Regulations relating to the Diploma in Pharmacy

Government Notice 378 of 1978
(OG 3715)
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The Regulations relating to the Diploma in Pharmacy were originally made in terms of section 49(1)(j) and (k) of the Pharmacy Act 53 of 1974, which was repealed by the Pharmacy Act 9 of 2004. Pursuant to section 72(2) of the Pharmacy Act 9 of 2004, the Regulations Relating to the Diploma in Pharmacy are deemed to have been made under the Pharmacy Act 9 of 2004. The Government Notice that publishes these regulations notes they have been passed on the recommendation of the South African Pharmacy Board.

ARRANGEMENT OF REGULATIONS
[The individual regulations do not have headings.]

1. The course of study leading to the Diploma in Pharmacy shall extend over four years of full-time study approved by the South African Pharmacy Board.

2. A candidate shall obtain credit for a subject by passing the examination in that subject in accordance with these regulations. A candidate shall qualify for the diploma by obtaining credit for such qualifying courses as are prescribed by these regulations.

3. No person shall be admitted as a candidate for the diploma unless -

(a) he holds the Matriculation Certificate of the Joint Matriculation Board or a certificate of full exemption from that examination issued by the said Board; and
(b) he has in the matriculation examination passed in Mathematics and one of the following subjects at standard grade - Biology, Botany, Chemistry, Physical Science, Physics, Physiology or Zoology; or

(c) he has, prior to the introduction of the standard and the higher grades in the matriculation examination, passed examinations of matriculation standard in Mathematics and in one of the following subjects - Biology, Botany, Chemistry, Physical Science, Physics, Physiology or Zoology.

4. The examinations shall be in the following sections -

First year - Pharmacy I.

Second year - Pharmacy II.

Third year - Pharmacy III.

Fourth year - Pharmacy IV.

5. (1) The subjects of examination shall be -

Pharmacy I -

(a) Botany, Chemistry I, Physics and Zoology; or

(b) Biology, Chemistry I, Mathematics and Physics.

Pharmacy II -

Chemistry II, Pharmaceutics I, Pharmacognosy and Physiology.

Pharmacy III -

Health Education (half-course), Pharmaceutical Chemistry I, Pharmaceutics II and Pharmacology I.

Pharmacy IV -

Forensic Pharmacy, Pharmaceutical Chemistry II, Pharmaceutics III, Pharmacology II and Pharmacy Administration.

(2) The scope of the examinations shall be in accordance with the syllabuses set out in the Schedule to these regulations.

6. The number of theory question papers and the duration of the theory examinations shall be as follows -

Pharmacy I -

Chemistry I - Two papers of two hours duration each.

Biology, Botany, Mathematics, Physics, Zoology - One three-hour paper for each subject.
Pharmacy II -

Chemistry II - Two papers of three hours’ duration each.

Pharmaceutics I, Pharmacognosy, Physiology - One three-hour paper for each subject.

Pharmacy III -

Health Education - One paper of two hours’ duration.

Pharmacology I - One paper of three hours’ duration.

Pharmaceutical Chemistry I, Pharmaceutics II - Two three-hour papers for each subject.

Pharmacy IV -

Forensic Pharmacy, Pharmaceutical Chemistry II, Pharmacology II, Pharmacy Administration - One three-hour paper for each subject.

Pharmaceutics III - Two three-hour papers.

7. Each theory examination shall be conducted by not fewer than two examiners appointed by the Board, one of whom shall not have taken part in the teaching of the subject under examination: Provided that in the case of Health Education and Pharmacy Administration, the Board shall appoint at each college an internal examiner who may have taken part in the teaching of these subjects and who shall set the question papers for candidates in his own college, and a moderator, who shall approve the question papers and act as an external examiner.

8. The examinations shall be held in November each year at centres determined by the Board and, in the discretion of the Board, supplementary examinations may be held in January or February each year.

9. Internal theory examinations shall be conducted at least twice in each year by internal examiners appointed by the Board at the college at which the candidate is taking his course of study.

10. (1) Practical examinations or other tests of practical ability, in subjects other than Pharmaceutics II (Practical), shall be conducted by internal examiners appointed by the Board at the college at which the candidate is taking his course of study. The Board shall appoint an external moderator for each practical subject at each institution, who shall approve the practical examination question papers or other tests of practical ability, shall inspect at least one of the practical examinations and shall examine the work done by the candidates and report thereon to the Board. The nature and number of practical examinations to be conducted during the year in each subject shall be as determined by the Board.

(2) The Pharmaceutics II (Practical) examination shall comprise the following -

(a) At least two Microbiology examinations, which shall carry 20 per cent of the total mark;

(b) at least two class tests, in general dispensing which shall carry 20 per cent of the total mark;
11. A candidate for admission to an examination shall submit an application to the Registrar on the form approved by the Board on or before 1 September or in the case of the supplementary examinations, on or before 14 January. Provided that a candidate who, for a good and sufficient reason, is not able to submit his examination entry form on 1 September shall be allowed to submit a late application if the completed examination entrance form is received by the Registrar not later than 14 September and the candidate pays an entrance fee equal to twice the amount of the fee prescribed for the examination for which he wishes to enter.

12. No candidate shall be admitted to an examination unless he has paid the prescribed examination entrance fee, which shall be submitted with the examination entrance form.

13. (1) The Board may permit a candidate to present himself for an aegrotat examination in a subject or subjects if he is prevented by illness from presenting himself for, or completing, an ordinary examination, other than a supplementary examination, in such subject or subjects. Provided that -

(a) the candidate shall within seven days of the date of the examination furnish the chief invigilator of the examination centre concerned with a medical certificate;

(b) the Board may refuse to grant an aegrotat examination, without disclosing its reasons;

(c) the Board may direct a candidate to present himself for examination at a centre determined by the Board.

(2) The Board may permit a candidate who has suffered the loss of a close relative before or at the time of an examination, other than a supplementary examination, to present himself for a special examination in the subject or subjects for examination in which he did not present himself at such time. Provided that -

(a) the Board may refuse to grant a special examination, without disclosing its reasons;

(b) the Board may require a candidate to produce such documentary evidence in support of his application as the Board deems necessary;

(c) the Board may require a candidate to present himself for examination at a centre determined by the Board.

(3) A candidate who wishes to present himself for examination in terms of (1) or (2) shall submit a written application to the Registrar within 14 days of the date on which the examination in the subject or subjects concerned took place.

(4) A candidate for an aegrotat examination or a special examination shall present himself for the examination referred to in regulation 19.
14. No person shall be admitted to an examination unless he holds a certificate issued by the college at which he is taking his course of study, to the effect that he has satisfactorily attended not less than 75 per cent of the classes of the prescribed course of study in the subject of examination and has obtained a mark of not less than 35 per cent in the theoretical part of the classwork in that subject during the year: Provided that a candidate who has obtained credit for all but one of the courses prescribed for Pharmacy I, Pharmacy II or Pharmacy IV, or, in the case of Pharmacy III, has obtained credit for all except one full course and one half-course, shall be permitted to present himself for examination in that course or half-course at the next ordinary examination without being required to obtain the said certificate: Provided further that, if he fails the examination again, he shall be required to repeat the prescribed course of study in that subject before presenting himself for further examination.

15. (1) The Registrar shall acknowledge receipt of each examination entry form and shall advise the candidate, if his entry is accepted, of the dates and times of the examination.

(2) The Registrar shall provide the candidate with an examination card, bearing his examination number, which must be produced at every examination: Provided that the candidate shall also produce positive proof of identity in addition to his examination card before he may be admitted to the examination room.

16. (1) The Board may grant exemption from examination in a subject or subjects prescribed for Pharmacy I and II on the ground of an examination passed at a university or other institution acceptable to the Board for the purpose: Provided that the diploma shall not be awarded to a candidate unless he has completed the courses prescribed for Pharmacy III and Pharmacy IV at one of the colleges for advanced technical education listed in regulation 17.

(2) An applicant for exemption from examination shall submit the prescribed entrance fee with his application.

17. (1) The following shall be approved institutions at which a course of study leading to the Diploma in Pharmacy may be taken -

Cape College for Advanced Technical Education.

Natal College for Advanced Technical Education.

Port Elizabeth College for Advanced Technical Education.

Pretoria College for Advanced Technical Education.

Witwatersrand College for Advanced Technical Education.

(2) A college for advanced technical education referred to in subregulation (1) shall submit to the Board not later than 31 March in each year lists of the names of all students enrolled in each year of study for the Diploma in Pharmacy.

18. (1) The Board, in determining whether a candidate has passed an examination in a subject, shall take into account the marks obtained by the candidate in internal theory examinations during the year.

(2) The maximum marks awarded for performance in the internal theory examination shall be one-third of the total marks awarded in the theory part of the subject.
(3) The marks for the internal practical examination awarded to a candidate in terms of regulation 10 shall be the final marks awarded to him in that section of each subject.

(4) The minimum marks which a candidate is required to obtain for a pass in an examination shall be 50 per cent, with a subminimum of 40 per cent in the external examination: Provided that the subminimum referred to shall not apply to final practical marks submitted on behalf of a candidate in terms of subregulation (3).

(5) The total mark awarded for a subject shall be calculated by combining the total theory and total practical marks in a ratio determined by the Board.

19. The Board may permit a candidate who fails an examination to present himself for re-examination in that subject in January or February of the following year: Provided that -

(a) a candidate shall not present himself for re-examination in more than two subjects in Pharmacy I, Pharmacy II, and Pharmacy IV, and for re-examination in Pharmacy III in not more than two subjects, save that a candidate who fails in Health Education in addition to two other subjects may present himself for re-examination in all three subjects: Provided further that he passes at least two of the following subjects simultaneously in the final year - Pharmacology II, Pharmaceutical Chemistry II, Pharmaceutics III;

(b) a candidate shall not present himself for re-examination in a subject if he obtains less than 40 per cent of the possible marks in that subject;

(c) a candidate shall not present himself for re-examination in terms of (a) unless he has passed the remaining examinations of the section concerned;

(d) a candidate shall not present himself for re-examination in a subject in Pharmacy IV other than Pharmacy Administration unless he has obtained a pass in the internal examination and has obtained the subminimum in the external examination;

(e) a candidate shall not present himself for re-examination in Pharmacy Administration unless he has obtained an average mark of not less than 40 per cent in the tests conducted in this subject during the year;

(f) a candidate who is permitted to present himself for re-examination may be required to write the examination at a centre determined by the Board;

(g) a candidate for re-examination on whose behalf a final practical mark has been submitted in terms of regulation 18 may elect to undergo a supplementary internal practical examination in addition to the external theory examination, in which case the college shall conduct such examination(s) and submit the final mark obtained to the Registrar: Provided that if the candidate does not elect to undergo such examination(s), the final practical mark referred to above shall be taken into account in determining whether the candidate has passed the examination(s).

20. The minimum marks which a candidate is required to obtain for a pass in a supplementary examination, an aegrotat examination or a special examination shall be those prescribed in regulation 18.

[The word “aegrotat” is misspelt in the Official Gazette, as reproduced above.]
21. A candidate who does not pass the examination in at least two of the courses prescribed for Pharmacy I, Pharmacy II or Pharmacy IV or at least one of the courses and the half-course prescribed for Pharmacy III shall not be granted credit for any of the courses completed by him for that year of study and shall be required to comply with the provisions of regulation 14 before he may again present himself for examination.

22. (1) Except as provided for in this regulation, no candidate shall be admitted to courses in Pharmacy II or Pharmacy III or Pharmacy IV unless he has obtained credit for all the courses prescribed in Pharmacy I or Pharmacy II or Pharmacy III, respectively.

(2) A candidate who obtained credit for three of the courses prescribed for Pharmacy I, including Chemistry I, shall be admitted to the courses Chemistry II and Physiology prescribed for Pharmacy II and shall be granted credit for those courses if he passes the examinations therein, on condition that he passes the examination in the outstanding Pharmacy I course at the same time.

(3) A candidate who has obtained credit for three of the courses prescribed for Pharmacy II shall be admitted to the half-course, Health Education, prescribed for Pharmacy III and shall be granted credit for this half-course if he passes the examination therein, on condition that he passes the examination in the outstanding Pharmacy II course at the same time.

(4) A candidate who enters for examinations in courses prescribed for Pharmacy I or Pharmacy II or Pharmacy III in terms of subregulations (2) or (3) shall, notwithstanding the proviso to regulation 14, be in possession of the certificate referred to in that regulation in respect of every such course.

23. The following Government Notices, relating to the rules and minimum curriculum for the Diploma in Pharmacy, are hereby withdrawn -


SCHEDULE

SYLLABUSES FOR THE DIPLOMA IN PHARMACY

Biology

1. Life - Features of living organisms, scope of biology.
2. The molecular basis of life.
3. Cells and tissues - Their structure and function.
4. The diversity of life - Selected examples from -

Viruses, bacteria, fungi, bryophytes, ferns, gymnosperms, angiosperms, lower and higher invertebrates, the phylum Chordata, basic principles of classification of living organisms, binomial nomenclature.
5. Transport and circulatory systems.
6. Respiration - Gas exchange, glycolysis, citric acid cycle, electron transfer system, production of energy.
7. Digestion, metabolism and nutrition.
8. Control systems - Nervous and hormonal.
9. Homeostasis and excretion.

**Botany**

A. Theory

1. Biology, its meaning and scope, and its two great subdivisions, botany and zoology; its value as a cultural and as a pharmaceutical subject. Meaning and scope of the more important subdivisions of biology: taxonomy, morphology, anatomy, physiology, genetics, evolution.

2. The plant kingdom and its main subdivisions their features; bacteria, algae, fungi, lichens, bryophytes, pteridophytes, gymnosperms and angiosperms as examples of the diversity of forms of plant life and of evolutionary history and tendencies.

3. The plant as a living organism; form, function of the roots, stem, leaves, flowers, fruit of a typical green herbaceous land plant and of a woody perennial showing secondary thickening. The influence of the habitat (soil and aerial) on plant organs. Nature of the modifications of organs for special functions. The cell and cell division. The tissues of typical angiosperms - their structure, arrangement and functions in brief. A typical flower - its structure and the functions of the various parts; the fruit and seed structure, dispersal, germination of seed.


5. A brief comparative study of the form, structure, life-history and reproduction of Bacillus subtilis, Tobacco, Mosaic Virus, Chlamydomonas, Spirogyra, Diatome, Fucus, Rhizopus nigricans, Saccharomyces, Claviceps, Penicillium, Agaricus (Psalliota), Funaria, Dryoptreis, Pinus, a typical Monocotyledon, a typical Dicotyledon.

*The word "Dicotyledon" is misspelt in the Official Gazette, as reproduced above.*

6. Principles of taxonomy as illustrated by a brief study of the representative of the following families - Liliaceae, Gramineae, Ranunculaceae, Leguminosae, Solanaceae, Compositae, Labiatae, Scrophulariaceae.
B. Practical

The examination, dissection, macroscopic and microscopic examination, description and drawing of plant material drawn from the list given above; demonstrations of ecological and physiological features to be arranged. The examination should aim at determining the powers of observation of the candidate, his capacity for describing and drawing faithfully what he has seen, and his capacity for interpreting botanical phenomena.

Chemistry I

Section 1 - General and Physical Chemistry

1.1 Atomic structure and the Periodic Table.

1.2 General properties of the elements.

1.3 Combining power.

1.4 Stoichiometry.

1.5 Equivalent masses and their determination.

1.6 The gaseous state.

1.7 The liquid and solid states.

1.8 Solutions and methods of expressing concentration.

1.9 Colloids.

1.10 Colligative properties.

1.11 Electrochemistry.

1.12 Acids and bases.

1.13 Chemical equilibrium.

1.14 Thermochemistry.

Section 2 - Inorganic and Analytical Chemistry

2.1 Classification of chemical reactions and reagents.

2.2 Balancing of equations.

2.3 The systematic descriptive and comparative chemistry of selected elements.

2.4 Theory of volumetric analysis.

2.5 Theory of qualitative analysis.

Section 3 - Organic Chemistry
3.1 Introduction. Types of organic formulae.
3.2 Structural and sterio-isomerism.
3.3 Formal and trivial nomenclature.

[Inconsistent use of punctuation in the Official Gazette, as reproduced above.]

3.3.1 Aliphatic compounds.— A review of basic reaction routes and the formal chemistry of alkanes, alkenes, alkynes, haloalkanes, polyhalogen derivatives of alkanes, alcohols aldehydes, ketones, ethers, amines, carboxylic acids, acid chlorides, acid anhydrides, acid amides, esters, nitriles.

3.3.2 Aromaticity in benzenoid systems.— With reference to the preparation and reactions of benzene, toluene, chlorobenzene, phenol, benzaldehyde, benzoic acid, benzenesulphonic acid, nitrobenzene, aniline.

Section 4 - Practical Chemistry

4.1 Qualitative analysis of selected cations and anions.
4.2 Volumetric analysis - Standardisation, neutralisation, redox and precipitation titrations.
4.3 Organic analysis.

[Inconsistent use of punctuation in the Official Gazette, as reproduced above.]

4.3.1 Qualitative determination of nitrogen, sulphur and halogen in organic compounds.
4.3.2 Characteristic reactions of selected functional groups.

Chemistry II

Section 1 - Physical Chemistry

1.1 Gases, liquids and solids.
1.2 Chemical bonding.
1.3 Solutions and phase equilibria.
1.4 Chemical kinetics.
1.5 Ionic equilibria.
1.6 Electrochemistry.
1.7 Nuclear and radiochemistry.

Section 2 - Analytical Chemistry
2.1 The principles of volumetric analysis.

2.2 Chromatographic techniques.

2.3 An introduction to instrumental techniques in analysis.

**Section 3 - Inorganic Chemistry**

3.1 The systematic and comparative chemistry of selected elements.

3.2 Complexes.

**Section 4 - Organic Chemistry**

4.1 Methods of purification and determination of physical constants.

4.2 The determination of molecular formulae of selected compounds.

4.3 A more advanced discussion of stereo-isomerism.

4.4 Prototropy and selected molecular rearrangements.

4.5 Discussion of the chemistry of selected classes of compounds drawn from the aliphatic, carbocyclic, aromatic and heterocyclic series with brief illustrations of the application of instrumental methods such as infrared and mass spectrometry to the elucidation of structure.

**Section 5 - Practical Chemistry**

5.1 Qualitative analysis of the elements.

5.2 Volumetric analysis - Standardisation, neutralisation, precipitation, redox, complexometric and adsorption titrations.

5.3 Instrumental analysis.

5.4 Preparation and purification of organic compounds on semi-micro scale.

**Forensic Pharmacy**

Candidates will be examined on their knowledge of the following legislation in so far as it has a bearing on the practice of pharmacy -

1. The Pharmacy Act, 1974 (Act 53 of 1974), and regulations made under the Act.

2. Regulations made under the Medical, Dental and Pharmacy Act, 1928 (Act 13 of 1928), in so far as they have not been replaced by regulations made under the Medicines and Related Substances Control Act, 1965, or be new regulations under the Pharmacy Act, but excluding the Therapeutic Substances Regulations.

3. The Liquor Act, 1928 (Act 30 of 1928) - Sections 5, 130, 131, 140 and 175 and regulations made under sections 130 and 131.

4. The Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972) -
4.1 Sections 1 (i), (iv), (vi), (vii), (xiv) and (xxiii), 2, 5, 8, 9 and 15 (a general knowledge only is required of the last-mentioned section);

[Inconsistent use of capitalisation in the Official Gazette, as reproduced above.]

4.2 The following regulations made under the Act -

4.2.1 The regulations on natural and artificial sweeteners, published under Government Notice R. 1881 of 12 October 1973;

[Inconsistent use of capitalisation in the Official Gazette, as reproduced above.]

4.2.2 Subregulations (3), (5), (21) and (24) of the regulation on labelling published under Government Notice R. 908 of 27 May 1977.

Until the new regulations are published under this Act on the following matters, students should become acquainted with the relevant regulations made under the old Foods, Drugs and Disinfectants Act and still in force, viz regulations 32 (disinfectants), 35 (ointments, creams and powders), 35bis (toothpastes, tooth powders and mouthwashes) and 40 (honey).

5. Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947) -

5.1 The sections relating to stock remedies, viz 1 (definitions only), 3, 7 and 21.

5.2 A general knowledge of the regulations relating to the registration and sale of stock remedies, in so far as they have a bearing on the practice of pharmacy, viz 1, 2 and 7. (Published under Government Notice R. 857 of 28 May 1971.)

6. The Medicines and Related Substances Control Act, 1965 (Act 101 of 1965) -

6.1 In particular the following section - 1 (i), (iii), (iv), (x), (xii), (xiii), (xv), (xvii), (xix), (xxi), (xxii), (xxiv), (xxv), (xxvi), (xxvii), (xxix), (xxx), (xxxii), (xxxiii), (xxxiv), (xxxv), (xxxvi), (xxxvii), (xxxviii), (xxxix), (xli) and (xlii), 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22A (and the Schedules) 23, 24, 26, 28, 29, 30, 32, 33, 35, 36 and 37.

[Inconsistent use of punctuation in the Official Gazette, as reproduced above.]

6.2 Regulations made under the Act. (Government Notice R. 352 of 21 February 1975). Candidates should have a general knowledge of the categories of medicines which are subject to registration in terms of the Act as well as of the procedure when applying for registration of a medicine and of the classification of medicines (regulations 2, 3 and 4). A detailed knowledge of the following regulations is necessary - 9, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, 33 and 34.

7. The Hazardous Substances Act, 1973 (Act 15 of 1973), and the regulations made under the Act relating to Group I and II Hazardous Substances.

8. The Abuse of Dependence-producing Substances and Rehabilitation Centres Act, 1971 (Act 41 of 1971), in particular the following sections in so far as they have not been
replaced by the provisions of the Medicines and Related Substances Control Act - 1 (iii), (iv),
(xiii), (xix), (xxii), (xxx), 2, 2A, 3, 4, 4A, 5 and 15. Parts I, II and III of the Schedule.

9. The Medical, Dental and Supplementary Health Service Professions Act, 1974
(Act 56 of 1974) - sections 36 (in so far as this section relates to pharmacy), 52 and 57.

Note.— The above knowledge will extend to any amendments to the specified sections of
schedules and to any relevant regulations or amendments thereof published on or before 30
April of the current year.

Health education

Aim.— To prepare the pharmacist and provide him with background information to
enable him to provide within the framework of his profession, information and advice to the
public on public health matters.

1. Introduction -

1.1 The meaning and significance of health education.

1.2 Theories and beliefs about health, disease and hygiene in South Africa.

1.3 Attitudes to illness and suffering in South Africa and the means of changing them.

1.4 The role of the pharmacist in health education.

1.5 Sources of health education information.

2. Factors which cause disease.

3. Infectious and communicable diseases, including their spread and prevention.

4. The problems related to and services available for common physical and mental
disabilities.

5. Health topics currently of interest.

6. Health aspects of food and nutrition.

7. Control of insects and other pests.

8. Correct use, storage and disposal of medicines.


10. Maternal health care and services.

11. Environmental factors influencing health.

12. First aid.

Mathematics
1. **Algebra.**— Real and complex numbers, exponents and radicals, inequalities, polynomials and equations, permutations, combinations and the binomial theorem.

2. **Trigonometry.**— Trigonometric functions for arbitrary angles, trigonometric formulae, inverse trigonometric functions.

3. **Probability and statistics.**— Probability, frequency distributions measures of central tendency of a distribution, standard deviation, the normal distribution, the Poisson distribution, significance t-test, Chi-square test, empirical curve fitting.


*Pharmaceutics I*

**Theory**

1. **General.**

   1.1 Introduction and orientation of the student to the modern practice of pharmacy, and the scope of Pharmaceutics in the pharmacy curriculum.

   1.2 Classification of medicinal preparations and general principles of the modern scientific approach in the design of dosage forms.

   1.3 Pharmacopoeias and formularies, and their use; drug nomenclature.

   1.4 Systems of measurement used in pharmacy and methods of calculation used in dispensing.

   1.5 Weighing and measuring: pharmaceutical balances and their sensitivity and capacity. The correct choice of volumetric measures.

2. **Physical Pharmacy.**

   Principles of those fields of physical chemistry which are of importance in pharmaceutical manipulations and in the design of medicinal dosage forms, and which involve a study of the following with special reference to their pharmaceutical applications -


   2.1.2 Polymorphism of drugs.

   2.1.3 Solutions and solubility. Colligative properties of solutions.

   2.1.4 The colloidal state. Coarse suspensions and colloidal dispersions; their properties, methods of preparation and stabilisation. Stokes’ law and its applications.

   2.1.5 Surface and interfacial phenomena - Adsorption, surface and interfacial tension, surface-active agents. Emulsions and emulsifying agents.
2.1.6 The flow properties of fluids and plastics systems - viscosity, rheology and gel formation.

2.1.7 The applications of ionisation and hydrogen ion concentration in pharmacy; theory and applications of ion exchange.

Practical

1. General.

1.1 Familiarisation with the apparatus used in a pharmaceutical laboratory and with the general layout, requirements and conduct of a dispensing department in a modern pharmacy.

1.2 The correct use of weighing and measuring equipment.

1.3 The correct manner of storing drugs.

2. The interpretation of prescriptions in both official languages and the dispensing of a selected range of medicinal dosage forms.

3. The preparation of a selected range of official compounded formulae of the British Pharmacopoeia and British Pharmaceutical Codex.

Pharmaceutics II

Theory

1. Pharmaceutical Operations and Principles of Manufacture. The following unit processes are examined with particular emphasis on the maintenance of high standards in the pharmaceutical manufacturing industry with respect to product quality and uniformity-

1.1 Extraction processes, principles of drug extraction and their application to large-scale methods. Maceration, percolation, infusion and other methods of extraction of crude drugs of natural origin.

1.2 Processes involving heat transfer. A general consideration of the problems encountered in the supply and transfer of heat in manufacturing operations-

1.2.1 Evaporation.— Basic theory and its application in the design and operation of typical large scale evaporators.

1.2.2 Drying.— Principles involved and pharmaceutical considerations; a study of the various types of plant in common use, including freeze-driers.

1.2.3 Distillation.— The distillation of miscible and immiscible liquid systems and the preparation of Purified Water. Destructive distillation.

1.3 Particle size reduction and mixing-

1.3.1 Communion of solid material and reduction of globule size in emulsions.

1.3.2 Mixing.
1.3.3 Particle size separation; measurement of particle and globule size.

1.3.4 Clarification of fluids - Filtration, sedimentation, centrifugation.

1.3.5 The choice of materials for the construction of pharmaceutical plant.


3. A study of the properties and uses of pharmaceutical adjuvants in formulation.

4. Basic Microbiology.

4.1 Introduction and historical development of the subject.

4.2 Bacteriology.

4.2.1 Nomenclature, classification, morphology, reproduction, identification, isolation of specific types, and factors affecting the growth of bacteria.

4.2.2 The composition and uses of culture media in the cultivation and examination of bacteria.

4.2.3 Bacterial biochemistry and staining methods.

4.2.4 Bacterial enumeration.

4.2.5 Distribution and occurrence of bacteria in the environment.

4.3 Moulds and yeast.— Classification and differentiation, general characteristics, growth requirements, pathogenic types. Their usefulness in the biosynthesis of antibiotics etc.

4.4 Rickettsiae.— General characteristics.

4.5 Viruses.— Their classification, characteristics and properties, and methods of cultivation. Bacteriophages.

4.6 Mutation and variation in bacteria and viruses.— Consequences and ecological considerations.

Practical

1. The dispensing and compounding of those dosage forms and official preparations not undertaken during Pharmaceutics I.

2. Pharmaceutical Technology -

2.1 The student will be expected to become acquainted with the use of the following types of equipment in pharmaceutical preparative work - Filtration apparatus; evaporating, distilling, condensing and drying equipment. Homogenisers, comminuting and particle size separation equipment; apparatus for measurement of particles in suspensions and globules in emulsions.
2.2 Investigation of the physico-chemical properties of pharmaceutical adjuvants, and of their uses as suspending, dispersing, emulsifying, solubilising, thickening and gelling agents.

2.3 The measurement and control of pH in pharmaceutical preparations.

2.4 Measurement of density of fluids.

3. **Microbiology.**— Application of the theory syllabus with emphasis on the cultivation and isolation of various types of micro-organisms, biochemical tests and staining methods, bacterial enumeration and microscopic studies.

**Pharmaceutics III**

*Theory*

1. Formulation of medicines -

   1.1 The general approach to modern drug formulation, and choice of dosage form and route of administration. Pharmaceutical, chemical, pharmacological, microbiological and biopharmaceutical considerations in the design of formulae and choice of adjuvants.

   1.2 A detailed study of the various dosage forms which are in current use, with emphasis on formulation, methods of preparation and standardisation in the production of medicines of optimal therapeutic activity, elegance, stability and convenience of administration.

   1.3 The stabilisation of pharmaceutical products, methods of eliminating or limiting microbial contamination - their importance in various dosage forms. The evaluation of stability.

   1.4 The importance of particle size in the formulation of medicaments and the processing of drugs.

   1.5 Presentation and packaging of pharmaceutical preparations, and package testing methods.

2. Applied pharmaceutical microbiology -

   2.1 Sterilisation methods -

   2.1.1 A critical appraisal of the various methods of sterilisation applicable to medicinal preparations, dressings and equipment used in the medical and pharmaceutical professions.

   2.1.2 The testing for sterility of these items.

   2.2 *Aseptic technique.*— The design and operating conditions of a laboratory for the preparation or manufacture of sterile products requiring aseptic manipulation. Sources of contamination and their elimination.

   2.3 The formulation and preparation of sterile medicaments -
2.3.1 Products for parenteral administration, and their route of injection. Pyrogens. Plasma substitutes and blood products.

2.3.2 Ophthalmic preparations and other products which may be required in sterile form.

2.4 Chemical disinfection -

2.4.1 The activity, mode of action, formulation and presentation of disinfectants and other antimicrobial substances which are used for the disinfection of, or limiting of microbial growth in, rooms and atmospheres, pharmaceutical materials, apparatus or preparations, or which are applied topically to the skin or mucous membranes, but excluding those disinfectants such as chemotherapeutic agents which are used solely for the treatment of infections within the body.

2.4.2 The evaluation of disinfectants.

2.5 *Antibiotics.*— The occurrence, stability, methods of production and formulation of a selected number of antibiotics in common use, and their standardisation by biological methods where applicable.

2.6 Immunology -

2.6.1 A general outline of the processes of infection and of the defence mechanisms of the body.

2.6.2 A detailed study of the preparation, properties and uses of antigen and antibody products of various types, including diagnostic preparations which are in current use.

3. Biopharmaceutics -

3.1 Pharmaceutical factors affecting drug absorption.

3.2 Utilisation of the distribution characteristics of drugs in the various tissues of the body, and of pharmacokinetic principles in the choice of route of administration, dose and dosage form of medicaments.

3.3 Utilisation of biopharmaceutical principles and parameters in the formulation of dosage forms, especially prolonged action medicaments, and their evaluation.

*Practical*

1. The formulation of pharmaceutical products for maximum therapeutic activity and stability, and the stability testing of these products.

2. Applied microbiology -

2.1 The formulation and preparation of parenteral, ophthalmic, and other medicaments in sterile form. Aseptic procedures.

2.2 The sterilisation of medicaments, dressings and pharmaceutical equipment by established methods, and the evaluation of sterilisation methods. Testing for sterility.

2.3 The evaluation of chemical disinfectants.
2.4 The preparation of vaccines.

3. **Drug evaluation.**— The practical application of biopharmaceutical methods of evaluation of formulated medicaments using in vitro and/or in vivo techniques, with special emphasis on unit oral dosage forms.

**Pharmaceutical Chemistry I**

1. Medicinal Chemistry -

1.1 Inorganic -

1.1.1 A study of the preparation, reactions and impurities of inorganic pharmaceutical compounds with reference to the action and use of these compounds.

1.1.2 The theory and medical application of radioactive pharmaceutical compounds and formulations.

1.1.3 Röntgenography and contrast media.

1.2 Organic -

1.2.1 A study of pharmaceutical compounds with particular reference to the synthesis, impurities, physical properties affecting therapeutic activity, toxicity and the relationship between structure and action.

1.2.1.1 Natural compounds with reference to the formation of synthetic medicinals therefrom, together with elementary aspects of biosynthesis.

[Inconsistent use of punctuation in the Official Gazette, as reproduced above.]

1.2.1.2 Selected synthetic medicinals and medicinal classes.

1.2.2 The metabolism of selected medicinals and medicinal classes.

2. Pharmaceutical Analysis -

2.1 Qualitative reactions and limit tests with a view to the identification and determination of the purity of organic and inorganic pharmaceutical compounds.

2.2 Application of elementary physical methods to the determination of the identity, purity, quality and therapeutic activity of pharmaceutical compounds and formulations (preparations).

2.3 Analysis of fats and oils of pharmaceutical importance.

2.4 Quantitative determination of the components of medicinals.

2.5 Miscellaneous analytical methods of application to medicinals and their dosage forms.

3. Practical -
Practical application of all the analytical methods and principles dealt with theoretically in Pharmaceutical Analysis.

*Pharmaceutical Chemistry II*

1. Medicinal Chemistry.

A study of the following medicinals and medicinal groups with special reference to the synthesis, impurities, physical properties affecting therapeutic activity, toxicity and the relationship between structure and action -

- Catecholamines and related compounds.
- Quaternary ammonium compounds.
- Histamine, antihistamines and phenothiazine derivatives.
- Barbiturates, hypnotics and xanthine derivatives.
- Anaesthetics.
- Analgesics, including antipyretics.
- Corticoids and sex hormones.
- Nitrogen mustards and other cytostatics.
- Antibiotics.
- Sulphonamides, sulphones and oral hypoglycaemics.
- Insulin.
- Anticoagulants and Vitamin K.
- Rodenticides, insecticides and herbicides.
- Vitamins.

2. Pharmaceutical Analysis.

Application of the following methods to the determination of the identity, purity and quality of pharmaceutical compounds and formulations (preparations) -

- Spectrometry.
- Electrometry.
- Potentiometry and polarography.
- Chromatography.
Cationic-anionic titrations.

X-ray diffraction.

Complexometry.

3. Practical -

3.1 Application of the methods dealt with under 2 to pharmaceutical dosage forms.

3.2 Exercise of analytical control over pharmaceutical formulations (preparations).

3.3 The synthesis, detection of impurities and general reactions of selected examples of pharmaceutical compounds dealt with under 1.

**Pharmacognosy**

*Theory*

1. The history and development of Pharmacognosy.

2. The methods of classification of natural products.

3. The study of natural products with reference to biological and geographical origin, cultivation, collection and preparation for the market, commercial varieties, adulteration, storage, evaluation, constituents and their actions and uses. These aspects should be studied where applicable and as determined by their present pharmaceutical and medicinal importance.

4. Surgical dressings and sutures.

5. The more important indigenous poisonous plants.

*Practical*

1. Examine and describe the macroscopical characters of crude drugs.

2. Examine microscopically crude drugs when presented alone, mixed or contaminated and report upon them.

3. Screen plants phytochemically and perform techniques used in natural product analysis.

4. Perform official identification tests on natural products and pure substances of natural origin.

5. Examine and report upon materials with respect to the fibres present and to their distribution.

**Pharmacology**

*Theory*

1. The scope of Pharmacology.
2. Drug transference and pharmacodynamics -
   2.1 Drug absorption in the organism and factors influencing drug absorption.
   2.2 Drug distribution in the organism and factors influencing drug distribution -
      2.2.1 Passive transport of drugs.
      2.2.2 Active transport of drugs.
   2.3 Drug metabolism and factors influencing drug metabolism.
   2.4 Drug excretion and factors influencing drug excretion.
3. Drug-receptor interactions -
   3.1 Interaction of one or more drugs with one receptor system -
      3.1.1 Chemical structure and action.
      3.1.2 Dose-response curves.
      3.1.3 Competitive interaction.
      3.1.4 Affinity and intrinsic activity.
   3.2 Interaction of one or more drugs with different receptor systems -
      3.2.1 Non-competitive interactions.
      3.2.2 Chemical antagonism.
      3.2.3 Functional interactions.
      3.2.4 Compounds with multiple actions.
      3.2.5 Specific and non-specific drug action.
      3.2.6 The pH and drug action.
3.3 The relation between stimulus and effect -
   3.3.1 The all-or-none response.
   3.3.2 Threshold phenomena.
   3.3.3 Receptor reserve.
5. Drugs acting on the nervous system -
5.1 Drugs acting on the peripheral nervous system -

5.1.1 The alpha and beta sympathomimetic and the alpha and beta sympatholytic drugs.

5.1.2 Indirect sympathomimetics and sympatholytics.

5.1.3 Parasympathomimetic and parasympatholytic drugs.

5.1.4 Ganglionic stimulant and ganglionic blocking drugs.

5.1.5 Curariform drugs.

5.1.6 Nonspecific musculotrophic drugs.

[The word “Nonspecific” is reproduced as it appears in the Official Gazette.]

5.2 Drugs acting on the central nervous system -

5.2.1 Central nervous system stimulants and dopaminergic drugs.

5.2.2 Central nervous system depressants and dopaminolytic drugs.

5.2.3 Drugs affecting behaviour.

5.2.4 Analgesics and antipyretics.

5.2.5 Drugs suppressing the cough centre.

6. Histaminergic and antihistamine drugs.

7. Drugs and allergy.

8. Drugs and the treatment of bronchopathy and rhinopathy.

9. Local anaesthetics.

10. Drugs and the gastro-intestinal tract -

10.1 Drugs acting in the mouth, throat and oesophagus.

10.2 Emetics and anti-emetics.

10.3 Antacids, absorbents and carminatives.

10.4 Laxatives.

11. Drugs and the cardiovascular system -

11.1 Cardiac glycosides.

11.2 Drugs depressing cardiac muscle.

11.3 Coronary vasodilators.
11.4  Antihypertensive drugs.
11.5  Blood cholesterol lowering agents.
12.  Drugs affecting the water and salt balance -
12.1  Acid-base balance and intravenous fluid therapy.
12.2  Diuretics and antidiuretics.
12.3  The ions (potassium, calcium, magnesium, fluoride, iodite, etc).
13.  Drugs and the hematopoietic system -
13.1  Drugs effective in anaemias.
13.2  Anticoagulant and coagulant drugs.
14.  The hormones -
14.1  Hormones of the pituitary gland.
14.2  Estrogens, progestogens and androgens, including oral contraceptives.
14.3  Anabolic steroid.
14.4  Andrenocortical hormones.
14.5  Adrenaline.
14.6  Thyroid hormones and antithyroid drugs.
14.7  Insulin and oral antidiabetic drugs.
15.  Vitamins and antivitamins.
17.  Immunisation.
18.  Chemotherapeutic agents -
18.1  Drugs used in bacterial infections.
18.2  Drugs used in fungal infections.
18.3  Drugs used in protozoan infections.
18.4  Drugs used in infections caused by flagellates and flukes.
18.5  Drugs used in infections caused by nematodes and cestodes.
18.6 Chemotherapy of cancer.

19. Gases, vapours and air pollution.

20. Insecticides and rodenticides.

21. Disinfectants, bactericides and bacteriostatics.

22. Weed killers.

23. Biochemical individuality, pharmacological individuality, pharmacogenetics.

**Practical**

1. Drug transference.

2. The use of isolated organ systems to demonstrate -
   
   2.1 Competitive antagonism.
   
   2.2 Competitive dualism.
   
   2.3 Non-competitive antagonism.

3. Determination of affinities and intrinsic activities of various drugs.

4. The effect of various drugs on blood pressure, heart rate and respiration of anaesthetized animals.

5. Quantitative determination of the effects on locomotor activity of test animals of stimulants and depressants of the central nervous system.


**Pharmacy administration**

1. Administration -

1.1 Review of Company Law and its influence on retail pharmacy, tax laws, Workmen’s Compensation Act, Shop Hours Ordinances, Shops and Offices Act, Unemployment Insurance Fund and commercial distributive trade.

   [Inconsistent use of punctuation in the Official Gazette, as reproduced above.]

1.2 The types of retail businesses - Sole owner, partnership, private company, public company, body corporate.

1.3 Running a business -

   1.3.1 Licences.

   1.3.2 Insurance.
1.3.3 Hire purchase agreements, and leases and leasing - General aspects.

1.3.4 Staff privileges - dress regulations, leave, etc.

2. Management -

2.1 Principles of modern management -

2.1.1 Organisation - Organisation charts, lines of authority, communication, accountability and responsibility, human relations.

2.1.2 Planning - Objectives, budgeting.

2.1.3 Leading. Leadership.

2.1.4 Control.

2.1.5 Staff and staff relationships.

3. Financial Administration -

3.1 Elementary bookkeeping.

3.2 The balance sheet - purpose and importance.

3.3 Definitions and applications -

3.3.1 Loan capital, working capital, share capital.

3.3.2 Liabilities and assets.

3.3.3 Creditors and debtors, including debtor control.

3.3.4 Stock, stock levels, stock control.

3.4 Trading statements (drawing up of trading statement, balance sheet, etc.).

3.5 Interpretation of trading statement -

3.5.1 Sales.

3.5.2 Gross and net profit, etc.

3.6 Budgeting.

3.7 Buying and stock-control system.

4. Acquiring a pharmaceutical business.

5. Marketing and merchandising in distributive trade, with special reference to retail pharmacy.
6. The Pharmacist as a Servant of the Public. General review of his moral and ethical responsibilities as a professional man.

7. The Structure of Pharmacy in South Africa -

7.1 Official pharmacy - Pharmaceutical Society of South Africa.

7.2 Retail pharmacy.

7.3 Wholesale and industrial pharmacy.

7.4 Institutional pharmacy.

7.5 Academic pharmacy.

7.6 Medical Schemes Act -

7.6.1 Contractual dispensing.

Physics

Theory

Mechanics -

1. Vectors.

1.2 Uniformly accelerated motion.

1.3 Momentum.

1.4 Force, energy and power.

1.5 Moments. Circular motion.

2. Properties of matter -

2.1 Density and relative density.

2.2 Kinetic theory of gases.

2.3 Elasticity.

2.4 Viscosity.

2.5 Diffusion.

2.6 Surface tension.

3. Heat -

3.1 Expansion of solids and liquids.
3.2 Expansion of gases.
3.3 Measurement of heat.
3.4 Change of state.
3.5 Transfer of heat.
3.6 Thermodynamics.


6. Atomic Physics -
   6.1 Atomic structure.
   6.2 Spectra.
   6.3 X-rays.
   6.4 The nucleus.

Practical

The estimation of accuracy of practical measurements. An experimental course illustrating the basic principles dealt with in the theoretical course.

Physiology

Theory

1. Microscopical structure of cells and tissues -
   1.1 Cytology of animal and human cells.
   1.2 Cell functions, control of cellular processes and cell fission, control of protein synthesis, functions of genes.
   1.3 Histology of the tissues and important organs of the body.

2. The functional organisation of the body and control of the internal environment -
   2.1 Organisation of the body in cells, tissues, organs and systems.
   2.2 The theory of regulating systems and homeostasis.

3. Body fluids and excretion -
   3.1 Extracellular and intracellular fluids, membrane transport and osmotic equilibria.
   3.2 Capillary dynamics and fluid exchange.
3.3 The lymphatic system, interstitial fluid exchange and oedema.

3.4 Special fluid systems of the body; cerebrospinal fluid, ocular fluids, pleural fluid, etc.

3.5 Formation of urine by the kidneys and excretion of urine, abnormal urinary constituents.

3.6 Control of the composition and volume of body fluids.

3.7 Control of the acid-base equilibrium of the body.

4. Blood and immunity -

4.1 Structure, development and life history of red blood cells. Anaemia and polycytaemia.

4.2 Resistance of the body against infection - the reticuloendothelia system, leucocytes, immunity, allergy and inflammation.

4.3 The blood groups, transfusion, transplant of tissues and organs, coagulation of blood and haemostasis.

5. The cardiovascular system -

5.1 The heart - physiology of cardiac muscle, excitation and conduction rhythmicity, electrocardiogram, pumping action of the heart, deviations from normal function.

5.2 Circulation of blood, arterial pressure and arterial flow, hypertension, cardiac output, venous pressure, shock, special circulation areas such as coronary circulation and pulmonary circulation.

5.3 Control of the functions of the heart and vessels, influence of exercise.

6. Respiration -

6.1 Mechanical principles of respiration, pulmonary ventilation, artificial respiration.

6.2 Principles of gaseous exchange, transport of oxygen and carbon dioxide by the blood and body fluids.

6.3 Control of respiration and deviations from normal respiration.

6.4 Physiology of aviation, space travel and deep-sea diving and industrial physiology.

7. Digestion and metabolism -

7.1 Movements of the gastro-intestinal tract, secretion and control thereof.

7.2 Digestion and absorption of nutrients.

7.3 Metabolism of carbohydrates, fats and proteins.
7.4 Composition of diet, nutrition and its control.

7.5 Exchange and transformation of energy.

7.6 Control of body temperature.

7.7 Disorders of digestion and of metabolism.

8. Endocrinology and reproduction -

8.1 Endocrine regulation, the pituitary gland, neurosecretions.

8.2 Hormones of the adrenal cortex, functions of thyroid and thymus.

8.3 Insulin, glucagon, diabetes mellitus.

8.4 Function of parathyroids, calcium metabolism, physiology of bone and teeth.

8.5 Reproduction and its endocrine control.

9. The nervous system and physiology of muscle -

9.1 Principles of bio-electricity, membrane and action potentials.

9.2 Physiology of muscle.

9.3 Functions of synapses, neurosystems.

9.4 General organisation of the nervous system.

9.5 Somesthetic sensations and interpretation of perceptions by the nervous system.

9.6 Physiological principles of mind processes and the control of motor functions.

9.7 Physiology of reflexes, functions of spinal cord, brain stem, basal ganglia and cerebellum.

9.8 The autonomic nervous system.

9.9 Automation, rhythmicity, autonomic balance, sleep and psychosomatic conditions.

9.10 The senses - Vision, hearing, taste and smell.

Practical

1. Histology.

2. Haematology -

2.1 Blood cell counts - Red blood cells and white blood cells.

2.2 Haemoglobin determinations.
2.3 Haematocrit value.

2.4 Calculation of indices.

2.5 Determinations related to blood groups, haemolysis, fragility, coagulation, sedimentation.

2.6 Biochemical determination of constituents of blood.

3. Cardiac and vascular physiology -

3.1 Haemodynamics, blood pressure and heart rate under various conditions.

3.2 Experimental physiology of the heart of the frog and/or mammalian heart.

4. Physiology of muscle and nerves -

4.1 Skeletal muscle and nerve tracts - Effects of stimuli, summation, temperature, loading, fatigue, velocity of impulse conduction, reflexes, tetani.

4.2 Contraction of smooth muscle.

5. Urine analysis -

Normal and abnormal urinary constituents.

6. Digestion and metabolism -

Determination of enzymes, capita selecta.

Zoology

Theory

1. Small mammal (e.g. rat, rabbit, guinea pig or cat) - external features, skin and appendages. Digestive system - main parts of the alimentary canal and related organs.

Enzymes and hormones - an outline of their functions in digestion.

Peristalsis.

Mouth - mucus, ptyalin.

Stomach - pepsin, HCl, rennin.

Pancreas - trypsinogen, steapsin, amylopsin.

Small intestine - erepsin, enterokinase, lipase.

Liver - bile pigments and salts.
Rectum - absorption of water, ejection of undigested food, excretion from vascular supply of walls.

Vascular system - heart, principal blood vessels.

Nature of arteries, veins, portal veins, capillaries.

Functions of blood transport, protection (phagocytosis, clotting, agglutination. Maintenance of constant temperature.

[Inconsistent use of punctuation in the Official Gazette, as reproduced above.]

Respiratory system.

Nervous system - spinal cord and nerves - Brain and cranial nerves.

Sympathetic system - reflex arc. Function of parts in general.

Skeletal system - vertebral column, skull, appendicular skeleton.

Names of bones - functions - attachment of muscles, support, protection. Urogenital system - kidney, gonads, ducts and associated glands.

Placenta.

Endocrine system - principal glands and their functions in general.

2. Microscopic anatomy of mammal - structure and physiology.


Epithelial tissue - trachea, oesophagus, stomach, intestine, skin, liver, pancreas, kidney.

Connective tissue - loose, dense (elastic, collagenous and reticular); adipose, pigment, lymph and lung tissue; bone, cartilage and blood (including clotting).

Muscular tissue - striated, cardiac and smooth.

Nervous tissue - ganglia and synapses, neuroglia.

Sensory organs and tissues - taste buds, end bulbs, Pacinian corpuscles, end plates, muscle spindles, free nerve endings, olfactory epithelium eye, ear.

The word “Pacinian” is misspelt in the Official Gazette, as reproduced above.]

Sex organs - testis, ovary, gametogenesis, sex determination.

3. Outline of classification - basic principles of classification; aggregation of animals into species, genera, families, classes, phyla.

4. General study of the following invertebrates -
Protozoa - Amoeba, Entamoeba, Trichomonas, Trypanosoma.

Plasmodium.

Babesia.

Platyhelminthes - Schistosoma, Fasiola, Taenia, Echinococcus.

Nemathelminthes - Trichocephalus (Trichuris), Strongyloides, hookworm.

Enterobius, Ascaris.

Arthropoda - crayfish or cockroach or locust (general morphology).

Bug, mosquito, flea, tsetse fly, housefly, louse and beetle (external structure, mouth parts and life history only).

Arachnida - Ticks and mites (the external structure, life history and hosts).

5. Parasitism.

6. Heredity - Mendelian heredity as illustrated by the inheritance of simple and sex-linked characteristics.

7. Embryology of the frog.

Practical

The complete dissection of the systems (other than muscular) of a small mammal, crayfish or cockroach or locust.

Identification of the bones of the skeleton, and of slides showing the macroscopic structure of animals or parts of animals mentioned in the theory syllabus.