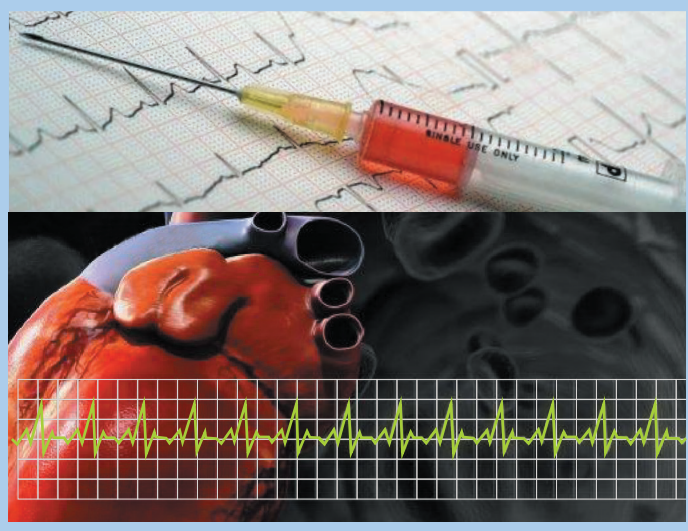
SECOND YEAR DIPLOMA IN PHARMACY

PH



# A LABORATORY MANUAL FOR
# PHARMACOLOGY AND TOXICOLOGY

Maharashtra State Board of Technical Education, Mumbai
(Autonomous) (ISO 9001 : 2015) (ISO / IEC 27001 : 2013)

## VISION

To ensure that the Diploma level Technical Education constantly matches the latest requirements of technology and industry and includes the all-round personal development of students including social concerns and to become globally competitive, technology led organization.

## MISSION

To provide high quality technical and managerial manpower, information and consultancy services to the industry and community to enable the industry and community to face the changing technological and environmental challenges.

## QUALITY POLICY

We, at MSBTE are committed to offer the best in class academic services to the students and institutes to enhance the delight of industry and society. This will be achieved through continual improvement in management practices adopted in the process of curriculum design, development, implementation, evaluation and monitoring system along with adequate faculty development programmes.

## CORE VALUES

MSBTE believes in the followings:

- Education industry produces live products.
- Market requirements do not wait for curriculum changes.
- Question paper is the reflector of academic standards of educational organization.
- Well designed curriculum needs effective implementation too.
- Competency based curriculum is the backbone of need based program.
- Technical skills do need support of life skills.
- Best teachers are the national assets.
- Effective teaching learning process is impossible without learning resources.

A Laboratory Manual for

# Pharmacology and Toxicology

## (0813)

Second Year
Diploma in Pharmacy (PH)

**Maharashtra State**

**Board of Technical Education, Mumbai**

**(Autonomous) (ISO-9001-2015) (ISO/IEC 27001:2013)**

Maharashtra State Board of Technical Education,
(Autonomous) (ISO 9001 :2015 ) (ISO/IEC 27001 : 2013)
4th Floor, Government Polytechnic Building, 49, Kherwadi,
Bandra ( East ), Mumbai - 400051.
(Printed on June, 2014)

# MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

## Certificate

This is to certify that, Mr. / Ms. ..... Roll no. ..... of Second Year Diploma in Pharmacy has completed the term work satisfactorily in **Pharmacology and Toxicology (0813)** for the academic year 200..... to 200..... as prescribed in the curriculum.

Place : .....  Enrolment No. : .....

Date : .....  Exam. Seat No. : .....

**Subject Teacher**  **Principal**

Seal of Institution

**External Examiner**

# LEARNING OVERVIEW

The subject Pharmacology and Toxicology is study of drugs and their effects on the body and vice versa.

Since the subject studies drugs and effects of drugs on the living system and vice versa, it is of great importance in the application of preclinical as well as clinical studies.

In the preclinical studies thorough knowledge about the drug, including mechanism of action, pharmacological actions, drug interactions and adverse effects can be known.

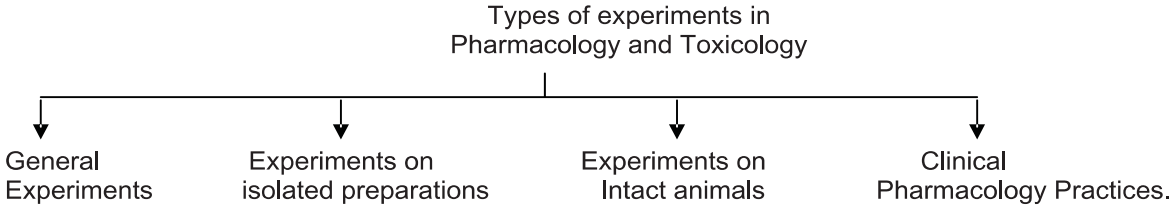
In the clinical trials Therapeutic index among the individuals is necessary provided all the conditions in the preclinical trial must be covered.

Before getting the knowledge about the action of drug on particular system, knowledge of anatomy and physiology e.g. knowledge of Cardio Vascular system must be known. Study of various drugs, their sources, chemical constituents, general category of drugs is covered in Pharmacognosy. Different branches covered under the head of Pharmacology are Pharmacodynamics, Pharmacokinetics, Pharmacotherapeutics, Toxicology, Chemotherapy, Pharmacoepidemiololgy, Pharmacoeconomics, posology, psychopharmacology and Clinical Pharmacy.

The purpose of laboratory techniques in Pharmacology and Toxicology is to develop a scientific foundation for the use of drugs in prevention, diagnosis and treatment of diseases.

Pharmacology and Toxicology is ever changing progressive science, as new information gets discovered and accumulated, changes in practical aspects are inevitable.

In this manual, an attempt has been made to acquaint the students with experimental approach to the science of Pharmacology with the addition of new experiments like Prescription study, Adverse Drug Reaction monitoring. The level of information in the manual is being maintained keeping in view practical aspects related to the subject.



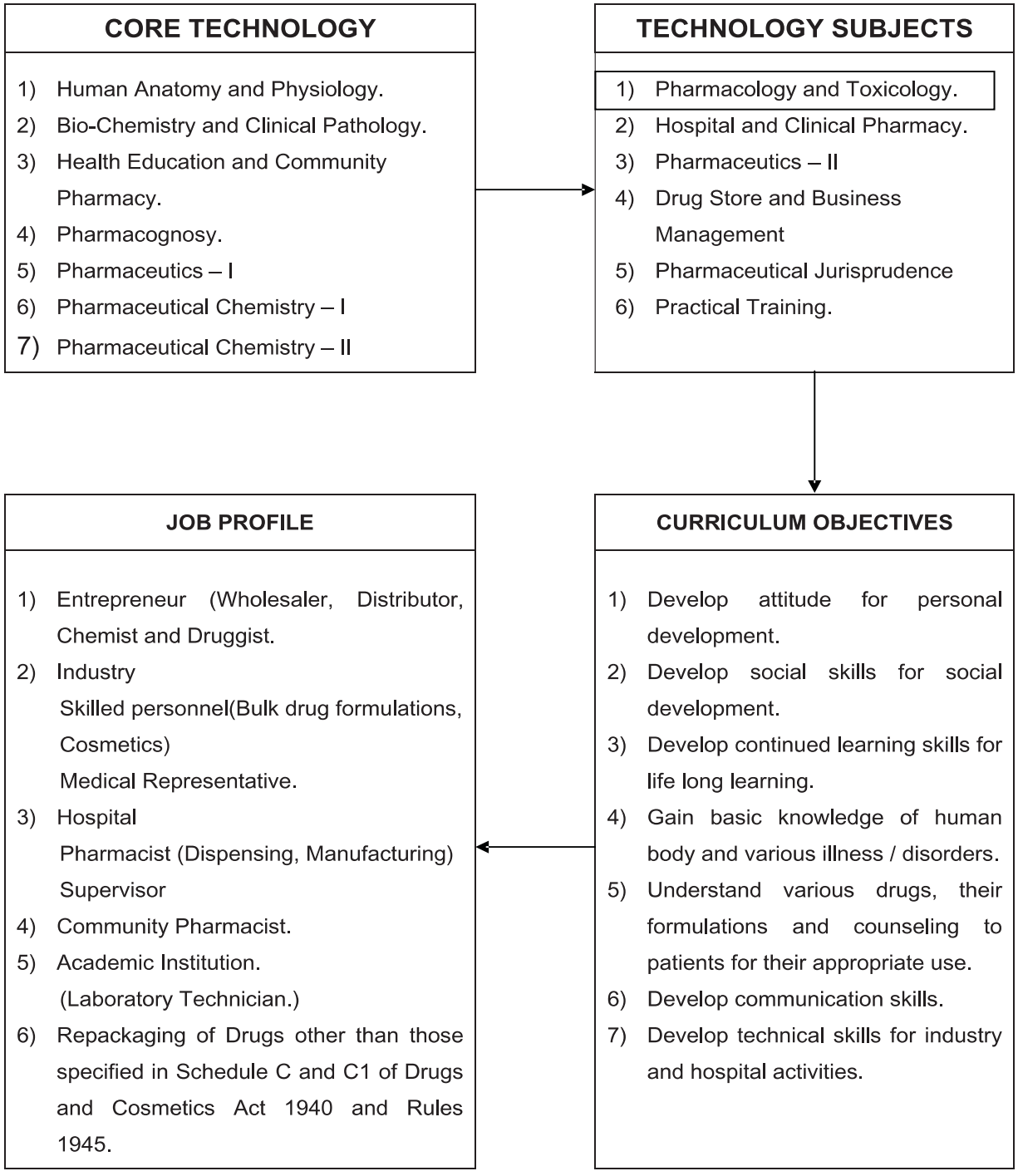

## IMPORTANCE OF THE SUBJECT

The main objective of the subject Pharmacology and Toxicology is

- To develop the skill of the pharmacist as a Clinical Pharmacist, Community pharmacist and Hospital Pharmacist.
- Study of Pharmacodynamics, Pharmacokinetics and Toxicology of the drug.

– To enable the pharmacist for counseling.
– Develop the skill of pharmacist to
    1. Identify the use / effect of the drug.
    2. Identify the toxic / adverse / side effect of the drug.
    3. Identify the contraindications of the drug in obstetrics, pediatrics and geriatrics.
    4. Identify the drug interactions.
    5. Identify and decide the dose and route of administration of the drug.

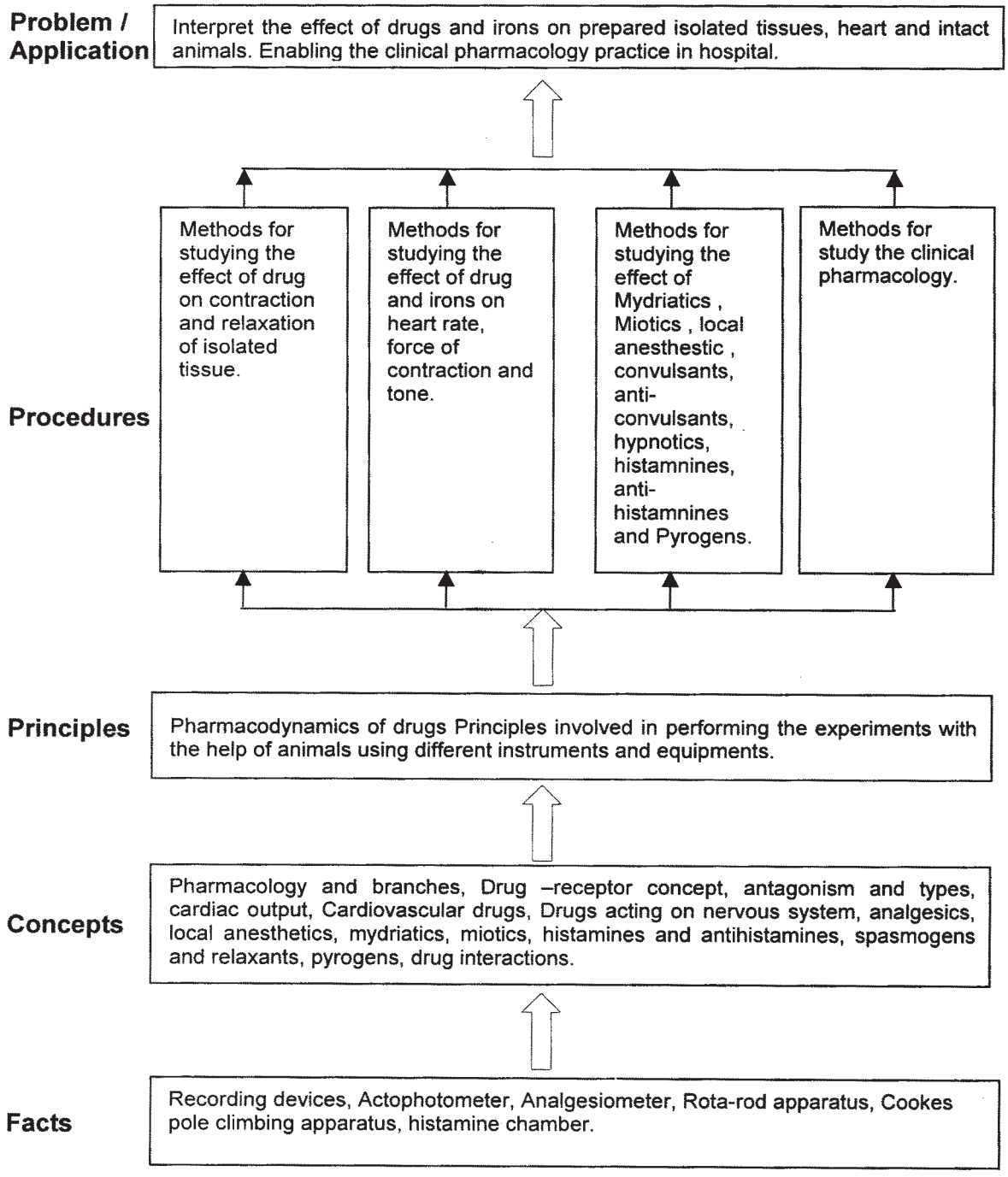
# LINK / BLOCK DIAGRAM
# SHOWING INTER RELATIONSHIP OF SUBJECT AREAS, CURRICULUM OBJECTIVES AND JOB PROFILE.



# GRAPHICAL STRUCTURE OF SUBJECT AREA

## Second Year Diploma in Pharmacy

## Pharmacology and Toxicology (0813)



## DEVELOPMENT OF SKILLS

The objective of curriculum is to develop the desired skills in the students so that they can solve the field problems. After undergoing through the laboratory experiments, it is expected that the following skills shall be developed in the students.

### Intellectual Skills:

I-1. Logical thinking.

I-2. Identification of different stages.

I-3. Understanding of concepts and mechanisms.

I-4. Interpretation from graph and observations.

### Motor Skills:

M-1. Ability to operate the computer and CD.

M-2. Ability to prepare the physiological salt solution.

## GRID TABLE

Following table gives grid of the experiments and related intellectual and motor skills.

Teacher shall ensure for development of generic skills during the practical.

Students are expected to focus on acquiring specific skills mentioned therein.

| Sr. No. | Name of the Experiments | Intellectual Skills | | | | Motor Skill |
|---|---|---|---|---|---|---|
| | | $I_1$ | $I_2$ | $I_3$ | $I_4$ | $M_1$ |
| 1 | Introduction to pharmacology and toxicology laboratory and animal house. | ✓ | | ✓ | | |
| 2 | Introduction to computers. | | | ✓ | | |
| 3 | To select the animals for experimental use in Pharmacology.<br>To observe and confirm the effect of anesthesia on animals. | ✓ | ✓ | ✓ | | ✓ |
| 4 | To study the common instruments and equipments used in experimental pharmacology. | | | ✓ | | ✓ |
| 5 | To study the various laboratory techniques used in experimental pharmacology. | ✓ | | ✓ | | ✓ |
| 6 | To prepare the physiological salt solution. | | ✓ | ✓ | | ✓ $M_2$ |
| 7 | To interpret from the graph by observing the effect of adrenaline on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | To interpret from the graph by observing the effect of Calcium ions and potassium ions on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | To interpret from the graph by observing the effect of acetylcholine on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | To interpret from the graph by observing the effect of acetylcholine on isolated rectus abdominus muscle of a frog by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | To interpret from the graph by observing the effect of acetylcholine on ileum of guinea pig by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | To interpret from the graph by observing the effect of spasmogens and relaxants on intestine of rabbit by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 13 | To observe and study the effect of Local anesthetics on rabbits cornea by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 14 | To observe and study the effect of Mydriatics on rabbits cornea by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 15 | To observe and study the effect of Miotics on rabbits cornea by using the CD of MSBTE.. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 16 | To observe and study the effect of Strychnine sulphate on voluntary muscles of a frog by using CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 17 | To interpret from the graph by observing the effect of digitalis on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 18 | To observe and study the effect of Hypnotics in mice by righting reflex method by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 19 | To observe and study the effect of hypnotics in mice by actophotometer by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 20 | To observe and study the effect of Convulsants and Anticonvulsants in mice by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 21 | To observe and study the effect of Pyrogens in rabbits (Test for Pyrogens I.P.) by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 22 | To observe and study the effect of chlorpromazine on animal behaviour in mice by using the CD of MSBTE. | ✓ | ✓ | ✓ | ✓ | ✓ |
| 23 | To observe and study the effect of Diphenyl hydramine in experimentally induced asthma in Guinea pig by using the CD of MSBTE | ✓ | ✓ | ✓ | ✓ | ✓ |
| 24 | Visit to hospital for observing the reaction of drug in the patient.<br>To understand the adverse drug reaction and monitor the same. | | ✓ | ✓ | | |
| 25 | Visit to hospital | | ✓ | ✓ | | |

**NOTE: - ✓ Identified Skills.**

## STRATEGY FOR IMPLEMENTATION

It is suggested that 45 to 50% experiments shall be completed in first term and remaining experiments in the second term.

## GUIDELINES FOR TEACHERS

Teachers shall discuss the following points with students before start of practical of the subject.

1. Learning Overview : To develop better understanding of importance of the subject. To know related skills to be developed such as intellectual skills and motor skills.
2. Link Diagram: context of the subject in the form of link diagram showing interrelationship of various subject areas, curriculum, objectives and job profiles.
3. Graphical structure: in this topics and sub topics are organized in systematic way so that ultimate purpose of learning the subject is achieved. This is changed in the form of fact, concept, principle, procedure, application and problem.
4. Know your laboratory: to understand the layout of laboratory, specification of equipment, procedure, working in groups, planning time etc. also to know total amount of work to be done in the laboratory.
5. Teacher shall acquire the knowledge about operating CD of experiments on the computers.
6. Explain prior concepts to the students before starting of each experiment.
7. Involve the student's activity at the time of conduct of each experiment.
8. While taking observation each student (from batch of 20 students) shall be given a chance to perform the experiment. A sufficient number of computers shall be available.
9. List of questions given at the end of each experiment. Teacher shall instruct the students to attempt all questions given at the end of each experiment. Teacher shall ensure that each student writes the answers to the allotted questions in the laboratory manual after performance is over.
10. If the experiment setup has variations in the specifications of the equipment, the teachers are advised to make necessary changes, wherever needed.
11. Teacher shall assess the performance of students continuously as per norms prescribed by MSBTE.
12. Teacher is expected to share the skills and competencies to be developed in the students.
13. Teacher may provide additional knowledge and skills to the students even though not covered in the manual but are expected from the students by the industries.
14. Teachers shall ensure that hospital visits recommended in the manual are covered.
15. Teacher may suggest the students to refer additional related literature of the technical papers, reference books, seminar proceedings, etc.
16. During assessment teacher is expected to ask questions to the students to tap their achievements regarding related knowledge and skills so that students can prepare while submitting record of the

practical. Focus should be given on development of enlisted skills rather than theoretical knowledge.

17. Teacher should enlist the skills to be developed in the students that are expected by the industry.
18. Teacher should organize group discussion, brain storming sessions, seminars to facilitate the exchange of knowledge amongst the students.
19. Teacher should ensure that revised CIAAN-2005 norms are followed simultaneously and progressively.
20. Teacher should give more focus on hands on skills and should actually share the same.
21. Teacher shall also refer to the circular No. MSBTE/D-50/Pharm. Lab. Manual /2006/3160 dated 4th May 2006 for additional guidelines.

## INSTRUCTIONS FOR STUDENTS

Students shall read the points given below for understanding theoretical concepts and practical applications.

1. Students should wear white Apron before entering into the laboratory.
2. Students should keep their belongings in locker which are not required during practical like, Bag, Extra files etc.
3. Students should always carry Laboratory Manual, rough notebook and practical requirements without fail.
4. Listen carefully to the lecture given by teacher about importance of subject, curriculum philosophy, graphical structure, skills to be developed, information about equipment, instruments, procedure, method of continuous assessment, tentative plan of working laboratory and total amount of work to be done in a year.
5. Students should perform the practical only at the place which allocated to him / her. (No change can be done without permission of subject teacher)
6. Read write up of each experiment to be performed, a day in advance.
7. Organize the work in the group and make a record of all observations.
8. Understand the purpose of experiment and its practical applications.
9. Write the answer of the questions allotted by teacher during practical hours if possible or afterwards, but immediately.
10. Students should not hesitate to ask any difficulty faced during conduct of practical.
11. The students shall study all the questions given in the laboratory manual and practice to write the answers to these questions.
12. Students shall develop maintenance skill as expected by the industries.

13. Students should develop the habits of pocket discussion, group discussion related to the experiments so that exchanges of knowledge, skills could take place.
14. Students shall attempt to develop related hands-on –skills and gain confidence.
15. Students shall focus on development of skills rather than theoretical or codified knowledge.
16. Students shall visit nearby workshops, workstation, industries, technical exhibitions, trade fair etc. even not included in the lab manual. In short, students should have exposure to the area of work right in the student's hood.
17. Students shall insist for the completion of recommended laboratory work, industrial visits, answers to the given questions, etc.
18. Students shall develop habits of evolving more ideas, innovations skills etc. than included in the scope of the manual.
19. Students shall develop technical magazines, proceedings of the seminars, refers websites related to the scope of the subjects and update their knowledge and skills.
20. Students should develop the habit of not to depend totally on the teachers but to develop self-learning techniques.
21. Students should develop the habit to react with the teacher without hesitation with respect to the academics involved.
22. Students should develop the habit to submit the practical exercise continuously and progressively on the scheduled dates and should get the assessment done.
23. Students should be well prepared while submitting the write up of the experiments. This will develop the continuity of the studies and he will not be over loaded at the end of the term.
24. Students should clean the platform before leaving the laboratory.

# List of Experiments and Record of Progressive Assessment

| Sr. No | Name of the Experiments | Page No. | Date of Perform-ance | Date of Submiss-ion | Assess-ment Max. Marks 10 | Sign. of Teacher and Remark |
|---|---|---|---|---|---|---|
| 1 | Introduction to pharmacology and toxicology laboratory and animal house. | 1 | | | | |
| 2 | Introduction to computers. | 4 | | | | |
| 3 | To select the animals for experimental use in Pharmacology.<br>To observe and confirm the effect of anesthesia on animals. | 7 | | | | |
| 4 | To study the common instruments and equipments used in experimental pharmacology. | 13 | | | | |
| 5 | To study the various laboratory techniques used in experimental pharmacology. | 18 | | | | |
| 6 | To prepare the physiological salt solution. | 22 | | | | |
| 7 | To interpret from the graph by observing the effect of adrenaline on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE. | 25 | | | | |
| 8 | To interpret from the graph by observing the effect of Calcium ions and potassium ions on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE. | 33 | | | | |
| 9 | To interpret from the graph by observing the effect of acetylcholine on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE. | 41 | | | | |
| 10 | To interpret from the graph by observing the effect of acetylcholine on isolated rectus abdominus muscle of a frog by using the CD of MSBTE. | 48 | | | | |
| 11 | To interpret from the graph by observing the effect of acetylcholine on ileum of guinea pig by using the CD of MSBTE. | 54 | | | | |
| 12 | To interpret from the graph by observing the effect of spasmogens and relaxants on intestine of rabbit by using the CD of MSBTE. | 60 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | To observe and study the effect of Local anesthetics on rabbits cornea by using the CD of MSBTE. | 67 | | | | |
| 14 | To observe and study the effect of Mydriatics on rabbits cornea by using the CD of MSBTE. | 74 | | | | |
| 15 | To observe and study the effect of Miotics on rabbits cornea by using the CD of MSBTE.. | 81 | | | | |
| 16 | To observe and study the effect of Strychnine sulphate on voluntary muscles of a frog by using CD of MSBTE. | 87 | | | | |
| 17 | To interpret from the graph by observing the effect of digitalis on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE. | 93 | | | | |
| 18 | To observe and study the effect of Hypnotics in mice by righting reflex method by using the CD of MSBTE. | 101 | | | | |
| 19 | To study and observe the effect of hypnotics in mice by actophotometer by using the CD of MSBTE | 108 | | | | |
| 20 | To observe and study the effect of Convulsants and Anticonvulsants in mice by using the CD of MSBTE. | 114 | | | | |
| 21 | To observe and study the effect of Pyrogens in rabbits (Test for Pyrogens I.P.) by using the CD of MSBTE | 121 | | | | |
| 22 | To observe and study the effect of chlorpromazine on animal behaviour in mice by using the CD of MSBTE. | 129 | | | | |
| 23 | To observe and study the effect of Diphenyl hydramine in experimentally induced asthma in Guinea pig by using the CD of MSBTE | 137 | | | | |
| 24 | Visit to hospital for observing the reaction of drug in the patient.<br>To understand the adverse drug reaction and monitor the same. | 144 | | | | |
| 25 | Visit to hospital | 147 | | | | |
| | | | | | Total Marks | |
| | | | | | Av. Marks out of 10 | |

**Note:-** The guidelines for the conduct of Annual Practical Examination are enclosed in the end at page No. 151

# Experiment No. 1

## 1.0 Title :

Introduction to Pharmacology and Toxicology laboratory and Animal House.

## 2.0 Prior Concepts :

Curriculum contents of the subject.

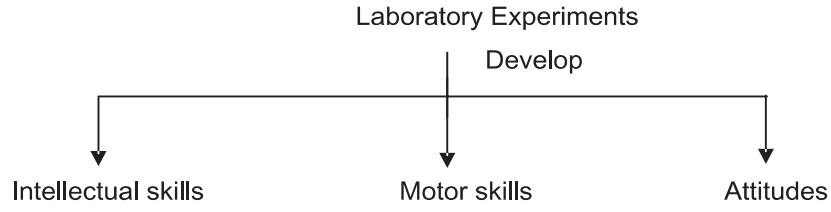
Common terms in Pharmacy.

## 3.0 New Concepts :

**Proposition 1 : Laboratory Experiments**

Laboratory Experiments are expected to develop intellectual skills, motor skills and attitudes in students.

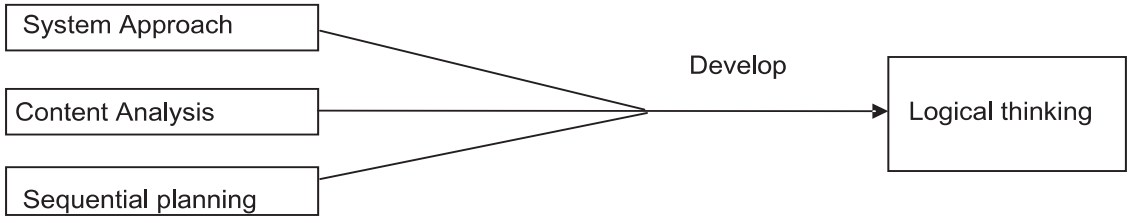
**Concept Structure :**




**Proposition 2 : Logical thinking.**

Logical thinking is developed in students through system approach, content analysis and sequential planning of laboratory work.

**Concept Structure :**



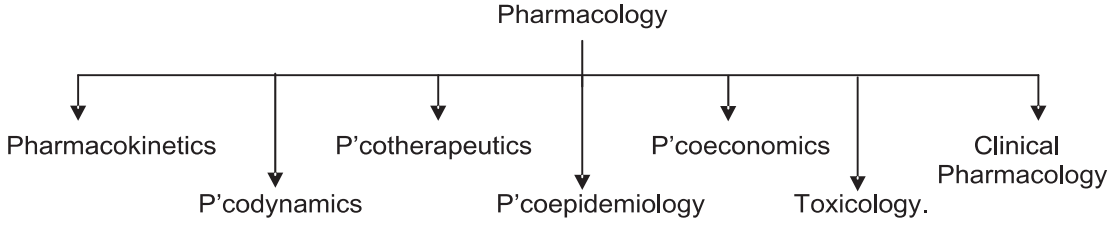

**Proposition 3 :**

Clean white apron/Laboratory coat is required along with dissection box.

**Proposition 4 : Pharmacology**

It is science in which the effect of drug is studied on living body

**Concept Structure :**




**Proposition 5 : Toxicology**

It is the branch in which effect of poisons is studied on living body.

**Proposition 6 ; Principle of Euthanasia**

The painless killing of animals in laboratory for the purpose of experiment.

## 4.0 Learning Objectives :

**4.1 Intellectual Skills :**

To understand general concept of animals and equipment in the laboratory.

**4.2 Motor Skills :**

To make students aware about different skills to be practiced.

## 5.0 Stepwise Procedure :

1. Read the learning overview carefully.
2. Listen to the lecture given by teacher about importance of subject, curriculum philosophy.
3. Graphical structure, skills to be developed, information about equipment, instrument, procedure, method of continuous assessment and tentative plan of work in laboratory.
4. Observe the laboratory for types of equipment, instruments for performing the experiment.
5. Observe the animals in animal house for performing the experiment.

## 6.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher) from each category.**

1. State the importance of graphical structure in understanding the scope of subject.
2. List the parameters of graphical structure in the hierarchy.
3. State the motor skills to be developed through this subject.
4. Classify the curriculum in different groups of subjects.
5. State the importance of job description in designing the curriculum.
6. Name the branches of subject Pharmacology and Toxicology.
7. What is the principle of euthanasia?
8. Name the five instruments you observed in the laboratory.
9. Name the five animals you observed in the laboratory animal house.
10. What is pharmacokinetics?
11. Which instructions a student should follow while performing the Pharmacology practical.
12. Write the requirements which are necessary to conduct the Pharmacology practical.
13. Which precautions should be followed while performing the Pharmacology practical.
14. Name the animals which are used in Pharmacology practical.
15. Name the five equipments observed in Pharmacology and Toxicology laboratory.

**(Space for answers)**

## (Space for answers)

# Experiment No. 2

## 1.0 Title :

Introduction to Computers and its parts.

## 2.0 Prior Concepts :

Computers

Applications of computers.

## 3.0 New Concepts :

**Proposition 1: Hardware.**

Hardware consists of following parts.

1. Central processing unit or microprocessor.

This is the part of the computer which processes instructions. it performs calculations, manages the flow of data and executes program instructions. CPU receives the program from an input source called as keyboard, from memory or from storage disc.

2. Memory

i. Read only memory (ROM)

It is built into system and can be read but not erased ,when the computer is switched off. the main function of ROM is to hold permanent operating instructions for computer.

ii.Random access memory (RAM)

It is used to store data in the computer for processing. The contents are written, read and changed by the microprocessor, when it is operating under the control programs of instructions stored in the ROM.RAM is volatile and erased when computer is switched off.

3. Storage.

i.Hard drive or hard discs are installed within the internal operating system and is directly linked to the processing unit.

ii. Disc drives or floppies are attached to the microprocessor so that external information can be transmitted into the system.

4. Work station.

It is the equipment used by the computer operator to run the computer

It consists of:

i. A keyboard which is similar to typewriter.

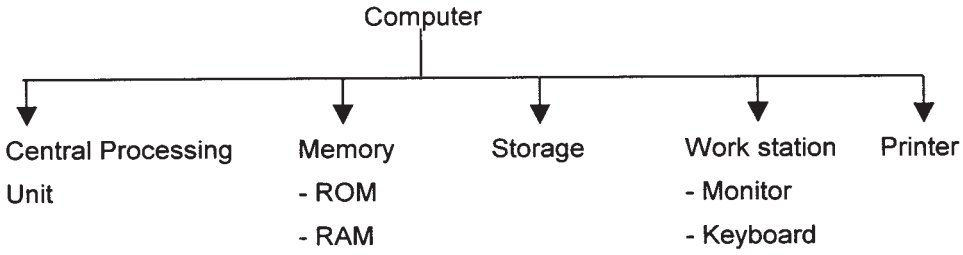
ii. A monitor or cathode ray tube (CRT).

It is the screen which is used visually to operate the system.

5. Printer.

It is the device which prints the information based strictly on commands given to it by the microprocessor.

**Concept Structure:**




**Proposition 2: Software.**

It includes the program and the data. A program is a sequence of instructions which direct the computer to perform specifications. Data are collection of characters or numbers manipulated by programs. Programs and data are assigned different file names.

**Proposition 3: Local Area Networks ( LANs).**

It is the network with computers and peripheral devices in a close proximity. It is linked by cable-telephone , coaxial or fiber optic

## 4.0 Learning Objectives :

**4.1 Intellectual Skills:**

To understand concept of computers and its parts.

**4.2 Motor Skills :**

Ability to operate the computer.

## 5.0 Questions :

**Write answers to Q.... Q.... Q.... Q.... (Questions to be allotted by subject teacher)**

1. What is computer? Mention the parts of the computer.
2. What is the function of central processing unit?
3. Mention types of memories.
4. Mention the parts of hardware.
5. What is the role of operating system in computer?
6. Mention types of storage devices.
7. Name the keys on keyboard and write their functions.
8. What is bit and byte?
9. List the versions of computers.
10. Write the application of computer in maintaining the patient profile in hospital.

**(Space for answers)**

## (Space for answers)

# Experiment No. 3

## 1.0 Title :

To select the animals for experimental use in Pharmacology.

To observe and confirm the effect of anesthesia on animals.

(Refer the Experiment No. 1 in the CD of MSBTE).

## 2.0 Prior Concept :

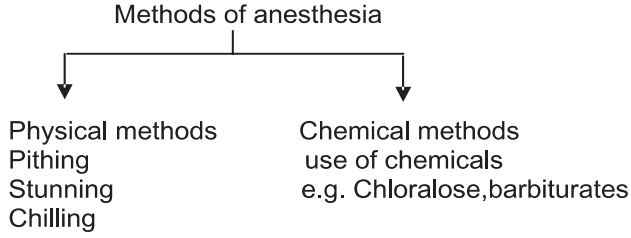
Different experimental animals, their anatomy, living style, behavior, breeding with storing.

## 3.0 New Concept :

**Proposition 1 :**

Loss of consciousness is called as an anesthesia.

**Concept Structure :**



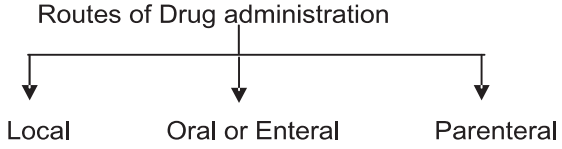

**Proposition 2 :**

An anesthetic depresses all parts of central nervous system by inhibiting the ascending reticular activating system, which controls pain and sensation.

**Proposition 3 :**

The way of administration of drugs into the body is called as routes of administration.

**Concept Structure :**




**Proposition 4 :**

Exposure of different body parts with help of dissecting instruments is called as dissection.

**Proposition 5 :**

Separation of tissues and organs outside the body is called as isolation.

## 4.0 Learning Objectives :

### 4.1 Intellectual Skills :

1. Ability to select the experimental animals.
2. To understand the concept.
3. To understand the Mechanism of action of the anesthetic drugs.

### 4.2 Motor Skills :

1. Ability to operate the computer and CD.

## 5.0 Requirements :

Dissection box, Weighing pan, Charts and pictures.

## 6.0 Diagrams :

### 6.1 Frog (*rana tigrina*)

Fig. 3.1

This is one of the most commonly used experimental animals in physiology, pharmacology and toxicology. It has been used in experiments for more than 200 years. It is easily available during rainy season .it is an amphibian animal and safe to handle.

**Experimental use :**

1. Study of isolated tissue such as rectus abdominus and heart preparation.
2. Study of drugs acting on central nervous system.
3. Study of retinal toxicity of drugs.
4. Study of drugs acting on neuromuscular junction.

### 6.2 Rat (*Rattus norvegicus* )

Fig. 3.2

It is small in size compared to other animals so drugs are required in small quantities. Vomiting center is absent and so drug can be administered orally. Gall bladder and tonsils are absent. Because of the absence of gall bladder, there is continuous flow of bile into the intestine. This facilitates the study of drugs acting on bile, cholesterol reabsorption etc.

**Experimental use :**

1. Psychopharmacological studies.
2. Study of analgesics and anticonvulsants.
3. Bioassay of various harmones such as insulin, oxytocin, vasopressin etc.
4. Study of estrus cycle, mating behaviour and lactation .
5. Studies n isolated tissue preparation like uterus, stomach, vas deferens, fundus strip, heart etc.
6. Chronic study on blood pressure.
7. Study of hepatotoxic and antihepatotoxic compounds.

### 6.3 **Guinea pig** (*Cavia porcellus*)

It is docile animal. it highly susceptible to tuberculosis and anaphylaxis. It is also highly sensitive to histamine and penicillin. It requires hexogenous ascorbic acid in diet.

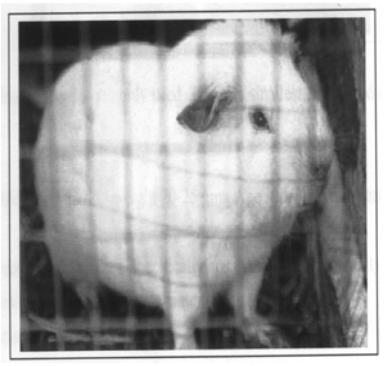


Fig. 3.3

**Experimental use :**

1. Evaluation of bronchodilators.
2. Anaphylactic and immunological studies.
3. Study of histamine and antihistamines.
4. Bioassay of digitalis.
5. Evaluation of local anesthetics.

### 6.4 **Mouse** (*Mus musculus*)

Swiss albino mice are commonly used. They are smallest, cheap and easy to handle.

Fig. 3.4

**Experimental use :**

1. Toxicological studies, specifically acute and subacute toxicity.
2. Bioassay of insulin.
3. Screening of analgesic and anticonvulsants.
4. Screening of chemotherapeutic agents.
5. Studies related to genetics and cancer research.
6. Study of drugs acting on central nervous system.

### 6.5 **Rabbit** (*Oryctolagus cuniculus* )

It is docile animal with large ears. Usually New Zealand white rabbits are used. The enzyme atropine esterase is present in rabbit's liver and plasma, so it can tolerate large dose of belladonna.

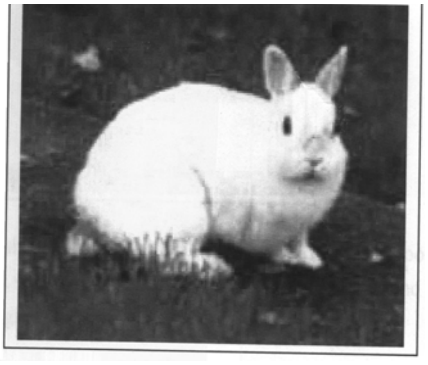


Fig. 3.5

**Experimental use :**

1. Pyrogen testing.
2. Bioassay of antidiabetics, curareform drugs and sex hormones.
3. Study of Mydriatics and Miotics.
4. Study of Local anaestheics.
5. Isolated preparations like heart, duodenum, ileum.

## 7.0 Stepwise procedure :

**Methods of producing anesthesia :**

**Physical methods.**

**Anesthesia for Frog.**

**A. Pithing.**

1. Hold the animal in the left hand with its dorsal part towards you.
2. Feel for the depression (occipitoatlantic junction) at the joint of skull with the pithing needle in the right hand.
3. Pass the pithing needle in the depression, move the needle side to side, thus separating the brain from spinal cord. Pass it upwards and rotate so as to destroy upper part of the brain.
4. Withdraw the needle and pass it downwards to complete destruction of the spinal cord.
5. Ensure the complete pithing by checking the reflexes by pressing the needle to the limbs.

**B. Chilling.**

1. Place the frog in refrigerator at about 4$^{o}$C.
2. Repeat the steps from 2 to step 7.

**Anesthesia for Mice, Rat, Guinea pig and Rabbits.**

**A. Stunning.**

1. Hold the animal in hand by tail
2. Give a stroke between brain and neck portion against a table.
3. Immediately place on platform and dislocate spinal cord by pulling the tail.

## 8.0 Standard Table :

| Parameters | Frog | Rat | Guinea pig | Mouse | Rabbit |
|---|---|---|---|---|---|
| Body weight (g) | 500 to 1000 | 200 to 300 | 600 to 800 | 25 to 30 | 2000 to 3000 |
| Life span (yrs) | 4 to 15 | 2 to 3 | 2 | 1 to 2 | 4 to 5 |
| Body temperature ($^{o}$ C) | 36 | 37.5 | 38.3 | 37.4 | 38.3 |

### 8.1 Observation Table :

| Parameters | Frog | Rat | Guinea pig | Mouse | Rabbit |
|---|---|---|---|---|---|
| Body weight (g) | | | | | |
| Life span (yrs) | | | | | |
| Body temperature ($^{o}$C) | | | | | |

## 9.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. List other five animals, which can be used for the experiment purpose.
2. Which effects you observed during pithing of the frog?
3. Why rabbits are used for Pyrogen testing.
4. What is stunning?
5. What is anesthesia?
6. Name the methods of producing anesthesia.
7. By chemical methods how anesthesia is produced.
8. What is Dissection and Isolation?
9. Write three experimental uses of frog and rabbit?
10. Why frog slips away from the hand? Give reason.

**(Space for answers)**

## (Space for answers)

# Experiment No. 4

## 1.0 Title :

To study the common instruments and equipments used in experimental Pharmacology.

( Refer the Experiment No.1 in the CD of MSBTE).

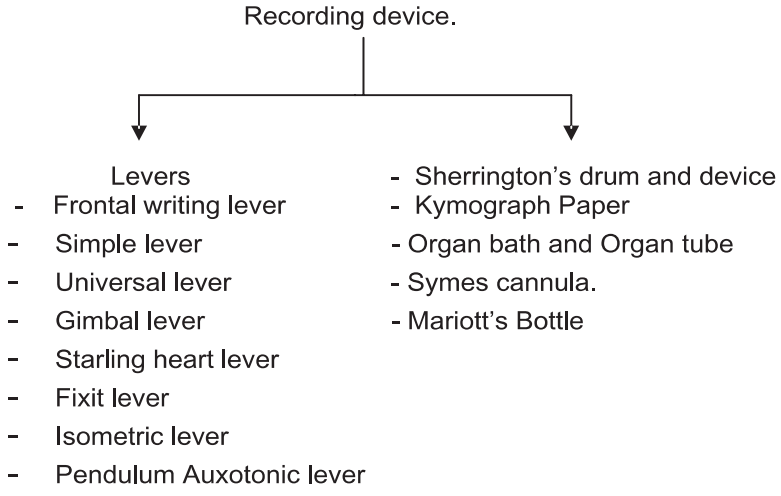
## 2.0 Prior Concept :

Instruments for Dissection.

## 3.0 New Concept :

**Proposition 1 :** Tracing of graph requires recording device.

**Concept Structure :**




## 4.0 Learning Objectives :

### 4.1 Intellectual skills :

To understand working and use of equipments.

### 4.2 Motor Skills :

Ability to handle and adjust the equipments.

Ability to setup the assembly.

## 5.0 Requirements :

Sherrington's recording drums and device, Organ bath and Organ tube, Symes cannula, Kymograph paper, Levers, Forceps, Scissors, Arrows, Dissection box.

## 6.0 Diagram :

### 6.1 Sherrington's recording drum and device :

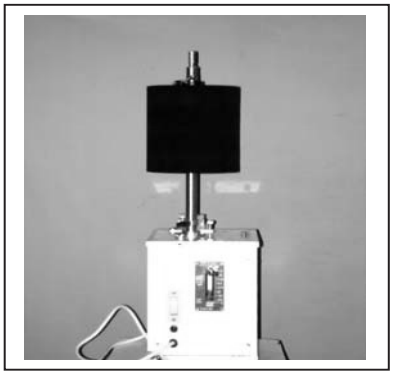


Fig. 4.1

It is used to move the kymograph at a desired speed. The drum (152 mm in diameter) on which the kymograph is fixed on the shaft of sherrington's revolving drum machine and this drum revolves at a fixed speed around the shaft. The shaft has a groove in which movable metal block is adjusted. This movable metal block is used to elevate or lower the position of drum. This metal block is moved up and down by rotating the screw meant for horizontal leveling of the machine. The gears in the basal part are for controlling the speed of rotating drum. The clutch on the backside of the machine is to start and stop the rotation of the drum during recording of responses. Generally the rotation speed of this machine ranges from 0.12mm/sec to 50mm/sec.

### 6.2 Organ bath assembly :

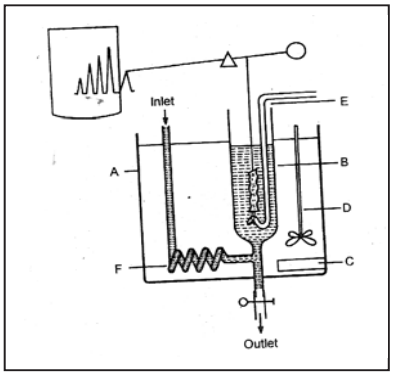



Fig. 4.2

The tissue bath used to put animal tissue for studying drug action is called as students organ bath. The organ bath essentially consist of (A) An outer Jacket ( water bath) made up of a steel, glass or Perspex; (B) The inner organ or tissue bath made up of glass with a capacity varying from 10ml to 50ml; (C) Thermostatically controlled heating rod; (D) Stirrer to keep the water in the outer jacket at uniform temperature; (E) Oxygen and delivery glass tube which also serves as tissue holder; and (F) glass coil, one end of which is connected to the lower end of the organ bath and the other to the container having the physiological salt solution. The glass coil is usually of double the capacity of inner organ bath to ensure warming up of the solution before it enters the organ bath.

The student organ bath having two units of inner tissue bath is called double unit organ bath.

### 6.3 Recording levers :

They are used to record the contraction or relaxation of the isolated tissue preparation. The recording is done on smoked papers fixed on Sherrington's recording drum. The speed of the drum is adjusted depending upon nature of experiment.

**1. Simple lever** (Side way writing) **:**
It is the simples type of lever made up of wood, stainless steel or Aluminium. A celluloid writing tip is attached at the end of the longer arm.

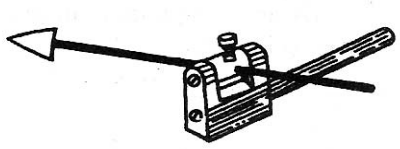


Fig. 4.3

**2.Frontal writing lever**(Writes frontally)**:**
This lever is designed in a such a way that the writing point rotates freely about its axis. It is used to record the contractions of isolated muscle preparations.

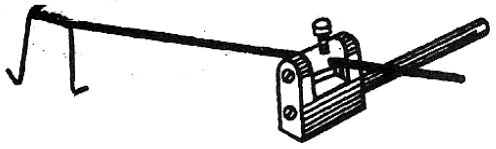


Fig. 4.4

**3. Starling heart lever :**
This lever is used to record the contraction of the heart.

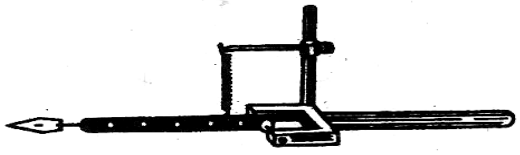


Fig. 4.5

**4. Brodies Universal lever :**
It is general utility lever.

Fig. 4.6

**5. Fixit lever :**
It is similar to Brodies lever but the central spindle has an ebonite roller on which three pins are set at right angle.

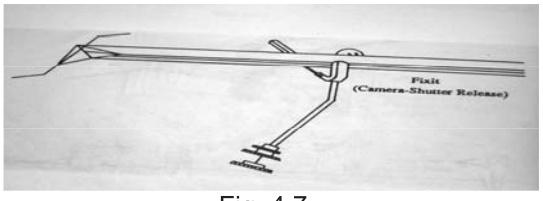



Fig. 4.7

**6. Gimbal lever :**

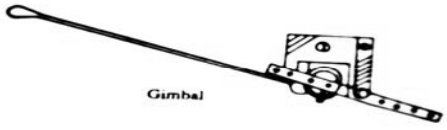



Fig. 4.8

**7. Isometric lever :**
It consist of heavy brass frame with spring steel wire fixed to each limb and carrying the lever from its center.

**8. Pendulum Auxotonic lever :**

### 6.4 Scissors and forceps :

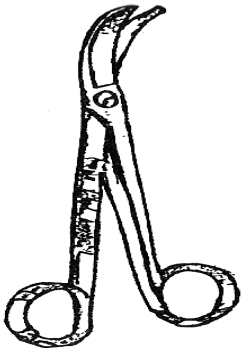


Fig. 4.9

Curved Scissor

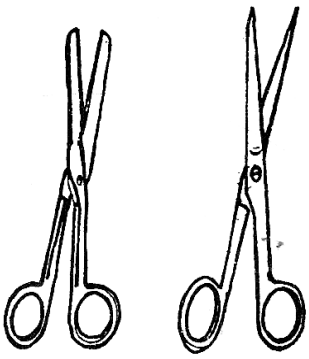


Fig. 4.10

Blunted and Pointed Scissors

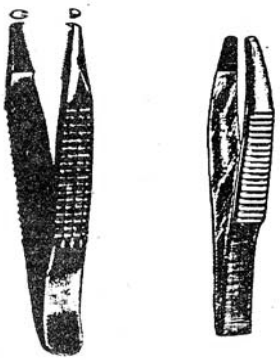


Fig. 4.11

Blunted and Pointed Forceps

### 6.5 Mariottes bottle :

It is employed as a convenient device for maintaining a steady pressure head since the pressure always corresponds to the lower lever of the glass tube.

## 7.0 Questions :

**Write answers to Q.... Q.... Q.... Q.... (Questions to be allotted by subject teacher)**

1. Name the five equipments used in experimental pharmacology.
2. Name the five levers used in experimental pharmacology.
3. What is the speed requirement for Sherringtons recording device.
4. How the capacity of organ tube is measured?
5. Name the five parts of organ bath assembly.
6. Which lever is used for experiment of isolated heart of frog?
7. Which lever is used for experiment of rectus abdominus muscle of frog?
8. List five instruments used for dissection of frog.
9. What is the use of Marriott's bottle?
10. What is the use of Symes Venous Cannula?

**(Space for answers)**

## (Space for answers)

# Experiment No. 5

## 1.0 Title :

To study the various laboratory techniques used in experimental Pharmacology.

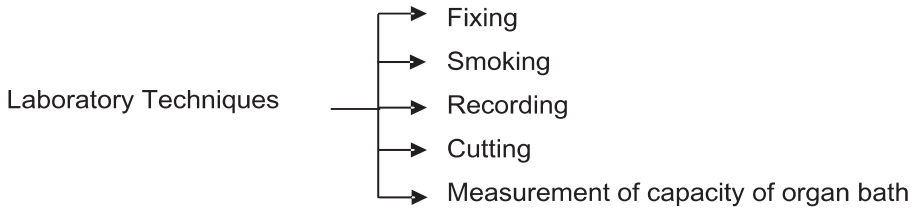
## 2.0 Prior Concept :

Effect of drug on animal preparation.

## 3.0 New Concept :

**Proposition 1 :** Graphical record of response.

**Concept Structure :**




## 4.0 Learning Objectives :

**4.1 Intellectual skills :**

1. To understand the composition of fixing solution.

**4.2 Motor Skills :**

1. Ability to Cut, Attach, Smoke, Kymograph paper to the drum.
2. Ability to fix Kymograph Paper in solution.
3. Ability to measure and fix the capacity of organ bath.

## 5.0 Requirements :

Sherrington's recording drum and device, Organ bath and Organ tube, Kymograph paper, Levers, Scissors, Dissection box.

## 6.0 Stepwise procedure :

**Recording procedure :**

**1. Adjustment for magnification :**

1. Adjust the magnification of response in order to get a proper recording of the observed physiological response.
   The tissue showing less contractility need more magnification and the reverse is true with the tissues, which have higher inherent rhythmic contractility.
2. Adjust for magnification by properly adjusting the distance between righting tip and fulcrum and the distance between the point of attachment to the tissues and the fulcrum by adjusting the relative distances desire degree of magnification is obtained.

$$\textbf{Magnification Value} = \frac{\text{Distance between fulcrum and Writing Point. (A)}}{\text{Distance between fulcrum and the point of attachment to the tissue (B)}}$$

**2. Application of load (Tension) :**

1. Select the proper length of longer and shorter arms depending upon magnification for the tissue, which is under study, and fix the fulcrum.
2. Balance the lever by putting the weight at the end of the shorter arms and mark the point of tissue attachment.
3. At equidistance i.e. Distance between fulcrum and the point of tissue attachment, from the fulcrum on the longer arms of the lever fix the desired load required for the particular tissue.
4. The tension for various tissue preparation are
   - Guinea pig ileum (1 gm.)
   - Guinea pig trachea (0.2 gm.)
   - Guinea pig vas deferens (0.5 gm.)
   - Rabbit duodenum (1 – 3 gm.)
   - Rat uterus (1 gm.)
   - Rat colon (0.5 gm.)
   - Rat fundus (1 gm.)
   - Fog rectus abdominus (1 gm.)

**3. Smoking of kymograph drums :**

1. Fix the kymograph paper tightly to the drum.
2. Smoke the drum uniformly with the black smoke of benzene and kerosene or the mixture of the two. (Uniform smoking is essential for proper recording. The recording can be done directly on the white paper with the help of pen attached to the tip of the lever.)

**4. Fixing of the tracings :**

1. Preserve the recordings on the smoke drum by properly fixing them with the help of fixing solution.

   (The commonly used resins to prepare fixing solution are shellac and colophony. A saturated solution of shellac is prepared in alcohol and it is allowed to stand for a week. The clear supernatant is decanted and is used for fixing the tracings. The solution may be reused several times and should be kept in a well-closed bottle to prevent evaporation of the solvent. One hundred fifty grams resin is dissolved in two litres of spirit.)

**5. Contact time :**

1. Allow the contact time of 90 seconds for the rectus abdominus muscle of the frog. (The time allowed for the drug to remain in contact with the tissue is called as contact time.)

**6. Time cycle :**

Follow the time cycle given below for the recording of response of frogs rectus abdominus muscle.

5 minutes time cycle.

1. 30 seconds : take the base line record.
2. 90 seconds : Allow the drug to contact with tissue.
3. 120 seconds : Give the first wash. (Give three subsequent washings at the interval of 1min.)
4. 300 seconds : Give the second dose.

## 7.0 Questions :

**Write answers to Q.... Q.... Q.... Q.... (Questions to be allotted by subject teacher)**

1. What is the composition of fixing solution used for kymograph paper?
2. How the fixing solution is prepared?
3. Write the time cycle, which should be followed for recording of response.
4. What is contact time?
5. How the magnification is adjusted?
6. By which method the response is recorded on kymograph?
7. Write the tension applied for preparations of guinea pig ileum and frogs rectus abdominus muscle?
8. Which laboratory techniques you learnt from this experiment?
9. What is the use of Kymograph paper?
10. What is smoking of drum?

**(Space for answers)**

## (Space for answers)

# Experiment No. 6

## 1.0 Title :

To prepare the Physiological salt solution.

## 2.0 Prior Concept :

Composition of ringer solution.

## 3.0 New Concept :

**Proposition 1 :** Function of composition of Ringer Solution.

## 4.0 Learning Objective :

### 4.1 Intellectual skills :

1. To understand the Mechanism of action of ions.

### 4.2 Motor Skills :

1. Ability to weigh the chemicals
2. Method of preparation of Physiological salt solution.

## 5.0 Requirements :

### 5.1 Apparatus :

Weighing balance, beaker, stirrer, spatula, butter paper.

### 5.2 Chemicals :

Sodium Chloride (NaCl)

Potassium Chloride (KCl)

Calcium Chloride ($CaCl_2$)

Sodium Bicarbonate ($NaHCO_3$)

Sodium Hydrogen Phosphate ($NaH_2PO_4$)

Glucose

Distilled water

## 6.0 Stepwise procedure :

1. Weigh all the chemicals accurately.
2. Dissolve alkalies and sodium hydrogen phosphate, glucose, calcium chloride separately in Distilled water in beaker.
3. Add the required amount by sodium bicarbonate by dissolving in sufficient volume of distilled water.
4. Add Sodium bicarbonate at the time of setting up of the experiment (since calcium carbonate is liable to be precipitated if the calcium and bicarbonate are kept long together).

## 7.0 Standard Table :

(Values are in gram / Litre.)

| Sr. No. | Composition | Frog-Ringer | Ringer -Locke | De Jalon | Krebs | Function |
|---|---|---|---|---|---|---|
| 1 | Sodium Chloride | 6.5 | 9.0 | 9.0 | 6.9 | To provide Isotonicity, Isomolarity, Contractility and excitability |
| 2 | Potassium Chloride | 0.14 | 0.42 | 0.42 | 0.35 | To provide Ionic balance |
| 3 | Calcium Chloride | 0.12 | 0.24 | 0.06 | 0.28 | To provide contractility. |
| 4 | Magnesium Sulphate | --- | --- | ---- | 0.28 | To stabilize the preparation. |
| 5 | Sodium Bicarbonate | 0.2 | 0.5 | 0.5 | 2.1 | To provide alkaline medium. |
| 6 | Sodium Dihydrogen Phosphate | 0.008 | --- | --- | --- | As a buffer. |
| 7 | Potassium Dihydrogen Phosphate | --- | --- | --- | 0.16 | As a buffer. |
| 8 | Glucose | 2.0 | 2.0 | 0.5 | 2.0 | To provide energy. |

## 8.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. Why sodium bicarbonate is added at the time of setting up of the experiment? Give reason.
2. What is the function of each composition in frogs ringers solution?
3. State three physiological salt solutions other than frogs ringer solution.
4. What is the use of ringer solution?
5. Which Physiological Salt Solution is used for experiment of isolated heart and rectus abdominus muscle preparation?
6. Which precaution should be taken while preparing the physiological salt solution?
7. What is contractility?
8. What is Isotonicity?
9. Why there is need of providing isotonic solution?
10. What is the need to provide buffer in physiological salt solution?

**(Space for answers)**

## (Space for answers)

# Experiment No. 7

## 1.0 Title:

To interpret from the graph by observing the effect of adrenaline on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE.

(Refer the Experiment No.1 in the CD of MSBTE.)

## 2.0 Prior Concepts:

Anatomy and Physiology of Heart.

Atria, ventricles.

## 3.0 New Concepts :

**Proposition 1:**

Drugs may influence the rate (chronotropy) and force (inotropy) of contraction of the heart. An increase in the heart rate is called **positive chronotropic effect,** while **negative chronotropic effect** is a decrease in heart rate. Similarly increase in force of contraction is called a **positive inotropic effect** and a decrease in force of contraction is called a **negative inotropic effect.**

**Proposition 2 : Mechanism of action .**

sympathomimetic amines such as adrenaline and nor adrenaline produce positive chronotropic and positive ionotropic effect,by acting on adrenergic ($\beta_1$) receptors which are present in heart. Whereas parasympathomimetic such as acetylcholine produce negative chronotropic and negative ionotropic effect by acting on muscarinic ($M_2$) receptors which are present in heart .

**Proposition 3 : Action potential .**

A phenomenon of continuously varying potential difference across the cell membrane is called as action potential.

The cardiac cells have an unusually long action potential, which can be divided into five phases (0-4)

Phase 0 : Depolarization

Na ion channels opens resulting in fast inward current.

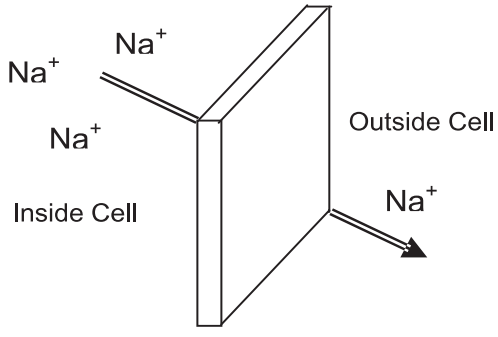



Fig. 7.1

Phase 1 : Partial Repolarization
Inactivation of Na ion channels.
K ion channels rapidly opens and closed causing transient outward current.

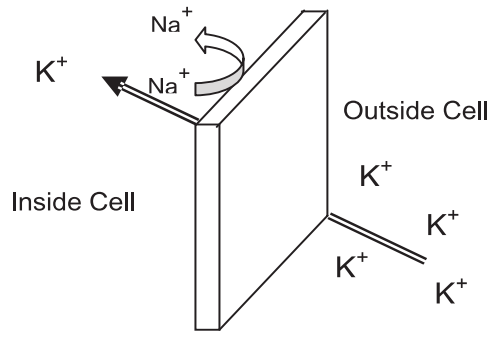



Fig.7.2

Phase 2 : Plateau.
Ca ion channels opens resulting in slow inward current (Balances the slow outward leak of K ions

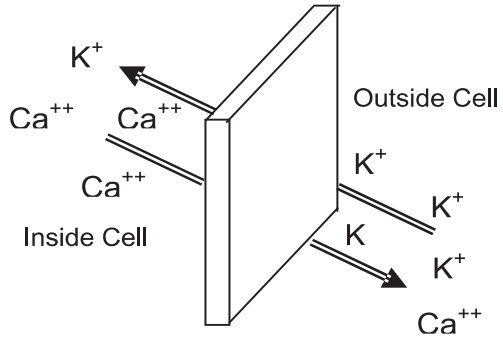



Fig.7.3

Phase 3 : Repolarization.
Ca ion channels closed.
K ion channels opens resulting in outward current.

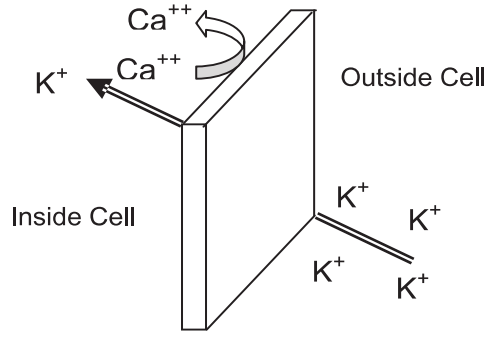



Fig.7.4

Phase 4 : Forward current.
Increase in depolarization is due to increase in Na permeability.
Spontaneous depolarization brings the cells to threshold of next action potential.

## 4.0 Learning Objectives :

### 4.1 Intellectual Skills :

1. To understand the mechanism of action of adrenaline.
2. Interpretation from the graph and observations.

**4.2 Motor Skills :**

1. Ability to operate the computer and CD.

## 5.0 Requirements:

Computers with LAN system,

MSBTE CD.

## 6.0 Strength of the Adrenaline :

Adrenaline 100 microgram per ml.

1mg = 1000 microgram.

1mg dissolved to 10 ml of distilled water it gives 100 microgram per ml.

## 7.0 Information from CD :

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment .

   i. Apparatus

   .....

   .....

   .....

   ii. Physiological salt solution.

   .....

   .....

   iii. Drugs.

   .....

   iv. Animal.

   .....

2. What is action potential?

3. What is the effect of adrenaline on action potential?

4. What is the effect of adrenaline on pacemakers and force of contraction?

5. How the excitatory effect on heart muscles takes place?

6. Describe how the contractility of heart muscles takes place?

7. Write the application of adrenergic drugs in cardiovascular conditions.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students of given experiments.

## 8.0 Diagram :

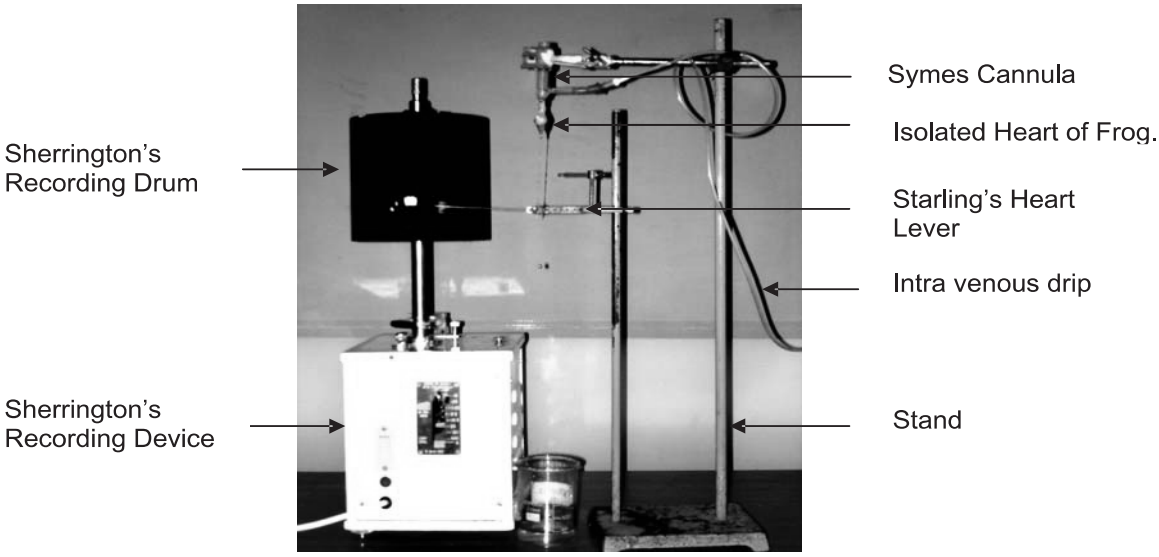



Fig. 7.5

Assembly for Isolated heart of a frogs experiment.


Graphical Record

Fig. 7.6

## 9.0 Stepwise Procedure :

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Pith the frog and pin it to the frog board
2. Give a midline incision on the abdomen. Remove the pectoral girdle and expose the heart .
3. Carefully remove the pericardium and put a few drops of frog ringer over the heart.
4. Trace the inferior Vena Cava, pass a thread below it, and give a small cut in order to insert the venous cannula, which in turn connected to a perfusion bottle containing frog's ringer.
5. Insert the cannula in the vena cava and tie the thread to assure the cannula in place.
6. Give a small cut in one of the aortae for the perfusate to come out.
7. Adjust a proper venous pressure by using marriott's bottle, which helps in attaining the constant pressure. Start the perfusion by opening screw clamp attached to the tube.
8. Cut the other parts attached to the heart and isolate the heart.
9. Mount the heart by fixing the cannula in screw clamp .
10. Attach one end of thread to the lower part of the ventricle and other end of thread to the Starling's heart lever.
11. Inject the graded doses of 0.1ml, 0.2ml, 0.4ml, 0.8ml of drug into the perfusion.
12. After completion of doses, label and fix the graph with the fixing solution.

**Precautions :**

1. Remove the blood from the heart completely after giving the small cut (blood causes formation of clot and heart stops.)
2. Give the sufficient time for the heart to recover between the two doses of drug by taking the baseline every time.
3. The rotation of Sherringtons recording drum should be away from the lever.

## 10.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Dose of Adrenaline (ml) | Heart rate (Beats/min) | Force of contraction | Tone |
|---|---|---|---|---|
| 1 | Frogs ringer | 30-35 | Normal | Normal |
| 2 | 0.1 ml | | | |
| 3 | Frogs ringer | | | |
| 4 | 0.2 ml | | | |
| 5 | Frogs ringer | | | |
| 6 | 0.4 ml | | | |
| 7 | Frogs ringer | | | |
| 8 | 0.8 ml | | | |

## 11.0 Conclusion :

Therefore, from the observations, it is concluded that adrenaline causes,

1……..(increase/decrease) in heart rate,

2……(increase/decrease) in force of contraction,

3…….. ……(increase/decrease) in tone.

## 12.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. List five drugs having sympathomimetic action.
2. Which type of effect is produced by adrenaline?
3. Name the adrenergic receptors present in the heart.
4. Name the cholinergic receptors present in the heart.
5. Why there is increase in heart rate and force of contraction?
6. What is Tachycardia and Bradycardia ?
7. Which precautions should be taken while performing the experiment?
8. Name the parts of isolated heart of a frogs assembly.
9. Draw the graph of effect of adrenaline on isolated heart of a frog.
10. What is your interpretation from the graph?

**(Space for answers)**

**(Space for answers)**

# Experiment No. 8

## 1.0 Title :

To interpret from the graph by observing the effect of Calcium ions and Potassium ions on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE.

(Refer the Experiment No.1 in the CD of MSBTE.)

## 2.0 Prior Concepts :

Anatomy and Physiology of Heart.

Atria , ventricles.

## 3.0 New Concepts :

**Proposition 1:**

Calcium ions are essential for vigorous contraction if calcium concentration is increased heart contract vigorously and fails to relax completely during successive beats and finally stops in systole (Contraction).

**Proposition 2 :**

Calcium which enters in the cells causes release of calcium stored in the sarcoplasmic reticulum by acting on ryanodyne receptors which raises the concentration of calcium within the cells.

This intracellular free calcium then interacts with troponin-actin-myosin system and causes contraction of the heart.

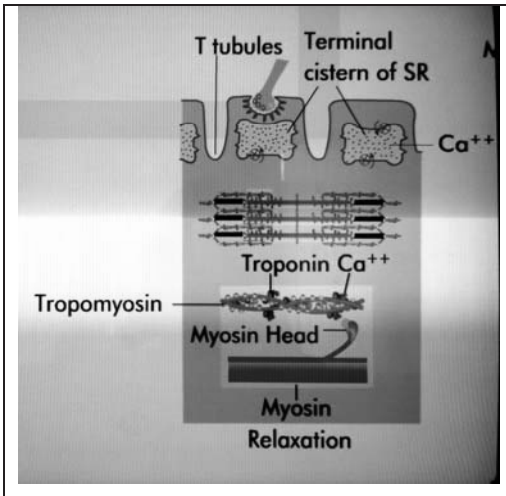



Fig. 8.1

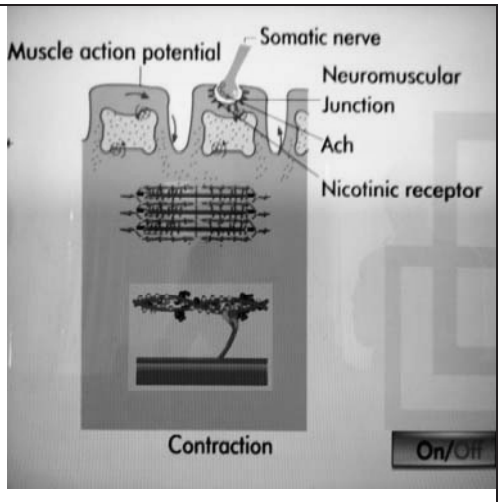



Fig. 8.2

**Proposition 3 :**

Potassium ions are present intracellularly which are responsible for relaxation of heart muscles.If potassium ion concentration is increased it causes heart to relax completely and heart stops in the diastole (Relaxation).

## 4.0 Learning Objectives:

### 4.1 Intellectual Skills:

1. To understand the mechanism of action of Calcium Chloride and Potassium Chloride.
2. Interpretation from the graph and observations.

### 4.2 Motor Skills:

1. Ability to operate the computer and CD.

## 5.0 Requirements:

Computers with LAN system,

MSBTE CD.

## 6.0 Graphical record:

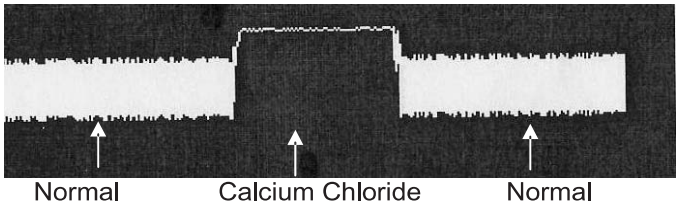



Fig. 8.3

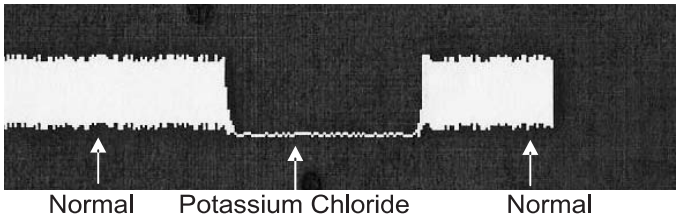



Fig. 8.4

## 7.0 Information from CD.

Write the answers in the space provided belowS to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i. Apparatus

……

……

……

ii. Physiological salt solution.

……

iii. Drugs.

……

iv. Animal.

……

2. What is the use of physiological salt solutions?

3. What was the invention of the scientist Ringer about sodium ion, calcium ions and potassium ions on heart muscles?

4. What is the effect of excess calcium and potassium ions on the heart?

5. What is the indication of beats /min. and height in mm in the graph?

6. How are normal contraction of heart before the administration of potassium ions ?

7. What is the effect of potassium ions on rate of contraction, force of contraction, tone and rhythmicity ?

8. What you observed from the recordings in the graph after the admistration of potassium chloride?

9. What is the effect of calcium ions on rate of contraction, force of contraction, tone and rhythmicity?

10. What you observed from the recordings in the graph after the administration of calcium chloride?

11. Which effect you learnt about potassium ions and calcium ions on cardiac muscles?

Teacher shall ask few more specific questions in the space provided below to confirm the learning of the students of given experiments.

## 8.0 Stepwise Procedure :

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Pith the frog and pin it to the frog board.
2. Give a midline incision on the abdomen. Remove the pectoral girdle and expose the heart.
3. Carefully remove the pericardium and put a few drops of frog ringer over the heart.
4. Trace the inferior Vena cava, pass a thread below it, and give a small cut in order to insert the venous cannula, which in turn connected to a perfusion bottle containing frog's ringer.
5. Insert the cannula in the vena cava and tie the thread to assure the cannula in place.
6. Give a small cut in one of the aortae for the perfusate to come out.
7. Adjust a proper venous pressure by using marriott's bottle, which helps in attaining the constant pressure. Start the perfusion by opening screw clamp attached to the tube.
8. Cut the other parts attached to the heart and isolate the heart.

9. Mount the heart by fixing the cannula in screw clamp.
10. Attach one end of thread to the lower part of the ventricle and other end of thread to the starling's heart lever.
11. Inject the graded doses of Calcium Chloride 0.1ml, 0.2ml of drug into the perfusion.
12. After completion of doses, label and fix the graph with the fixing solution.
13. Similarly repeat the step no.11 and 12 for Potassium Chloride.

**Precautions :**

1. Remove the blood from the heart completely after giving the small cut (blood causes formation of clot and heart stops.)

2. Give the sufficient time for the heart to recover between the two doses of drug by taking the baseline every time.

3. The rotation of Sherringtons recording drum should be away from the lever.

## 9.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Dose of Calcium Chloride (ml) | Heart rate (Beats/min) | Force of contraction | Tone |
|---|---|---|---|---|
| 1 | Frogs ringer | 30-35 | Normal | Normal |
| 2 | 0.1 ml | | | |
| 3 | Frogs ringer | | | |
| 4 | 0.2 ml | | | |
| 5 | Frogs ringer | | | |

| Sr. No. | Dose of Potassium Chloride (ml) | Heart rate (Beats/min) | Force of contraction | Tone |
|---|---|---|---|---|
| 1 | Frogs ringer | 30-35 | Normal | Normal |
| 2 | 0.1 ml | | | |
| 3 | Frogs ringer | | | |
| 4 | 0.2 ml | | | |
| 5 | Frogs ringer | | | |

## 10.0 Conclusion :

Therefore, from the observations, it is concluded that Calcium ions causes ,
1…….……..(increase/decrease) in heart rate,

2……(increase/decrease) in force of contraction,

3…….. ……(increase/decrease) in tone.

Also Potassium ions causes,

1……..……...(increase/decrease) in heart rate,

2……(increase/decrease) in force of contraction,

3…….. ……(increase/decrease) in tone.

## 11.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. How a Calcium ion produces contraction of heart?
2. Why there is increase in heart rate and force of contraction?
3. Which type of effect is produced by Calcium ions?
4. Which type of effect is produced by Potassium ions?
5. What will be the effect, if the dose of Calcium ions is increased?
6. What will be the effect, if the dose of Potassium ions is increased?
7. How the concentration of calcium within the cells is increased?
8. Draw the graph of effect of calcium ions on isolated heart of a frog.
9. Draw the graph of effect of Potassium ions on isolated heart of a frog.
10. What is your interpretation from the graph?

**(Space for answers)**

**(Space for answers)**

# Experiment No. 9

## 1.0 Title :

To interpret from the graph by observing the effect of acetylcholine on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE.

(Refer Experiment No. 1 in the CD of MSBTE)

## 2.0 Prior Concepts :

Anatomy and Physiology of Heart.

Atria, ventricles.

## 3.0 New Concepts :

**Proposition 1 :**

Acetylcholine (Ach.) is a parasympathomimetic drug (Cholinergic drug) and neurohumoral transmitter released at end plate of postganglionic nerve fibre. Parasympathomimetic drugs stimulate the effector cells innervated by postganglionic parasympathetic cholinergic nerves.

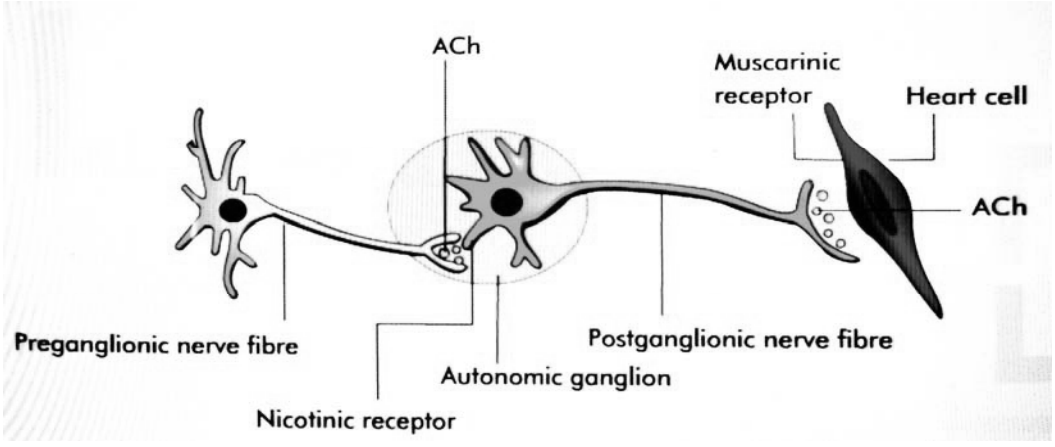



Fig. 9.1

Location of muscarinic and nicotinic receptors.

**Proposition 2 : Mechanism of action**

Acetylcholine produces negative chonotropic and negative ionotropic effect on heart. Acetylcholine mainly acts on muscarinic and nicotinic receptors.

Muscarinic receptors are $M_1$, $M_2$ and $M_3$ and Nicotinic receptors are $N_M$ and $N_N$.

| Receptors | Location | Effect |
|---|---|---|
| $M_1$ | CNS, ganglia, Gastric parietal cells. | CNS excitation, gastric acid secretion |
| $M_2$ | AV node of atria. | Cardiac inhibition. |
| $M_3$ | Exocrine glands, smooth muscles. | Increase in secretions, Smooth muscle contraction. |
| $N_M$ | Skeletal neuromuscular junction. | Skeletal muscle contraction. |
| $N_N$ | CNS and autonomic ganglia. | Stimulation of autonomic ganglia |

## 4.0 Learning Objectives :

### 4.1 Intellectual Skills :

1. To understand the mechanism of action of Acetylcholine.
2. Interpretation from the graph and observations.

### 4.2 Motor Skills :

1. Ability to operate the computer and CD.

## 5.0 Requirements :

Computers with LAN system,

MSBTE CD.

## 6.0 Graphical record :

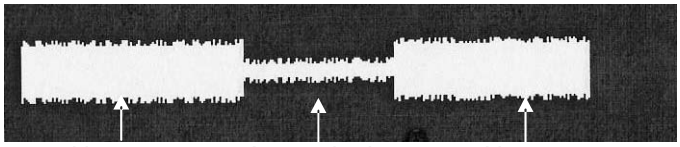



Fig. 9.2

## 7.0 Information from CD.

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiments?

i. Apparatus

.....

.....

.....

ii. Physiological salt solution.

.....

iii. Drug.

.....

iv. Animal.

.....

2. What is composition of parasympathetic system?

3. Where the nicotinic and muscarinic receptors are present?

4. Where the Acetylcholine is released ?

5. What is the effect of Acetylcholine on pacemaker cells and impulse generation?

6. Where the impulses are formed?

7. What is the effect of Acetylcholine on action potential, contractility and heart?

8. What will be the effect if potassium ions permeability is increased?

9. Draw a diagram of single peak indicating contraction and relaxation.

10. What is the effect of Acetylcholine on heart rate, force of contraction and tone?

11. Draw a graph indicating effect of Acetylcholine on the isolated Heart of a Frog.

12. Write the applications of cholinergic drugs

Teacher shall ask few more specific questions in the space provided to confirm the learning of the students of given experiments.

## 8.0 Stepwise Procedure :

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Pith the frog and pin it to the frog board.
2. Give a midline incision on the abdomen. Remove the pectoral girdle and expose the heart
3. Carefully remove the pericardium and put a few drops of frogs ringer over the heart.
4. Trace the inferior Vena cava, pass a thread below it, and give a small cut in order to insert the venous cannula, which in turn connected to a perfusion bottle containing frog's ringer.
5. Insert the cannula in the vena cava and tie the thread to assure the cannula in place.
6. Give a small cut in one of the aortae for the perfusate to come out.
7. Adjust a proper venous pressure by using marriott's bottle, which helps in attaining the constant pressure. Start the perfusion by opening screw clamp attached to the tube.
8. Cut the other parts attached to the heart and isolate the heart.
9. Mount the heart by fixing the cannula in screw clamp.
10. Attach one end of thread to the lower part of the ventricle and other end of thread to the Starling's heart lever.
11. Inject the graded doses of acetylcholine 0.1ml, 0.2ml, 0.4ml, 0.8ml of drug into the perfusion.
12. After completion of doses, label and fix the graph with the fixing solution.

**Precautions :**

1. Remove the blood from the heart completely after giving the small cut (blood causes formation of clot and heart stops.)
2. Give the sufficient time for the heart to recover between the two doses of drug by taking the baseline every time.
3. The rotation of Sherringtons recording drum should be away from the lever.

## 9.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Dose of Acetylcholine (ml) | Heart rate (Beats/min) | Force of contraction | Tone |
|---|---|---|---|---|
| 1 | Frogs ringer | 30-35 | Normal | Normal |
| 2 | 0.1 ml | | | |
| 3 | Frogs ringer | | | |
| 4 | 0.2 ml | | | |
| 5 | Frogs ringer | | | |
| 6 | 0.4 ml | | | |
| 7 | Frogs ringer | | | |
| 8 | 0.8 ml | | | |

## 10.0 Conclusion :

Therefore, from the observations , it is concluded that acetylcholine causes,

1……..(increase/decrease) in heart rate,

2……(increase/decrease) in force of contraction,

3…….. ……(increase/decrease) in tone.

## 11.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. Write the mechanism of action of acetylcholine.
2. Why there is decrease in heart rate and force of contraction?
3. List five drugs having parasympathomimetic action.
4. Which type of effect is produced by Acetylcholine?
5. Name and write the location of muscarinic receptors in the body.
6. Name and write the location of nicotinic receptors in the body.
7. Draw the graph (dose response) of effect of acetylcholine on the heart.
8. List five drugs having parasympathomimetic action.
9. List five drugs having parasympatholytic action.
10. What is your interpretation from the graph?

**(Space for answers)**

**(Space for answers)**

# Experiment No.10

## 1.0 Title:

To interpret from the graph by observing the effect of acetylcholine on isolated rectus abdominus muscle of a frog by using the CD of MSBTE.

(Refer the Experiment No. 2 in the CD of MSBTE)

## 2.0 Prior Concepts :

Muscles and types of muscles.

Stirated muscles, non striated muscles and cardiac muscles.

## 3.0 New Concepts :

**Proposition 1:**

Acetylcholine is a parasympathomimetic drug, which acts on muscarinic and nicotinic receptors. frog's rectus abdominus muscle is a skeletal muscle. Acetylcholine by acting on nicotinic receptors specifically on $N_M$ receptors causes contraction of rectus abdominus muscle.

## 4.0 Learning Objectives :

### 4.1 Intellectual Skills :

1.To understand the mechanism of action of Acetylcholine.

2. Interpretation from the graph and observations.

### 4.2 Motor Skills :

1. Ability to operate the computer and CD.

## 5.0 Requirements :

Computers with LAN system,

MSBTE CD.

## 6.0 Graphical record:


N – Normal.
Ach. – Acetylcholine.

## 7.0 Information from CD.

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiments?

i. Apparatus

……

……

……

ii. Physiological salt solution.

……

iii. Drug.

……

iv. Animal.

……

2.What is the function of skeletal muscle?

3.What is Neuromuscular junction?

4.Which interaction is responsible for muscle contraction after release of acetylcholine?

5.Draw the assembly setup for the experiment.

6.What is the action of acetylcholine on skeletal muscle?

7.Draw the graph for the effects of acetylcholine on the rectus abdominus muscle of a frog.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students of given experiments.

## 8.0 Stepwise Procedure :

Listen the procedure carefully from the CD.

Read the following steps.

1. Pith the frog and pin it to the frog board.
2. Give a midline incision on the abdomen and expose the whole abdomen.
3. Dissect out and transfer a recti muscles to a petridish containing frog ringer at a room temparature, which is constantly supplied with aeration.
4. Separate the muscle into two pieces by a sharp scissor.
5. Select one piece of muscle and tie thread to both the ends of a muscle.
6. Tie one end of the muscle to aeration tube and other end to the frontal writing lever.
7. Balance the weight of 1gram on the lever by using piece of plasticin wax.
   (Balance the lever by putting the weight at the end of the shorter arms and mark the point of tissue attachment.
   After the contraction of the muscle, it will not relax rapidly, make it relax by suspending the weight of 1gram.otherwise relax the preparation for 30min. before the attachment to the lever.)
8. Follow the time cycle given below for the recording of response of frogs rectus abdominus muscle.
   5 minutes time cycle.
   i) 30 seconds – Take the base line record.
   ii) 90 seconds – Allow the drug to contact with tissue.
   iii) 120seconds- Give the first wash. (Give three subsequent washings at the interval of 1min.)
   iv) 300seconds – Give the second dose.
8. Inject the doses of 0.1ml, 0.2ml, 0.3ml, 0.4ml of acetylcholine into the organ tube containing rectus abdominus muscle and frogs ringer solution.
9. After completion of doses, label and fix the graph with the fixing solution.

**Precautions :**

1. Cut out all the blood capillaries present on muscle preparation by using a sharp scissor.

(The enzyme cholinesterase is present in the blood, which causes destruction of acetylcholine into acetic acid and choline.)

2. Use thin piece of muscle (2-3 cm) as it is more sensitive than bulky piece.

## 9.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Dose of Acetyl choline (ml) | Response (Height of contraction in mm) |
|---|---|---|
| 1 | Frogs ringer | |
| 2 | 0.1 ml | |
| 3 | Frogs ringer | |
| 4 | 0.2 ml | |
| 5 | Frogs ringer | |
| 6 | 0.3 ml | |
| 7 | Frogs ringer | |
| 8 | 0.4 ml | |
| 9 | Frogs ringer | |

## 10.0 Conclusion :

Therefore, from the observations, it is concluded that Acetylcholine causes,

……(Contraction/Relaxation) of rectus abdominus muscle of a frog.

## 11.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. What is the effect of acetylcholine on rectus abdominus muscle of a frog?
2. What is the mechanism of action of acetylcholine?
3. How the metabolism of acetylcholine takes place?
4. How the duration of action of acetylcholine is increased?
5. Write to which category the rectus abdominus muscle belongs?
6. Write the names of the muscles other than rectus abdominus.
7. Draw the graph (dose response) of effect of acetylcholine on rectus abdominus muscle of a frog.
8. List five drugs, which causes contraction of skeletal muscles.
9. What is the purpose of giving washings to the muscle preparation?
10. Write the 5 min. time cycle, which should be followed while performing the experiment.

**(Space for answers)**

# Experiment No. 11

## 1.0 Title:

To interpret from the graph by observing the effect of acetylcholine on ileum of guinea pig by using the CD of MSBTE.

(Refer the Experiment No. 2 in the CD of MSBTE)

## 2.0 Prior Concept :

Different parts of Digestive system.

Esophagus, stomach, small intestine, large intestine.

## 3.0 New Concepts :

**Proposition 1: Peristalsis.**

It is a coordinated contraction and relaxation of circular and longitudinal layers of muscles.

**Proposition 2 : Spasm.**

It is a sustained involuntary muscle contraction and the drugs which produces spasm are called as spasmogens.

## 4.0 Learning Objectives :

### 4.1 Intellectual Skills :

1.To understand the mechanism of action of acetylcholine.

2. Interpretation from the graph and observations.

**4.2 Motor Skills :**

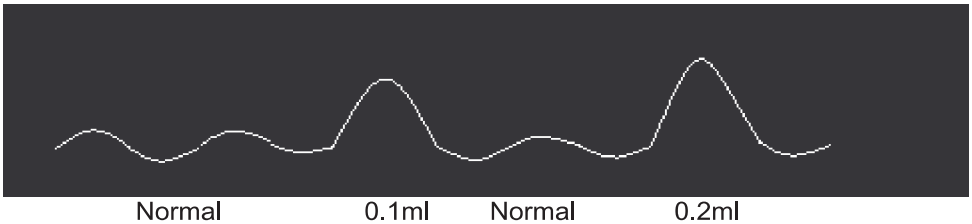
1. Ability to operate the computer and CD.

## 5.0 Requirements :

Computers with LAN system,

MSBTE CD.

## 6.0 Graphical record:




Ach. - Acetylcholine

## 7.0 Stepwise Procedure :

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Sacrifice the guinea pig by blowing on the head.
2. Give a midline incision on the abdomen and expose the whole abdomen.
3. Dissect out and transfer the ileum in a Petridish containing tyrode solution at a room temperature, which is constantly supplied with aeration.

4. Place one end of ileum over the tip of the pipette and apply the air pressure, to wash out the contents.
   (Use the ileum directly, if animal has not been fed recently.)
5. Pass a thread to both the ends of ileum by inserting a needle from the inner side of the ileum.
6. Tie one end of the muscle to aeration tube and other end to the frontal writing lever.
7. Balance the weight of 1gram on the lever by using piece of plasticin wax.
   (Balance the lever by putting the weight at the end of the shorter arms and mark the point of tissue attachment.)
8. Follow the time cycle given below for the recording of response of guinea pig ileum.
   5 minutes time cycle.
   i) 30 seconds – Take the base line record.
   ii) 90 seconds – Allow the drug to contact with tissue.
   iii) 120 seconds- Give the first wash.
   (Give three subsequent washings at the interval of 1min.)
   iv) 300 seconds – Give the second dose.
9. After completion of doses, label and fix the graph with the fixing solution.

**Precautions :**

1. Avoid the use of forceps to transfer the ileum, because it damages the tissue, handle it by fingers.
2. Avoid the application of excessive air pressure.
3. Use about 2 cm – 3 cm piece of ileum for the experimental purpose.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Dose of Acetyl choline (ml) | Response (Height of contraction in mm) |
|---|---|---|
| 1 | Tyrode solution | |
| 2 | 0.1 ml | |
| 3 | Tyrode solution | |
| 4 | 0.2 ml | |
| 5 | Tyrode solution | |
| 6 | 0.3 ml | |
| 7 | Tyrode solution | |
| 8 | 0.4 ml | |
| 9 | Tyrode solution | |

## 9.0 Information from CD.

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiments.

   i. Apparatus

   ……

   ……

   ……..

   ii. Physiological salt solution.

   ……

   iii. Drug.

   ……..

   iv. Animal.

   ……

2. What is the peristalsis?

3. Which reflexes are responsible for increasing and decreasing the motility of gastrointestinal tract?

4. Which action of acetylcholine increases peristaltic activity?

5. Which is the action of cholinergic drugs?

6. Draw the graph (dose response) for the effects of acetylcholine on the guinea pig ileum of a frog.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students of given experiments.

## 10.0 Conclusion :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

Therefore, from the observations it is concluded that acetylcholine causes,

……. (contraction/ relaxation) of ileum of guinea pig.

## 11.0 Questions :

1. Name the four parts of stomach.
2. What is function of small intestine?
3. Name two involuntary muscles with their locations.
4. Write to which category of muscle the ileum of guinea pig belongs?
5. Which precautions should be taken while performing the experiment.
6. What is the purpose of applying the tension of one gram to the lever?
7. Draw the graph (dose response) of effect of acetylcholine on ileum of guinea pig.
8. What is peristalsis?
9. What is spasm?
10. Which effect is produced by acetylcholine on the ileum of guinea pig?

**(Space for answers)**

## (Space for answers)

# Experiment No. 12

## 1.0 Title:

To interpret from the graph by observing the effect of spasmogens and relaxants on intestine of rabbit by using the CD of MSBTE.

(Refer the Experiment No. 3 in the CD of MSBTE)

## 2.0 Prior Concept :

Parts of digestive system.

Esophagus, stomach, small intestine, large intestine.

Peristalsis, spasm, types of spasm.

## 3.0 New Concepts :

**Proposition 1: Spasmogens.**

The drugs, which produce spasm, are called as spasmogens.

Spasmogens are also called as spasmodics, spasmogenics.

E.g. Acetylcholine, Barium chloride.

**Proposition 2 : Relaxants.**

The drugs, which relieves the spasm of the smooth muscles by producing relaxation of smooth muscles.

Relaxants are also called as antispasmodics, spasm relaxants, and spasmolytics.

e.g. Atropine, Adrenaline.

## 4.0 Learning Objectives :

**4.1 Intellectual Skills :**

1.To understand the mechanism of action of Acetylcholine.

2. Interpretation from the graph and observations.

**4.2 Motor Skills :**

1. Ability to operate the computer and CD.

## 5.0 Requirements :

Computers with LAN system,

MSBTE CD.

## 6.0 Graphical record:

Normal 0.1ml Ach. Normal 0.1ml $BaCl_2$ 0.1ml each Ach. + Atropine

Ach. – Acetylcholine.

$BaCl_2$ - Barium chloride.

## 7.0 Stepwise Procedure :

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Give a midline incision on the abdomen and expose the whole abdomen.
2. Dissect out and transfer the piece of small intestine in a petridish containing tyrode solution at a room temperature, which is constantly supplied with aeration.
   (Cut the piece of 2-3 cm of intestine 5-10 cm. below the stomach).
3. Place one end of intestine over the tip of the pipette and apply the air pressure, to wash out the contents.
   (Use the intestine directly, if animal has not been fed recently.)
4. Pass a thread to both the ends of intestine by inserting a needle from the inner side of the intestine.
5. Tie one end of the intestine to aeration tube and other end to the frontal writing lever.
6. Balance the weight of 1gram on the lever by using piece of plasticin wax.
   (Balance the lever by putting the weight at the end of the shorter arms and mark the point of tissue attachment.)
7. Follow the time cycle given below for the recording the response of intestine of rabbit.
   5 minutes time cycle.
   i) 30 seconds – Take the base line record.
   ii) 90 seconds – Allow the drug to contact with tissue.
   iii) 120 seconds- Give the first wash.
   (Give three subsequent washings at the interval of 1min.)
   iv) 300 seconds – Give the second dose.
8. Inject the doses into the organ tube containing tyrode solution and intestine preparation as given in the observation table.
9. After completion of doses, label and fix the graph with the fixing solution.

**Precautions :**

1. Avoid the use of forceps to transfer the intestine, because it damages the tissue, handle it by fingers.
2. Avoid the application of excessive air pressure.
3. Use about 2cm-3cm piece of intestine for the experimental purpose.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Drug | Dose (ml) | Tone and force of contraction | Response (Height of contraction in mm. |
|---|---|---|---|---|
| 1. | Tyrode solution | - | Normal | |
| 2. | Acetylcholine | 0.1 | Increases | |
| 3. | Barium chloride | 0.1 | Increases | |
| 4. | Atropine + Acetylcholine | 0.1 each | Normal | |
| 5. | Adrenaline | 0.1 | Decreases | |

## 9.0 Information from CD.

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiments.

   i. Apparatus

   ……

   ……

   ……

   ii. Physiological salt solution.

   ……..…..

   iii. Drugs.

   ……...

   iv. Animal.

   ……

2. What is spasm?

3. What are spasmogens?

4. What are relaxants?

5. What is cramp and atony?

6. How acetylcholine produces spasmogenic action?

7. How atropine acts as a spasmolytic?

8. Draw a graph (dose response) of effect of acetylcholine and barium chloride on intestine of rabbit.

9. Draw a graph (dose response) of effect of atropine+acetylcholine on intestine of rabbit.

10. Draw a graph (dose response) of effect of adrenaline on intestine of rabbit.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students of given experiments.

## 10.0 Conclusion :

Therefore, from the observations it is concluded that acetylcholine causes,

i……..contraction / relaxation ) of intestine of a rabbit.

ii. Atropine administered with acetylcholine produces,…….... (spasmogenic / spasmolytic) effect.

iii. Administration of adrenaline causes,……(Contraction / relaxation) of intestine of a rabbit.

## 11.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. What are spasmogens? List five examples of spasmogens.
2. Write the clinical applications of spasmogens.
3. What are relaxants? List five examples of relaxants.
4. Write the clinical applications of relaxants.
5. Which types of receptors are present in rabbit's intestine?
6. Why force of contraction increases after administration of Acetylcholine? Give reason.
7. Why force of contraction is normal after administration of Acetylcholine in presence of Atropine? Give reason.
8. Which type of movement is shown by isolated intestine of rabbit?
9. Which is the difference between frog's ringer and tyrode solution in respect of composition?
10. Which precaution should be taken while performing this experiment?

**(Space for answers)**

**(Space for answers)**

# Experiment No. 13

## 1.0 Title :

To observe and study the effect of Local anesthetics on rabbits cornea.

(Refer the Experiment No.4 in the CD of MSBTE.)

## 2.0 Prior Concepts :

Anatomy and physiology of eye.

Cornea, Pupil, Lens, Retina, Iris.

## 3.0 New Concepts :

**Proposition 1 : Local anesthetics.**

The agents, which causes reversible loss of sensation of part of the body with which they are in contact. e.g. Xylocaine.

They produce loss of sensation of localized part of the body.

**Proposition 2 : Applications of Local anesthetics.**

Local anesthetics are used to produce following types of anesthesia.

Surface anesthesia : Anesthesia of eye, ear, throat, urethra and skin is produced.

Infiltration or block anesthesia : The drug is infiltrated subcutaneously and nerve endings are anaesthetized by direct exposure to the drug.

Nerve block or condition block : The drug is injected very close to the nerve.

Spinal anesthesia : The drug is injected into subarachnoid space. When drug is injected outside the dura, the technique is known as epidural anesthesia.

**Proposition 3 : Mechanism of action.**

Local anesthetics mainly blocks $Na^+$ channels. This causes blockade of initiation and propagation of action potential by preventing the voltage dependent increase in $Na^+$ conductance, which affects depolarization.

**Proposition 4 : Membrane stabilizing effect.**

The action which affects the process of depolarization leading to failure of propagation of an impulse without affecting the resting potential is known as membrane stabilizing effect.

**Proposition 5 : Corneal reflex**

The wick of cotton is touched on the cornea of rabbit's eye. If rabbit closes the eyelids it is called as positive corneal reflex and if eyelids remain open it is called as negative corneal reflex.

## 4.0 Learning Objectives

### 4.1 Intellectual Skills:

1. To understand the concept.
2. To understand the Mechanism of action of local anesthetics.
3. To understand corneal reflex.
4. Interpretation of result from observations.

### 4.2 Motor Skills:

1. Ability to operate the computer and CD.

## 5.0 Requirements:

Computers with LAN system,

MSBTE CD.

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

   i. Apparatus.

   ……

   ……

   ……..…….

   ii.Drugs.

   ……

   ……

   iii.Animal.

   ……..

2. How the action potential is generated?

3. Which channels are present within the plasma membrane of axon?

4. Write the effect of opening of $Na^+$ and $K^+$ channel on action potential.

5. What are local anesthetics?

6. How membrane stabilizing effect is produced by local anesthetics?

7. How the corneal reflex is checked?

8. Which effect is observed after instillation of xylocaine into the eye.

9. Write the applications of local anesthetics.

10. Write the duration of action of local anesthetics.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure:

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Select a healthy rabbit of either sex weighing 2-3 kg.
2. Open the rabbit holder. Place the rabbit in the rabbit holder and close it gently so that the head region will protrude outside.
3. Cut the eyelashes of both the eyes with a sharp scissor.
   (Care should be taken that this step will not produce any harm to the eye.)
4. Wash the cornea of rabbit eye by putting distilled water drop-by-drop using dropper.
5. Keep the right eye as a control and use left eye for experimental purpose.
6. Check both eyes for corneal reflex by touching the cotton wick to the cornea.
7. Instill 2-3 drops of xylocaine 1% in left eye.

8. Check the corneal reflex after one minute after instillation of the drug.
9. Check the corneal reflexes till the eye recovers from the effect of the drug.
10. Take 3 readings to confirm the recovery from the effect of a drug.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No | Time (Min.) | Corneal reflex | |
|---|---|---|---|
| | | Left eye (Xylocaine 1%) | Right eye |
| 1 | 1 | + ve | + ve |
| 2 | 2 | | |
| 3 | 3 | | |
| 4 | 4 | | |
| 5 | 5 | | |
| 6 | 6 | | |
| 7 | 7 | | |
| 8 | 8 | | |
| 9 | 9 | | |
| 10 | 10 | | |
| 11 | 11 | | |
| 12 | 12 | | |
| 13 | 13 | | |
| 14 | 14 | | |
| 15 | 15 | | |

## 9.0 Conclusion :

Therefore, from the observations it is concluded that,

i. The onset of action of xylocaine is……..min.

ii. Duration of action is……min.

iii. Xylocaine produces……(surface/ infiltration) local anesthetic effect.

## 10.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. List five drugs of the local anesthetic category.
2. Write the mechanism of action of local anesthetics.
3. How the duration of action of local anesthetics is determined?
4. How the rabbit are prepared for the experiment?
5. What is the corneal reflex?
6. What is the membrane stabilizing effect?

7. Write the onset of action and duration of action of xylocaine.
8. For which purpose the surface anesthesia is used?
9. How the duration of action of local anesthetics is increased?
10. Write the therapeutic uses of local anesthetics.

**(Space for answers)**

## (Space for answers)

# Experiment No. 14

## 1.0 Title :

To observe and study the effect of Mydriatics on rabbits cornea.

(Refer the Experiment No. 5 in the CD of MSBTE).

## 2.0 Prior Concepts :

Anatomy and physiology of eye.

cornea,pupil,lens,retina,iris.

## 3.0 New Concepts :

**Proposition 1: Mydriatics**

Mydriasis is the effect which causes increase in the size of pupil of eye.

The agents which causes mydriasis are called as mydriatics.

e.g. Ephedrine , Adrenaline.

**Proposition 2: Process of Mydriasis.**

Mydriatics causes mydriasis due to contraction of radial muscle fibres (dilator pupillae) and relaxation of circular muscle fibres (constrictor pupillae) of iris of eye due to sympathetic stimulation.

**Proposition 3: Light reflex.**

The sharp beam of light is produced with a pen torch on the pupil by moving the pen torch from left to right corner of eye. If the pupil moves from left to right corner of eye then the light reflex is taken as a positive.

**Proposition 4: Cycloplegia.**

Mydriasis causes contraction of radial muscle fibres (dilator pupillae) and relaxation of circular muscle fibres (constrictor pupillae) of iris of eye.

Because of mydriasis individual can see the objects which are far away but fails to see the objects which are too near, this is termed as a cycloplegia.

## 4.0 Learning Objectives

### 4.1 Intellectual Skills:

1. To understand the concept.
2. To understand the process of mydriasis.
3. To understand light reflex.
4. Interpretation of result from observations.

### 4.2 Motor Skills :

1. Ability to operate the computer and CD.

## 5.0 Requirements:

Computers with LAN system,

MSBTE CD.

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i.Apparatus.

……

……

……

ii.Drugs.

……..

iii. Animal.

……..

2. List the parts of the eye.

3.How the size of muscle fibres is controlled?

4.How the pupil size is regulated?

5. Name the nerves which are innervated by circular muscles and radial muscles.

6.What is the effect of bright light and dim light on the pupil size of the eye?

7.Show diagrammatically the effect of bright light and dim light on the pupil size of the eye.

8.What is Cycloplegia?

9.What is photophobia?

10.Show diagrammatically the effect on vision observed in cycloplegia.

11.What is the effect of mydriatic drug on the eye?

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure:

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Select a healthy rabbit of either sex weighing 2-3 kg.

2. Open the rabbit holder. Place the rabbit in the rabbit holder and close it gently so that the head region will protrude outside.
3. Cut the eyelashes of both the eyes with a sharp scissor.
   (Care should be taken that this step will not produce any harm to the eye).
4. Wash the cornea of rabbit eye by putting distilled water drop by drop using dropper.
5. Keep the right eye as a control and use left eye for experimental purpose.
6. Check both eyes for corneal reflex by touching the cotton wick.
7. Check the light reflex by producing a sharp beam of light with a pen torch to the cornea from sidewise of left to right corner of the eye.
8. Instill 2-3 drops of Homatropine 1% in left eye.
9. Check the corneal reflex and light reflex after ten minute after instillation of the drug.
   Also measure the size of the pupil by using a transparent scale without touching to the cornea.
10. Check the corneal reflexes and light reflex till the eye recovers from the effect of the drug.
11. Take 3 readings to confirm the recovery from the effect of a drug.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr.No. | Time (Min.) | Left Eye (Homatropine 1%) | | |
|---|---|---|---|---|
| | | Corneal reflex | Light Reflex | Pupil Size (mm.) |
| 1 | 0 | +ve | +ve | 5-6 |
| 2 | 10 | | | |
| 3 | 20 | | | |
| 4 | 30 | | | |

## 9.0 Conclusion :

Therefore, from the observations it is concluded that,

i. The normal pupil size is …….mm.

ii. After instillation of drug the maximum pupil size is……. mm.

iii. The onset of action is after ……..min.

iv. The duration of action is …….min.

v. Homatropine produces ……..(Mydriatic /Miotic) effect.

## 10.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. What are Mydriatics? List five examples of Mydriatics drugs.
2. How the process of mydriasis takes place?
3. Write the applications of Mydriatics drugs.
4. What is the light reflex?
5. What is the effect of Mydriatics on pupil size of eye?
6. When the corneal reflex is taken as a positive?

7. When the light reflex is taken as a positive?
8. How the corneal reflex is checked?
9. How the light reflex is checked?
10. Write the therapeutic uses of mydriatics.

**(Space for answers)**

## (Space for answers)

# Experiment No. 15

## 1.0 Title :

To observe and study the effect of Miotics on rabbits cornea.

(Refer the Experiment No. 5 in the CD of MSBTE).

## 2.0 Prior Concepts :

Anatomy and physiology of eye.

Cornea, pupil, lens, retina, iris.

## 3.0 New Concepts :

**Proposition 1: Miosis**

Miosis is the effect, which causes decrease in the size of pupil of eye.

The agents which causes miosis are called as Miotics

e.g. Physostigmine.

**Proposition 2: Process of Miosis.**

Miotics causes Miosis due to contraction of circular muscle fibres (constrictor pupillae) and relaxation of radial muscle fibres (dilator pupillae) of iris of eye due to parasympathetic stimulation.

**Proposition 3: Spasm of Accomodation.**

Due to parasympathetic stimulation contraction of ciliary muscles takes place which results in relaxation of suspensory ligament of lens.

This reduces the tension of lens and allows the lens to bulge, thereby increasing its thickness and decreases focal length therefore person is able to see objects, which are near but can't see objects, which are far away.This is called as spasm of accommodation or paralysis of accomodation.

## 4.0 Learning Objectives:

**4.1 Intellectual Skills:**

1. To understand the concept.
2. To understand the process of Miosis.
3. Interpretation of result from observations.

**4.2 Motor Skills :**

1. Ability to operate the computer and CD.

## 5.0 Requirements :

Computers with LAN system,

MSBTE CD.

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i. Apparatus.

……

……

……

ii. Drugs.

……

iii. Animal.

……..

2.What are Miotics?

3. What is Paralysis or spasm of Accomodation?

4.Show diagrammatically the effect observed on vision in paralysis of Accomodation or spasm of Accomodation.

5. Write the effect of miotic drug on eye.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure:

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Select a healthy rabbit of either sex weighing 2-3 kg.
2. Open the rabbit holder. Place the rabbit in the rabbit holder and close it gently so that the head region will protrude outside.
3. Cut the eyelashes of both the eyes with a sharp scissor.

(Care should be taken that this step will not produce any harm to the eye).

4. Wash the cornea of rabbit eye by putting distilled water drop by drop using dropper.
5. Keep the right eye as a control and use left eye for experimental purpose.
6. Check both eyes for corneal reflex by touching the cotton wick.
7. Check the light reflex by producing a sharp beam of light with a pen torch to the cornea from sidewise of left to right corner of the eye.
8. Instill 2-3 drops of Physostigmine 4% in left eye.
9. Check the corneal reflex and light reflex after ten minute after instillation of the drug.
   Also measure the size of the pupil by using a transparent scale without touching to the Cornea.
10. Check the corneal reflexes and light reflex till the eye recovers from the effect of the drug.
11. Take 3 readings to confirm the recovery from the effect of a drug.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr.No. | Time (Min.) | Left Eye (Physostigmine 4%) | | |
|---|---|---|---|---|
| | | Corneal reflex | Light Reflex | Pupil Size (mm.) |
| 1 | 0 | +ve | +ve | 5-6 |
| 2 | 10 | | | |
| 3 | 20 | | | |
| 4 | 30 | | | |

## 9.0 Conclusion :

Therefore, from the observations it is concluded that,

i. The normal pupil size is …….mm.

ii. After instillation of drug the maximum pupil size is…… mm.

iii. The onset of action is after ……..min.

iv. The duration of action is ……..min.

v. Physostigmine produces……..(Mydriatics /Miotic) effect.

## 10.0 Questions :

**Write answers to Q.... Q.... Q.... Q.... (Questions to be allotted by subject teacher)**

1. What are miotics?
2. List five drugs of Miotic category.
3. What is miosis?
4. How the process of Miosis takes place?
5. Write the precautions to be taken while performing the experiment.
6. Which step is to be taken to avoid the drainage of the drug from the ocular cavity?
7. Write the difference between mydriatic and miotic drugs.
8. What is the effect of paralysis of accommodation on the focal length of eye?
9. Which another major class of drug produces miosis?
10. Write the therapeutic uses of Miotics.

**(Space for answers)**

## (Space for answers)

# Experiment No. 16

## 1.0 Title:

To observe and study the effect of Strychnine sulphate on voluntary muscles of a frog by using CD of MSBTE.

(Refer experiment No.6 in the CD of MSBTE.)

## 2.0 Prior Concepts:

Muscles and types of muscles.

Striated muscles, non striated muscles and cardiac muscles.

## 3.0 New Concepts:

**Proposition 1: Reflex action.**

It is the involuntary response to a stimulus conveyed to the nervous system by passage of excitation potential from a receptor to a muscle or gland.

**Proposition 2: Mechanism of action of Strychnine.**

Strychnine act mainly on spinal cord but it also stimulate the entire neuraxis. It acts as competitive antagonist of inhibitory transmitter Glycine at the postsynaptic inhibitory sites. When given orally or parenterally in animals strychnine produces convulsions characterized by tonic extension of the body. Excessive stimulation is followed by depression and death.

## 4.0 Learning Objectives:

### 4.1 Intellectual Skills:

1. To understand the concept.
2. To understand the mechanism of action of Strychnine.
3. Interpretation of result from observations.

### 4.2 Motor Skill:

1.Ability to operate the computer and CD.

## 5.0 Requirements:

Computers with LAN system,

MSBTE CD.

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i.Apparatus.

……

……

……

ii.Drugs.

……

iii. Animal.

……

2. What is reflex action?

3. Which neurons are involved in the reflex arc?

4. Draw a diagram showing location of neurons.

5. When acetylcholine is released at neuromuscular junction?

6. What is effect of sensory neuron, interneuron and motor neuron on antagonistic muscle?

7. How the excitatory effect is observed upon administration of Strychnine?

8. How the stretch reflex is inhibited?

9. Why stretching of limbs of frog occurs after dipping the limbs into glacial acetic acid?

10.What is the effect of Strychnine on voluntary muscles?

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure:

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Pith the frog and hold it on a stand with the help of a clamp.
2. Dip one of the leg of a frog in a glacial acetic acid and observe stretching of a leg.
3. Inject 0.1ml of strychnine sulphate solution intraperitoneally to a frog.

4. After one minute once again dip the same leg in glacial acetic acid and observe stretching of a leg.
5. Repeat the same procedure for 0.2ml, 0.3ml and 0.4ml of strychnine sulphate and observe the stretching of a leg.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr.No. | Drug | Dose (ml.) | Chemical | Response |
|---|---|---|---|---|
| 1 | Normal | - | Glacial acetic acid | Normal movement of leg. |
| 2 | Strychnine sulphate | 0.1 | Glacial acetic acid | |
| 3 | Strychnine sulphate | 0.2 | Glacial acetic acid | |
| 4 | Strychnine sulphate | 0.3 | Glacial acetic acid | |
| 5 | Strychnine sulphate | 0.4 | Glacial acetic acid | |

Normal- Without the given drug.

## 9.0 Conclusion :

Therefore from observations it is concluded that Strychnine sulphate causes,

i…….(Stimulation/ depression ) of spinal cord .

ii……(Contraction/relaxation) of voluntary muscles.

## 10.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. What are spinal cord stimulants?
2. List the five drugs having spinal cord stimulant action.
3. What is the effect of Glycine on motor neuron?
4. How strychnine stimulates the spinal cord?
5. Why glacial acetic acid produces stretching of legs of frog?
6. What is the effect of increased dose of strychnine on spinal cord?
7. Write the therapeutic uses of strychnine.
8. Which CNS effects are observed after administration of strychnine into the frog?
9. Write the name of antidote used in the treatment of strychnine poisoning.
10. List three categories of drugs having CNS stimulant action.

## (Space for answers)

# Experiment No. 17

## 1.0 Title:

To interpret from the graph by observing the effect of digitalis on heart rate and force of contraction on isolated heart of a frog by using the CD of MSBTE.

(Refer Experiment No. 7 in the CD of MSBTE)

## 2.0 Prior Concepts:

Anatomy and physiology of Heart

Atria, ventricles.

## 3.0 New Concepts:

**Proposition 1: Cardiotonics.**

The drugs, which give strength or energy to the activity of the heart, are called as Cardiotonics. Cardiotonics increases the force of contraction of cardiac muscles and stimulates the overall activity of the heart.

e.g. Digitalis , Strophanthus.

**Proposition 2: Mechanism of action of Digitalis.**

Digitalis produces a direct action on digitalis receptors which is called as $Na^+/K^+$/ATPase system. $Na^+/K^+$ /ATPase is responsible for regulating electrolyte movement within the cardiac muscles.

Digitalis causes retention of $Ca^{++}$ within the cardiac muscles with a resultant loss or expulsion of $K^+$. Thus the $Ca^{++}$ which are retained in the myocardium are cardiac stimulants and responsible for positive inotropic effect.

**Proposition 3: Congestive Heart failure.**

It is the inability of the heart to maintain the circulation; sufficient to meet the body's need affecting right or left ventricle.

It is marked by breathlessness and abnormal retention of Na+ and water resulting in edema with congestion of lungs and peripheral circulation.

**Proposition 4: Starlings law of heart.**

The force of systolic contraction is directly proportional to the fiber length in a systole.since systolic contraction represents cardiac output and fiber length in a diastole indicates venous pressure , the law indicates that cardiac output is directly related to venous return or venous pressure during diastole.

## 4.0 Learning Objectives

### 4.1 Intellectual Skills:

1. To understand the concept.
2. To understand the mechanism of action of digitalis.
3. Interpretation from graph and observations.

**4.2 Motor Skill:**

1.Ability to operate the computer and CD.

## 5.0 Requirements:

Computers with LAN system,

MSBTE CD.

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i. Apparatus.

……

……

……

ii. Drugs.

……

iii. Animal.

……..

2. Write the composition of Modified ringer solution.

3. What is Congestive Heart failure?

4. Write down the cause of Congestive Heart failure.

5. Which effects are observed in Congestive Heart failure?

6. What is hypo dynamic heart?

7. Write the effects of digitalis on a hypo dynamic heart.

8. What is the effect of digitalis on cardiac muscles?

9. Why digitalis is called as cardiotonic? Give reasons.

10. What is the effect of Digoxin and calcium chloride on the isolated heart ?

11. What is the effect of Modified ringer solution on isolated heart?

12. What is the effect of Digoxin and calcium chloride on the isolated heart after giving Modified ringer solution.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure:

Listen the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Pith the frog and pin it to the frog board.
2. Give a midline incision on the abdomen. Remove the pectoral girdle and expose the heart.
3. Carefully remove the pericardium and put a few drops of frog Ringer over the heart.
4. Trace the inferior Vena Cava, pass a thread below it, and give a small cut in order to insert the venous cannula, which in turn connected to a perfusion bottle containing Frog's ringer.
5. Insert the cannula in the vena cava and tie the thread to assure the cannula in place.
6. Give a small cut in one of the aortae for the perfusate to come out.
7. Adjust a proper venous pressure by using Marriott's bottle, which helps in attaining the constant pressure. Start the perfusion by opening screw clamp attached to the tube.
8. Cut the other parts attached to the heart and isolate the heart.
9. Mount the heart by fixing the cannula in screw clamp.
10. Attach one end of thread to the lower part of the ventricle and other end of thread to the Starling's heart lever.
11. Inject the graded doses of Digoxin+ calcium chloride 0.1ml, 0.2ml, 0.4ml of drug into the normal ringer perfusion.
12. Replace the normal ringer with modified ringer solution and inject the graded doses of Digoxin+ calcium chloride 0.1ml, 0.2ml, 0.4ml of drug.
13. Observe and record the responses.
14. Label and fix the graph with the fixing solution.

**Precautions:**

1. Remove the blood from the heart completely after giving the small cut (blood causes formation of clot and heart stops.)

2. Give the sufficient time for the heart to recover between the two doses of drug by taking the baseline every time.

3. The rotation of Sherringtons recording drum should be away from the lever.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Dose of Digoxin +Calcium chloride | Heart rate (Beats/min) | Force of contraction | Tone |
|---|---|---|---|---|
| 1 | Normal ringer | 30-35 | Normal | Normal |
| 2 | 0.1 ml | | | |
| 3 | Normal ringer | | | |
| 4 | 0.2 ml | | | |
| 5 | Normal ringer | | | |
| 6 | 0.4 ml | | | |
| 7 | Modified ringer | | | |
| 8 | 0.1 ml | | | |
| 9 | Modified ringer | | | |
| 10 | 0.2ml | | | |
| 11 | Modified rringer | | | |
| 12 | 0.4ml | | | |

## 9.0 Conclusion :

Therefore, from the observations it is concluded that Digoxin causes,
(Normal ringer)

1……..(increase/decrease) in heart rate,

2……(increase/decrease) in force of contraction,

3…….. ……(increase/decrease) in tone.

(Modified ringer)

1……..(increase/decrease) in heart rate,

2……(increase/decrease) in force of contraction,

3…….. ……(increase/decrease) in tone.

## 10.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. What are cardiotonics? List the five examples of cardiotonic drugs.
2. Write the five therapeutics uses of digitalis.

3. What is hypodynamic heart?
4. How the hypodynamic state of heart is produced experimentally?
5. What is starling's law of Heart?
6. How digitalis is useful in congestive heart failure?
7. Write the effects of digitalis on cardiac output, conduction velocity, automaticity and blood pressure.
8. What is the effect of digitalis on electrocardiogram?
9. What is the effect of digitalis on the heart rate?
10. Why digoxin and calcium chloride are administered in markedly failing heart? Give reason.

**(Space for answers)**

## (Space for answers)

# Experiment No. 18

## 1.0 Title :

To observe and study the effect of hypnotics in mice by righting reflex method by using the CD of MSBTE.

(Refer the Experiment No. 8 in the CD of MSBTE)

## 2.0 Prior Concepts :

Stimulation, Depression, Reflex activity.

## 3.0 New Concepts :

**Proposition 1 : Central Nervous System (C.N.S.) Depressants.**

The drugs which produce depression of central nervous system or having inhibitory action on the central nervous system are called as C.N.S. depressants.

e.g. Barbiturates.

**Proposition 2 : Hypnotics and Sedatives**

The drugs which produce calm down effect are called as sedatives.

e.g. Pentobarbitone

The drugs which produce sleep resembling to natural sleep are called as Hypnotics.

e.g. Diazepam .

**Proposition 3 : Central Nervous System (C.N.S.) Stimulants.**

The drugs which produce stimulation of central nervous system (brain and spinal cord) are called as C.N.S. stimulants.

e.g. amphetamine, caffeine, theophylline, theobromine.

**Proposition 4 : Righting reflex**

When the animal (mice ) is dropped from the height, it immediately restores the posture and behaves normally. This immediate regaining is called as righting reflex.

**Proposition 5 : Mechanism of action.**

Barbiturates induce sleep in man and animal by potentiating GABAergic inhibition by increasing the lifetime of Chloride channel opening induced by the GABA and thus depressing the CNS. Phenobarbitone Na produces quick onset of sleep which is indicated by loss of righting reflex and recovery is detected as animals regain their righting reflex.

## 4.0 Learning Objectives :

### 4.1 Intellectual Skills :

1. To understand the concept.
2. To understand the mechanism of action of sedatives and hypnotics.
3. To understand the righting reflex.
4. Interpretation from the observations.

### 4.2 Motor Skills :

1. Ability to operate the computer and CD.

## 5.0 Requirements :

Computers with LAN system,

CD of MSBTE .

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i.Apparatus.

……

……

……

ii.Drugs.

……..

iii. Animal.

……..

2.What is sleep?

3. Which are the components of normal sleep?

4. What is insomnia and hyposomnia?

5.How hyperpolarization of neuronal cells takes place?

6.How the subject sleeps?

7. What is hypnosis?

8. What is anxiolytic effect?

9. Which barbiturates are used clinicallyin the treatment of insomnia?

10.What is righting reflex?

11.Which effect is observed after the administration of Phenobarbitone sodium solution into the mice.

12. What is the clinical use of Phenobarbitone ?

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure :

Listen the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Weight and select three healthy mice of either sex.
2. Label the mice as $M_1$, $M_2$ ,$M_3$.
3. Observe the normal righting reflex in all the three animals as follows.
4. Lift the animal at a time up to the height and drop the animal gently on the platform having cushion.
5. Inject 1ml saline Intraperitoneally to the mouse no.1 i. e. $M_1$. and observe the righting reflex.
6. Inject the Phenobarbitone sodium (45mg/kg) of body weight of mouse no.2 i.e. $M_2$ and observe the righting reflex.
7. Keep mouse no. 3 i.e. $M_3$ as a control.
8. Note the time of onset of action as the animal loses righting reflex i.e. falls asleep.
9. Note the time of recovery from the sleep as the animal turns to recover its normal posture.
10. Tabulate your observations.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Animal No. | Drug | Dose mg / kg | Onset of action | Duration of Action | Righting reflex |
|---|---|---|---|---|---|---|
| 1 | $M_1$ | Saline | 1 ml | | | |
| 2 | $M_2$ | Phenobarbitone | 45 mg / kg | | | |
| 3 | $M_3$ | Control | | | | |

## 9.0 Conclusion :

Therefore, from the observations it is concluded that,

After the administration of saline solution,

i. righting reflex is……..(present/absent).

After the administration of Phenobarbitone sodium solution,

ii. righting reflex is……..(present/absent).

iii. phenobarbitone produces……..(CNS stimulant/depressant) effect.

## 10.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. What are sedatives and hypnotics?
2. List the five drugs which are used as sedatives and hypnotics.
3. Write the mechanism of action of sedatives and hypnotics.

4. What is righting reflex?
5. How the righting reflex is checked?
6. Why righting reflex is absent after administration of phenobarbitone?
7. How phenobarbitone produces hypnotic effect?
8. Write the onset time and duration of action the phenobarbitone sodium.
9. What are CNS stimulants and depressants?
10. List the five drugs from CNS stimulant and depressant category.

**(Space for answers)**

**(Space for answers)**

# Experiment No. 19

## 1.0 Title:

To observe and study the effect of hypnotics in mice by actophotometer by using the CD of MSBTE.

(Refer experiment No.8 in the CD of MSBTE.)

## 2.0 Prior Concepts:

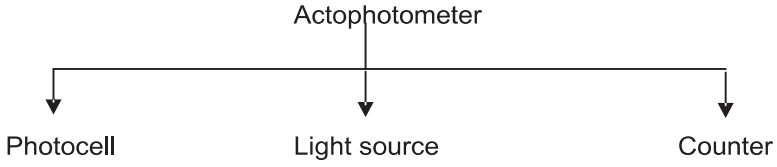
Stimulation, Depression, Reflex activity.

## 3.0 New Concepts:

**Proposition 1: Actophotometer.**

The locomotor activity of mice is studied by the using the actophotometer. The actophotometer operates with photoelectric cells which are connected in a circuit in a counter .

**Concept Structure:**




**Proposition 2: Process of recording.**

A count is recorded when the beam of light falling on photocell is cut off by the movement of mice.

## 4.0 Learning Objectives

### 4.1 Intellectual Skills:

1. To understand the concept.
2. To understand the mechanism of action of hypnotics
3. Interpretation of result from observations.

### 4.2 Motor Skill:

1.Ability to operate the computer and CD.

## 5.0 Requirements:

Computers with LAN system,

MSBTE CD.

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i.Apparatus.

i.Apparatus.

……

……

……..

ii.Drugs.

……

……

2. Which effects are produced by increasing the dose of sedatives and hypnotics?

3.On which part of the brain barbiturates and benzodiazepines act?

4. How the depression of CNS is produced by barbiturates and benzodiazepines?

5. Mention the parts of actophotometer or activity cage.

6. How the completion of electric circuit takes place in actophotometer?

7. How the digital counter shows readings.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure:

Listen the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Select three healthy mice of either sex weighing not less than 20gm.
2. Place individual mice in actophotometer . turn on the equipment and note down the interruptions in 10 minutes.
   (The digital counter shows the readings which is interruptions made by the mice)
3. Inject 0.2ml of diazepam intraperitoneally in individual mice and observe the activity of three individual mice at an interval of 15 minutes up to 1hour.
4. Further increase the dose of diazepam and observe the activity of mice.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Animal No. | Activity score (in 10 min.) | | | | | % Score |
|---|---|---|---|---|---|---|---|
| | | Before the drug | After the drug | | | | |
| 1 | A | | | | | | |
| 2 | B | | | | | | |
| 3 | C | | | | | | |

## 9.0 Conclusion :

Therefore , from the observations it is concluded that,

Diazepam produces…….(CNS stimulant/depressant) effect.

## 10.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher.)**

1. Name the methods of studying the effect of chlorpromazine in mice.
2. List the five examples of drugs of CNS depressant category.

3. Write the uses of CNS depressant drugs.
4. Write the therapeutic uses of Chlorpromazine.
5. List the parts of actophotometer.
6. What is the mechanism of action of Chlorpromazine?
7. What is reflex activity?
8. What is locomotor activity of an animal?
9. Which types of drugs influence the locomotor activity?
10. Draw a well labeled diagram of actophotometer.

**(Space for answers)**

**(Space for answers)**

# Experiment No. 20

## 1.0 Title :

To observe and study the effect of Convulsants and Anticonvulsants in mice by using the CD of MSBTE.

(Refer the Experiment No.9 in the CD of MSBTE).

## 2.0 Prior Concepts :

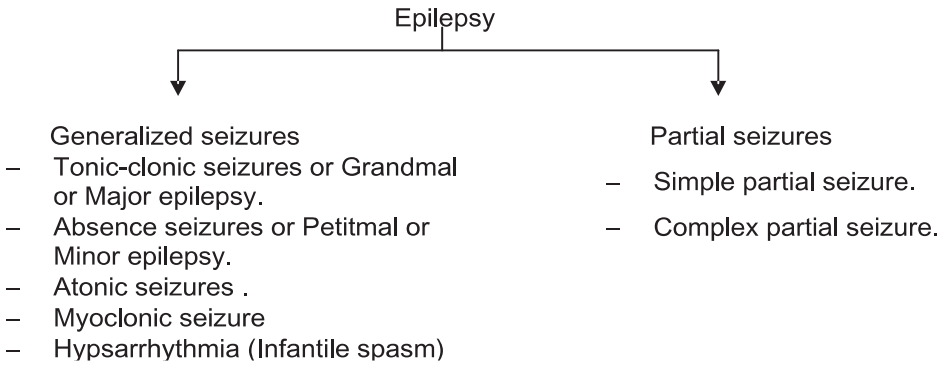
Characters in epilepsy, convulsions.

## 3.0 New Concepts :

**Proposition 1 : Epilepsy**

It is a group of disorders of CNS characterized by paroxysmal cerebral dysrythmia, Manifesting as a brief episodes (seizures) of loss or disturbance of consciousness, with or without characteristic body movements.

**Concept Structure :**




**Proposition 2 : Antiepileptic Drugs.**

Drugs used in the treatment of convulsions are called as antiepileptic drugs.

**Proposition 3 : Phases of convulsions**

Tonic, Clonic, Straubes, flexon

**Proposition 4 : Straubes tail**

Erection of tail in 'S' shaped structure is called as Straubes tail.

**Proposition 5 : Mechanism of action of Diazepam .**

Diazepam acts as a agonist on GABA receptors and potentiates the action of GABA. GABA is having inhibitory action on the CNS.

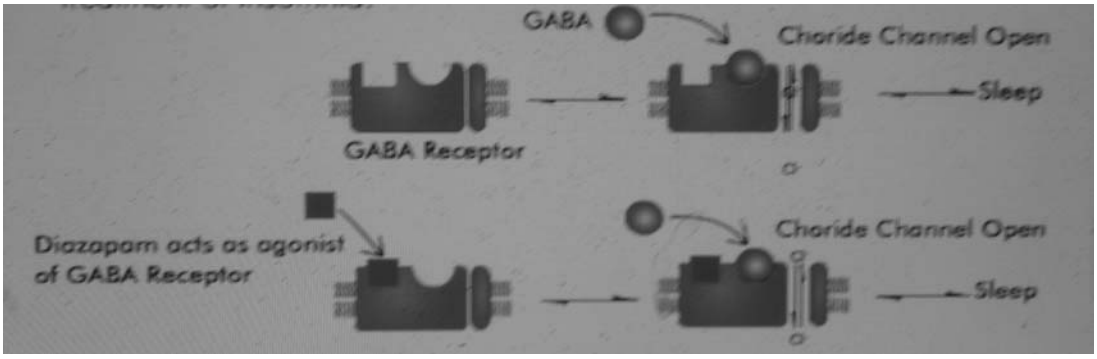



Fig. 20.1

## 4.0 Learning Objectives

**4.1 Intellectual Skills :**

1. To understand the concept.
2. To understand the Mechanism of action antiepileptic drugs.
3. Interpretation of result from observations.

**4.2 Motor Skills :**

1. Ability to operate the Computer and CD.

## 5.0 Requirements :

Computers with LAN system,

CD of MSBTE.

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i.Apparatus.

……

……

……

ii.Drugs.

……

……..

iii.Animal.

……..

2. What is epilepsy?

3. Which characters are observed in epilepsy?

4. Write the types of epilepsy?

5. What is generalized epilepsy and partial epilepsy?

6. Which characters are seen in petitmal epilepsy?

7. What is the reason of episodes of convulsions?

8. Write the mechanism of action of diazepam.

9. Which effect is observed in after the administration of strychnine sulphate in mice?

10. Which effect is observed in after the administration of strychnine sulphate in mice which is previously treated with diazepam?

11. Write the use of diazepam.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure :

Listen the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Weigh and select two healthy mice of either sex.
2. Label the mice as a $M_1$ and $M_2$.
3. Inject Strychnine Sulphate (4 mg i.p.) in mouse no. 1 i.e. $M_1$ and observe following characters.
   - Straubes tail.
   - Jerky Convulsions.
   - Severity of convulsions.
4. Inject Diazepam (4 mg/kg) in Mouse no. 2 i.e. $M_2$.
5. After 30 min, inject Strychnine Sulphate (4 mg i.p.) to the same ($M_1$) mouse and again observe the characters mentioned in step 3.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Animal | Drug | Dose mg / kg | Onset time | Characters | Recovery |
|---|---|---|---|---|---|---|
| 1 | $M_1$ | Strychnine Sulphate | 4 | | | |
| 2 | $M_2$ | Diazepam + Strychnine Sulphate | 2 - 4 | | | |

## 9.0 Conclusion :

Therefore, from the observations , it is concluded that

i. Strychnine Sulphate produces……..(convulsant/anticonvulsant) effect.

ii. Diazepam produces…….(convulsant/anticonvulsant) effect.

## 10.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. List five antiepileptic drugs.
2. List types of generalized seizures.
3. List types of partial seizures.
4. What is straubes tail?

5. List phases of convulsions.
6. Write the character observed after the injection of Strychnine Sulphate.
7. Write the character observed after the injection of diazepam.
8. How the diazepam acts?
9. Write the onset time and recovery for Strychnine Sulphate.
10. Write the onset time and recovery for the diazepam.

**(Space for answers)**

**(Space for answers)**

# Experiment No. 21

## 1.0 Title :

To observe and study the effect of Pyrogens in rabbits (Test for Pyrogens I.P.) by using the CD of MSBTE.

(Refer the Experiment No.10 in the CD of MSBTE).

## 2.0 Prior Concepts :

Pyrogens: Pyrogens are products of metabolism of microorganisms. Chemically Pyrogens are lipid substances associated with carrier molecule, which is usually a polysaccharide but may be a peptide.

Pyrogens are responsible for rise in body temperature, chills, body aches, cutaneous vasoconstriction and rise in arterial blood pressure.

## 3.0 New Concepts :

**Proposition 1 : Pyrexia.**

The increase in body temperature than the normal ($36.6^0$C-$37.2^0$C) is called as pyrexia.

**Proposition 2 : Cause of pyrexia.**

Normal body temperature is regulated by a center in the hypothalamus, which is responsible for balance between heat loss and heat production. Body temperature rises when there is disturbance in this hypothalamic thermostat.

The disturbance in this hypothalamic thermostat occurs due to production of prostaglandins in case of injury, Pyrogens etc.

**Proposition 3 : Analgesic and antipyretic drugs.**

The drugs, which relieve the pain associated with the inflammation, are called as analgesic drugs. e.g. Aspirin, Ibuprofen.

The drugs, which lower the elevated body temperature, are called as antipyretic drugs.
e.g. Paracetamol.

**Proposition 4 : Shams Test (Preliminary Test).**

If rabbits are to be used for the first time in a Pyrogen test or have not been used during the two previous weeks, conditioning of rabbits is done one to three days before testing the substance being examined by injecting intravenously 10ml/kg of body weight of pyrogen free saline solution warmed to about $38.5^0$C before starting of main test.

Rabbits are housed in a room which away from any type disturbances and temperature is within $3^0$C, for at least 18 hours before the main test.

**Proposition 5 : Preparation of sample for the test.**

Dissolve the substance being tested in a pyrogen free saline solution. Warm the liquid being tested to $38^0$C before the injection into rabbits.

The volume of injection should not less than 0.5ml/kg and not more than 10ml/kg of body weight of animal.

**Proposition 6 : Test rabbits.**

Use healthy, adult rabbits of either sex, preferably of the same variety, weighing not less than 1.5kg, fed on a complete and balanced diet and not showing loss of body weight during the week preceding the test.

House the animals individually in an area of uniform temperature (+_2$^0$C), preferably with uniform humidity and free from disturbances likely to excite them.

Do not use the animals for pyrogen test more frequently than once every 48 hours. After a pyrogen test in the course of which a rabbits temperature has risen by 0.6$^0$C or more or after a rabbit has given a test substance that was adjudged pyrogenic at least 2 weeks must be allowed to elapse before the animal is used again.

## 4.0 Learning Objectives

**4.1 Intellectual Skills :**

1. To understand the concept.
2. To understand the mechanism of pyrexia.
3. Interpretation of result from observations.

**4.2 Motor Skills :**

1. Ability to operate the Computer and CD.

## 5.0 Requirements :

Computers with LAN system,

CD of MSBTE.

## 6.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i. Apparatus.

……

……

……

ii. Drugs.

……

……

iii. Animal.

……

……

2. How the sample is prepared for the test?

3.What are Pyrogens? What is their effect on the body?

4.What are endotoxins?

5.Write the dose, route of administration, injection period, temperature, site of administration in this in rabbits.

6.Which device is preferred for recording of temperature in rabbits?

7.Name the parts of telethermometer.

8.In which condition the Test for Pyrogens I.P. passes?

9. In which condition the Test for Pyrogens I.P.?

10. Which is the next procedure if, the Test for Pyrogens I.P. fails?

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure :

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

Shams Test:

1. Select healthy, adult rabbits of either sex and weighing not less than 1.5kg. not showing loss of body weight during last week.
2. Keep the rabbits in a rabbit holder.
3. Record the normal body temperature 90 min. before the injection of normal saline solution, by inserting a temperature sensing probe of telethermometer into the rectum of rabbit upto a depth of 5cm.
4. Inject 10ml/kg normal saline solution intravenously through the marginal vein of ear of rabbit.
5. Record the body temperature for 3 hours at an interval of 30min by inserting a temperature sensing probe of telethermometer into the rectum of rabbit upto a depth of 5cm.
   ( Do not select rabbits for the Main test which shows a temperature difference of $0.6^0$C or more).

Main Test:

1. Select three rabbits after performing the Shams Test.
2. Place rabbits in a rabbit holder.
3. Record the normal body temperature 90 min. before the injection of test sample at an interval of 30 min., by inserting a temperature sensing probe of telethermometer into the rectum of rabbit upto a depth of 5cm.
   (Rabbits showing temperature difference more than $0.2^0$C between two successive readings in the determination of initial temperature should not be used for the test).
4. Inject slowly 10ml/kg test sample intravenously through the marginal vein of ear of rabbit over a period of not exceeding 4min.
   (Volume of injection should NLT 0.5ml/kg and NMT 10ml/kg of body weight.)
5. Record the body temperature for 3 hours at an interval of 30 min., by inserting a temperature sensing probe of telethermometer into the rectum of rabbit up to a depth of 5cm.
6. Take the difference between initial temperature and temperature after injection of test sample.
7. Sum the temperature difference of three rabbits.
8. If sum of temperature difference of three rabbits does not exceed $1.4^0$ C and rise in temperature of any individual rabbit is less than $0.6^0$ C, then test sample passes the test. The test sample is considered as Pyrogens free.
9. If rise in temperature of any individual rabbit is $0.6^0$ C or more, or if sum of temperature difference of three rabbits exceeds $1.4^0$ C, continue the test by using five other rabbits.

10. If NMT three of eight rabbits shows individual rise in temperature of $0.6^0$ Cor more and if sum of the temperature difference of eight rabbits does not exceed $3.7^0$ C, the preparation being examined passes the test.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr.No. | Parameters | Time (Min.) | Rabbits | | |
|---|---|---|---|---|---|
| | | | 1 | 2 | 3 |
| 1 | Initial body temperature ($^0$C) | | 38.2 | | |
| 2 | Body temperature after injection of test sample ($^0$C) | 30 | | | |
| | | 60 | | | |
| | | 90 | | | |
| | | 120 | | | |
| | | 150 | | | |
| | | 180 | | | |
| 3 | Difference=Highest temp. -Initial temp. | | | | |

Sum of the difference =Difference in temperature ( rabbit 1+ rabbit 2+rabbit 3)

## 9.0 Conclusion :

Therefore, the sum of difference of three rabbits is,

…… ($^0$C)

The temperature difference of individual rabbit is,

…… ($^0$C)

Therefore, the given sample is …… (pyrogenic/apyrogenic)

And ……..(passes/not passes) the test for Pyrogens I.P.

## 10.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. What are Pyrogens?
2. Why parenteral preparation should be Pyrogens free? Give reasons.
3. What is Pyrexia?
4. What is the cause of pyrexia?

5. What are analgesics? List five examples of analgesics.
6. What are antipyretics? List five examples of antipyretics.
7. Write the precautions to be taken about rabbits while performing the experiment.
8. By which methods the Pyrogens are removed from the parenteral preparations?
9. How the temperature is controlled in body?
10. Write the other five quality control test, which should be checked before the administration of parenteral preparations.

**(Space for answers)**

**(Space for answers)**

# Experiment No. 22

## 1.0 Title :

To observe and study the effect of Chlorpromazine on animal behavior by using the CD of MSBTE.

(Refer the Experiment No.11 in the CD of MSBTE)

## 2.0 Prior Concepts :

Conditioned and non-conditioned avoidance response.

## 3.0 New Concepts :

**Proposition 1 : Tranquillizer / Neuroleptics.**

The drugs which produces calm down effect without producing Hypnosis are called as Tranquillizers.

e.g. Chlorpromazine, Trifluoperazine.

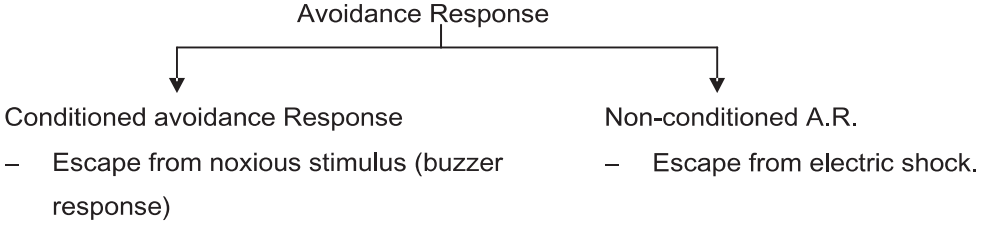
**Proposition 2 : Psychotropic / Psychoactive Drugs.**

Drugs which selectively modify the behavioral pattern are known as e called Psychotropic.

**Proposition 3 : Avoidance Response.**

Escape from the stimulus is called as avoidance response.

**Concept Structure :**




## 4.0 Learning Objectives:

### 4.1 Intellectual Skills :

1. To understand the concept.
2. To understand the mechanism of action of chlorpromazine.
3. Interpretation of result from observations .

### 4.2 Motor Skills :

1. Ability to operate the computer and CD.

## 5.0 Requirements :

Computers with LAN system,

CD of MSBTE.

## 6.0 Diagram:

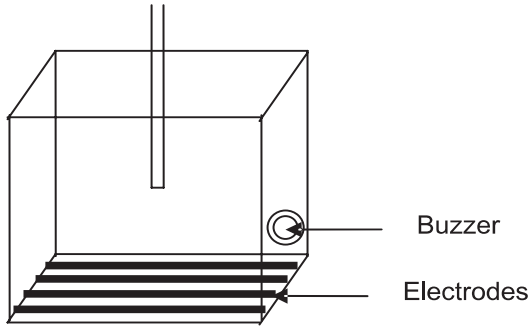



Fig. 22.1

Cookes pole climbing apparatus

## 7.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i.Apparatus.

……

……

…….

ii.Drugs.

……

……

iii. Animal.

……..

1. What is nosology?

2. Write the uses of antipsychotic drugs.

3. Which actions are produced by chlorpromazine?

4. What is taming effect?

5. Which effects are produced by chlorpromazine in higher doses?

6. Write the clinically useful properties of chlorpromazine.

7. What is ataractic activity?

8. What is tranquilization?

9. How the taming and hypnosis potentiating effects of chlorpromazine are studied in the laboratory ?

10. Write the names of methods which are used to observe the taming and hypnosis potentiating effect of animals?

11. Which apparatus is used to study taming and hypnosis potentiating effect in animals?

12. Draw a diagram of Cookes pole climbing apparatus.

13. List the parts of Cookes pole climbing apparatus.

14. What is noncoditioned avoidance response?

15. What is coditioned avoidance response?

16. What is the effect of chlorpromazine on conditioned avoidance response in mice.

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 8.0 Stepwise Procedure :

Listen to the procedure carefully from the CD.

Read the following steps. (These steps are reproduced for information from actual conduct of experiment on animals).

1. Weigh and select two healthy mice of either sex.
2. Label the Mice as a $M_1$ and $M_2$.
3. Observe the normal behavior.
4. Train both the mice ($M_1$ and $M_2$) for the non-conditioned avoidance response. (i.e. training to climb up on pole to escape from electric shock by placing in cookes pole climbing apparatus.)
5. After this, train both the mice ($M_1$ and $M_2$) for conditioned avoidance response (i.e. training to climb up on pole to escape from electric shock by responding to buzzer sound.)
6. Inject 1 ml saline intraperitoneally in mouse no. 1 i.e. $M_1$ and place the animal in cookes pole climbing apparatus and treat the animal as follows.
7. Give the electric shock and note the response.
8. Give the buzzer sound followed by electric shock and note the response.
9. Inject chlorpromazine ( 4 mg / kg) i.p. in $M_2$ and treat animal as in step no. 6.
10. Tabulate the observations.

## 9.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Animal | Drug | Dose mg / kg | Response | |
|---|---|---|---|---|---|
| | | | | Conditioned | Unconditioned |
| 1 | $M_1$ | Saline | 1 ml. | | |
| 2 | $M_2$ | Chlorpromazine | 4 mg / kg | | |

## 10.0 Conclusion :

Therefore , from the observations it is concluded that, chlorpromazine causes,

…….(CNS stimulant/depressant) effect.

## 11.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. What is conditioned avoidance response?
2. What is unconditioned avoidance response?
3. Name the five antipsychotic drugs.
4. What is Schizophrenia?
5. How the mice is trained for avoidance of response?
6. What is the action of chlorpromazine in mice?
7. What are tranquillizers?
8. List the five examples of drugs used as tranquillizers or Narcoleptics?
9. What are psychoactive drugs?
10. What are antipsychotic drugs?

**(Space for answers)**

**(Space for answers)**

# Experiment No. 23

## 1.0 Title:

To observe and study the effect of Diphenyl hydramine in experimentally induced asthma in Guinea pig by using the CD of MSBTE

(Refer the Experiment No. 12 in the CD of MSBTE).

## 2.0 Prior Concepts:

Asthma

Use of Guinea pig.

## 3.0 New Concepts:

**Proposition 1 : Histamine**

Potent biogenic amines, present in various biological fluids, platelates, leucocytes, basophils and mast cells.

**Proposition 2 : Antihistamines**

The drugs which reverses the actions of histamine by competitive antagonism is called as Antihistamines.

e.g. Diphenyl hydramine.

Chlorpheniramine Maleate.

**Proposition 3 :**

Histamine acts on $H_1$, $H_2$, and $H_3$ receptor

| Receptor | Location |
|---|---|
| $H_1$ | Bronchi |
| $H_2$ | GIT |
| $H_3$ | CNS. |

**Proposition 4 : Anaphylactic Shock**

The shock due to antigen – antibody (IgE) reaction and includes, bronchospasm, asphyxia, fall in Blood pressure and death.

**Proposition 5 : Formation of Histamine**

$$\text{Histidine} \xrightarrow{\text{Histidine decarboxylase}} \text{Histamine}$$

**Proposition 6 : Histamine aerosol**

It is suspension of drug dispersed in fine spray or mist form.

## 4.0 Learning Objectives :

### 4.1 Intellectual Skills :

1. To understand the concept.
2. To understand the Mechanism of action of antihistamines.
3. Interpretation of result from observations.

### 4.2 Motor Skills :

1. Ability to operate the computer and CD.

## 5.0 Requirements:

Computers with LAN system,

CD of MSBTE.

## 6.0 Diagram :

Histamine aerosol chamber

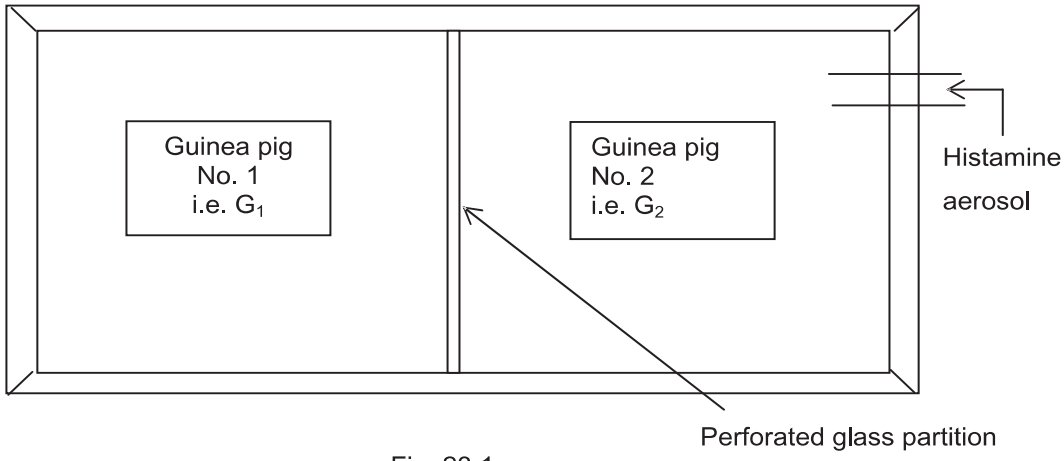



Fig. 23.1
Histamine aerosol chamber

## 7.0 Information from CD:

Write the answers in the space provided below to the following questions after the observation of CD on computer screen.

1. Write down the requirements for the experiment.

i.Apparatus.

……

……

……

ii.Drugs.

……

……...

iii. Animal.

……

2. What is meant by allergic person?

3. What are allergens? Write examples of common allergens.

4. Name the reaction which occurs after exposure to the allergens. Write the name of the substances which are released in the same.

5. How the complications are treated which occurred after the release of biological mediators?

6. Which are the effects of release of biological mediators?

7. Which animals are used for the screening of the antihistaminic drugs? Why?

8. How the effect of histamine and antihistamines is tested?

9. Which effects of antihistamines are observed in asthma?

10. Draw a diagram of histamine aerosol chamber.

11. List the parts of histamine aerosol chamber.

12. Which effects are observed in control rabbit and test rabbit after the introduction of histamine aerosol?

13. How the action of antihistaminic drugs is studied ?

Teacher shall write few more specific questions in the space provided below to confirm the learning of the students for the given experiment.

## 7.0 Stepwise Procedure :

1. Weigh and select two healthy Guinea pig of either sex.
2. Label the Guinea pig no. 1 i.e. $G_1$ and Guinea pig no. 2 i.e. $G_2$.
3. Inject the normal saline in Guinea pig no. 1 i.e $G_1$ (Volume of injection should be same which is to be administered in $G_2$)
4. Inject Diphenyl hydramine HCL to Guinea pig no. 2 i.e. $G_2$, one hour before start of the experiment.
5. Place both the Guinea pigs i.e. $G_1$ and $G_2$ on either side of partition in histamine aerosol chamber.
6. Observe the normal behavior and breathing in both the animals.
7. Introduce a histamine aerosol (20 mg/ml) by means of compressor pump and observe both the animals for following symptoms.

- Bronchospasm (breathing difficulty is observed)
- Convulsions.
- Head drop

8 Discontinue the aerosol as soon as $G_1$ shows signs of bronchospasm, convulsions and Head drop.

9. Remove the $G_1$ and inject (if necessary) 0.003 mg / kg of adrenaline intra peritoneally.

## 8.0 Observation Table :

Fill the observations from the observed CD.

| Sr. No. | Animal | Drug | Dose mg / kg | Response | | |
|---|---|---|---|---|---|---|
| | | | | Bronchospasm | Convulsions | Head drop |
| 1 | $G_1$ | Saline | | | | |
| 2 | $G_2$ | Diphenhydramine | | | | |
| 3 | $G_1$ | Adrenaline | | | | |

## 10.0 Conclusion :

Therefore , from the observations it Is concluded that,

i. Histamine causes ……(bronchoconstriction/bronchodilation).

ii. Dihenhydramine produces……..(histaminic/antihistaminic) effect.

## 11.0 Questions :

**Write answers to Q…. Q…. Q…. Q…. (Questions to be allotted by subject teacher)**

1. Mention the symptoms which are observed after introduction of Histamine aerosol (i.e after onset of action)
2. List five drugs from antihistamine class.
3. Why there is bronchospasm after introduction of histamine.
4. Which signs are observed in anaphylactic shock?
5. How the anaphylactic shock occurs?
6. What is Histamine?
7. What is Histamine aerosol?
8. How Histamine forms?
9. How Histamine produces the bronchospasm?
10. What is Asthma?

**(Space for answers)**

## (Space for answers)

# Experiment No. 24

## 1.0 Title:

Visit to hospital for observing the reaction of drug in the patient.

To understand the adverse drug reaction and monitor the same.

## 2.0 Prior Concepts:

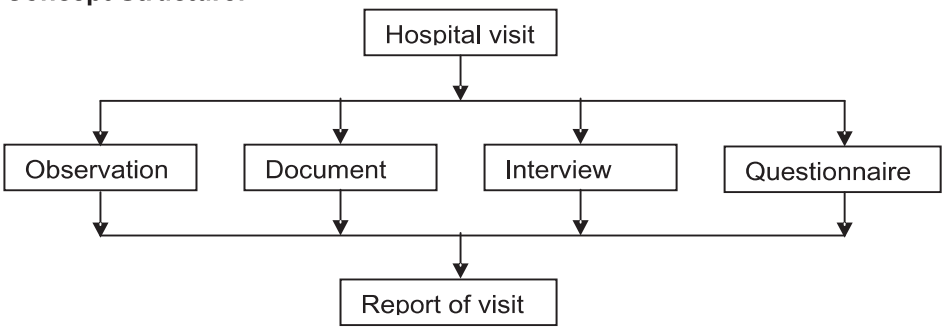
Drug interactions.

## 3.0 New Concepts:

**Proposition 1:**

Methods of information collection during visit include, observations, documents, interviews and questionnaire. Information collected should be used for writing report on visit.

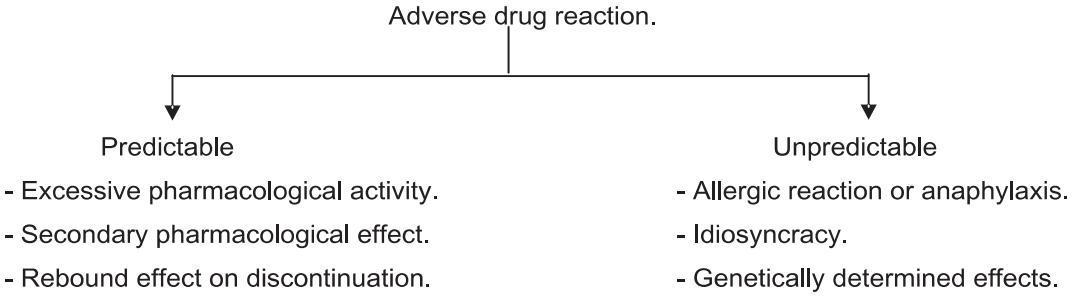
**Concept Structure:**




**Proposition 2 : Adverse drug reaction.**

It is noxious and unintended effect of drug which occurs at doses normally used in man for the prophylaxis, diagnosis or therapy of disease .

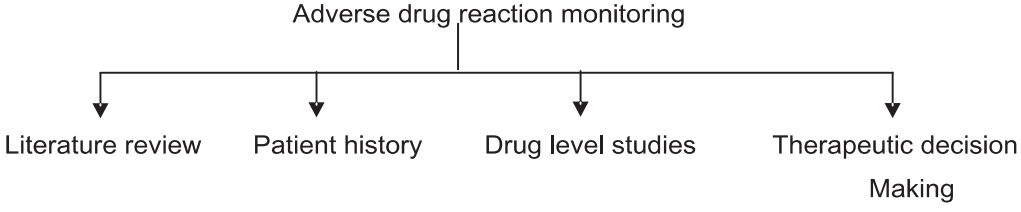
**Concept Structure:**




**Proposition 3 : Adverse drug reaction monitoring.**

Monitoring of adverse drug reaction makes drug therapy safer.

**Concept Structure:**



## 4.0 Learning Objectives:

After visit the students should be able to ,

1. To understand the type of adverse drug reaction .
2. To monitor the adverse drug reaction.
3. To write a report on visit.

## 5.0 Requirements:

White apron, pen , pencil, eraser, scale etc.

## 6.0 Stepwise Procedure :

1. Decide the date and time of visit to hospital , by taking the permission from appropriate authority.
2. Before the visit teacher will explain concept structure written in proposition 1.
3. Guide students about information to be collected during the visit.
4. Assign responsibility of collecting information to different group of students . A group may include four students.
5. A group of students may visit and study as per the availability of time .
6. Write the information collected in the space provided in the manual.
7. Teacher shall guide the students in report of visit.

## 7.0 Format for visit report:

| Name and Address of Hospital | Age of patient | Sex | Present Drug Treatment |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| Date of Reaction onset | Type of Adverse Reaction | Monitoring Steps |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

## 8.0 Conclusion :

Therefore, by making the observations it is concluded that,

i. The adverse reaction was due to

(The reason for occurrence of adverse drug reaction should be written e.g. improper dose or combination).

ii. To monitor the adverse drug reaction.

(Write the steps taken to monitor the adverse drug reaction).

# Experiment No. 25

## 1.0 Title :

Visit to hospital

(Teacher shall write the title of visit . It shall include the relevant study in clinical pharmacology e.g. Treatment in poisoning , Prescription study).

## 2.0 Prior Concepts :

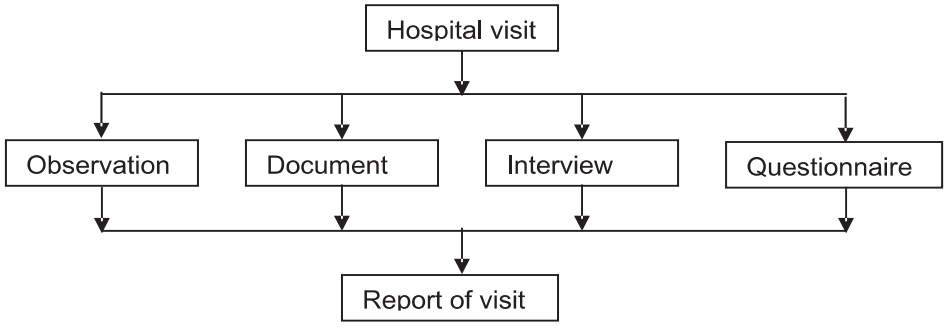
(Teacher shall write the relevant concepts depending on the study to be done).

## 3.0 New Concepts :

**Proposition 1 :**

Methods of information collection during visit includes , observations, documents, interviews and questionnaire. Information collected should be used for writing report on visit.

**Concept Structure:**




(Teacher shall write the relevant one or more propositions).

## 4.0 Learning Objectives :

After visit the students should be able to ,

1. To understand the concept .
2. To write a report on visit.

( Teacher shall write relevant learning objectives).

## 5.0 Requirements:

White apron, pen , pencil, eraser, scale etc.

## 6.0 Stepwise Procedure :

1. Decide the date and time of visit to hospital , by taking the permission from appropriate authority.
2. Before the visit teacher will explain concept structure written in proposition 1.
3. Guide students about information to be collected during the visit.
4. Assign responsibility of collecting information to different group of students . A group may include four students.
5. A group of students may visit and study as per the availability of time .
6. Write the information collected in the space provided in the manual.
7. Teacher shall guide the students in report of visit.

## 7.0 Format for visit report:

(Teacher shall write the format for visit report for the given title of visit).

## 8.0 Conclusion :

(Teacher shall write the relevant conclusion format for the given title of the visit).

# APPENDIX

## Guidelines for conduct of Annual Practical Examination

Sub: Pharmacology and Toxicology Max. Marks:80

Class: S.Y.D.Pharm. Time: 3hrs.

| | Marks |
|---|---|
| Q.1. Write synopsis on the following. | 16 |
| Q.2. C. D. based questions. | 30 |
| Q.3. Identify the given spot and describe about the spot. | 24 |
| Q.4. Viva-voce. | 10 |

In order to maintain the uniformity in conduction of annual practical examination ,
The distribution of questions and marks should be as follows.

External examiner: Q.2 and Q.4 Marks:40

Internal examiner: Q.1 and Q.3 Marks:40

Details of each question mentioned above are given on the next page.

Q.1. Synopsis 16

Synopsis is of 16 marks in which questions like following can be asked.

- Four questions of 4 marks each in which, principle of demonstrative experiments can be asked. Or,
- Eight questions of 2 marks each based on basic techniques in pharmacology practicals can be asked.

Q.2. C. D. based questions. 30

15 questions of 2 marks each.

Q.3. Identify the given spot and describe about the spot. 24

- The total No. of spots should be 12, each carrying 2 marks.

These two marks are divided as follows.

- Identification of spot 01
- Description of spot ( principle of working, use etc.) 01

Q.4. Viva-voce. 10

Viva should be conducted on practical based and theory based questions.

In case spot viva may be conducted.

# List of Laboratory Manuals Developed by MSBTE For Diploma In Pharmacy

## First Year

| | | |
|---|---|---|
| 1. | Pharmaceutics - I | (0805) |
| 2. | Pharmaceutical Chemistry - I | (0806) |
| 3. | Pharmacognosy | (0807) |
| 4. | Biochemistry and Clinical Pathology | (0808) |
| 5. | Human Anatomy and Physiology | (0809) |

## Second Year

| | | |
|---|---|---|
| 1. | Pharmaceutics - II | (0811) |
| 2. | Pharmaceutical Chemistry - II | (0812) |
| 3. | Pharmacology and Toxicology | (0813) |
| 4. | Hospital and Clinical Pharmacy | (0816) |

## PHARMACIST'S OATH

- I swear by the Code of Ethics of Pharmacy Council of India in relation to the community and shall act as an integral part of health care team.
- I shall uphold the laws and standards governing my profession.
- I shall strive to perfect and enlarge my knowledge to contribute to the advancement of pharmacy and public health.
- I shall follow the system, which I consider best for pharmaceutical care and counseling of patient.
- I shall endeavour to discover and manufacture drugs of quality to alleviate sufferings of humanity.
- I shall hold in confidence the knowledge gained about the patients in connection with my professional practice and never divulge unless compelled to do so by the law.
- I shall associate with organizations having their objectives for betterment of Profession of Pharmacy and make contribution to carry out the work of those organizations.
- While I continue to keep this oath unviolated, may it be granted to me to enjoy life and practice of pharmacy respected by all, at all times!
- Should I trespass and violate this oath, may the reverse be my lot!

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