

**YEAR - V**

MRCGP

**Fifth Year:**

| S.No. | Name of Subject   | No. of hours of Theory | No. of hours of Hospital posting* | No. of hours of Seminar |
|-------|---|------------------------|-----------------------------------|-------------------------|
| (1)   | (2)   | (3)                    | (4)                               | (5)                     |
| 5.1   | Clinical Research   | 3                      | -                                 | 1                       |
| 5.2   | Pharmacoepidemiology and Pharmacoeconomics                      | 3                      | -                                 | 1                       |
| 5.3   | Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring | 2                      | -                                 | 1                       |
| 5.4   | Clerkship *   | -                      | -                                 | 1                       |
| 5.5   | Project work (Six Months)                                       | -                      | 20                                | -                       |
|       | <b>Total hours</b>  | <b>8</b>               | <b>20</b>                         | <b>4 = 32</b>           |

\* Attending ward rounds on daily basis.

**Fifth Year examination :**

| S.No. | Name of Subject   | Maximum marks for Theory |           |       | Maximum marks for Practicals |           |           |
|-------|---|--------------------------|-----------|-------|------------------------------|-----------|-----------|
|       |   | Examination              | Sessional | Total | Examination                  | Sessional | Total     |
| 5.1   | Clinical Research   | 70                       | 30        | 100   | -                            | -         | -         |
| 5.2   | Pharmacoepidemiology and Pharmacoeconomics                      | 70                       | 30        | 100   | -                            | -         | -         |
| 5.3   | Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring | 70                       | 30        | 100   | -                            | -         | -         |
| 5.4   | Clerkship *   | -                        | -         | -     | 70                           | 30        | 100       |
| 5.5   | Project work (Six Months)                                       | -                        | -         | -     | 100**                        | -         | 100       |
|       |   |                          |           | 300   |                              |           | 200 = 500 |

\* Attending ward rounds on daily basis.

\*\* 30 marks – viva-voce (oral)

70 marks – Thesis work

1. Eligibility for appearing Examination.— Only such students who produce certificate from the Head of the Institution in which he or she has undergone the Pharm.D. or as the case may be, the Pharm.D. (Post Bacculaureate) course, in proof of his or her having regularly and satisfactorily undergone the course of study by attending not less than 80% of the classes held both in theory and in practical separately in each subject shall be eligible for appearing at examination.
2. Mode of examinations.— (1) Theory examination shall be of three hours and practical examination shall be of four hours duration.
  - (2) A Student who fails in theory or practical examination of a subject shall re-appear both in theory and practical of the same subject.
  - (3) Practical examination shall also consist of a viva –voce (Oral) examination.
  - (4) Clerkship examination – Oral examination shall be conducted after the completion of clerkship of students. An external and an internal examiner will evaluate the student. Students may be asked to present the allotted medical cases followed by discussion. Students' capabilities in delivering clinical pharmacy services, pharmaceutical care planning and knowledge of therapeutics shall be assessed.
3. Award of sessional marks and maintenance of records.— (1) A regular record of both theory and practical class work and examinations conducted in an institution imparting training for Pharm.D. or as the case may be, Pharm.D. (Post Bacculaureate) course, shall be maintained for each student in the institution and 30 marks for each theory and 30 marks for each practical subject shall be allotted as sessional.
  - (2) There shall be at least two periodic sessional examinations during each academic year and the highest aggregate of any two performances shall form the basis of calculating sessional marks.
  - (3) The sessional marks in practicals shall be allotted on the following basis:-
    - (i) Actual performance in the sessional examination (20 marks);
    - (ii) Day to day assessment in the practical class work, promptness, viva-voce record maintenance, etc. (10 marks).

4. Minimum marks for passing examination.— A student shall not be declared to have passed examination unless he or she secures at least 50% marks in each of the subjects separately in the theory examinations, including sessional marks and at least 50% marks in each of the practical examinations including sessional marks. The students securing 60% marks or above in aggregate in all subjects in a single attempt at the Pharm.D. or as the case may be, Pharm. D. (Post Baccalaureate) course examination shall be declared to have passed in first class. Students securing 75% marks or above in any subject or subjects shall be declared to have passed with distinction in the subject or those subjects provided he or she passes in all the subjects in a single attempt.
5. Eligibility for promotion to next year.— All students who have appeared for all the subjects and passed the first year annual examination are eligible for promotion to the second year and, so on. However, failure in more than two subjects shall debar him or her from promotion to the next year classes.
6. Internship.— (1) Internship is a phase of training wherein a student is expected to conduct actual practice of pharmacy and health care and acquires skills under the supervision so that he or she may become capable of functioning independently.  
(2) Every student has to undergo one year internship as per Appendix-C to these regulations.
7. Approval of examinations.— Examinations mentioned in regulations 10 to 12 and 14 shall be held by the examining authority hereinafter referred to as the university, which shall be approved by the Pharmacy Council of India under sub-section (2) of section 12 of the Pharmacy Act, 1948. Such approval shall be granted only if the examining authority concerned fulfills the conditions as specified in Appendix-D to these regulations.
8. Certificate of passing examination.— Every student who has passed the examinations for the Pharm.D. (Doctor of Pharmacy) or Pharm.D. (Post Baccalaureate) (Doctor of Pharmacy) as the case may be, shall be granted a certificate by the examining authority.

### **CHAPTER-III**

#### **Practical training**

9. Hospital posting.— Every student shall be posted in constituent hospital for a period of not less than fifty hours to be covered in not less than 200 working days in each of second, third & fourth year course. Each student shall submit report duly certified by the preceptor and duly attested by the Head of the Department or Institution as prescribed. In the fifth year, every student shall spend half a day in the morning hours attending ward rounds on daily basis as a part of clerkship. Theory teaching may be scheduled in the afternoon.
10. Project work.— (1) To allow the student to develop data collection and reporting skills in the area of community, hospital and clinical pharmacy, a project work shall be carried out under the supervision of a teacher. The project topic must be approved by the Head of the Department or Head of the Institution. The same shall be announced to students within one month of commencement of the fifth year classes. Project work shall be presented in a written report and as a seminar at the end of the year. External and the internal examiners shall do the assessment of the project work.
- (2) Project work shall comprise of objectives of the work, methodology, results, discussions and conclusions.
11. Objectives of project work.— The main objectives of the project work is to—
- (i) show the evidence of having made accurate description of published work of others and of having recorded the findings in an impartial manner; and
  - (ii) develop the students in data collection, analysis and reporting and interpretation skills.
12. Methodology.— To complete the project work following methodology shall be adopted, namely:—
- (i) students shall work in groups of not less than *two* and not more than *four* under an authorised teacher;
  - (ii) project topic shall be approved by the Head of the Department or Head of the Institution;
  - (iii) project work chosen shall be related to the pharmacy practice in community, hospital and clinical setup. It shall be patient and treatment (Medicine) oriented, like drug utilisation reviews, pharmacoepidemiology, pharmacovigilance or pharmacoconomics;
  - (iv) project work shall be approved by the institutional ethics committee;
  - (v) student shall present at least three seminars, one in the beginning, one at middle and one at the end of the project work; and
  - (vi) two-page write-up of the project indicating title, objectives, methodology anticipated benefits and references shall be submitted to the Head of the Department or Head of the Institution.

13. Reporting .— (1) Student working on the project shall submit jointly to the Head of the Department or Head of the Institution a project report of about 40-50 pages. Project report should include a certificate issued by the authorised teacher, Head of the Department as well as by the Head of the Institution
- (2) Project report shall be computer typed in double space using Times Roman font on A4 paper. The title shall be in bold with font size 18, sub-titles in bold with font size 14 and the text with font size 12. The cover page of the project report shall contain details about the name of the student and the name of the authorised teacher with font size 14.
- (3) Submission of the project report shall be done at least one month prior to the commencement of annual or supplementary examination.

14. Evaluation.— The following methodology shall be adopted for evaluating the project work—

- (i) Project work shall be evaluated by internal and external examiners.
- (ii) Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of four students).
- (iii) Three seminars presented by students shall be evaluated for twenty marks each and the average of best two shall be forwarded to the university with marks of other subjects.

|   |              |
|---|--------------|
| (iv) Evaluation shall be done on the following items: | <b>Marks</b> |
| a) Write up of the seminar                            | (7.5)        |
| b) Presentation of work                               | (7.5)        |
| c) Communication skills                               | (7.5)        |
| d) Question and answer skills                         | (7.5)        |

**Total** (30 marks)

(v) Final evaluation of project work shall be done on the following items: **Marks**

|                               |        |
|-------------------------------|--------|
| a) Write up of the seminar    | (17.5) |
| b) Presentation of work       | (17.5) |
| c) Communication skills       | (17.5) |
| d) Question and answer skills | (17.5) |

**Total** (70 marks)

*Explanation.*— For the purposes of differentiation in the evaluation in case of topic being the same for the group of students, the same shall be done based on item numbers b, c and d mentioned above.

## Fifth year

### 5.1 CLINICAL RESEARCH (THEORY)

**Theory : 3 Hrs. /Week**

#### **1. Drug development process:**

Introduction

Various Approaches to drug discovery

1. Pharmacological
2. Toxicological
3. IND Application
4. Drug characterization
5. Dosage form

#### **2. Clinical development of drug:**

1. Introduction to Clinical trials
2. Various phases of clinical trial.
3. Methods of post marketing surveillance
4. Abbreviated New Drug Application submission.
5. Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines
6. Challenges in the implementation of guidelines
7. Ethical guidelines in Clinical Research
8. Composition, responsibilities, procedures of IRB / IEC
9. Overview of regulatory environment in USA, Europe and India.
10. Role and responsibilities of clinical trial personnel as per ICH GCP
  - a. Sponsor
  - b. Investigators
  - c. Clinical research associate
  - d. Auditors
  - e. Contract research coordinators
  - f. Regulatory authority
11. Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)
12. Informed consent Process
13. Data management and its components
14. Safety monitoring in clinical trials.

**References :**

- a. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
- b. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.
- c. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
- d. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
- e. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
- f. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
- g. Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.



## 5.2 PHARMACOEPIDEMIOLOGY AND PHARMACOECONOMICS (THEORY)

**Theory : 3 Hrs. /Week**

### 1. **Pharmacoepidemiology :**

#### **Definition and scope:**

Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications.

#### **Measurement of outcomes in pharmacoepidemiology**

Outcome measure and drug use measures

Prevalence, incidence and incidence rate. Monetary units, number of prescriptions, units of drugs dispensed, defined daily doses and prescribed daily doses, medication adherence measurement

#### **Concept of risk in pharmacoepidemiology**

Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio

#### **Pharmacoepidemiological methods**

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods

Drug utilization review, case reports, case series, surveys of drug use, cross – sectional studies, cohort studies, case control studies, case –cohort studies, meta – analysis studies, spontaneous reporting, prescription event monitoring and record linkage system.

#### **Sources of data for pharmacoepidemiological studies**

Ad Hoc data sources and automated data systems.

#### **Selected special applications of pharmacoepidemiology**

Studies of vaccine safety, hospital pharmacoepidemiology, pharmacoepidemiology and risk management, drug induced birth defects.

### 2. **Pharmacoeconomics:**

#### **Definition, history, needs of pharmacoeconomic evaluations**

Role in formulary management decisions

#### **Pharmacoeconomic evaluation**

Outcome assessment and types of evaluation

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods:

Cost – minimization, cost-benefit, cost – effectiveness, cost utility

### 3. **Applications of Pharmacoeconomics**

Software and case studies

### 5.3 CLINICAL PHARMACOKINETICS AND PHARMACOTHERAPEUTIC DRUG MONITORING (THEORY)

Theory : 2 Hrs. /Week

1. **Introduction to Clinical pharmacokinetics.**
2. **Design of dosage regimens:**  
Nomograms and Tabulations in designing dosage regimen, Conversion from intravenous to oral dosing, Determination of dose and dosing intervals, Drug dosing in the elderly and pediatrics and obese patients.
3. **Pharmacokinetics of Drug Interaction:**
  - a. Pharmacokinetic drug interactions
  - b. Inhibition and Induction of Drug metabolism
  - c. Inhibition of Biliary Excretion.
4. **Therapeutic Drug monitoring:**
  - a. Introduction
  - b. Individualization of drug dosage regimen (Variability – Genetic, Age and Weight, disease, Interacting drugs).
  - c. Indications for TDM. Protocol for TDM.
  - d. Pharmacokinetic/Pharmacodynamic Correlation in drug therapy.
  - e. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations.
5. **Dosage adjustment in Renal and hepatic Disease.**
  - a. Renal impairment
  - b. Pharmacokinetic considerations
  - c. General approach for dosage adjustment in Renal disease.
  - d. Measurement of Glomerular Filtration rate and creatinine clearance.
  - e. Dosage adjustment for uremic patients.
  - f. Extracorporeal removal of drugs.
  - g. Effect of Hepatic disease on pharmacokinetics.
6. **Population Pharmacokinetics.**
  - a. Introduction to Bayesian Theory.
  - b. Adaptive method or Dosing with feed back.
  - c. Analysis of Population pharmacokinetic Data.
7. **Pharmacogenetics**
  - a. Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes.
  - b. Genetic Polymorphism in Drug Transport and Drug Targets.
  - c. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations

## APPENDIX-B

(See regulation 9)

### CONDITIONS TO BE FULFILLED BY THE ACADEMIC TRAINING INSTITUTION

- 1) Any authority or institution in India applying to the Pharmacy Council of India for approval of courses of study for Pharm.D. and Pharm.D. (Post Baccalaureate) under sub-section (1) of section 12 of the Pharmacy Act, 1948 shall comply with the infrastructural facilities as prescribed by the Pharmacy Council of India from time to time.
- 2) Pharm.D. and Pharm.D. (Post Baccalaureate) programmes shall be conducted only in those institutions which -
  - a) are approved by the Pharmacy Council of India for B.Pharm course as provided under section 12 of the Pharmacy Act, 1948;
  - b) have 300 bedded hospital attached to it.

#### (i) Hospital Details

1. Institution with their own hospital of minimum 300 beds.
2. Teaching hospital recognised by the Medical Council of India or University, or a Government hospital not below the level of district headquarter hospital with 300 beds with clearly defined Memorandum of Understanding including housing pharmacy practice department with minimum carpet area of 30 square feet per student along with consent to provide the professional manpower to support the programme.
3. Corporate type hospital with minimum 300 beds with clearly defined Memorandum of Understanding including housing pharmacy practice department with minimum carpet area of 30 square feet per student along with consent to provide the professional manpower to support the programme.
4. Number of institutions which can be attached to one hospital shall be restricted by the student pharmacist to bed ratio of 1:10.

#### (ii) Speciality

- a) Tertiary care hospitals are desirable
- b) Medicine[compulsory], and any three specialization of the following
  1. Surgery
  2. Pediatrics
  3. Gynecology and obstetrics
  4. Psychiatry
  5. Skin and VD
  6. Orthopedics

#### (iii) Location of the Hospital

Within the same limits of Corporation or Municipality or Campus with Medical Faculty involvement as adjunct faculty.

### 3) TEACHING STAFF REQUIREMENT

- i) Staff Pattern : All faculty shall be full time. However part time perceptors in hospital shall be allowed.
- ii) Subject wise specialisation of the Teaching Staff :

| S.No. | Subject  | Specialisation required  |
|-------|--|--|
| 1.    | Pharmacy Practice                                    | M.Pharm in Pharmacy Practice or Pharmacology or Pharmaceutics.                                   |
| 2.    | Human Anatomy & Physiology                           | M.Pharm in Pharmacology or Pharmacy practice   |
| 3.    | Pharmaceutics (Dispensing & General Pharmacy)        | M.Pharm in Pharmaceutics   |
| 4.    | Pharmacognosy-I                                      | M.Pharm in Pharmacognosy   |
| 5.    | Pharmaceutical Organic Chemistry-I                   | M.Pharm in Pharmaceutical chemistry or Pharmaceutical Analysis or Quality assurance or Bulk Drug |
| 6.    | Pharmaceutical Inorganic Chemistry                   | M.Pharm in Pharmaceutical chemistry or Pharmaceutical Analysis or Quality assurance or Bulk Drug |
| 7.    | Pharmaceutical microbiology                          | M.Pharm in Pharmaceutics or Pharmaceutical Biotechnology   |
| 8.    | Pathophysiology                                      | M.Pharm Pharmacy practice or Pharmacology  |
| 9.    | Applied Biochemistry & Clinical Chemistry            | M.Pharm in Pharmacology or Pharmacy practice or Pharmaceutical chemistry                         |
| 10.   | Pharmacology-I                                       | M.Pharm in Pharmacology or Pharmacy practice   |
| 11.   | Pharmaceutical Jurisprudence                         | M.Pharm in Pharmaceutics   |
| 12.   | Pharmacology-II                                      | M.Pharm in Pharmacology or Pharmacy practice   |
| 13.   | Pharmaceutical Dosage Forms                          | M.Pharm in Pharmaceutics or Industrial Pharmacy  |
| 14.   | Pharmacotherapeutics –I, II and III                  | M.Pharm Pharmacy practice or Pharmacology  |
| 15.   | Community Pharmacy                                   | M.Pharm in Pharmacy practice or Pharmacology or Pharmaceutics                                    |
| 16.   | Hospital Pharmacy                                    | M.Pharm in Pharmacy practice or Pharmacology or Pharmaceutics                                    |
| 17.   | Clinical Pharmacy                                    | M.Pharm in Pharmacy practice   |
| 18.   | Computer Science or Computer Application in pharmacy | MCA  |
| 19.   | Mathematics  | M.Sc. (Maths)  |

iii) Teaching Staff :

| <b>Department/Division</b>  | <b>Name of the post</b> | <b>No.</b> |
|---|-------------------------|------------|
| Department of Pharmaceutics   | Professor               | 1          |
|   | Asst. Professor         | 1          |
|   | Lecturer                | 2          |
| Department of Pharmaceutical Chemistry<br>(Including Pharmaceutical Analysis) | Professor               | 1          |
|   | Asst. Professor         | 1          |
|   | Lecturer                | 3          |
| Department of Pharmacology  | Professor               | 1          |
|   | Asst. Professor         | 1          |
|   | Lecturer                | 2          |
| Department of Pharmacognosy   | Professor               | 1          |
|   | Asst. Professor         | 1          |
|   | Lecturer                | 1          |
| Department of Pharmacy Practice   | Professor               | 1          |
|   | Asst. Professor         | 2          |
|   | Lecturer                | 3          |

iv) Prescribed qualifications and experience for Professor, Assistant Professor, Lecturer and others :

| <b>Sl. No.</b> | <b>CADRE</b>        | <b>QUALIFICATIONS</b>  | <b>EXPERIENCE</b>  |
|----------------|---------------------|--|--|
| 1.             | Lecturer            | i) Basic degree in pharmacy (B.Pharm).<br>ii) Registration as a pharmacist under the Pharmacy Act.<br>iii) First Class Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm) | No minimum requirement.  |
| 2.             | Assistant Professor | i) Basic degree in pharmacy (B.Pharm).<br>ii) Registration as a pharmacist under the Pharmacy Act.<br>iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm)             | Three years experience in Teaching or Research at the level of Lecturer or equivalent. |

|    |  |   |   |
|----|--|---|---|
|    |  | iv) Ph.D. degree (with First Class degree either at Bachelor's or Master's level) in the appropriate branch of specialization in Pharmacy.  |   |
| 3. | Professor                                  | <ul style="list-style-type: none"> <li>i) Basic degree in pharmacy (B.Pharm).</li> <li>ii) Registration as a pharmacist under the Pharmacy Act.</li> <li>iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm).</li> <li>iv) Ph.D. degree (with first Class either at Bachelor's or Master's level) in appropriate branch of specialization in Pharmacy.</li> </ul>          | <ul style="list-style-type: none"> <li>i) Ten years experience in Teaching or Research.</li> <li>ii) Out of which five years must be as Assistant Professor.</li> </ul>   |
| 4. | Director or Principal or Head of institute | <ul style="list-style-type: none"> <li>i) Basic degree in pharmacy (B.Pharm).</li> <li>ii) Registration as a pharmacist under the Pharmacy Act.</li> <li>iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm)</li> <li>iv) Ph.D. degree (with first Class degree either at Bachelor's or Master's level in the appropriate branch of specialization in Pharmacy.</li> </ul> | <ul style="list-style-type: none"> <li>i) Fifteen years experience in Teaching or Research.</li> <li>ii) Out of which five years must be as Professor or above in Pharmacy.</li> </ul> <p>Desirable :<br/>Administrative experience in responsible position.</p> <p>The maximum age for holding the post shall be 65 years.</p> |

**Note :** If a class or division is not awarded at Master's level, a minimum of 60% marks in aggregate or equivalent cumulative grade point average shall be considered equivalent to first class or division, as the case may be.

v) Workload of Faculty :

Professor – 8 hrs. per week

Assistant Professor – 12 hrs. per week

Lecturers – 16 hrs. per week

vi) Training of Pharmacy Practice Faculty :

a) Teaching staff will be trained as per the module prescribed by the Central Council.

b) Duration of training – Minimum 3 months.

c) Training sites – Institutions running pharmacy practice or Programmes for atleast five years.

d) Trainer – Professor or Assistant Professor with minimum of five years of clinical pharmacy teaching and practice experience.

4) NON-TEACHING STAFF :

| Sl.No. | Designation                                   | Required (Minimum)       | Required Qualification  |
|--------|---|--------------------------|---|
| 1      | Laboratory Technician                         | 1 for each Dept          | D. Pharm  |
| 2      | Laboratory Assistants or Laboratory Attenders | 1 for each Lab (minimum) | SSLC  |
| 3      | Office Superintendent                         | 1                        | Degree  |
| 4      | Accountant                                    | 1                        | Degree  |
| 5      | Store keeper                                  | 1                        | D.Pharm or a Bachelor degree recognized by a University or institution. |
| 6      | Computer Data Operator                        | 1                        | BCA or Graduate with Computer Course                                    |
| 7      | Office Staff I                                | 1                        | Degree  |
| 8      | Office Staff II                               | 2                        | Degree  |
| 9      | Peon  | 2                        | SSLC  |
| 10     | Cleaning personnel                            | Adequate                 | ---   |
| 11     | Gardener                                      | Adequate                 | ---   |

## 5) ACCOMMODATION :

Suitable and sufficient accommodation with adequate ventilation, lighting and other hygienic conditions should be provided to the rooms for Principal or the Head of the department, office, class rooms, library, staff, staff common room, students common room, museum, laboratories, stores, etc.

At least two lecture halls alongwith eight laboratories as specified below should be provided for: —

|   |      |
|---|------|
| 1. Pharmaceutics and Pharmacokinetics Lab                   | - 2  |
| 2. Life Science (Pharmacology, Physiology, Pathophysiology) | - 2  |
| 3. Phytochemistry or Pharmaceutical Chemistry               | - 2  |
| 4. Pharmacy Practice  | - 2  |
|   | ---- |
| Total =   | 8    |
|   | ---- |

In addition to the laboratories, balance room, aseptic room or cabinet, animal house and a machine room shall also be provided.

Floor area of the laboratory should not be less than 30 square feet per student required to work in the laboratory at any given time subject to a minimum of 750 square feet.

Laboratories should be fitted and constructed in a manner that these can be kept reasonably clean. Gas and water fittings, shelves, fuming cupboards be provided wherever necessary.

## 6. EQUIPMENT AND APPARATUS :

### Department wise list of minimum equipments

#### A. DEPARTMENT OF PHARMACOLOGY :

##### I. Equipment:

| S.No. | Name                                    | Minimum required Nos.  |
|-------|---|--|
| 1     | Microscopes                             | 15   |
| 2     | Haemocytometer with Micropipettes       | 20   |
| 3     | Sahli's haemocytometer                  | 20   |
| 4     | Hutchinson's spirometer                 | 01   |
| 5     | Spygmomanometer                         | 05   |
| 6     | Stethoscope                             | 05   |
| 7     | Permanent Slides for various tissues    | One pair of each tissue<br>Organs and endocrine glands<br>One slide of each organ system |
| 8     | Models for various organs               | One model of each organ system   |
| 9     | Specimen for various organs and systems | One model for each organ system  |
| 10    | Skeleton and bones                      | One set of skeleton and one spare bone   |



|    |  |                        |
|----|--|------------------------|
| 11 | Different Contraceptive Devices and Models                 | One set of each device |
| 12 | Muscle electrodes  | 01                     |
| 13 | Lucas moist chamber  | 01                     |
| 14 | Myographic lever   | 01                     |
| 15 | Stimulator   | 01                     |
| 16 | Centrifuge   | 01                     |
| 17 | Digital Balance  | 01                     |
| 18 | Physical /Chemical Balance                                 | 01                     |
| 19 | Sherrington's Kymograph Machine or Polyrite                | 10                     |
| 20 | Sherrington Drum   | 10                     |
| 21 | Perspex bath assembly (single unit)                        | 10                     |
| 22 | Aerators   | 10                     |
| 23 | Computer with LCD  | 01                     |
| 24 | Software packages for experiment                           | 01                     |
| 25 | Standard graphs of various drugs                           | Adequate number        |
| 26 | Actophotometer   | 01                     |
| 27 | Rotarod  | 01                     |
| 28 | Pole climbing apparatus                                    | 01                     |
| 29 | Analgesiometer (Eddy's hot plate and radiant heat methods) | 01                     |
| 30 | Convulsiometer   | 01                     |
| 31 | Plethysmograph   | 01                     |
| 32 | Digital pH meter   | 01                     |

## II. Apparatus:

| S.No | Name  | Minimum required Nos. |
|------|---|-----------------------|
| 1    | Folin-Wu tubes                                    | 60                    |
| 2    | Dissection Tray and Boards                        | 10                    |
| 3    | Haemostatic artery forceps                        | 10                    |
| 4    | Hypodermic syringes and needles of size 15,24,26G | 10                    |
| 5    | Livers, cannulae                                  | 20                    |

**NOTE: Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.**

## B. DEPARTMENT OF PHARMACOGNOSY :

### I. Equipment:

| S.No. | Name                             | Minimum required Nos. |
|-------|----------------------------------|-----------------------|
| 1     | Microscope with stage micrometer | 15                    |
| 2     | Digital Balance                  | 02                    |
| 3     | Autoclave                        | 02                    |

|    |  |    |
|----|--|----|
| 4  | Hot air oven                               | 02 |
| 5  | B.O.D.incubator                            | 01 |
| 6  | Refrigerator                               | 01 |
| 7  | Laminar air flow                           | 01 |
| 8  | Colony counter                             | 02 |
| 9  | Zone reader                                | 01 |
| 10 | Digital pH meter                           | 01 |
| 11 | Sterility testing unit                     | 01 |
| 12 | Camera Lucida                              | 15 |
| 13 | Eye piece micrometer                       | 15 |
| 14 | Incinerator                                | 01 |
| 15 | Moisture balance                           | 01 |
| 16 | Heating mantle                             | 15 |
| 17 | Flourimeter                                | 01 |
| 18 | Vacuum pump                                | 02 |
| 19 | Micropipettes (Single and multi channeled) | 02 |
| 20 | Micro Centrifuge                           | 01 |
| 21 | Projection Microscope                      | 01 |

## II. Apparatus:

| S.No. | Name                        | Minimum required Nos. |
|-------|-----------------------------|-----------------------|
| 1     | Reflux flask with condenser | 20                    |
| 2     | Water bath                  | 20                    |
| 3     | Clavengers apparatus        | 10                    |
| 4     | Soxhlet apparatus           | 10                    |
| 6     | TLC chamber and sprayer     | 10                    |
| 7     | Distillation unit           | 01                    |

**NOTE: Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.**

## C. DEPARTMENT OF PHARMACEUTICAL CHEMISTRY :

### I. Equipment:

| S.No. | Name                                  | Minimum required Nos. |
|-------|---------------------------------------|-----------------------|
| 1     | Hot plates                            | 05                    |
| 2     | Oven                                  | 03                    |
| 3     | Refrigerator                          | 01                    |
| 4     | Analytical Balances for demonstration | 05                    |
| 5     | Digital balance 10mg sensitivity      | 10                    |
| 6     | Digital Balance (1mg sensitivity)     | 01                    |
| 7     | Suction pumps                         | 06                    |
| 8     | Muffle Furnace                        | 01                    |

|    |                                   |    |
|----|-----------------------------------|----|
| 9  | Mechanical Stirrers               | 10 |
| 10 | Magnetic Stirrers with Thermostat | 10 |
| 11 | Vacuum Pump                       | 01 |
| 12 | Digital pH meter                  | 01 |
| 13 | Microwave Oven                    | 02 |

## II. Apparatus:

| S.No. | Name  | Minimum required Nos. |
|-------|---|-----------------------|
| 1     | Distillation Unit                               | 02                    |
| 2     | Reflux flask and condenser single necked        | 20                    |
| 3     | Reflux flask and condenser double/triple necked | 20                    |
| 4     | Burettes  | 40                    |
| 5     | Arsenic Limit Test Apparatus                    | 20                    |
| 6     | Nessler's Cylinders                             | 40                    |

**NOTE: Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.**

## D. DEPARTMENT OF PHARMACEUTICS :

### I. Equipment:

| S.No | Name   | Minimum required Nos. |
|------|--|-----------------------|
| 1    | Mechanical stirrers                                      | 10                    |
| 2    | Homogenizer  | 05                    |
| 3    | Digital balance  | 05                    |
| 4    | Microscopes  | 05                    |
| 5    | Stage and eye piece micrometers                          | 05                    |
| 6    | Brookfield's viscometer                                  | 01                    |
| 7    | Tray dryer   | 01                    |
| 8    | Ball mill  | 01                    |
| 9    | Sieve shaker with sieve set                              | 01                    |
| 10   | Double cone blender                                      | 01                    |
| 11   | Propeller type mechanical agitator                       | 05                    |
| 12   | Autoclave  | 01                    |
| 13   | Steam distillation still                                 | 01                    |
| 14   | Vacuum Pump  | 01                    |
| 15   | Standard sieves, sieve no. 8, 10, 12, 22, 24, 44, 66, 80 | 10 sets               |
| 16   | Tablet punching machine                                  | 01                    |
| 17   | Capsule filling machine                                  | 01                    |
| 18   | Ampoule washing machine                                  | 01                    |
| 19   | Ampoule filling and sealing machine                      | 01                    |

|    |   |               |
|----|---|---------------|
| 20 | Tablet disintegration test apparatus IP                         | 01            |
| 21 | Tablet dissolution test apparatus IP                            | 01            |
| 22 | Monsanto's hardness tester                                      | 01            |
| 23 | Pfizer type hardness tester                                     | 01            |
| 24 | Friability test apparatus                                       | 01            |
| 25 | Clarity test apparatus  | 01            |
| 26 | Ointment filling machine  | 01            |
| 27 | Collapsible tube crimping machine                               | 01            |
| 28 | Tablet coating pan  | 01            |
| 29 | Magnetic stirrer, 500ml and 1 liter capacity with speed control | 05 EACH<br>10 |
| 30 | Digital pH meter  | 01            |
| 31 | All purpose equipment with all accessories                      | 01            |
| 32 | Aseptic Cabinet   | 01            |
| 33 | BOD Incubator   | 02            |
| 34 | Bottle washing Machine  | 01            |
| 35 | Bottle Sealing Machine  | 01            |
| 36 | Bulk Density Apparatus  | 02            |
| 37 | Conical Percolator (glass/copper/stainless steel)               | 10            |
| 38 | Capsule Counter   | 02            |
| 39 | Energy meter  | 02            |
| 40 | Hot Plate   | 02            |
| 41 | Humidity Control Oven   | 01            |
| 42 | Liquid Filling Machine  | 01            |
| 43 | Mechanical stirrer with speed regulator                         | 02            |
| 44 | Precision Melting point Apparatus                               | 01            |
| 45 | Distillation Unit   | 01            |

## II. Apparatus:

| S.No | Name                                   | Minimum required Nos. |
|------|--|-----------------------|
| 1    | Ostwald's viscometer                   | 15                    |
| 2    | Stalagmometer                          | 15                    |
| 3    | Desiccator*                            | 05                    |
| 4    | Suppository moulds                     | 20                    |
| 5    | Buchner Funnels (Small, medium, large) | 05 each               |
| 6    | Filtration assembly                    | 01                    |
| 7    | Permeability Cups                      | 05                    |
| 8    | Andreason's Pipette                    | 03                    |
| 9    | Lipstick moulds                        | 10                    |

**NOTE: Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.**

**E. DEPARTMENT OF PHARMACEUTICAL BIOTECHNOLOGY :**

| S.No. | Name   | Minimum required Nos. |
|-------|--|-----------------------|
| 1     | Orbital shaker incubator                         | 01                    |
| 2     | Lyophilizer (Desirable)                          | 01                    |
| 3     | Gel Electrophoresis<br>(Vertical and Horizontal) | 01                    |
| 4     | Phase contrast/Trinocular Microscope             | 01                    |
| 5     | Refrigerated Centrifuge                          | 01                    |
| 6     | Fermenters of different capacity<br>(Desirable)  | 01                    |
| 7     | Tissue culture station                           | 01                    |
| 8     | Laminar airflow unit                             | 01                    |
| 9     | Diagnostic kits to identify infectious<br>agents | 01                    |
| 10    | Rheometer  | 01                    |
| 11    | Viscometer                                       | 01                    |
| 12    | Micropipettes (single and multi<br>channeled)    | 01 each               |
| 13    | Sonicator  | 01                    |
| 14    | Respinometer                                     | 01                    |
| 15    | BOD Incubator                                    | 01                    |
| 16    | Paper Electrophoresis Unit                       | 01                    |
| 17    | Micro Centrifuge                                 | 01                    |
| 18    | Incubator water bath                             | 01                    |
| 19    | Autoclave  | 01                    |
| 20    | Refrigerator                                     | 01                    |
| 21    | Filtration Assembly                              | 01                    |
| 22    | Digital pH meter                                 | 01                    |

**NOTE: Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.**

**F. DEPARTMENT OF PHARMACY PRACTICE :****Equipment:**

| S.No. | Name  | Minimum required Nos. |
|-------|---|-----------------------|
| 1     | Colorimeter   | 2                     |
| 2     | Microscope  | Adequate              |
| 3     | Permanent slides (skin, kidney,<br>pancreas, smooth muscle, liver etc.,)                                      | Adequate              |
| 4     | Watch glass   | Adequate              |
| 5     | Centrifuge  | 1                     |
| 6     | Biochemical reagents for analysis of<br>normal and pathological constituents in<br>urine and blood facilities | Adequate              |
| 7     | Filtration equipment  | 2                     |
| 8     | Filling Machine   | 1                     |
| 9     | Sealing Machine   | 1                     |

|    |  |          |
|----|--|----------|
| 10 | Autoclave sterilizer   | 1        |
| 11 | Membrane filter  | 1 Unit   |
| 12 | Sintered glass funnel with complete filtering assemble       | Adequate |
| 13 | Small disposable membrane filter for IV admixture filtration | Adequate |
| 14 | Laminar air flow bench                                       | 1        |
| 15 | Vacuum pump  | 1        |
| 16 | Oven   | 1        |
| 17 | Surgical dressing  | Adequate |
| 18 | Incubator  | 1        |
| 19 | PH meter   | 1        |
| 20 | Disintegration test apparatus                                | 1        |
| 21 | Hardness tester  | 1        |
| 22 | Centrifuge   | 1        |
| 23 | Magnetic stirrer   | 1        |
| 24 | Thermostatic bath  | 1        |

**NOTE:**

- 1. Computers and Internet connection (Broadband), six computers for students with internet and staff computers as required.**
- 2. Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and the department.**

**G. CENTRAL INSTRUMENTATION ROOM :**

| <b>S.No.</b> | <b>Name</b>  | <b>Minimum required Nos.</b> |
|--------------|--|------------------------------|
| 1            | Colorimeter  | 01                           |
| 2            | Digital pH meter   | 01                           |
| 3            | UV- Visible Spectrophotometer                                | 01                           |
| 4            | Flourimeter  | 01                           |
| 5            | Digital Balance (1mg sensitivity)                            | 01                           |
| 6            | Nephelo Turbidity meter                                      | 01                           |
| 7            | Flame Photometer   | 01                           |
| 8            | Potentiometer  | 01                           |
| 9            | Conductivity meter   | 01                           |
| 10           | Fourier Transform Infra Red Spectrometer (Desirable)         | 01                           |
| 11           | HPLC   | 01                           |
| 12           | HPTLC (Desirable)  | 01                           |
| 13           | Atomic Absorption and Emission spectrophotometer (Desirable) | 01                           |
| 14           | Biochemistry Analyzer (Desirable)                            | 01                           |

|    |   |    |
|----|---|----|
| 15 | Carbon, Hydrogen, Nitrogen Analyzer (Desirable) | 01 |
| 16 | Deep Freezer (Desirable)                        | 01 |
| 17 | Ion- Exchanger                                  | 01 |
| 18 | Lyophilizer (Desirable)                         | 01 |

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