosystem
- Structure and function of an ecosystem

18

- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:
 - a. Forest ecosystem
 - b. Grassland ecosystem
 - c. Desert ecosystem
 - d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

(6 Lectures)

Unit 4: Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

(8 Lectures)

Unit 5: Environmental Pollution

Definition

- Causes, effects and control measures of:
 - a. Air pollution
 - b. Water pollution
 - c. Soil pollution
 - d. Marine pollution
 - e. Noise pollution

f. Thermal pollution

g. Nuclear pollution

- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides



Unit 6. Section 1

SYLLABUS
BACHELOR IN PHARMACY
(Semester -II)
Effective from 2010-2011

Semester II

Paper BPH- 201

PHARMACEUTICS -III DISPENSING PHARMACY (THEORY)

Teaching Hours: 4 h/week

1. Prescriptions

Reading and understanding of prescriptions. Modern methods of prescribing and common Latin abbreviations. Prescription errors.

2. Posology

Factors influencing dose. Calculations of doses on the basis of age, sex and surface area.

3. Incompatibility in Prescriptions

Physical, chemical and therapeutic incompatibility.

4. Powders

Types of powders, their merits and demerits, classification of powders, compounding, storage and packaging of powders requiring special consideration like effervescent powders, bulk powders, dusting powders, insufflations, dentifrices and cachets.

5. Tablets

Types of tablets, merits and demerits, preparation methods, equipments, storage, packaging and evaluation of tablets.

6. Capsules

Hard and soft gelatin capsules, merits and demerits, preparation, storage, packaging and evaluation of capsules.

7. Liquid Dosage forms

Preparation, merits, demerits, solubility and methods of increasing solubility. Preparation, packaging and storage of liquid formulations for internal and external use. Factors affecting liquid dosage form.

8. Emulsions and Suspensions

Emulsions – Definition, types and identification tests, merits and demerits, uses and classification of emulsifying agents and preparation and stability of emulsions. Evaluation of Emulsions.

Suspensions – Definition, types, merits and demerits, use of suspending agents, flocculated and deflocculated suspensions, formulation and stability of suspensions. Evaluation of suspensions.

9. Semi-Solid Dosage forms

Ointments: Classification of ointments and ointment bases. Factors governing selection of an ideal ointment base, preparation, packaging, labeling and storage of ointments. Evaluation of Ointments.

Pastes, Jellies, Poultices: Formulation.

Suppositories and Pessaries: Types, suppositories bases, displacement value, preparation, packaging, labeling and storage.

10. Sterile Dosage forms

Definition, types, merits and demerits. Elementary study of the formulation characteristics of the following types : Injectable preparations, ophthalmic and ENT products, Total Parenteral Nutrition, dialysis fluids. General requirements of sterile dosage forms. Handling, packaging, storage and dispensing of sterile dosage forms.

11. Community pharmacy: Organisation and structure of retail and wholesale drug store, drug store maintenance of records, patient counseling, role of pharmacist in patient health care.

PRACTICALS

Teaching Hours: 4 h/week

1. Student's Orientation

Introduction to the laboratory equipment, weighing methodology, general instructions and handling of prescriptions, labeling instructions.

2. Prescription Reading:

Minimum of 05 prescriptions from the clinical practice

3. Legal and Ethical aspects of Dispensing and compounding of prescriptions

The students should be trained about these aspects and evaluated by questionnaire.

4. Pharmaceutical Calculations

Introduction to Imperial, metric and S.I., weights and measures, interconversion. Calculations of reducing and enlarging recipes; percentage calculations, % w/v, v/v, and w/w, alcohol dilutions, use of alligation methods; proof spirit, isotonic solutions, mEq units, displacement value of suppositories.

5. Compounding and Dispensing of Prescriptions

At least 50 prescriptions, representing the following classes of products, should be compounded and dispensed: Powders, capsules, tablets, Mixtures, emulsions, lotions and liniments, ointments, creams, pastes, suppositories, ENT preparations, incompatibilities, miscellaneous products

Books Recommended:

1. Indian Pharmacopoeia, Govt. of India.
2. Remington's Pharmaceutical Sciences.
3. Nanda, Popli and Sharma: Current dispensing practices.
4. R.K.Khar and Pratibha Nand: Dispensing Pharmacy, CBS Publishers, Delhi.
5. A.K. Gupta and S.S. Bajaj: Introduction to Pharmaceutics-II, 2nd Ed, CBS Publishers, New Delhi.
6. Cooper and Gunn: Dispensing for pharmaceutical students, 12th Edition, CBS Publishers, Delhi.
7. B.M. Mittal: Textbook of Pharmaceutical Formulation, 4th Edition, Vallabh Prakashan, Delhi.
8. Merck Manual: www.Merck.com/pubs/manual.
9. James Swarbrick and James C. Boylan: Encyclopedia of pharmaceutical Technology, Vol. 12,- Prescribing of Drugs - pp-443-464, Marcel Dekker Inc. New York.
10. Asgar Ali and A.D. Mahamuni: Pharmaceutics-II (Theory and Practise of Dispensing Pharmacy), Vallabh Prakashan, New Delhi.
11. Agarwal SP and Khanna R: Textbook of Dispensing and Community Pharmacy.

Semester-II

Paper BPH- 202

Pharmaceutical Chemistry-II

(Organic Chemistry)

Sem. II
BPH-202

PHARMACEUTICAL CHEMISTRY II
ORGANIC CHEMISTRY (THEORY)
Teaching Hours : 4 h/week

1. Basic Principles and concepts of Organic Chemistry:
Polarity of bonds & molecules, dipole moment, resonance, inductive and electromeric effects, intra-molecular and intermolecular hydrogen bonding, hyperconjugation.

2. Stereochemistry:
Isomerism, nomenclature of isomers, stereoisomerism, diastereomerism, enantiomers, Specification of R and S, D and L configuration, mesostructures, Racemic modification and resolution of racemic mixtures, conformational analysis, geometrical isomerism, determination of configuration and optical activity.
Structure, nomenclature, preparation and reactions/properties of the following groups of compounds (including mechanism of reactions wherever necessary).

3. Aliphatic & Alicyclic Hydrocarbons:
Alkanes, alkenes, alkynes, cycloalkanes, Bayer strain theory

4. Alkyl & Acyl Halides:
SN¹ and SN² reactions, mechanism and stereochemistry, Dehydrohalogenation of alkyl halides, E₁ and E₂ mechanism, chloroform, carbon tetrachloride, trichloroethylene and haloethane.

5. Aliphatic Alcohols:
Primary, secondary and tertiary alcohol, methanol, ethanol, proof spirit, denatured alcohol. Di and trihydric alcohols: glycols, glycerol, ethylene glycol, propylene glycol, dimercaprol.

6. Ethers:
Thioethers, divinyl ether.

7. Aldehydes and Ketones:
Formaldehyde, acetaldehyde and its polymers, mechanism of Aldol condensation, Claisen condensation, Cannizzaro's reaction, Benzoin condensation, Perkin's condensation, Wittig reaction, Mannich reaction.

8. Carboxylic Acids.
Formic acid, acetic acid, oxalic acid, lactic acid, gluconic acid

9. Esters
Lactides, Lactones, ethyl acetate, ethyl nitrate.

10. Amides and Imides
Succinamide, succinimide, glutaramide, glutarimide

11. Aliphatic amines and related compounds:
Alkylamines, Hoffmann's rearrangement, differentiation of 1°, 2° and 3° amines, β-hydroxy and β-halo-alkylamines, diamines, urea and ureides, cramiphen hydrochloride, dicyclamine hydrochloride, mustine hydrochloride, cyclamic acid, thiambutosine.

12. Organometallic compounds

Wittig's reagent, their preparation & synthetic applications

13. Carbanion-

Reactions involving Carbanions: malonic ester, synthesis of carboxylic acids, acetoacetic ester, synthesis of ketones, Decarboxylation of β -ketoacids and malonic acids, direct and indirect alkylation of esters and ketones, alkylation of carbonyl compounds via enamines, α , β -unsaturated carbonyl compounds (conjugate addition) including Michael and Diels- Alder reaction.

PRACTICAL

Teachy.

Hours: 4 h/week

1. Lassaigne's test for N, S and halogens
2. Identification of organic compounds based on solubility and functional group test (aliphatic and aromatic acid, amines, aldehydes and ketones, phenol, alcohol, ester, amide, anilide, nitro)
3. Performance of qualitative test for alkaloids, carbohydrates, glycosides, proteins and amino acids.
4. Test for identity of selected drugs: atropine, caffeine, quinine, glucose, sucrose, ascorbic acid, aspirin and paracetamol.
5. Synthesis of Picric acid, Hippuric acid, acetanilide, aspirin

Books Recommended:

1. R.T. Morrison and R.N. Boyd, Organic Chemistry, Allyn and Bacon Inc, Boston, USA.
2. I.L. Finar, Organic Chemistry, Vol.1, The English Language Book Society and Longman Group Limited, London.
3. J.B. Hendrickson, D.J. Cram and C.S. Hammond, Organic Chemistry, McGraw Hill Kogakusha, Limited, Tokyo.
4. P. Sykes, A Guide books to mechanism in Organic Chemistry, Orient Longman, New Delhi.
5. L.M. Atherton, Bentley and Drivers - Textbook of Pharmaceutical Chemistry, Oxford University Press, Delhi.
6. A.A. Siddiqui & Siddiqui: *Experimental pharmaceutical chemistry*, New Delhi.
7. S.N. Pandeya, A textbook of pharmaceutical organic chemistry (Mechanistic approach) Vol- I, S.G. Publishers, Varanasi.

Semester-II

Paper BPH- 203

PHARMACOGNOSY II
(PHARMACEUTICAL BIOLOGY- II) (THEORY)

Teaching Hours: 3 h/week

1 Introduction to Phytoconstituents

Definition, classification, chemical tests and pharmaceutical importance of: Carbohydrates and their derivatives, fats and proteins; alkaloids, glycosides, flavonoids, steroids, saponins, tannins, resins, lipids and volatile oils.

2. Principles of plant classification

Diagnostic features and medicinal significance of important plants with special reference to:

- i) **Algae:** Rhodophyceae (Agar, Alginic acid, Diatoms).
 - ii) **Fungi:** Ergot, Yeast and penicillium.
 - iii) **Gymnosperm:** Pinaceae (Turpentine, Colophony), Gnetaceae (Ephedra).
 - iv) **Angiosperm:** Apocynaceae, Asteraceae, Lamiaceae, Rubiaceae, Rutaceae, Solanaceae, Scrophulariaceae, Leguminosae, Papaveraceae, Acanthaceae and Apiaceae.
 - v) **Pteridophytes:** Male fern.
3. Plant based drugs used in Modern medicine: Taxol, Vincristine, Vinblastine, Morphine, Reserpine, Digitoxin, Quinine, Artemisinin, Menthol and Citral.

PRACTICAL

Teaching Hours: 3 h/week

1. General chemical tests for phytoconstituents given in theory.
2. Study of diagnostic characters of families mentioned in theory.

Books Recommended

1. Trease and Evans, Textbook of Pharmacognosy.
2. T.E. Wallis: Textbook of Pharmacognosy C.B.S. Publishers, Delhi.
3. AC. Dutta: Botany for Degree students, Oxford University Press, New Delhi.
4. Mohd. Ali: Text Book of Pharmacognosy, CBS, New Delhi.

5. C.K. Kokate, A.P. Purohit and S.B. Gokhle: Pharmacognosy
6. V.E., Tylor, L.R. Brady and S.B., Robbers: Pharmacognosy, K.M. Varghese Co. Bombay.
7. Mohd. Ali: Pharmacognosy (Pharmacognosy and Phytochemistry), Vol.I, CBS Publishers and Distributors, New Delhi, Bangalore.
8. Saroja Joshi and Vidhu Aeri: Practical Pharmacognosy, Frank Bros, New Delhi.

Semester-II

Paper BPH- 204

HUMAN ANATOMY & PHYSIOLOGY - II(THEORY)

Teaching Hours: 3 h/week

1. Cardiovascular System and Blood

- i) Structures and functions of heart and blood vessels.
- ii) Heart sounds, ECG, Cardiac cycle, Blood pressure and its regulations.
- iii) Circulation (Pulmonary, Cerebral, Coronary, Placental and Foetal). Hemodynamics, Factors affecting circulation.
- iv) Lymphatic system.
- v) Blood composition and functions. Immune mechanisms, Hemostasis and blood coagulation.
- vi) Blood groups, Rh factor, blood transfusion.
- vii) Disorders of blood.
- iv) Hypoxia, Anoxia, Dyspnoea, artificial respiration.

2. Digestive System

- i) Gross anatomy of the alimentary canal.
- ii) Physiology of digestion.
- iii) Liver and pancreas.

3. Endocrine System

Introduction to endocrinology and general mechanisms of hormone action: Pituitary hormones, their physiological functions, their control by hypothalamus. Formation, secretion and regulation of thyroid hormones and their functions, diseases of the thyroid. Adrenocortical hormones, their chemistry, secretion, regulation and functions. Abnormalities of adrenocortical secretion, Pancreatic hormones and their metabolic effects and pathophysiology of diabetes mellitus. Parathormone, calcitonin and control of calcium metabolism.

4. Reproductive System

- i) Structure and function of male & female reproductive organs.
- ii) Spermatogenesis.
- iii) Puberty, ovulation, menstrual cycle, reproductive cycles.
- iv) Pregnancy, lactation, menopause and sex hormones

5. Urinary System

- i) General disposition of organs of excretory system.
- ii) Physiological consideration of urine formation and factors controlling it.
- iii) Micturition.
- iv) The Body Fluid compartments, Regulation of body fluid constituents and their volumes.
- v) Acid-base physiology: Hydrogen ion production, body buffer systems (bicarbonate, phosphate, and proteins), respiratory and renal regulation of acid base balance, correction of acidosis and alkalosis.

6. Special Senses

- i) Physiology of hearing, taste, smell and vision.
- ii) Structure and functions of skin.
- iii) Regulation of body temperature.

PRACTICAL
Teaching Hours: 3 h/week

1. Haematology

- i) Estimation of haemoglobin.
- ii) Total RBC count.
- iii) Total WBC count (TLC).
- iv) Differential leukocyte count (DLC).
- v) Platelets count.
- vi) Determination of blood group and Rh factor.
- vii) Determination of ESR (demonstration).
- viii) Determination of blood clotting and bleeding time.

2. Cardiovascular System

- Determination of blood pressure by palpatory and auscultating methods.
Recording ECG and its interpretation.

Books Recommended:

Theory

1. Sujit K. Chaudhuri: Concise Medical Physiology.
2. C.C. Chatterjee: Human Physiology.
3. Kathleen J.W. Wilson Ross and Wilson: Anatomy and Physiology in Health and Illness
4. T.W.A. Glenister and Jean R.W. Ross: Anatomy and Physiology for Nurses
5. Arthur C. Guyton: Textbook of Medical Physiology.
6. Cyril A. Keele, Erie Neil, Norman Joels and Samson Wrights: Applied Physiology.

Practical

1. Shukant R. Apte: Experimental Physiology.
2. Ramesh K. Goyal, Natyar M. Patel and Shailesh A. Shah: Practical Anatomy, Physiology and Biochemistry.
3. Sir John Y. Dacie and S. M. Lewis: Practical Haematology.

SYLLABUS
BACHELOR IN PHARMACY
(Semester -III)

Effective from 2010-2011

Semester- III

Paper BPH- 301

PHARMACEUTICAL MATHS AND BIOSTATISTICS

(STATISTICS AND CALCULUS)

Teaching Hours: 4 h/week

1. Condensation of the data collected; various forms of distribution tables.
2. Diagrammatical and graphical representation of data: bar diagrams, pie-diagram, and histogram, frequency polygon, Ogives.
3. Measures of central tendency: mean, median and mode.
4. Measures of dispersion-range, semi inter-quartile range, mean deviation, standard deviation and coefficient of variation.
5. Significance tests-test of significance: Z-test, Student's t-test and chi-square test of significance.
6. Limits of algebraic functions.
7. Lim Sin o/o; axioms on limits; of trig. Functions.
8. Differential coefficient of a function; derivatives of x^n , N_0R .
9. Correlation between two variables: Karl Pearson's coefficient of correlation, Spearman's rank correlation.
10. Probability
11. Derivative formula of sum and difference of two functions generalizing it for more than two; derivative of product of two functions-generalizing it for the product of 3 functions; derivatives of quotient of two functions.
12. Derivative of trigonometrical functions and inverse functions.
13. Derivative by method of substitution.
14. Derivative of function of a function.
15. Parametric functions; implicit function; log. Differentiation.
16. Higher order derivatives.
17. Tangent and normal, velocity and acceleration.
18. Approximate values, maxima and minima.
19. Derivation of formulae of integration from derivative formula.
20. Integration of sum and difference of two functions.
21. Integration by substitution, integration by parts.
22. Definite integration, interpretation of definite integration.
23. Ordinary differential equations of the first order.
24. Linear differential equations with constant coefficient.

Books Recommended

1. Prasad: Differential Calculus.
2. Prasad: Integral Calculus.
3. Q.S. Ahmad, M.Vaseem Ismail and S.A. Khan: Biostatistics.
4. Croxton and Frerick: Statistics.
5. M.Vaseem Ismail: Remedial Mathematics

Semester- III

Paper BPH- 302

PHARMACEUTICS-IV
PHARMACEUTICAL MICROBIOLOGY
INCLUDING BIOLOGICAL PHARMACY (THEORY)
Teaching Hours: 4 h/week

1. Introduction to microbiology and Study of Microbes

Microbiology and its branches and their importance

Bacteria- Classification, identification, staining, enumeration, cultivation- growth rate curve, factors affecting growth, Bacterial metabolism- EMP and TCA pathways, Bacteriological media, Bacterial resistance.

Viruses- Structure, reproduction, detection and identification, enumeration, bacteriophage, Pharmaceutical significances of , moulds, yeasts, and actinomycetes

2. Immunology and Immunological Products

Introduction, types of immunity, Component of immune-system, humoral immunity, cellular immunity.

General method of the preparation of bacterial vaccines, toxoids, viral vaccine, rickettsial vaccines, antitoxins, and other products related to immunity. Preparation and standardization of immunological products, e.g., BCG vaccines, diphtheria toxoids, small pox vaccine poliomyelitis vaccine, tetanus anti-toxin and Diagnostic biologicals.

3. Disinfection

Classification and mode of action of disinfectants, factors influencing disinfection, dynamics of disinfection; disinfectants, antiseptics and their evaluation, antimicrobial preservative effectiveness in a pharmaceutical product.

4. Sterility testing of pharmaceutical products

Sterility testing of products according to IP, BP and USP. Sterility testing of parenteral products - solids, liquids, ophthalmic and other sterile products according to the I.P., B.P. and U.S.P. Sterility testing of sterile surgical devices, dressings, implants, absorbable, haemostats, surgical ligatures and sutures, surgical catgut .

5. Microbial spoilage and preservation of Pharmaceutical products

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage, preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

6. Sterilization methods and Principles

Methods of sterilization- Physical, chemical, heat, radiation, gaseous, filtration. Validation of sterilization processes, Equipments employed in large scale sterilization. Examples of the materials sterilized by different methods, sterility indicators.

7. Aseptic Technique

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

8. Fermentation Technology

Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. Large scale production fermentor design and its various controls. Study of the production of - penicillins, citric acid, fungal diastase, and dextran.

9. Microbiological Standardization

Microbiological methods for standardization of antibiotics, Radio-immunoassay. Assessment of a new antibiotic and testing of antimicrobial activity of a new substance.

10. Control of microbial contamination during manufacture

General aspects-environmental cleanliness and hygiene, quality of starting materials, process design, quality control and documentation.

PRACTICALS

Teaching Hours: 4 h/week

Exercises illustrating the course contents of theory including:

1. Preparation of various types of culture media.
2. Studying of different laboratory equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes.
3. Sub culturing of bacteria- Nutrient stabs and slants preparations.
4. Various staining methods-Simple and Grams staining.
5. Isolation of pure culture of micro-organisms by multiple streak plate technique
6. Evaluation of antiseptic and disinfectants e.g. RWC..
7. Sterility testing-different methods as per IP
8. Hanging drop slide preparation.
9. Microbial viable count in a pharmaceutical product and total count of bacteria
10. Biochemical reactions- litmus milk test, gelatin liquefaction, carbohydrate metabolism.
11. Thermal death time determination.
12. Microbiological assay of antibiotics.
13. Studying of the environment micro flora and testing of aseptic area.
14. Other experiments based on theory syllabus

Books Recommended

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
3. Pelczar and Reid: Microbiology.
4. Dawson and Mirne: Immunological and Blood products.
5. Rose: Industrial Microbiology.
6. Prescott and Dunn: Industrial Microbiology.
7. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
8. Cooper and Gunn's: Tutorial Pharmacy
9. I.P., B.P., U.S.P.- latest editions
10. Edward: Fundamentals of Microbiology
11. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi

12. Asgar Ali and D.C. Bhatt,: Pharmaceutical Microbiology- Concept and techniques, Birla Publications Pvt. Ltd., Delhi.
13. Miller, B.M. and Litsky W; Industrial Microbiology, McGrawHill, New York.
14. PUBMED - on Internet (www.pubmed.com)
15. Remington's Pharmaceutical Sciences.
16. Pepler: Microbial Technology
17. Ananthnarayan : Text Book of Microbiology, Orient Longman

Semester-III

Paper BPH -303

Pharmaceutical Chemistry-III (Organic & Medicinal Chemistry including Heterocyclics)

Total Teaching Hours: 4 Hrs/week

1. Aromatic Compounds Structure and resonance of benzene, aromatic character, mechanism of electrophilic aromatic substitution, orientation effects in electrophilic substitution, nucleophilic aromatic substitution.

2. Preparation, properties and actions of Phenols, aromatic aldehydes, aromatic carboxylic acids, aromatic nitro compounds, aryl amines, diazonium salts, aryl halides and ketones.

3. Polynuclear aromatic hydrocarbons Naphthalene, phenanthrene and anthracene.

4. Heterocyclic compounds Study of fundamentals of heterocyclics, nomenclature, methods of synthesis and important chemical reactions of the following:

i. Five-membered heterocycles

Furan, thiophene, pyrrole, thiazole, oxazole, imidazole, pyrazole, triazole and tetrazole.

ii. Six-membered heterocycles

Pyridine, pyridazine, pyrimidine, pyrazine and pyrones

iii. Benz-fused heterocycles

Quinoline, isoquinoline, indole and benzimidazole

5. The following topic shall be treated covering outlines of synthetic procedures (of selected drugs), uses, and structure activity relationship including physicochemical and steric aspects and mode of action.

- Thyroid hormones and antithyroid drugs
- Coagulants and anticoagulants (Synthesis of warfarin, dicoumarol)
- Expectorants and antitussives
- Antiseptics and disinfectants
- Vitamins
- Diagnostic agents & hypoglycaemic agents.

PRACTICAL

Total Hours: 4Hrs/week

1. Identification of organic compounds and preparation of simple derivatives.

2. Synthesis based on O- and N-acetylation, nitration and bromination.

Books Recommended:

1. R.T.Morrison and R.N. Boyd, Organic Chemistry, Allyn and Bacon Inc., Boston (USA)
2. I.L.Finar, Organic Chemistry, Vol.1 & 11, Me ELBS and Longman Group Ltd., London.
3. L.M.Atherden, Bentley and Driver's-Textbook of Pharmaceutical Chemistry, Oxford University Press, Delhi.
4. F.G.Mann & B.C.Saunders, Practical Organic Chemistry, Longman, London and New York.
5. Vogels Text Book of practical Organic Chemistry, Longman, London. New York.
6. S.N.Pandeya, A Textbook of pharmaceutical chemistry (Heterocyclics & biomolecules) Vol-II, S.G.Publishers, Varanasi.

Semester-III

Paper BPH -304

PHARMACOGNOSY III GENERAL PHARMACOGNOSY (THEORY) Total Teaching Hours: 4 h/week

1. Pharmaceutical Aids

Biological sources, chemical constituents, adulterants and uses of:

Starches, acacia gum, tragacanth, sterculia, guar gum, pectin, arachis oil, castor oil, sesame oil, cotton seed oil, olive oil, cotton, silk, wool, regenerated fibres, asbestos, kaolin, prepared chalk, kieselghur.

2. Animal Products

Biological sources, chemical constituents, adulterants and uses of:

Shellac, cochineal, cantherides, woolfat, lard, beeswax, honey, musk, lanolin, gelatin.

3. Plant Products

Introduction to plant bitters, sweeteners, nutraceuticals, cosmeceuticals and photosensitising agents.

4. Toxic Drugs

Study of Allergens, hallucinogens, narcotics, toxic mushrooms.

5. Enzymes

Biological sources, preparation, characters and uses of:

Diastase, papain bromelain, ficin, yeast, pancreatin, urokinase, pepsin, trypsin, pencillinase, hyaluronidase and stryptokinase.

6. Natural pesticides and Insecticides

Introduction to herbicides, fungicides, fumigants and rodenticides- Tobacco, Pyrethrum, Neem.

7. Adulteration and Evaluation of crude drugs

Different methods of adulteration; Evaluation of drugs by organoleptic, microscopic, physical, chemical and biological methods. Deterioration of herbal drugs by insect.

8. Quantitative microscopy

Definition and determination of stomatal index, stomatal number, palisade ratio, vein islet number, vein termination number, Lycopodium spore method. Micrometers and measurement of microscopic characters.

PRACTICAL

Total Teaching Hours: 4 h/week

1. Identification of unorganized drugs through morphological, sensory and chemical characteristic of: Agar, arachis oil, castor oil, tragacanth, acacia, gums, starches, woolfat, lard, beeswax, honey, lanolin, gelatin, cotton, regenerated cellulose, silk, wool and synthetic fibres used in surgical dressings.
2. Morphological description of drugs: Senna, plantago, fennel, black pepper, ginger, rauwolfia, datura, nux vomica, nim, vinca, podophyllum, turmeric, colchicum, cinchona, gokhru, ergot.

3. Quantitative microscopy (Determination of stomatal index ,determination of vein isles, vein termination and determination of palisade ratio) e.g Senna and Datura
4. Determination of dimensions of starch grains and length of fibres.

Books Recommended

1. Trease and Evans, Textbook of Pharmacognosy.
2. T.E. Wallis: Textbook of Pharmacognosy C.B.S. Publishers, Delhi.
3. M. Heinrich, Fundamentals of Pharmacognosy and phytotherapy, Churchill, Livingstone. .
4. C.K. Kokate, P.P. Purohit and S.B. Gokhle: Pharmacognosy, Nirali Prakshan, Pune.
5. Mohd. Ali: Textbook of Pharmacognosy, CBS Publishers, New Delhi.
6. V.E. Tylor, L.R. Brady and S.B. Robbers: Pharmacognosy, K.M. Varghese Co. Bombay.
7. Mohd. Ali: Pharmacognosy (Pharmacognosy and Phytochemistry), Vol.I, CBS Publishers and Distributors, New Delhi, Bangalore.

Semester-III

Paper BPH -305

**Pathophysiology, Toxicology, & Health Education
(Theory)**

Semester-III 2hrs/ week
Paper BPH-305

**PATHOPHYSIOLOGY, TOXICOLOGY
AND HEALTH EDUCATION (THEORY)**

Total Teaching Hours : ~~2~~ 2 hr/week

1. **General aspect of Pathophysiology:**
Inflammation, Allergy

2. **Health Education**
 - i) Spread and prevention of communicable disease: AIDS, sexually transmitted disease, small pox, measles, influenza, diphtheria, whooping cough, meningitis, tuberculosis, polio-myelitis, viral hepatitis, cholera, typhoid, amoebiasis, malaria, filariasis, rabies, tetanus, leprosy
 - ii) Control of population explosion, national family planning program means of contraception (mechanical, chemicals, surgical, Immunological, physical and physiological).
 - iii) First aid of cardiac arrest (cardiopulmonary resuscitation technique)

3. **Pathophysiology of the following disorders:**
 - i) Disorders of cells and tissues: hypoplasia, hyperplasia, hypertrophy, metaplasia, neoplasia.
 - ii) Disorder of blood vessels: heart atheroma, arteriosclerosis, aneurysms, thrombophlebitis, embolism, varicose veins, congenitive cardiac failure, ischaemic heart disease, rheumatic heart diseases, arrhythmia, hypertension.
 - iii) Disorders of the respiratory tract: tonsillitis, bronchitis, bronchial asthma and cough.
 - iv) Disorders of the digestive tract: gastritis, peptic ulcers, cirrhosis of liver, jaundice.

- v) Disorders of the urinary system: glomerulonephritis, renal calculi
- vi) Disorders of the nervous system: Epilepsy, Parkinsons' disease, Alzheimer's disease, migraine, depression, schizophrenia
- vii) Disorders of the reproductive system: Impotency, infertility, cryptorchism.
- viii) Disorders of bone, joints and cartilages: Osteoporosis, gout, arthritis, rickettes.

4. Toxicology

- i) Definition, scope and its branches.
- ii) Management of poisoned patients.

Books Recommended:

1. Kathleecn J.W. Wilson: Anatomy and Physiology in Health and Illness.
2. H.E.A. Mentz: Pathophysiology in Medical Science.
3. Thomas H. Kent, Michael N. Hart: Introduction to Human Disease.
4. Martha J. Miller: Pathophysiology-Principle of Disease.
5. Philip J. Williams and James L. Burson: Industrial Toxicology.
6. P.K. Gupta and D.K. Salunkhe: Modern Toxicology.
7. B.C. Katzung: Basic and Clinical Pharmacology.
8. D.r. Laurance: Evaluation of Drug activities: Pharmacometrics, Vol. I
9. J.E. Park and K. Park: Textbook of Preventive and Social Medicine.
10. Yash Pal Bedi: A Handbook of Hygiene and Public Health.
11. Material published by Ministry of Health, Family Planning and Urban Development (Department of Family Planning).

Semester III

DM-01

PROPOSED SYLLABUS FOR DISASTER MANAGEMENT AT UG LEVEL

TOTAL NO OF HOURS – 50

Learner Objectives

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between hazard, vulnerability, risk and capacity; Ways of disaster prevention or reducing impact of disasters and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
4. To enhance awareness of institutional processes in the country for Disaster Management and
5. To develop rudimentary ability to respond to their surroundings with an objective to reduce the risk of disaster, in areas where they live, with due sensitivity

DM-01

Disaster Management
B Pharm Sem - III

| UNITS | NO. OF LECTURES |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| UNIT I. Introduction to disaster | (2 Hours) |
| Concepts Definitions –disaster, hazard, vulnerability, risks, resilience | |
| UNIT II. Disaster – classification causes and impact | (10 Hours) |
| Natural disaster Manmade disaster Atmosphere related disasters – cyclone Hydro meteorological hazards (Flood & Drought) Tsunami Landslide Acid rains Ozone depletion Global warming Air pollution Noise pollution Socio, economic and environmental effects of disasters | |
| UNIT III . Human induced disasters | (5 Hours) |
| Accidents Fires Industrial & Chemical Disasters Nuclear Disasters | |

UNIT IV . Approaches to disaster risk reduction

(5 Hours)

Disaster management cycle
Disaster risk management

UNIT V. Interrelationship between disaster and development

(5 Hours)

Factors effecting vulnerabilities,
Differential impacts,
Impact of development projects such as dams, embankment, changes in the land use etc.
Climate change adaptation
Relevance of indigenous knowledge
Appropriate knowledge and local resources

UNIT VI . Disaster management in India

(5 Hours)

Disaster vulnerability of India
Components of disaster relief: Water, Food, Sanitation, Shelter, Health, Waste Management
Nodal Ministries/agencies for disaster management
Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

UNIT VII. Disaster and health

(8 Hours)

Health problems related to disaster
National health emergency and disaster management program
Role of health care practitioner in disaster management
Preparedness in health sector
Health policy and legislation on disaster
Mass causality management
Pre hospital emergency care /First Aid
Hospital reception and treatment
Re distribution of patients between hospitals
Epidemiological surveillance and disease control
Prevention of Epidemics following disaster
Laboratory services
Safe Water supply
Food safety

Safe sanitation and personal hygiene
Solid waste management
Disposal of dead bodies
Long term health effects caused by disaster

UNIT VIII. Do's and don'ts during various disaster (5 Hours)

Flood – Before flood, during flood, after flood
Earth quake – Before Earth quake, during Earth quake, after Earth quake
Cyclone – Before Cyclone, during Cyclone, after Cyclone
Land slide – Before Land slide, during Land slide, After Land slide
Tsunami - Before Tsunami, during Tsunami, after Tsunami
Fire
Nuclear emergency

UNIT IX. Project work – field work, case studies (5 Hours)

The project /fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety, capacity to cope, improve resilience. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions are discussed below.

Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM Plans and community based disaster preparedness plans. Information on these would be available with the district Collector or Municipal Corporations. The scope for students to collaborate on these initiatives is immense. Teachers may explore possibilities. Teachers could ask students to explore and map Disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teachers could work on ways of addressing these vulnerabilities, preparing plans in consultation with local administration or NGOs.

Students could conduct mock drills in schools, colleges or hospitals. Evaluate the drills and suggest fill the gaps. Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local

environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by students in the project work.

Teaching Resources

1. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press, 2000
2. H Sarvoththaman , K J Anandha Kumar, (2013)Disaster Management- Engineering & Environmental aspects .Asiatech Publishers Inc , New Delhi
3. Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8, 2008
4. Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
5. Coppola P Damon, 2007. Introduction to International Disaster Management,
6. Carter, Nick 1991. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
7. Cuny, F. 1983. Development and Disasters, Oxford University Press.
8. Document on World Summit on Sustainable Development 2002.
9. Govt. of India: Disaster Management Act 2005, Government of India, New Delhi.
10. Government of India, 2009. National Disaster Management Policy,
11. Gupta Anil K, Sreeja S. Nair. 2011 Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
12. Indian Journal of Social Work 2002. Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.
13. Kapur, Anu & others, 2005: Disasters in India Studies of grim reality, Rawat Publishers, Jaipur
14. Kapur Anu 2010: Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.
15. Parasuraman S, Acharya Niru 2000. Analysing forms of vulnerability in a disaster, The Indian Journal of Social Work, vol 61, issue 4, October
16. Pelting Mark, 2003 The Vulnerability of Cities: Natural Disaster and Social Resilience Earthscap publishers, London
17. Reducing risk of disasters in our communities, Disaster theory, Tearfund, 2006.
18. WHO (2006), Health Sector Resources for Disaster Management, World Health Organization, Country Office, India, 2006
19. Tirthanka Roy (2012) Natural Disasters and Indian History, Oxford University Press, New Delhi, India.

SYLLABUS
BACHELOR IN PHARMACY
(Semester -IV)

Effective from 2010-2011

Semester-IV

Paper BPH-401

PHARMACEUTICS-V PHYSICAL PHARMACY (THEORY)

Teaching Hours: 4 h/week

1. Complexation and Drug action

Metal complexes, organic molecular complexes, inclusion compounds, methods of analysis of complexes. Protein binding and its determination.

2. Kinetic and Drug Stability

Rates and orders of reactions, influence of temperature and other factors on reaction rates, decomposition and stabilization of medicinal agents, accelerated stability analysis, ICH and WHO guidelines.

3. Surface and interfacial phenomenon

Surface and interfacial tension, surface free energy, measurement of surface and interfacial tension, spreading coefficient, complex films, adsorption phenomenon, adsorption at solid/liquid interface. Surface activity, general classification of surfactants, hydrophilic-lipophilic system, solubilization, factors affecting solubilization, mechanism of solubilization, pharmaceutical applications of solubilization, co-solubilization. Micelle formation, factors affecting micelle formation- determination of critical micelle concentration.

4. Buffers

Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting tonicity.

5. Rheology

Fundamentals of rheology- Introduction, types of flow, quantitative measurement of flow, mechanical models to illustrate viscoelasticity, thixotropy, measurement of thixotropy, thixotropy in formulations, rheology of disperse systems, application of rheology to pharmacy. Methods of measuring viscosity.

6. Micromeritics

Introduction, importance in Pharmacy, fundamental properties of collection of particles like particle size, particle size distribution, particle shape, particle volume, particle number, surface area. Various methods and equipments employed for size separation and different methods of size reduction. Determination of surface area and particle volume. Derived properties of loose powder, flow properties of powders, angle of repose, Carr's compressibility index, Hausner's ratio and factors affecting flow of powders.

7. Coarse and colloidal Suspensions

Suspensions - Interfacial properties of suspended particles, settling in suspensions, formulation of suspension. Study of different types of equipments used in suspension formulation.

8. Emulsions

Emulsions- theories of emulsification, physical stability of emulsions, preservation of emulsions, rheological properties of emulsions, phase equilibria, emulsion and microemulsion formulation. Study of different types of equipments used in emulsion formulation.

9. Diffusion and Dissolution

Steady state diffusion, procedures and apparatus, USP dissolution apparatus, drug release mechanisms.

PRACTICALS

Teaching Hours: 4 h/week

1. Study of complexation.
2. Design, conduction and reporting of accelerated testing in studying chemical stabilization against hydrolytic decomposition of drugs.
3. Determination of surface and interfacial tension
4. Determination of HLB value of surfactant by saponification method.
5. Determination of HLB value by modified Griffin acacia emulsion method.
6. Determination of spreading coefficient of organic liquid by stalagamometer.
7. Determination of CMC (Critical Micelle Concentration) of surfactants by surface tension methods.
8. Qualitative and quantitative study of adsorption phenomenon.
9. Preparation and properties of colloids.
10. Viscosity determination of Newtonian and Non-Newtonian liquids by one point and ultipoint viscometers.
11. Determination of particle size by various method eg. optical method, sieving method, sedimentation method using Andreasson pipette
12. Determination of flow properties of powder through the tube as a function of length of tube, diameter of orifice of tube and pressure head.
13. Experiments demonstrating the measurement of angle of repose of powders and the factors affecting flow.
14. Any other new experiment that can be included from time to time in support of the theoretical aspects of the course.

Books Recommended:

1. Martin: Physical Pharmacy, K.M.B. Varghese Co. Bombay.
2. A.T. Florence and D. Attwood W: Physiochemical principles of Pharmacy.
3. Shotton and Ridgeway: Physical Pharmaceutics.
4. Remingtons Pharmaceutical Sciences, Mark Publishing Co.
5. H.S. Beans, A.H. Beckett and J.E. Carless: Advances in Pharmaceutical Sciences, Vol. 1 to 4.
6. S.P. Agarwal, Rajesh Khanna: Physical Pharmacy, CBS Publishers, New Delhi.

Semester-IV

Paper BPH-402

PHARMACEUTICAL CHEMISTRY IV

(Pharmaceutical Analysis & Inorganic Chemistry) Total Teaching Hours: 4 Hrs/week

1. Introduction

Significance of quantitative analysis in quality control, different techniques of analysis. **2. Acid-base titrations** Theories of acidimetry and alkalimetry, classification, direct titration of strong acids, weak acids, strong bases & weak bases. Theories of indicators, types of acid-base indicators. Preparation and standardization of acids and bases. Some exercises related to the determination of acids & bases. Some official assay procedures e.g. hydrochloric acid, phosphoric acid, sodium hydroxide, calcium carbonate, nitric acid. **3. Oxidation & reduction titrations:** Concepts of oxidation and reduction, redox reactions, strengths & equivalent weights of oxidizing and reducing agents, redox indicators, potassium permanganate titrations, iodometry & iodimetry, ceric ammonium sulphate titrations, potassium iodate titrations. Pharmaceutical applications, preparation and standardization of redox titrants e.g. sodium thiosulphate etc.

4. Precipitation titrations Preparation & standardization of titrants like silver nitrate, ammonium thiocyanate; titrations according to Mohr's and Volhard's methods; ammonium and potassium thiocyanate titrations; indicators; applications in pharmaceutical analysis, Fajan's method and Gaylussac's method. **5. Diazotisation titrations** Different conditions involved in diazotisation of different amines, end point determination, and pharmaceutical analytical applications such as in the assay of sulfonamides. **6 Gravimetric analysis** Introduction, precipitation techniques, supersaturation, co-precipitation, digestion, washing of the precipitates, filtration paper and crucibles, ignition, specific examples of Gravimetric estimations like barium as barium sulphate, aluminum as aluminum oxide, calcium as calcium oxalate, magnesium as magnesium pyrophosphate. **7. Non-aqueous titrations** Theoretical considerations, scope and limitations, acid base equilibria in non-aqueous media, titration of weak bases, titration of weak acids. Pharmaceutical products should be selected for illustration e.g. ephedrine and methyl dopa. **8. Complexometric titrations** Types of

Complexometric titrations, metal ion, indicators, pM indicators, factors influencing the stability of complexes and applications e.g. calcium gluconate, bismuth carbonate, bismuth subnitrate, ligand's and determination of hardness of water..

PRACTICAL

Total Hours: 4 hrs/week

1. Acid base titrations

Preparation and standardization of acids and bases, some exercises related to the determination of acids and bases separately and in mixture form. Some official assay procedures e.g. of boric acid, ascorbic acid shall also be covered.

2. Oxidation-reduction titrations

Preparation and standardization of some redox titrants e.g. potassium permanganate, potassium dichromate, iodine, sodium thiosulphate etc. Exercises involving use of potassium iodate, potassium bromate, ceric ammonium sulphate shall be performed.

3. Precipitation titrations

Preparation and standardization of titrants like silver nitrate and ammonium thiocyanate, titrations according to Mohr's and Volhard's methods.

4. Gravimetric analysis

Determination of water of hydration, some exercises related to Gravimetric estimation of metal ions such as barium, magnesium & calcium shall be covered.

5. Diazotisation titration

Assay of sulphonamides like wise any two official assays.

6. Complexometric titration

Any two official assays done by this method.

Books Recommended:

1. L.M.Atherden, Bentley and Driver's Text book of Pharmaceutical Chemistry, Oxford University Press, Delhi

2. G.L.Jenldns, J.E.Christian, G.P.Hager. Quantitative Pharmaceutical Chemistry, McGrawHill Company, New York.
3. Pharmacopoeia of India 1985, Govt. of India, Ministry of Health, Delhi.
4. I.Bassett, R.C.Denney, G.H.Jeffery, J.Mendham, Yogel's Textbook of quantitative Inorganic Analysis, The ELBS and Longman, London.
5. A.H. Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, Vol I & II. The Athlone Press of the University of London.
6. D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch. "Fundamental od analytical Chemistry" VIII edition, Thompson and Brookscote, Singapore.
7. Ashutosh Kar "Pharmaceutical drug analysis" II edition. New Age International Pvt. Ltd, New delhi.

Semester-IV

Paper BPH-403

Pharmacology- I

Semester-VI 4hrs/ week
Paper BPH-403

PHARMACOLOGY-I (THEORY)
Total Teaching Hours : ~~6~~ 4 h/week

1. General Pharmacology

- i) Definition, scope and branches of pharmacology.
- ii) Routes of drugs administration and drug delivery systems.
- iii) Dynamics of absorption, distribution and excretion of drugs.
- iv) Basic pharmacokinetic parameters employed in the use of drugs, their bioavailability and biotransformation, metabolizing enzymes as targets of drugs action (induction and inhibition).
- v) Mechanisms of drugs action, drug receptors and cellular signaling systems.
- vi) Drug antagonism and synergism.
- vii) Drug dependence and related conditions.
- viii) Adverse drug effects and their monitoring, iatrogenic diseases.
- ix) Pharmacogenetics.

2. Autocoids

- i) Histamine, Antihistaminics.
- ii) Serotonin, agonists and antagonists.
- iii) Arachidonic acid metabolites
- iv) Renin Angiotensin Aldosterone System, Plasmakinins, VIP, neurotensin, substance P, PAF.

3. Pharmacology of Autonomic Nervous System

- i) Cholinergic receptors, cholinergic drug (parasympathomimetics, cholinomimetics, anticholinesterases).
- ii) Anticholinergic drugs.

- iii) Adrenoceptors, sympathomimetics, adrenoceptors blockers.
- iv) Drugs action on autonomic ganglia (ganglionic stimulants, ganglion blocking agents).
- v) Neuromuscular blocking agents and centrally acting muscle relaxants.

4. Drug in Ocular Pharmacology

- i) Mydriatic and miotic agents and drugs used in glaucoma.

PRACTICAL

Total Hours : ~~6~~ 4 h / week

- 1 Study of instruments used in experimental Pharmacology, smoking and fixing a kymograph.
- 2 Handling of laboratory animals.
- 3 Techniques of drug administrations in animals.
- 4 Influence of routes of administration of drugs on drug response.
- 5 Experiments on isolated tissue preparations
 - i) To record CRC of acetylcholine using guinea pig ileum / rat intestine.
 - ii) Determination of dose ratio.
 - iii) Study of competitive antagonism using acetylcholine and atropine
 - iv) Potentiation of acetylcholine responses with anticholinesterases.
 - v) Determination of PD_{50} value.
6. Study of drug absorption in vitro.
7. Determination of intraocular pressure in rabbits.

Books Recommended:

Theory

1. C.R. Craig and R.E. Stitze: Modern Pharmacology
2. Goodman Gilman's : The Pharmacological Basis of Therapeutics by Alfred Goodman Gilman, Theodore W. Rall, Alan S. Nies and Palmer Taylor.
3. D.R. Laurence and P.N. Bennett: Clinical Pharmacology.

4. K.D. Tripathi: Essentials of Medical Pharmacology.
5. R.S. Satoskar and S.E. Bhandarkar: Pharmacology and Pharmacotherapeutics.
6. H.P. Rang and M.M. Dale: Pharmacology.
7. James Crossland: Lewis's Pharmacology, revised.

Practical

1. Pharmacological experiments on isolated preparations by Edinburgh University, Pharmacology Staff, 1968
2. U.K. Sheth, N.K. Dadkar and Usha G. Kamat: Selected topics in experimental pharmacology.
3. S.K. Kulkarni: Handbook of experimental Pharmacology.
4. M.N. Ghosh: Fundamental of Experimental Pharmacology.
5. Ian Kitchen: Textbook of invitro Pharmacology.
6. Robert A. Turner: Screening methods in Pharmacology, Vol. 1
7. S.K. Barar: Essentials of Pharmacotherapeutics
8. K.K. Pillai, Experimental Pharmacology, CBS, New Delhi.

Semester-IV

Paper BPH- 404

COMPUTER APPLICATIONS

Teaching Hours: 3 h/week

1. Fundamentals of Computers

Computers, its types and uses, computer generations, hardware, software, elements of a computer system.

Number Bases-Decimal, binary, octal, hexadecimal, data representation.

Storage devices - Primary memory, hard disk, floppy disk, CDROM.

Input and output devices.

2. Programming

High level languages, machine languages, syntax, semantics.

Program design aims- Stages in programming, flow charts.

3. Application Software

Wordprocessing techniques, file manipulations and formatting, printing setups, mail-merge. Table handling. Mathematical equations, graphs, picture handling and drawings.

About spreadsheet programs, workbooks/worksheets, Formatting of sheets, Formulae and functions, graphs. Import and export of files/ data.

Presentation Packages, slide designing, graphs. Import and export facilities.

4. Operating System-DOS, Windows and Unix

Operating system-definition, organization, functions, operations and types, history of DOS, Windows and UNIX operating systems, handling of drives, directories and files, commands-internal, external.

Program groups, items, icons, clipboard, folders, task swapping.

Major differences between DOS and UNIX operating systems

5. Data Transmission and Networks

Hardware and software components. Seven layer model. Bus, star and ring topologies.

6. Programming Language 'C'

Data types, constants, variables, arithmetic and relational expression, symbolic constants, input and output, increment and decrement operators, assignment statement, if-else, switch statements.

Loops-while, do-while, for-transfer statements, functions, header files, recursion, pointers and arrays, structures.

PRACTICALS

Teaching Hours: 3 h/week

MS Office—MS word. MS Excel.

Powerpoint, DOS Comands

Books recommended

1. Bryon S. Gottfried: McGraw Hill Book Co. (Schaum's Series) Programming with C.
2. E. Balagumswamy: Tata McGraw Hill Publishing Co., Programming in C.
3. John Sheeley and Roger Hunt: Computer Studies, First Course, Delhi: A.K. Wheeler & Co 1986.
4. R.J. Scidal, and M. L. Rubin (Ed.): Computer and Communications: Implications for Education. Academic press. 1977.
5. V. Rajaraman: Fundamental of Computers, IInd Edition, East Economy Edition.

SYLLABUS
BACHELOR IN PHARMACY
(Semester -V)
Effective from 2010-2011

Semester-V

Paper BPH -501

PHARMACEUTICS-VI PHARMACEUTICAL FORMULATION AND COSMETOLOGY (THEORY) Teaching Hours: 4 h/ week

1. Preformulation studies

- i) Study of physical properties of drugs like physical form, polymorphism, solubility, salt formation, dissolution and partitioning effects and their influence on formulation, stability and bioavailability of products.
- ii) Study of chemical properties like hydrolytic degradation, oxidation, racemization, decarboxylation, polymerization and their influence on formulation and stability of products. Drug substance – excipient interaction study.
- iii) Study of pro-drugs in solving problems related to stability, bioavailability and elegance of formulations.

2. Raw materials used for Cosmetic preparations

Surfactants, humectants, preservatives, herbal materials, perfumes, colors (FD &C approved Dyes and types of dyes)

3. Skin Care Products

Introduction to anatomy and physiology of skin, formulation of skin cleansers and moisturizers, sun screen products.

4. Color Cosmetics

Lipsticks and nail lacquers

5. Dental Products:

Dentifrices, tooth powder and tooth paste.

6. Hair Care Products

Introduction to hair structure, shampoos, hair conditioners, hair setting lotions, hair creams, hair bleaches and dyes.

7. Personal Hygiene Products

Shaving soaps and creams, after shave preparations, antiperspirants and deodorants.

8. Blood Products and Plasma Substitutes

Classification of blood products; collection, processing and storage of whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin foam, plasma substitute, ideal requirements and large scale preparation of dextran.

9. Radio Pharmaceuticals

Production of radiopharmaceuticals, radiation hazards, radiological safety, medical and pharmaceutical applications of radiopharmaceuticals.

10. Evaluation and QC of Cosmetic Products.

PRACTICALS

Teaching Hours: 4 h/ week

Preparation and quality control tests for:

- i) Cold cream

- ii) Vanishing cream
- iii) Cleansing lotion and cream
- iv) Moisturizing cream
- v) Tooth powders
- vi) Tooth pastes
- vii) Hair creams
- viii) Hair setting lotions
- ix) Shampoos
- x) Hair colorants
- xi) Shaving creams
- xii) After shave lotions
- xiii) Other cosmetics
- xiv) Stability study of some formulations.

Books Recommended

1. G. S. Banker and C. T. Rhodes: Modern Pharmaceutics, Second Edition, Volume 40, Marcel Dekker, Inc., New York, 1990.
2. L. Lachman, H. A. Lieberman and J. L. Kaing: The Theory and practice of Industrial Pharmacy, Vargheese Publishing House, Mumbai, 1987.
3. M. E. Aulton: Pharmaceutics, Science of Dosage Form Design.
4. Remington's Pharmaceutical Sciences.
5. E.A.Rawlins: Bentley's Textbook of Pharmaceutics, University Printing House, Oxford, 1988.
6. J. Swarbrick: Current concepts in the pharmaceutical Sciences: Dosage form. Design and Bioavailability, Lea and Febiger, Philadelphia, 1973.
7. L.Z. Benet: Biopharmaceutics as the basis for the design of drug products, In Drug Design.
8. A. Martin: Physical Pharmacy, Vargheese Publishing House, Mumbai, 1991.
9. B.M.Mittal, Textbook of Pharmaceutical formulation.
10. D.F.Williams and W.H.Schmitt: Chemistry and Technology of the cosmetics and Toileteries Industry.
11. Harry's Cosmetology
12. W.A.Poucher: Perfumes, Cosmetics and Soaps Vol. I, II and III Chapman and Hall London.
13. F.Y. Wells and H.Lubove: Cosmetics and the Skin, Reinhold Pub. New York.

Semester-V

Paper BPH -502

**Pharmaceutical Chemistry-V
Pharmaceutical Analysis-II-
(Physical Chem. & Principals of Instrumental Analysis)**

Teaching Hours: 4 h / week

1. Solutions

Solution, expressing concentration of solutions, solution of solid in liquids, factor influencing solubility, ideal and non ideal solution.

2. Colligative properties

Lowering of vapour pressure and Raoult's Law, osmosis and osmotic pressure, measurement of osmotic pressure, pharmaceutical applications of osmosis, theories of semipermeable membranes, elevation of boiling point and its experimental determination, depression of freezing point and its determination).

3. The Distribution law

Distribution coefficient, distribution law, conditions for validity of distribution law, association of solute in one of the solvents, dissociation of the solute in one of the solvents. The solute enters into chemical combination with one of the solvents. Application of distribution law, solvent extraction method.

4. Chemical Kinetics

Rate equation and order of a reaction, rate constant or velocity constant, molecularity of a reaction, order and molecularity of simple reactions, factors influencing rate of reaction, unit of rate constant, zero order reactions, first order reactions, pseudo first order reactions.

5. Catalysis

Homogeneous and heterogeneous catalysis, acid base catalysis, theories of catalysis, poisoning and applications of catalysis. **6. Thermodynamics**

First law of thermodynamics, work done in expansion of gases, internal energy, enthalpy, heat capacity.

7. Potentiometric analysis

Electrode potential, electrodes, galvanic cell, convention to write a galvanic cell, pH determination, application of potentiometric titrations.

8. Conductometric analysis

Definitions, cell constant, variance law's, measurement of conductance, application of conductometric titration..

9. Aquametry

Brief account of aquametry, physical and chemical methods for water determination, Karl Fischer's spectrophotometric method, gas chromatography, electrochemical methods.

10. Spectrofluorimetry

Fluorescence, spectrofluorimetry and analytical factors. Principles of turbidimetry, Instrumentation

11. Chromatography

Fundamental principles of chromatography, adsorption, partition, column, paper, thin-layer chromatography.

12. Polarimetry

Principle, polarization types of molecules analyzed, optical rotation, factors affecting instrumentation and application

13. Refractometry

Refractive index, factors affecting, measurement of refractive index, instrumentation and application, molecular refractivity & chemical constitution.

PRACTICAL Teaching Hours: 4 h / week

Experiments based on surface tension, viscosity, partition coefficient, kinetics, solubility product, and critical solution temperature. Exercises involving Polarimetry, refractometry and pH-determination. TLC and Paper chromatography.

Books Recommended:

1. J.R. Barrante, Physical Chemistry of Life Sciences, Printeil.
2. K.J. Laidler, Physical Chemistry with Biological Applications, Benjamin.
2. S.C. Wallwork, Physical Chemistry for Students of Pharmacy and Biology, Longman.
3. L. M. Atherden, Bentley and Drivers'-Textbook of Pharmaceutical Chemistry, OxfordUniversity press, Delhi.
4. A.J. Mce, Physical Chemistry, E.L. B.S., London.
5. H.H. Willard, L.L. Merritt and J.A. Dean, Instrumental Methods of Analysis, Van Nostrand Reinhold, New York.
6. Samuel Glasstone and David Lewis, Elements of Physical Chemistry, Macmiilan Press, London.
7. A.H. Beckett and J.B. Staenlake, Practical Pharmaceutical Chemistry, Vol. 1 and 11. The Athlone Press of the University of London.
8. K.A. Connors, A Textbook of Pharmaceutical Analysis Wiley - Interscience, New York.

Semester-V

Paper BPH -503

**Pharmaceutical Chemistry-VI
(Chemistry of Natural Products)**

**PHARMACEUTICAL CHEMISTRY- VI
(CHEMISTRY OF NATURAL PRODUCTS) -THEORY**

Teaching Hours: 4 h / week

1. General methods of isolation of natural products, belonging to different groups.

2. Carbohydrates

An account of the chemistry of mono, di- and polysaccharides: glucose, fructose, sucrose, maltose, lactose, cellulose, starch, glycogen and Chitin. Study of the naturally occurring glycosides (excluding cardiac glycosides) Indican ruberythric acid, amygdalin, salicin, sinigrin and arbutin.

3. Proteins and amino acids

Classification, general methods of preparation and properties of amino acids, general nature of proteins, classification of proteins, End group analysis, Basic idea regarding primary, secondary, tertiary and quaternary structure of protein.

4. Terpenoids

Introduction, classification, isolation methods, general methods of structure determination, chemistry and synthesis of monoterpenoids; acyclic monoterpenoids e.g. citral, monocyclic monoterpene : -pinene, camphor, sesquiterpenoids: fernesal.

5. Alkaloids

Definition of alkaloids, classification, isolation, general methods of determination of structure, estimation of functional groups, structure elucidation and syntheses of some selected simple members, ephedrine, nicotine, atropine, quinine, morphine and reserpine.

6. Xanthine bases

Introduction in relation to uric acid, Isolation, structure determination and synthesis of Caffeine, theophylline and theobromine.

7. Study of the chemistry of lipids (fats, oils and waxes); phospholipids.

8. Chemistry of Nucleic acid (Preliminary studies along with synthesis of purine and pyrimidine bases).

PRACTICAL Teaching Hours: 4 h / week

1. Analysis of fixed oils:, determination of acid value, saponification value, iodine value, ester value and hydroxyl value. 2. Isolation of a few naturally occurring compounds such as caffeine, from tea leaves. 3. Estimation of following organic groups: hydroxyl (alcoholic and phenolic), amino, carboxylic groups and acetyl group.

Books Recommended:

- 1 . I.L.Finar,'Organic Chemistry VoI-II, The English Language Book Society, London.
2. Pharmacopoeia of India 1985, Govt. of India, Ministry of Health, Delhi.
3. R.K.Bansal, Heterocyclic Chemistry, Wiley Eastern, New Delhi.
4. Joul Smith, Heterocyclic Chemistry, ELBS, London.
5. O. P. Agarwal : chemistry of natural products. Vol I & II.

Semester-V

Paper BPH -504

**Pharmacognosy- IV
(Pharmacognosy and Phytochemistry- I)**

Paper BPH 504

**PHARMACOGNOSY IV
PHARMACOGNOSY & PHYTOCHEMISTRY I (THEORY)**
Teaching Hours: 2h/Week

- 1. Biogenetic pathways**
Formation of primary and secondary metabolites. Study of Calvin cycle, TCA cycle, Shikimic acid pathway, Embden-Maerhoef pathway, acetate hypothesis, isoprenoid pathway. Biosynthesis of carbohydrates, lipids and volatile oils.
- 2. Carbohydrates and lipids**
Biological sources, chemical constituents, adulterants and uses of:
Plantago, bael, chalmooogra oil, neem oil, shark liver oil, cod liver oil, rice bran oil, kokum butter, guggul lipids.
- 2. Tannins**
Biological sources, chemical constituents, chemical test and uses of:
Pale catechu, black catechu, nutgalls, *Terminalia belerica*, *Terminalia chebula*, *Terminalia arjuna*.
- 4. Volatile oils**
Biological sources, chemical constituents, adulterants and uses of:
Black pepper, turpentine, mentha, coriander, cardamom, cinnamon, cassia, lemon peel, orange peel, lemon grass, citronella, cumin, caraway, dill, spearmint, clove, anise, star anise, fennel, nutmeg, eucalyptus, chenopodium, ajowan, sandal wood.

PRACTICAL
Teaching Hours: 3h/Week

1. Microscopic examination of the following powdered drugs and their mixtures:
 - i) Leaf: Senna
 - ii) Root: Rauwolfia
 - iii) Seed: Nux vomica
 - iv) Bark: Cinchona, Cinnamon
 - v) Fruits: Fennel, Coriander
 - vi) Wood: Quassia,
 - vii) Rhizome: Ginger

Books Recommended:

1. Trease and Evans, Textbook of Pharmacognosy.
2. CK Kokate, PP Purohit and SB Gokhle: Pharmacognosy, Nirali Prakshan, P-Pune.
3. Mohd. Ali, Text Book of Pharmacognosy, CBS, New Delhi
4. J Bruneton: Pharmacognosy and Phytochemistry, Medicinal Plants, Lavoisier Publishing, France.
5. VE Tylor, LR Brady and SB Robbers: Pharmacognosy, K M Varghese Co., Bombay
6. TE Wallis: Text Book of Pharmacognosy, CBS Publishers & Distributors, New Delhi
7. Saroja Joshi and Vidhu Aeri: Practical Pharmacognosy, Frank Bros & Co, Publishers, Ltd, New Delhi
8. BP Jakson and DW Snowdon: Powdered Vegetable Drugs, Churchill Ltd., London.

Semester-V

Paper BPH -505

Biochemistry-I

Semester-V
Paper BPH-505

BIOCHEMISTRY-I (THEORY)
Total Teaching Hours: 25

- 1. Enzymes**
 - i) Classification of enzymes.
 - ii) General mechanisms of enzyme action.
 - iii) Factors affecting the velocity of enzyme catalysed reaction.
 - iv) Activators and inactivators of enzymatic reactions.
 - v) Application of metabolic antagonism.
- 2. Biological Oxidations**
 - i) Oxidation-reduction chains in nature.
 - ii) Oxidative phosphorylation.
- 3. Metabolism of Carbohydrate**
 - i) Anaerobic metabolism of Glucose.
 - ii) Aerobic metabolism (Kreb's cycle).
 - iii) HMP pathway.
 - iv) Regulation of blood glucose concentration.
 - v) Glycogenesis.
 - vi) Glycogenolysis.
 - vii) Gluconeogenesis.
- 4. Metabolism of Lipids**
 - i) Fatty acid metabolism.
 - ii) Oxidation of fatty acids.
 - iii) Biosynthesis of fatty acids.
 - iv) Synthesis and degradation of triglycerides.
 - v) Hormonal influence on the mobilisation of fat in adipose tissue.
 - vi) Ketosis.

PRACTICAL
Total Hours: 50

1. Estimation of glucose in blood.
2. Estimation of Liver glycogen.
3. Estimation of Chloride in Serum.
4. Determination of SGOT and SGPT.
5. Determination of Serum bilirubin.
6. Fat determination in milk.
7. Estimation of Lactose in milk

Books Recommended:

Theory

1. Lubert Stryer: Biochemistry.
2. Abraham Mazur and Benjamin Harrow: Textbook of Biochemistry.
3. Albert L. Lehninger: Principles of Biochemistry.
4. R.W. McGilvery and Gerald Goldstein: Biochemistry - A functional approach.
5. H.G. Bray and Sybil P. James: Biochemistry for Medical Students.
6. John W. Suttle: Introduction to Biochemistry.
7. W. Martin, Peter A. Mayes, Victor, W. Rodwell: Harper's Review of Biochemistry.
8. Karlson P: Introduction to Modern Biochemistry.

Practical

1. Varun K. Malhotra: Practical Biochemistry for Students.
2. Harold Varley: Practical Clinical Biochemistry.
3. David T. Plummer: An Introduction to Practical Biochemistry.

SYLLABUS
BACHELOR IN PHARMACY
(Semester -VI)
Effective from 2010-2011

PHARMACEUTICS -VII
HOSPITAL AND CLINICAL PHARMACY (THEORY)

Teaching Hours: 4 h /week

PART I - HOSPITAL PHARMACY

1. Status of health care system in India
Organization of health care system, National health policy, Health services: Maternal and child health, Family planning and adolescent health, Prevention and control of locally endemic diseases like Kala-azar, Dengue, Filariasis, Malaria, Tuberculosis. Non-communicable disease like cardiovascular diseases, Diabetes, Cancer, HIV/AIDS and Diarrhoea
2. Hospitals: Definition and role of hospitals in health delivery systems. Types of hospitals.
3. Hospital Pharmacy
Definition, functions and objectives of hospital pharmacy, location, layout and flow chart of material and men, facilities required including equipments
4. Drug distribution system in hospitals
 - i. Out patients, ii. In patients: Detailed discussion of a) Unit dose dispensing b) Floor ward stock system and satellite pharmacy services c) Central sterile services
5. Hospital drug policy
Composition, organization and functions of Pharmacy and Therapeutics Committee, hospital formulary system
6. Surgical instruments, hospital equipments and health accessories: Nomenclature and uses
7. Pharmacovigilance
Definition, Types of adverse drug reactions, adverse drug reaction monitoring
8. Pharmacoeconomics
Definition and scope, types of economic evaluation

PART II - CLINICAL PHARMACY

1. Introduction to clinical pharmacy: Definition and scope
2. Patient counseling and Patient compliance
Definition, elements and benefits of patients counseling. Compliance to treatment, Reasons and consequences of non-compliance
3. Drug interactions of clinically important drugs
Definition, introduction and mechanisms of drug interactions, drug-drug interaction with reference to analgesics, diuretics, cardiovascular drugs, gastrointestinal drugs, vitamins and hypoglycaemic agents, Drug food interactions
4. OTC medicines
Use of OTC medicines in fever, headache, motion sickness, oral hygiene, tobacco use and smoking cessation, diarrhoea and constipation, common cold and cough
5. Drug toxicity and its management

- Introduction, general treatment of poisoning, systemic antidotes, Treatment of poisoning due to insecticides, heavy metals, narcotics, barbiturates, organophosphorous compounds.
6. Drug dependence and addiction: complications and treatment
 7. Diseases: Etiology, pathophysiology, signs and symptoms of Tuberculosis, hepatitis, rheumatoid arthritis, peptic ulcer, epilepsy, diabetes mellitus, bronchial asthma, cardiovascular diseases.
 8. Drug information services
Establishment of drug information centre, Qualities and abilities of a drug information specialist, Sources of literature
 9. Introduction to social pharmacy
Definition and Scope of Social Pharmacy: Preventing morbidity, Health education, Health promotion

Books recommended:

1. W. E. Hassan: Hospital Pharmacy
2. Remington's: The science and practice of pharmacy
3. R. Walker and C. Edwards: Clinical Pharmacy and Therapeutics
4. Herfindal et al.: Clinical Pharmacy and Therapeutics
5. G. Parthasarathi et al.: A text book of clinical pharmacy practice
6. H.P. Tipnis and Amrita Bajaj: Clinical Pharmacy
7. P. Nand and R.K. Khar: Hospital and Clinical Pharmacy
8. G. Harding et al: Social Pharmacy-Innovation and Development

Paper BPH- 602

PHARMACEUTICS-VIII
FORENSIC PHARMACY AND ETHICS (THEORY)
Teaching Hours: 4 h/ week

Sem-VI

1. Historical Background

Drug legislation in India, Code of Ethics for Pharmacists.

2. Drug Laws

(A detailed study: Case study (actual/simulated) inclusive of recent amendments)

- i) Pharmacy Act 1948.
- ii) Drugs and cosmetic Act 1940, Rules 1945.
- iii) Poison Act.
- iv) Factory Act.
- v) Medical termination of pregnancy Act.
- vi) The Insecticide Act.
- vii) Prevention of cruelty of animals act.
- viii) Narcotic Drugs and Psychotropic Substances Act, and Rules there under.
- ix) Drugs and Magic Remedies (Objectionable Advertisements) Act 1954.
- x) Medicinal and Toilet Preparations (Excise Duties) Act 1955, Rules 1976.
- xi) Delhi shops and Establishment Act.
- xii) The Drug (price control) order.
- xiii) Indian Patents Act as applicable to drugs and pharmaceuticals.
- xiv) AICTE Act. 1987.

Books Recommended

1. N. K. Jain: Pharmaceutical Jurisprudence
2. S. P. Aggarwal and R. Khanna: Pharmaceutical Jurisprudence, Tata Publishers.

**PHARMACEUTICAL CHEMISTRY-VII
(MEDICINAL CHEMISTRY-I) - THEORY**

Teaching Hours: 4 h / week

1. Physico-Chemical properties of drugs in relation to biological activity, solubility, partition coefficient, ionization, hydrogen bonding, P_{ka} values, isosterism, geometrical and optical isomers, steric effect and drug-receptor interactions.
2. Modern concepts of rational drug design: a brief introduction
3. General pathway of drug metabolism, sites of drug biotransformation, role of cytochrome P-450 monooxygenase in oxidative biotransformation. Oxidative, reductive, hydrolytic and conjugation reactions. Factors affecting the drug metabolism.
4. The following topics shall cover nomenclature, classification, synthetic procedures of the compounds mentioned under each category, structure activity relationship (SAR), mode of action and therapeutic uses:

(a) DRUGS AFFECTING THE CENTRAL NERVOUS SYSTEM:

- i. **General anesthetics:** Halothane, Methoxy Fluorane, Fluoroxene, Thiopental Sodium and Ketamine
- ii. **Sedative-hypnotics & Anxiolytics:** Phenobarbital, Glutethimide, Meprobamate, Chloral Hydrate, Diazepam, Oxazepam, Lorazepam and Buspirone.
- iii. **Anticonvulsants:** Phenytoin, Trimethadione, Ethosuximide, Valproic Acid, Primidone and Carbamazepine.
- iv. **Antipsychotics -** Chlorpromazine, Perphenazine, Haloperidol, Risperidone, Mofindine and Clozapine.
- v. **Antidepressants -** Imipramine, Amitriptyline, Fluoxetine, Meclizemide and Isocarboxazide.
- vi. **Hallucinogens-** Phencyclidine (PCP) and Dimethyltryptamine (DMT)
- vii. **Antiparkinson agents -** Levodopa, Amantadine, Procyclidine and Trihexiphenidyl.
- viii. **Opiate analgesics & Nonopiate analgesics -** Diphenoxylate, Loperamide, Levallorphan, Levo-Propoxyphene and Dextromethorphan.
- ix. **Nonsteroidal Anti-inflammatory agents-** Aspirin, Mefenamic Acid, Indomethacin, Ibuprofen, Naproxen, Acetaminophen, Phenylbutazone, Oxyphenbutazone, Diclofenac, Nimesulide, Probenecid and Allopurinol.

(b) DRUGS AFFECTING THE PERIPHERAL NERVOUS SYSTEM:

- i. **Local anesthetics -** Cocaine, Benzocaine, Lidocaine, Procaine and Dibucaine.

- ii. **Skeletal muscle relaxants** - Chlorphenesin, Dantrolene Sodium, Baclofen and Metaxalone.

(c). DRUGS AFFECTING THE AUTONOMIC NERVOUS SYSTEM:

- i. **Adrenergic agents:** Epinephrine, Norepinephrine, Ephedrine, Isoproterenol, Terbutaline and Naphazoline.
- ii. **Antiadrenergic agents:** Phenoxybenzamine, Phentolamine, Propranolol, Metoprolol and Prazosin.
- iii. **Cholinergic agents:** Acetylcholine, Methacholine, Bethanechol, Physostigmine, and Pyridostigmine.
- iv. **Anticholinergic and Antispasmodic agents** - Cidinium Bromide, Dicyclomine, Benztropine and Cyclopentolate.
- v. **Histamine and antihistamines:** Diphenhydramine Hydrochloride, Tripeleminamine, Pyrilamine, Pheniramine, Chlorpheniramine, Promethazine, Meclizine and Antazoline.

[d]. DRUGS AFFECTING THE KIDNEY:

- i. **Diuretics:** Acetazolamide, Dichlorphenamide, Chlorthalidide, Chlorthalidone, Furosemide, Ethacrynic Acid, Furosemide, Triamterene and Amiloride.

PRACTICAL

Teaching Hours: 4 h / week

Synthesis of compounds of medicinal interest including synthesis involving two steps and synthesis of heterocyclic compounds.

Books Recommended.

1. M.E. Wolf, *Burger's Medicinal Chemistry*, John Wiley and Sons, New York.
2. R.F. Doerge, Wilson & Gisvold's *Textbook of Organic Medicinal and Pharmaceutical Chemistry*, Lippincott.
3. W.O. Foye, *Principles of Medicinal Chemistry*, Lea & Febiger, Philadelphia.
4. D.I. Ednieer and L.A. Mitschier, *Alc Organic Chemistry of Drug synthesis Vol. I, II & III* John Wiley and Sons, New York.
5. S.N. Pandeya, *A Textbook of medicinal chemistry, Vol-I*, S.G. Publishers, Varanasi.
6. Ashutosh Kar, *Medicinal Chemistry*, Wiley Eastern, Ltd., New Delhi.
7. I.L. Finar, *Organic Chemistry Vol. II*, 'Re English Language Book Society, London

PHARMACOGNOSY V
PHARMACOGNOSY & PHYTOCHEMISTRY II (THEORY)

Teaching Hours: 2h/Week

1. Resinous drugs

Classification, formation and chemical nature. Biological sources, chemical constituents, identification test, adulterants and uses of: Benzoin, Peru balsam, Tolu balsam, colophony, myrrh, asafoetida, jalap, colocynth, ginger, turmeric, capsicum, cannabis, podophyllum.

2. Glycosides

Nature and classification. Biological sources, chemical constituents, adulterants and uses of: Digitalis, strophanthus, squill, thevetia, oleander, cascara, aloe, rhubarb, senna, quassia, dioscorea, quillaia, glycyrrhiza, ginseng, gentian, senega, wild cherry, withania, Bitter almond. Biosynthesis of Cardiac and Anthraquinone glycoside.

3. Alkaloids

Biological sources, chemical constituents, adulterants and uses of: Areca nut, belladonna, hyoscymus, stramonium, duboisia, coca, coffee, tea, cinchona, opium, ipecac, nux vomica, ergot, rauwolfia, vinca, kurchi, ephedra, colchicum, vasaca, pilocarpus, aconite, *Solanum xanthocarpum*. Biosynthesis of tropane, cinchona and opium alkaloids.

4. Herbarium

Preparation of herbarium sheets and their importance in authentication of plants.

PRACTICAL

Teaching Hours: 3h/Week

1. Identification of organised drugs on the basis of morphological and microscopy of: Digitalis, Quassia, Cinchona, Ipecac, Rauwolfia, Caraway, Clove, Coriander, Aconite.
2. Chemical tests of: Plantago, Pale catechu, Black catechu, Tannic acid, Clove, Cinnamon, Benzoin, Peru balsam, Tolu balsam, Colophony, Asafoetida, Aloe, Cinchona, Ipecac, Nux vomica.
3. Pharmacognosy tour for field collection of medicinal and aromatic plants. (2 Weeks)
4. Preparation of herbarium sheets and monograph on one of the collected plant during tour.

Books Recommended:

1. Trease and Evans, Textbook of Pharmacognosy.
2. CK Kokate, PP Purohit and SB Gokhle: Pharmacognosy, Nirali Prakshan, P-Pune.
3. Mohd. Ali, Text Book of Pharmacognosy, CBS, New Delhi
4. J Bruneton: Pharmacognosy and Phytochemistry, Medicinal Plants, Lavoisier Publishing, France.
5. VE Tylor, LR Brady and SB Robbers: Pharmacognosy, K M Varghese Co., Bombay
6. TE Wallis: Text Book of Pharmacognosy, CBS Publishers & Distributors, New Delhi
7. Saroja Joshi and Vidhu Aeri: Practical Pharmacognosy, Frank Bros & Co., Publishers, Ltd, New Delhi

Pharmacology II (Theory)

Teaching hours: 4 hrs/week

Semester VI
Paper BPH-605

1. Drugs acting on the Central Nervous System

- i) Introduction to CNS Neurotransmitters.
- ii) General Anaesthetics, Dissociative and Neurolept-anesthesia
- iii) Sedatives & Hypnotics
- iv) Alcohol
- v) Antiepileptics
- vi) Antianxiety drugs
- vii) Antidepressant drugs
- viii) Antipsychotic drugs
- ix) Antiparkinsonian drugs
- x) Opioid analgesics and Antagonists
- xi) Non-Steroidal analgesics, anti-inflammatory and anti-pyretic agents, drugs used in gout
- xii) Drugs of abuse
- xiii) Local anaesthetics
- xiv) Nootropic agents

2. Drugs Acting on Gastrointestinal System

- i) Drugs used in Constipation & Diarrhoea
- ii) Drugs used in Peptic ulcer
- iii) Emetics and antiemetics
- iv) Prokinetic agents

3. Drugs Acting on Cardiovascular System

- i) Drugs used in Congestive Heart Failure
- ii) Antiarrhythmic drugs
- iii) Antihypertensive drugs

iv) Vasodilators and Drugs used in Angina

v) Hypolipidemic drugs

vi) Nitric oxide

4. Drugs Acting on the Blood and Blood Forming Agents

i) Coagulants & Anticoagulants

ii) Haematinics (iron, vitamin B₁₂ and Folic acid)

iii) Fibrinolytic agents

iv) Antiplatelet drugs

v) Plasma expanders

5. Diuretics

6. Drugs Acting on Respiratory System

i) Drugs used in cough

ii) Drugs used in Bronchial Asthma

Practical 4 hrs/week

1. Identification of unknown drugs using rat ileum (agonist/antagonist)

2. Stages of chloroform and ether anaesthesia

3. Study of phenobarbitone induced hypnosis

4. Determination of analgesic activity (morphine/aspirin)

5. Study of anticonvulsant activity using electroshock and chemical convulsants

6. Seminars on the drugs studied in theory

Books Recommended:

Theory

1. Goodman Gilman's The Pharmacological Basis of Therapeutics (Joel G. Hardman & Lee E. Limbard, eds).

2. Rang & Dale's Pharmacology, H.P Rang and M.M. Dale, eds, Churchill Livingstone.

3. Basic and clinical pharmacology by B.G. Katzung, McGraw Hill.

4. Essentials of Medical Pharmacology by K.D. Tripathy, Jaypee.
5. D.R. Laurence & P.N. Bennet, Clinical Pharmacology, Saunders.
6. Pharmacology & Pharmacotherapeutics by R.S. Satoskar, S.D. Bhandarkar & N.N. Rege, Popular Prakashan.
7. Essentials of Pharmacotherapeutics by F.S.K. Barar, S. Chand & Company.

Practical

1. Handbook of Experimental Pharmacology by S.K. Kulkarni, Vallabh Prakashan.
2. Experimental Pharmacology by K.K. Pillai, CBS, Publishers, Delhi.
3. Fundamentals of Experimental Pharmacology by M.N. Ghosh, Hilton & Company.
4. Screening methods in Pharmacology by Robert A Turner, Elsevier.
5. Selected topics in Experimental Pharmacology by U.K. Seth, N.K. Dadkar, Usha G. Kamat, Kothari Book Depot.
6. Drug screening methods by S.K. Gupta, Jaypee.

Semester-VI
Paper BPH- 606

BIOCHEMISTRY-II (THEORY)
Total Teaching Hours: 25

1. **Metabolism of Proteins**
 - i) Amino acid degradation and urea cycle.
 - ii) Metabolism of tyrosine and Tryptophan.
2. **Protein Synthesis**
 - i).Transmission and expression of genetic information.
 - ii) DNA genetic role.
 - iii) DNA Structure and replication.
 - iv) RNA and transcription.
 - v) Protein synthesis
 - vi) Gene-protein relationship.
 - vii) Control of Protein Synthesis.
3. **Metabolism of Nucleic Acids**

Metabolism of purines and pyrimidines.
4. **Metabolism of Inorganic Elements**

Calcium, Phosphorous, Magnesium, Trace elements.
5. **Basic Principles of Molecular Biology**

Gene cloning: Restriction endonuclease, Restriction sites, Cloning vectors, Antibiotic marker gene, Application of DNA recombinant technology, DNA library.

PRACTICAL
Total Hours: 50

1. Estimation of protein in Serum.
2. Determination of Creatinine in blood.
3. Estimation of Uric acid in Serum.
4. Determination of acid and alkaline phosphate.
5. Determination of blood Cholesterol.
6. Estimation of RNA and DNA.
7. Electrophoretic separation of Serum proteins.

Books Recommended:

Theory

1. Lubert Stryer: Biochemistry.
2. Abraham Mazur and Benjamin Harrow: Textbook of Biochemistry.
3. Albert L. Lehninger: Principles of Biochemistry.
4. R. W. McGilvery and Gerald Goldstein: Biochemistry - A functional approach.
5. H.G. Bray and Sybil P. James: Biochemistry for Medical Students.
6. John W. Suttie: Introduction to Biochemistry.
7. W. Martin, Peter A. Maye, Victor, W. Rodwell: Harper's Review of Biochemistry.
8. Karlson P: Introduction to Modern Biochemistry.

Practical

1. Varun K. Malhotra: Practical Biochemistry for Students.
2. Harold Varley: Practical Clinical Biochemistry.
3. David T. Plummer: An Introduction to Practical Biochemistry.

SYLLABUS
BACHELOR IN PHARMACY
(Semester -VII)
Effective from 2010-2011

**PHARMACEUTICS- IX
PHARMACEUTICAL MANAGEMENT**

Teaching Hours:3+(1 P) h /Week

1. Personnel Management and Industrial Relations

Objectives and functions of personnel department including Managerial and operative functions. Functional areas of Personnel management. Industrial relations: problems of labor management relations, causes of industrial disputes, remedies, industrial dispute act, trade union grievance and grievance handling procedure, causes of grievances, need for grievance procedure, grievance redressal machinery.

2. Motivation

Objectives, rules of motivation, motivation steps. Types of motivation, Financial and non-financial motivators. Theories of motivation: McGregor's Theory X and Y, Herzberg's time factor theory, McClelland's need for achievement theory, Vroom's expectancy theory, Behavioral theory, Employee- Centered approach, Maslow's need Hierarchy theory.

3. Communication

Importance, nature of communication, types of communication- oral vs. written, media of communication. Barriers to communication. Communication failure. Achieving effective communication.

4. Materials management

Materials handling, equipment, inventory management, economic ordering quantity, ABC analysis, value analysis, classification and codification of stores, obsolete, surplus and scrap management, lead time, inventory carrying costs, safety stock, solutions to problems relating to EOQ.

5. Purchasing and Store Keeping

Objectives, organisation and responsibilities of purchasing department, methods and types of purchasing- centralised and decentralised purchasing. Types of stores, depot, location and layout of a store, problems and development.

6. Drug Supply

Planning and management, supply process and its pitfalls, planning for drug supply, planning models, steps to develop a formulary, predicting drug requirements, procurement cycle and its methods, designing training programs to improve pharmaceutical logistics.

7. Pharmaceutical Marketing

Goals, theories of selling process, company market systems, market and sale forecasting, market test method, statistical demand analysis, types of sales organizations, salesmanship, qualification of a salesman, channels of distribution, advertising, presentation and analysis of statistical data. (charts, frequency distribution).

8. Establishment of a pharmaceutical factory

Choice of site, trends in location of a plant, plant facilities, layout of stores in an industry, layout of injectable unit or sterile area, tableting department and area requirement for each department.

9. Production and Maintenance Management

A brief exposure of various functions and objectives of production management, various activities of production management, production organization, productivity and wastivity. Objectives of maintenance management, probability distributions, reliability engineering, preventive maintenance and its benefits.

10. Pharmaceutical Management Project work (Credit-1):

Project work dealing with various theoretical aspects which has been taught in Pharmaceutical Management to stimulate critical thinking on topic assigned.

Books Recommended

1. Principles of Marketing, by Philips Kottler.
2. Personnel management and Industrial Relations, by R.S. Davar.
3. Personnel management, by Mamoria.
4. Materials management, by Gopalkrisnan, and R.K. Rajput.
5. Purchasing and Store Keeping, by D.R. Gupta, R.K. Rajput.
6. Managing Drug Supply: management sciences for health, by Borbon.
7. Pharmaceutical Marketing by Smith.
8. Establishment of a pharmaceutical factory, by S.P. Aganil.
9. Quantitative techniques for managerial decision making, by U.K. Srivastava and S.C. Sharma.
10. Marketing Management by Philips Kottler, Tenth Edition, Printice Hall of India Pvt. Ltd.
11. Marketing Strategy: A Global Perspective by Vernon R. Stauble The Dryden Press.
12. D.A. Whetton and K.S. Cameron, Developing Management Skills, New York :Harper Collins, 1995, 72-73.
13. Peter F. Drucker, Management: Tasks, Responsibilities, Practices, New York: Harper and Row, 1974, 523.
14. Stanley C. Hollander, The Wheel of Retailing, J. of Marketing, July 1960, pp37-42.
15. Amber G. Rao and Peter B. Miller, Advertising/ Sales Response functions, J. of Advertising Research, April 1975, pp7-15.
16. Pharmaceutical Management by Alka Ahuja, Sanjula Baboota, Javed Ali and R.K. Khar

PHARMACEUTICS -X
PHARMACEUTICAL TECHNOLOGY- (THEORY)
Teaching Hours: 4 h / Week

1. Mixing

Fluid mixing, mechanism and type of flow, equipments. Solid mixing, mixing mechanism. Equipment

2. Capsules

Hard gelatin capsules: Formulation of shell and contents, capsule production, filling operation and equipments employed.

Soft gelatin capsules: Manufacture, processing and quality control.

3. Microencapsulation

Importance and application, different techniques, equipments employed.

4. Tablets

Production of tablets, additives and components, preparation of components for compression, forms of compressed tablets, evaluation.

Tablet coating- Sugar coating, film coating, air suspension coating, film defects.

5. Measurement of tablet punch forces

Transmission of forces through a powder, Distribution of forces within the powder mass, effect of pressure on the relative volume, adhesion and cohesion of particles strength of granules and tablets. Factors affecting the Strength of tablets.

6. Pharmaceutical Aerosols

Components, formulation, types of systems, manufacturing, operation of an aerosol package, quality control and testing, oral, inhalation, nasal and topical aerosols. Future developments.

7. Controlled drug delivery system

Introduction, terminology, drug targeting, design and fabrication of oral controlled release drug delivery system. Introduction to implantable and transdermal therapeutic system.

8. Packaging technology

Types of containers, materials used, closures, unit dose packaging, strip packaging materials, packaging of solid, parenterals, and ophthalmic dosage forms, stability aspects of packaging.

9. Good Manufacturing Practices for pharmaceuticals

Status and applicability of regulation, current good manufacturing practices in manufacturing, processing, packaging and holding of drugs, production and process controls, ISO 9000 certification.

PRACTICALS
Teaching Hours: 4 h / Week

1. Preparation of tablets by the following techniques:
 - a. Wet granulation (Aqueous).
 - b. Wet granulation (non-aqueous).
 - c. Dry granulation (Slugging).
 - d. Direct compression.
2. Coating of tablets - sugar coating and film coating.
3. Strip packing of tablets.
4. Quality control of tablets.
5. Filling and sealing of hard capsules.
6. Quality control of capsules.
7. Preparation of sustained release dosage forms employing various techniques.
8. Preparation of an aerosol dosage form and its evaluation.
9. Preparation and evaluation of microcapsules by employing various techniques.
10. To compare dissolution profile of conventional and controlled release dosage form of drugs.
11. Study of solid-solid mixing by double cone blender and evaluation of the quality of mixing.
12. Any other experiments illustrative of theory of syllabus.

Books Recommended

1. Lachman, L., Liberman, H. A. and Kanig, J. L., Theory and practices of Industrial Pharmacy, 3rd Edition, 1986.
2. Aulton, M. E., Pharmaceutics: The science of dosage form design, ELBS publisher, 1988.
3. Robinson and Lee, Controlled drug delivery: Fundamentals and applications, 2nd Edition, Marcel Dekker, Inc., 1987.
4. Banker, G.S. and Rhodes, C.T., Modern Pharmaceutics, 2nd Edition, Marcel Dekker, 1990.
5. Remington's Pharmaceutical Sciences, 18th Edition, Mack Publishing Company, 1990.
6. Cooper and Gum's Tutorial Pharmacy, 6th Edition, CBS Publishers and Distributors, 1999.
7. Jain, N. K., Advances in controlled and novel drug delivery system, 1st Edition, CBS Publishers and Distributors, 2001.
8. Kydonieus, A., Treatise on controlled drug delivery, Marcel Dekker, Inc., 1991.
9. Liberman, H. A., Lachman, L. and Schwartz, J. B., Pharmaceutical dosage forms: Tablets, Vol. 1, 2 and 3, 2nd Edition Marcel Dekker, 1989.

10. Krowczynski, I., Extended release dosage forms, CRC press, Inc., Boca Raton, 1987.
11. Brody, A. L. and Marsh, K. S., Encyclopedia of packaging technology, 2nd Edition, John Wiley and Sons Inc., 1997.
12. Sharma, P.P., How to practice GMPs, 2nd Edition, Vandana Publications, 1995.
13. Swarbrick, J. and Boylan, J. C., Encyclopedia of pharmaceutical Technology, Vol 2, 4, 6, 7, 14 Marcel Dekker, 1988.
14. "Controlled drug delivery" (available at NC State University's web sites <http://www5.bae.ncsu.edu>)
15. Braek, S. D., Controlled drug delivery, Vol. I&II.
16. Brahmankar, D. M. Jaiswal, S. B., Biopharmaceutics and Pharmacokinetics- A Treatise
17. Encyclopedia of Controlled Drug delivery (Vol I and Vol II)
18. Vyas, S. P. and Khar, R. K. Controlled drug delivery: Concepts and Advances, Vallabh Prakashan, 2002.

Paper BPH-703

**PHARMACEUTICAL CHEMISTRY -VIII
(MEDICINAL CHEMISTRY II)- THEORY**

Teaching Hours: 4 h / week

1. Steroids

Nomenclature, stereochemistry, classification and isolation methods of Steroids, Chemistry of cholesterol, diosgenin, ergosterol, β -sitosterol and steroidal alkaloids, Biosynthesis of Diosgenin.

2. Hormones**Sex Hormones and Analogues:**

- i. **Androgens & Anabolic Agents:** Testosterone, Stanozolol
- ii. **Estrogens and Progestational Agents:** Estradiol, Progesterone, Diethylstilbestrol
- iii. **Oral Contraceptives :-** Norethynodrel, Norgestrel
- iv. **Corticoids: Adrenocorticoids And Glucocorticoids:** Cortisone acetate, Prednisolone, Betamethasone, Triamcinolone, Aldosterone

3. Prostaglandins

4. The following topics shall cover under nomenclature, classification, synthetic procedures of the compounds, structure activity relationship (SAR), mode of action and therapeutic uses:

(a). DRUGS AFFECTING BLOOD AND THE CARDIOVASCULAR SYSTEM:

- i. **Antihyperlipidemics :** Lovastatin, Fluvastatin, Bezafibrate, fenofibrate.
- ii. **Cardiac glycosides**
- iii. **Antihypertensive agents:** Methyldopa, Clonidine, Guanethidine, Verapamil, Captopril, Enalapril, Propranolol, Atenolol, Phenoxybenzamine, Phentolamine, Nifedipine, Losartan, Diltiazem.
- iv. **Vasodilators :-** Hydralazine, Minoxidil, Diazoxide
- v. **Antiarrhythmics :-** Disopyramide, Amiodarone.

(b) ANTI-INFECTIVE AND ANTI-INVASIVE AGENTS:

- i. **Anti-amoebics :** Metronidazole, Tinidazole, and Diloxinide Furoate.
- ii. **Anthelmintic:** Mebendazole, Thiabendazole, Pyrantel, Levamisol and Niclosamide.
- iii. **Anti-trypanosomal:** Nifurtimox.
- iv. **Anti-malarials:** Chloroquine, Primaquine, Proguanil, and Amodiaquine.
- v. **Antibacterial Quinolones:** Ciprofloxacin, Ofloxacin.

- vi. Anti-tubercular: Isoniazid, Pyrazinamide, Ethambutol, and
* Paraaminosalicylic Acid.
- vii. Anti-fungals: Fluconazole, Tolnaftate, Ketoconazole and Clotrimazole.
- viii. Antiviral: Idoxuridine, Acyclovir, Zidovudine and Ganciclovir.
- ix. Anti-neoplastic: Thiotepe, Carmustine, Chlorambucil, Cyclophosphamide,
and Mechlorethamine.
- x. Sulphonamides: Sulphaacetamide, Sulphanilamide, Sulphadiazine,
Sulphisoxazole, Trimethoprim and Sulphamethoxazole.
- xi. Antibiotics : Ampicillin, Cefadroxil, Chloramphenicol, Doxycyclin

PRACTICAL

Teaching Hours: 4 h / week

Two or three step synthesis of some compounds of medicinal interest.

Books Recommended.

1. M.E. Wolff, Burger's Medicinal Chemistry, John Wiley and Sons, New York.
2. R.F. Doerge, Wilson & Gisvold's Text Book of Organic Medicinal and
Pharmaceutical Chemistry, J. Lippincott Co., Philadelphia.
3. W.O. Foye, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
4. S.N. Pandeya, A Textbook of medicinal chemistry, Vol.-II, S.G. Publishers, Varanasi.
5. A. Kar, Medicinal Chemistry, Wiley Eastern, Limited Publishers, New Delhi.
6. D. Lednicher and L.A. Mitschlar, 'Re Organic Chemistry of Drug Synthesis, Vol. II, &
III, John Wiley and Sons, New York.
7. Vogel's Text Book of Practical Organic Chemistry, ELBS & Longman, London, and
New York.
8. F.G. Meinn and H.C. Saunders, Practical Organic Chemistry, ELBS & Longman,
London and New York.

**PHARMACOGNOSY VI
INDUSTRIAL PHARMACOGNOSY I (THEORY)**

Total Teaching: 2 Hours/week

1. Extraction and Isolation Techniques

General methods used for the extraction, isolation and identification of alkaloids, lipids, glycosides, flavonoids, saponins, volatile oils and resins. Application of column, paper and thin layer chromatographic techniques for the isolation of phytopharmaceuticals.

2. Phytopharmaceuticals

Isolation, identification and estimation of:

Caffeine, eugenol, digoxin, piperine, tannic acid, diosgenin, hesperidine, berberine, calcium sennosides, rutin, glycyrrhizin, menthol, ephedrine, quinine, andrographolides and guggul lipids.

3. Quality control and Standardization of herbal drugs

Quality control of herbal drugs as per WHO, AYUSH and Pharmacopoeial guidelines- Extractive values, ash values, chromatographic techniques (TLC, HPTLC and HPLC) for determination of chromatographic markers. Determination of heavy metals, insecticides, pesticides and microbial load in herbal preparations.

4. Herbal formulations

Principles involved in Ayurveda, Sidha, Unani, Chinese and Homeopathic systems of medicines. Preparation of Ayurvedic formulations like Aristas, Asava, Ghutika, Taila, Churna, Avaleha, Ghrita and Bhasms; Unani formulations like Majooms, Safoofs. Determination of alcohol contents in Aristas and bhasams.

5. Worldwide trade of crude drugs and volatile oils

Study of drugs having high commercial value and their regulations pertaining to trade.

PRACTICALS

4 Hours/week

1. Extraction and TLC profile of volatile oils: Eucalyptus, Clove, Cumin and Lemon grass.
2. Extraction, Isolation and TLC profile of alkaloids: Rauwolfia, Cinchona, Tea and Datura
3. Extraction and isolation of Lipids, Resins, Tannic acids, Sennosides and Quinine.
4. Determination of Moisture content, Ash value, Swelling factor, Extractive values and foreign organic matter in herbal drugs.

Books Recommended

1. M. Heinrich, *Fundamentals of Pharmacognosy and phytotherapy*, Churchill Livingstone
2. Anusuya, Ramachandran, Bindu, *Textbook of Industrial Pharmacognosy*.
3. Suroj Joshi and Vidhu Aeri, *Practical Pharmacognosy*.
4. Kokate CK, *Practical Pharmacognosy*, Nirali Prakashan Publication, Pune.
5. Pullok K. Mukherjee, *Quality Control Herbal drugs*, Business Horizon Publication, New Delhi.
6. Mohammad Ali, *Textbook of Pharmacognosy*, Vol 1 and 2, CBS publications, Delhi.
7. Kalra AN, *Textbook of Industrial Pharmacognosy*, CBS publications, Delhi.
8. Jackson and Snowdon, *Atlas of Microscopy of Medicinal Plants, Culinary herbs and spices*, CBS publications, Delhi.
9. Stahl E, *Thin Layer Chromatography* Springer, Verlag, Berlin.
10. Handa S.S, *Extraction Technology*.

PHARMACOLOGY-III(THEORY)

Total Hours: 24h/week

1. **Pharmacology of Hormones and Hormone Antagonists**
 - i) Hypothalamic and Anterior Pituitary Hormones
 - ii) Posterior Pituitary Hormones: Oxytocin, Oxytocics, Tocolytics, Vasopressin and Vasoactive peptides
 - iii) Thyroid and Antithyroid drugs
 - iv) Parathyroid hormone, Vitamin D, Calcitonin & drugs affecting calcium balance
 - v) Insulin, Oral hypoglycemic (Insulin secretagogues), Antihyperglycemic agents
 - vi) Adrenocortical steroids and their analogues, synthesis inhibitors, antagonists
 - vii) Estrogens, Progestins, Contraceptives, Drugs used in infertility
 - viii) Androgens, Antiandrogens & Drug treatment of Erectile dysfunction.
2. **Evaluation of New Drugs**
 - i) Drug discovery
 - ii) Preclinical evaluation of drugs (Pharmacodynamic studies, Toxicological studies, Pharmacokinetic studies, Assessment of safety index)
 - iii) Clinical trials: Ethics of research, Phases of clinical trials
 - iv) Orphan drugs
3. **Miscellaneous Drugs**
 - i) Immunomodulators, Immunotherapy and Gene therapy
 - ii) Antiseptics, Disinfectants and Ectoparasiticides
 - iii) Vitamins
 - iv) Vaccines and Sera

PRACTICAL

Total Hours: 4 h/week

1. Bioassay of acetylcholine by various methods (Comparative and Graphical)
2. Seminars on the drugs studied in theory.

Books Recommended:

Theory

1. Goodman Gilman's The Pharmacological Basis of Therapeutics (Joel G. Hardman & Lee E. Limbird, eds).
2. Rang & Dale's Pharmacology, H.P. Rang and M.M. Dale, eds, Churchill Livingstone.
3. Basic and clinical Pharmacology by B.G. Katzung, McGraw Hill.
4. Essentials of Medical Pharmacology by K. D. Tripathy, Jaypee.
5. D.R. Laurence & P.N. Bennett, Clinical Pharmacology, Saunders.
6. Pharmacology & Pharmacotherapeutics by R. S. Satoskar, S. D. Bhandarkar & N.N. Rege, Popular Prakashan.
7. Essentials of Pharmacotherapeutics by F.S.K. Barar, S.Chand & Company.

Practical

1. Handbook of experimental Pharmacology by S.K.Kulkarni, Vallabh Prakashan.
2. Experimental Pharmacology by K. K. Pillai, CBS, Publishers, Delhi.
3. Fundamentals of Experimental Pharmacology by M.N. Ghosh, Hilton & Company.
4. Screening methods in Pharmacology by Robert A. Turner, Elsevier.
5. Selected topics in Experimental Pharmacology by U. K. Sheth, N. K. Dadkar, Usha G.Kamat, Kothari Book Depot.
6. Drug screening methods by S.K. Gupta, Jaypee.

BU-07

Semester-VII

Unani Pharmacy Theory

(Teaching Hours: 2 h/week)

1. A detailed discussion of factors affecting the quality of raw herbal (Unani) drugs.
2. Safety parameters required in the preparation and preservation of Unani compound drugs.
3. Study of different biologically active compounds responsible for the activity of the plant.
4. Extraction and estimation of: (a) Alkaloids, (b) Essential oils by different methods.

PRACTICAL

Teaching Hours: 2 h/week

1. Extraction of plants.
2. Essential oils (Volatile oils) extraction.
3. Sample collection of some important Unani herbs.

SYLLABUS
BACHELOR IN PHARMACY
(Semester -VIII)
Effective from 2010-2011

PHARMACEUTICAL BIOTECHNOLOGY (Theory)

Teaching Hours: 3 hr per week

1. Genetic Engineering

- i) Brief introduction to biotechnology with reference to pharmaceutical sciences
- ii) Basic Techniques of genetic engineering: flow of genetic information and basic methodology of genetic engineering
- iii) Recombinant DNA Technology: Introduction to rDNA technology and genetic engineering, steps involved in rDNA technology, techniques used in rDNA technology.
- iv) Application of genetic engineering in medicine: Production of biotechnology derived therapeutic proteins like human insulin, humatrop (Somatropin rDNA Origin), interferon and recombinax HB (hepatitis b). Protein engineering.

2. Plant Cell Culture:

- i) Introduction to plant biotechnology
- ii) Cell Suspension Cultures: initiation, characteristics, batch cultures and continuous cultures
- ii) Production of secondary metabolites: Strategies for enhancement of secondary metabolites: culture parameters, elicitors, biotransformation of precursors, production of phytochemicals using bioreactors.
- iii) Protoplast isolation, fusion and its applications
- iv) Gene Transfer in medicinal plants: transgenic plants, genetic transformation: indirect and direct gene transfer and recent developments in the use of transgenic plants

3. Animal cell culture and Immunotechnology:

- i) Introduction to animal biotechnology
- ii) Basic techniques of animal cell culture: culture media, methods of culture initiation, cell lines maintenance, scale-up of animal cells, application of animal cell culture in pharmaceutical sciences
- iii) Immunotechnology: blood and related products, immunological defensive response, immunoglobulins, vaccines, hybridoma technology, development and production of monoclonal antibodies, therapeutic and diagnostics application of monoclonal antibodies.

4. Enzyme Biotechnology:

- i) Enzyme immobilization: properties of enzymes and carrier;
 - ii) methods of immobilization: carrier binding, cross linking and entrapping,) advantages
 - iv) reactors for immobilized enzymes
 - iii) applications of enzyme immobilization
- microbial production of different enzyme like amylase, protease, lipase & asparaginase. Techniques of immobilization of enzymes, factors affecting enzyme kinetics, advantages of immobilization over isolated enzymes, production of 6-aminopenicillanic acid by immobilized enzyme system

5. Microbial biotechnology

Fermentation technology: Isolation, Selection, Screening of Industrial important microbes, Strain improvement, bioreactor designing, fermentation medium, types of fermentations, optimization of fermentation process, principle and procedure involving in downstream process. Specific Fermentations: Selection of organism, fermentation & purification of penicillin, streptomycin, tetracycline, cephalosporin, vitamin B₁₂, glutamic acid, lysine, citric acid, lactic acid and alcohol. Microbial Transformations: Types, Methods of bioconversions & Application in Pharma Industry, Steroidal transformation.

Books recommended

- 1) W. Crueger & A. Crueger, Industrial microbiology, Panima publication, New Delhi.
- 2) P. F. Stanbury & A. Whitaker, Principles of fermentation technology, Pergamon Press
- 3) K. Sambamurthy & A. Kar, Text Book of Pharmaceutical Biotechnology, New Age publication, New Delhi
- 4) G. Reed, Prescott & Dunn, Industrial Microbiology, MC Caraw Hill BooK Company
- 5) B.D. Singh, Biotechnology, Kalyani publishers, Noida (U.P)
- 6) D.P. Katare, A. Ahmad & V. Aeri, Pharmaceutical biotechnology basics & fundamental, Capital publishers, New Delhi
- 7) Purohit, Kulkarni & Saluj, Pharmaceutical biotechnology, Agrobios publication, New Delhi.

Practicals

Teaching hrs : 3hr per week

- 1] Primary screening for amylase producing bacterial strain
- 2] Production of amylase by submerged fermentation by shake flask method
- 3] Immobilization of amylase enzyme by entrapment method
- 4] Effect of temperature and pH on amylase activity
- 5] Working of a submerged fermentor
- 6] Biotransformation of tannin to gallic acid by Solid state fermentation
- 7] Production and downstream of single cell protein
- 8] Production and downstream of probiotic

PHARMACEUTICS-XI
BIOPHARMACEUTICS AND PHARMACOKINETICS (THEORY)
 Teaching Hours: 4 h / Week

A. Biopharmaceutics

1. Introduction to biopharmaceutics, definition, historical development of the subject, fundamental principles, concepts and its role in formulation development and clinical setting.

2. Drug Absorption

Various mechanisms, factors affecting drug absorption-physicochemical, physiological and pharmaceutical.

3. Drug disposition

Distribution in blood, plasma -protein binding, application of drug-protein binding.

4. Determination of bioavailability and bioequivalence:

Measures of bioequivalence study and single dose bioequivalence study and relevant statistics, review of regulatory requirements for conducting bioequivalence study.

B. Pharmacokinetics

5. Introduction to pharmacokinetics, importance in bioavailability and clinical practice. Concepts, definition and explanation of terminologies used.

6. Compartment models - concepts and their importance in the study of pharmacokinetics.

7. One compartment open model. Determination of pharmacokinetic parameters from plasma and urine data after i.v. injection and oral administration. Percent absorbed time plot and absorption rates based on one compartment model.

8. Two compartment open model, pharmacokinetics of single and multiple dose administration as applied to intravenous (rapid) and oral administration, intravenous transformation. Dosage adjustment in patients with and without renal failure.

9. Clearance concept, mechanism of renal clearance, clearance ratio, determination of renal clearance.

10. Extraction ratio, hepatic clearance, biliary excretion, ^{extra} hepatic circulation.

11. Non-Linear Pharmacokinetics with special reference to one compartment model after i.v. drug administration. Michaelis Menton equation. Detection of non-linearity (saturation mechanism).

12. Invitro-Invivo evaluation.**PRACTICALS**

Teaching Hours: 4 h / Week

1. Establishment of standard curve of a drug substance.
2. Disintegration and Dissolution of peroral tablets.
3. Influence of vehicle on drug availability from topical dosage forms in-vitro.
4. Release of drug from suppository base.
5. Evaluation of antacid products, by acid neutralizing capacity and Rosset-Rice test methods.

6. Comparative in-vitro release rate studies of marketed formulations.
7. Determination of bioavailability of marketed formulations by plasma concentration method.
8. Determination of bioavailability of marketed formulations by urinary excretion method.
9. Drug release from capsules, effect of diluents etc.
10. Effect of protein binding by egg albumin; dialysis method.
11. Determination of pharmacokinetic parameters, determination and evaluation of bioavailability of drug administered by IV, IM and P.O.
12. Practice numericals based on the portions covered under theory syllabus.

Books Recommended

1. J.G. Wagner: Text Book of Biopharmaceutics and Pharmacokinetics.
2. Shargel and Yu: Text Book of Biopharmaceutics and Pharmacokinetics (Prentice Hall).
3. Controlled drug bioavailability published by Wiley interscience.
4. Blanchard and Brodie: Principles and Perspective in drug bioavailability.
5. R.E. Notari: Biopharmaceutics and Pharmacokinetics.
6. Remington's Pharmaceutical Sciences.
7. Rowland and Tozer: Textbook of clinical Pharmacokinetics
8. J. Swarbrick: Current concepts in Pharmaceutical sciences and Biopharmaceutics
9. Javed Ali, Roop K. Khar and Alka Ahuja, TextBook of Biopharmaceutics and Pharmacokinetics, Birla Publication, 2001.
10. H.F. Lodish, and J.E. Rothman: The assembly of cell membranes Sci. Am. 240:48-63, 1979.
11. R.I. Oberle, G.L. Amidon: J. Pharmacok. and Biopharm., 15: 529-544, (1987).
12. A.Rubinstein, V.H.K. Li and J. R. Robinson: In Oral sustained release formulations, Design and Evaluation, NewYork, Pergman, 1988 chap 6.
13. A. Tsuji, Tamai: J Pharm. Res. Carrier mediated intestinal transport of drugs 13(7) 963-977 (1966).
14. J.P. Skelly, W.H. Barr: In Robinson, J.R. Lee, V.H.L. (eds) Controlled Drug Delivery. Fundamentals and applications 2nd eds. NewYork Macel Dekker, 1987.
15. P.G. Welling: Pharmacokinetic considerations of controlled release drug products. Drug Dev. Ind. Pharm. 9, 1185-1225 (1983).
16. S. Gardner: Bioequivalence requirements and in-vivo bioavailability procedures Fed. Reg. 42:1651(1977).
17. Biopharmaceutics And Pharmacokinetics (Theoretical Concepts and illustrative Practical Exercises) by Dr. Javed Ali, Dr Alka Ahuja, Dr Sanjula Baboota and Dr. Roop K. Khar.

Paper BPH-803

**PHARMACEUTICAL CHEMISTRY-IX
(PHARMACEUTICAL ANALYSIS - III) - THEORY**

Teaching Hours: 4 h / week

1. Advanced chromatographic techniques

Theory of ion exchange, type of exchangers, ion-exchange equilibria, ion-exchange separation, applications in pharmaceutical analysis. High performance liquid chromatography, HPTLC and instrumentation with reference to quantitative estimation of drugs and biopharmaceutical agents, Gas chromatography & Gas-TLC chromatography.

2. Visible and ultraviolet absorption spectrophotometry

Principles of visual and UV absorption spectrophotometry, qualitative and quantitative analysis. Instrumentation.

3. Nuclear Magnetic Resonance

An introduction to the theory of NMR, chemical shifts, spin-spin coupling, NMR instrumentation, structure elucidation of simple organic compounds and qualitative analysis of drugs.

4. Infrared spectrophotometry

Origin of infrared spectra and regions, qualitative and quantitative analysis, instruments and applications.

5. Mass spectrometry

Basic principles, instrumentation, the mass spectra, types of ion, determination of molecular formula, molecular weight, fragmentation, mass spectra of some simple molecules.

6. Atomic absorption spectroscopy

Theory of absorption of radiant energy by atoms, equipment, and analytical applications.

7. Flame photometry

Theory of emission spectra, equipment, and qualitative and quantitative applications with reference to flame photometry.

8. Polarography

Introduction, theoretical consideration, organic polarography, dropping mercury electrode, basic principles of polarographic instruments, methods of analysis, experiments including amperometric titrations.

9. Different methods of analysis of following drugs related to functional group with particular reference to instrumental methods:

- i. Antibiotics: Nalidixic acid, ciprofloxacin, tetracycline, and chloramphenicol.
- ii. Vitamins: Ascorbic acid, thiamine, vitamin A
- iii. Barbiturates: Phenobarbitone.
- iv. Sulphonamides: Sulfanilamide, Sulphadiazine, and dapsone.
- v. Steroids: Dexamethasone, prednisolone.

PRACTICAL
Teaching Hours: 4 h / week

1. Experiments based on thin-layer and paper chromatography
2. Analysis of drugs by instrumental methods as included in Indian Pharmacopoeia.

Books Recommended:

1. L.G.Chatter, A Text Book of Pharmaceutical Chemistry, Vol. I and II, Marcel Dekker, New York.
2. A.H. Beckett and J.B. Sterlake, Practical Pharmaceutical Chemistry, Vol I and II, Ale Athlone press of the University of London.
3. H.H.Willard, L.L.Merritt and J.A. Dean, Instrumental Methods of Analysis, Van Nostrand Reinhold, New York.
4. J.Basset, R.C. Denney, G.H. Jeffery and S. Medthan; Vogel's Textbook of Quantitative Inorganic Analysis including elementary instrumental analysis, The ELBS, and Longman.
5. K.A. Connors, A Text Book of Pharmaceutical Analysis Wiley-Interscience, New York.
6. Jenkins et. al. Quantitative pharmaceutical chemistry.
7. D.C. Garrat, Re Quantitative analysis of Drugs, Chapman & Hall, London.
8. R.M. Sliverstein, G.C. Bassier and J.C. Morrill, Spectroscopic identification of organic compounds- John Wiley & Sons, New York.
9. John R. Dyer- Application of absorption spectroscopy of organic compounds.

1. Plant Biotechnology

History and scope of plant tissue culture, growth media, plant growth regulators; callus and suspension culture, Biotransformation, immobilization, hairy root culture. Transgenic plants and their applications, plant tissue culture as source of secondary metabolites, applications of plant biotechnology.

2. Herbal cosmetics

Importance of herbals as Shampoos (soapnut), Conditioners and hair darkeners, (Amla, Henna, Hibiscus, Tea), Skin care (Aloe, Turmeric, Lemon peel, Vetiver).

3. Traditional herbal drugs

Common names, sources, morphology, active constituents and uses (traditional, folklore, pharmacological and clinical uses of: Punarnava (*Boerhavia diffusa*), Shankhpushpi (*Convolvulus microphylla*), Lehsun (*Allium sativum*), Guggul (*Commiphora mukul*), Kalmegh (*Andrographis peniculata*), Tulsi (*Ocimum sanctum*), Valerian (*Valerian officinalis*), Artemisia (*Artemisia annua*), Chirata (*Swertia chirata*), Asoka (*Saraca indica*), Saffron (*Crocus sativa*), Shilajit, Brahmi (*Bacopa monnieri*) and *Centella asiatica*), Salai (*Boswellia serrata*), Giloe (*Tinospora cordifolia*), *Gymnema sylvestre*, *Ruta graveolens*).

4. Plants based industries and research institutes in India

Knowledge about the herbal products being manufactured by premier herbal industries and thrust area of the institutes involved in plant research.

5. Patents: Indian and International patent laws, proposed amendments as applicable to herbal/natural products and processes; intellectual Property Rights with special reference to phytoconstituents.

PRACTICALS**4 Hours/week**

1. Estimation of ascorbic acid and anthraquinone glycosides by UV spectroscopy.
2. Estimation of total phenolics, flavonoids and tannins.
3. Development and evaluation of herbal cosmetic formulations.
4. Morphological and powder study (single and mixture) of selected traditional drugs.

Books Recommended

1. Trease and Evans, Text book of Pharmacognosy.
2. M. Heinrich, Fundamentals of Pharmacognosy and phytotherapy, Churchill, Livingstone.
3. Indian Pharmacopoeia, Ayurvedic Pharmacopoeia, Indian Herbal Pharmacopoeia
4. Mohammad Ali, Text book of Pharmacognosy, Vol 1 & 2, CBS, New Delhi.
5. J.B. Harborne: Phytochemical Methods, Chapman and Halls, London.
6. The Wealth of India, Raw materials and Industrial Product, Vol: 1-10, NISCAIR, New Delhi.
7. Veeriddi, Medicinal plant biotechnology.
8. Rajesh Nema, Kamal Singh Rathore, Bal Krishna, Text book of Cosmetics, CBS Publishers, Delhi.

Semester-VIII
Paper BPH- 805

PHARMACOLOGY-IV (THEORY)
(Total Hours: 2 hrs/week)

1. Chemotherapy of Microbial diseases

Antimicrobial agents (AMAs): Introduction, Classification, Site and Mechanism of Action of AMAs, Problems arising with use of AMAs.

- i. Sulfonamides
- ii. Quinolones and treatment of Urinary tract infection
- iii. Penicillins, Cephalosporins and other β lactam antibiotics
- iv. Aminoglycosides
- v. Macrolides, Ketolides, Lincosamides, Oxazolidinones & other antibacterial drugs
- vi. Broad spectrum antibiotics, Tetracyclines and Chloramphenicol
- vii. Chemotherapy of Tuberculosis & Leprosy
- viii. Antifungal drugs
- ix. Antiviral drugs
- x. HIV and Antiretroviral drugs
- xi. Anthelmintics
- xii. Antimalarial drugs
- xiii. Antiamoebic & other antiprotozoal drugs

2. Chemotherapy of Neoplastic Diseases

Anticancer drugs, resistance to cytotoxic drugs

3. Bioassays

- i) Definition, Importance, Principles, Advantages and Disadvantages, methods for bioassay of agonist and bioassay of antagonists
- ii) Bioassay of some important drugs:
Insulin, Glucagon, Heparin, Oxytocin, Vasopressin, ACTH, Gonadotrophin, d- Tubocurarine, Digitalis

PRACTICAL
(Total Hours: 4 hrs/week)

1. Bioassay of acetylcholine by various methods (Three point and Four Point)
2. Seminars on the drugs studied in theory.

Books Recommended:

Theory

1. Goodman Gilman's The Pharmacological Basis of Therapeutics (Joel G. Hardman & Lee E. Limbird, eds.)
2. Rang & Dale's Pharmacology, H.P. Rang and M.M. Dale, eds, Churchill Livingstone.
3. Basic and clinical Pharmacology by B.G. Katzung, McGraw Hill.
4. Essentials of Medical Pharmacology by K. D. Tripathy, Jaypee.
5. D.R. Laurence & P.N. Bennett, Clinical Pharmacology, Saunders.
6. Pharmacology & Pharmacotherapeutics by R. S. Satoskar, S. D. Bhandarkar & N.N. Rege, Popular Prakashan.
7. Essentials of Pharmacotherapeutics by F.S.K. Barar, S.Chand & Company.