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EXTRACT FROM THE REPORT OF
THE PHARMACY EDUCATION COMMITTEE
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PHARMACY COUNCIL OF PAKISTAN
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DACCA

Circulated to all participants of the Special Group Meeting on
Pharmacy Education, by :
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SCHEDULE 'A'
SYLLABUS FOR B. PHARM. COURSE

I. PHARMACEUTICS

History of Pharmacy:

Past and present history, including code of ethics, Pharmacopoeias, Formularies and Codices officially recognized in Pakistan.

Forensic Pharmacy:

Pharmacy Act, Drugs Act, Drugs Rules, Poisons Act, Poisons Rules, Dangerous Drugs Act and Dangerous Drugs Rules as in force in Pakistan.

Galenical Pharmacy:

Raw materials used in Pharmacy
General properties of Drug Constituents
Solvents used in extracting drugs
Extraction of drugs-
various extractions-processes-infusion
maceration and percolation, etc.
Changes liable to occur in the Pharmaceutical preparations
Preservation, deterioration and standardization of Galenicals
Assays of Drugs and important Vitamins and Hormones.

Physical Pharmacy:

Solids, solutions, isotonic solutions, ionization, solubility, complexation, surface phenomenon, viscosity, colloids, emulsions, crystallisation, rheology and its application to Pharmacy.

Bio-Pharmacy:

Effects of Physico-chemical properties on drug action
Effect of formulation on drug action
Absorption control, principles of prolonged drug action and sustained release medication
Blood products, plasma substitutes, medicinal gases
Surgical dressing, principles of sterilization, sterility of preparations and materials
Containers for proprietary and dispensed medicines
Stability testing of Pharmaceuticals
Safety methods in Pharmaceutical Laboratories.

Pharmacy Management and Retail and Hospital Pharmacy:

Dispensing:

The prescription, proper handling of prescription.

The dispensary, proper dispensing of powders, tablets, capsules solutions, mixtures, elixirs, ointments, emulsions, suspensions, liniments, eye, ear, nose and throat medications, aerosols, suppositories, lotions.

Compounding accuracy, organic and inorganic incompatibilities special incompatibilities of pharmaceutical products.

Pharmacy Administration:

A study of the principles and problems encountered in the acquisition, operation and control of retail Pharmacy. The business principles of drug stores.

Accountancy and Book Keeping:

As applicable to retail and industrial Pharmacy.

Hospital Pharmacy:

The Hospital, its organization, administration and principles. Responsibilities and duties of a hospital pharmacist. Development of a budget, purchasing and inventory control with special reference to indoor and outdoor patients; the physical facilities and equipment, safety measures in the hospital.

PRACTICAL

A general course illustrative of the theoretical section of the above including dispensing and preparation of medicaments.

II. PHARMACEUTICAL TECHNOLOGY

Layout Plan of a pharmaceutical manufacturing plant including quality control and plant location.

Materials of plant construction.

Pharmaceutical processes and dosage forms; powder dosage forms, manufacturing of effervescent powders, tablets, triturates, official and non-official solutions, emulsions, suspensions, lotions, ointments, internal and external liquids.

Production of Antibiotics, Radio-Pharmaceuticals, polymers.

Special consideration of powder mixing, manufacture of capsules, compressed tablets, techniques of production of enteric coated tablets techniques involving the preparation of sustained release drugs.

Manufacture of Heterogenous mixtures, (Disperse System) Colloids, Emulsions, Suspensions, Suppositories, Douches, Creams and Pastes.

Pharmaceutical problems involved in formulation and process development. Preservation, storage and packing. Surfactants dispersion stability.

Basic knowledge of all unit processes and unit operations in Bio and Pharmaceutical Engineering. Heat transfer, mass transfer, fluid flow.

Product design; packaging and packing; safety methods in pharmaceutical laboratory.

PRACTICAL

A general course illustrative of the above including laboratory scale production of tablets, injections, ointments, liquid preparations and sterile products.

III. PHARMACEUTICAL CHEMISTRY

PART I

The general principles of physical chemistry including the modern conceptions of structure; valency; reactivity.

The general character of the elements and their compounds as indicated by their position in the periodic table and the electronic structure. The preparation and properties of the elements and compounds of pharmaceutical importance or used in organic syntheses and degradations.

The occurrence of impurities in medicinal chemicals and preparations used in Pharmacy, the principles underlying qualitative and quantitative analysis; the principles underlying tests for purity.

A general consideration of mechanism of organic reactions. The methods of formation and preparation and the general chemical properties of substances containing the chief functional groups illustrated by reference to compounds used in Pharmacy. The chemistry of (a) naturally occurring compounds of pharmaceutical importance; (b) the main groups of substance which exhibit physiological activity; (c) those which combat invading organisms.

PRACTICAL

A general course of pharmaceutical chemistry illustrative of the theoretical section of this syllabus including exercises in physical chemistry, in qualitative and quantitative analysis of inorganic and organic preparations.

PHARMACEUTICAL CHEMISTRY

PART II

General:

A more detailed consideration of the theoretical section of the Part I Syllabus in Pharmaceutical Chemistry.

The use of omission, absorption and X-ray spectra in the determination of structure. The mass spectrograph. Isotopes and the use of Isotopic indicators. Natural and induced radioactivity. Molecular and ionic nature of crystalline solids. Thermodynamic concepts, first and second laws. Reversibility, irreversibility and equilibrium.

The theory underlying those physical instruments used in quantitative chemical analysis and for the determination of structure.

The idea of activation, activity co-efficients, inter-atomic distances, interionic attraction theory; complexions.

Organic:

The chemistry of cyclic systems not covered in Part I derivatives of which are used in Pharmacy. An extension of the survey of chemistry of (a) naturally occurring compounds of pharmaceutical importance (b) the main groups of substances which exhibit therapeutic activity (c) those which combat invading organisms.

An elementary consideration of enzymes, fermentation and in vitro bio-synthesis.

A consideration of conjugated systems; polymerisation and polycondensation; strainless ring systems; free radicals.

PRACTICAL

Advanced pharmaceutical analysis including the use of spectrophotometer and other physical instruments used in quantitative estimations; measurement of fluorescence.

Experiments illustrative of the inorganic, physical and organic chemistry of Part I and Part II of this syllabus.

Exercises illustrative of modern organic reactions and of the techniques employed in chromatography.

Organic preparations involving several stages.

A critical survey of the literature on a selected topic of limited scope. The survey to be legibly written and limited to 3,000 words, excluding the bibliography.

The critical survey of the literature carried out by the candidate must be certified by a responsible teacher and submitted with the practical note books at the practical examination. The survey may be retained by the examiners until after the examination and it will then be returned to the school which the candidate attended.

IV. PHARMACOGNOSY

Historical development. Official and unofficial drugs. Definition of drug; crude drugs and a general view of their origin, distribution, cultivation, collection and commerce. Evaluation of crude drugs. Preparation of drugs for commercial market, storage and preservation of drugs. Identification of constituents of natural drugs. Drug adulteration. Classification of drugs, important unorganized drugs and their constituents.

The study of the following with respect to their biological origins:

Venoms, Hormones, Vitamins, Antibiotics, Enzymes, Allergens, Pesticides. Biogenesis of drugs, chemical taxonomy.

Structural characters of a few selected and representative taxonomic groups of official plant originated drugs and other which represent the major sources of medicinally useful constituents like alkaloids, glycosides, tannis, volatile oils, resins, carbohydrates, etc.

PRACTICAL

A general course illustrative of the theoretical section including microscopic and macroscopic examination and description of the characters (including diagrammatic transverse section wherever possible) of the drugs. Identification of, in their entire and broken condition by their gross characters and by qualitative tests, the crude drugs studied in theory.

V. PHYSIOLOGY AND BIOCHEMISTRY

Physiology:

Elementary knowledge of biochemical principles, structure and functions of animal tissues, histological structure of various organs of the body.

Physiology of blood.

Physiology of heart and factors which modify its action. Dynamics of circulation and mechanism of circulatory adaptations.

Tissue fluid, formation and circulation of lymph.

Respiration: Mechanics and regulation of respiratory movements. Chemistry of respiration.

Foods and proximate principles of food.

Physiology and enzymes of digestion and absorption. **Structure of** alimentary canal. Faeces and defaecation.

Metabolic fate of proximate principles in the body. Energy exchanges in the organism. Anabolic and catabolic processes. Formation of urine. Functions of the skin. Temperature regulation.

Physiology of endocrine organs.

Reproduction: Formation of spermatozoa and ova. Physiology of male and female reproductive organs.

Muscles: Physiology of voluntary, involuntary and cardiac muscles.

Nervous system: Conduction of nerve impulses. Properties of nerve cells. Reflex action. Principal efferent and afferent paths of C.N.S. Function of spinal cord and brain. The autonomic nervous system. Special senses: Physiology of vision, hearing sensation of smell, taste and cutaneous sensations. Labyrinthine sensations and maintenance of posture.

Histology: Staining and identification of section of tissues and organs of the body. Preparation and staining of blood slides. Differential count of leucocytes. Enumeration of R.B.C. and W.B.C. Haemoglobin determination.

Biochemistry:

General tests for carbohydrates, fats and proteins. To demonstrate the constituents of milk, bread and egg. Tests for abnormal constituents of urine. Quantitative analysis of sugar in urine, study of enzymes in saliva, gastric juice and pancreatic juice.

PRACTICAL

A general course illustrative of the theoretical section including clinical, histological and bio-chemical tests.

VI. PHARMACOLOGY

General Pharmacology:

Definitions; sources of drugs; routes of administration; absorption, fate and mode of action of drugs in human body. Structure and action of relationship of drugs.

Special Pharmacology: Dose effect and actions of the following groups of official drugs (only a few representative drugs in each group are to be discussed).

Gastro-intestinal system: Bitters, carminative, emetics and anti-emetics, anti-acids and purgatives.

Cardiovascular system: Blood vessels: vasoconstrictors and vasodilators. Heart: Cardiac glycosides and quinidine sulphate, procainamide etc.

General Nervous system: Parasympathomimetic, parasympatholytic, sympathomimetic and sympatholytics.

Other Drugs:

Diuretics, antidiuretics, oxytocics and contraceptives, histamines and antihistamines, expectorants, cough depressants.

Chemotherapy:

Chemotherapeutic agents, anti-bacterial and anti-malarials, antibiotics and anthelmintics, anti-cancer agents.

Toxicology:

Toxic action of phenol, chloroform, strychnine, morphine, pathiedine, cocaine, atropine, digitalis, sulphonamides, barbiturates and antimalarials.

PRACTICAL

A general course illustrative of the theoretical section including action of drugs and biological standardization.

VIII. MATHEMATICS AND STATISTICS

Arithmetic:

Numbers, factors and primes, fractions, decimals and negative numbers, roots, logarithmic scales, slide rules, the metric system, dimensions, dimensional analysis.

Algebra and Geometry:

Algebraic definitions, indices, logarithms in algebra, identities, equations.

Rectangular co-ordinates, equations of the first degree in both variables, equations of the first degree in Y and second degree in X, equations of the second degree in both X and Y, equation of the forms $Y=Z$, exponential and logarithmic curves, graphical solution of equations, graphical solution of simultaneous equations, polar co-ordinates.

Arithmetic progression, geometric progression, infinite and convergent series, irrational numbers; permutations and combinations, the binomial theorem, the significance of each and natural logarithms, logarithmic series.

Differential calculus:

Rate processes, definition of a function, limit of a function, derivative of a function. Differentiation of a function. Relation between the derivatives of inverse functions, differentiation of implicit functions. Applications of differential calculus.

Differential equations.

Integral calculus:

Integration as a summation, algebraic integration, rules for the algebraic integration of functions, reduction of integrals to standard form. Graphical integration, integration by computation.

Trigonometry:

Trigonometric functions, relations between trigonometric functions, angular measures, variation of $\sin Q$, $\cos Q$, and $\tan Q$, with $\sin Q$ and $\cos Q$ as the sum and difference of two angles. Sum and difference of sines and co-sine, derivatives of the trigonometric functions, power series for $\sin Q$ and $\cos Q$. Integration of the trigonometric functions, inverse trigonometric function, definite integrals of odd and even functions.

Statistical analysis of repeated measurements:

Mean and variance, standard deviation, statistics and experimental errors, standard error. The normal distribution, limits of error of a mean. The factor, large sets of repeated measurement, cumulative frequency, probability.

Comparison of data by statistical methods, tests of significance:

Normal deviate test. The 't' test, variance ratio test.
Analysis of variance. The X^2 test, regression.

Some applications of statistics to biological assay and bacteriology:

Biological assays, toxicity tests, analysis of variance, bacteriological counts.

Some applications of statistics in Pharmacy:

Sampling, tests for uniformity of weight of tablets. Qualitative test on samples, limits for content of active ingredient in tablets. Dispensing errors.

IX. MICROBIOLOGY

Introduction:

Historical introduction. Scope of Microbiology with special reference to pharmaceutical science.

Characteristics of Bacteria:

General morphology: Cellular morphology, including shape, movement, cell wall and permeability, protoplasm and protoplasmic bodies, bacterial spores, capsules, flagella etc.

Physiology of Bacteria:

Growth curve and growth characteristics, nutritional requirements. Culture media and culture, staining reactions. Transformation and Transduction.

Micro-Organism other than Bacteria:

(a) Molds (b) Yeasts (c) Virus and Rickettsia (d) Protozoa.

Animal Parasitology:

Protozoal parasites: Amoeba, Malarial parasites, Leishmania, Trypanosomes.

Tapeworms, Hook-worms, Round worms.

Microbiology of Environment:

(a) Air (b) Water (c) Milk

Immunology:

Immunity, antigen, antibodies and antigen-antibody reactions, hypersensitivity and allergy. Serological and diagnostic methods (Kahn test, Widal test).

Sterilization and Disinfection:

Theory and practice. Vaccine and sera, Bio-assay of vitamins and antibiotics.

Microbial Diseases and their control:

Important diseases of microbial origin, their symptoms, laboratory findings and the control of those diseases.

PRACTICAL

A general course illustrative of the above theoretical section including microbiological assay of amino acids, vitamins and antibiotics.

SCHEDULE 'B'
SYLLABUS FOR DIPLOMA/INTERMEDIATE IN PHARMACY

I. GENERAL PHARMACY

(a) Principles of Pharmacy:

Heat - Sources and uses of Heat in Pharmacy;

Heat processes - Fusion, ignition, calcination, drying, desiccation, exsiccation, evaporation, distillation and sublimation;

Refrigeration - Principles and use of refrigerators, cold storage and freeze drying;

Solids - Precipitation, crystalization, granulating and scaling;

Solutions - Types, solubility, solvents, properties of solutions like osmosis, viscosity, surface-tension, absorption, ionization and pH;

Colloidal state - Collids, suspensoids and emulsoids;

Mechanical separation - Decantation, filtration, colation, centrifugal separation and other means of clarification;

Drugs of Vegetable and Animal Origin - Collection, drying and storage, enzyme action in drugs;

Mechanical Sub-Division of Drugs and Chemicals - Comminution, trituration, mixing and sifting;

Extraction Processes - Expression, infusion, decoction, maceration, percolation, diacalation and diffusion;

Apparatus and Aids involved - in the above processes.

(b) Galenical Pharmacy:

General methods of preparation of official galenicals - aqua, infusion, spirits, tinctures, extracts, liniments, liquors, plasters, poultices, syrups, glycerines, elixirs, confections, juices, powders, mucilages and tablets.

Preservation and storage of pharmaceutical products.

General composition of official galenicals.

Surgical dressings - ligatures and sutures and their standards.

(c) Biological Pharmacy:

Elementary knowledge of bacteriology and immunity as supplies to sera, vaccines, toxins, antibiotics and antitoxins, vitamins, hormones, dried serum, extract liver, extract of pituitary (post-lobe) and protein hydrolysates.

(d) Ethics in Pharmacy:

Pharmaceutical profession and its responsibilities; institution of Pharmacy in relation to society; pharmacists in relation to doctors, nurses, patients, customers, the public wholesale dealers, employers and employees; codes of conduct in dispensing and advertising of drugs and medicines with special reference to poisons, narcotics, abortifacients and contraceptives; rules of receiving, dispensing, checking and delivery of prescriptions; fair pricing and fair service.

(e) Pharmaceutical Economics:

Elements of double-entry, book-keeping and accountancy; drug store organization; business correspondence; filing; advertising; location and management of drug stores and dispensaries; prescription pricing.

(f) Dispensing Pharmacy:

Prescription - definition, significance and handling.

ACCURACY and care in dispensing: FORM OF ADMINISTERING MEDICINES; LABELLING AND PACKING of and CONTAINERS for dispensed medicines; and a thorough study of the following:

MIXTURES - Definition, classification mixtures containing insoluble (diffusible and indiffusible) solids, immiscible and precipitate forming liquids etc. EMULSIONS - theory, natural and synthetic emulgents, stability, types-gum, soap, protein, starch, natural and synthetic wax and wool alcohol emulsions, O/W and W/O. Emulsions, emulsifiers; INCOMPATIBLE PRESCRIPTIONS. Pharmaceutical and Chemical (Inorganic and organic) Incompatibility, intentional and unintentional and adjusted incompatibility, handling of incompatible prescriptions POWDERS - Trituration simple, compound, and effervescent powders, compressed powders - tablet triturates, powders enclosed in cachets and capsules, powders containing liquids and those for external use; pills excipients, coating and varnishing, enteric pills; pills containing small doses, oxidising substances, camphor and camphoraceous and oily substances, pill machines; TABLETS - Granulation and its importance, diluents, granulating agents, adhesives, disintegrants, lubricants in tablet making, compression and tablet machine, sugar coating and polishing of tablets; LOTIONS AND LINIMENTS; OINTMENTS AND CREAMS - Ointment bases and their choice, emulsified ointments and creams, penicillin ointments and creams; PASTES-Gelatin, starch, tragacanth, soap and cellulose; ether pastes; SUPPOSITORIES - forms, shapes and sizes; suppository bases, suppository moulds, displacement value of medicaments, glycerine, cocoa butter, gelatine and soap-glycerine suppositories, containing various types of medicines; SOLUTIONS - Inhalations, nasal sprays throat paints and gargles, eye and ear preparations; PASTILLES AND LOZENGES; PLASTERS; DENTAL PREPARATIONS - Various dentifrices and mouth washes; DERMATOLOGICAL PREPARATIONS; STERILIZED PREPARATIONS - Routes of parenteral administration of medicines and importance of sterilization isotonic solutions, apyrogenic water, containers for sterilized preparations, limit of alkalinity of glass, transfusion sets, sterilization by heating and filtration, chemicals used in

sterilization bactericides, disinfectants, bacteriostatics and antiseptics and their use, phenol co-efficient, Rideal Walker (R.W) and Chick Martin tests, sterilization of surgical dressings and appliances, autoclaves, bacteria-proof filters, tests of sterility of medicaments and dressings. Precautions for asepsis. APPARATUS AND EQUIPMENT REQUIRED FOR DISPENSING MEDICINES)

(g) Posology:

Detection of overdoses in prescriptions.

(h) Pharmaceutical Latin:

LATIN as required in interpretation of prescriptions and their translation into English.

(i) Forensic Pharmacy:

Study of dangerous drugs Act, Opium Act, Poisons Act, Drugs Act, Drugs Rules, Pharmacy Act, the Excise Act and such other Acts as materially affect the Pharmacy profession.

PRACTICAL

- (a) Dispensing not less than 100 prescriptions covering a wide range of medicinal preparations including all the classes listed under "DISPENSING PHARMACY" maintaining complete record of each.
- (b) Preparation of simple pharmaceutical products such as aqua, extracts, syrups, tinctures, spirits, liniments, ointments and pills.
- (c) Differentiation of bacteria, yeasts and moulds, examination of bacterial slides, preparation of culture media, tests of sterility of different kinds of medicaments.

II. CHEMISTRY AND PHARMACEUTICAL CHEMISTRY

Physical Chemistry:

Laws of chemical combination, stoichiometry, atomic theory, electron and chemical bonds, properties of gases, properties of liquids, solutions, chemical kinetics, chemical equilibrium, pH.

Inorganic Chemistry:

Hydrogen, Oxygen and its compounds, Nitrogen and its compounds, Halogens, Carbon and Silicon, Boron and Aluminium, Lithium and Beryllium and their compounds. Transition elements, Noble gases, elementary metallurgy of Fe, Cu, Ag, Pb.

Organic Chemistry:

Introduction of organic chemistry, Hydrocarbons, Monohalo alkanes, Alcohols, Aldehydes and Ketones, Carboxylic acids, Aromatic hydrocarbons, Natural products.

Pharmaceutical Chemistry:

The general principles of inorganic and organic chemistry as illustrated by the elements and compounds in frequent use in Pharmacy. The general character and properties of the main types of Aliphatic substances and similar aromatic compounds of frequent use in Pharmacy. The principles underlying the tests of purity and the chemical assays in the British Pharmacopoeia.

PRACTICAL

1. The cutting and bending of glass tubing. The preparation of simple apparatus involving the use of corks and tubes, e.g. gas generating tubes and flasks, wash bottles etc.
2. Preparation of simple gases, e.g. Hydrogen, Oxygen, Chlorine, Carbon dioxide, Hydrogen sulphide, Hydrochloric acid and Sulphur dioxide and study of their properties.
3. Qualitative analysis of simple salts.
4. The use of standard solutions for acidimetry and alkalimetry, simple exercises in permanganometry for iron.
5. Preparation of distilled water B.P. and Hydrochloric acid B.P.
6. Simple exercises in gravimetric analysis; decomposition of salts on heating; qualitative and quantitative results of heating substances like magnesium carbonate, potassium chloride and hydrated barium chloride.
7. Assay of important drugs using simple volumetric methods and estimation of sulphate by gravimetric methods.
8. The performance of limit tests for the presence of As, Pb, Cl, Fe, SO₄
9. Preparation of simple organic substances acetanilide, acetamide, iodoform.
10. Tests for alkaloids, proteins, carbohydrates.

III. BOTANY AND PHARMACOGNOSY

Botany:

General Histology:

Physiology of Plant cell, Photosynthesis.

Morphology of Angiosperm-Gynosperm:

The seed, root, stem, leaf and fruit. Inflorescence and classification of plants and plant parts. Emphasis is placed upon the cell and its contents, tissues and organs. General study of crude drugs and their sources.

Study of Medical Plants of Pakistan:

A thorough study of the medicinal plants of Pakistan including their cultivation, harvesting, storage. Important alkaloids, resins, volatile oils, carbohydrates and their uses.

PRACTICAL

1. Morphological description of the parts of plants.
2. Histological characters of the parts of plants, viz, root, stem and leaf.
3. Record the macroscopical characters (including diagrammatic ~~transverse~~ section) of a drug.
4. Identification of Cinnamon, Cinchona, Digitalis, Cloves, Ispaghul, Cardamom, Ephedra and Ginger.

IV. ZOOLOGY, PHYSIOLOGY AND HYGIENE AND FIRST AID

Zoology:

General Histology: Cell, The Tissue, Cell Division

Protozoology: Amoeba, Plasmodium, Trypanosomes

Parasitology: Liver fluke, Ascaris

Frog: Skeletal system, Digestive system, Blood, Vascular system, Nervous system, Urinogenital system.

Evolution: Theories, variation, heredity, economic importance of insects and parasites.

Physiology and Hygiene:

Elementary ideas of general physiology, physiology of respiration, physiology of circulation, physiology of digestion, physiology of nervous and skeletal system, cardiovascular system, hormones, vitamins, enzymes, general principles of hygiene and public health, epidemiology.

First Aid:

Haemorrhage, pressure points, fractures, burns and scalds, poisons-general principles of treatment. Loss of consciousness and convulsions. Asphyxia by drowning, by choking, by gas. Snake and dog bites, scorpions.

PRACTICAL

1. The dissection, microscopical examination and description of specimens of parts of frog.
2. Identification of various charts, models and microscopic slides illustrative of the theory of human anatomy and physiology, and qualitative analysis of urine and stools.
3. Use of first aid kits.

V. ELEMENTARY PHARMACOLOGY AND TOXICOLOGY

Mode of action of drugs. Absorption and excretion and pharmacodynamics of drugs. Toxic effects of drugs. Vitamins, hormones, chemotherapy, antibiotics and disinfectants. Elementary pharmacology and toxicology of the important drugs, official and non-official, with special reference to side effect and toxic action of drugs.

PRACTICAL

Practical demonstration in experimental pharmacology illustrating action of drug on different systems.

VI. PHYSICS AND MATHEMATICS

Physics:

Introduction to modern physics. Mechanics, general principles of mechanics. Sound, sound waves, heat-specific heat, latent heat, general principles of heat. Electricity - Electrostatics, electric current and circuit elements, direct and alternating currents. Electromechanical instruments, light properties of light, mirrors and lenses, optical instruments, interference, diffraction and polarisation. Atomic structure - nuclear radiation, its detection and use in pharmacy.

Mathematics:

Pharmaceutical Arithmetic:

Numbers, fractions, decimal fractions, metric system, roots, slide rule, logarithmic scale. Different systems of weights and measures; calculations of doses; reducing and enlarging of recipes; percentage solutions; alligation; isotonic solutions; specific gravity; specific volume, thermometric scales; proof spirit, dilution and concentration of solutions.

Algebra and Trigonometry:

Algebraic definition, simple identities, factors and equations, and elementary ideas of trigonometry.

PRACTICAL

1. The use of vernier calipers, screw-gauge, balance, hydrometer; simple pendulum; the determination of volumes by weighing in air and water, density of solids and liquids.
2. The determination of melting points, boiling points.
3. The determination of refractive indices of slab and prism.
4. The comparison of electromotive forces and of resistances, the use of galvanometer, ammeter and voltmeter.

VII. ENGLISH

There shall be only one paper carrying 50 marks and consisting of two sections. The first section shall consist of questions of a general, non-detailed nature from a prescribed text-book of English prose selections tallying with the general standard prevailing for the intermediate examination of Science or Pharmacy in a University or Board. The second section will be on composition consisting of questions on the correct use of the English idioms and construction and exercises on essay and precis writing. The aim of this section is to test the capacity of the students to write correct English.

SCHEDULE 'C'

EQUIPMENT FOR B. PHARMACY COURSE

1. Analytical Balances
2. Tablet Compression Machines
3. Tablet Granulation Machines
4. Mixers and Mills
5. Dryers
6. Coating and Polishing Pans.
7. Incubators and Sterilizers
8. Colorimeter
9. pH Meter
10. Polarimeter
11. Refractometer
12. Centrifuges
13. Tablet Disintegrator
14. Microscopes
15. Miscellaneous Pharmaceutical (Manufacturing) equipment
16. Electric Thermometer for Pyrogen Testing
17. Percolator
18. Blood Counting Equipment
19. Monsanto Hardness Tester and Friabilator
20. Dispensing Equipment
21. Microbiological Assay Equipment
22. Spectrophotometers
23. Fluorimeter
24. Viscometer
25. Constant Temp. Water Bath
26. Chromatography Equipment
27. Pharmaceutical Test Equipment
28. Homogenisers
29. Mechanical Shakers
30. Injection Filling and Sealing Equipment
31. Ointment Production Equipment
32. Pharmacology, Bio-Assay Equipment
33. Distillation Stills

SCHEDULE 'D'

SPACE AND EQUIPMENT FOR DIPLOMA/INTERMEDIATE IN PHARMACY

Adequate building space at an average rate of 50 sq.ft. of floor area per student including among other special requirements one lecture room, two laboratories fitted with working benches (3' x 2' per student), gas and water taps, one room for balances and other physical apparatus, a room for miscellaneous machineries and apparatus, and one room for staff members:

The approximate details are given below for guidance:

- A. One laboratory approximately 45' x 27' provided with:
 - (a) 4 working benches, each 21' x 4 1/2' fitted with three sinks and having 12 cupboards on each side, each 1 1/2' wide 2' deep x 3' high and usual gas and water fittings and shelves.
 - (b) A side table 28' long, 2 1/2' wide and 3' high and provided with 2 fume cupboards with usual gas and water fittings and shelves.
- B. One Biological (Pharmacognosy) laboratory approximately 25' x 27' equipped with usual gas and water fittings and provided with four working benches approximately, one 27' x 2' and three 21' x 2'.
- C. One lecture room, approximately 45' x 27'
- D. Balance Room and Physical Apparatus Room 10' x 12'
- E. Miscellaneous apparatus room 10' x 15'
- F. Stores Room 10' x 27'
- G. Staff Room 15' x 15'
- H. Head of the institution room 15' x 12'

NB. In science colleges, except for Pharmacognosy laboratory all other laboratories and rooms may be shared with other departments, if available and adequate.

1. There shall be at least three members of the teaching staff for two classes consisting of 40 students in each class. In practicals, one teacher will be in charge of not more than 20 students.
2. In case the course is offered by a science college having departments of Chemistry, Physics, Botany, Zoology etc, the minimum number of staff may be restricted to two, a teacher of Pharmacy and teacher of Pharmacognosy.
3. The following equipment in adequate number and quantity in addition to general apparatus and chemicals and other laboratory outfits and equipment generally needed for the teaching of Physics, Chemistry and Biology to Inter Science students should also be provided.

List 'A' (Compulsory for all Institutions)

1. 10 Conical percolators of copper and glass
2. 1 Medium size tincture press
3. 1 Hand grinding mill
4. 2 Platform balances
5. 1 Emulsifier
6. 2 Hand centrifuges
7. 2 Sets of sieves of various numbers
8. 8 Dispensing scales
9. 2 Pill making machines (hand)
10. 3 Suppository moulds
11. 3 ointment slabs and spatulas
12. 20 Dispensing Mortars and Pestles
13. 1 Set granulating sieves
14. 1 Refrigerator
15. 1 Westphal balance
16. 1 Autoclave
17. 1 Incubator
18. 1 Seitz filter

List 'B' (Optional)

1. 1 Tablets machine
2. 1 Ampoule filling and scaling machine
3. 1 collapsible-tube filling machine
4. 1 Pill coating and polishing pan. containers for different medicaments q.s.
5. 2 Bacteria-proof filters-candles
6. 6 Chemical Balances
7. 10 Dissecting microscopes
8. 1 Microscope
9. 2 Capsule filling machines
10. Biological charts and models
11. Biological slides
12. Anatomical and physiological charts and models
13. Bacteriological charts and slides
14. Bacteriological microscope (recording drum equipment for simple pharmacological demonstration)

4. Every institution shall maintain a museum of crude drugs specified in the course, preferably, also a herbarium of the same.

NB. If classes in pharmacognosy, pharmaceutical chemistry and physiology are held in the same laboratories as are used by departments of chemistry, botany, zoology, in a science college, the list B may not be separately required.