

**NATIONAL BOARD FOR TECHNICAL EDUCATION**

**NATIONAL DIPLOMA**

**HIGHER NATIONAL DIPLOMA**

**IN**

**PHARMACEUTICAL TECHNOLOGY**

**CURRICULUM AND COURSE SPECIFICATIONS**

**PLOT B BIDA ROAD P.M.B. 2239 KADUNA**

**2005**

## **NATIONAL DIPLOMA**

### **1.0 GOAL AND OBJECTIVES**

This programme is designed to produce pharmaceutical technicians who will assist in production processes in pharmaceutical and allied products manufacture as well as assist in carrying out identification and quality tests on such products.

At the end of the programme the diplomate should be able to:

- 1.1 Assist in production processes in pharmaceutical and allied products manufacture.
- 1.2 Maintain and install simple pharmaceutical wares.
- 1.3 Assist in carrying out identity and quality tests on drugs and allied products.
- 1.4 Obtain information on drugs and other pharmaceutical substances using official reference books.
- 1.5 Assist in preparing simple extemporaneous medicament in duly recognized pharmacies and hospitals.
- 1.6 Read and interpret medical prescriptions and when necessary dispense such prescriptions.

# **PHARMACEUTICAL TECHNOLOGY**

## **HIGHER NATIONAL DIPLOMA**

### **GOAL AND OBJECTIVES**

#### **GOAL**

This programme is designed to produce pharmaceutical technologists who can take part in industrial production of pharmaceuticals and allied products and carry out identification and quality tests on such products.

#### **OBJECTIVES**

At the end of the programme, the diplomate should be able to:

- 1.1 Take part in production processes in pharmaceutical and allied products manufacture.
- 1.2 Install and maintain pharmaceutical and allied products wares.
- 1.3 Carry out identification and quality tests on pharmaceuticals and allied products.
- 1.4 Obtain and analyse information on pharmaceutical substances using official reference books.
- 1.5 Prepare simple extemporaneous medicament in duly recognized pharmacies and hospitals.
- 1.6 Read and interpret medical prescriptions and when necessary dispense such prescriptions.
- 1.7 Market pharmaceutical wares and equipment.

## **2.0 Entry Requirements**

### **2.1 National Diploma**

The entry requirement into National Diploma Pharmaceutical Technology programme are as follows:-

[a] Four credit level passes in GCE “O” level or Senior Secondary School certificate (SSCE) at not more than two sittings.

The four subjects must include mathematics, chemistry, biology and any other subject Plus at least passes in physics and English Language.

[b] Four credit passes in an NBTE recognized preliminary National Diploma course offered in a Polytechnic or similar post secondary technical institution. The credit passes must include mathematics, chemistry, biology, physics.

### **2.2 Higher National Diploma**

The minimum entry requirement into the Higher National Diploma in Pharmaceutical Technology is as follows-

The National Diploma in Pharmaceutical Technology obtained from an accredited programmes, with at least lower credit pass or

In addition to [a], [b] and [c] above the candidate must have acquired not less than one year post ND cognate work experience.

In exceptional cases, ND diplomats with a pass (CGPA of 2.0 – 2.49) in the ND examination with two or more years of cognate experience in the specific field may be considered for admission into the HND programme.

### 3.0 Curriculum

3.1 The curriculum of all ND and HND programme consists of four main components. These are:

- I. General studies/education
- II. Foundation courses.
- III. Professional courses.
- IV. Supervised Industrial work experience scheme (SIWES).

3.2 The General education component shall include course in Art and Humanities – English Language, communication, History. These are compulsory. Mathematics and Science (for non-Science based programmes) Social Studies – Citizenship (the Nigerian constitution) Political science, sociology, Philosophy, geography, entrepreneurship Studies.

The courses in citizenship, entrepreneurship, Philosophy of Science and Sociology are compulsory. Physical and Health Education (one semester credit only).

3.3 The General Education component shall account for not more than 15% of total contact hours for the programme.

3.4 Foundation Courses include courses in Economics, Mathematics, Pure Sciences, Technical Drawing, Descriptive Geometry, and Statistics, etc. the number of hours will vary the programmes and may account for about 10 – 15% of the total contact hours.

3.5 Professional Courses are courses, which give the student the theory and practical skills he needs to practice his field of calling at the technical/technologists level.

3.6 Student Industrial work Experience Scheme (SIWES) shall be taken during vacation following the end of the second semester of the first year. See details of SIWES at paragraph 8.0

## **4.0 Curriculum Structure**

### **4.1 ND Programmes**

The structure of the ND programme consist of four semesters of classroom, laboratory and workshop activities in the college – and a semester (3 – 4 months) of supervised industrial work experience scheme (SIWES). Each semester shall be of 17 weeks duration made up as follows:

15 contact weeks of teaching, i.e. recitation, practical exercises quizzes, test, etc.; and

2 weeks for examinations and registration. SIWES shall take place at the end of the second semester of the first year.

### **4.2 HND Programme**

The structure of the programme is similar to that the ND save that the SIWES at the end of the first year is not compulsory.

## **5.0 Accreditation**

Each programme offered either at the ND or HND level shall be accredited by the NBTE before the diplomas can be awarded either of the two diploma certificates. Details about the process of accrediting a programme for the award of the ND or HND are available from the Executive Secretary, National Board for Technical Education, P. M. B. 2239, Kaduna, Nigeria.

## **6.0 Conditions for the award of the ND/HND**

Institutions offering accredited programmes will award the National diploma to candidates who successfully completed the programme after passing prescribed coursework, examinations, diploma project and the supervised industrial work experience. Such candidates should have completed a minimum of between 72 and 80 semester credit units depending on the programme.

Diplomas shall be classified as follows:

|              |   |                       |
|--------------|---|-----------------------|
| Distinction  | - | GPA of 3.50 and above |
| Upper Credit | - | GPA of 3.00- 3.49     |
| Lower Credit | - | GPA of 2.50 – 2.99    |
| Pass         | - | GPA of 2.00 – 2.49    |

## **7.0 Guidance note for Teachers Teaching the Programme.**

- 7.1 The new curriculum is drawing unit courses. This is keeping with the provisions of the National Policy on education which stress the need to introduce the semester credit units which will enable a student who so wish to transfer the units already completed in an institution of similar standard from which he is transferring.
- 7.2 In designing the units, the principles of the modular system by product has been adopted; thus making each of the professional modules, when completed provide the students with technician operative skills, which can be used for employment purposes.
- 7.3 As the success of the credit unit system depends on the articulation of programmes between the institutions and industry, the curriculum content has been written in the behavioral objectives, so that is clear to all, the special Learning objective of the student who successfully completed some of the courses or the diplomates of the programme. There is a slight departure in the presentation of the performance based curriculum which state categorically, the special learning objective for the students, also, there is a deliberate attempt to further involve the staff of the department teaching by having another column called Teachers activities. This is to ensure that the teachers deliver the required learning objectives. There is a third column for the Resources required for each learning objective. Each department is expected to develop its own teaching curriculum from this minimum Guide curriculum and ensure that the resources required are available. The Academic Board of the institution may vet departmental submission on the final curriculum. Our aim is to continue to see to it that a solid internal evaluation system exists in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the polytechnic system.

- 7.4 The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice in the ratio 50:50 or 60:40, or the reverse.

## **8.0 Guidelines on SIWES programme**

- 8.1 For the smooth operation of the SIWES, the following guidelines shall apply:  
Responsibility for placement of Students.

- [a] Institution offering the ND programme shall arrange to place the students in industry. By April 30 of each year, six copies of the master list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE which shall, in turn, authenticate the list and forward it to the Industrial Training Fund, Jos.
- [b] The Placement officers should discuss and agree with industries on the following:
  - I. A task inventory of what the student should be expected to experience during the period of attachment. It may be wise to adopt one already approved for each field.
  - II. The industry-based supervisor of the students during the period, likewise the institution based supervisor.
  - III. The evaluation of the student during the period. It should be noted that the final grading of the student during the period of attachment should be weighted more on the evaluation by his industry-based supervisor.

## **8.2 Evaluation of Student during the SIWES**

In the evaluation of the student, cognizance should be taken of the following items:

- [a] Punctuality
- [b] Attendance
- [c] General attitude to work



- [d] Respect for authority
- [e] Interest in the field/technical area
- [f] Technical competence as a potential technician in his field.

### **8.3 Grading of SIWES**

To ensure uniformity of grading scales, the institution should ensure that the uniform grading of students' work which has been agreed to by all polytechnics is adopted.

### **8.4 The Institution based Supervisor**

The institution-based supervisor should initial the log book during each visit. This will enable him to check and determine to what extent the objectives of the scheme are being met and to assist students having any problems regarding the specific given to them by their industry-based supervisor.

### **8.5 Frequency of visit**

Institutions should ensure that students placed on the attachment are visited within one month of their placement. Other visits shall be arranged so that:

- I. There is another visit six weeks after the first visit; and
- II. A final visit in the last month of the attachment.

### **8.6 Stipend for Students in SIWES**

The rate of stipend payable shall be determined from time to time by the Federal Government after due consultation with the Federal Ministry of Education, the Industrial Training fund and the NBTE.

### **8.7 SIWESD as a component of the Curriculum**

The completion of SIWES is important in the final determination of whether the student is successful in the programme or not. Failure in the SIWES is an indication that the student has not shown sufficient interest in the field or has no potential to become a skilled technician in his field. The SIWES should be graded on a fail or pass basis. Where a student has satisfied all other requirements but failed SIWES, he may only be allowed to repeat another four months SIWES at his own expense.

**National Board for Technical Education,  
Kaduna.  
2002**

**PHARMACEUTICAL TECHNOLOGY  
NATIONAL DIPLOMA  
YEAR I – SEMESTER I**

| COURSE  | COURSE TITLE                                       | L  | T  | P  | CU   | CH  | PRE-REQUISITE |
|---------|--|----|----|----|------|-----|---------------|
| STB 111 | Cell Biology                                       | 15 | -  | 45 | 3.0  | 60  |               |
| BCH 111 | General and Physical Chemistry                     | 30 | -  | 45 | 3.0  | 75  |               |
| BPH 111 | Mechanics and Properties of matter and Heat Energy | 30 | -  | 45 | 3.0  | 75  |               |
| MTH 112 | Algebra and Elementary Trigonometry                |    |    |    |      |     |               |
| CHE 111 | Introduction to Chemical Engineering and Processes | 30 | -  | -  | 2.0  | 30  |               |
| PTD 111 | Technical Drawing                                  | 30 | -  | -  | 2.0  | 30  |               |
| PCT 111 | Introduction to Pharmacology                       |    |    |    |      |     |               |
| GNS 101 | Use of English I                                   | 60 | -  | -  | 3.0  | 60  |               |
|         |  | 30 | 15 | -  | 3.0  | 45  |               |
|         |  | 45 | -  | -  | 2.0  | 45  |               |
|         | STB - Science Laboratory Technology                |    |    |    |      |     |               |
|         | BCH - Basic Sciences (Chemistry)                   |    |    |    |      | 420 |               |
|         | BPH – Basic Sciences (Physics)                     |    |    |    |      |     |               |
|         | MTH – Basic Sciences (Mathematics)                 |    |    |    | 21.0 | 420 |               |
|         | CHE – Chemical Engineering Technology              |    |    |    |      |     |               |
|         | PTD – Basic Science (Technical Drawing)            |    |    |    |      |     |               |
|         | GNS – General Studies                              |    |    |    |      |     |               |

**PHARMACEUTICAL TECHNOLOGY**  
**NATIONAL DIPLOMA**  
**YEAR I – SEMESTER II**

| COURSE  | COURSE TITLE   | L  | T | P  | CU  | CH  | PRE-REQUISITE |
|---------|--|----|---|----|-----|-----|---------------|
| BCH 121 | Organic and In organic chemistry                           | 30 | - | 45 | 30  | 75  |               |
| EGT 123 | Introduction to Water Treatment Technology                 | 15 | - | 30 | 2.0 | 45  |               |
| STM 211 | Introductory Microbiology                                  | 15 | - |    |     |     |               |
| CME 122 | Basic workshop practice                                    | 15 |   | 45 | 3.0 | 60  |               |
| COM 101 | Introduction to computing                                  | 60 | - | 30 | 40  | 90  |               |
| GLT 111 | General Laboratory Techniques                              |    |   | 45 | 3.0 | 60  |               |
|         | <u>Module</u>  |    | - |    |     |     |               |
|         | i. Care and maintenance of laboratory and simple equipment | -  |   | 15 | 1.0 | 15  |               |
|         | ii. Safety in the laboratory                               |    | - |    |     |     |               |
|         | iii. Preparation of laboratory and side shelf reagents     | -  | - |    |     |     |               |
|         | iv. Separation techniques and sample management            | -  |   | 15 | 1.0 | 15  |               |
| PCT 121 | Pharmaceutical calculations                                |    | - | 15 | 1.0 | 15  |               |
| GNS 102 | Communication in English                                   | -  | - |    |     |     |               |
|         |  | 15 | - | 15 | 1.0 | 15  |               |
|         |  | 45 |   | 30 | 3.0 | 45  |               |
|         |  |    |   | -  | 2.0 | 45  |               |
|         | FST – Food Technology                                      |    |   |    | 240 | 480 |               |
|         | GLT – General Laboratory Techniques                        |    |   |    |     |     |               |

**PHARMACEUTICAL TECHNOLOGY**  
**NATIONAL DIPLOMA**  
**YEAR II – SEMESTER I**

| COURSE  | COURSE TITLE                          | L  | T | P  | CU   | CH  | PRE-REQUISITE |
|---------|---------------------------------------|----|---|----|------|-----|---------------|
| FST 212 | Food Analysis                         | 30 | - | 45 | 3.0  | 75  |               |
| GLT 111 | General Laboratory Techniques         | -  | - | 15 | 1.0  | 15  |               |
|         | v.    Photography and audiovisuals    | -  | - | 15 | 1.0  | 15  |               |
|         | vi.   Vacuum techniques               | 30 | - | 45 | 3.0  | 75  |               |
| CME 212 | Unit Operations I                     | 15 | - | 45 | 2.0  | 60  |               |
| PCT 211 | Compounding I                         | 15 | - | 45 | 2.0  | 60  |               |
| PCT 212 | General Dispensing of Practice        | 15 | - | 35 | 2.0  | 45  |               |
| PCT 213 | Introduction to Drug quality control  | 30 | - | -  | 2.0  | 30  |               |
| COM 123 | Computer packages I                   | 15 | - | 60 | 30   | 75  |               |
| GNS 123 | Introduction to medical sociology     |    |   |    |      |     |               |
|         | STC – Science Laboratory Technology   |    |   |    | 21.0 | 375 |               |
|         | EHT – Environmental Health Technology |    |   |    | 16.0 | 450 |               |

**PHARMACEUTICAL TECHNOLOGY**  
**YEAR II – SEMESTER II**

| COURSE  | COURSE TITLE                    | L  | T | P  | CH   | CH  | PRE-REQUISITE |
|---------|---------------------------------|----|---|----|------|-----|---------------|
| CHE 222 | Unit Operations II              | 30 | - |    | 20   | 30  |               |
| FST 215 | Food Microbiology               | 15 | - | 45 | 3.0  | 60  |               |
| COM 215 | Computer application package II | -  | - | 90 | 4.0  | 95  |               |
| PCT 221 | Pharmacy laws and ethics        | 15 | - | -  | 1.0  | 15  |               |
| PCT 222 | Seminar                         | 15 | - | -  | 1.0  | 15  |               |
| PCT 223 | Project                         | -  | - | -  | 6.0  |     |               |
|         |                                 |    |   |    | 17.0 | 285 |               |
|         |                                 |    |   |    | 18.0 | 215 |               |

**PHARMATICAL TECHNOLOGY**  
**HIGHER NATIONAL DIPLOMA**  
**YEAR I –SEMESTER I**

| <b>COURSE</b> | <b>COURSE TITLE</b>                    | <b>L</b> | <b>T</b> | <b>P</b> | <b>CU</b> | <b>CH</b> | <b>PRE-REQUISITE</b> |
|---------------|--|----------|----------|----------|-----------|-----------|----------------------|
| COM 311       | Computer Programming                   | 15       | -        | 45       | 3.0       | 60        |                      |
| STM 413       | Pharmaceutical Microbiology            | 15       | -        | 45       | 3.0       | 60        |                      |
| GLT 301       | Laboratory Management                  | 30       | -        | -        | 2.0       | 30        |                      |
| STY 312       | General Principles of Pharmacology I   | 15       | -        | 45       | 2.0       | 60        |                      |
| PCT 311       | Good Manufacturing Practice            | 30       | -        | 45       | 3.0       | 75        |                      |
| PCT 312       | Pharmaceutical and Medicinal Chemistry | 30       | -        | 60       | 4.0       | 90        | STC 313              |
| GNS 111       | Use of English III                     | 30       | -        | -        | 2.0       | 30        |                      |
|               | <b>TOTAL</b>                           |          |          |          | 19.0      | 405       |                      |

**COM – Computer**

**STY – science Laboratory Technology**

**PHARMATICAL TECHNOLOGY**  
**HIGHER NATIONAL DIPLOMA**  
**YEAR I –SEMESTER II**

| <b>COURSE</b> | <b>COURSE TITLE</b>                   | <b>L</b> | <b>T</b> | <b>P</b> | <b>CU</b> | <b>CH</b> | <b>PRE-REQUISITE</b> |
|---------------|---------------------------------------|----------|----------|----------|-----------|-----------|----------------------|
| GLT 302       | Instrumentation (general)             | 15       | -        | 30       | 2.0       | 45        |                      |
| STH 301       | Biochemical Method                    | 15       | -        | 90       | 2.0       | 105       |                      |
| STC 313       | Organic Chemistry                     | 15       | -        | 30       | 2.0       | 45        |                      |
| STM 312       | Microbiological Techniques            | 15       | -        | 30       | 2.0       | 45        |                      |
| STY 321       | General Principles of Pharmacology II | 15       | -        | 30       | 2.0       | 45        |                      |
| PCT 321       | Tablets, Capsules and Solid Dosages   | 30       | -        | 60       | 4.0       | 90        |                      |
| GNS 302       | Communication in English III          | 30       | -        | -        | 2.0       | 30        |                      |
|               | <b>TOTAL</b>                          |          |          |          | 18.0      | 375       |                      |



**PHARMATICAL TECHNOLOGY**  
**HIGHER NATIONAL DIPLOMA**  
**YEAR I1-SEMESTER I**

| <b>COURSE</b> | <b>COURSE TITLE</b>                            | <b>L</b> | <b>T</b> | <b>P</b> | <b>CU</b>   | <b>CH</b>  | <b>PRE-REQUISITE</b> |
|---------------|--|----------|----------|----------|-------------|------------|----------------------|
| GLT 303       | Biological and Chemical Instrumentation        | 30       | -        | 45       | 3.0         | 75         |                      |
| STY 412       | Clinical Pharmacology I                        | 30       | -        | 45       | 3.0         | 75         |                      |
| STY 423       | General Principles of Pharmacology II          | 15       | -        | 45       | 3.0         | 60         |                      |
| PCT 411       | Liquid and Semi-liquid Pharmaceutical Products | 30       | -        | 45       | 3.0         | 75         |                      |
| PCT 412       | General and Hospital Dispensing Practice       | 15       | -        | -        | 1.0         | 15         |                      |
| GNS 420       | Industrial Management                          | 30       | -        | 60       | 4.0         | 50         |                      |
|               | <b>TOTAL</b>                                   |          |          |          | <b>17.0</b> | <b>350</b> |                      |

**PHARMATICAL TECHNOLOGY**  
**HIGHER NATIONAL DIPLOMA**  
**YEAR I I–SEMESTER II**

| <b>COURSE</b> | <b>COURSE TITLE</b>                             | <b>L</b> | <b>T</b> | <b>P</b> | <b>CU</b> | <b>CH</b> | <b>PRE-REQUISITE</b> |
|---------------|---|----------|----------|----------|-----------|-----------|----------------------|
| STH 404       | Forensic Biochemistry                           | 15       | -        | 30       | 2.0       | 45        |                      |
| PCT 421       | Antimicrobial agents                            | 30       | -        | 60       | 4.0       | 90        |                      |
| PCTY 422      | Chemical Sterilants                             | 15       | -        | 45       | 2.0       | 60        |                      |
| PCT 423       | Infusions, Injections, Aseptic/Sterile Products | 30       | -        | 60       | 4.0       | 90        |                      |
| PC T 424      | Quality Control Techniques                      | 30       | -        | 45       | 3.0       | 75        |                      |
| PCT 424       | Seminar   | 15       | -        | -        | 1.0       | 15        |                      |
| PCT 425       | Research Project                                | -        | -        | -        | 6.0       |           |                      |
| GNS 402       | Literary Appreciation Oral Compresition         | 30       | -        | -        | 2.0       | 30        |                      |
|               | <b>TOTAL</b>                                    |          |          |          | 24.0      | 405       |                      |

PROGRAMME: Pharmaceutical Technology National Diploma

COURSE: Introduction to Pharmacology

CODE: PCT 111

DURATUON (Hours/Week): Lecture: 2 Tutorial: 1 Practicals: 0

UNITS: 2.0

GOAL: This course is designed to provide students with knowledge of how drugs act on living cells.

General Objectives: On completion of this course, the diplomate will be able to:

**1.0** Know basic principles involved in Pharmacology.

**2.0** Know the principles of drug administration, adsorption, distribution and excretion

**3.0** Know mechanism of drug action in the body

|   |   |   |                                      |
|---|---|---|--------------------------------------|
| PROGRAMME: Pharmaceutical Technology: Nation Diploma  |   |   |                                      |
| COURSE CODE/TITLE PCT 111 Introduction to Pharmacology Theory only                            |   |   |                                      |
| Course Specification Provide the students with the knowledge of how drugs act on living cells |   |   |                                      |
| WEEK <b>General Objective 1.0</b> Know basic principles involved in Pharmacology              |   |   |                                      |
|   | Special Learning Objective:   | Teaching Learning Activities                                | Resources                            |
|   | <b>BASIC PRINCIPLES IN PHARMACOLOGY</b>   |   |                                      |
|   | 1.1 Define Pharmacology.  |   |                                      |
|   | 1.2 Explain the broad divisions of pharmacology thus:-<br><br>(i) Pharmacokinetics and<br>(ii) Pharmacodynamics |   |                                      |
|   | 1.3 Explain Pharmacotherapeutics and Toxicology   |   |                                      |
|   | 1.4 List sources of drugs (plants, animal, mineral, synthetic and semi-synthetic                                | Shows students some medicinal plants, animals mineral, etc. | Samples of medicinal plants animals. |
|   | 1.5 Explain basic for drug classification.  |   |                                      |
|   | 1.6 Classify common drugs based on the criteria in 1.5 above.   | Show students extraction equipment.                         | Extractions equipment                |
|   | 1.7 Explain in outline the form of occurrence of drug substances in plants, animal.                             |   |                                      |
|   | 1.8 Describe an outline methods of extraction of drug substances of plant and animal origin                     |   |                                      |

|  |  |                                  |              |
|--|--|----------------------------------|--------------|
|  | 1.9 Extract medicinal portions from common local plants.   | Supervise extraction practicals. |              |
| <b>General Objective 2.0</b> Know the principles of drug administration, adsorption distribution and excretion |  |                                  |              |
|  | Special Learning Objective:  | Teaching Learning Activities     | Resources    |
|  | 2.1 Identify common routes of drugs administration with special emphasis on oral, intravenous intramuscular and subcutaneous.  | Use human models                 | human models |
|  | 2.2 Identify other routes of drug administration e.g. sublingual rectal, intraperitoneal etc.  | Use human models                 | human models |
|  | 2.3 List factors that influence the choice of route of drug administration e.g. pharmacokinetic principles of drugs absorption in the body, Pharmacokinetic principles of drugs distribution in the body. Excretion from the body ways of drug metabolism in the body. | Use human models                 | human models |
|  | 2.4 .Describe the forms of the drugs that may be administered through the routes listed in 2.1 and 2.2 above.  |                                  |              |
|  | 2.5 Describe methods of drug absorption in the body.   | Use human modules                | human models |
|  | 2.6 Describe methods of drugs distribution in the body.  | Use human models                 | human models |

|  |      |   |                  |              |
|--|------|---|------------------|--------------|
|  | 2.7  | Identify routes and methods of drug excretion from the body.                            | Use human models | human models |
|  | 2.8  | Explain Metabolism of drugs   |                  |              |
|  | 2.9  | Describe various ways of drug metabolism in the body                                    |                  |              |
|  | 2.10 | Describe the passage of drugs across the cell membrane.                                 |                  |              |
|  | 2.11 | Describe active and passive diffusion of drugs across a cell membrane.                  |                  |              |
|  | 2.12 | Explain how the various routes affect absorption and distribution of drugs.             |                  |              |
|  | 2.13 | Explain factors that affect absorption distribution, metabolism and excretion of drugs. |                  |              |

**General Objective 3.0** Know mechanism of drug action in the body

|  |                                   |  |  |                    |
|--|-----------------------------------|--|--|--------------------|
|  | <b>Pharmacodynamic Principles</b> |  |  |                    |
|  | 3.1                               | Identify various mechanism of drug action in the body.           | Demonstrate drug actions using laboratory animals. | Laboratory animals |
|  | 3.2                               | Explain receptor and non-receptor action of drugs with examples. |  |                    |

|  |   |  |  |
|--|---|--|--|
|  | 3.3 Define agonist, partial agonist, antagonist, potentiation synergism, etc. |  |  |
|  | 3.4 Explain drug potentiation and antagonism in a biological system.          |  |  |
|  | 3.5 Explain close-response relationship.                                      |  |  |
|  | 3.6 Define dose, concentration and response/effect.                           |  |  |
|  | 3.7 Explain graded and quantal responses.                                     |  |  |
|  | 3.8 Distinguish between affinity and potency of a drug.                       |  |  |

### PRACTICAL CONTENTS

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES  | RESOURCES             |
|------|---|--|-----------------------|
|      | 1.6 Classify common drugs based on the criteria in 1.5 above.<br>1.9 Extract medicinal portions from common local plants. | Show students extraction equipment.<br>Supervise extraction practicals | Extractions equipment |

PROGRAMME: PHARMACEUTICAL TECHNOLOGY: NATIONAL DIPLOMA  
COURSE: PHARMACEUTICAL CALCULATIONS  
CODE: PCT 121  
DURATION (Hour/Week): Lecture: 1            Tutorials: 0            Practicals: 3  
UNITS: 2.0  
GOAL: This course is designed to enable the diplomate determine accurate dosage in drug preparation.

General Objective: On completion of this course, the student will be able to:

- 1.0 Know how to calculate the percentage strength of a preparation
- 2.0 Know the use of aliquot proportion in dilution of small quantities
- 3.0 Know calculations for aliquot proportion in dilution of small quantities.
- 4.0 Know the art of weighing and measurement
- 5.0 Know methods of filtration and straining
- 6.0 Know how to make solutions



|                                      |  |  |                                    |
|--------------------------------------|--|--|------------------------------------|
| PROGRAMME: Pharmaceutical Technology |  |  |                                    |
| Course: Pharmaceutical Calculations  |  | Course Code: PCT 121                                     | Contact Hours: Hrs (Units) 45      |
| WEEK                                 | General Objectives: THIS COURSE IS DESIGNED TO ENABLE THE STUDENT DETERMINE ACCURATE DOSAGE IN DRUGS PREPARATION   |  |                                    |
|                                      | Special Learning Objective:  | Teachers Activities                                      | Resources                          |
| WEEK                                 | General Objective: 1.0 Know how to calculate the percentage strength of a preparation  |  |                                    |
|                                      | Special Objective  | Teachers Activities                                      | Resources                          |
| 1-2                                  | <p>1.1 Explain strength of a solution as parts of dissolved substance in parts of solution<br/>e.g. 1 in 4,000 = <math>\frac{1}{4000} \times 100/1 = 1/40 = 0.025\%</math></p> <p>1.2 Explain the formula for weight in volume (W/V) solution as Solid 1 part by weight.</p> <p>1.3 Explain 1% solution as 1g of solution in 100ml i.e. 1g in 100ml = 1%</p> <p>1.4 Explain the equivalent weight of solute<br/>W/W mixtures of solids with solids<br/>V/V solution of liquid in liquid.</p> | <p>Demonstrate portions admixture</p> <p>Assignments</p> | <p>Scales, measuring cylinders</p> |

| General Objective: 2.0 Know the use of aliquot proportion in dilution of small quantities |  |                              |            |
|---|--|------------------------------|------------|
|   | Special Objective  | Teachers Activities          | Resources. |
| 3-4   | 2.1 Explain small quantities in powders by dilution using aliquot portion of diluents e.g. lactose 1 in 10 or 1 in 1000. | Demonstrate 2.1 for students | Glasswares |
|   | 2.2 Explain aliquot portions of solution as 1 in 1000 or 0.1g in 100ml = 100mg in 100ml.                                 | Demonstrate 2.2              | Glasswares |
|   | 2.3 Define aliquot portions in powders and solution as powders aliquot titration.  |                              |            |

| General Objective: 3.0 Know calculations for aliquot proportion in dilution of small quantities. |                   |                     |            |
|--|-------------------|---------------------|------------|
|  | Special Objective | Teachers Activities | Resources. |
|  |                   |                     |            |

|     |  |  |  |
|-----|--|--|--|
| 5-6 | <p>3.1 Define calculation on bulk preparations as scaling up, scaling down</p> <p>3.2 Explain dilution and dilution factor</p> <p>3.3 Calculate from experimental data. degree of dilution to determine required volume from concentrate.</p> <p>3.4 Identify homogeneous mixtures, heterogeneous mixtures.</p> <p>3.5 Produce homogeneous and heterogeneous mixtures, using mortar and pestle.</p> <p>3.6 Classify mixtures as<br/> Mixtures of solids<br/> Mixtures of liquid and solid<br/> Mixture containing semi solids.<br/> Mixture of liquids</p> <p>3.7 Explain the contribution of incorrect mixing on incorrect dosage</p> | <p>Show students homogenous and heterogeneous mixture and show the different</p> <p>Supervise practicals<br/> Identification of mixtures</p> | <p>Homogeneous<br/> Heterogeneous mixture</p> <p>Mortar, pestle solvents, glassware.</p> |
|-----|--|--|--|

| General Objective: 4.0 Know the technique of weighing and measurement |                   |   |                                       |                      |
|---|-------------------|---|---------------------------------------|----------------------|
|   | Special Objective | Teachers Activities   | Resources.                            |                      |
| 7-8   | 4.1               | Identify various methods of weighing and measuring.   | Scales, measuring cylinders, balances |                      |
|   | 4.2               | Weigh and measure substances using. Various weighing instruments.                                   |                                       |                      |
|   | 4.3               | Identify true and false meniscus.   |                                       | Supervise practicals |
|   | 4.4               | Identify correct holding of bottle with medicament during weighing.                                 |                                       |                      |
|   | 4.5               | Align the bottom of meniscus with graduation line for accurate measure of volume between graduation |                                       | Supervise practicals |

| General Objective: 5.0 Know methods of filtration and straining |   |                                      |                     |
|---|---|--------------------------------------|---------------------|
|   | Special Objective   | Teachers Activities                  | Resources.          |
| 9-10  | 5.1 Describe types of filtration coarse filtration, fine filtration                     | Demonstrate filtration for students. | Filters             |
|   | 5.2 Identify materials for the types of filtrations in 5.1 above.                       | Supervise filtration.                | Filters             |
|   | 5.3 Filter various liquids and mixtures using the materials and equipment in 5.2 above. | Supervise practicals.                | Filters glasswares. |
|   | 5.4 Reduce the viscosity of a given liquid using a filtration medium of high porosity.  |                                      | Filtration medium   |

|       |   |   |                       |
|-------|---|---|-----------------------|
|       | General Objective: 6.0 Know how to make solutions   |   |                       |
| 11-12 | Special Learning Objective  | Teachers Activities                           | Resources.            |
|       | 6.1 Define solution as a process of mass transfer.  |   |                       |
|       | 6.2 Describe the processes of finely powdering solid, agitation; elevating the temperature of the liquid to increase the rate of solubility of the solid. |   |                       |
|       | 6.3 Prepare the following solutions and adjust to the volume<br>Mist magnesium trisilicate;<br>Calamine lotion;<br>Linctuses                              | Supervise Practical preparation of solutions. | Laboratory glasswares |

### PRACTICAL CONTENTS

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES                              | RESOURCES                             |
|------|--|--|---------------------------------------|
|      | 3.3 Calculate from experimental data, degree of dilution to determine required volume. From concentrate<br>3.5 Produce homogeneous and heterogeneous mixtures, using mortar and pestle | Demonstrate weighing and measuring for students. | Scales, measuring cylinders, balances |

|  |   |   |  |
|--|---|---|--|
|  | <p>4.1 Identify various methods of weighing and measuring.</p> <p>4.2 Weigh and measure substances using Various weighing instruments.</p> <p>4.3 Identify true and false meniscus.</p> <p>4.4 Identify correct holding of bottle with medicament during weighing.</p> <p>4.5 Align the bottom of meniscus with graduation line for accurate measure of volume between graduation</p> <p>5.2 Identify materials for the types of filtrations in 5.1 above.</p> <p>5.3 Filter various liquids and mixtures using the materials and equipment in 5.2 above.</p> <p>5.4 Reduce the viscosity of a given liquid using a filtration medium of high porosity.</p> <p>6.3 Prepare the following solutions and adjust to the volume<br/> Mist magnesium trisilicate;<br/> Calamine lotion;<br/> Linctuses</p> | <p>Supervise practicals</p> <p>Supervise practicals</p> |  |
|--|---|---|--|

PROGRAMME: PHARMACEUTICAL TECHNOLOGY: NATIONAL DIPLOMA

COURSE: COMPOUNDING 1

CODE: PCT 211

DURATION (HOURS/WEEK) Lectures 1 Tutorials 0 Practicals 3

UNITS: 2.0

GOAL: This course is designed to enable the diplomate understand and carry out basic compounding operations.

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Know the fundamental operations in compounding.
- 2.0 Know the technologies of size reduction and size separation.
- 3.0 Know the techniques and operation of dispensing balances.
- 4.0 Carry out basic compounding operations.
- 5.0 Know the basic equipment requirement for a hospital compounding unit.
- 6.0 Know construction requirements of a hospital compounding unit.
- 7.0 Know the basis and selection procedure for galenicals used in the formulation of preparations in compounding unit



|   |   |   |   |
|---|---|---|---|
| Programme: Pharmaceutical Technology National Diploma                                       |   |   |   |
| Course: Compounding I   |   | Code: PCT 211   | Duration 1 – 0 – 3 (30 Hrs)                             |
| Course Objectives: To enable student understand and carry out basic compounding operations. |   |   |   |
| WEEK  | General Objectives: 1.0 Know the fundamental operations in compounding.   |   |   |
|   | Specific (Performance) Objectives   | Teachers Activities   | Resources   |
| 1   | <p>Fundamental Operations in Compounding</p> <p>1.2 Identify units of measurement for solid Substances.</p> <p>1.3 Weigh of solid and liquids</p> <p>1.4 Identify units of measurement for liquids substances;</p> <p>1.5 Identify apparatus used for liquid measurement;</p> <p>1.6 Calculate accuracy of weights/volumes;</p> <p>1.7 Carry out basic proportional calculations and allegations of quantities.</p> <p>1.8 Carry out compounding operations using official references on brake and Manu graph</p> | <p>Show students various scales</p> <p>Show various measuring cylinders/<br/>Glassware</p> <p>Supervise compounding practicals.</p> | <p>Weighing scales</p> <p>Glassware</p> <p>Utensils</p> |

| General Objectives 2.0 Know the technologies of size reduction and size separation |     |   |  |                      |
|--|-----|---|--|----------------------|
| 2  | 2.1 | Explain the concept of size reduction.  | Show students instrument and equipment | Setters, series etc. |
|  | 2.2 | Identify instruments and equipment use in size reduction in compounding e.g. mortars.           |  |                      |
|  | 2.3 | Reduce particle size using homogenizers, mills e.g. the equipment and instruments in 2.2 above. | Supervise practicals                   | Mills, homogenizers  |
|  | 2.4 | Describe different methods for determining particle size.                                       |  |                      |
|  | 2.5 | Determine particle size by any of the methods in 2.4 above.                                     | Supervise practicals                   |                      |

| General Objectives 3.0 Know the techniques and operation of dispensing balances |     |   |  |                      |
|---|-----|---|--|----------------------|
| 3   | 3.1 | Classify different weighing instruments (pan, analytical, top loading, beam, chain balances, etc.). | Show students various weighing instruments | Weighing instruments |
|   | 3.2 | Weigh compounding substances using weighing balances;.  | Supervise weighing practicals              | "                    |
|   | 3.3 | Calibrate of weighing balances  | "  | "                    |
|   | 3.4 | Services of weighing balances.  | "  | "                    |

General Objectives 4.0 Carry out basic compounding operations

|   |   |   |   |
|---|---|---|---|
| 4 | <p>4.1 Describe the techniques of trituration of solid with solid substances.</p> <p>4.2 Prepare divided powders.</p> <p>4.3 Prepare effervescent powders.</p> <p>4.4 Prepare bulk powders, dusting powders, etc</p> <p>4.5 Package and label of powders;</p> <p>4.6 Describe the techniques of mixing solids and liquids substances.</p> <p>4.7 Mix solid and liquid substances.</p> <p>4.8 Describe the techniques of mixing liquids substances.</p> <p>4.9 Mix liquid substances applying the techniques in 4.8 above.</p> | <p>Demonstrate technique for students</p> <p>Supervise practicals<br/>4.2 – 4.5<br/>4.7 and 4.9</p> | <p>Utensils</p> <p>Packaging and labeling machines</p> <p>Mixing machine.</p> |
|---|---|---|---|

General Objectives: 5.0 Know the basic equipment requirement for a hospital compounding unit

|   |  |  |   |
|---|--|--|---|
| 5 | <p><b>Hospital Compounding Unit</b></p> <p>5.1 Explain the criteria for selection of basic compounding apparatus for hospital compounding</p> <p>5.2 Identify types and unit quantities of weighing and measuring equipments for hospital compounding.</p> <p>5.3 Identify types and quantities of size reduction equipment for hospital compounding.</p> <p>5.4 Identify types and sizes of water production equipment in hospital compounding</p> <p>5.5 Identify types and sizes of product filling and distribution apparatus in hospital compounding</p> <p>5.6 Identify types of glass wares for compounding operations</p> <p>5.7 Select containers and other packaging materials for the preparations.</p> <p>5.8 Describe the placement and arrangement of equipment in the compounding unit.</p> | <p>List the requirements with examples</p> <p>Show the reframe 5.2 – 5.6 to students to make sketches.</p> | <p>ST2</p> <p>Equipment for size reduction water production falling apparatus compounding</p> <p>Glassorares</p> <p>Packaging</p> <p>Waterrals.</p> |
|---|--|--|---|

General Objectives 6.0 Know construction requirements of a hospital-compounding unit.

|   |     |  |   |                   |
|---|-----|--|---|-------------------|
| 6 | 6.1 | Outline the set up of a compounding unit.  | Show a sketch of a compounding unit                   | Compounding unit  |
|   | 6.2 | Describe the location and size of compounding room in relation to other units of the pharmacy. |   |                   |
|   | 6.3 | Describe the requirements for floor construction and maintenance in a compounding unit.        |   |                   |
|   | 6.4 | Describe the wall construction and furnishing of a compounding unit                            | Lead students on a visit to hospital compounding unit | Compounding unit. |
|   | 6.5 | Identify types of slabs, benches and furnishings for a compounding unit.                       |   |                   |
|   | 6.6 | Describe types of provisions ventilation and air control considerations in a compounding unit. |   |                   |

General Objectives 7.0 Know the basis and selection procedure for galenicals used in the formulation of preparations in compounding unit

|  |     |  |  |                           |
|--|-----|--|--|---------------------------|
|  | 7.1 | Identify the nature and size of products for preparation in compounding unit.              | Show students various sizes of products for compounding. | Products for compounding. |
|  | 7.2 | Identify galenicals and other chemicals required for different extemporaneous preparation. |  |                           |
|  | 7.3 | Select galenicals and other chemicals for different  |  | Galenicals.               |

|   |     |   |  |  |
|---|-----|---|--|--|
| 7 |     | extemporaneous stock control and purchasing processes.  |  |  |
|   | 7.4 | State various galenicals for extemporaneous preparation * storage consideration of galenicals and finished. |  |  |
|   | 7.5 | Store various galenicals for extemporaneous preparations.   |  |  |
|   | 7.6 | Select monographs and compilation of formularies.   |  |  |

**PRACTICAL CONTENTS**

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES              | RESOURCES          |
|------|---|----------------------------------|--------------------|
|      | 1.3 Weigh of solid and liquids  |                                  |                    |
|      | 1.5 Identify apparatus used for liquid measurement;   |                                  |                    |
|      | 1.8 Carry out compounding operations using official references on brake and Manu graph              | Supervise compounding practicals | Utensils           |
|      | 2.2 Identify instruments and equipment use in size reduction in compounding e.g. mortars.           |                                  |                    |
|      | 2.3 Reduce particle size using homogenizers, mills e.g. the equipment and instruments in 2.2 above. | Supervise practicals             | Mills homogenizers |

|  |   |  |                                     |
|--|---|--|-------------------------------------|
|  | 3.2 Weigh compounding substances using weighing balances  | Supervise weighing practicals                            | ”                                   |
|  | 3.3 Calibrate of weighing balances  | ”  | ”                                   |
|  | 3.4 Services of weighing balances   | ”  | ”                                   |
|  | 4.2 Prepare divided powders.  | Supervise practicals<br>42 – 45                          | Packaging and labeling<br>machines  |
|  | 4.3 Prepare effervescent powders.   | 47 and 49  |                                     |
|  | 4.4 Prepare bulk powders, dusting powders, etc  |  |                                     |
|  | 4.5 Package and label of powders;   |  |                                     |
|  | 4.7 Mix solid and liquid substances.  |  |                                     |
|  | 4.9 Mix liquid substances applying the techniques in 4.8 above.                                       |  |                                     |
|  | 5.2 Identify types and unit quantities of weighing and measuring equipments for hospital compounding. | Show the reframe<br>52 – 56 to students to make sketches | Glassware<br>Packaging<br>Materials |
|  | 5.3 Identify types and quantities of size reduction equipment for hospital compounding.               |  |                                     |
|  | 5.4 Identify types and sizes of water production equipment in hospital compounding                    |  |                                     |
|  | 5.5 Identify types and sizes of product filling and   |  |                                     |

|  |  |   |                                 |
|--|--|---|---------------------------------|
|  | <p>distribution apparatus in hospital compounding</p> <p>5.6 Identify types of glass wares for compounding operations</p> <p>5.7 Select containers and other packaging materials for the preparations.</p> <p>6.5 Identify types of slabs, benches and furnishings for a compounding unit</p> <p>7.1 Identify the nature and size of products for preparation in compounding unit.</p> <p>7.2 Identify galenicals and other chemicals required for different extemporaneous preparation.</p> <p>7.3 Select galenicals and other chemicals for different extemporaneous stock control and purchasing processes..</p> <p>7.5 Store various galenicals for extemporaneous preparations.</p> | <p>Show students various sizes of products for compounding.</p> | <p>Products for compounding</p> |
|--|--|---|---------------------------------|



PROGRAMME: PHARMACEUTICAL TECHNOLOGY: NATIONAL DIPLOMA

COURSE: GENERAL DISPENSING PRACTICE

CODE: PCT 212

DURATION (HOURS/WEEK) Lectures 1 Tutorials 0 Practical 3

UNITS: 2.0

GOAL: This course is designed to provide the student with a basic knowledge of general hospital dispensing practice

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Know the scope of hospital dispensing practice.
- 2.0 Know the history of pharmacy practice in Nigeria.
- 3.0 Understand the difference between dispensing and prescription.
- 4.0 Know how to interpret prescriptions.
- 5.0 Know general dispensing procedures.
- 6.0 Know different kinds of containers for dispensing.
- 7.0 Know different kinds of container labels.
- 8.0 Know preparations used in extemporaneous dispensing.
- 9.0 Understand the dosage and uses of galenicals in the laboratory.
- 10.0 Know doses of dispensed products.
- 11.0 Understand methods of preparation and uses of emulsifying agents.
- 12.0 Know how to prepare oral unit dosage forms.
- 13.0 Know preparation of ointments pastern and jells.
- 14.0 Know how to prepare suppositions and pastries

|  |  |  |                                    |
|--|--|--|------------------------------------|
| PROGRAMME: Pharmaceutical Technology: National Diploma   |  |  |                                    |
| General Dispensing Practice:   |  | Code: PCT 212  | Duration 60 Hours                  |
| Course: This course is designed to provide the student with knowledge of general hospital dispensing practice. |  |  |                                    |
| WEEK   | General Objectives: 1.0 Know the scope of hospital dispensing practice     |  |                                    |
| 1  | Specific Objectives  | Teacher Activities   | Resources                          |
|  | 1.1 Define dispensing as provided in the Pharmacy and Poisons Act of 1993. | Explain with a sketch and organogram of hospital dispensary. | Hospital dispensary prescriptions. |
|  | 1.2 Outline the scope and components of hospital dispensing.               |  |                                    |
|  | 1.3 Differentiate between dispensing and compounding.                      |  |                                    |
|  | 1.4 Explain prescription as covered by law.                                |  |                                    |
|  | 1.5 Outline the general principles of dispensing a prescription.           |  |                                    |

| General Objective 2.0 Know the history of pharmacy practice in Nigeria |   |                                 |             |
|--|---|---------------------------------|-------------|
| 2  | 2.1 Outline the history of pharmacy practice in Nigeria.<br>2.2 Outline the legislature covering pharmacy practice in Nigeria<br>2.3 Outline the organogram of a hospital pharmacy<br>2.4 Outline the organogram of a community pharmacy.<br>2.5 Identify hospital pharmacy personnel and their functions | Provide copy of the legislature | Copy of Law |

| General Objective 3.0 Understand the difference between dispensing and prescription. |   |  |                      |
|--|---|--|----------------------|
| 3  | 3.1 Define dispensing.<br>3.2 Define prescription.<br>3.3 Identify parts of a prescription.<br>3.4 Explain the role of the following n dispensing and prescription<br>Medical practitioner<br>Veterinary surgeon<br>Pharmacist<br>Pharmaceutical technologist<br>Pharmacy assistant | Show students descriptions for interpretation. | Sample Prescriptions |

|  |                 |  |  |
|--|-----------------|--|--|
|  | Nurse attendant |  |  |
|--|-----------------|--|--|

General Objective 4.0 Know how to interpret prescriptions

|   |  |                              |       |
|---|--|------------------------------|-------|
| 4 | 4.1 Explain Latin terms used in prescription.  | Use samples of prescriptions | Chart |
|   | 4.2 Identify prescribed drugs and doses.   |                              |       |
|   | 4.3 Explain other instruction on a prescription e.g. method of administration<br>Duration of treatment                 |                              |       |
|   | 4.4 Identify route of administration e.g. through mouth, ear, eye, anus skin injection, intramuscular intravenous etc. |                              |       |
|   | 4.5 Identify parts of the body to which preparation is to be applied of for external use                               |                              |       |

General Objective 5.0 Know general dispensing procedures.

|   |   |                             |               |
|---|---|-----------------------------|---------------|
| 5 | 5.1 Explain general dispensing procedures.                                      | Show students reframe books | Reframe books |
|   | 5.2 Identify hygienic factors for reducing contamination of dispensed products. |                             |               |
|   | 5.3 Obtain dispensing information from reference                                |                             |               |

|  |   |  |  |
|--|---|--|--|
|  | books.  |  |  |
|  | 5.4 Identify possible risk of errors in dispensing. |  |  |

**General Objective 6.0 Know different kinds of containers for dispensing.**

|   |  |   |                   |
|---|--|---|-------------------|
| 6 | 6.1 Identify desirable features of containers for dispensing e.g. easy to clean and sterilize, non coercers etc.     | Explain features with samples of containers | Container samples |
|   | 6.2 Identify dispensing containers that could be airtight, security closed, hermetically sealed.                     | "   | "                 |
|   | 6.3 Identify materials that could be used for making dispensing containers e.g. glass, plastic rubber, metal         | "   | "                 |
|   | 6.4 Describe other methods of packaging prescription other than in containers e.g. paper wrappings plastic bags etc. | "   | "                 |

**General Objective 7.0 Know different kinds of containers for labels.**

|   |   |  |                   |
|---|---|--|-------------------|
| 7 | 7.1 Explain labeling.   | Show types of labels and labeling machines | Labeling machines |
|   | 7.2 Identify types of labeling.   |  |                   |
|   | 7.3 Identify information that should be on a label e.g. dosage; route of administration; contraindication; expiring date; shelf life; storage conditions, disposal methods etc. |  |                   |

|  |   |  |  |
|--|---|--|--|
|  | 7.4 Dispose drugs following 6.1 – 6.7 above.<br>7.5 Explain proper name label and proper name |  |  |
|--|---|--|--|

| General Objectives 8.0 Know preparations used in extemporaneous dispensing |  |  |   |
|--|--|--|---|
| 8  | 8.1 Explain extemporaneous preparations.   | Show samples of extemporaneous preparation | Extemporaneous preparations             |
|  | 8.2 Identify examples of extemporaneous preparations.                                    |  |   |
|  | 8.3 Explain the effect of light on extemporaneous preparations.                          |  |   |
|  | 8.4 Describe methods of protecting extemporaneous preparations from light.               | Demonstrate 8.3 – 8.5 for students         | Chemical Science<br>Pharmacy laboratory |
|  | 8.5 Protect extemporaneous preparations from light.                                      |  |   |
|  | 8.6 Describe methods of extraction in extemporaneous preparations.                       | Show preparations affected by light        |   |
|  | 8.7 Identify alcoholic and aqueous extemporaneous preparations.                          | Lectures and Practicals                    |   |
|  | 8.8 Explain uses of water, tinctures, spirit, and extract in extemporaneous preparation. |  |   |
|  | 8.9 Assist in preparing various extemporaneous preparations for dispensing.              | Supervise practicals                       |   |

| General Objective 9.0 Understand the dosage and uses of galenicals in the laboratory |     |   |                            |            |
|--|-----|---|----------------------------|------------|
| 9  | 9.1 | Explain galenicals.   | Show samples of galeticals | Galeticals |
|  | 9.2 | List various galenicals                                       |                            |            |
|  | 9.3 | Explain uses of powders.                                      |                            |            |
|  | 9.4 | Identify poisons and non poisons.                             |                            |            |
|  | 9.5 | Describe the temperature and methods of storage of galeticals |                            |            |

| General Objectives 10.0 Know doses of dispensed products. |      |  |                           |                      |
|---|------|--|---------------------------|----------------------|
| 10  | 10.1 | Classify dispensed products as<br>Solutions<br>Suspensions;<br>Emulsions;<br>Creams;<br>Powders;<br>Oral dosages;<br>Ointment;<br>Ellies;<br>Suppositions;<br>Peccaries. | Show samples of solutions | Samples of solutions |
|   | 10.2 | Identify medium for preparation of the products in 10.1 above e.g. aromatic waters.  |                           |                      |

|  |   |  |  |
|--|---|--|--|
|  | 10.3 Explain uses of aromatic waters as flavoring, preservatives etc. |  |  |
|  | 10.4 Identify different forms of solutions.                           |  |  |

General Objectives 11.0 Understand methods of preparation and uses of emulsifying agents.

|    |   |  |                       |
|----|---|--|-----------------------|
| 11 | 11.1 Explain suspensions and emulsions as solids.<br>11.2 Identify diffusible and non-diffusible solids.<br>11.3 Identify suspending and emulsifying agents.<br>11.4 Determine when to apply the agents in 11.3 above<br>11.5 Classify emulsion as<br>Oil in water<br>Water in oil. | Show samples of suspensions and emulsions. | Suspensions emulsions |
|----|---|--|-----------------------|

General Objectives 12.0 Know how to prepare oral unit dosage forms

|    |  |                               |                                   |
|----|--|-------------------------------|-----------------------------------|
| 12 | 12.1 Define powder and oral unit<br>- dosage forms<br>- bulk powders for internal use<br>- bulk powders for external use<br>- divided (i.e single dose powder)<br>- granules or effervescent granules<br>- sachets<br>- hard capsules.<br><br>12.2 Prepare and package individual powders. | Show examples of each of 12.1 | Samples of powders and oral units |
|----|--|-------------------------------|-----------------------------------|



|  |  |                      |                 |
|--|--|----------------------|-----------------|
|  | <p>12.3 Identify tablets and capsules.</p> <p>12.4 Explain granulation.</p> <p>12.5 Describe the techniques for filling capsules.</p> <p>12.6 Fill capsules.</p> | Supervise practicals | Capsule filler. |
|--|--|----------------------|-----------------|

General Objectives: Know preparation of ointments pastern and jells

|    |  |  |   |
|----|--|--|---|
| 13 | <p>13.1 Identify ointments pastes and gells.</p> <p>13.2 Identify ointment bases.</p> <p>13.3 Describe the characteristic of ointment bases.</p> <p>13.4 Describe methods of preparation of\ ointment by fusion.</p> <p>13.5 Prepare ointment by fusion.</p> <p>13.6 Explain factors affecting the stability of ointments.</p> | Show samples of ointments, pastes and gells. | Samples of ointments, pastes and gells. |
|----|--|--|---|

|  |  |  |                         |
|--|--|--|-------------------------|
| General Objectives. 14.0 Know how to prepare suppositories and pastries. |  |  |                         |
| 14   | 14.1 Define suppositories and pastries.<br>14.2 Identify types of suppository base.<br>14.3 Describe characteristics of suppository base.<br>14.4 Describe shapes and sizes of suppositories and pastries. | Show samples of suppositories and pastries | Suppositories pastries. |

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES | RESOURCES    |
|------|--|---------------------|--------------|
|      | 4.6 Identify parts of the body to which preparation is to be applied of for external use.<br><br>9.4 Identify poisons and non poisons<br><br>10.2 Identify medium for preparation of the products in 10.1 above e.g. aromatic waters<br><br>10.3 Identify different forms of solutions<br><br>11.2 Identify diffusible and non-diffusible solid<br><br>11.3 Identify suspending and emulsifying agents | Use human model     | Human models |

|  |   |  |   |
|--|---|--|---|
|  | <p>12.2 Prepare and package individual powders</p> <p>12.3 Identify tablets and capsules</p> <p>12.6 Fill capsules</p> <p>13.1 Identify ointments pastes and gells</p> <p>13.2 Identify ointments bases</p> <p>13.5 Prepare ointment by fusion</p> <p>14.2 Identify types of suppository base</p> | <p>Show samples of ointments, pastes and gells</p> | <p>Samples of ointments, pastes and gells</p> |
|--|---|--|---|

PROGRAMME: Pharmaceutical Technology (ND)  
COURSE: INTRODUCTION TO DRUG QUALITYCONTROL  
CODE: PCT 213  
UNITS: 2.0  
DURATION (Hour/Week): Lecture: 1 Tutorials: 0 Practicals: 2  
GOAL: This course is designed to introduce students to the basic theory and practice of the quality control of drugs and related substances.

General Objectives: On completion of the course, diplomates will be able to:

- 1.0 Know the concept of quality control of drugs.
- 2.0 Know the use of official reference books in drug quality control analysis.
- 3.0 Know how to carry out basic identity tests on pharmaceutical substances.
- 4.0 Know the maintenance of quality control laboratory

|   |  |   |  |
|---|--|---|--|
| PROGRAMME: Pharmaceutical Technology (ND)   |  |   |  |
| Course: Introduction to Drug Quality control  |  | PCT 213   | Duration 1 – 0 - 2                                 |
| Course Objectives: To introduce students to the basic theory and practice of the quality control of drugs and related substances. |  |   |  |
| WEEK  | General Objectives 1.0 Know the concept of quality control of drugs.                             |   |  |
|   | Special Learning Objective:  | Teacher Activities  | Resources  |
|   | 1.1 Define quality control.  |   |  |
|   | 1.2 Explain the terms<br>Substandard<br>Fake<br>Adulterated                                      | Show students' samples of substandard fake and adulterated drugs.       | Samples of substandard fake and adulterated drugs. |
|   | 1.3 List the components and types of drugs in quality control.                                   |   |  |
|   | 1.4 Explain the objectives and need for quality control of drugs and related substances.         |   |  |
|   | 1.5 Explain the official limits of chemical substances.  |   |  |
|   | 1.6 List factors that contribute to error interpretation of results in quality control of drugs. |   |  |
|   | 1.7 Describe the layout and setting of a drug quality control laboratory.                        | Take students into a quality control laboratory and explain the layout. |  |

| General Objectives: 2.0 Know the use of official reference books in drug quality control analysis. |  |   |                        |
|--|--|---|------------------------|
|  | <p><b>Specific Objectives:</b></p> <p>2.1 Define reference book</p> <p>2.2 List types of reference books in quality control of drugs and related substances.</p> <p>2.3 Describe methods and techniques of using reference books in quality control of drugs and related products.</p> | <p>Show students different reference books and explain the content and use to them.</p> | <p>Reference books</p> |

| WEEK | General Objectives 3.0 Know how to carry out basic identity tests on pharmaceutical substances.   |  |  |
|------|---|--|--|
|      | <p>3.1 Classify quality control tests.</p> <p>3.2 Describe types of physical identity tests on pharmaceutical substances.-: odour, taste, colour, appearance, density.</p> <p>3.3 Describe the methods and procedure for determining the physical characteristics of pharmaceutical substances.</p> <p>3.4 List types of organoleptic tests for pharmaceutical substances<br/>Deformed diver minatory<br/>Descriptive;<br/>Preference</p> |  |  |

|  |  |  |   |
|--|--|--|---|
|  | <p>3.5 List common pharmaceutical raw materials.<br/>Plant, animal, mineral</p> <p>3.6 Describe procedures for quality control of pharmaceutical raw materials.</p> <p>3.7 Describe raw material sampling techniques.</p> <p>3.8 Describe product sampling techniques.</p> <p>3.9 Describe stock control techniques in pharmaceuticals quality control.</p> <p>3.10 Explain test method validation of pharmaceutical substances.</p> <p>3.11 Describe test methods for validation of pharmaceutical substances.</p> <p>3.12 Identify analytical instruments for validation of pharmaceutical substances e.g</p> <ul style="list-style-type: none"> <li>Colorimeter</li> <li>Spectrophotometer</li> <li>Flame photometer</li> <li>Raman spectrophotometer</li> <li>Atomic absorption spectrophotometer</li> <li>X-ray spectroscopy</li> <li>Ph meter</li> <li>Gas liquid chromatograph</li> <li>Column chromatograph</li> <li>Polarimeter</li> <li>Refractometer</li> </ul> | <p>Show students the various instrument and explain their functions.<br/>Demonstrate their uses.</p> | <p>Spectrophotometer colorimeter<br/>flame photometer<br/>Raman spectrophotometer<br/>Atomic absorption spectrophotometer<br/>X ray spectroscopy phmeter<br/>Gas liquid chromatograph</p> |
|--|--|--|---|





PRACTICAL CONTENTS

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES  | RESOURCES   |
|------|---|--|---|
|      | 3.12 Identify analytical instruments for validation of pharmaceutical substances e.g<br>Colorimeter<br>Spectrophotometer<br>Flame photometer<br>Raman spectrophotometer<br>Atomic absorption spectrophotometer<br>X-ray spectroscopy<br>Ph meter<br>Gas liquid chromatograph<br>Column chromatograph<br>Polarimeter<br>Refractometer<br>Microscopes<br>Centrifuge<br>Incubator<br>Colony counter etc. | Show students the various instrument and explain their functions.<br>Demonstrate their uses. | Spectrophotometer colorimeter<br>flame photometer<br>Raman spectrophotometer<br>Atomic absorption spectrophotometer<br>X ray spectroscopy phmeter<br>Gas liquid chromatograph |

PROGRAMME: PHARMACEUTICAL TECHNOLOGY: NATIONAL DIPLOMA

COURSE: PHARMACY LAWS AND ETHICS

CODE: PCT 221

DURATION (HOURS/WEEK) Lectures 1 Tutorials 0 Practicals 0

UNITS: 1.0

GOAL: This course is designed to enable the diplomate acquire a basic knowledge of the laws and ethics of the practice of pharmaceutical technology as a profession.

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Know the history of pharmacy and pharmaceutical technology in Nigeria.
- 2.0 Know schedule poisons
- 3.0 Know some legal terms used in pharmacy and pharmaceutical technology.
- 4.0 Know criminal offences in pharmaceutical manufacture and pharmacy practice.

|   |   |                                   |                               |
|---|---|-----------------------------------|-------------------------------|
| PROGRAMME: Pharmaceutical Technology: National Diploma  |   |                                   |                               |
| Course: Pharmacy laws and Ethics  |   | Course Code: PCT 221              | Contact hours 15 (1 – 0) unit |
| Course Objectives This course is designed to enable the diplomate acquire a basic knowledge of the laws and ethics of the practice of pharmaceutical Technology profession. |   |                                   |                               |
| 1   | <p>1.0 Know the history of pharmacy and pharmaceutical technology in Nigeria.</p> <p>1.1 List manufacturing companies of drugs, detergents, food and nutrients, additive in Nigeria.</p> <p>1.2 Outline the origin of the companies in 1.1 above and their locations.</p> <p>1.3 Identify the products of the companies in 1.1 above.</p> <p>1.4 Identify the sources of raws materials for the companies in 1.1 above.</p> <p>1.5 Classify the drugs manufactured by the companies in 1.1 above..</p> <p>1.6 Explain the pharmacy ordnance of 1927, 1936 and 1960.</p> <p>1.7 Explain poison and pharmacy act 1964.</p> <p>1.8 Explain dangerous drugs law cap 48.</p> | Show samples of classified drugs. | Classified drugs              |

| General Objectives: |   | 2.0 Know schedule poisons |                   |
|---------------------|---|---------------------------|-------------------|
| 2                   | 2.1 Define poisons.   |                           |                   |
|                     | 2.2 Classify schedule poisons. Under part one, part two and part three. |                           |                   |
|                     | 2.3 List examples of poison   | Show samples of poison    | Samples of poison |
|                     | 2.4 Identify poison.  |                           |                   |
|                     | 2.5 Describe methods of labeling of poisons                             |                           |                   |
|                     | 2.6 Describe methods of storage of poisons.                             |                           |                   |
|                     | 2.7 Describe methods of disposal of poisons.                            |                           |                   |
|                     | 2.8 Store, label and dispose of poisons.                                |                           |                   |
|                     | 2.9 Outline methods of manufacture act common poisons                   |                           |                   |

| General Objectives: 3.0 Know some legal terms used in pharmacy and pharmaceutical technology. |     |   |                              |                             |
|---|-----|---|------------------------------|-----------------------------|
| 3   | 3.1 | Define drugs  | Provide samples of the drugs | Samples of dangerous drugs. |
|   | 3.2 | Explain the following dispense, pharmacy, patient, proprietary, medicine                                |                              |                             |
|   | 3.3 | Explain the term dangerous drugs.   |                              |                             |
|   | 3.4 | Explain the following drugs as dangerous<br>Prepared opium<br>Medicinal opium<br>Indian hemp<br>Cocaine |                              |                             |
|   | 3.5 | Identify other socially and medically dangerous drugs   |                              |                             |

| General Objective: 4.0 Know criminal offences in pharmaceutical manufacture and pharmacy practice |     |   |  |  |
|---|-----|---|--|--|
| 4   | 4.1 | List offences considered criminal in law in pharmaceutical manufacture and practice. E.g. refusal to dispense dispensing negligence adulteration products practicing in without registration. |  |  |
|   | 4.2 | List penalties for the offences in 4.1 above.   |  |  |
|   | 4.3 | Identify national agencies responsible for controlling the quality of the manufacture of pharmaceutical   |  |  |

**PRACTICAL CONTENTS**

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES                     | RESOURCES               |
|------|---|---|-------------------------|
|      | <p>1.3 Identify the products of the companies in 1.1 above.</p> <p>1.4 Identify the sources of raw materials for the companies in 1.1 above.</p> <p>2.4 identify poison</p> <p>2.8 Store, label and dispose of poisons</p> <p>3.6 Identify other socially and medically dangerous drugs</p> | <p>Show samples of classified drugs</p> | <p>Classified drugs</p> |

**HIGHER NATIONAL DIPLOMA**

**PHARMACEUTICAL TECHNOLOGY**

|  |  |  |                                     |
|--|--|--|-------------------------------------|
| PROGRAMME: HIGHER NATIONAL DIPLOMA PHARMACEUTICAL TECHNOLOGY |  |  |                                     |
| COURSE: PHARMACEUTICAL MICROBIOLOGY                          |  | CODE STM 413                                   | 2 0 3                               |
| Course Specification: THEORY AND PRACTICAL                   |  |  |                                     |
| WEEK   | General Objectives: 1.0 Outline the scope of pharmaceutical microbiology |  |                                     |
|  | Special Learning Objective.  | Teachers Activities                            | Resources                           |
|  | SCOPE OF PHARMACEUTICAL MICROBIOLOGY                                     |  |                                     |
|  | 1.1 Explain the general principles of drug production.                   |  | Blackboards<br>Over head projectors |
|  | 1.2 Explain the general principles of drug action.                       |  |                                     |
|  | 1.3 Outline the laws regulating the production, scale and uses of drugs. | Conduct visit to pharmaceutical establishments |                                     |
|  | 1.4 Outline microbiological standards in the pharmaceutical industry.    |  |                                     |

|      |   |                     |           |
|------|---|---------------------|-----------|
| WEEK | General Objectives: 2.0 Know the various sources of drugs and the importance of microorganisms in the pharmaceutical Industry |                     |           |
|      | Special Learning Objective.   | Teachers Activities | Resources |



|   |  |  |                        |
|---|--|--|------------------------|
| 2 | <p>Microorganisms in Pharmaceutical Industry</p> <p>2.1 Identify plant sources of drugs.</p> <p>2.2 Identify animal sources of drug.</p> <p>2.3 Identify microbial sources of drugs.</p> <p>2.4 Explain synthesis drugs.</p> <p>2.5 Differentiate between drugs from sources 2.1 to 2.3 and drugs from 2.4.</p> <p>2.6 Explain the role of microorganisms in the spoilage of drugs</p> | <p>Show students plants with medicinal properties e.g. Nim (Azadichasrita)</p> | <p>Plant materials</p> |
|---|--|--|------------------------|

|      |   |                     |           |
|------|---|---------------------|-----------|
| WEEK | General Objectives: 3.0 Understand the role of microorganisms as the main sources of antibiotics. |                     |           |
|      | Special Learning Objective.   | Teachers Activities | Resources |

|     |                              |  |   |
|-----|------------------------------|--|---|
|     | <b>MICROBIAL ANTIBIOTICS</b> |  |   |
| 3-4 | 3.1                          | Describe the production of penicillin antibiotic from microbial sources.                           | Petri dishes<br>Media multo-disc<br>Filter paper<br>Antibotcs |
|     | 3.2                          | Explain the semi-synthetic production of penicillin.   |   |
|     | 3.3                          | Explain the modifications of the basic structure of penicillin to produce other antibiotics.       |   |
|     | 3.4                          | Describe the production of Cephalosporins.   |   |
|     | 3.5                          | Describe the production of Streptomycin and related antibiotics.                                   |   |
|     | 3.6                          | Describe the production of Tetracycline.   |   |
|     | 3.7                          | Describe the production of Chloramphenicol.  |   |
|     | 3.8                          | Describe the production of antibiotics from Bacillus spp.  |   |
|     | 3.9                          | Describe production of synthetic antibiotics.  |   |
|     |                              | Attempt to isolate soil microorganism with antibiotic properties<br>Test their antibiotic activity |   |

|      |   |                     |           |
|------|---|---------------------|-----------|
| WEEK | General Objectives: 4.0 Understand the general principles and mechanisms of action of the various kinds of antimicrobial agents |                     |           |
|      | Special Learning Objective.   | Teachers Activities | Resources |

|     |  |  |                         |
|-----|--|--|-------------------------|
| 5-6 | <p>4.1 Define the following terms: -<br/> i) antimicrobial agents<br/> ii) antibiotic spectrum<br/> iii) bacteria static activity<br/> iv) bactericidal activity<br/> v) antiseptics/disinfectants.</p> <p>4.2 Explain antibiotic synergism and antagonism</p> <p>4.3 Explain the mode of action of antibiotics on cell wall synthesis.</p> <p>4.4 Explain the mode of action of an ell membrane.</p> <p>4.5 Explain the mode of action of antibiotics that inhibit protein synthesis.</p> <p>4.6 Explain the mode of action antifungal agents</p> <p>4.7 Explain the mode of action of sulphonamides.</p> <p>4.8 List the qualities of a good disinfectant/antiseptic</p> <p>4.9 Explain the mode of action of disinfectant.</p> <p>4.10 Explain the factors that affect the mode of action of disinfectant antiseptics.</p> <p>4.11 Describe the various methods of testing for efficiency of disinfectants/antiseptics.</p> | <p>Demonstrate antibiotic sensitivity using paper, disc and MIC</p> <p>Demonstrate antimicrobial properties of common disinfectants/antiseptics.</p> | <p>Do same as above</p> |
|-----|--|--|-------------------------|

| WEEK | General Objectives:: 5.0 Understand the factors that determine the sensitive or resistance to antibiotics by microorganisms  |  |                      |
|------|--|--|----------------------|
|      | Special Learning Objective:  | Teachers Activities  | Resources            |
|      | <p>ANTIBIOTIC RESISTANCE</p> <p>5.1 Explain susceptibility/resistance of microorganisms to different antibiotics.</p> <p>5.2 List factors that can affect susceptibility/resistance of microorganisms to ant microbial agent.</p> <p>5.3 Explain changes in susceptibility/resistance of microorganisms to ant microbial agent.</p> <p>5.4 Explain the effects of age, nutritional factors, temperature, PH and water activity on susceptibility/resistance by microorganisms</p> <p>5.5 Test for microbial susceptibility/resistance to antibiotics using various techniques.</p> <p>5.6 Explain the resistance of microorganisms to antibiotics due to genetic factors of chromosomal origin.</p> <p>5.7 Explain resistance due to genetic factors of extra chromosomal origin (Plasmids)</p> <p>5.8 Explain resistance due to non-genetic factors..</p> | <p>Demonstrate the effect of physiochemical factors on the susceptibility/resistance of microorganisms to some antibiotics.</p> <p>Carry out antibiotic sensitivity tests.</p> <p>Carry out MIC tests.</p> | <p>Same as above</p> |

| WEEK | General Objectives:: 6.0 Understand the principles involved in the microbiological assay of ant microbial agents   |   |                      |
|------|--|---|----------------------|
|      | Special Learning Objective:  | Teachers Activities   | Resources            |
|      | <p style="text-align: center;"><u>MICROBIOLOGICAL ASSAY</u></p> <p>6.1 Explain though term Biological potency</p> <p>6.2 Explain the physical and chemical methods of assay.</p> <p>6.3 Describe the microbiological methods of assay of ant microbial.</p> <p>6.4 Explain the units of measurement in assay</p> <p>6.5 Carry out a microbiological assay using a given sample e.g. blood, setum, urine and tissue fluid</p> | <p>Carry out microbiological assay to demonstrate bioactivities</p> | <p>Same as above</p> |

| WEEK | General Objectives: 7.0 Know the role of microorganism n the production of vitamins and amino acids  |                     |           |
|------|--|---------------------|-----------|
|      | Special Learning Objective   | Teachers Activities | Resources |
|      | <p data-bbox="352 531 1041 596"><b>MICROORGANISMSIN THE PRODUCTION OF VITAMINS AND AMINO ACIDS</b></p> <p data-bbox="352 634 1041 699">7.1 Explain the general principles of vitamin synthesis.</p> <p data-bbox="352 738 1041 803">7.2 Describe vitamin B3 synthesis by Pseudomonas spp</p> <p data-bbox="352 842 1041 907">7.3 Describe vitamin B3 synthesis by Asbbva gossypi, and Premothecium asbbvii</p> <p data-bbox="352 946 1041 1011">7.4 Describe the principles of amino acid synthesis.</p> <p data-bbox="352 1050 1041 1115">7.5 Describe L-Lysine production by E coli combine wth Acrobacter aero genes</p> <p data-bbox="352 1154 1041 1252">7.6 Describe L-Gutamin acid production by Microcosms, Arthrobacter and <u>Brevibacterium</u> spp.</p> <p data-bbox="352 1291 1041 1356">7.7 Explain the advantages of L-form of amino acids produce by microbes.</p> |                     |           |

| WEEK  | General Objectives: 8.0 Understand drug tolerance and addiction and the factors governing them  |  |           |
|-------|---|--|-----------|
|       | Special Learning Objective  | Teachers Activities  | Resources |
| 13-14 | <p style="text-align: center;"><b><u>DRUG TOLERANCE ABUSE AND ADDICTION</u></b></p> <p>8.1 Define the terms<br/> i) tolerance<br/> ii) abuse<br/> iii) addiction</p> <p>8.2 Explain the individual responses to drugs.</p> <p>8.3 Explain the factors affecting drug disposition in the body e.g. age, diet, and physiological state. Etc.</p> <p>8.4 Describe the different types of drug abuse</p> <p>8.5 Explain the characteristics of drug addicts.</p> <p>8.6 Explain addiction to the central nervous system (CNS) by stimulants/depressants..</p> <p>8.7 Describe different methods of control of drug abuse and addiction.</p> | <p>Conduct visit to drug addiction rehabilitation centre</p> |           |



PRACTICAL CONTENTS

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES   | RESOURCES |
|------|---|---|-----------|
|      | 2.1 Identify plant sources of drugs.<br>2.2 Identify animal sources of drug.<br>2.3 Identify microbial sources of drugs<br>5.5 Test for microbial susceptibility/resistance to antibiotics using various techniques<br>6.5 Carry out a microbiological assay using a given sample e.g. blood, setum, urine and tissue fluid | Show students plants with medicinal properties e.g. Nim (Azadichastrita)<br>Carry out MIC tests |           |

PROGRAMME: Higher National Diploma Pharmaceutical Technology

COURSE: General Principles of Pharmacology 1

CODE: STY 312

UNIT: 2.0

DURATION: (Hours/Week):      Lecture: 1              Tutorials: 0              Practicals: 3

GOAL: The course is designed to provide the students with an introduction knowledge at pharmacology

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Definition and Introduction to pharmacology
- 2.0 Know sources of drugs
- 3.0 Understand the concept of drug dosage
- 4.0 Know factors modifying drugs actions
- 5.0 Know routes of drug administration
- 6.0 Understand basic Pharmacokinetics

|  |  |  |                                     |
|--|--|--|-------------------------------------|
| PROGRAMME: Higher National Diploma Pharmaceutical Technology |  |  |                                     |
| COURSE: General Principles of Pharmacology 1                 |  | Course Code STY 312                    | Contact Hours: 60 Hours (2.0 Units) |
| Course Specification: Theory/Practicals                      |  |  |                                     |
| WEEK   | General Objective: 1.0 Definition and Introduction to pharmacology                 |  |                                     |
|  | Special Learning Objective:  | Teachers Activities                    | Resources                           |
|  | 1.1 Define pharmacology  | Show chart of branches of Pharmacology | Charts                              |
|  | 1.2 List branches of pharmacology  |  |                                     |
|  | 1.3 Define pharmacodynamics, pharmaco kinetics and toxicology.                     |  |                                     |
|  | 1.4 Explain the relationship between pharmacology, physiology and patho-physiology |  |                                     |

| General Objective: 2.0 Know sources of drugs |   |                                   |  |
|--|---|-----------------------------------|--|
| WEEK   | SPECIAL LEARNING OBJECTIVE  | TEACHERS ACTIVITIES               | RESOURCE   |
| 3 – 4  | 2.1 Identify various sources of drugs from plants; animals; minerals; synthetic and semi-synthetic materials. | Show samples of sources of drugs. | Prepare samples of plant and animal sources of drugs |
|  | 2.2 Collect samples of the sources identified in 2.1 above.   |                                   |  |
|  | 2.3 Explain the active ingredients in the sources in 2.1 above.   |                                   |  |
|  | 2.4 Outline methods of extraction of the drugs from the source in 2.1 above.                                  |                                   |  |
|  | 2.5 Explain active ingredients of drugs from the source in 2.1 above.   |                                   |  |

| General Objective: 3.0 Understand the concept of drug dosage. |  |  |  |
|---|--|--|--|
| 5 - 6   | 3.1 Explain drug dosage  |  |  |
|   | 3.2 Define the following terms in relation to drugs and dosage.<br><br>Side effect;<br>Cummulation;<br>Antagonistic;<br>Overdose;<br>Under dose. |  |  |

| WEEK  | General Objective: 4.0 Know factors modifying drugs actions |   |           |
|-------|---|---|-----------|
|       | Special Learning Objective                                  | Teachers Activities   | Resources |
| 7 – 8 | 4.1   | Explain physico-chemical properties of drugs, PH, pka               |           |
|       | 4.2   | Physio-pathological status – disease state.                         |           |
|       | 4.3   | Explain possible genetic factors that modify drug action.           |           |
|       | 4.4   | Explain the effects of notation, age, rest, weight on drug actions. |           |
|       | 4.5   | List examples of 4.3 and 4.4 above                                  |           |

| WEEK   | General Objective: 5.0 Know routes of drug administration  |   |                           |
|--------|--|---|---------------------------|
|        | Special Learning Objective   | Teachers Activities                       | Resources                 |
| 9 - 10 | 5.1 Identify routes of drug administration emphasizing on oral; intravenous; sub-cutaneous (SC); intramuscularly (IM); sub-lingual; pulmonary; rectal; intraperitoneal; topical; routes (eye, nose skin weight intradermal | Demonstrate routes of drug administration | Syringes; dispensing cups |
|        | 5.2 Distinguish between oral and parenteral routes.  |   |                           |
|        | 5.3 State advantages and disadvantages of the various routes stated in 5.1 above.  |   |                           |
|        | 5.4 Administer drugs through the various route in 5.1 above.   | Supervise drug administration by students |                           |

| WEEK    | General Objective: 6.0 Understand basic Pharmacokinetics |                     |           |
|---------|--|---------------------|-----------|
|         | Special Learning Objective                               | Teachers Activities | Resources |
| 11 - 13 |  |                     |           |

|  |  |   |                                   |
|--|--|---|-----------------------------------|
|  | <p>6.1 Describe transportation of drugs across body cell membrane.</p> <p>6.2 Describe factor responsible for transportation of drugs through the body.</p> <p>6.3 Explain the involvement of protein in drug movement through the body.</p> <p>6.4 Explain drug intervention.</p> <p>6.5 Explain drug metabolism.</p> <p>6.6 List types of drug metabolism.</p> <p>6.7 Identify sites of drug metabolism n the body.</p> <p>6.8 Explain drug interaction in enhancing/inhibiting microsomal enzymes.</p> <p>6.9 Identify routes of drug excretion.</p> <p>6.10 Identify sites of drug excretion.</p> <p>6.11 Explain factors affecting drug excretion</p> | <p>Discussion</p> <p>Demonstration</p> <p>Explain with models</p> | <p>Chalk board.</p> <p>models</p> |
|--|--|---|-----------------------------------|



PRACTICAL CONTENTS

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES                       | RESOURCES |
|------|--|---|-----------|
|      | 2.1 Identify various sources of drugs from plants; animals; minerals; synthetic and semi-synthetic materials.<br><br>2.2 Collect samples of the sources identified in 2.1 above.<br>5.4 Administer drugs through the various routes in . 5.1 above<br>6.9 Identify routes of drug excretion<br>6.10 Identify sites of drug excretion | Supervise drug administration by students |           |

PROGRAMME: Higher National Diploma Pharmaceutical Technology

COURSE: Good Manufacturing Practice

CODE: PCT 311

DURATION: (Hours/Week):          Lecture: 2                  Tutorials: 0                  Practicals: 3

UNIT: 3.0

GOAL: This course is designed to enable the diplomat know the routine practices in a pharmaceutical manufacturing Industry.

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Know the scope of pharmaceutical industry.
- 2.0 Know the organizational structure of a pharmaceutical manufacturing industry.
- 3.0 Know the principles of equipment maintenance in pharmaceutical manufacture.
- 4.0 Know types and principles of pharmaceutical manufacturer
- 5.0 Know various storage methods in pharmaceutical manufacture.
- 6.0 Know the principles of validation.
- 7.0 Know the principles of products complain and recall

|   |  |  |                                    |
|---|--|--|------------------------------------|
| Course: Good Manufacturing Practice                               |  |  |                                    |
| Theory/Practicals   |  | Code PCT 311                               | Duration: 75 hours                 |
| General Objectives: 10 Know the scope of pharmaceutical industry. |  |  |                                    |
| Week  | Specific Objective   |  |                                    |
| 1 - 2   | 1.1 List range of pharmaceutical products.   | Display pharmaceutical products:           | Sample of pharmaceutical products. |
|   | 1.2 Explain the main characteristics of pharmaceutical industries-<br>Cleanliness;<br>Aseptic and sterile conditions,<br>Extreme care in production  | Drugs;<br>Detergents;<br>Antiseptics, etc. |                                    |
|   | 1.3 List measures in ensuring safe manufacturing environment in pharmaceutical industries.   |  |                                    |
|   | 1.4 Explain the conditions specifying the following in the drug industry<br>Health and cleanliness of personnel;<br>Cleanliness sanitation and protection of utensils and materials<br>service sanitation. |  |                                    |
|   | 1.5 Explain the major position of the food and drug Act of 1974.   |  |                                    |
|   | 1.6 Describe the importance of codea   |  |                                    |

|  |  |   |                                       |
|--|--|---|---------------------------------------|
|  | <p>atimentarius.</p> <p>1.7 Explain the sanitary standards for water used in pharmaceutical manufacture.</p> <p>1.8 Identify cleaning agents for pharmaceutical industry.</p> <p>1.9 Describe methods of pharmaceutical plant cleaning and disinfectant.</p> <p>1.10 Clean and disinfect pharmaceutical plant.</p> <p>1.11 Identify factors that influence choice of cleaning materials for a pharmaceutical plant.</p> <p>1.12 Describe the basic principles for hygienic design of pharmaceutical plants</p> <p>1.13 Explain good manufacturing practice (GMP).</p> <p>1.14 Identify the components of good manufacturing practice as it affects pharmaceutical manufacturing.</p> | <p>Conduct students through cleaning of pharmaceutical plant environment and utensils</p> | <p>Cleaning agents and materials.</p> |
|--|--|---|---------------------------------------|

| WEEK  | General Objective 2.0: Know the organizational structure of a pharmaceutical manufacturing industry.   |   |              |
|-------|--|---|--------------|
| 3 - 4 | <p>2.1 Describe the layout of a pharmaceutical manufacturing plant.</p> <p>2.2 Explain the features of a typical pharmaceutical manufacturing plant e.g.<br/>Cleanliness;<br/>Sterility etc.</p> <p>2.3 Describe the organizational of structure of a typical pharmaceutical manufacturing company.</p> <p>2.4 Explain the critical role of the quantity control section in pharmaceutical manufacture.</p> <p>2.5 Identify the roles of pharmaceutical technology in pharmaceutical manufacture.</p> <p>2.6 Explain quality assurance.</p> <p>2.7 Explain the objectives of quality assurance.</p> <p>2.8 .Describe methods of quality assurance in pharmaceutical manufacture.</p> | Distribute sketches of typical layout of a pharmaceutical manufacturing plant | Plant design |

| WEEK  | General Objectives 3.0 Know the principles of equipment maintenance in pharmaceutical manufacture.  |   |  |
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| 5 - 6 | <p>3.1 Identify various equipment used in pharmaceutical manufacture.<br/>           Millings;<br/>           Mixing;<br/>           Emulsifying;<br/>           Separating;<br/>           Filtering;<br/>           Distilling;<br/>           Tableting;<br/>           Concentrating;<br/>           Pelleting;<br/>           Coating;<br/>           Powdering;<br/>           Gellating;<br/>           Drugging;<br/>           Sealing;<br/>           Packaging</p> <p>3.2 Identify equipment for quality control of pharmaceutical practice.</p> <p>3.3 Identify equipment for sanitizing, sterilizing utensils equipment and environment in pharmaceutical manufacture.</p> | <p>Guide students to identifying and sketch the various equipment 3.1. – 3.3. Grade sketches.</p> | <p>Pharmaceutical equipment for milling, mixing, emulsifying, separating, filtering, distilling, tableting, concentrating, pelleting, coating, powdering, gellating, drugging, sealing, packaging.</p> |

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|       | <p>3.4 Carry out the processes listed in 3.1 above using the listed equipment.</p> <p>3.5 Carry out the processes listed in 3.2 above using the identified equipment.</p> <p>3.6 Carry out the processes listed in 3.3 above using the identified equipment.</p> <p>3.7 Describe the sanitary and other factors necessary for good choice of equipment in the pharmaceutical industry.</p> <p>3.8 Describe the economic factors in equipment selection including capacity, total equipment or material cost, installation cost, maintenance cost, estimated life and replacement cost, depreciation cost.</p> <p>3.9 Identify various materials for equipment construction.</p> | Involve students in the various activities in 3.1 – 3.3 in the pharmacy workshop. Grade reports. |                |
| WEEK  | General Objective 4.0 Know types and principles of pharmaceutical manufacturer  |  |                |
| 7 - 8 | <p>4.1 Explain batch and continuous manufacture.</p> <p>4.2 Describe method of accepting and recording raw materials for various pharmaceutical products manufacture.</p>   |  | Recording book |

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|  | 4.3 Receive and records raw materials for various pharmaceutical products manufacture.              | Supervise work receipts and recording                                      | Pharmaceutical workshop |
|  | 4.4 Interpret and apply various formula and methods in various pharmaceutical products manufactures |  |                         |
|  | 4.5 Explain and apply various manufacturing techniques e.g. sterile manufacture.                    | Supervise and grade reports of manufacture in the pharmaceutical workshop. |                         |
|  | 4.6 Explain contract manufacture  |  |                         |
|  | 4.7 Describe and apply various process controls during batch or continuous manufacture..            |  |                         |

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| WEEK   | General Objectives: 5.0 Know various storage methods in pharmaceutical manufacture. |  |                       |
| 9 - 10 | 5.1 Explain product stability.  | Conduct Students on visit to storage to rectify raw materials and storage conditions. Grade Reports. | Storage raw materials |
|        | 5.2 Describe various methods of storing pharmaceutical raw materials.               |  |                       |
|        | 5.3 Store various pharmaceutical raw materials.                                     |  |                       |
|        | 5.4 Identify pharmaceutical packaging materials.                                    |  |                       |
|        | 5.5 Identify various storage conditions for pharmaceutical product.                 |  |                       |
|        | 5.6 Explain primary, secondary packaging  |  |                       |



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|  | <p>materials.</p> <p>5.7 Identify factors that affect product stability.</p> <p>5.8 Explain stability testing.</p> <p>5.9 Test for stability.</p> |  |  |
|  |   | Conduct stability test. Grade reports. |  |

| WEEK    | General Objectives: 6.0 Know the principles of validation.   |  |  |
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| 11 - 12 | <p>6.1 Explain drug validation.</p> <p>6.2 Describe the process of validation.</p> <p>6.3 Explain concurrent validation.</p> <p>6.4 Explain retrospective validation.</p> <p>6.5 Explain revalidation.</p> <p>6.6 Explain analytical validation.</p> <p>6.7 Explain validation of the analyst.</p> |  |  |

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| WEEK    | General Objectives: 7.0 Know the principles of products complain and recall |                              |                              |
| 13 - 14 | 7.1 List possible courses of products complaints and recall.                | Display product recall forms | Display product recall forms |
|         | 7.2 Describe the process of products recall.                                |                              |                              |
|         | 7.3 Describe categories of recall.  |                              |                              |

#### PRACTICAL CONTENTS

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES  | RESOURCES  |
|------|---|--|--|
|      | 1.8 identify cleaning agents for pharmaceutical industry<br>1.10 Clean and disinfect pharmaceutical plant<br><br>3.1 Identify various equipment used in pharmaceutical manufacture.<br>Millings;<br>Mixing;<br>Emulsifying;<br>Separating;<br>Filtering;<br>Distilling;<br>Tableting;<br>Concentrating;<br>Pelleting;<br>Coating;<br>Powdering;<br>Gellating;<br>Drugging;<br>Sealing;<br>Packaging | Guide students to identifying and sketch the various equipment 3.1. – 3.3. Grade sketches. | Cleaning agents and materials<br><br>Pharmaceutical equipment for milling, mixing, emulsifying, separating, filtering, distilling, tableting, concentrating, pelleting, coating, powdering, gellating, drugging, sealing, packaging. |

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|  | <p>3.2 Identify equipment for quality control of pharmaceutical practice.</p> <p>3.3 Identify equipment for sanitizing, sterilizing utensils equipment and environment in pharmaceutical manufacture.</p> <p>3.4 Carry out the processes listed in 3.1 above using the listed equipment.</p> <p>3.5 Carry out the processes listed in 3.2 above using the identified equipment.</p> <p>3.6 Carry out the processes listed in 3.3 above using the identified equipment</p> <p>3.9 Identify various materials for equipment construction.</p> <p>4.1 Receive and records raw materials for various pharmaceutical products manufacture.</p> <p>4.2 Interpret and apply various formula and methods in various pharmaceutical products manufactures</p> <p>5.3 Store various pharmaceutical raw materials</p> <p>5.9 Test for stability</p> | <p>Involve students in the various activities in 3.1 – 3.3 in the pharmacy workshop. Grade reports.</p> <p>Contact stability test. Grade reports.</p> |  |
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PROGRAMME: Higher National Diploma Pharmaceutical Technology

COURSE: Pharmaceutical and Medicinal

Chemistry

CODE: PCT 312

DURATION: (Hours/Week):           Lecture: 2           Tutorials: 0           Practicals: 4

UNIT: 2.0

GOAL: This course is designed to enable the diplomate understand the chemical nature of drugs and their manufacture.

GENERAL OBJECTIVES: On completion of this course, the diplomate will be able to:

- 1.0 Understand the Physiochemiical properties of drugs in relation to biological acction.
- 2.0 Understand the metabolic changes in drugs in the body system.
- 3.0 Understand the chemistry of antimaterials.
- 4.0 Understand the chemistry of the antineoplastic agents.
- 5.0 Understand the chemistry of the sulfonamides, sulfones and folate reductase inhibitors with antibacterial action.
- 6.0 Understand the chemistry of the antibacterial antibiotics
- 7.0 Understand the chemistry of steroids and steroid hormones.
- 8.0 Understand the chemistry of the vitamins
- 9.0 Understand the chemistry of the pesticides.
- 10.0 Know the general techniques applied in the analysis and quality control of drugs.

| PROGRAMME: PHARMACEUTICAL TECHNOLOGY HIGHER NATIONAL DIPLOMA   |                                       |  |   |   |
|--|---------------------------------------|--|---|---|
| Course: Pharmaceutical and Medicinal Chemistry   |                                       | Course Code: PCT 312   | Contact Hours: 2-0-3 Hrs: 75  |   |
| Course Specification: This is course is designed to provide the student with an understanding of the application of chemical processes in the manufacture and analysis of selected drugs |                                       |  |   |   |
| WEEK   | General Objective: 1.0 Understand the |  |   |   |
| 1  | Special Learning Objective:           |  | Teachers Activities   | Resources   |
|  | 1.1                                   | Define a drug.   | Explain and illustrate the activities in 1.1 to 1.15 with appropriate examples.<br>Ask students questions on the subject matter taught to assess their learning out come. | Chalkboard, chalk, recommended textbooks, lecture notebook. |
|  | 1.2                                   | Outline the history of the development of drugs.   |   |   |
|  | 1.3                                   | Describe the various routes of the distribution of drug in the body system. E.g.<br>- Oral administration<br>- Parental administration<br>- Protein binding<br>- Drug metabolism<br>- Excretion. |   |   |
|  | 1.4                                   | Define acid and base according to the lowry and brousted principle.  |   |   |
|  | 1.5                                   | Classify types of drugs e.g. acidic, basic or neutral.   |   |   |
|  | 1.6                                   | Classify drugs according to their physiological activities, viz.<br>- anti malarial agents<br>- anti infective agents<br>- anti bacterial agents<br>- anti viral agents<br>-                     |   |   |
|  | Special Learning Objective:           |  |   |   |

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|    | <ul style="list-style-type: none"> <li>- antineoplastic agents</li> <li>- central nervous system depressants</li> <li>- central nervous system stimulants</li> <li>- sulfonamides, folic acid and dihydrofolate reductase inhibitors with antibacterial action</li> <li>- adrenergic agents</li> <li>- cholinergic drugs and related agents</li> <li>- diuretics</li> <li>- cardiovascular agents</li> <li>- local anesthetic agents</li> <li>- histamine and antihistamine agent</li> <li>- analgesic agents</li> <li>- steroids and therapeutically related compounds</li> <li>- prostaglandins, leukotrienes and other eicosanoids</li> <li>- hormones</li> <li>- vitamins and related compounds, etc.</li> </ul> <p>1.7 Define degree of ionization (IPKA)</p> <p>1.8 Explain how the degree of ionization affects the activities of some drugs e.g. sulphonamides.</p> <p>1.9 Explain the following concepts in drug</p> <ul style="list-style-type: none"> <li>- structure activity relationships (SAR)</li> <li>- partition coefficient</li> <li>- combinatorial chemistry</li> </ul> <p>1.10 Explain the use of i.1. above in the statistical prediction of pharmacological activities of drugs</p> |  |  |
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|      | Special Learning Objective:   | Teachers Activities | Resources |
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| 1.11 | Define biological receptor  |                     |           |
| 1.12 | Describe how the interaction of a drug and receptor can result to pharmacological responses in the body system. |                     |           |
| 1.13 | Describe the forces involved in the drug – receptor interactions.   |                     |           |
| 1.14 | Explain isomerism   |                     |           |
| 1.15 | Explain the effects of stereoisomerisms on pharmacological activities of drugs.                                 |                     |           |
| 1.16 | Explain molecular modification in drug design   |                     |           |
| 1.17 | Explain the meaning of calculated conformations,  |                     |           |
| 1.18 | Describe how 1.17 above can be used in molecular modeling of drugs (computer added drug design).                |                     |           |
| 1.19 | Modify a named drug by applying molecular modeling.   |                     |           |



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|  | General Objective: 2.0 Understand the metabolic changes in drugs in the body system. |                     |           |
|  | Special Learning Objective:  | Teachers Activities | Resources |

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| 2 - 3 | <p>2.1 Explain the role of the liver enzymes in drug metabolism</p> <p>2.2 Explain the two phases in drug metabolism (phases I and II)</p> <p>2.3 Explain phase I a involving the modification of the drug via oxidation and reduction reactions, etc.</p> <p>2.4 Explain phase II as involving the conjugation of phase I products mainly into water excretable products, e.g. glucuronids; sulphates, etc.</p> <p>2.5 Explain the term bioavailability.</p> <p>2.6 Explain how the site of biotransformation of drugs affects oral bioavailability.</p> <p>2.7 Explain how the effect (metabolism) of a drug in the body system depends on such factors as:-</p> <ul style="list-style-type: none"> <li>- The structure of the drugs</li> <li>- Route of administration</li> <li>- Sex</li> <li>- Strain and species of animal</li> <li>- Age</li> <li>- Diet</li> <li>- Presence of other chemicals, etc.</li> </ul> | Show the three samples in each of the classes in 2.2 | Drug samples |
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| WEEK | General Objective: 3.0 Understand the chemistry of Antimalarials   |   |                   |
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|      | Special Learning Objective:  | Teachers Activities   | Resource          |
| 4    | 3.1 Outline the historical development of antimalarial drug.<br>3.2 Classify antimalarial drugs according to their physiological activities, namely:-<br>- sporozoitocides<br>- exoerythrocytic schizontoices<br>- Erythrocytic schizontocides.<br>- Sporontocides.<br>3.3 Classify antimalarial drugs according to their chemotherapeutical actigities, namely:<br>- Cinchona alkaloids<br>- 4-aininoquinolines<br>- 9-animonoacridines<br>- 8-Aninoquillnolines<br>- biguanides<br>- pyrimidines<br>- sulfones<br>3.4 Explain alkaloids.<br>3.5 List alkaloids isolated from plants and animal tissues, e.g. quinine; nicotine, cocains, ephedrine, etc.<br>3.6 Describe the major sources, chemical structures and physiological activities of the drugs listed in 3.5 above. | The activities in 3.1 to 3.7<br><br>Explain, illustrate with relevant examples and ask students relevant question | Chalk board Chalk |

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|  | <p>3.7 Describe the stereochemistry and the metabolic changes of the drugs listed in 3.5 above.</p> <p>3.8 Design a plan for the isolation of drugs listed in 3.5 above from their natural source.</p> <p>3.9 Extract alkaloids from named plants</p> <p>3.10 Describe the general methods of the preparation of quinine in the laboratory.</p> <p>3.11 Prepare quinine in the laboratory.</p> <p>3.12 Write and describe the general structure of the 4-aminoquinoline antimalarial drugs.</p> <p>3.13 Derive the structure of the important members of the series 3.12 above and give their generic as well as their IUPAC names e.g. chloroquine, hydrochloroquine, santoquine, camoquine, etc.</p> <p>3.14 Describe the general method of preparation of the 4-aminoquinolines antimalarials</p> <p>3.15 Prepare chloroquine and camoquine in the laboratory.</p> <p>3.16 Describe the modification of the 4-aminoquinoline structure and explain their effect on the activities of their derivatives.</p> <p>3.17 Explain the chemotherapeutic uses of the 4-aminoquinoline antimalarials.</p> <p>3.18 Write and describe general structure of 8-aminoquinolines antimalarials.</p> <p>3.19 Derive the structures of the important members of the series from 3.18 above and give their generic as well as their IUPAC names e.g. pamaquine, etc.</p> | <p>Supervise designing of extraction plan</p> <p>Supervise extraction of alkaloids from plants</p> <p>Explain and illustrate the activities in 3.10 to 3.45 with appropriate examples and ask students relevant questions.</p> <p>Supervise quinine preparation in the laboratory.</p> <p>Supervise preparation in the laboratory</p> | <p>Drawing boards</p> <p>Soxhlet extraction equipment</p> <p>Chalkboard chalk</p> <p>Glass wares</p> <p>Glass wares</p> |
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|  | <p>3.35 Explain the metabolism of the biguanides and give the chemical names of the metabolites e.g. 4,6-diamino, 1-para-chlorophenyl, etc.</p> <p>3.36 Describe the physical properties of proguanil and state its physiological uses.</p> <p>3.37 Write and describe the general structure of the pyrimidines.</p> <p>3.38 Derive the structures of the important members of the series from 3.37 above and give both their generic and IUPAC names e.g. primethamine (Daraprim).</p> <p>3.39 Describe the synthesis of pyrimethamine in the laboratory.</p> <p>3.40 Synthesise pyrimethanimine (Daraprim) in the laboratory.</p> <p>3.41 Describe the modification of the structure of pyrimidine and the effects on the physiological activities of the derivatives.</p> <p>3.42 Explain the physiological uses of pyrimethamine.</p> <p>3.43 Write and describe the general structure of the sulphone antimalarials .</p> <p>3.44 Derive the structures of the important members of the series and give both their generic and IUPAC names e.g. 4,4' Dianino diphenyl sulfone (Dapsone DDS)</p> <p>3.45 Describe the modification of the structure of dapsone and its effect on the physiological activities of derivatives (diacetyl and monoacetyl derivatives)</p> |                     |          |
|  | General Objective: 4.0 Understand the chemistry of the Antineoplastic agents   |                     |          |
|  | Special Learning Objective:  | Teachers Activities | Resource |

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| 5 - 6 | <p>4.1 Explain antineoplastic agents.</p> <p>4.2 Classify antineoplastic agent into the following given examples:-</p> <ul style="list-style-type: none"> <li>- Alkylating agents</li> <li>- Antimetabolites</li> <li>- Hormones</li> <li>- Miscellaneous group</li> </ul> <p>4.3 Classify the alkylating agents into:-</p> <ul style="list-style-type: none"> <li>- Nitrogen mustards</li> <li>- Ethyleneic imine</li> <li>- Esters of sulfonic acid</li> <li>-</li> </ul> <p>4.4 describe the general mode of action of the alkylating agents.</p> <p>4.5 Write the general formula of the nitrogen mustards.</p> <p>4.6 Describe with chemical equation the mechanism of action of the nitrogen mustards with the biological materials of the body system.</p> <p>4.7 Classify nitrogen mustards into their three groups and give examples of the members of each follows:</p> <ul style="list-style-type: none"> <li>(i) Alkyl group – mechlorethamine HCL</li> <li>(ii) Phenyl group – chlorambucil (leukeran) - melphalan</li> <li>(iii) Heterocyclic group - uracil</li> </ul> <p>4.8 Describe the method of synthesizing melphalan in the laboratory.</p> | <p>Explain and illustrate the activities in 4.1 to 4.20 with appropriate examples.</p> <p>Ask students relevant questions to determine their learning outcome</p> | Chalkboard chalk |
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|  | <p>4.9 Synthesising melphalan in the laboratory</p> <p>4.10 Write the general structure of the ethylenimines and derive the formulas and nomenclatures of the members of the group.</p> <p>4.11 Describe the mechanism of action of the ethylenimines mentioned and in 4.10 above and relate them to physiological activities.</p> <p>4.12 Give the general structure of the sulphonic acid Esters and derive the formula and generic name of the most active compound in the group (myceram).</p> <p>4.13 Explain the meaning of anti-metabolites.</p> <p>4.14 Classify the Anti-metabolite as:</p> <ul style="list-style-type: none"> <li>- Folic acid antagonists</li> <li>- Pyrimidine antagonists</li> <li>- Purine antagonists</li> </ul> <p>4.15 write the structure folic acid and derive the formula of the folic acid antagonist (ethotrexate)</p> <p>4.16 describe the mode of action of the folic acid antagonists in the synthesis of nucleic acid</p> <p>4.17 Identify a sample of pyrimidine Antagonist and describe their mode of action in the synthesis nucleic acid.</p> <p>4.18 List examples of purine antagonists and describe their mechanism of action in the synthesis of nucleic acid.</p> <p>4.19 Classify the miscellaneous antineoplastic agents as:</p> <ul style="list-style-type: none"> <li>- Urathaine</li> <li>- Alkaloids from vinca sosea.</li> </ul> | <p>Supervise synthesis of melphanlam in the laboratory</p> | <p>Glass wares equipment</p> |
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|  | 4.20 Write the structure of the most important member of the urethane group.<br>4.21 Describe the modification of the structure of urethane and the effect on its physiological activities. |  |  |
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| WEEK | General Objective: 5.0 Understand the chemistry of the sulfonamides; sulfones, and folate reductase inhibitors with antibacterial action |                     |          |
| 7    | Special Learning Objective:  | Teachers Activities | Resource |

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|  | <p>5.1 Outline the historical development of sulphonamide or sulphanilamide drugs.</p> <p>5.2 Draw the chemical structure of the sulphanilamide molecule.</p> <p>5.3 Explain why azodyes containing sulphanilamide molecule have antibacterial activities e.g. Prontosil ( 2' 4' Diamino azobenzene – 4 - sulphonamide).</p> <p>5.4 Describe the synthesis sulphanilamide and N-substituted sulphamilamide.</p> <p>5.5 Synthesise sulphanilamide and a name N-substitute sulphanilamide e.g. sulphapyridine.</p> <p>5.6 Describe the mode of therapeutic action of sulphonamides.</p> <p>5.7 Explain the significance of folic acid in the therapeutic action of sulphonamides.</p> <p>5.8 Describe the synthesis of folic acid</p> <p>5.9 Synthesis folic acid in the laboratory</p> <p>5.10 Describe the effect of the modification of the structure of sulphonamide on its therapeutic action..</p> | <p>Explain and illustrate the activities in 5.1 to 5.14 with appropriate examples.</p> <p>Ask relevant questions to the students</p> <p>Supervise laboratory synthesis of the named drug</p> | <p>Chalkboard chalk</p> <p>Textbooks.</p> <p>Glass wares</p> |
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|  | <p>5.11 Explain the relationship between invitro activities of sulphonamides and their degrees of ionization.</p> <p>5.12 Describe the metabolism of sulphonamides in the body</p> <p>5.13 Classify sulphonamides according to their uses and give examples of each class:</p> <ul style="list-style-type: none"> <li>- Sulphonamides used for systemic infections</li> <li>- Sulphonamides used for intestinal infections</li> <li>- Miscellaneous sulphonamides.</li> </ul> <p>5.14 Describe the physical and chemical properties of each of sulphonamides listed in 5.13 above.</p> |  |  |
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| WEEK | General Objective: 6.0 Understand the chemistry of the Anti-bacterial Anti-bSpecial Learning Objective: |
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Teachers Activities

Resources

6.1 Outline the origin of anti-bacterial anti-biotics

6.2 Classify anti-bacterial anti-biotics as:

- B-lactam antibiotics (Penicillins and cephalosporius)
- The aminoglycosides
- The Tetracyclines
- Te macroclides
- The Linconcyines
- The Polypeptides

6.3 Write the general structure of penicillins

6.4 Derive the structure of important homologueous members of the penicillins and give their IUPAC names

6.5 Describe the various methods of preparing pencillins, namely:

- Preparation from natural source.
- Synthesis
- Semi synthesis

6.6 Apply the various methods described in 6.5 above in the preparation of the pencillins in the laboratory

6.7 Describe the physical and chemical properties of the pencillins.

6.8 Identify drugs from each class in 6.5 above.

6.9 Identify the active ingredient in antineoplastic agents.

Explain and illustrate activities in 6.1 to 6.47 with appropriate examples.

Ask students relevant questions to determine the learning outcome

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|  | <p>6.8 Describe the clinical features of the pencillins e.g. hydrolysis by gastric juice, etc.</p> <p>6.9 Classify the pencillins into:</p> <ul style="list-style-type: none"> <li>- Natural pencillins</li> <li>- Acid resistant pencillins</li> <li>- Pencillinase resistant pencillins</li> <li>- Broad spectrum pencillins.</li> </ul> <p>6.10 Describe the mode of the therapeutic action of each class of pencillins mentioned in 6.9 above.</p> <p>6.11 Test prepared pencillins for effectiveness on microbes</p> <p>6.12 Define the cephalosporins and write their general structure.</p> <p>6.13 Outline the sources of cephalosporins and name the product e.g. Cephalosporins C</p> <p>6.14 Describe hydrolysis of cephalosporin C to 7-Aminocephalosporamic acid (7 – ACA)</p> <p>6.15 Describe how 7 – ACA can be used in the preparation of semi-synthetic cephalosprins.</p> <p>6.16 Write the chemical structures and give the generic names of the important semisynthetic cephalosporins.</p> <p>6.17 Prepare a named important semisynthetic cephalosporin from cephalosporin C.</p> <p>6.18 State the factors responsible for oral inactivation of cephalosporin s.</p> <p>6.19 Define the tetracyclines and state their natura sources .</p> <p>6.20 Write the general structure Tetracyclines .</p> | Supervise test | Glass wares culture microscopes |
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|  | <p>6.21 Derive and name the important members of the Tetracyclines from 6.19 above.</p> <p>6.22 Describe the effect of the following on the Tetracyclines:</p> <ul style="list-style-type: none"> <li>- Acid (epimerisation)</li> <li>- Base</li> <li>- <math>\text{Ca}^{2+}</math>, <math>\text{Fe}^{2+}</math> and <math>\text{Al}^{3+}</math></li> </ul> <p>6.23 Describe the effect of Tetracyclines on newly formed bones and teeth.</p> <p>6.24 Describe the effect structural modification of the Tetracyclines on their therapeutic activities.</p> <p>6.25 Outline the natural sources of chloramphenicol (chloromycetin)</p> <p>6.26 Write the structure of chloramphenicol.</p> <p>6.27 Explain the incident of Diastereoisomerism in chloramphenicol and give the IUPAC names of isomers (Threo and Erythro isomers)</p> <p>6.28 Describe the method of preparing the two isomers of chloramphenicol</p> <p>6.29 Describe the method of preparing chloramphenicol from its threo-isomers.</p> <p>6.30 Prepare the two isomers of chloramphenicol in the laboratory and from threo-isomers prepare chloramphenicol.</p> <p>6.31 Test the prepared chloramphenicol for effectiveness.</p> <p>6.32 Describe the effect of modify the structure of chloramphenicol on its therapeutic activities.</p> <p>6.33 State the uses of chloramphenicol and its effect in the body system.</p> | <p>Supervise laboratory preparation of chloramphenicol and test</p> | <p>Glass wares microscopes</p> |
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|  | <p>6.34 Define the macrolides.</p> <p>6.35 Identify the sources of the natural macrolides.</p> <p>6.36 Describe how the natural macrolides can be isolated from their natural sources and name the isolates.</p> <p>6.37 Write the structure of the most important macrolides namely Erythromycin and oleandomycin.</p> <p>6.38 Describe the general characteristics of the structure of macrolides.</p> <p>6.39 Describe the physical and chemical properties of the macrolides.</p> <p>6.40 Define Aminoglycosides.</p> <p>6.41 State the sources of the natural Aminoglycosides.</p> <p>6.42 Classify the aminoglycosides into:</p> <ul style="list-style-type: none"> <li>- Streptomycin</li> <li>- Kanamycin</li> <li>- Neomycin</li> <li>- Paromomycin</li> <li>- Neutamycin</li> </ul> <p>6.43 State the uses of the classes of Aminoglycosides listed in 6.40 above.</p> <p>6.44 Describe the physical and chemical properties of the Aminoglycosides.</p> <p>6.45 Write the chemical structure of streptomycin</p> <p>6.46 Describe the physical properties of streptomycin</p> <p>6.47 State the uses of streptomycin.</p> |  |  |
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| WEEK | General Objective: 7.0 Understand the chemistry of the steroids and steroids hormones.   |   |   |
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|      | Special Learning Objective:  | Teachers Activities   | Resources                               |
| 9    | <p>7.1 Define the steroids</p> <p>7.2 Classify the important therapeutic steroids as:-</p> <ul style="list-style-type: none"> <li>- Male and female hormones.</li> <li>- Female contraceptive</li> <li>- Anti-inflammatory agents</li> <li>- Cardiac steroid.</li> <li>- Diuretics</li> <li>- Anti-biotics</li> <li>- Digestants (bile acids)</li> <li>- Vitamin D Precursors</li> </ul> <p>7.3 Explain the nomenclature, stereochemistry and numbering system of the steroid.</p> <p>7.4 Explain the importance of stereochemistry in the physiological activities of the steroids.</p> <p>7.5 Write the chemical structures and names of the parent steroid compound from where the other steroids are derived e.g. Cholestane, Androstane, Pregnane, Estrane, etc.</p> <p>7.6 Write the chemical structure and the IUPAC names of specific example of the parent compound listed in 7.5 above e.g. Cholestaol; Testosterone, 17 B-Estadiol and Cortisone.</p> | <p>Explain and illustrate the activities in 7,1 to 7.22 with appropriate examples.</p> <p>Ask the students appropriate question to determine their learning outcome</p> | <p>Chalkboard chalk</p> <p>Textbook</p> |

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|  | <p>7.7 Differentiate between the male and female sex hormones as estrogens and progesterone for female Testosterone for male</p> <p>7.8 Explain progestins estrogens and their uses.</p> <p>7.9 Classify estrogens into:-</p> <ul style="list-style-type: none"> <li>- Human estrogens and derivatives e.g. Estradiol</li> <li>- Equine estrogens e.g. Equitenin</li> <li>- Synthetic estrogens e.g. diethyl stilbestrol (DES)</li> </ul> <p>7.10 Write the chemical structures of the examples given in 7.9 above.</p> <p>7.11 Explain the metabolism of estradiol to give the less active estrone.</p> <p>7.12 Describe the two major ways of protecting estradiol from oxidation as:</p> <ul style="list-style-type: none"> <li>- Temporary Protection</li> <li>- Permanent Protection</li> </ul> <p>7.13 Classify progestins as:</p> <ul style="list-style-type: none"> <li>- Progesterone and derivatives</li> <li>- Testosterone derivative and 19 – nor testosterone derivatives</li> </ul> <p>7.14 Write the chemical structure of progesterone and outline its origin.</p> <p>7.15 Describe the modification of progesterone to produce the following more active derivatives.</p> <ul style="list-style-type: none"> <li>- 17 &amp; Hydroxy Progesterone Caproate</li> <li>- Medroxy Progesterone.</li> </ul> <p>7.16 Explain the effect of light on the progesterone derivatives</p> |  |  |
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|  | <p>7.17 Describe the metabolism of testosterone to produce the following more physiological active derivatives:-</p> <ul style="list-style-type: none"> <li>- Ethisterone (17 &amp; Ethinyl Testosterone)</li> <li>- Dimethisterone</li> <li>- Norethymodrol</li> <li>- Norethymodrone</li> <li>- Norgestrel</li> </ul> <p>7.18 Describe the therapeutic activities of the derivatives listed in 7.17 above.</p> <p>7.19 Describe the metabolism of estrogens to produce the following metabolites</p> <ul style="list-style-type: none"> <li>- Estrone</li> <li>- Estriol</li> <li>- 2 – Methoxy Estrone</li> </ul> <p>7.20 Describe the conjugation of Estrogen</p> <p>7.21 Describe the properties and uses of the conjugates produced in 7.20 above.</p> <p>7.22 Explain the meaning of Anabolic/Androgenic ratio and give examples.</p> |  |  |
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| WEEK | General Objective: 8.0 Understand the chemistry of the vitamins. |                     |           |
|      | Special Learning Objective:                                      | Teachers Activities | Resources |

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| 10 | 8.1 | Define the vitamins.  | Explain and illustrate the activities 8.1 to 8.8 with appropriate examples.                            | Hormone samples drug sa,[;es |
|    | 8.2 | Explain the importance of vitamin in the body.  |  |                              |
|    | 8.3 | List the important vitamins as: A, B, C, D, E and K.                                      | Ask relevant questions from the students to determine the level of understanding of the subject matter |                              |
|    | 8.4 | Draw the structures of the vitamins listed in 8.3 above and explain their chemical nature | Give appropriate assignment  |                              |
|    | 8.5 | Classify vitamins as:<br>- Fat soluble ( A, D, E and K)<br>- Water soluble (B and C)      |  |                              |
|    | 8.6 | State the sources of and requirements for the fat soluble and water soluble vitamins      |  |                              |
|    | 8.7 | Describe the methods of preparing the vitamins listed in 8.5 above                        |  |                              |
|    | 8.8 | Prepare the vitamins listed in 8.5 above in the laboratory                                | Supervise laboratory preparation of vitamins   |                              |

| WEEK | General Objective: 9.0 Understand the chemistry of Pesticides  |   |                                  |
|------|--|---|----------------------------------|
| 11   | Special Learning Objective:  | Teachers Activities   | Resources                        |
|      | 9.1 Explain the term: Pesticides   | Explain and illustrates activities in 9.1 to 9.11 with appropriate examples<br><br>Ask relevant questions and give assignment | Chalkboard chalk<br><br>Textbook |
|      | 9.2 List types of Pesticides and write their chemical structures   |   |                                  |
|      | 9.3 Describe the biochemical action of Pesticides.   |   |                                  |
|      | 9.4 Illustrate with chemical equation degradative products of the Pesticides in a system   |   |                                  |
|      | 9.5 Explain insect pheromones as active substances that mediate humeral correlations among individuals of a given species e.g. sex attractants of insects. |   |                                  |
|      | 9.6 Explain the use of insect pheromones as a pest control measure.  |   |                                  |
|      | 9.7 List the three important insecticides of plant origin as nicotine, rotenone and the pyrethrins.  |   |                                  |
|      | 9.8 Write the chemical structures of the insecticides listed in 9.7 above.,  |   |                                  |
|      | 9.9 List the two important synthetic insecticides as:-<br><br>- Benzene hexachloride (BHC)<br>- Dichlorodiphenyl/trichloroethane (DDT).                    |   |                                  |

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|      | 9.10 Describe the methods of synthesising the insecticides listed in 9.9 above.<br>9.11 Synthesise the insecticides listed in 9.9 above |                     |           |
| WEEK | General Objective: 10.0 Know the general techniques applied in the analysis and quality control of drugs.                               |                     |           |
| 12   | Special Learning Objective:   | Teachers Activities | Resources |

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|--|---|---|-------------------------|
|  | <p>10.1 Define quality control</p> <p>10.2 Explain the significance of 10.1 above in . industry</p> <p>10.3 Explain the role of Regulatory bodies (e.g. National Agency for Food and Drug Administration and Control) (NAFDAC; Pharmaceutical Council of Nigeria (PCN); standard organisation of Nigeria (SAN; Institute of chartered chemists of Nigeria (ICCONS) etc. for long industries.</p> <p>10.4 List the various bodies of standards available for analysis in drug industries (e.g. British Pharmacopocia etc.)</p> <p>10.5 Explain the uses of 10.4 above</p> <p>10.6 List the steps involved in quality control procedure (i.e. raw materials, intermediate, finished product)</p> <p>10.7 Explain the following terms commonly used in drug analysis:-</p> <ul style="list-style-type: none"> <li>- Bio-availability</li> <li>- Bio-activity</li> <li>- Stability</li> </ul> | <p>Explain and illustrate activities in 10.1 to 10.19 with appropriate examples.</p> <p>Ask relevant questions to the students and give them assignment</p> | <p>Chalkboard chalk</p> |
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|  | <p>10.8 Describe the methodology used in the determination of the quality of drugs isolated from natural sources as:-</p> <ul style="list-style-type: none"> <li>- Extraction</li> <li>- Separation (purification)</li> <li>- Isolation</li> <li>- Theoretical deductions</li> <li>- Pharmacological testing (Qualitative and Quantitative).</li> </ul> <p>10.9 Describe the pharmacological testing procedure as:-</p> <ul style="list-style-type: none"> <li>- *Qualitative methods</li> <li>- Microscopic examination</li> <li>- Histo-chemical examination</li> <li>- Qualitative chemical analysis</li> <li>- *Quantitative methods</li> <li>- Detection of foreign matter</li> <li>- Determination of moisture in drug</li> <li>- Determination of ash value</li> <li>- Determination of active principles</li> </ul> <p>10.10 Describe the methods listed in 10.9 above.</p> <p>10.11 Identify the analytical instruments commonly used in drug analysis and quality control. (PH spectrophotometer, mass spectrophotometer, Atomic Absorption spectrophotometer,</p> | <p>Assist students to carry out the physical identification of the named instruments</p> | <p>Listed equipment</p> |
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|       | Nuclear Magnetic Resonance, Refractometer, Polarimeter, X-ray diffractor weighing balance  |   |   |
| 10.12 | Describe a plan for the extraction of named drugs from their natural sources e.g. Alkaloids.                                       | Supervise design plan, extract active components of drugs using equipment in 10.11. | Soxhlet Extraction apparatus                        |
| 10.13 | Extract named and drugs from a named plant.  | Characterise using instruments in 10.11 above                                       | IR, UV/Visible spectrophotometer. Gas Chromatograph |
| 10.14 | Characterise by instrumental analysis the products from 10.13 above.   | Determine chemical contents by analysis.  | Polarimeter Weighing balance.                       |
| 10.15 | Determine the chemical contents of selected synthesized drugs e.g. Aspirin, Quinine, Chloramphenicol, etc.                         |   |   |
| 10.16 | Compare results obtained in 10.14 and 10.15 above with normal levels (data) set by NAFDAC, SON, PCN, WHO, ICCON and similar bodies |   |   |
| 10.17 | Make proper deductions from all available data.  |   |   |
| 10.18 | Describe the methods of monitoring drug therapy (immuno assay)   |   |   |
| 10.19 | Monitor drug therapy using the methods in above .  | Supervise the monitoring of drug therapy  | Microtitre plate reader.                            |

PRACTICAL CONTENTS

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES   | RESOURCES                       |
|------|---|---|---------------------------------|
|      | 3.8 Design a plan for the isolation of drugs listed in 3.5 above from their natural source                  | Supervise designing of extraction plan  | Drawing boards.                 |
|      | 3.11 Prepare quinine in the laboratory  | Explain and illustrate the activities in 3.10 to 3.45 with appropriate examples and ask students relevant questions | Glass wares                     |
|      | 3.15 Prepare chloroquine and camoquine in the laboratory  |   |                                 |
|      | 3.21 Prepare a named 8-aminoquinoline ant malarial in the laboratory.                                       |   |                                 |
|      | 3.28 Prepare quinacrine in the laboratory,  | Supervise laboratory preparation of quinacrine  | Glass wares                     |
|      | 3.40 Synthesise pyrimethaninone (Daraprine) in the laboratory.  | Supervise laboratory synthesis of the named drug.   | Glass wares                     |
|      | 5.5 Synthesise sulphanilamide and a name N-substitute sulphanilamide e.g. sulphapyridine.                   |   |                                 |
|      | 5.9 Synthesise folic acide in the laboratory.   |   |                                 |
|      | 6.6 Apply the various methods described in 6.5 above in the preparation of the pencillins in the laboratory | Supervise test  | Glass wares culture microscopes |
|      | 6.8 Identify drugs from each class in 6.5 above.  |   |                                 |
|      | 6.9 Identify the active ingredient in antineoplastic agents.  |   |                                 |
|      | 6.11 Test prepared pencillins for effectiveness on microbes.  |   |                                 |
|      | 6.17 Prepare a named important semisynthetic cephalosporin from cephalosporin C.                            |   |                                 |



PROGRAMME: Higher National Diploma Pharmaceutical Technology

COURSE: General Principles of Pharmacology II

CODE: STY 321

DURATION: (Hours/Week):      Lecture: 1              Tutorials: 0              Practicals: 2

UNIT: 2.0

GOAL: This course is designed to enable the student acquire knowledge of drug actions.

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Know drug response curves.
- 2.0 Know pharmacodynamics
- 3.0 Know drug Valuation & Screening

|   |   |                                     |                                |
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| PROGRAMME: PHARMACEUTICAL TECHNOLOGY: HIGHER NATIONAL DIPLOMA |   |                                     |                                |
| Course: GENERAL PRINCIPLE OF PHAR.MACOLOGY II                 |   | Course Code: STY 321                | Contact Hours: 76 Hrs. 2 Units |
| Course Specification: Theory/Practicals                       |   |                                     |                                |
| WEEK  | General Objective: 1.0 Know drug response curves.                         |                                     |                                |
| 1 – 5   | Special Learning Objective:   | Teachers Activities                 | Resources                      |
|   | 1.1 Explain the mechanism of drug effects.                                | Explain with responses curve charts | Charts.                        |
|   | 1.2 Explain dose-effect relationship and determination                    |                                     |                                |
|   | 1.3 Determine I.D <sub>50</sub> . ED50. TD50 and Therapeutic index.       |                                     |                                |
|   | 1.4 Explain the arithmetic/Log dose-response curves.                      |                                     |                                |
|   | 1.5 Explain the advantage of log dose-response.                           |                                     |                                |
|   | 1.6 Interpret response curve competitive and non-competitive antagonisms. |                                     |                                |
| WEEK  | General Objective: 2.0 Know pharmacodynamics                              |                                     |                                |
|   | Special Learning Objective:   | Teachers Activities                 | Resources                      |

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| 6 – 8 | <p>2.1 Explain the general mechanism of drug action</p> <p>2.2 Explain agonists, antagonists, partial agonists potentiation, synergism, additive with regard to drugs.</p> <p>2.3 Explain concepts of drug – receptor interaction and effect production.</p> | <p>Lecturer<br/>Discussion<br/>Demonstration</p> | <p>Chalk board<br/>Chalk<br/>Charts.</p> |
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| WEEK   | General Objective 3.0 Know drug Valuation & Screening   |  |           |
|--------|---|--|-----------|
| 9 - 14 | Special Learning Objective.   | Teachers Activities  | Resources |
|        | 3.1 Explain drug valuation and screening<br>3.2 Explain biological assay.<br>3.3 List types of biological assay.<br>3.4 Explain the perpetration and procedure for biological assay.<br>3.5 Carry out biological assay of given drug.<br>3.6 Explain drug screening.<br>3.7 List types of screening – simple or blind<br>3.8 Explain drug screening applying various methods.<br>3.9 Explain dry evaluation in potency, affinity.<br>3.10 Evaluate drugs for potency affinity<br>3.11 Explain traicity.<br>3.12 Describe methods of screaming for traicity.<br>3.13 Screen drugs for toxicity.<br>. | Supervise students to carryout biological assay and drug screening. Grade Reports. | Report    |

**PRACTICAL CONTENTS**

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES   | RESOURCES |
|------|--|---|-----------|
|      | 3.5 Carry out biological assay of given drug.<br>3.13 Screen drugs for toxicity. | Supervise students to carryout biological assay and drug screening. Grade Reports |           |



PROGRAMME: Higher National Diploma Pharmaceutical Technology

COURSE: Tablets, Capsules and Solid Dosages.

CODE: PCT 321

DURATION: (Hours/Week):          Lecture: 2                  Tutorials: 0                  Practicals: 4

UNIT: 4.0

GOAL: This course is designed to enable the diplomate know the techniques of manufacture of tablets, capsules and solid dosages.

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Know fundamentals of pharmaceutical manufacturing operations
- 2.0 Know the techniques of tablet manufacture
- 3.0 Know the principles and techniques of capsule manufacture
- 4.0 Know the principle and technique of manufacturing other solid dosages powder packages.
- 5.0 Know the theory of sustained formulations.

| <b>PROGRAMME PHARMACEUTICAL TECHNOLOGY; HIGHER NATIONAL DIPLOMA</b> |   |   |  |
|---|---|---|--|
| <b>COURSE</b> Tablets, capsules and solid dosages                   |   | <b>Course Code</b> PCT 321  | <b>Duration</b> 2-0-4 Unit 4.0                     |
| <b>COURSE GOAL:</b>   |   |   |  |
| <b>WEEK</b>   | <b>Learning Objectives</b>  | <b>Theory/Practicals</b>  | <b>Teachers Activity</b>                           |
|   | <b>General Objective</b> 1.0 Know fundamentals of pharmaceutical manufacturing operations   |   |  |
| 1 - 3   | 1.1 Explain the scope of pharmaceutical industry<br>1.2 List products that constitute pharmaceuticals<br>1.3 Identify the characteristics of a pharmaceutical industry e.g.<br>Cleanliness<br>Sterility<br>1.4 Differentiate between compounding and manufacturing  |   | Conduct visit to pharmaceutical industry<br>“<br>“ |
|   | <b>General Objective:</b> 2.0 Know the techniques of tablet manufacture.  |   |  |
| <b>WEEK</b>   | <b>Specific Learning Objectives</b>   | <b>Teachers Activity</b>  | <b>Resources</b>                                   |
| 4 - 7   | 2.1 Identify different types of tableting machines<br>2.2 Identify machines for<br>- weighing<br>- size reduction<br>- size separation<br>- for tableting<br>2.3 Describe the working principles of the machines in 2.2 above.<br>2.4 Weigh formulation and other materials for tableting, reduce sizes and separate sizes.<br>2.5 Identify powers for pharmaceuticals.<br>2.6 Describe the techniques of preparing powder for tableting<br>2.7 Identify equipment for preparing powder for tableting | Physically identify the machines<br><br><br><br><br><br><br><br><br>Physically identify the powders | Tableting machines and utensils                    |

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|  | <p>2.8 Prepare powder for tableting</p> <p>2.9 Explain the principles of tablet formulation</p> <p>2.10 Describe the technique of tablet production</p> <p>2.11 Identify different types of conventional tableting machines</p> <p>2.12 Explain the operational principles of conventional tableting machine</p> <p>2.13 Produce tablets of various formulations using conventional tableting machine</p> <p>2.14 Describe the techniques for coating of tablets</p> <p>2.15 Identify tablet coating machines</p> <p>2.16 Coat tablets using coating machines</p> <p>2.17 Explain precautionary measures in the manufacture of tablets</p> <p>2.18 Apply the precautionary measures in 2.17 above in the manufacture of tablets.</p> <p>2.19 Identify different containers for packaging of tablets.</p> <p>2.20 Identify different tablet packaging machines.</p> <p>2.21 Package tablets.</p> <p>2.22 Identify storage conditions for tablets</p> <p>2.23 Store tablets</p> | <p>Supervise practical of powder preparation</p> <p>Physically identify tableting machines and its parts</p> <p>Supervise practical production of tablets</p> <p>Supervise crating of tablets</p> <p>Supervise packaging of tablets</p> | <p>Machines for powder preparation</p> <p>Tableting machine</p> <p>Tableting machine</p> <p>Tablet coating machines</p> <p>Packaging containers</p> |
| General Objective: 3.0 Know the principles and techniques of capsule manufacture |   |   |   |
| 8 - 9  | <p>3.1 Explain capsules.</p> <p>3.2 Explain the advantages of capsulated drugs.</p> <p>3.3 Identify drugs that need copsulating.</p> <p>3.4 List the advantages and disadvantages of capsulated drugs.</p> <p>3.5 Identify various types and shapes of capsules.</p>  | <p>Show samples of various types and shapes of capsules</p>   | <p>Samples of capsules</p>  |

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|  | <p>3.6 Identify capsulating machines.</p> <p>3.7 Describe the working principles of capsulating machines.</p> <p>3.8 Identify the various parts of the capsulating machines</p> <p>3.9 Describe the techniques of preparing powder for capsulating.</p> <p>3.10 Prepare powder for copulating.</p> <p>3.11 Capsulate using convantenal machines.</p> <p>3.12 Package and label capsules.</p> | <p>Students should see capsulating machines and identify and draw the parts</p> <p>Students should prepare powder for capsulating and capsule using machines</p> | <p>Capsulating machines</p> <p>Size reduction, seiving equipment and utensils<br/>Capsulating machines</p> |
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|         | General Objective: 4.0 Know the principle and technique of manufacturing other solid dosages powder packages)  |   |   |
| 10 - 12 | <p>4.1 Explain powder packages.</p> <p>4.2 Identify preparations suitable for sutaining as powder</p> <p>4.3 Explain the characteristics of good sachet.</p> <p>4.4 Identify various types of sachets</p> <p>4.5 Choose sachets for various types of powder.</p> <p>4.6 Prepare powder for satcheting</p> <p>4.7 Formulate powder for satcheting</p> <p>4.8 Identify satcheting machines</p> | <p>Show powder, packages, various sachets, machines</p> | <p>Powders sachets, Sachet machines</p> |

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|         | 4.9 Explain the working principles of astcheting machines   |   |  |
|         | 4.10 Sachets powder.  |   |  |
|         | General Objective: 5.0 Know the theory of sustained formulations.   |   |  |
| 13 - 15 | Special Objective:<br>5.1 Explain sustained motion preparation.<br>5.2 Identify liquid oral drugs.<br>5.3 Explain suspending agenda.<br>5.4 List examples of suspending agents<br>5.5 Identify suspending agents.<br>5.6 Explain the processes involved in sustained action preparation | Show students sample of liquid oral medicine. | Sample of liquid oral medicine<br><br>Samples of suspending agents |

#### PRACTICAL CONTENTS

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES | RESOURCES |
|------|--|---------------------|-----------|
|      | 1.3 Identify the characteristics of a pharmaceutical industry e.g.<br>Cleanliness<br>Sterility<br>2.1 Identify different types of tableting machines<br>2.2 Identify machines for <ul style="list-style-type: none"> <li>- weighing</li> <li>- size reduction</li> <li>- size separation</li> <li>- for tableting</li> </ul> 2.4 Weigh formulation and other materials for |                     |           |

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|  | <p>tableting, reduce sizes and separate sizes.</p> <p>2.5 Identify powers for pharmaceuticals.</p> <p>2.7 Identify equipment for preparing powder for tableting</p> <p>2.8 Prepare powder for tableting</p> <p>2.11 Identify different types of conventional tableting machines</p> <p>2.13 Produce tablets of various formulations using conventional tableting machine</p> <p>2.15 Identify tablets coating machines</p> <p>2.16 Coat tablets using coating machines</p> <p>2.18 Apply the precautionary measures in 2.17 above in the manufacture of tablets</p> <p>2.19 Identify different containers for packaging of tablets</p> <p>2.20 Identify different tablet packaging machines.</p> <p>2.21 Package tablets.</p> <p>2.22 Identify storage conditions for tablets</p> <p>2.23 Store tablets</p> <p>3.3 Identify drugs that need copsulating</p> <p>3.5 Identify various types and shapes of capsules</p> <p>3.6 Identify capsulating machines</p> <p>3.8 Identify the various parts of the capsulating machines</p> <p>3.10 Prepare powder for copulating</p> <p>3.11 Capsulate using convantenal machines</p> <p>3.12 Package and label capsules.</p> <p>4.4 Identify various types of sachets</p> | <p>Supervise crating of tablets</p> <p>Supervise packaging of tablets</p> <p>Students should prepare powder for capsulating and capsulate using machines</p> | <p>Packaging containers</p> <p>Capsulating machines</p> <p>Size reduction, sieving equipment and utensils<br/>Capsulating machines</p> |
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|  | 4.5 Choose sachets for various types of powder. |  |  |
|  | 4.6 Prepare powder for satcheting               |  |  |
|  | 4.7 Formulate powder for satcheting             |  |  |
|  | 4.8 Identify satcheting machines                |  |  |
|  | 4.10 Sachets powder.                            |  |  |
|  | 5.2 Identify liquid oral drugs                  |  |  |
|  | 5.5 Identify suspending agents                  |  |  |

PROGRAMME: Higher National Diploma Pharmaceutical Technology

COURSE: Clinical Pharmacology I

CODE: STY 412

DURATION: (Hours/Week):           Lecture: 2                   Tutorials: 0                   Practicals: 3

UNIT: 3.0

GOAL: This course is designed to give the diplomate a general knowledge of effect of drugs on body organs.

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Know Cardio Vascular Pharmacology.
- 2.0 Know pharmacology of the respiratory system.
- 3.0 Know renal pharmacology
- 4.0 Know Gastro-intestinal pharmacology
- 5.0 Know endocrine and reproductive pharmacology
- 6.0 Know antacid (local Hormones) pharmacology
- 7.0 Know pharmacology of the ANS and neuromuscular system
- 8.0 Know pharmacology of the central nervous system
- 9.0 Know hypnotic and secretive drugs - diazepam
- 10.0 Know drug management of diseases of the musco skeletal system
- 11.0 Know drug management of diseases of the genito urinary system
- 12.0 Know drug management of diseases of the skins and soft tissues
- 13.0 Know drug management of diseases of ear, nose and throat.
- 14.0 Know drug management of diseases of hair and nail.
- 15.0 Know drug management of diseases of the eye.



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| <b>PROGRAMME: PHARMACEUTICAL TECHNOLOGY: HIGHER NATIONAL DIPLOMA</b>                                |   |   |                                |                  |
| Course: Clinical Pharmacology I   |   | Course Code: STY 412  | Contact Hours: 60 Hrs (3 Unit) |                  |
| Course Specification: Designed to give general knowledge of how drugs affect different body organs. |   |   |                                |                  |
| <b>WEEK</b>   | <b>General Objectives: 1.0 Cardio Vascular Pharmacology</b> |   |                                |                  |
| 1   | <b>Special Learning Objectives:</b>                         |   | <b>Teachers Activities</b>     | <b>Resources</b> |
|   | 1.1   | List blood diseases e.g. anaemia and Iron imbalance and therapy such as; Iron, Vitamin B, Folic acid. | Identify diseases with charts  | Charts           |
|   | 1.2   | List diseases of iron imbalances  |                                |                  |
|   | 1.3   | Explain therapy for the diseases in 1.1 and 1.2 above   |                                |                  |
|   | 1.4   | Identify diseases of the heart: (arrhythmias, cardiac failures and angine pectoris).                  | Identify drugs physically      | Heart drugs      |
|   | 1.5   | Identify drugs for heart diseases.  | Identify drugs physically      |                  |
|   | 1.6   | List disease of the blood vessels. (hypertension).  |                                |                  |
|   | 1.7   | Identify anti-typertensive drugs.   |                                |                  |
|   | 1.8   | Identify sources of active ingredients for the drugs in 1.5 above.                                    |                                |                  |

| WEEK | <u>General Objectives: 2.0 Pharmacology of the Respiratory System.</u>  |                            |                                       |
|------|---|----------------------------|---------------------------------------|
|      | <u>Special Learning Objectives</u>  | <u>Teachers Activities</u> | <u>Resources</u>                      |
|      | 2.1 Identify irritant and toxic gases and vapours with examples; Co, HCN, CCL <sub>4</sub> , Gasoline, Kerosine.          | Discussion<br>Use models   | Chalk Board.<br><br>Visit to hospital |
|      | 2.2 Identify signs of respiratory irritation by gases and ram pour.   |                            |                                       |
|      | 2.3 Identify drugs that control respiratory irritation.   |                            |                                       |
|      | 2.4 Describe the mode of action of the drugs in 2.3.  |                            |                                       |
|      | 2.5 Explain asthma and coughs with the bronchodilators-suebustamol (B <sub>2</sub> - agonist) and anti-tissue mucohytics. |                            |                                       |
|      | 2.6 Explain treatment of asthma and coughs with brochod. Tatus – suebushamol (Bz – agorst) and antitsine draltor.         |                            |                                       |
|      | 2.7 Identify the active ingredients in the drugs in 2.3 and 2.6 above.  | Carry out analysis         | Analytical instruments                |

| WEEK | <u>General Objectives: 3.0 Know Renal Pharmacology</u>   |   |   |
|------|--|---|---|
|      | <u>Special Learning Objectives</u>   | <u>Teachers Activities</u>  | <u>Resources</u>  |
| 3    | 3.1 List known human renal disorders<br>3.2 Describe clinical symptoms of the disorder in 3.1 above.<br>3.3 List drugs influencing the renal system in abnormal functions.<br>3.4 Identify the active ingredients in the drugs in 3.3 above.<br>3.5 Explain the mode of action of the drugs in 3.3 above<br>3.6 Identify diuretic with examples<br>3.7 Describe the manufacturing process of drugs listed in 3.3 above | Lecture<br>Discussion<br><br><br><br><br><br>Show samples of diuretics<br>Explain with flow charts. Visit manufacturing plant | <br><br><br><br><br><br><br><br>Manufacturing flow chart.<br>Samples of diuretics |
| WEEK | <u>General Objectives: 4.0 Know Gastro-intestinal Pharmacology</u>   |   |   |
|      | <u>Special Learning Objectives</u>   | <u>Teachers Activities</u>  | <u>Resources</u>  |

|   |     |  |   |              |
|---|-----|--|---|--------------|
| 4 | 4.1 | Identify drugs influencing the GIT system in an abnormal condition, e.g. gastric acid production, diarrhea, constipation.. | Display drugs   | Drug Samples |
|   | 4.2 | Describe the clinical symptoms of the ailments in 4.1 above.   |   |              |
|   | 4.3 | Identify the sources of the active ingredient in the drugs in 4.1 above  | Explain manufacturing process with flow chart. Visit to manufacturing plant | Flow chart   |
|   | 4.4 | Describe the manufacturing process of each of the drugs in 4.1. above  |   |              |

| WEEK | <u>General Objectives: 5.0 Know Endocrine and Reproductive Pharmacology</u> |  |  |                          |
|------|---|--|--|--------------------------|
|      | <u>Special Learning Objectives</u>  | <u>Teachers Activities</u>   | <u>Resources</u>   |                          |
| 5    | 5.1   | List all known disorder of the endocrine and reproductive system.  | Show samples of drugs and flow chart of the manufacturing process. | Drug samples flow chart. |
|      | 5.2   | Identify various endocrine glands and drugs influencing them. E.g Thyroid, ACTH, Pancreatic glands – insulin, oestrogen, progesterone and rogens |  |                          |
|      | 5.3   | Identify the active ingredients of the drugs in 5.2 above.   |  |                          |
|      | 5.4   | Explain the mode of action of the drugs in 5.3 above.  |  |                          |
|      | 5.5   | Describe the manufacture of the drugs in 5.2 above   |  |                          |

| WEEK   | General Objectives: 6.0 Know Antacid (Local Hormones) Pharmacology |  |                           |
|--|--|--|---------------------------|
| 6  | Special Learning Objectives  | Teachers Activities  | Resources                 |
|  | 6.1 Describe the action of antacid.                                | Show samples of drugs and flow chart of manufacturing process. | Drug samples flow charts. |
| 6.2 Describe the influence of various neuromodulators and mediators affecting the function of body organs. |  |  |                           |
| 6.3 Explain the action of 5, HTT Histamine, PG, Vasymessin, Kesrmis, angrotensm.                           |  |  |                           |
| 6.4 Describe the processes of manufacture of antacid.  |  |  |                           |
| 6.5 Identify the sources of the active ingredients of the drugs in 6.2. above                              |  |  |                           |

| General Objective: 7.0 Know Pharmacology of the ANS and Neuromuscular system |                            |                     |          |
|--|----------------------------|---------------------|----------|
|  | Special Learning Objective | Teachers Activities | Resource |
|  |                            |                     |          |

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|---|---|--|--|
| 7 | <p>7.1 Explain define Neuro transmitters with examples.</p> <p>7.2 Describe symptoms of various disorders</p> <p>7.3 Describe uses of agents in influencing parasympathetic system:</p> <ul style="list-style-type: none"> <li>a) Acetyline, carbochnol mesthacholne, nicotine.</li> <li>b) Pilocarpine, muscarine, arecoline</li> <li>c) Physsostigmine, neostiginine, enclophronium, pyridostigmine and organophosphate –malthin</li> <li>d) Astropine, scopolamine, homatropine, propantheline, pirenzepines.</li> </ul> <p>7.4 Explain the mode of action of the agents in 7.3.</p> <p>7.5 Describe uses of agents influencing sympathetic system:</p> <ul style="list-style-type: none"> <li>a) Adrenaline, noradrenaline, isoprenaline, dopamine.</li> <li>b) Phenylepherine, methoxamne, tyramine, amphetamine, ephedsrine.</li> <li>c) <b>Blockers:</b> Phenoxybenzamine, phentolamine, tolazoline, ergot alkaloids.</li> </ul> <p>7.6 Describe symptoms of disorders of the sympathetic system</p> <p>7.7 Describe the mode of action of the agents in 7.5. above.</p> <p>7.8 Identify sources of the active ingredients of the drugs in 7.3. and 7.5 above.</p> | <p>Explain with charts and models</p> <p>Show samples of neurotransmitters</p> | <p>Charts models.</p> <p>Neurotransmitters</p> |
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| WEEK | General Objective: 8.0 Know Pharmacology of the Central Nervous System. |                     |           |
|------|---|---------------------|-----------|
|      | Special Learning Objective:   | Teachers Activities | Resources |
|      |   |                     |           |



|      |   |   |                    |
|------|---|---|--------------------|
| 8.1  | Explain general Anaesthesia and theories of anaesthesia.                                  | Show samples                              | Samples            |
| 8.2  | Explain the theories of anaesthesia   |   |                    |
| 8.3  | Identify volatile and gaseous anaesthesia, Halothane, Chloroform, ether, pentobarbitones. |   |                    |
| 8.4  | Describe the application of the various type of anaesthesia through I.V;L.P I.M; S.C      |   |                    |
| 8.5  | Identify the Signs and different stages of anaesthesia.                                   | Visit to hospital                         | Visit to hospital  |
| 8.6  | Explain the effect of Narcotic analgesic on the CNS; morphine, or codeine.                |   |                    |
| 8.7  | Explain drug tolerance, physical dependence and abuse.                                    |   |                    |
| 8.8  | Identify alcohol (ethanol, methanol) by physical tests                                    | Conduct physical tests. Show drug samples | Drug samples       |
| 8.9  | Identify non-narcotic analgesic in Pain – Aspirin and its derivatives.                    |   | Drug samples       |
| 8.10 | Identify hypnotic and Sedative drugs – Diazepam   |   |                    |
| 8.11 | Identify CNS stimulants – Strychnine, Picrotoxin, Pentobarbitone.                         | Conduct practical distillation            | Distillation still |
| 8.12 | Identify anticonvulsant drugs   |   |                    |
| 8.13 | Describe process of manufacture of 8.3, 8.8, 8.9, 8.10, 8.11, 8.12.                       |   |                    |
| 8.14 | Produce alcohol by distillation.  |   |                    |

| WEEK | General Objective 9.0 Know Hypnotic and Secretive drugs – Diazepam.  |  |                  |
|------|--|--|------------------|
|      | Special Learning Objective:  | Teachers Activities  | Resources        |
| 9    | 9.1 Identify the following drugs: <ul style="list-style-type: none"> <li>(i) CNS Stimulants – strychnine, Picrotoxin, Pentylenetetrazol to induce convulsion and Anticonvulsant drugs.</li> <li>(ii) Anti-anxiety drugs.</li> <li>(iii) Anti-depressant drugs.</li> <li>(iv) Neuroleptic drugs.</li> </ul> | Show drug samples  | Drug samples     |
|      | 9.2 Identify the sources of the active ingredients in the drugs in 9.1. above  | Visit industries that manufacture hypnotic and secretive drugs | Visit industries |
|      | 9.3 Describe the mode of action of the drugs in 9.1 above.   |  |                  |
|      | 9.4 Describe the manufacturing process of the drugs in 9.1. above.   |  |                  |

| General Objective: 10.0 Know drug management of the musculo-skeletal system |  |                                     |              |
|---|--|-------------------------------------|--------------|
|   | Special Objective;   | Teachers Activities                 | Resources    |
|   | 10.1 List diseases of the musco-skeletal system.                                     | Show students samples of the drugs. | Drug samples |
| 10  | 10.2 Identify drugs commonly used in treating diseases of the musco-skeletal system. |                                     |              |

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|  | <p>10.3 Explain the safe dosage for the drugs in 10.2 above.</p> <p>10.4 Explain the mechanism of action of the drugs in 10.2 above.</p> <p>10.5 Identify the sources of the active ingredients of the drugs in 10.2 above.</p> <p>10.6 Describe possible side effects of the drugs in 10.2 above</p> <p>10.7 Outline the process of manufacturing of the drugs in 10.2 above</p>  | <p>Conduct visit to manufacturing plant</p>                              | <p>Industrial visit</p> |
| <p>General Objective 11.0 Know drug management of diseases of the genitor-urinary system</p> |  |  |                         |
| 11   | <p>11.1 List diseases of the genito-urinary system.</p> <p>11.2 Identify the external symptom of the disease in 11.1 above.</p> <p>11.3 Identify drugs commonly used in treating diseases of the genito urinary system.</p> <p>11.4 Explain the safe dosage for the drugs in 11.3 above.</p> <p>11.5 Explain the mechanism of action of the drugs in 11.3 above.</p> <p>11.6 Identify the sources of the active ingredients of the drugs in 11.3 above</p> | <p>Show picture to student</p> <p>Show students samples of the drugs</p> | <p>Drug samples</p>     |

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|  | 11.7 Describe possible side effects of the drugs in 11.3 above.        | Industrial visit |  |
|  | 11.8 Describe the process of manufacturing of the drugs in 11.3 above. |                  |  |

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| General Objective: 12.0 Know drug management of diseases of the skin and soft tissues. |  |   |               |
| 12   | 12.1 List diseases of the skin and soft tissues.                                     | .Show students drug samples             | Drug samples  |
|  | 12.2 Identify the external symptoms of the diseases in 12.1 above.                   | Show pictures of the diseases           |               |
|  | 12.3 Identify drugs commonly used in treating diseases of the skin and soft tissues. |   |               |
|  | 12.4 Explain the mechanism of action of the drugs in 12.3 above.                     | Show drug samples                       | Drugs samples |
|  | 12.5 Identify the sources of the active ingredients of the drugs in 12.3 above       |   |               |
|  | 12.6 Describe possible side effects of the drugs in 12.3 above.                      |   |               |
|  | 12.7 Describe the process of manufacturing of the drugs in 12.3 above.               | Use flow charts                         | Flow charts   |
| General Objective: 13.0 Know drug management of diseases of ear, nose and throat       |  |   |               |
|  | 13.1 List diseases of the ear, nose and throat.                                      | Show pictures of diseases manifestation | Pictures      |
|  | 13.2 Identify symptoms of the diseases in 13.1                                       |   |               |

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| 13 | above.<br>13.3 Identify drugs commonly used in treating diseases of the ear, nose and throat.<br>13.4 Identify the sources of active ingredients in the drugs in 13.3 above<br>13.5 Describe possible side effects of the drugs in 13.1 above.<br>13.6 Describe the process of manufacturer of the drugs in 13.3 above. | Show drug samples<br><br>Industrial Visit | Drug samples<br><br>Industry |
|----|---|---|------------------------------|

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| General Objective: 14.0 Know drug management of diseases of hair and nail |  |  |                                   |
| 14  | 14.1 List diseases of the hair and nail<br>14.2 Identify external symptoms of the diseases in 14.1 above.<br>14.3 Identify drugs commonly used in treating diseases in 14.1 above.<br>14.4 Identify the sources of the ingredients in the drugs in 14.3 above.<br>14.5 Explain the mechanism of action of the drugs in 14.1 above.<br>14.6 Describe the preparations of the drugs in 14.3 above. | Show pictures of diseases hair and nail.<br><br>Industrial visit | Pictures.<br><br>Industrial visit |

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|----|---|---------------|----------|
|    | General Objective: 15.0 Know drug management of diseases of the eye.  |               |          |
| 15 | <p>15.1 List diseases of the eye.</p> <p>15.2 Identify external symptoms of the diseases of the eye.</p> <p>15.3 Identify drugs commonly used in treating diseases of the eye.</p> <p>15.4 Identify sources of the active ingredients of the drugs in 15.3 above.</p> | Show pictures | Pictures |

#### PRACTICAL CONTENTS

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES                        | RESOURCES                            |
|------|---|--|--------------------------------------|
|      | <p>1.4 Identify diseases of the heart: (arrhythmias, cardiac failures and angine pectoris).</p> <p>1.5 Identify drugs for heart diseases</p> <p>1.7 Identify anti-hypertensive drugs</p> <p>3.6 Identify diuretics with examples</p> <p>4.1 Identify drugs influencing the GIT system in an abnormal condition, e.g. gastic acid production, diarrhea, constipation</p> <p>7.9 Identify the following drugs:<br/> e. Ganglion blockers –s<br/> stimulants (icotine),.<br/> Blockers</p> | Show samples of diuretics<br>Display drugs | Samples of diuretics<br>Drug samples |

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|  | <p>Hexamethonium,<br/>mecamylemine<br/>pempdine,<br/>Pentamethonium,<br/>Tryptophan.</p> <p>f. Neuro muscular<br/>blockers – tubocurarine,<br/>Suxamethonium,<br/>Decamethonium and their<br/>Therapeutic uses</p> <p>g. Anstaicoagulants:<br/>Heparm, oral<br/>anticoagulants,<br/>courmarins, warfarin.</p> <p>h. Lsocial anaesthetics:<br/>cocaine, procaine,<br/>procarrids, Ldoaine. Its<br/>uses.</p> <p>8.3 Identify voltatile and gaseous anaesthesia,<br/>Hallothane Chloroform, ether, pentobabitones</p> <p>8.14 Produce alcohol by distillation</p> <p>9.1 Identify the following drugs:</p> <p>(i) CNS Stimulants<br/>– strychnine,<br/>Pcrofoxic,<br/>Penthlenetetrazol<br/>to induce<br/>convulsion and</p> | <p>Show drug samples</p> | <p>Drug samples</p> |
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|  | <p>Anticonvulsant drugs.</p> <p>(ii) Anti-anxiety drugs.</p> <p>(iii) Anti-depressant drugs.</p> <p>(iv) Neuroleptic drugs.</p> |                          |                     |
|  | <p>10.2 Identify drugs commonly used in treating diseases of the musco-skeletol system.</p>                                     |                          |                     |
|  | <p>11.3 Identify drugs commonly used in treating diseases of the genitor urinary system</p>                                     | <p>Show drug samples</p> | <p>Drug samples</p> |
|  | <p>12.3 Identify drugs commonly used in treating diseases of the skin and soft tissues.</p>                                     |                          |                     |
|  | <p>13.3 Identify drugs commonly used in treating diseases of the ear, nose and throat</p>                                       |                          |                     |
|  | <p>14.3 Identify drugs commonly used in treating diseases in 14.1 above</p>   |                          |                     |
|  | <p>15.3 Identify drugs commonly used in treating diseases of the eye.</p>   |                          |                     |



PROGRAMME: PHARMACEUTICAL TECHNOLOGY

COURSE: ANTIMICROBIAL AGENTS

CODE: PCT 421

DURATION (HOURS/WEEK)    Lectures    2                      Tutorials    0                      Practicals    4

UNITS: 6.0

GOAL: This course is designed to enable the student know the nature and methods of production of antimicrobial agents.

GENERAL OBJECTIVES: On completion of this course, the diplomate should be able to:

- 1.0 Outline the historical development of antimicrobial agents.
- 2.0 Know the nature and mode of action of sulphonamides
- 3.0 Know the nature and mode of action of penicillins and cephalosporins.
- 4.0 Know the nature and mode of action of the aminoglycosides.
- 5.0 Know the nature and mode of action of chloramphenicol and tetracyclines.
- 6.0 Know the nature and mode of action of the macrolides.
- 7.0 Know the nature and mode of action of peptide antibiotics.
- 8.0 Know synthetic antibiotics.
- 9.0 Know antimycotic agents.
- 10.0 Know polyene antimycotic agents.
- 11.0 Know imidazole compounds.
- 12.0 Know antiviral agents.
- 13.0 Know the concept of drug resistance.
- 15.0 Know methods of antibiotic sensitivity.

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| PROGRAMME: ANTIMICROBIAL AGENTS HIGHER NATIONAL DIPLOMA  |  |                    |                   |
| General Dispensing Practice:   |  | Coe: PCT 421       | Duration 60 Hours |
| Course: This course is designed to enable the student know the nature and methods of production of antimicrobial agents. |  |                    |                   |
| WEEK   | General Objectives: 1.0 Outline the historical development antimicrobial agents. |                    |                   |
| 1  | Specific Objectives  | Teacher Activities | Resources         |

|  |  |   |                               |
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|  | <p>1.6 Define: Antimicrobial agents<br/>Chemotherapeutic agents.<br/>Antibiotics.</p> <p>1.7 Explain two ways through which the agents in 1.1 above may be formed –<br/>[I] naturally as by product of microorganisms;<br/>[ii] synthetic.</p> <p>1.8 Outline the contributions of the following persons to the development of antimicrobial agents.</p> <ul style="list-style-type: none"> <li>- Paul Ehlich</li> <li>- Thomas and Bronmi</li> <li>- C. H. Browning</li> <li>- Ian Fleming</li> <li>- Do mag</li> <li>- Woods</li> <li>- Waksman.</li> </ul> <p>1.9 Classify antimicrobial agents into</p> <ul style="list-style-type: none"> <li>- chemical agents.</li> <li>- Physical agents.</li> </ul> <p>1.10 Explain:</p> <ul style="list-style-type: none"> <li>- antibiotic</li> <li>- antiseptic</li> <li>- disinfectant</li> <li>- bacteriocidal</li> <li>- bacteriostatic.</li> </ul> | <p>Show students samples of natural and synthetic antibiotics</p> | <p>Samples of antibiotics</p> |
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| General Objective 2.0 Know the nature and mode of action of sulphonamides. |   |                                       |                           |
|--|---|---------------------------------------|---------------------------|
| 2  | 2.6 Describe the structure of the sulphonamides.<br>2.7 Explain the antimicrobial action of the sulphonamides.<br>2.8 Explain the action of sulphonamides in the inhibition of synthesis of folic acid.<br>2.9 Identify the source of sulphonamides.<br>2.10 Describe the mode of production of sulphonamides.<br>2.11 Identify other derivatives of sulphonamides e.g.<br>Sulphathiazole<br>Sulphapyridine.<br>2.12 Identify common sulphonamide based drugs e.g. septrin, etc.<br>2.13 Describe the process of manufacture of the common sulphonamide drugs in 2.65 above.<br>2.14 Prepare sulphonamides in the laboratory. | Show student samples of sulphonamides | Samples of sulphonamides. |



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|  | 3.12 Culture penicillin in the laboratory.                   | Supervise practical culturing of penicillin. | Incubators<br>Media<br>Glasswares |
|  | 3.13 Compare the structure of penicillin with cephalosporin. |  |                                   |
|  | 3.14 Describe the lactam ring.                               | Conduct industrial visit.                    | Industrial visit.                 |
|  | 3.15 Describe the industrial production of penicillin.       |  |                                   |

General Objective 4.0 Know the nature and mode of action of the aminoglycosides.

|   |  |  |                     |
|---|--|--|---------------------|
| 4 | 4.7 List antibiotics of the aminoglycosides group:<br>- streptomycin<br>- kanamycin<br>- gentamycin                          | Show samples of antibiotics of the group | Antibiotic samples. |
|   | 4.8 Explain the relationship between antibiotics of the aminoglycosides group  |  |                     |
|   | 4.9 Identify the organisms that produce the antibiotics:<br>- Streptomycin - <u>streptomyces griseus</u><br>- Micromonospora |  |                     |
|   | 4.4. Culture and preserve pure cultures of the organisms in 4.3 above.   |  |                     |
|   | 4.5. Explain the clinical features and mechanism of action of the aminoglycosides.   | Supervise culturing of organism          | Incubator, etc.     |
|   | 4.6. Explain the advantages of aminoglycosides over penicillin.  |  |                     |
|   | 4.7. Explain the limitations of aminoglycosides.   |  |                     |
|   | 4.8. Describe the range of activity of streptomycin, kanamycin and gentamycin.   |  |                     |
|   | 4.9. Describe the industrial process for the manufacture of aminoglycosides.   |  |                     |
|   |  |  |                     |

| General Objective 5.0 Know the nature and mode of action of chloramphenicol and tetracyclines. |      |  |   |                          |
|--|------|--|---|--------------------------|
| 5  | 5.5  | Identify the microbial sources of chloramphenicol and tetracyclines.   | Supervise culturing and microscopic identification. | Incubator                |
|  | 5.6  | Culture species of streptomycetes for production of chloramphenicol and tetracyclines.   |   |                          |
|  | 5.7  | Explain the structure of chloramphenicol and tetracycline.   |   |                          |
|  | 5.8  | Explain the mode of action of chloramphenicol, and tetracyclines.  | Supervise culturing and microscopic identification. | Incubator.               |
|  | 5.9  | Identify the following organisms.<br>- <u>streptomyces aureofaciens</u> for production of <u>chlortetracycline</u><br>- <u>Streptomyces rimosus</u> for production of <u>oxytetracycline</u> . |   |                          |
|  | 5.10 | Culture and preserve pure culture of the organisms in 5.5 above.   |   |                          |
|  | 5.11 | Explain the range of activities of chloramphenicol and tetracyclines.  | Conduct industrial visit.                           | Pharmaceutical industry. |
|  | 5.12 | Describe the industrial production of chloramphenicol and tetracyclines.   |   |                          |

| General Objective 6.0 Know the nature and mode of action of the macrolides. |      |  |                                       |                 |
|---|------|--|---------------------------------------|-----------------|
| 6   | 6.5  | Describe the structure of macrolides as monocyclic lactone rings to which sugars are attached.       | Show students samples of antibiotics  | Samples         |
|   | 6.6  | Identify antibiotics of the macrolides group:<br>- Erythromycin<br>- Oleandomycin.                   |                                       |                 |
|   | 6.7  | Identify the sources of the antibiotics in 6.2 above.<br>- erythromycin from streptomyces erythreus. |                                       |                 |
|   | 6.8  | Identify the three types of erythromycins A, B and C and their sources.                              | Show students samples of antibiotics. | Samples         |
|   | 6.9  | Culture and store pure culture of <i>S. erythreus</i> .  |                                       |                 |
|   | 6.10 | Describe the industrial production of erythromycin and oleandomycin.                                 | Supervise culturing of bacteria       | Incubator, etc. |

| General Objective 7.0 Know the nature and mode of action of peptide antibiotics. |      |   |  |                         |
|--|------|---|--|-------------------------|
| 7  | 7.6  | Describe the structure of peptide antibiotics.  | Show students samples of the antibiotics | Samples                 |
|  | 7.7  | List all known polypeptide antibiotics:<br>- bacitracin<br>- gramicidins<br>- polymyxins. |  |                         |
|  | 7.8  | explain the range of activities of the antibiotics in 7.2 above.                          | Supervise microscopic identification.    | Incubator refrigerator. |
|  | 7.9  | Explain why bacitracin and gramicidin are used topically only.                            |  |                         |
|  | 7.10 | Identify <i>Bacillus polymyxa</i> as the organism that produces polymyxins.               |  |                         |
|  | 7.11 | Culture and store pure cultures of <i>B. polymyxa</i> .                                   | Supervise culturing                      |                         |



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|  | <p>7.12 Identify the five chemical varieties of polymyxins A B C D E.</p> <p>7.13 Describe the commercial production of sulphate derivatives of polymyxin B;<br/> <math>R_1 = \text{phenylalanine}</math><br/> <math>R_2 = 6\text{-methylheptanoyl}</math>.</p> <p>Polymyxin E<br/> <math>R_1 = \text{D leucine}</math><br/> <math>R_2 = 6\text{-methyloctanoyl}</math>.</p> | Visit pharmaceutical industry. | Pharmaceutical industry. |
|--|--|--------------------------------|--------------------------|

General Objectives 8.0 Know synthetic antibiotics

|  |   |   |  |
|--|---|---|--|
|  | <p>8.10 Describe the structure of nalidixic acid.</p> <p>8.11 Describe the chemical nature of nalidixic acid.</p> <p>8.12 Explain the mode of action of nalidixic acid as an antimicrobial agent.</p> <p>8.13 Describe the range of action of nalidixic acid as an antimicrobial agent.</p> <p>8.14 Describe the commercial production of nalidixic acid.</p> <p>8.15 Produce nalidixic acid.</p> | <p>Show drug samples to students.</p> <p>Show samples of extemporaneous preparation</p> <p>Supervise laboratory production.</p> | <p>Drug samples</p> <p>Extemporaneous preparations</p> <p>Glasswares, etc.</p> |
|--|---|---|--|

| General Objective 9.0 Know antimycotic agents. |   |  |                    |
|--|---|--|--------------------|
| 9  | 9.6 Outline the scope of mycosis.<br>9.7 Explain why the development of antimycotic agents have not been as successful as antimicrobial agents. | Show student samples of antimycotic drugs. | Antimycotic drugs. |

| General Objectives 10.0 Know polyene antimycotic agents. |  |  |              |
|--|--|--|--------------|
| 10   | 10.5 Describe the nature of polyene antimycotic agents.<br>10.6 Describe the chemical structure of antimycotic agents.<br>- amphotericin B<br>- nystatin.<br>10.7 Explain the mode of action of the agents in 10.2 above.<br>10.8 Describe the mode of manufacture of polyene. | Show flow diagram of manufacture of polyene. | Flow diagram |

| General Objectives 11.0 Know imidazole Compounds.. |   |  |               |
|--|---|--|---------------|
| 11   | 11.1 Describe the nature of imidazole antimicrobial/antimycotic agents.<br>11.2 Explain the range of activities of the agents in 11.1 above.<br>11.3 Explain the mode of action of imidazole.<br>11.4 Explain the uses and modes of action of the following imidazole.<br>- Clootrimazole;<br>- Ketoconazole;<br>- Miconazole.<br>11.5 Explain the chemical nature of the agents in 11.4 above. | Show student samples of imidazole drugs. | Drug samples. |





|  |  |                                      |                            |
|--|--|--------------------------------------|----------------------------|
|  | antibiotics.<br>14.11 Describe the agar overlay method of testing effectiveness of antibiotics.<br>14.12 Test effectiveness of antibiotics using the methods in 14.6 and 14.7 above. | Supervise laboratory practical test. | Petridishes and incubator. |
|--|--|--------------------------------------|----------------------------|

**PRACTICAL CONTENTS**

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES                         | RESOURCES             |
|------|--|---|-----------------------|
|      | 2.9 Prepare sulphonamides in the laboratory  |   |                       |
|      | 3.2 Identify penicillium organisms that could be used to produce penicillin e.g.<br><ul style="list-style-type: none"> <li>- P. notatum</li> <li>- P. notatum</li> <li>- P. chrysogenum.</li> </ul>                                    | Show various samples of penicillin          | Samples of penicillin |
|      | 3.3 Identify other organisms which are capable of producing penicillin e.g. species of<br><ul style="list-style-type: none"> <li>- Aspergillus</li> <li>- Tricholphyton</li> <li>- Epidemophyton</li> <li>- Cephalosporium.</li> </ul> | Practical microscopic identification        | Microscopes           |
|      | 3.8 Culture penicillin in the laboratory   | Supervise practical culturing of penicillin | Incubators            |
|      | 4.3 Identify the organisms that produce the antibiotics:<br><ul style="list-style-type: none"> <li>- Streptomycin - <u>Streptomyces griseus</u></li> <li>- Micromonospora</li> </ul>   |   |                       |

|  |   |   |   |
|--|---|---|---|
|  | <p>5.1 Culture species of streptomyces for production of chloramphenicol and tetracyclines</p> <p>5.5 Identify the following organisms</p> <p>5.6 Culture and preserve pure culture of the organisms in 5.5 above</p> <p>6.5 Culture and store pure culture of <i>S. erythraeus</i></p> <p>7.6 Culture and store pure culture of <i>B. polymyxa</i></p> <p>8.6 Produce nalidixic acid</p> <p>11.6 Produce the agents in 11.4 above</p> <p>11.7 Test the agents produced in 11.6 above for effectiveness</p> <p>14.8 Test effectiveness of antibiotics using the methods in 14.6 and 14.7 above.</p> | <p>Supervise culturing and microscopic identification</p> <p>Supervise culturing</p> <p>Supervise practical production of imidazoles</p> <p>Supervise laboratory practical test</p> | <p>Incubator</p> <p>Glassware<br/>Reagent</p> <p>Petri dishes<br/>antiglare incubator</p> |
|--|---|---|---|

PROGRAMME: PHARMACEUTICAL TECHNOLOGY: HIGHER NATIONAL DIPLOMA

COURSE: CHEMICAL STERILIZERS (ANTISEPTICS, AND DISINFECTANTS)

CODE: PCT 422

DURATION: LECTURES 1 TUTORIALS 0 PRACTICALS 3

UNITS: 2.0

GOAL: This course is designed to enable diplomats know the nature and methods of production of chemical sterilizers.

General Objectives: On completion of this course, the diplomats' should be able to:

- 1.0 Know the scope of chemical sterilizers.
- 2.0 Know Halogens as disinfectants and antiseptics.
- 3.0 Know alcohols as disinfectants and antiseptics.
- 4.0 Know phenols and their derivatives as sterilizing agents.
- 5.0 Know the peroxides as sterilizing agents.
- 6.0 Know antiseptic dyes.

General Objective 1.0: Know the scope of chemical sterilizers

|                        |  |  |                           |
|------------------------|--|--|---------------------------|
|                        | <p>1.1 Define antiseptic sterilant</p> <p>1.2 Outline the history of antiseptic and disinfectants and the contribution of the following:</p> <p style="padding-left: 40px;">Ignatz Semmelweis<br/>Joseph Lister<br/>Robert Koch<br/>Neuber<br/>Kronig and Paul.</p>  |  |                           |
| General Objective 2.0: | Know Halogens as disinfectants and antiseptics   |  |                           |
|                        | <p>2.1 List the halogens.</p> <p>2.2 Describe the characteristics of halogens.</p> <p>2.3 Describe the mode of action of halogens as disinfectants and antiseptics.</p> <p>2.4 Describe the range of activities of halogens as disinfectants and antiseptics</p> <p>2.5 Describe the uses of halogen disinfectants and antiseptics e.g. in surgical operation, water treatment.</p> <p>2.6 List available compounds of iodine and non ionic compounds used for disinfection e.g. polyvinylpyrrolidone.</p> <p>2.7 Describe the nature of polyvinylpyrrolidone.</p> | <p>Explain from the periodic table.</p> <p>Show some samples of halogen disinfectants.</p> | <p>the periodic table</p> |



|                       |   |   |   |
|-----------------------|---|---|---|
|                       | <p>2.8 Prepare polyvinylpyrrolidone</p> <p>2.9 Test the compound in 2.8 above for antiseptic activities.</p> <p>2.10 List derivatives of chlorine commonly used as antiseptics and disinfectants e.g.<br/>hypochloride;<br/>parasulphonic dichloramide<br/>benzoic acid (halazone)<br/>succinchlorimide</p> <p>2.11 Prepare the compounds in 2.10 above in the laboratory.</p> <p>2.12 Test the compounds in 2.10 above for antiseptic activities.</p> <p>2.13 Explain the limitations of chlorine compounds as disinfectant.</p> | <p>Supervise laboratory preparation and test.</p> <p>“ “</p>  | <p>Laboratory Wares</p> <p>“ “</p>  |
| General Objective 3.0 | Know alcohols as disinfectants and antiseptics.   |   |   |
|                       | <p>3.1 Explain the characteristics of alcohols.</p> <p>3.2 Describe the mode of action of alcohol as disinfectants.</p> <p>3.3 Identify the three alcohols used mainly as disinfectants<br/>ethanol<br/>methanol<br/>isopropyl alcohol(CH<sub>3</sub>)CHOH).</p> <p>3.4 Prepare the three alcohols in 3.3 above in the laboratory.</p> <p>3.5 Test the alcohols prepared in 3.3 above for sterilizing effect</p> <p>3.6 Explain why isopropyl alcohol is the most effective of the alcohols as a sterilizing agent.</p>           | <p>Show samples of alcohol.</p> <p>Supervise physical identification</p> <p>Supervise laboratory Preparation and test</p> | <p>samples of alcohol.<br/>ethanol,<br/>methanol,<br/>isopropyl alcohol,<br/>Laboratory wares</p> |

|                       |  |   |  |
|-----------------------|--|---|--|
| General Objective 4.0 | Know phenols and their derivatives as sterilizing agents.  |   |  |
|                       | <p>4.1 Describe the structure of phenol (carboic acid), o-cresol, M-cresol, p-cresol, cresyla cetate.</p> <p>4.2 Describe the structure of phenol derivative hexachlorophene, chlorohexidene.</p> <p>4.3 Explain the mode of action of phenol as disinfectant.</p> <p>4.4 Explain phenol coefficient.</p> <p>4.5 Describe the physical characteristics of phenols and cresols.</p> <p>4.6 Explain the uses of resyl acetate as an antiseptic and analgesic.</p> <p>4.7 Prepare phenols and cresols in the laboratory</p> | Supervise laboratory Preparation of phenols and cresols.  | Laboratory wares.                                    |
| General Objective 5.0 | Know the peroxides as sterilizing agents.  |   |  |
|                       | <p>5.1 Explain the mode of action of peroxides as sterilizing agents.</p> <p>5.2 Explain the uses of sodium peroxide, Zinc peroxide in disinfection.</p> <p>5.3 Prepare zinc peroxide , sodium peroxide</p> <p>5.4 Test the prepared zinc peroxide, sodium peroxide for antiseptic action.</p>   | <p>Show samples of peroxides</p> <p>Supervise laboratory Preparation and test of zinc peroxide,</p> | <p>Samples of peroxides</p> <p>Laboratory wares.</p> |

|                       |  |  |                  |
|-----------------------|--|--|------------------|
|                       |  | sodium peroxide.                             |                  |
| General Objective 6.0 | Know antiseptic dyes.  |  |                  |
|                       | 6.1 Identify dyes with antiseptic properties e.g. acridine derivatives e.g. acriflavin<br>rosaniline dyes, crystal violet.<br>6.2 Describe the mode of action of acridine derivatives.<br>6.3 Identify the scope of action of acriflavin<br>crystal violet | Show samples of acriflavin<br>crystal violet | Samples of dyes. |

#### PRACTICAL CONTENTS

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES                                       | RESOURCES               |
|------|--|---|-------------------------|
|      | 2.8 Prepare polyvinylpyrrolidone<br>2.9 Test the compound in 2.8 above for antiseptic activities<br>2.11 Prepare the compounds in 2.10 above in the laboratory               | Supervise laboratory preparation and test<br>” ”          | Laboratory Wares<br>” ” |
|      | 3.3 Identify the three alcohols used mainly as disinfectants<br>ethanol<br>methanol<br>isopropyl alcohol(CH <sub>3</sub> )CHOH).<br>3.4 Prepare the three alcohols in 3.3 in | Supervise physical identification<br>Supervise laboratory |                         |

|     |   |   |                   |
|-----|---|---|-------------------|
|     | the laboratory.   | preparation   |                   |
| 3.5 | Test the alcohols prepared in 3.3 above for sterilizing effect  | And test  |                   |
| 5.2 | Prepare zinc peroxide , sodium peroxide   | Supervise laboratory Preparation and test of zinc peroxide, sodium peroxide | Laboratory wares. |
| 5.3 | Test the prepared zinc peroxide, sodium peroxide for antiseptic action  |   |                   |
| 6.1 | Identify dyes with antiseptic properties e.g. acridine derivatives e.g<br>Acridflavin<br>Rosaniline dyes, crystal violet. | Show samples of acridflavin<br>crystal violet<br>.                          | Samples of dyes   |
| 6.3 | Identify the scope of action of acridflavin<br>crystal violet   |   |                   |

PROGRAMME: Higher National Diploma Pharmaceutical Technology

COURSE: General Principles of Pharmacology III

CODE: STY 423

DURATION: (Hours/Week):           Lecture: 1           Tutorials: 0           Practicals: 3

UNIT: 2.0

GOAL: This course is designed to provide diplomate with further knowledge of drug actions.

GENERAL OBJECTIVES: On completion of this course, the diplomate will be able to:

- 1.0 Understand the basic principles of chemotherapy
- 2.0 Understand the uses and mechanism action of Ant microbial drugs
- 3.0 Understand the mechanism of action of antituberculosis drug
- 4.0 Understand the use and mechanism of action of anti malaria drugs
- 5.0 Understand the use and mechanism of action of amebicidal drugs
- 6.0 Understand the use and action of antineoplastic drugs
- 7.0 Understand drugs that influence metabolic and endocrine functions. Thyroid hormones.
- 8.0 Know the role and actions of sex hormones.
- 9.0 Know corticosteroids and their action.
- 10.0 Know insulin and its importance

|   |  |  |                               |
|---|--|--|-------------------------------|
| PROGRAMME: SCIENCE LAB, TECHNOLOGY (PHYSIOLOGY AND PHARMACOLOGY OPTION) HND   |  |  |                               |
| Course: General Principles of Pharmacology III  |  | Course Code: STY 423   | Contact Hours: 3 Hrs (3 Unit) |
| Course Specification:   |  |  |                               |
| WEEK  | General Objective: 1.0 Understand the basic principles of chemotherapy |  |                               |
| 1   | Special Learning Objective:  | Teachers Activities  | Resources                     |
|   | 1.1 Define chemotherapy, antibiotics, and antiseptics.                 | Use diagrams + illustrate the differences between the three in 1.1 above | Diagrams                      |
|   | 1.2 Outline the contribution of Paul Ehrlich to pharmacology.          |  |                               |
| 1.3 Explain chemicals as selective inhibitors of disease.   |  |  |                               |
| General Objective: 2.0 Understand the uses and mechanism of action of Anti microbial drugs  |  |  |                               |
| 2 - 3   | Special Learning Objective:  | Teachers Activities  | Resources                     |
|   | 2.1 Classify the antimicrobial drugs                                   | Show the three samples in each of the classes in 2.2                     | Drug samples                  |
|   | 2.2 Identify 3 nos. drugs in each of the classes below:-               |  |                               |
| <ul style="list-style-type: none"> <li>a) Sulfonamides, and sulfones</li> <li>b) Penicillin and cephalosporins</li> <li>c) Tetracycline</li> <li>d) Urinary, antiseptics</li> <li>e) Amin glycosides</li> <li>f) Anti tuberculosis</li> <li>g) Antifugals.</li> </ul> |  |  |                               |

| WEEK | General Objective:  |                                 |                 |
|------|---|---------------------------------|-----------------|
|      | Special Learning Objective:   | Teachers Activities             | Resource        |
|      | <p>2.3 Explain the antimicrobial spectrum in terms of gram negative or positive organism for three the antibiotics in 2.2.</p> <p>2.4 Explain broad or narrow spectrum activity of any two antibiotics.</p> <p>2.5 Identify the cellular site of action of anti microbial drugs.</p> <p>2.6 Explain the mechanism of action of the drugs in 2.2 above.</p> <p>2.7 Justify the need for combine therapy.</p> <p>2.8 Explain the problem of resistance to anti microbial drugs.</p> <p>2.9 Explain the term “cross resistance”</p> <p>2.10 List the major adverse effects of associated with some antimicrobial drugs.</p> <p>2.11 Describe the methods of manufacture of the drugs in 2.2 above.</p> | <p>Conduct industrial visit</p> | <p>Industry</p> |

| WEEK | General Objective: 3.0 Understand the mechanism of action of antituberculosis drug  |                          |              |
|------|---|--------------------------|--------------|
|      | Special Learning Objective:   | Teachers Activities      | Resource     |
| 4    | 3.1 Identify major and secondary drugs used in the chemotherapy of tuberculosis.  | Show drug samples        | Drug samples |
|      | 3.2 State the preferred regimens, dosage, duration and procedures for chemoprophylaxis used in the treatment of tuberculosis. |                          |              |
|      | 3.3 Explain the mechanism of streptomycin and Rifampin in the treatment of tuberculosis.                                      |                          |              |
|      | 3.4 State the factors contributing to treatment failure.  |                          |              |
|      | 3.5 Identify the sources of the active ingredients of the drugs in 3.3 above  |                          |              |
|      | 3.6 Describe the process of manufacture of the drugs in 3.3 above.  | Conduct industrial visit | Industry     |



| WEEK  | General Objective: 4.0 Understand the use and mechanism of action of anti malaria drugs   |                     |              |
|---|---|---------------------|--------------|
|   | Special Learning Objective:   | Teachers Activities | Resource     |
| 5 - 6   | 4.22 Describe the life-cycle of malaria parasites   | Use charts          | Chart        |
|   | 4.2 Describe the following therapeutic objectives:<br>a) Causal prophylaxis<br>b) Suppression infection<br>c) Clinical cure<br>d) Radical cure<br>e) Game tocidal                       |                     |              |
|   | 4.3 Identify the drugs which are used to achieve each of the therapeutic objectives listed above.<br>a) Primaquine<br>b) Chloroquine<br>c) Chorquanide<br>d) Pyrimethamne<br>e) Quinine | Show drug samples   | Drug samples |
|   | 4.4 Explain the mode of action of the drugs in 4.3. above.  |                     |              |
|   | 4.3 Identify the site(s) of action of the drug on stage(s) of sthe life-cycle of the malaria parasite.  |                     |              |
|   | 4.4 List the major complications of P. falciparum infection.  |                     |              |
| 4.5 Describe the process of manufacture of the drugs in 4.3 above |   |                     |              |

| WEEK | General Objective: 5.0 Understand the use and mechanism of action of amebicidal drugs |                                   |                              |
|------|---|-----------------------------------|------------------------------|
|      | Special Learning Objective:   | Teachers Activities               | Resource                     |
| 7    | 5.1 Define amebiasis  |                                   |                              |
|      | 5.2 Identify the stages of the life cycle of the protozoa.                            | Conduct laboratory identification | Microscope stains.<br>Charts |
|      | 5.3 Identify entamoeba in the laboratory  | Use life cycle charts             |                              |
|      | 5.4 Indicate which stage is responsible for acute symptoms or carrier state.          |                                   |                              |
|      | 5.5 Identify the drugs use in acute intestinal amoebiasis.                            |                                   |                              |
|      | 5.6 Identify two supporting drugs in the treatment of amoebiasis.                     |                                   |                              |
|      | 5.7 Classify the drugs used in treating chronic intestinal amebiasis.                 |                                   |                              |
|      | 5.8 Explain the mode of action of drug used in treating amoebiasis.                   |                                   |                              |

| General Objective: 6.0 Understand the use and action of antineoplastic drugs |  |                                |                   |
|--|--|--------------------------------|-------------------|
|  | Special Learning Objective:  | Teachers Activities            | Resources         |
| 8  | 6.1 Explain cancer   | Show students cancerous tissue | Prepared specimen |
|  | 6.2 Explain the origin or etiology of cancer.  |                                |                   |
|  | 6.3 Describe the general features of cancer.   |                                |                   |
|  | 6.4 Identify antineoplastic agents   | Show students drug samples     | Drug samples      |
|  | 6.5 Classify the antineoplastic agents.  |                                |                   |
|  | 6.6 Describe the mode of action of antineoplastic agents                               |                                |                   |
|  | 6.7 Identify the site(s) and mechanism of action of each class of antineoplastic agent | Conduct industrial visit       | Industry          |
|  | 6.8 Identify drugs from each class in 6.5 above.                                       |                                |                   |
|  | 6.9 Identify the active ingredient in antineoplastic agents.                           |                                |                   |

|   |   |  |                    |
|---|---|--|--------------------|
|   | General Objective: 7.0 Understand drugs that influence metabolic and endocrine functions. Thyroid hormones.   |  |                    |
|   | Special Learning Objective:   | Teachers Activities                                | Resources          |
| 9 | <p>7.1 Explain the nature and synthesis of thyroid hormones?</p> <p>7.2 Explain the iodine cycle.</p> <p>7.3 Explain the physiological effects and action of thyroid hormones.</p> <p>7.4 Identify anti-thyroid drugs.</p> <p>7.5 Explain the mode of action of the drugs in 7.4. above</p> | Students to physically identify anti-thyroid drugs | Anti-thyroid drugs |

|    |   |   |   |
|----|---|---|---|
|    | General Objective: 8.0 Know the role and actions of sex hormones.   |   |   |
|    | Special Learning Objective:   | Teachers Activities   | Resources   |
| 10 | <p>8.1 Explain the general concept of the sex hormones.</p> <p>8.2 Locate sex hormones in the human body.</p> <p>8.3 Identify the sex hormones-Estrogens, progesterone and Androgens.</p> <p>8.4 Explain the concept of oral contraceptives and its adverse effects.</p> <p>8.5 Identify oral contraceptics.</p> <p>8.6 Explain the mode of action of oral contraceptics</p> <p>8.7 Describe the process of manufacture of oral contraceptics</p> | <p>Supervise students identify hormones and drugs</p> <p>Show students drug samples</p> | <p>Hormone samples drug sa,[;es</p> <p>Drug samples</p> |

| General Objective: 9.0 Know corticosteroids and their action |   |  |              |
|--|---|--|--------------|
|  | Special Learning Objective:   | Teachers Activities                      | Resources    |
| 11   | 9.1 Explain the concept of adrenal steroids and the pituitary – adrenal relationship.<br>9.2 Explain the effects and uses of the corticosteroids<br>9.3 Identify common corticosteroids.<br>9.4 Explain the metabolism and mode of action of corticosteroids<br>9.5 Outline the mode of manufacture of corticosteroids. | Show students samples of corticosteroids | Drug samples |

| General Objective: 10.0 Know insulin and its importance |   |                      |                 |
|---|---|----------------------|-----------------|
|   | Special Learning Objective:   | Teachers Activities  | Resources       |
| 12  | 10.1 Explain insulin deficiency and diabetes.   | Show insulin samples | Insulin samples |
|   | 10.2 Explain the mode of action and factors that influence action of insulin.                   |                      |                 |
|   | 10.3 Describe insulin preparations and their duration of action, and also their adverse effect. |                      |                 |
|   | 10.4 Explain the duration and mode of action of insulin   |                      |                 |
|   | 10.5 Explain hypoglycemic agents  |                      |                 |
|   | 10.6 Prepare insulin.   |                      |                 |

PRACTICAL CONTENTS

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES                                  | RESOURCES    |
|------|---|--|--------------|
|      | 2.2 Identify 3 nos. drugs in each of the classes below:-<br><br>h) Sulfonamides, and sulfones<br>i) Penicillin and cephalosporins<br>j) Tetracycline<br>k) Urinary, antiseptics<br>l) Amin glycosides<br>m) Anti tuberculosis Antifugals. | Show the three samples in each of the classes in 2.2 | Drug samples |
|      | 3.1 Identify major and secondary drugs used in the chemotherapy of tuberculosis   | Show drug samples                                    | Drug samples |
|      | 4.3 Identify the drugs which are used to achieve each of the therapeutic objectives listed above.<br>f) Primaquine<br>g) Chloroquine<br>h) Chorquanide<br>i) Pyrimethamne<br>j) Quinine   | Show drugs samples                                   | Drug samples |
|      | 6.3 Describe the general features of cancer   |  |              |
|      | 6.7 Identify drugs from each class in 6.5 above   |  |              |
|      | 7.4 Identify anti-thyroid drugs   | Show students drug samples                           | Drug samples |
|      | 8.4 Identify oral contraceptics   |  |              |
|      | 9.3 Identify common corticosteroids   |  |              |
|      | 10.6 Prepare insulin  | Show students drug samples                           | Drug samples |



Programme: Pharmaceutical Technology HND

Course: Liquid and Semi Liquid Pharmaceutical Products

Code; PCT 411

Duration: 90 Hours

Unit: 4.0

Goal: This course is designed to provide the student with knowledge of the techniques of the manufacture of liquid and semi liquid preparations.

General Objective: On completion of this course, the diplomaee will be able to:

- 1.0 Understand the techniques in liquid and semi solid products manufacture
- 2.0 Know the principles and techniques involved in the preparation of mixtures (Liquid pharmaceuticals)
- 3.0 Know the principles and techniques involved in the preparation of solutions
- 4.0 Understand the principles and techniques involved in the preparation of suspensions
- 5.0 understand the principles and techniques involved in the preparation of emulsions
- 6.0 Understand the principles and techniques involved in the preparation of semi-solid pharmaceutical formulations.

| General Objective: 1.0 Understand the techniques in liquid and semi solid products manufacture |   |   |                                   |
|--|---|---|-----------------------------------|
|  | Special Learning Objective:   | Teachers Activities   | Resources                         |
| 1 - 2  | Specific )Performance) Objectives   | Conduct tutorials with skeletons on bulk measuring                  | Bulk measuring instruments m Xers |
|  | 1.1 Describe bulk measuring techniques for liquid and semi-solid pharmaceutical products manufacture. |   |                                   |
|  | 1.2 Identify instruments for bulk measuring as in 1.1 above.  |   |                                   |
|  | 1.3 Carry out bulk measurement for liquid and semi-liquid pharmaceutical products manufacture         |   |                                   |
|  | 1.4 Describe techniques of mixing of liquid substances: for pharmaceutical products manufacture.      | Supervise students measure out portions, mix and formulate emulates |                                   |
|  | 1.5 Identify equipment for the operation in 1.4 above.  | Students should identifying equipment mix liquid substances         | Mixing utensils and equipments    |
|  | 1.6 Mix liquid substances for pharmaceutical products manufacture.                                    |   |                                   |
|  | 1.7 Describe fusion and spatula methods in liquid and semi-solid product mixing.                      |   |                                   |

|  |   |  |  |
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|  | <p>1.8 Explain operation principles of liquid and semi-solid mixing equipment</p> <p>1.9 Describe the techniques of formulation of suspending agents..</p> <p>1.10 Describe the technique of formulation of emulsifying agents.</p> <p>1.11 Formulate suspending agents and emulsifying agents</p> <p>1.12 Maintain and care for liquid and semi solid mixing apparatus.</p> <p>1.13 Select containers for extemporaneous liquid and semi-solid preparations.</p> |  |  |
| General Objective: 2.0 Know the principles and techniques involved in the preparation of mixtures (Liquid pharmaceuticals) |   |  |  |
|  | Specific Learning Objective:  | Teacher Activities   | Resources  |
| 3 - 4  | <p>2.1 Define Mixture</p> <p>2.2 Identify types of mixtures</p> <p>2.3 Describe techniques of preparing mixtures containing diffusible solids.</p> <p>2.4 Describe techniques of preparing mixtures containing in diffusible solids.</p> <p>2.5 Prepare mixture containing diffusible solids,</p>   | <p>Supervise students mix, prepare pharmaceutical mixture and label</p> <p>Supervise student prepare</p> | <p>Mixers labeling machines, pharmacy workshop laboratory</p> <p>Mixing utensils and equipment</p> |

|  |   |  |  |
|--|---|--|--|
|  | in diffusible solids.   | mixtures.  |  |
|  | 2.6 Identify containers and closures for mixtures.  |  |  |
|  | 2.7 Label mixtures.   | Supervise student label  | Labeling machine                             |
|  | 2.8 Carry out routine maintenance of equipment used in preparing mixtures.  |  |  |
| General Objective: 3.0 Know the principles and techniques involved in the preparation of solutions |   |  |  |
|  | Special Learning Objective  | Teachers Activities  | Resources                                    |
| 5 - 6  | 3.1 Define “solutions”  | Conduct tutorials conduct physical identification of types of solutions utensils equipment and instruments for preparing solutions | Pharmaceutical laboratory utensils equipment |
|  | 3.2 Identify types of solutions (oral solutions: draughts, slixir, linctuses, syrups, etc and topical solutions; colloidons, lotions, paints, solutions for oral cavity: mouthwashes and gargles) | Supervise preparation of solution in the pharmaceutical labeling package and label solutions                                       |  |
|  | 3.3 Describes techniques of preparing solutions   |  |  |
|  | 3.4 Identify utensils, instruments and equipments for preparing solutions   |  |  |
|  | 3.5 Prepare the various solutions identifies as in 2.1 above.   |  |  |
|  | 3.6 Identify package materials for solutions  | Supervise student package and label solutions  | Packaging materials labeling machine.        |
|  | 3.7 Package solutions   |  |  |
|  | 3.8 Label packaged solutions  |  |  |

| General Objectives: 4.0 Understand the principles and techniques involved in the preparation of suspensions |  |  |                  |
|---|--|--|------------------|
|   | Specific Objectives                                      | Teachers Activities  | resources        |
| 7 - 8   | 4.1 define suspensions.                                  | Tutorials on types of suspensions and suspending agents.   | Utensils         |
|   | 4.2 Identify types of suspensions.                       |  |                  |
|   | 4.3 Identify suspending agents.                          | Supervise students formulate package and label suspension. | Libeling machine |
|   | 4.4 Describe formulation techniques for suspensions.     |  |                  |
|   | 4.5 Explain mode of operation of homogenizes and other   |  |                  |
|   | 4.6 Formulate suspensions.                               |  |                  |
|   | 4.7 Maintain equipment use in manufacturing suspensions. |  |                  |
|   | 4.8 Identify labeling requirement for suspensions.       |  |                  |
|   | 4.9 Label suspensions                                    |  |                  |

| General Objective 5.0 understand the principles and techniques involved in the preparation of emulsions |   |  |                                  |
|---|---|--|----------------------------------|
|   | Specific Objectives   | Teachers activities  | Resources                        |
| 8 - 9   | 5.1 Define emulsions.   | Students to physically identify emulsions and emulsifying agents | Pharmacy laboratory utensils     |
|   | 5.2 Identify types of emulsions.  |  |                                  |
|   | 5.3 Identify emulsifying agents   | Supervise students produce emulsions in the laboratory           |                                  |
|   | 5.4 Describe formulation techniques (wet and dry gum method) for emulsions            |  |                                  |
|   | 5.5 Formulate maintenance and emulsion care of equipment used in emulsion compulsions |  |                                  |
|   | 5.6 Produce emulsion  |  |                                  |
|   | 5.7 Identify packaging materials for emulsions  |  |                                  |
|   | 5.8 Packaged emulsions  |  |                                  |
|   | 5.9 Label emulsions   |  |                                  |
|   |   |  | Packaging and labeling equipment |



|  |   |  |  |
|--|---|--|--|
|  | <p>6.12 Identify various types of creams</p> <p>6.13 Identify cream bases</p> <p>6.14 Describe cream formulate techniques</p> <p>6.15 Formulate creams</p> <p>6.16 Describe the characteristics of other semi-solid preparations paste, gels</p> <p>6.17 Describe the technique for formulation of paste and gels</p> <p>6.18 Formulate pastes and gels.</p> <p>6.19 Show and care for equipment used in the formulation semi-solid preparations</p> <p>6.20 Identify containers and closures for paste and gels</p> <p>6.21 Label paste and gels</p> |  |  |
|--|---|--|--|

**PRACTICAL CONTENTS**

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES | RESOURCES |
|------|--|---------------------|-----------|
|      | <p>1.2 Identify instruments for bulk measuring as in 1.1 above.</p> <p>1.3 Carry out bulk measurement for liquid and semi-liquid pharmaceutical products</p> |                     |           |



|  |   |   |  |
|--|---|---|--|
|  | <p>manufacture</p> <p>1.5 Identify equipment for the operation in 1.4 above</p> <p>1.6 Mix liquid substances for pharmaceutical products manufacture</p> <p>1.12 Maintain and care for liquid and semi solid mixing apparatus</p> <p>1.13 Select containers for extemporaneous liquid and semi-solid preparations</p> <p>.</p> <p>2.2 Identify types of mixtures</p> <p>2.5 Prepare mixture containing diffusible solids, in diffusible solids.</p> <p>2.6 Identify containers and closures for mixtures.</p> <p>2.7 Label mixtures.</p> <p>2.8 Carry out routine maintenance of equipment used in preparing mixtures.</p> <p>3.2 Identify types of solutions (oral solutions: draughts, slixir, linctuses, syrups, etc and topical solutions; colloidons, lotions, paints, solutions for oral cavity: mouthwashes and gargles)</p> | <p>Supervise student to prepare mixture</p> <p>Supervise students label</p> | <p>Mixing utensils and equipment</p> <p>Labeling machine</p> |
|--|---|---|--|

|  |  |   |  |
|--|--|---|--|
|  | <p>3.5 Identify utensils, instruments and equipments for preparing solutions</p> <p>3.6 Prepare the various solutions identifies as in 2.1 above.</p> <p>3.7 Identify package materials for solutions</p> <p>3.8 Package solutions</p> <p>3.9 Label packaged solutions</p> <p>4.2 Identify types of suspensions</p> <p>4.3 Identify suspending agents</p> <p>4.6 Maintain equipment use in manufacturing suspensions</p> <p>4.7 Label suspensions</p> <p>5.4 Identify types of emulsions</p> <p>5.5 Identify emulsifying agents</p> <p>5.6 Produce emulsion</p> <p>5.7 Identify packaging materials for emulsions</p> <p>5.8 Packaged emulsions</p> <p>5.9 Label emulsions</p> <p>6.5 Identify various ointment bases, types and characteristics.</p> <p>6.8 Formulate ointments.</p> <p>6.9 Label of ointments</p> <p>6.12 Identify various types of creams</p> <p>6.13 Identify cream bases</p> <p>6.15 Formulate creams</p> <p>6.18 Formulate pastes and gels</p> <p>6.21 Label paste and gels.</p> | <p>Supervise students package and label solutions</p> | <p>Packaging materials labeling machine</p> <p>Packaging and labeling equipments</p> |
|--|--|---|--|

**PROGRAMME:** Pharmaceutical Technology HND

**COURSE:** General and Hospital dispensing Practice.

**CODE:** PCT 412

**UNITS:** 1.0

**GOAL:** This course is designed to enable the diplomate understand the structure and organisation of a pharmacy unit in a hospital setting and the art of dispensing prescriptions.

**DURATION;** 15 Hours (1 Hour Lecture/ Practical per week)

**GENERAL OBJECTIVE:** On completion of this course, the diplomate should be able to:

- 1.0 Know the historical development of pharmacy practice in Nigeria.
- 2.0 Know the organogram of a hospital/community pharmacy
- 3.0 Understand prescription and dispensing prescription

| <b>General Objective: 1.0 Know the historical development of pharmacy practice in Nigeria</b> |   |  |                             |
|---|---|--|-----------------------------|
| <b>WEEK</b>   | <b>Specific (Performance) Objectives</b>  | <b>Teachers Activities</b>   | <b>Resources</b>            |
|   | 1.1 Outline the historical evolvement of Pharmacy practice in Nigeria;<br>1.2 Explain Pharmacy practice regulatory laws and guidelines.<br>1.3 Identify pharmacy regulatory bodies in Nigeria (e.g. Pharmacist council of Nigeria);<br>1.4 Explain drug use regulations in Nigeria and the regulatory bodies;<br>1.5 Explain the laws regulatory handling of drugs and poisons in hospitals and community pharmacies;<br>1.6 Describe the process of drug purchase, storage and stock control<br>1.7 Explain patent and proprietary medicines.<br>1.8 The setting up and operation of patent medicine stores;<br>1.9 Describe the process of drug inventory and recording keeping system;<br>1.10 Take drug inventory | Conduct tutorials<br><br><br><br><br><br><br><br><br><br><br>Supervise students take inventory and grade reports | Inventory sheets            |
| <b>General Objective: 2.0 Know the organogram of a hospital/community pharmacy</b>            |   |  |                             |
| <b>WEEK</b>   | <b>Specific (Performance) Objectives</b>  | <b>Teachers Activities</b>   | <b>Resources</b>            |
| 6-10  | 2.1 Explain the responsibilities of a hospital pharmacy.<br>2.2 List the personnel requirements of a hospital pharmacy.<br>2.3 Explain organizational Flow Chart of a hospital pharmacy;<br>2.4 Explain the responsibilities, roles and functions of different personnel cadres in a pharmacy unit of a hospital.   | Conduct student on a tour of hospital and community pharmacy.  | Hospital community pharmacy |

| <b>General Objective: 3.0 Understand prescription and dispensing prescription</b> |  |  |  |
|---|--|--|--|
| <b>WEEK</b>   | <b>Specific (Performance) Objectives</b>   | <b>Teachers Activities</b>   | <b>Resources</b>   |
|   | 2.5 Explain the relationship of hospital pharmacy with other units of the hospital;<br>2.6 Describe the organizational chart of a community pharmacy.<br>2.7 Describe the administrative structure of a community pharmacy;<br>2.8 Explain the process of financial management, accounting and record keeping of pharmacy unit.  |  |  |
| 11-5  | 3.1 Define "Prescription".<br>3.2 Identify components of prescriptions;<br>3.3 Interpret abbreviations, Latin terms used in prescriptions<br>3.4 Interpret and execute prescriptions containing extemporaneous preparations;<br>3.5 Interpret and execute prescriptions containing ready made drugs;<br>3.6 Apply pharmacy information books (British pharmacopoeia, British pharmaceutical codex, etc) in interpreting and handling prescriptions;<br>3.7 Package different dosage forms;<br>3.8 Interpret dosages in prescriptions, their calculations and interpretations;<br>3.9 Label dispensed products, auxiliary labels;<br>3.10 Communicate prescription directives of patients;<br>3.11 Record prescribed drugs. | Conduct tutorials to explain components of prescriptions to students<br><br>Show prescription<br><br>Conduct tutorials to show students the use of pharmacy information books. | Samples of prescriptions<br><br>Pharmacy information books<br><br>Packaging materials and containers |

PRACTICAL CONTENTS

| WEEK | PRACTICALS   | TEACHERS ACTIVITIES | RESOURCES                          |
|------|--|---------------------|------------------------------------|
|      | 1.10 Take drug inventory<br><br>3.7 Package different dosage forms;<br>3.9 Label dispensed products, auxiliary labels;<br>3.10 Communicate prescription directives of patients;<br>3.11 Record prescribed drugs. |                     | Packaging materials and containers |

**PROGRAMME:** Pharmaceutical Technology HND

**COURSE:** Infusions, injections, aseptic/sterile products

**CODE:** PCT 423

**DURATION:** 90 Hours            2 - 0 - 4

**UNIT:** 4.0

**GOAL:** This course is designed to enable diplomate know the techniques of and produce infusions, injections, aseptic/sterile products.

**GENERAL OBJECTIVES:** On completion of this course, the diplomate should be able to:-

- 1.0 Know the historical development of pharmacy practice in Nigeria
- 2.0 Know the manufacturing processes of infusions
- 3.0 Know the manufacturing processes of other aseptic/sterile products





|             |  |  |  |
|-------------|--|--|--|
|             | 1.19 Dry ampoules using the drying machine<br>1.20 Fill ampoules and vials<br>1.21 Seal ampoules<br>1.22 Sterilize ampoules and vials  |  | Filling machine ampoule<br>sealer; ampoule filling machine   |
| <b>WEEK</b> | <b>General Objective 2.0</b> Know the manufacturing processes of infusions   |  |  |
| 6-10        | <b>Specific Objectives</b>   | <b>Teachers Activity</b>   | <b>Resources</b>   |
|             | 2.1 Define infusions;<br>2.2 Describe the applications of infusions;<br>2.3 Identify the components of infusions;<br>2.4 Describe the adjustment of the toxicity and pH of infusion solutions;<br>2.5 Adjust toxicity and pH of infusion solutions;<br>2.6 Identify types of filters used in clarification of solutions for infusion;<br>2.7 Carry out classification of solution for infusion by filtration;<br>2.8 Maintain filtration apparatus;<br>2.9 Identify properties of packaging materials for infusions;<br>2.10 Maintain infusion packaging materials;<br>2.11 Describe the sterilization processes (moist heat sterilization, etc);<br>2.12 Describe the infusions modes of operation of sterilization equipment (autoclaves, irradiators, etc);<br>2.13 Sterilize solutions and infusions using sterilization equipment ;<br>2.14 Maintain of sterilization equipment;<br>2.15 Label infusions. | Supervise student adjust toxicity and pH.<br><br>Supervise students carry out filtration.<br><br>Show packaging materials to identify properties.<br><br>Supervise student carry out sterilization | pH meters filters<br><br>Packaging materials<br><br>Sterilization equipment e.g. autoclaves, irradiators sterilize filters etc |

| <b>WEEK</b> | <b>General Objective: 3.0 Know the manufacturing processes of other aseptic/sterile products</b>  |  |  |
|-------------|---|--|--|
| 11 - 15     | <b>Specific Objectives</b><br>3.1 Explain aseptic processing;<br>3.2 Identify materials requiring aseptic processing;<br>3.3 Describe the formulation of Eye drops, eye lotions, eye ointments;<br>3.4 Formulate eye drops, eye lotions, eye ointments<br>3.5 Describe the properties and requirements of aseptic area;<br>3.6 Explain filtration;<br>3.7 Identify types of filtration equipment;<br>3.8 Explain the modes of operation of filtration equipment;<br>3.9 Carry out aseptic filtration;<br>3.10 Describe the design of aseptic room; laminar flow units<br>3.11 Describe environmental and air control; measures in aseptic conditions;<br>3.12 Explain personnel considerations in aseptic processing;<br>3.13 Carry out aseptic processing technique e.g. aseptic filling and dilutions from stock solutions/powders; | <b>Teachers Activities</b><br><br>Show student materials for aseptic processing and explain. Why?<br><br><br><br><br><br><br><br><br><br>Supervise students carry out aseptic filtration<br><br><br><br><br><br><br><br><br><br>Supervise students carry out aseptic processing. | <b>Resources</b><br><br>Aseptic materials<br><br><br><br><br><br><br><br><br><br>Filtration equipment<br><br><br><br><br><br><br><br><br><br>Filling equipment |

**PRACTICAL CONTENTS**

| <b>WEEK</b> | <b>PRACTICALS</b>  | <b>TEACHERS ACTIVITIES</b>               | <b>RESOURCES</b> |
|-------------|--|--|------------------|
|             | 1.6 Identify containers and closures for ampoules and vials;<br>1.13 Identify equipment used in the sterilization of ampoules and vial | Students to physical identify containers |                  |



|  |   |  |  |
|--|---|--|--|
|  | 3.13 Carry out aseptic processing technique e.g. septic filling and dilutions from stock solutions/powders. |  |  |
|--|---|--|--|

**PROGRAMME:** Pharmaceutical Technology HND

**COURSE:** Quality Control Techniques

**CODE:** PCT 424

**DURATION:** 60 Hours 1 hours lectures and 3 hours practical per week

**UNIT:** 2.0

**COURSE GOAL:** This course is designed to enable students knows and apply basic quality control annytical techniques on finished pharmaceutical dosage forms and allied products.

**GENERAL OBJECTIVES:** On completion of this course, the diplomate should be able to:

- 1.0 Know the historical development of pharmacy practice in Nigeria
- 2.0 Know the procedure and techniques of antibiotic assay
- 3.0 Know the procedure and techniques of sterility testing

| <b>General Objective: 1.0 Know the historical development of pharmacy practice in Nigeria</b> |  |   |                                      |
|---|--|---|--------------------------------------|
| <b>WEEK</b>   | <b>Specific (Performance) Objectives</b>   | <b>Teachers Activities</b>  | <b>Resources</b>                     |
| 1 - 5   | 1.1 Explain the term potentiometric analysis in quality control.<br>1.2 Describe methods of preparation of drugs for examination.<br>1.3 Prepare drugs for examination according to official reference books;<br>1.4 Apply potentiometric analysis;<br>1.5 Apply the techniques of potentiometric analysis in quality control<br>1.6 Identify instruments used in potentiometric analysis<br>1.7 Care and maintenance instruments for potentiometric analysis.   | Supervise students in potentiometric analysis   | Potentiometric analysis instruments. |
| <b>General Objective: 2.0 Know the procedure and techniques of antibiotic assay</b>           |  |   |                                      |
| <b>WEEK</b>   | <b>Special Learning Objectives</b>   | <b>Teachers Activities</b>  | <b>Resources</b>                     |
| 6 - 10  | 2.1 Define antibiotic assay<br>2.2 Explain the uses and applications of antibiotic assay<br>2.3 Describe methods of assaying antibiotics in drug samples agar diffusion methods; broth dilution tests;<br>2.4 Apply any of the methods in 2.3 above in assaying antibiotics.<br>2.5 Describe methods of assaying antibiotics in body fluids;<br>2.6 Carry out antibiotics assay in body fluids;<br>2.7 Describe methods of selection of reference test organisms;<br>2.8 Select reference test organisms.<br>2.9 Describe methods of maintenance of test cultures. | Supervise students carry out antibiotic assay<br><br><br><br><br><br><br><br><br><br>Supervise student :<br>(i) select reference test | Laboratory glasswares.               |



PRACTICAL CONTENTS

| WEEK | PRACTICALS  | TEACHERS ACTIVITIES                                 | RESOURCES |
|------|---|---|-----------|
|      | <p>1.6 Identify instruments used in potentiometric analysis</p> <p>1.7 Care and maintenance instruments for potentiometric analysis.</p> <p>2.4 Apply any of the methods in 2.3 above in assaying antibiotics.</p> <p>2.6 Carry out antibiotics assay in body fluids;</p> <p>2.8 Select reference test organisms.</p> <p>2.10 Maintain test culture.</p> <p>2.14 Screen for antimicrobial substances;</p> <p>2.17 Maintain and care for bio-assay equipment and apparatus.</p> <p>2.18 Carry out antibiotic assay of penicillin, amino glycosides, etc</p> <p>3.5 Prepare culture media</p> <p>3.8 Carry out sterility tests</p> <p>3.10 Maintain equipment used in sterility testing operation</p> | <p>Supervise students carry out sterility tests</p> |           |



Pharmaceutical Technology  
National Diploma  
Higher National Diploma

List of minimum facilities

A. Laboratories.

1. Biology/Microbiology laboratory  
See science laboratory Technology (ND)  
Biology/Microbiology
2. Chemistry laboratory  
See science laboratory Technology (ND)
3. Physics laboratory  
See science laboratory Technology (ND)
4. Instrument room  
See General laboratory Techniques (ND)  
General instrumentation HND  
Biological and Chemical instrumentation HND

B. Workshop

1. Pharmacy workshop ND/HND
2. Wood and metal workshop ND
3. Drawing instruments. ND

C. Studios

1. Computer laboratories/studio ND/HND

PARTICIPANTS

| S/N | Names of Participants   | Addressess  |
|-----|-------------------------|---|
| 1   | Alh A A. Folawewo       | National President NAPH & P. I.                       |
| 2   | Mr. O. E. Okafo         | N. B. T E., Kaduna Coordinating Editor                |
| 3   | Dr. Lawrence Henshsw    | School of Health Yechnology Calabar Cross river State |
| 4   | Muhammed Audu           | General Hospital Kankia, Kastina State                |
| 5   | R O. Christian          | Aba, Abia State, Abia Sate                            |
| 6   | Mr. Yohanna Jigan       | Ministgry of Health Kaduna                            |
| 6   | Chief J. O. Ogunseyin   |   |
| 7   | Muhamud Muhammed Umbara | Muritala Mohammed specialist Hospital, Kano           |
| 8   | Edith Asiri (Miss)      | Abia State University Teaching Hospital, Abia state   |
| 9   | Am f. Efijimue          | Ughelli Delta State Hospital                          |
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| 11  | Dr. Annka               | Department of Pharmacy, ABU, Zaria                    |
| 12  | A. I. Ifejika           | N. B. T. E., Kaduna                                   |
| 13  | Adbulakrim Zubairu      | N. B. T. E., Kaduna                                   |
| 14  | Kolawole Adegboye       | F.C.T., Abuja   |
| 15  | Pastor S O. Soremekun   | H. M. B., Lagos                                       |
| 16  | A. S. Aboyin            | Ministry of Health, Enugu State                       |
| 17  | Mr. Fwowe               | Ministry of Health, Oyo State                         |
| 18  | Mallam Ado Garba        | Ministry of Health, Kano State                        |
| 19  | Alhaji Musa B. Bodinga  | Ministry of Health, Sokoto State                      |
| 20  | Hajapa A Yusuf          | Ministry of Health, Kogi State                        |

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| 21 | Balogun R.Adetola           | Ministry of Health, Kebbi State                      |
| 22 | <u>Alh. Shehu Umar</u>      | Ministry of Health, Kebbi State                      |
| 23 | <u>Alh. Saminu Hussaini</u> | Ministry of Health, Kano State                       |
| 24 | <u>Mrs. Tejuoso W. O.</u>   | Ministry of Health Auto Padic Hospital Igbobi, Lagos |
| 25 | <u>Ibrahim Omeiza Usman</u> | Centgral Hospital, Abuja                             |
| 26 | Mr. Ayo Ibuje               | Min. of Health                                       |
| 27 | Elder Tayo Abejunde         | Min. of Health                                       |
| 28 | Chief Fakonya               | Ogun State Min. of Health                            |
| 29 | Mr. Achibung                | Delta State Min. of Health                           |
| 30 | Mr. Okpara                  | Bayelsa State Min. of Health                         |