

A LABORATORY MANUAL FOR
**PHARMACEUTICAL
CHEMISTRY II**

**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.

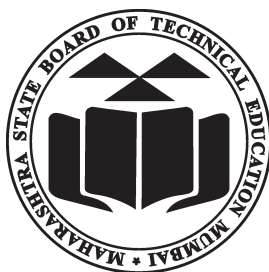
A Laboratory Manual for

Pharmaceutical Chemistry – II

(Organic Pharmaceutical Chemistry)

(0812)

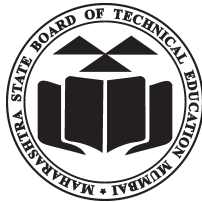
Second Year Diploma in Pharmacy



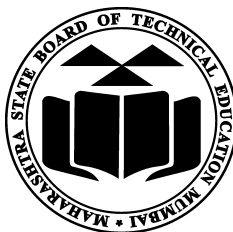
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Maharashtra State Board of Technical Education,
(Autonomous) (ISO 9001 :2015) (ISO/IEC 27001 : 2013)
4th Floor, Government Polytechnic Building, 49, Kherwadi,
Bandra (East), Mumbai - 400051.
(Printed on June, 2014)



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 **Pharmaceutical Chemistry-II (0812)** for the academic year 20_____ to 20 _____ as prescribed in the curriculum.

Place: _____

Enrolment No.: _____

Date: _____

Exam. Seat No.: _____

Subject Teacher

Ext. Examiner

Principal



LEARNING OVERVIEW

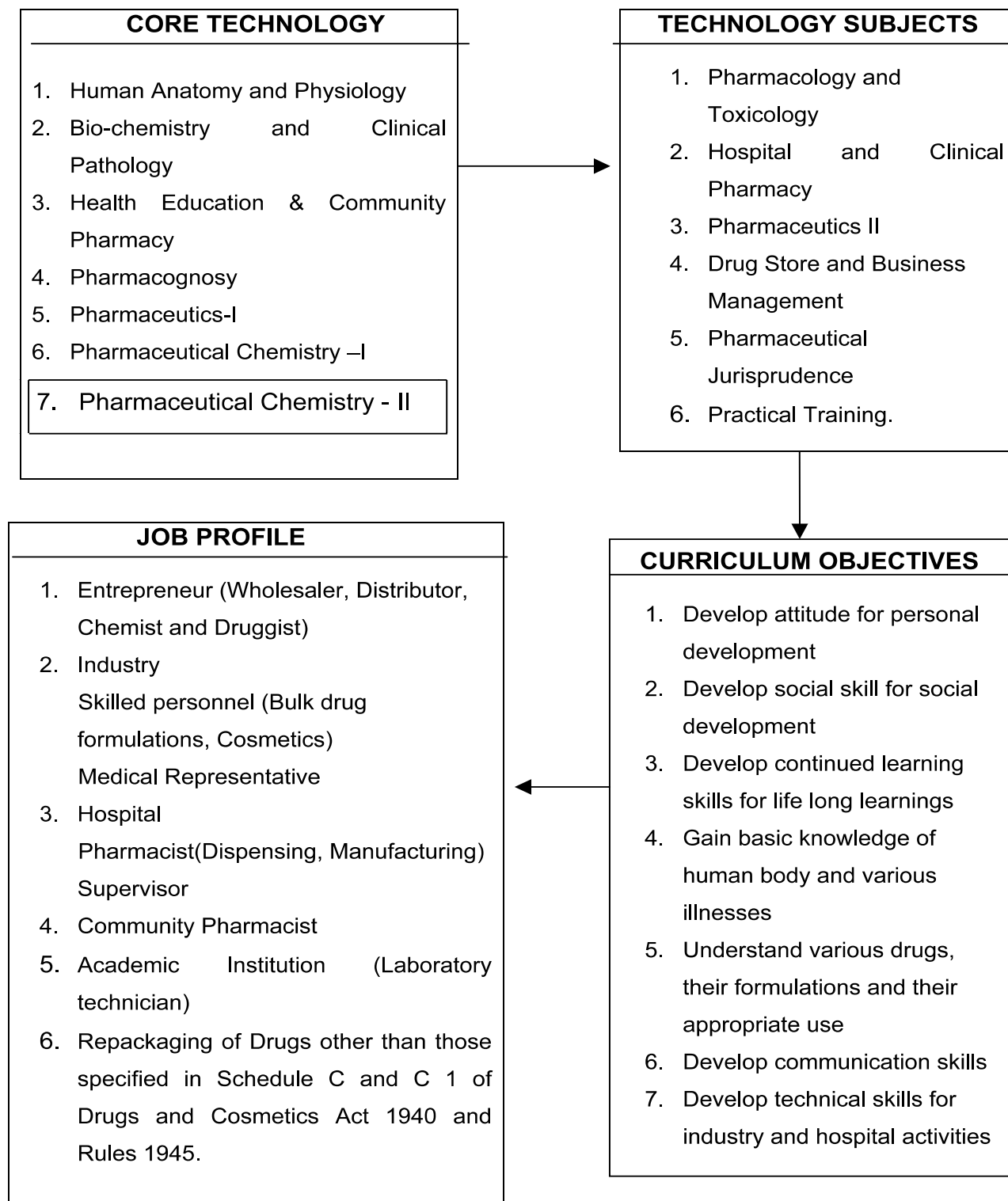
Importance of the Subject

1. Pharmaceutical Chemistry is the Chemistry of substances used as medicines.
2. Pharmaceutical Chemistry II is the chemistry of drugs of organic origin.
3. Organic pharmaceutical chemistry is concerned with medicinal organic Compounds, determination of their structure, synthesis, isolation, and their Chemistry.

Objectives of the Subject

1. To provide the guidelines and procedure for systematic qualitative analysis of organic drugs. Identification of drug plays an important role in discovery of new drug molecules or for already existing drug substances.
2. To get familiarize with various aspects of identification of organic drugs and make to understand procedure for performing specific tests and preparation of derivative.
3. To understand concept of purity of organic compounds to be used as medicines by various tests.
4. To understand and perform official identification tests.
5. To understand synthesis of organic compounds of industrial significance.
6. To develop analytical/technical/preparatory skills for industry activity.
7. To understand the meaning of basic concepts of “**Quality**” and “**Purity**” of Pharmaceutical substances.

LINK/BLOCK DIAGRAM SHOWING INTER RELATIONSHIP OF SUBJECT AREAS, CURRICULUM OBJECTIVE AND JOB PROFILE



**GRAPHICAL STRUCTURE OF SUBJECT AREA
SECOND YEAR DIPLOMA IN PHARMACY
PHARMACEUTICAL CHEMISTRY-II
(ORGANIC PHARMACEUTICAL CHEMISTRY)**

**PROBLEM/
APPLICATION**

Enable students to

- Identify unknown drugs (perform qualitative analysis of unknown drugs).
- Synthesize or prepare drugs.
- Analyse given sample of drug to determine whether it complies with official stands or not.

PROCEDURE

Methods involved in performing physical examination and preliminary tests, determination/detection of elements, determination of function group/s, confirmatory tests, preparing derivative, performing basic organic reactions like acetylation, bromination, oxidation-reduction, nitration hydrolysis to synthesize drugs.

PRINCIPLES

Intermolecular or interionic forces exhibited by both solute and solvent, acid - base character, basic chemical reactions like oxidation, reduction, esterification, hydrolysis, bromination, acetylation, nitration.

CONCEPTS

Solubility, acid -base behaviour, aromaticity, aliphaticity, saturation, unsaturation, purity of drug, functional groups.

FACTS

Organic compounds: carbohydrates, phenols, aromatic acids, aldehydes, Ketones, simple esters, amines, amides, aliphatic acids, hydrocarbons, and ethers.

DEVELOPMENT OF SKILLS

Following is the broad perspective of acquisition of intellectual and motor skills. Due care is to be taken so that a student systematically studying the subject will acquire the skills enlisted below:

a) Intellectual Skills:

- 1) To understand concept of the experiment.
- 2) To understand test procedure.
- 3) To analyse and interpret the observations.
- 4) To understand the precautions.
- 5) To plan the experiment.
- 6) To perform calculations.

b) Motor Skills:

- 1) Ability to write systematic report.
- 2) Ability to handle equipment, take and record observations.
- 3) Ability to refer standard literature/Indian Pharmacopoeia.
- 4) Ability to work according to the plan of the experiment.
- 5) Ability of group working.

GRID TABLE

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

- ❖ Teacher shall ensure development of generic skills during the practicals.
- ❖ Students are expected to focus on acquiring specific skills mentioned therein.

Sr. No	Name of Experiment	Intellectual Skill	Motor skill
1	Introduction to Laboratory	--	--
2	To determine the melting point of the given solid organic compound.	I1, I2, I3	M2
3	To determine the boiling point of given liquid organic compound.	I1, I2, I3	M2
4	To identify the given organic drug D1 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1, M2, M3, M4, M5
5	To identify the given organic drug D2 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
6	To identify the given organic drug D3 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
7	To identify the given organic drug D4 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
8	To identify the given organic drug D5 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
9	To identify the given organic drug D6 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
10	To identify the given organic drug D7 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
11	To identify the given organic drug D8 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
12	To identify the given organic drug D9 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
13	To identify the given organic drug D10 by Systematic Qualitative Analysis.	I1, I2, I3, I5	M1,M2, M3, M4,M5
14	To perform and report identification test on the given sample of Aspirin or Acetyl Salicylic Acid as per Indian Pharmacopoeia (IP)	I1, I3	M1, M2, M3
15	To perform and report identification test on the given sample of Paracetamol as per Indian Pharmacopoeia (IP)	I1, I3	M1, M2, M3
16	To perform and report identification test on the given sample of Ascorbic Acid as per Indian Pharmacopoeia (IP)	I1, I3	M1, M2, M3
17	To perform and report identification test on the given sample of Sulphamethoxazole as per Indian Pharmacopoeia (IP)	I1, I3	M1, M2, M3

Sr. No	Name of Experiment	Intellectual Skill	Motor skill
18	To perform and report identification test on the given sample of Ampicillin Trihydrate as per Indian Pharmacopoeia (IP)	I1, I3	M1, M2, M3
19	To perform and report identification test on given sample of Promethazine Hydrochloride as per Indian Pharmacopoeia (IP)	I1, I3	M1, M2, M3
20	To Perform and report identification test on given sample of Prochlorperazine Maleate as per Indian Pharmacopoeia (IP)	I1, I3	M1, M2, M3
21	To perform and report identification test on the given sample of Quinine Sulphate as per Indian Pharmacopoeia (IP)	I1, I3	M1, M2, M3
22	To synthesize Acetanilide from aniline and to find out its percentage practical yield and melting point.	I1, I4, I5, I6	M2, M4, M5
23	To synthesize Benzoic acid from benzamide and to find out its percentage practical yield and melting point.	I1, I4, I5, I6	M2, M4, M5
24	To synthesize Phenyl benzoate from phenol and to find out its percentage yield and melting point.	I1, I4, I5, I6	M2, M4, M5
25	To synthesize p- Bromoacetanilide from acetanilide and to find out its percentage practical yield and melting point.	I1, I4, I5, I6	M2, M4, M5
26	To synthesize Picric acid from phenol and to find out its percentage yield and melting point.	I1, I4, I5, I6	M2, M4, M5
27	To visit chemical/analytical laboratory and to write report of it.	I1, I5	M1, M2, M4, M5
28	To prepare and submit computerized report of Expt. No.....(any one organic compound from D1 to D10) of Systematic Qualitative Analysis.	I1, I2	M1, M2

NOTE Identified skills are indicated by numbers

STRATEGY FOR IMPLEMENTATION

It is suggested that 40 to 50% experiments shall be completed in first term and remaining experiments in second term.

GUIDELINES FOR TEACHERS

Teachers shall discuss the following points with students before start of practicals 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/Block Diagram:** Context of the subject in the form of link diagram showing interrelationship of various subject areas, curriculum objectives and job profile.
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 arranged in the form of fact, concept, principle, procedure and application.
4. **Know your Laboratory work:** To understand the layout of laboratory including water, electrical and gas connection specifications of Equipment/Instruments/Materials, procedure, working in groups, planning time etc. Also to know total amount of work to be done in the laboratory.
5. Teacher shall ensure that required equipment are in working condition before start of experiment, also keep Standard Operating Procedure
6. Explain prior concepts, specific apparatus/instrument/machine to the students before starting of each experiment.
7. Involve students' activity at the time of conduct of each experiment.
8. While taking reading/observation each student (from batch of 20 students) shall be given a chance to perform/observe the experiment.
9. List of questions is given at the end of each experiment. Teacher shall instruct the student to attempt all questions given at the end each experiment/exercise. Teacher shall ensure that each student writes the answers to the allotted questions in the laboratory manual after performance is over.
10. Question bank for different classes of organic compound is also given on the Page No.93 to 95. Teacher shall instruct the students to attempt all questions corresponding to the experiment of organic compound identified.
11. Teacher shall assess the performance of students continuously as per norms prescribed by MSBTE.
12. Teacher shall ensure that the respective skills and competencies are developed in the students after the completion of the practical exercise.
13. Teacher is expected to share the skills and competencies to be developed in the students.
14. 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 or profession.
15. Teachers shall ensure that industrial, analytical laboratory visits recommended in the manual are covered.
16. Teacher may suggest the students to refer additional related literature of the technical papers/reference books/seminar proceedings, etc.
17. 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 practicals. Focus should be given on development of enlisted skills rather than theoretical/codified knowledge.
18. Teacher should enlist the skills to be developed in the students that are expected by the industry and profession.

19. Teacher shall organize group discussions/brain storming sessions/seminars to facilitate the exchange of knowledge amongst the students.
20. Teacher shall ensure that revised CIAAN-2004 norms are followed simultaneously and progressively.
21. Teacher should give more focus on hands on skills and should actually share the same.
22. Teacher shall also refer to the Circular No. MSBTE/D-50/Pharm Lab Manual/2006/3160 dated 4th May 2006 for additional guidelines.
23. Teacher shall give any one or more compound from the list of different of classes of organic compound given on page no. xiii, for Systematic Qualitative Analysis and Teacher should instruct students that any compound from the list will be asked in the examination (whether they have performed the Systematic Qualitative Analysis of that compound in regular practical or not).
24. Teacher shall instruct the students that dummy compound can also be given in place of genuine compound for identification tests experiments, in the examination.
25. While setting practical examination, teacher shall see that the students will be able to complete the practical, considering time required for viva and synopsis.
26. Teacher shall assign for experiments to the student in such a way that they have to refer Indian Pharmacopoeia and should see that the students are well acquainted with the use of pharmacopoeia.
27. Teacher may assign one or more experiments in a practical depending on the time requirement of the experiments.
28. Teachers shall explain all subtitles of the experiments thoroughly to the students before start of the actual experiments.

INSTRUCTIONS FOR STUDENTS

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

1. Students should note the following essential requirements for pharmaceutical chemistry practical: I-card, practical manual, locker key, laboratory coat, fractional weight box, match box, test tube holder, soap, washing powder, napkin, etc.
2. 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 work in laboratory and total amount of work to be done in a year. Student shall clear all his/her doubts before starting the practical.
3. Students shall undergo study visit of the laboratory for types of equipment, instruments, material to be used, before performing experiments.
4. Read the write up of each experiment to be performed a day in advance.
5. Organize the work and arrange the experiment by procuring required apparatus and chemicals.
6. Follow time management and complete all experiment in time.
7. Understand the purpose of experiment and its practical implications.

8. Student shall refer practical handbook for Pharmaceutical Chemistry-II for Systematic Qualitative Analysis of unknown organic compound. Student shall replace reagent bottle at the proper place.
9. Students should maintain discipline in the laboratory. Any misbehaviors or indiscipline in the laboratory may lead to serious mishap.
10. Students should handle hazardous chemicals carefully. They should wear hand gloves while handling corrosive chemicals like bromine, con. sulphuric acid etc.
11. Students should wash their hands thoroughly with soap, before leaving laboratory.
12. Write the answers of the questions allotted by the teacher during practical hours if possible or afterwards, before next practical.
13. Student should not hesitate to ask any difficulty faced during conduct of practical/exercise.
14. The student shall study all the questions given in the laboratory manual and practice to write the answers to these questions.
15. Students shall visit the recommended industries and analytical laboratory. Student shall also write brief report of the visit at the end of manual.
16. Student shall develop maintenance and working skills as expected by the industries or medical shops.
17. Student should develop the habit of pocket discussion/group discussion related to the experiments/exercises so that exchanges of knowledge/skills could take place.
18. Student shall attempt to develop related hands-on-skills and gain confidence.
19. Student shall focus on development of skills rather than theoretical or codified knowledge.
20. Student shall visit the nearby medical shop, industries, laboratories, 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 hood.
21. Student shall insist for the completion of recommended laboratory work, industrial visits, answers to the given questions, etc.
22. Student shall develop the habit of evolving more ideas, innovations, skills etc. than included in the scope of the manual.
23. Student shall refer technical pharmaceutical, health magazines, and proceedings of the Seminars, refer websites related to the scope of the subjects and update their knowledge and skills.
24. Student should develop the habit of not to depend totally on teachers but to develop self-learning techniques with help of library and group discussions.
25. Student should develop the habit to interact with the teacher without hesitation with respect to the academics involved.
26. Student should develop habit to submit the practicals exercise continuously and progressively on the scheduled dates and should get the assessment done.
27. Student should be well prepared while submitting the write up of the exercise. This will develop the continuity of the studies and he will not be overloaded at the end of the term.
28. Do not use cell-phone in the laboratory.

List of Experiments and Record of Progressive Assessment

Sr.No. and Name of Experiment	Pg No	Date of Performance	Date of Submission	Assessment Max. Marks 10	Sign of Teacher and Remarks
1.Introduction to Laboratory	1				
2. To determine the melting point of the given solid organic compound.	6				
3. To determine the boiling point of given liquid organic compound.	9				
4. To identify the given organic drug/compound D1 by Systematic Qualitative Analysis.	12				
5. To identify the given organic drug/compound D2 by Systematic Qualitative Analysis.	20				
6. To identify the given organic drug/compound D3 by Systematic Qualitative Analysis.	28				
7. To identify the given organic drug/compound D4 by Systematic Qualitative Analysis.	36				
8. To identify the given organic drug/compound D5 by Systematic Qualitative Analysis.	44				
9. To identify the given organic drug/compound D6 by Systematic Qualitative Analysis.	52				
10. To identify the given organic drug/compound D7 by Systematic Qualitative Analysis.	60				
11. To identify the given organic drug/compound D8 by Systematic Qualitative Analysis.	68				
12. To identify the given organic drug/compound D9 by Systematic Qualitative Analysis.	76				
13. To identify the given organic drug/compound D10 by Systematic Qualitative Analysis.	84				
14.To perform & report identification test on the given sample of Aspirin or Acetyl Salicylic Acid as per Indian Pharmacopoeia (IP)	96				

Sr.No. & Name of Experiments	Pg No	Date of Performance	Date of Submission	Assessment Max. Marks 10	Sign of Teacher and Remarks
15. To perform & report identification test on the given sample of Paracetamol as per Indian Pharmacopoeia (IP)	101				
16.To perform and report identification test on the given sample of Ascorbic Acid as per Indian Pharmacopoeia. (IP)	106				
17.To perform & report identification test on the given sample of Sulphamethoxazole as per Indian Pharmacopoeia (IP)	111				
18.To perform & report identification test on the given sample of Ampicillin Trihydrate as per Indian Pharmacopoeia (IP)	116				
19.To Perform & report identification test on given sample of Promethazine Hydrochloride as per Indian Pharmacopoeia (IP)	121				
20.To Perform & report identification test on given sample of Prochlorperazine Maleate as per Indian Pharmacopoeia (IP)	126				
21.To perform & report identification test on the given sample of Quinine Sulphate as per Indian Pharmacopoeia (IP)	131				
22. To synthesize Acetanilide from aniline and to find out its percentage practical yield and melting point.	136				
23. To synthesize Benzoic acid from benzamide and to find out its percentage practical yield and melting point.	141				
24. To synthesize Phenyl benzoate from phenol and to find out its percentage yield and melting point.	147				
25. To synthesize p-Bromoacetanilide from acetanilide and to find out its percentage practical yield and melting point.	152				

Sr.No. & Name of Experiments	Pg No	Date of Performance	Date of Submission	Assessment Max. Marks 10	Sign of Teacher and Remarks
26. To synthesize Picric acid from phenol and to find out its percentage yield and melting point.	157				
27. To visit chemical/analytical laboratory and to write report of it.	162				
28. To prepare and submit computerized report of Expt. No.....(any one organic compound from D1 to D10) of Systematic Qualitative Analysis.	165				
				Total Marks Avg. Marks out of 10 *	

* To be transferred to Proforma of CIAAN-2004 (Proforma ---)

Note: The guidelines for the conduct of annual practical examination are enclosed in the end at the page number 167.

DRUGS/COMPOUNDS FOR PHARMACEUTICAL CHEMISTRY – II PRACTICALS

Systematic qualitative analysis of unknown organic drugs (minimum 10 drugs)

1. Benzoic Acid/Succinic acid/Cinnamic acid
2. Chloroform/Carbon tetrachloride/Bromobenzene
3. Salicylic Acid/Citric Acid/Aspirin
4. Glucose/Sucrose/Lactose/ Fructose
5. Methyl Salicylate/Ethyl acetate
6. Urea/Thiourea/Benzamide.
7. Phenol/Paracetamol/Resorcinol
8. Ethyl alcohol/Methyl alcohol/Benzyl alcohol
9. Acetone/Acetophenone.
10. Nitrobenzene/Aniline/Acetanilide.
11. Phthalic anhydride.

- Note:** 1) Any two organic compound from each of above group should be given for qualitative analysis.
- 2) Any of above mentioned compounds can be given for examination, although the student has not done systematic qualitative analysis of that compound. But, It must have done by the other student.

Official identification tests for drugs as per Indian Pharmacopoeia (minimum 8 drugs)

1. Aspirin /Analgin
2. Paracetamol
3. Ascorbic acid
4. Methyl salicylate
5. Sulphamethoxazole / Sulfanilamide
6. Sulfacetamide sodium
7. Ampicillin trihydrate
8. Caffeine
9. Phenobarbitone
10. Nicotinic acid / Nicotinamide
11. Promethazine hydrochloride
12. Prochlorperazine maleate
13. Chloramphenicol
14. Quinine Sulphate
15. Tetracycline hydrochloride

Note: Dummy Samples of above mentioned drugs should be also given during regular practical and examinations.

Preparation of Simple Organic Compounds

1. Acetanilide from Aniline
2. Benzoic Acid from benzamide.
3. Phenyl benzoate from Phenol
4. p-Bromoacetanilide from acetanilide
5. Picric acid from Phenol
6. Phthalimide from phthalic anhydride

Experiment No. 1

1.0 Title:

Introduction to Laboratory/Laboratory Work.

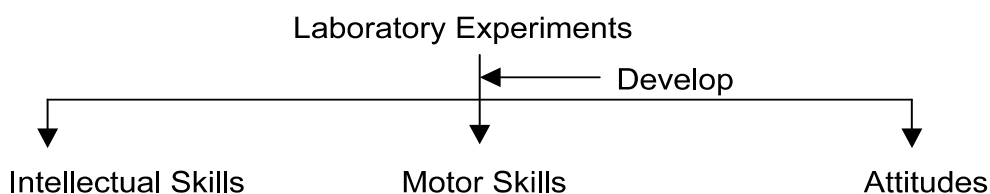
2.0 Prior concepts:

Curriculum contents, Scope of work, Planning, Assessment.

3.0 New Concepts:

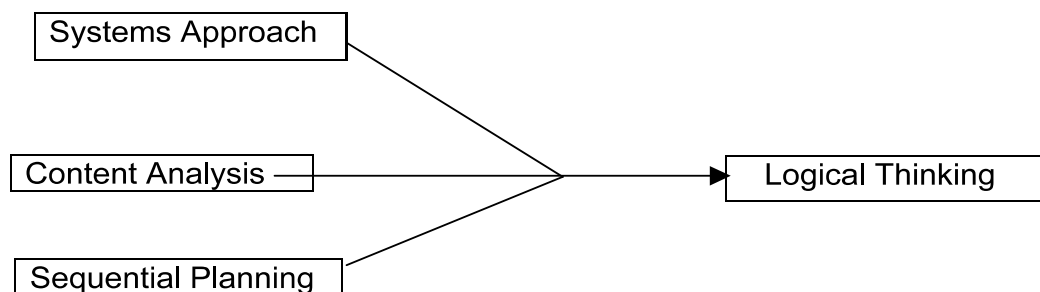
Proposition 1: Laboratory Experiments

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



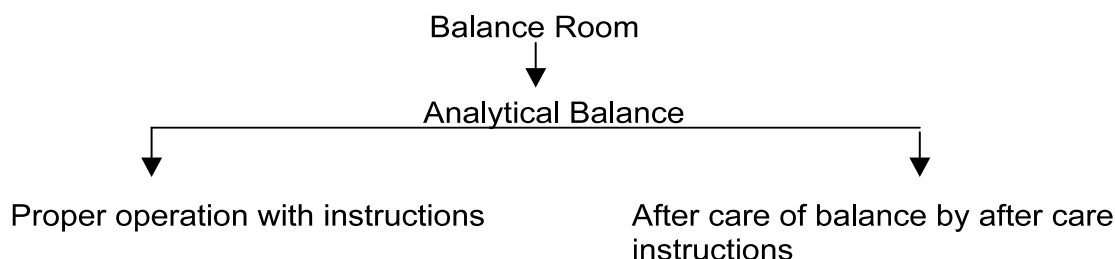
Proposition 2: Logical thinking

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



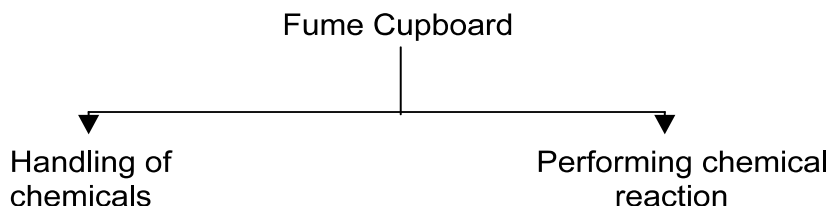
Proposition 3: Balance Room

It is a room where analytical weighing balance is kept. The operation of balance is demonstrated to the students and they handle the balance under the supervision of teacher.



Proposition 4: Fume Cupboard

It is an enclosed chamber with exhaust fan for handling dangerous chemicals and processing reactions.

**4.0 Procedure:**

1. Read the learning overview carefully.
2. Listen to the lecture given by teacher about importance of the subject, curriculum philosophy, graphical structure, and skills to be developed, information about equipment, instrument, procedure, and method of continuous assessment and tentative plan of work in laboratory.
3. Take the students round the laboratory, show balance room, fume cupboard and explain about the general working in laboratory.
4. Student shall observe the equipment/instrument and record the information in the following table.
5. Observe the charts and diagrams displayed in the laboratory.
6. Understand general precautions to be followed while working in the laboratory.

5.0 Equipments / Instruments in Laboratory : (Student shall write information)

Sr. No.	Name of Equipment/Instrument	Specifications Size/diameter/capacity	Use in Laboratory	Use in Industry
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Give five chemicals / reagents on the rack		Specifications Size/diameter/capacity	Use in Laboratory	Use in Industry
1				
2				
3				
4				
5				
Give two names of Scientists displayed in laboratory		Work of Scientist		
1				
2				
Give two names of two charts displayed in laboratory		Title of Chart		
1				
2				
Give two names of two experimental set ups in laboratory		Purpose of Experiment		
1				
2				

6.0 Questions: Answer Q..... from Group A and Q....., Q..... from Group B and Q....., Q..... from Group C. Question numbers are to be allotted by the teacher.

Group A

1. What is the importance of the link diagram of the curriculum of the subject?
2. List two types of skills given in the experiment.
3. How graphical structure is useful in understanding the scope of the subject?

4. Write the sequence of terms of graphical structure.
(Refer graphical structure)
5. Write the meaning of curriculum for the subject.

Group B

1. Write the main compartments of the chemistry laboratory?
2. What is the maximum and minimum temperature that can be measured by 100°C & 360° C thermometer?
3. State meaning of Analytical grade reagents?
4. What is the significance of '20° C' written on graduated pipettes?
5. Can the Systematic Qualitative Analysis be substituted by identification tests for finding out the unknown compound?

Group C

1. Name five essential requirements you must have for performing practical in the chemistry laboratory.
2. Give the heading under which day to day assessment is done in the practicals.
3. Do you prefer working in-group or alone for chemistry practicals? Why?
4. Give five advantages and five disadvantages of working in-group.
5. What is the use of fume cupboard in the chemistry laboratory?

(Space for Answers)

(Space for Answers)

Experiment No. 2

1.0 Title:

To determine the melting point of the given solid organic compound.

2.0 Prior Concepts:

Temperature effects, Structural aspects of organic compounds such as Intra-molecular forces, State of occurrence.

Teacher shall explain theory related to determination of physical constant.

3.0 New Concepts:

Proposition 1: Purity

High purity of organic compound is indicated by a sharp melting point. Laboratory experiment of determination of melting point will put light on purity concept.

Proposition 2: Identity

A definite and sharp melting point is an identity for pure crystalline organic compounds. Determination of melting point is valuable criterion for identification of organic compound.

4.0 Learning Objectives:

4.1 Intellectual Skills:

1. To understand concepts of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.

4.2 Motor Skills:

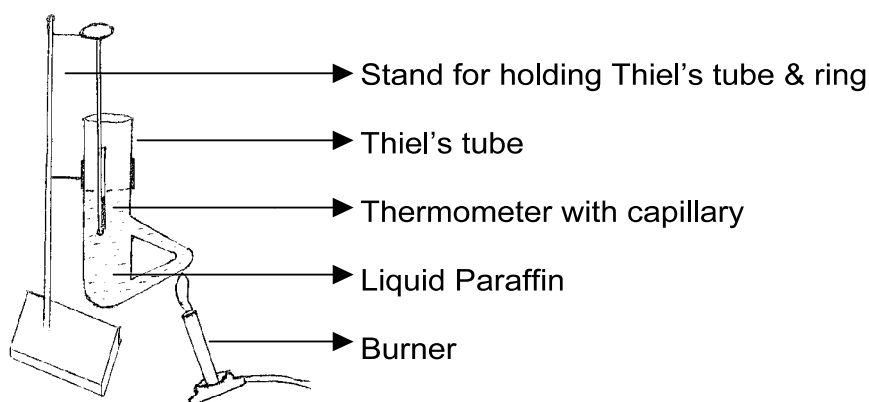
1. Ability to handle equipment, take and record observations.

5.0 Apparatus:

1. Glass wares: Thiel's tube, Thermometer, Thread/Rubber ring, Capillary tube
2. Chemicals: Liquid paraffin

(Note: If liquid paraffin is not available, melting point can be determined by using concentrated sulphuric acid with caution.)

6.0 Diagram: Melting Point Apparatus



7.0 Stepwise procedure:

1. Take a capillary and seal its at one end, by holding it in flame for a while.
2. Take a small quantity (about 3-5 mg) of powdered organic compound into sealed capillary tube.
3. Tie the capillary tube containing given sample of organic compound to thermometer near its bulb with the help of thread/rubber ring.
4. Immerse the thermometer with capillary tube into liquid paraffin taken in a Thiel's tube. Care should be taken not to allow thread/rubber ring come in contact with liquid paraffin.
5. Heat the Thiel's tube slowly with the help of gas burner.
6. The rate of heating should not be more than $3^{\circ}\text{C}/\text{min}$.
7. Note the temperature at which solid organic compound is converted to liquid and record it as the melting point of the given sample of organic compound.
8. Repeat the procedure twice and take the observation.

8.0 Observations:

Melting Point Temperature	
Sr.No.	Temperature in $^{\circ}\text{C}$
1.
2.
3.

9.0 Results:

Melting point of given sample of organic compound is Melting point of given sample as of organic compound per official book is.....

10.0 Conclusion:

If the Melting point of given organic compound is not same as the value stated in official book/literature, it may be due to presence of impurities in the given organic compound. Hence the given sample is..... (pure/impure)

11.0 Questions:

Note: Write answers of the following Q., Q....., Q..... Q.....
(Question numbers to be allotted by teacher)

1. Define melting point?
2. How melting point is useful in identification of organic compound?
3. Whether impurity increases, decreases or has no effect on melting point?
4. Which alternative liquid can be used if liquid paraffin is not available?
5. Why slow heating is required to get accurate melting point?
6. What is the purpose of using calibrated thermometer for determination of melting point?
7. What is melting point range of the organic compound?

(Space for Answers)

Experiment No. 3

1.0 Title:

To determine the boiling point of given liquid organic compound.

2.0 Prior Concepts:

Vapour pressure, Atmospheric pressure.

3.0 New Concepts:

Proposition 1: Boiling Point

Boiling point of liquid is that temperature at which vapour pressure of liquid equals to atmospheric pressure. Boiling point is employed as criterion for identity and purity of liquid organic substance.

4.0 Learning Objectives:

4.1 Intellectual Skills:

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to handle equipment, take and record observations.

5.0 Apparatus:

1. Glass wares: Thiel's tube, Thermometer, Thread/Rubber ring, Capillary tube, Boiler tube.
2. Chemicals: Liquid Paraffin
(**Note:** If liquid paraffin is not available, boiling point can be determined by using concentrated sulphuric acid with caution)

6.0 Diagram: (Student shall draw it as per assembled apparatus and label it)

7.0 Stepwise procedure:

1. Fill the Thiel's tube with liquid paraffin to more than 50% capacity of main limb and clamp it.
2. Seal one end of capillary so that there is no opening left.
3. Place about 3-4 drops of liquid in the boiler tube filling it to a height of 8-10mm.
4. Insert the capillary, open end down in liquid containing in the boiler tube.
5. Attach the boiler tube to thermometer bulb with the help of thread and suspend it in Thiel's tube.
6. Heat the Thiel's tube gradually with low flame.
7. When bubbling from capillary initiates, discontinue heating. There will be steady stream of bubbles from capillary tube.
8. When bubble stops emerging and liquid begins to rush in capillary tube, note the temperature. This is of liquid.
9. Repeat the procedure twice and take observations.

8.0 Observation Table

Boiling Point Temperature	
Sr. No.	Temperature in ° C
1
2
3

9.0 Result:

The boiling point of given organic compound is

The boiling point of given organic compound as per official book is.....

10.0 Conclusion:

If the boiling point of given organic compound is not same as the value stated in official book/literature, it may be due to presence of impurities in the given organic compound. Hence the given sample is..... (pure/impure)

11.0 Questions:

Note: Write answers of the following Q., Q., Q. Q.
(Question numbers to be allotted by the teacher)

1. What is vapor pressure?
2. Why Thiel's tube is used? Give reason.
3. Why liquid paraffin is used? Give reason.
4. What will be the effect if Thiel's tube is heated vigorously?
5. What will be the effect on boiling point if atmospheric pressure is reduced?
6. What is range of thermometer?

7. What is application of boiling point determination?
8. How boiling point of liquid is criteria of purity?
9. State the reason of atmospheric pressure.
10. What will be effect on boiling point if two liquids are mixed?

(Space for Answers)

Experiment No. 4

1.0 Title:

To identify the given organic drug/compound D1 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

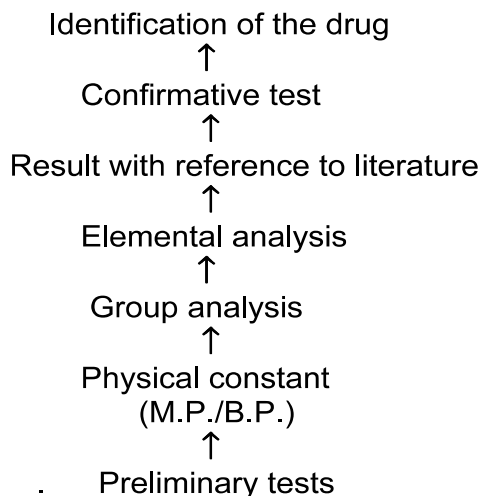
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and than strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: - The melting point / boiling point of the given organic compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
I	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		
II			

Conclusion:The given organic drug/ compound found to containelements.

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/compound was found to contain functional group/groups.

7.5 Result:

The given organic drug/ compound was having m.p/b.p....., elements andfunctional group/groups, therefore with reference to literature, the organic drug/ compound may be.....

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student shall write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. List out all organoleptic tests for organic compound.
2. Which preliminary tests can be perform for finding out unsaturation in the organic compound.
3. Give one important characteristic each of aromatic and aliphatic compound.
4. Why all aromatic compounds give sooty flame on burning?
5. Give concentration of concentrated sulphuric acid used in the laboratory.

(Space for Answers)

Experiment No. 5

1.0 Title:

To identify the given organic drug/compound D2 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

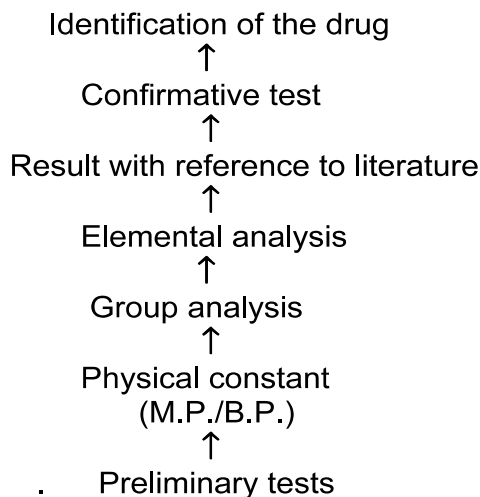
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and than strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: - The melting point / boiling point of the given organic compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
I			
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion:The given organic drug/compound found to containelements.

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/ compound was found to contain.....functional group/groups.

7.5 Result:

The given organic drug/compound was having⁰ m.p/b.p., elements andfunctional group/groups, therefore with reference to literature, the compound may be

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural Formula and Category:

(Student shall write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. Which class of organic compounds are acidic to litmus but do not give effervescence with sodium bicarbonate.
2. Arrange the following class of organic compounds in the increasing order of acidic nature, Carboxylic acids, phenols, Nitrophenols.
3. What is Beilstein's test?
4. Give concentration of liquor ammonia used in laboratory.

(Space for Answers)

Experiment No. 6

1.0 Title:

To identify the given organic drug/compound D3 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

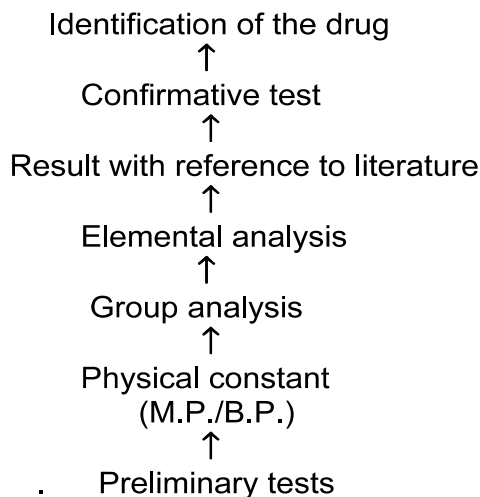
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and then strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: - The melting point / boiling point of the given organic compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
I			
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion: The given organic drug/ compound found to containelements

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/ compound was found to contain.....functional group/groups.

7.5 Result:

The given organic drug/ compound was having⁰ m.p/b.p., elements andfunctional group/groups, therefore with reference to literature, the compound may be

8.0 Confirmative Test:(Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student shall write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. If a compound decolourises bromine water with formation of precipitate what is the possible compound?
2. What is chemical composition of soda lime?
3. Whether boiling point varies from place to place? Explain.
4. Give the concentration of concentrated hydrochloric acid used in laboratory.

(Space for Answers)

Experiment No. 7

1.0 Title:

To identify the given organic drug /compound D4 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

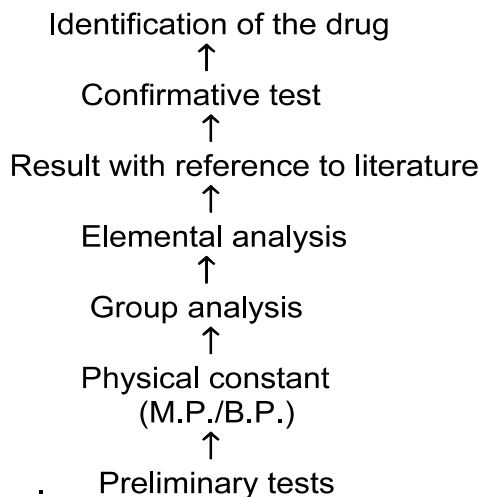
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and then strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: - The melting point / boiling point of the given organic compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
I			
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion: The given organic drug/ compound found to containelements.

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/compound was found to contain..... functional group/groups.

7.5 Result:

The given organic drug/ compound was having m.p/b.p....., elements andfunctional group/groups, therefore with reference to literature, the organic drug/ compound may be.....

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student shall write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. What is the theory of Lassaigne's test?
2. Name the alternative method for Lassaigne's test?
3. Why don't you do any test for "C" in detection of element in elemental analysis?
4. Give concentration of concentrated nitric acid used in laboratory.

(Space for Answers)

Experiment No. 8

1.0 Title:

To identify the given organic drug/compound D5 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

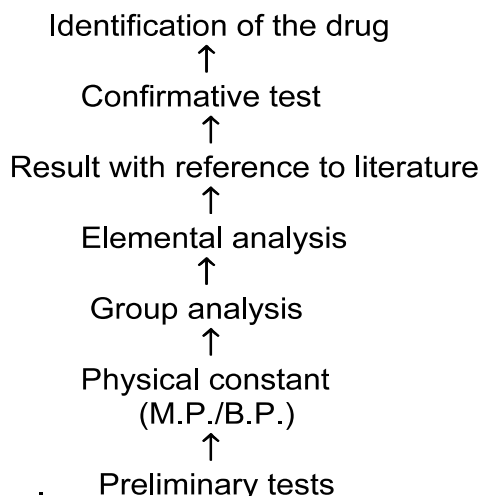
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and than strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: The melting point / boiling point of the given organic drug/ compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
I			
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion: The given organic drug/ compound found to containelements

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/ compound was found to contain.....functional group/groups.

7.5 Result:

The given organic drug/ compound was having m.p/b.p....., elements andfunctional group/groups, therefore with reference to literature, the organic drug/ compound may be.....

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student should write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. What precaution you will take for detection of halogens in elemental analysis, if the compound contains "N" and/or "S"?
2. Give the test for detection of "N" and "S" together in elemental analysis?
3. Write chemical equations for detection of "N" "S" and halogens in the elemental analysis?
4. What is difference between acetic acid and glacial acetic acid?

(Space for Answers)

Experiment No. 9

1.0 Title:

To identify the given organic drug/compound D6 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

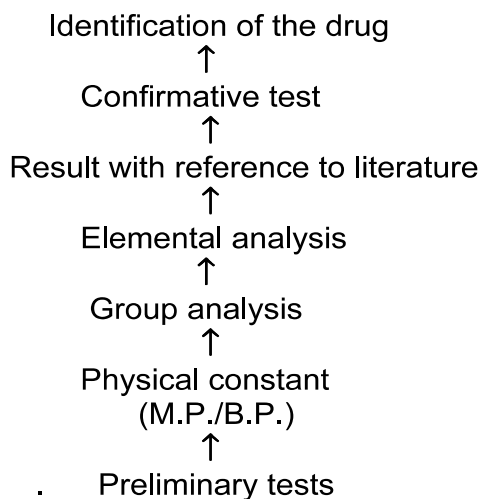
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a.	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and then strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion:The melting point / boiling point of the given organic drug/compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c I	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion:The given organic drug/ compound found to containelements.

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/compound was found to contain.....functional group/groups.

7.5 Result:

The given organic drug/ compound was having m.p/b.p....., elements andfunctional group/groups, therefore with reference to literature, the organic drug/ compound may be.....

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student should write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. Give group test for
Aldehydes/carbohydrates/acids/phenol/ester/onhydride/ketone/alcohol/
ethernitro/amine/amide/anilide group.
2. Give five ideal characteristics of derivative/
3. Give significance of derivative?
4. Give the following reactions/tests-
 - a) Diazotisation test
 - b) Phthalein test

- c) Libermann's nitroso test
- d) Fehling's test
- e) Benedict's test
- f) Barfoed's test Scilwanoff's test
- g) Neutral reduction test
- h) Acid reduction Test
- i) Acid reduction test

(Space for Answers)

Experiment No. 10

1.0 Title:

To identify the given organic drug/compound D7 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

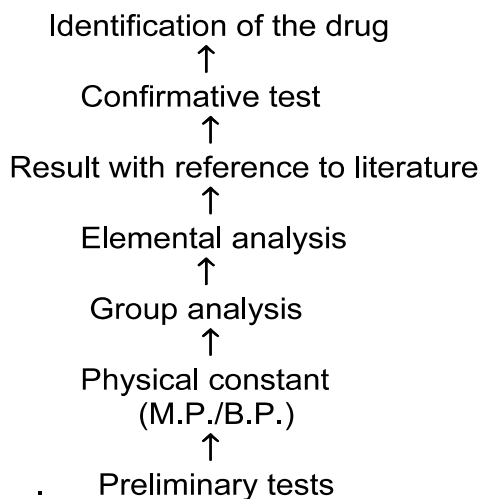
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and then strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: The melting point / boiling point of the given organic drug/compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
I			
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion: The given organic drug/ compound found to containelements.

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/ compound was found to contain.....functional group/groups.

7.5 Result:

The given organic drug/ compound was having m.p/b.p....., elements andfunctional group/groups, therefore with reference to literature, the organic drug/ compound may be.....

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student should write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. What is Tollen's reagent? How it is prepared?
2. How neutral solution of a compound is prepared for distinguishing tests for acids?
3. Name the functional groups present in compound analysed.
4. Name any two organic compounds belonging to the same chemical class as that of the compound analysed.

(Space for Answers)

Experiment No. 11

1.0 Title:

To identify the given organic drug/compound D8 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

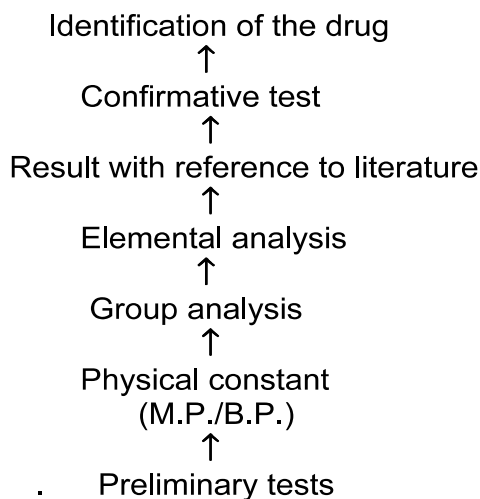
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and then strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: The melting point / boiling point of the given organic drug/compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion: The given organic drug/compound found to containelements.

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/compound was found to contain.....functional group/groups.

7.5 Result:

The given organic compound was having⁰ m.p/b.p., elements andfunctional group/groups, therefore with reference to literature, the compound may be

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student should write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. Name the possible derivatives, which can be prepared from the compound you have analysed.
2. Write chemical reaction involved in the preparation of derivative,
3. What are the different dosage forms in which the detected drug can be administered? (if applicable)

(Space for Answers)

Experiment No. 12

1.0 Title:

To identify the given organic drug/compound D9 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

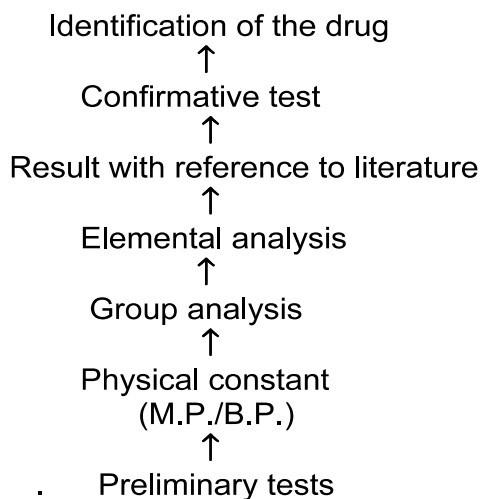
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and then strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: The melting point / boiling point of the given organic drug/ compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
I			
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion: The given organic drug/ compound found to containelements.

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/ compound was found to contain.....functional group/groups.

7.5 Result:

The given organic drug/ compound was having m.p/b.p....., elements andfunctional group/groups, therefore with reference to literature, the organic drug/ compound may be.....

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student should write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

1. Give industrial uses / pharmaceutical; uses/medicinal uses of the compound identified.
2. Give names of two official/marketed preparations of the identified compound.(if applicable)
3. Name a manufacturing company manufacturing the identified compound.
4. Name a compound having same category (uses) as that of the compound identified.

(Space for Answers)

Experiment No. 13

1.0 Title:

To identify the given organic drug/compound D10 by Systematic Qualitative Analysis.

2.0 Prior Concepts:

Drug, Qualitative analysis, Organic compounds, Melting point/Boiling point, Aromatic compound, Aliphatic compound.

3.0 New Concepts:

Proposition 1: Preliminary Tests

These are primary tests carried out to get some idea/clue about the compound. No definite conclusion can be drawn from these tests.

Proposition 2: Physical Constant (Melting Point/Boiling Point)

It is characteristic, distinguishing physical identity of the organic compound.

Proposition 3: Elemental Analysis

It is finding out of all elements present in the organic compound by some colour and precipitation reaction.

Proposition 4: Group Analysis

It is to find out different functional group present in the organic compound.

Functional group is the group of elements present in the compound that renders characteristic chemical and physical property to the compound.

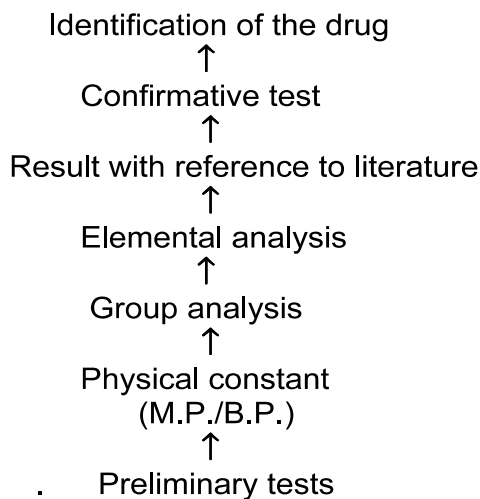
Proposition 5: Literature for reference:

It is a reference table in which compounds are classified according to elements, groups and physical constants.

Final identification of the compound is done with reference to this table.

Proposition 6: Confirmative Test:

These are specific colour reactions or preparation of simple derivatives and determining its M.P/B.P., which confirms identification of the organic drug.

General concept structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To understand test procedure.
3. To analyse and interpret the observations.
4. To plan the experiment.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.
4. Ability to work according to the plan of the experiment.
5. Ability of group working.

5.0 Apparatus:

1. Glass wares: Test tubes, Beakers, Measuring cylinder, Graduated pipettes, Evaporating dish, Water bath, Thiel's tube, 100° thermometer, 360° thermometer, Wire gauze.
2. Chemicals: All general and table reagents.

6.0 Stepwise Procedure:

1. Start the conduct of Systematic Qualitative Analysis.
2. Refer to Laboratory Handbook for the sequence of various tests & for a literature for reference.

7.0 Observation Table and Conclusions:**7.1 Preliminary Tests:**

Sr. No.	Test	Observation	Inference
a	Colour		
b.	Odour		
c.	Solubility behavior: 0.2 ml or 4 drops of liquid /solid or 0.1 gm of solid + 3 ml of the solvent. Shake thoroughly. If sample does not dissolve warm gently and cool to room temperature.		
I	Solubility in water		
II	Cold or hot solution, test with litmus.		
III	If acidic, add a substance to 10% sodium bi-carbonate solution		
IV	If not soluble in water, then try in 2N NaOH		
V	If not soluble in 2 N NaOH, then try in dil. HCl		
d.	Action of reagents		
I	Action of cold NaOH: About 0.2 g/3 drops of compound + 2 ml of water + 2ml 10% NaOH and the mixture is shaken well		
II	Action of hot con. H_2SO_4 : 0.1g solid or 2 drops of liquid + 1ml con. H_2SO_4 , warm.		
III	Action of Na_2CO_3 solution: 10 ml of 10% Na_2CO_3 solution +0.2 g of solid or 4 drops of liquid.		

Sr. No.	Test	Observation	Inference
IV	Action of KMnO_4 solution: 0.2 g of solid or 4 drops of liquid + 10ml Na_2CO_3 soln + drop-by-drop KMnO_4 solution.		
V	Action of bromine water:		
VI	Action of FeCl_3 soln.: Substance +water+ a drop or two of FeCl_3 soln.		
e.	Heating on oxidized copper gauze (Beilstein's test)		
f.	Heating in a dry test tube.		
g.	Heating on a clean glass rod.		
h.	Heating with soda lime: Take in hard glass test tube, 0.5 g of substance + 2g of finely powdered soda lime + 1 g of coarse soda lime. If the substance is liquid , add 5 drops of it to a fine layer of soda lime. Close the tube by a cork with a bent delivery tube, heat from top of test tube downwards gently at first and then strongly, and collect the product.		

Conclusion: On the basis of the tests performed above and with reference to handbook the given organic drug/compound is

- 1) Aromatic/Aliphatic
- 2) Saturated /Unsaturated
- 3) Acid/Base/ /Neutral/ Phenol Halide
- 4).....
- 5).....

7.2 Determination of Physical Constant:

Conclusion: - The melting point / boiling point of the given organic drug/ compound was found to be

7.3 Determination of Elements (Lassaigne's Test)

Sr. No.	Test	Observation	Inference
a.	Test for Nitrogen: 3 –4 ml filtrate + solid FeSO_4 , till saturation, heat to boil for few minutes, then acidify with con. H_2SO_4 .		
b.	Test for Sulphur: i) 2 ml filtrate + 1 drop of dilute sodium hydroxide solution + four drops of freshly prepared and very dilute solution of sodium nitroprusside. ii) 2 ml filtrate + acetic acid to acidify + few drops of lead acetate solution. iii) 2 ml filtrate + HCl to neutralize the soln+ few drops of FeCl_3 solution.		
c	Test for Halogens: Acidify 5 ml the filtrate with dilute H_2SO_4 boil well to reduce the volume to one third to expel H_2S if S and /or HCN if N, already found to be present. Then add few drops of dil HNO_3 (to acidify) and AgNO_3 solution.		
I			
II	Chloroform layer test Filtrate, acidify with mineral acid+ 1 ml of chloroform + few drops of fresh chlorine water, shake well and observe the colour of the chloroform layer.		

Conclusion: The given organic drug/ compound found to containelements.

7.4 Determination of Functional Group/Groups (For Elements)

Sr. No.	Test	Observation	Inference

Conclusion: The given organic drug/ compound was found to contain..... functional group/groups.

7.5 Result:

The given organic drug/ compound was having m.p/b.p....., elements andfunctional group/groups, therefore with reference to literature, the organic drug/ compound may be.....

8.0 Confirmative Test: (Specific Colour Reaction or Derivative)

Sr. No.	Test	Observation	Inference

9.0 Structural formula and Category:

(Student should write it from Indian Pharmacopoeia)

10.0 Questions:

Note: Write answers to Q Q.....Q..... from page no.92 to 95 and write answers to the following Q., Q(Question numbers to be allotted by the teacher)

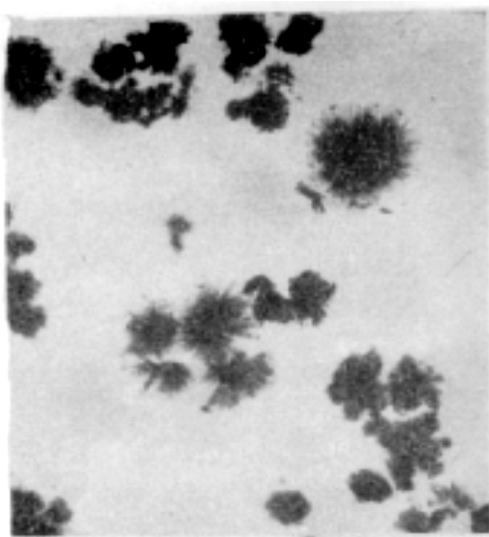
1. Why all aromatic compounds give sooty flame on burning?
2. Which classes of compounds decolorize potassium permanganate solution, although they are not saturated compounds?
3. What is the effect of impurities on the melting of a compound?
4. Enlist the elements, which are used in the systematic qualitative analysis?
5. Give equations involved in elemental analysis of –
a) Nitrogen b) Sulphur c) Halogen

(Space for Answers)

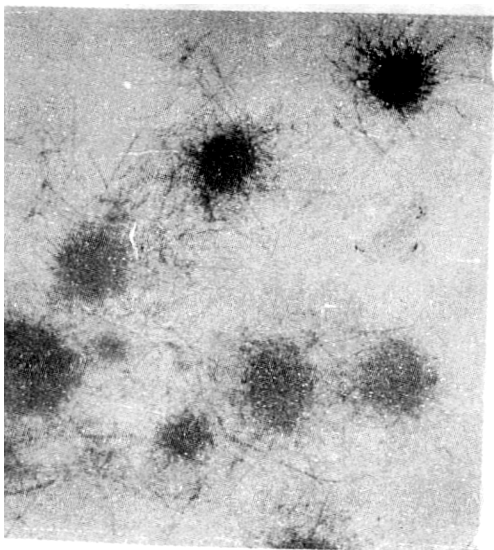
OSAZONES OF DIFFERENT CARBOHYDRATES
(Related to experiment No.4 to 13)



GLUCOSAZONE /
FRUCTOSAZONE



GALACTOSAZONE



LACTOSAZONE

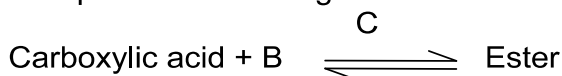


MALTOSAZONE

QUESTION BANK ON SYSTEMATIC QUALITATIVE ANALYSIS FOR DIFFERENT CLASSES OF ORGANIC DRUG/ COMPOUNDS

CARBOXYLIC ACIDS

1. How will you identify presence of carboxylic acid (-COOH) functional groups.
2. What are the different elements present in Cinnamic acid.
3. Name different carboxylic acids and state their uses.
4. Write structure of organic acid containing Phenolic (-OH) group.
5. Name the organic acid mentioned in Q.4.
6. Complete the following:



Name B and C in above reaction.

7. What happens when aromatic carboxylic acids are heated with soda lime?
8. What is the common derivative which can be prepared from carboxylic acid?
9. Give the general physical and chemical properties of carboxylic acid.
10. Why organic carboxylic acids are weak acids?
11. How may carboxylic groups are present in succinic acid and benzoic acid?
12. How neutral solution of acid is prepared during group analysis?

HALOGEN COMPOUNDS

1. Name different halogen elements.
2. Give common chemical test for halogens.
3. How halogens in the organic compounds are differentiated by chemical test.
4. Give one example of halogen substituted aliphatic acid.
5. Give one example of aromatic nuclear halogen substituted acid.
6. Give one example of halogen substituted aliphatic hydrocarbon.
7. Give one example of aromatic nuclear halogen substituted hydrocarbon.
8. Give one example of aromatic side chain halogen substituted hydrocarbon.
9. What are acyl halides?
10. Arrange the following halogen compound in the order of increasing strength of carbon-halogen bond in the compound:
Acyl chlorides, nuclear halogen substituted aromatic compounds, aliphatic halogen substituted compounds.
11. Formation of which class of compound gives offensive odour in carbylamine test?

HYDROXY ACIDS

1. Why salicylic acid gives violet colour with ferric chloride solution?
2. How aspirin and salicylic acid can be differentiated by the chemical test?
3. Name the hydroxy acids appearing as it intermediate in the Kreb's cycle.
4. Differentiate between alcoholic and phenolic-OH group.
5. Why some samples of aspirin gives violet colour with ferric chloride solution?

CARBOHYDRATES

- 1 Define Carbohydrates.
- 2 Give Example of each one of the following:
 - i) Non reducing sugar
 - ii) Reducing disaccharide
 - iii) Reducing monosaccharide
 - iv) Polysaccharide
- 3 Give Significance of Fehling's Test
- 4 Give significance of Borfoed's Test
- 5 Give significance of Selliwanoff's Test
- 6 Reducing property of a sugar is due to which functional group?
- 7 List out all functional groups present in glucose.
- 8 Can you differentiate between glucose and fructose by osazone test? Why?
- 9 Name one test, which can differentiate between glucose and fructose.
- 10 Name one test, which can differentiate between sucrose & Glucose.
- 11 Name one test, which can differentiate between Sucrose & Maltose.
- 12 Name one test, which can differentiate between Starch & sugar.
- 13 What is the observation of heating in dry test tube test for sugars?
- 14 What is glycosidic bond?
- 15 Sucrose is glycoside or fructoside
- 16 Give chemical name of lactose.
- 17 Monosaccharides present in sucrose are _____ and _____.
- 18 Monosaccharides present in maltose are _____ and _____.
- 19 Monosaccharides present in lactose are _____ and _____.
- 20 Why cellulose cannot be used as a food for human being?
- 21 What is group test for carbohydrates?

ESTERS

1. What are esters?
2. What is esterification?
3. What happens when esters are hydrolysed
4. Mention the functional groups involved in the formation of ester group.
5. State the qualitative tests for esters.
6. What are the general properties of esters?
7. State medicinal uses of esters.

AMIDES

- 1 Amides are acidic, basic or neutral?
- 2 Give common test for amides
- 3 Which two functional groups are involved in the formation of amides?
- 4 What is Biurette test? What is its significance?
- 5 What happens when urea is heated in dry test tube?
- 6 Which is the functional group present in urea?
- 7 In Beilstein's test urea gives green flame, therefore urea contains halogen (State true or false)
- 8 Why urea gives green colour in Beilstein's test?

PHENOLS

1. What are phenols
2. Why phenols are acidic? Explain

3. Name different qualitative tests for identification of phenols.
4. What is liquefied phenol I.P.
5. How phenols can be distinguished from alcohols by chemical tests.
6. How will you distinguish phenols and alcohols?
7. What are the different elements present in paracetamol?
8. Explain phthalein test for phenols.
9. What is the effect of concentrated solution of phenol on bromine water?
What happens when bromine water is added in excess?
10. Give two characteristics of phenyl benzoate as an ideal derivative of phenol.

ALCOHOLS

1. What are alcohols?
2. Name the functional group present in alcohols.
3. State whether alcohols are acids/bases/or neutral
4. What happens when a dry piece of sodium metal is added to alcohol?
5. State what happens when alcohols are heated with acids in presence of sulphuric acid?
6. What are primary, secondary and tertiary alcohols?

KETONES

- 1 Give common group test for ketones.
- 2 Why camphor does not give common group for ketones?
- 3 Which common derivative is prepared for ketones?
- 4 Give chemical name of ketone
- 5 Give Chemical name of benzophenone.

AROMATIC & NITRO COMPOUNDS

1. What are nitro-derivatives of benzene and aniline and write their structures?
2. How nitro (NO₂) group is to be detected in the given organic compound?
3. What happens when aromatic nitro compound such as nitro benzene is nitrated?
4. How will you carry out nitration of nitro benzene?
5. What are general properties of aromatic nitro compounds?

AMINES

1. What are amines? How will you detect amine (-NH₂) functional group?
2. What is carbylamine test? How it is performed?
3. What is difference between amines and amides?
4. What are the elements present in amines?
5. Whether amines are acids/bases/or neutral compounds? Why?
6. Why aliphatic amines give ammoniacal odour but aromatic amines give fishy odour.
7. Name one primary aromatic amine which occurs as liquid.
8. What is solubility of amines in a) water b) sodium hydroxide c) dilute hydrochloric acid.
9. What is diazotisation test?

Experiment No. 14**1.0 Title:**

To perform and report identification test on the given sample of Aspirin or Acetyl Salicylic Acid as per Indian Pharmacopoeia (I.P.)

2.0 Prior Concepts:

Indian Pharmacopoeia, Drug, Monographs of drugs in I.P., Compliance with I.P. tests

3.0 New Concepts:**Proposition 1: Organoleptic Description**

It is the information in respect of nature, odour and taste of drug.

Proposition 2: Solubility

Statements of solubility's are indicated by a descriptive terms and are intended to apply at 20°C to 30°C. The following table indicates the meaning of the terms used in statements of approximate solubility's.

Table for approximate solubility

Description Term (Statement of approximate solubility)	Approximate volume of solvent in milliliters per gram of solute
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble	From 1000 to 10,000
Insoluble or practically insoluble	More than 10,000

Proposition 3: Identification Tests

These are tests to verify that the article being examined is in accordance with the label on container. Failure of an article, taken from a labeled container, to meet the requirements of a prescribed identification test indicates that the article may be mislabeled or substituted. These tests are not necessarily sufficient to establish absolute proof of identity.

Proposition 4: Pharmaceutical Category

Pharmaceutical category of a drug deals with its pharmaceutical and medicinal uses like pharmaceutical aid, analgesic etc.

General concept structure:

Sample complies/ does not comply
the tests as per I.P.
↑
Identification tests as per I.P.
↑
Solubility in different solvents
↑
Description of the drug

4.0 Learning Objectives:**4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia

5.0 Apparatus:

1. Glass wares: Thiel's tube, Test tubes, Capillary.
2. Chemicals: Sodium hydroxide solution, Ferric chloride solution, Alcohol (95%), Sulphuric acid, Chloroform, Ether.

6.0 Structural formula of the drug:

(Student shall refer to I.P. and write)

7.0 Stepwise Procedure:**1. Procedure for Description:**

Observe the given drug critically for the following description. The drug is crystals or crystalline powder, colourless or white, odourless or almost odourless as per I.P.

2. Procedure for Solubility:

Perform solubility test in the different solvents. The drug is sparingly soluble in water, freely soluble in alcohol, soluble in chloroform and in ether, slightly soluble in water.

3. Procedure for Identification Tests:

- A. Boil about 0.5 g of drug with 10 ml of sodium hydroxide solution for 3 minutes, cool and add 10 ml of dilute sulphuric acid – a white crystalline precipitate is produced, it has odour of acetic acid. Filter, dissolve the precipitate in about 2 ml of water and add ferric chloride solution, a deep violet colour is produced.
- B. To the filtrate obtained in test A add 3 ml of alcohol (95%) and 3 ml of sulphuric acid and warm; the odour of ethyl acetate is perceptible.
- C. Determination of Melting Point: The drug melts at about 142° C

8.0 Observation Table:**Report on Identification tests on sample of Aspirin**

Sr. No.	Test	Observation	Inference*
1.	Description		
a)	Nature	.....	.....
b)	Colour	.....	.....
c)	Odour	.....	.....
2.	Solubility		
a)	Water	.....	.....
b)	Alcohol	.....	.....
c)	Chloroform	.....	.....
d)	Ether	.....	.....
3.	Identification Tests		
a)	Test A	.....	.....
b)	Test B	.....	.....
c)	Test C	.....	.....

*If observation is as per given in the procedure, then write, “complies the test “; if not then write, “does not comply the test”.

9.0 Result:

The given sample of Aspirin complies the tests __ __ __, (student shall write tests number from observation table) and does not comply the tests __ __ __ (student shall write tests number from observation table) for Identification as per I.P.

10.0 Pharmaceutical Category:

Analgesic, Antipyretic, and Anti-inflammatory.

11.0 Questions:

Note: Write answers of the following Q., Q., Q. Q.,
(Question numbers to be allotted by the teacher)

1. What is the effect on aspirin when it is stored in moist atmosphere?
2. Write chemical name of aspirin.
3. Write functional group present in aspirin.
4. List two uses of aspirin?
5. List two brand names of aspirin?
6. What are the dosage forms of aspirin?
7. What is dose of aspirin?
8. Give the mechanism of action of aspirin.
9. List two official preparations of aspirin.
10. List four companies manufacturing aspirin as bulk drug.

12.0 Reference:

Indian Pharmacopoeia 1996, Page No.69.

(Space for Answers)

(Space for Answers)

Experiment No. 15

1.0 Title:

To perform and report identification test on the given sample of Paracetamol as per Indian Pharmacopoeia (I.P.)

2.0 Prior Concepts:

Indian Pharmacopoeia, Drug, Monographs of drugs in I.P. Compliance with I.P. tests

3.0 New Concepts:

Proposition 1: Organoleptic Description

It is the information in respect of nature, odour and taste of drug.

Proposition 2: Solubility

Statements of solubility's are indicated by a descriptive terms and are intended to apply at 20° C to 30° C. The following table indicates the meaning of the terms used in statements of approximate solubility's.

Table for approximate solubility

Description Term (Statement of approximate solubility)	Approximate volume of solvent in milliliters per gram of solute
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble	From 1000 to 10,000
Insoluble or practically insoluble	More than 10,000

Proposition 3: Identification Tests

These are tests to verify that the article being examined is in accordance with the label on container. Failure of an article, taken from a labeled container, to meet the requirements of a prescribed identification test indicates that the article may be mislabeled or substituted. These tests are not necessarily sufficient to establish absolute proof of identity.

Proposition 4: Pharmaceutical Category

Pharmaceutical category of a drug deals with its pharmaceutical and medicinal uses like pharmaceutical aid, analgesic etc.

General concept structure:

Sample complies/ does not comply
the tests as per I.P.
↑
Identification tests as per I.P.
↑
Solubility in different solvents
↑
Description of the drug

4.0 Learning Objectives:**4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia

5.0 Apparatus:

1. Glass wares: Test tubes, Thiel's tube, Capillary
2. Chemicals: Alcohol, Acetone, Sodium hydroxide solution, Ether, Ferric chloride solution, Hydrochloric acid, Potassium dichromate.

6.0 Structural formula of the drug:

(Student shall refer to I.P. and write)

7.0 Stepwise Procedure:**1. Procedure for Description:**

Observe the given drug critically for the following description. The drug is white crystal or crystalline powder, odorless, taste is slightly bitter.

2. Procedure for Solubility:

Perform solubility test in the different solvents. The drug is freely soluble in alcohol (95%), acetone and solutions of alkali hydroxide, sparingly soluble in water, and very slightly soluble in ether.

3. Procedure for Identification Tests:

- A. Dissolve 0.1 g of sample in 10 ml of water and add 0.1 ml of ferric chloride solution; a violet colour develops.
- B. Boil 0.1 g in 1 ml of hydrochloric acid for 3 minutes, add 10 ml of water and cool; no precipitate is produced. Add 0.05 ml of 0.0167 M potassium dichromate; a violet colour develops which does not turn red (distinction from phenacetin)

C. Determination of Melting Point: Melts between 168° C and 172° C

8.0 Observation Table:

Report on Identification tests on sample of Paracetamol

Sr. No.	Test	Observation	Inference*
1.	Description		
a)	Nature	.....	.....
b)	Colour	.....	.....
c)	Odour	.....	.....
d)	Taste	.....	.....
2.	Solubility		
a)	Water	.....	.....
b)	Alcohol	.....	.....
c)	Acetone	.....	.....
d)	Solution of alkali hydroxides	.....	.....
e)	Ether	.....	.....
3.	Identification Tests		
a)	Test A	.....	.....
b)	Test B	.....	.....
c)	Test C	.....	.....

*If observation is as per given in the procedure, then write "complies the test"; if not then write "does not comply the test".

9.0 Result:

The given sample of Paracetamol complies the tests __ __ __, (student shall write tests number from observation table) and does not comply the tests __ __ __ (student shall write tests number from observation table) for Identification as per I.P.

10.0 Pharmaceutical Category:

Analgesic and Antipyretic.

11.0 Questions:

Note: Write answers of the following Q., Q., Q., Q.,
(Question numbers to be allotted by the teacher)

1. Give chemical name of the drug.
2. Name the functional groups present in the drug.
3. With reference to I.P. State the meaning of "freely soluble" or "sparingly soluble" substance?
4. Give chemical tests, which differentiate between paracetamol and phenacetins?
5. What are the components of solution?
6. State meaning of the term "analgesic".
7. State the meaning of the term "antipyretic".
8. What is the importance of identification tests?
9. Can you use the drug in medicinal formulation, if it is not complying the Identification tests as per I.P.? Why?
10. List two marketed preparations of paracetamol.
11. List two official preparations of paracetamol.

12.0 Reference:

Indian Pharmacopoeia 1996, Page No. 554.

(Space for Answers)

(Space for Answers)

Experiment No. 16

1.0 Title:

To perform and report identification test on the given sample of Ascorbic Acid as per Indian Pharmacopoeia. (I.P.)

2.0 Prior Concepts:

Indian Pharmacopoeia, Drug, Monographs of drugs in I.P. Compliance with I.P. tests

3.0 New Concepts:

Proposition 1: Organoleptic Description

It is the information in respect of nature, odour and taste of drug.

Proposition 2: Solubility

Statements of solubility's are indicated by a descriptive terms and are intended to apply at 20° C to 30° C. The following table indicates the meaning of the terms used in statements of approximate solubility's.

Table for approximate solubility

Description Term (Statement of approximate solubility)	Approximate volume of solvent in milliliters per gram of solute
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble	From 1000 to 10,000
Insoluble or practically insoluble	More than 10,000

Proposition 3: Identification Tests

These are tests to verify that the article being examined is in accordance with the label on container. Failure of an article, taken from a labeled container, to meet the requirements of a prescribed identification test indicates that the article may be mislabeled or substituted. These tests are not necessarily sufficient to establish absolute proof of identity.

Proposition 4: Pharmaceutical Category

Pharmaceutical category of a drug deals with its pharmaceutical and medicinal uses like pharmaceutical aid, analgesic etc.

General concept structure:

Sample complies/does not comply
the tests as per I.P.



Identification test as per I.P.



Solubility in different solvents



Description of the drug

4.0 Learning Objectives:**4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.

5.0 Apparatus:

1. Glass wares: Test tubes, Capillary, Thiel's tube.
2. Chemicals: Alcohol, Sodium hydroxide, Ferric chloride solution, Hydrochloric acid, Chloroform, Ether, Benzene, Sodium nitroprusside solution, Sodium bicarbonate, Ferrous sulphate solution, Sulphuric acid.

6.0 Structural formula of the drug:

(Student shall refer to I.P. and write)

7.0 Stepwise Procedure:**1. Procedure for Description:**

Observe the given drug critically for the following description. Refer to Indian Pharmacopoeia 1996.

2. Procedure for Solubility:

Perform solubility test in the different solvents as per Indian Pharmacopoeia 1996.

3. Procedure for Identification Tests:

Refer to Indian Pharmacopoeia 1996

8.0 Observation Table:**Report on Identification tests on sample of Ascorbic Acid**

Sr. No.	Test	Observation	Inference*
1.	Description		
a)	Nature	.....	.....
b)	Colour	.....	.....
c)	Odour	.....	.....
d)	Taste	.....	.....
2.	Solubility		
a)	Water	.....	.....
b)	Alcohol	.....	.....
c)	Chloroform	.....	.....
d)	Ether	.....	.....
e)	Benzene	.....	.....
3.	Identification Tests		
a)	Test B	.....	.....
b)	Test C	.....	.....
c)	Test D	.....	.....

*If observation is as per given in the procedure, then write, "complies the test "; if not then write, "does not comply the test".

9.0 Result:

The given sample of Ascorbic acid complies the tests __ __ __, (student shall write tests number from observation table) and does not comply the tests __ __ __ (student shall write tests number from observation table) for Identification as per I.P.

10.0 Pharmaceutical Category:

Vitamin (anti-scorbutic) and pharmaceutical aid (antioxidant).

11.0 Questions:

Note: Write answers of the following Q., Q., Q. Q., (Question numbers to be allotted by the teacher)

1. Give synonym of Ascorbic Acid.
2. What is "Antiscorbutic"?
3. State meaning of antioxidant?
4. List two marketed preparations of ascorbic acid.
5. List two official medicinal preparations of Ascorbic Acid.
6. What is the functional group present in the drug?
7. Ascorbic acid is water-soluble vitamin or fat-soluble vitamin?
8. Give 4 riched natural sources of Ascorbic Acid
9. What are the symptoms of the scurvy?
10. List the vitamins of group B.
11. List fat-soluble vitamins.

12.0 Reference:

Indian Pharmacopoeia 1996, Page No. 66.

(Space for Answers)

(Space for Answers)

Experiment No. 17

1.0 Title:

To perform and report identification test on the given sample of Sulphamethoxazole as per Indian Pharmacopoeia (I.P.)

2.0 Prior Concepts:

Indian Pharmacopoeia, Drug, Monographs of drugs in I.P. Compliance with I.P. tests

3.0 New Concepts:

Proposition 1: Organoleptic Description

It is the information in respect of nature, odour and taste of drug.

Proposition 2: Solubility

Statements of solubility's are indicated by a descriptive terms and are intended to apply at 20⁰ C to 30⁰C. The following table indicates the meaning of the terms used in statements of approximate solubility's.

Table for approximate solubility

Description Term (Statement of approximate solubility)	Approximate volume of solvent in milliliters per gram of solute
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble	From 1000 to 10,000
Insoluble or practically insoluble	More than 10,000

Proposition 3: Identification Tests

These are tests to verify that the article being examined is in accordance with the label on container. Failure of an article, taken from a labeled container, to meet the requirements of a prescribed identification test indicates that the article may be mislabeled or substituted. These tests are not necessarily sufficient to establish absolute proof of identity.

Proposition 4: Pharmaceutical Category

Pharmaceutical category of a drug deals with its pharmaceutical and medicinal uses like pharmaceutical aid, analgesic etc.

General concept structure:

Sample complies/ does not comply
the tests as per I.P.
↑
Identification tests as per I.P.
↑
Solubility in different solvents
↑
Description of the drug

4.0 Learning Objectives:**4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia

5.0 Apparatus:

1. Glass wares: Test tubes, Capillary, Thiel's tube.
2. Chemicals: Alcohol, Acetone, Chloroform, Ether, Sodium hydroxide solution, Sodium nitrite solution, 2-naphthol solution in alcohol, Hydrochloric acid.

6.0 Structural formula of the drug:

(Student shall refer to I.P. and write)

7.0 Stepwise Procedure:

1. Procedure for Description:

Observe the given drug critically for the following description. The drug is white or almost white, crystalline powder, almost odorless.

2. Procedure for Solubility:

Perform solubility test in the different solvents. The drug is freely soluble in acetone, alcohol (95%), slightly soluble in chloroform and in ether, practically insoluble in water. It dissolves in dilute solution of sodium hydroxide.

3. Procedure for Identification Tests:

A. Dissolve about 5 mg in 10 ml of 1 M hydrochloric acid and dilute 1 ml to 10 ml with water. The resulting solution without further acidification is tested for presence of primary aromatic amines- to above solution add 0.2 ml of sodium nitrite solution after 2 minutes add solution to 1 ml of 2-naphthol solution; an intense orange red colour, usually a precipitate of the same colour is produced.

B. Determination of Melting Point: The drug melts between 169°C and 172°C.

8.0 Observation Table:

Report on Identification tests on sample of Sulphamethoxazole

Sr. No.	Test	Observation	Inference*
1.	Description		
a)	Nature	.....	.....
b)	Colour	.....	.....
c)	Odour	.....	.....
2.	Solubility		
a)	Acetone	.....	.....
b)	Alcohol	.....	.....
c)	Chloroform	.....	.....
d)	Ether	.....	.....
e)	Water	.....	.....
f)	Solution of sodium hydroxide	.....	.....
3.	Identification Tests		
a)	Test A	.....	.....
b)	Test B	.....	.....

*If observation is as per given in the procedure, then write "complies the test"; if not then write "does not comply the test".

9.0 Result:

The given sample of Sulphamethaxazole complies the tests __ __ __, (student shall write tests number from observation table) and does not comply the tests __ __ __ (student shall write tests number from observation table) for Identification as per I.P.

10.0 Pharmaceutical Category:

Antibacterial

11.0 Questions:

Note: Write answers of the following Q., Q., Q. Q.,
(Question numbers to be allotted by the teacher)

1. What are sulphonamides?
2. What is diazotisation?
3. At what temperature diazotisation is to be carried out?
4. Give two uses of sulphonamides?
5. Write mechanism of action of sulphonamide.
6. Write composition of co-trimoxazole.
7. Define drug synergism.
8. Write dose of co-trimoxazole.
9. Write two brand names of co-trimoxazole.
10. Give two adverse reactions of Sulphamethaxazole.

12.0 Reference:

Indian Pharmacopoeia 1996, Page No. 731.

(Space for Answers)

(Space for Answers)

Experiment No. 18

1.0 Title:

To perform and report identification test on the given sample of Ampicillin Trihydrate as per Indian Pharmacopoeia (I.P.)

2.0 Prior Concepts:

Indian Pharmacopoeia, Drug, Monographs of drugs in I.P., Compliance with I.P. tests.

3.0 New Concepts:

Proposition 1: Organoleptic Description

It is the information in respect of nature, odour and taste of drug.

Proposition 2: Solubility

Statements of solubility's are indicated by a descriptive terms and are intended to apply at 20⁰ C to 30⁰ C. The following table indicates the meaning of the terms used in statements of approximate solubility's.

Table for approximate solubility

Description Term (Statement of approximate solubility)	Approximate volume of solvent in milliliters per gram of solute
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble	From 1000 to 10,000
Insoluble or practically insoluble	More than 10,000

Proposition 3: Identification Tests

These are tests to verify that the article being examined is in accordance with the label on container. Failure of an article, taken from a labeled container, to meet the requirements of a prescribed identification test indicates that the article may be mislabeled or substituted. These tests are not necessarily sufficient to establish absolute proof of identity.

Proposition 4: Pharmaceutical Category

Pharmaceutical category of a drug deals with its pharmaceutical and medicinal uses like pharmaceutical aid, analgesic etc.

General concept structure:

Sample complies/ does not comply
the test s per I.P.
↑
Identification tests as per I.P.
↑
Solubility in different solvents
↑
Description of the drug

4.0 Learning Objectives:**4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia

5.0 Apparatus:

1. Glass wares: Test tubes, Capillary, Thiel's tube.
2. Chemicals: Alcohol, Chloroform, Ether, Fixed oil, Ninhydrin reagent, Potassium cupritartrate solution.

6.0 Structural formula of the drug:

(Student shall refer to I.P. and write)

7.0 Stepwise Procedure:**1. Procedure for Description:**

Observe the given drug critically for the following description. The drug is White, micro crystalline odourless or almost odourless.

2. Procedure for Solubility:

Perform solubility test in the different solvents. The drug is slightly soluble in water, practically insoluble in alcohol, chloroform, ether and fixed oil. It is soluble in dilute solution of acids and alkali hydroxides.

3. Procedure for Identification Tests:

- A. Place 0.1 ml of 0.1% w/v solution of Ninhydrin on filter paper, dry at 105° , superimposed 0.1 ml of 0.1% w/v solution of drug. Heat for 5 minutes at 105° , allow to cool, reddish violet colour is produced.
- B. Suspend 10 mg of drug in 1 ml of water add 2 ml mixture of 2 ml potassium cupritartrate solution and 6 ml of water, magenta violet colour is immediately produced.

8.0 Observation Table:**Report on Identification tests on sample of Ampicillin Trihydrate**

Sr. No.	Test	Observation	Inference*
1.	Description		
a)	Nature	.....	.....
b)	Colour	.....	.....
c)	Odour	.....	.....
2.	Solubility		
a)	Water	.....	.....
b)	Alcohol	.....	.....
c)	Fixed Oil	.....	.....
d)	Chloroform	.....	.....
e)	Ether	.....	.....
f)	Dilute acid	.....	.....
g)	Dilute alkali hydroxide	.....	.....
3.	Identification Tests		
a)	Test A	.....	.....
b)	Test B	.....	.....

*If observation is as per given in the procedure, then write "complies the test "; if not then write "does not comply the test".

9.0 Result:

The given sample of Ampicillin Trihydrate complies the tests __ __ __, (student shall write tests number from observation table) and does not comply the tests __ __ __ (student shall write tests number from observation table) for Identification as per I.P.

10.0 Pharmaceutical Category:

Antibiotic.

11.0 Questions:

Note: Write answers of the following Q., Q., Q., Q., (Question numbers to be allotted by the teacher)

1. Give chemical name of the drug.
2. Name the functional groups present in the drug.
3. Define the term broad spectrum and narrow spectrum antibiotics.
4. Write the dose of ampicillin trihydrate.
5. Write common name for potassium cupritartrate solution.
6. Which amino acid is present in the structure of drug?
7. What is effect of penicillinase and penicillin acylase on the drug?
8. Why ampicillin trihydrate gives Ninhydrin test positive?
9. Write two brand names of ampicillin trihydrate.
10. List two official preparations of ampicillin trihydrate.
11. Write the chemical class of ampicillin trihydrate.

12.0 Reference:

Indian Pharmacopoeia 1996, Page No. 57.

(Space for Answers)

(Space for Answers)

EXPERIMENT No.19**1.0 Title:**

To perform and report identification test on given sample of Promethazine Hydrochloride as per Indian Pharmacopoeia (I.P.)

2.0 Prior Concepts:

Indian Pharmacopoeia, Drug, Monograph of drugs in I.P. Compliance with I.P. tests.

3.0 New Concepts:**Proposition 1: Organoleptic Description**

It is the information in respect of nature, odour and taste of drug.

Proposition 2: Solubility

Statements of solubility's are indicated by a descriptive terms and are intended to apply at 20°C to 30°C. The following table indicates the meaning of the terms used in statements of approximate solubility's.

Table for approximate solubility

Description Term (Statement of approximate solubility)	Approximate volume of solvent in milliliters per gram of solute
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble	From 1000 to 10,000
Insoluble or practically insoluble	More than 10,000

Proposition 3: Identification Tests

These are tests to verify that the article being examined is in accordance with the label on container. Failure of an article, taken from a labeled container, to meet the requirements of a prescribed identification test indicates that the article may be mislabeled or substituted. These tests are not necessarily sufficient to establish absolute proof of identity.

Proposition 4: Pharmaceutical Category

Pharmaceutical category of a drug deals with its pharmaceutical and medicinal uses like pharmaceutical aid, analgesic etc.

General concept structure:

Sample complies / does not comply
the tests as per I.P.

↑

Identification tests as per I.P.

↑

Solubility on different solvents

↑

Description of the drug

4.0 Learning Objectives**4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia

5.0 Apparatus:

1. Glass wares: Test tubes, Thiel's tube, Capillary.
2. Chemicals: Alcohol, Chloroform, Ether, Nitric Acid, Potassium dichromate, Sulphuric, Di-phenylecarbazine solution.

6.0 Structural formula of the drug.

(Student shall refer to I.P. and write)

7.0 Stepwise Procedure

1. Procedure for Description

Observe the given drug critically for the following description. White or faintly yellowish, crystalline powder.

2. Procedure for Solubility

Perform solubility test in different solvents. Drug is very soluble in water, freely soluble in chloroform, alcohol and practically insoluble in ether.

3. Procedure for Identification Tests

A. Dissolve 0.1 gm drug in 3 ml of water and add 1 ml of Nitric acid drop wise, a precipitate is produced which dissolves rapidly to give a red solution which becomes orange and then yellow. Heat the solution to boiling, it becomes orange and orange-red precipitate is produced.

B. Introduce into a test-tube 0.1g of drug (equivalent to about 10 mg of chloride ion), add 0.2 g of potassium dichromate and 1 ml of sulphuric acid. Place a filter-paper strip moistened with 0.1 ml of diphenylcarbazide solution over the mouth of the test-tube; the paper turns violet-red. (Do not bring the moistened paper into contact with the potassium dichromate solution)

C. Determination of Melting point: The drug melts at about 222°C.

8.0 Observation Table:

Report on Identification tests on sample of Promethazine Hydrochloride

Sr. No.	Test	Observation	Inference*
1.	Description		
a)	Nature	.....	.....
b)	Colour	.....	.....
c)	Odour	.....	.....
2.	Solubility		
a)	Water	.....	.....
b)	Alcohol	.....	.....
c)	Chloroform	.....	.....
d)	Ether	.....	.....
3.	Identification Tests		
a)	Test A	.....	.....
b)	Test B	.....	.....
c)	Test C	.....	.....

* If observation is as per given in the procedure, then write "complies the test "; if not then write "does not comply the test".

9.0 Result:

The given sample of Promethazine Hydrochloride complies the tests __ __ __, (student shall write tests number from observation table) and does not comply the tests __ __ __ (student shall write tests number from observation table) for Identification as per I.P.

10.0 Pharmaceutical Category:

Histamine H-receptor antagonist, Antiemetic

11.0 Questions:

Note: Write answers of the following Q., Q., Q. Q.
(Question numbers to be allotted by the teacher)

1. Write chemical name of the drug.
2. Write functional groups present in the drug.
3. Give mechanism of action of the drug.
4. Define the term 'Antiemetic'.
5. Give uses of promethazine hydrochloride.
6. List two marketed preparations of promethazine hydrochloride.
7. List official preparations of promethazine hydrochloride.
8. Write two drugs having same category.
9. Write doses of promethazine hydrochloride.

12.0 Reference:

Indian Pharmacopoeia 1996, Page No. 629.

(Space for Answers)

(Space for Answers)

EXPERIMENT No. 20**1.0 Title:**

To perform and report identification test on given sample of Prochlorperazine Maleate as per Indian Pharmacopoeia (I.P.)

2.0 Prior Concepts:

Indian Pharmacopoeia, Drug, Monograph of drugs in I.P., Compliance with I.P. tests.

3.0 New Concepts:**Proposition 1: Organoleptic Description**

It is the information in respect of nature, odour and taste of drug.

Proposition 2: Solubility

Statements of solubility's are indicated by a descriptive terms and are intended to apply at 20°C to 30°C. The following table indicates the meaning of the terms used in statements of approximate solubility's.

Table for approximate solubility

Description Term (Statement of approximate solubility)	Approximate volume of solvent in milliliters per gram of solute
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble	From 1000 to 10,000
Insoluble or practically insoluble	More than 10,000

Proposition 3: Identification Tests

These are tests to verify that the article being examined is in accordance with the label on container. Failure of an article, taken from a labeled container, to meet the requirements of a prescribed identification test indicates that the article may be mislabeled or substituted. These tests are not necessarily sufficient to establish absolute proof of identity.

Proposition 4: Pharmaceutical Category

Pharmaceutical category of a drug deals with its pharmaceutical and medicinal uses like pharmaceutical aid, analgesic etc.

General concept structure:

Sample complies /does not comply
the tests as per I.P.

↑

Identification tests as per I.P.

↑

Solubility on different solvents

↑

Description of the drug

4.0 Learning Objectives:**4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia.

5.0 Apparatus:

1. Glass wares: Test tubes, Thiel's tube, Capillary
2. Chemicals: Alcohol, Ether, Sulphuric acid, Sodium hydroxide solution, Bromine solution, Resorcinol.

6.0 Structural formula of the drug:

(Student shall refer to I.P. and write)

7.0 Stepwise Procedure:**1. Procedure for Description**

Observe the given drug critically for the following description. White or pale yellow, crystalline powder; almost odourless; taste, slightly bitter.

2. Procedure for Solubility

Perform solubility test in different solvents. Drug is almost insoluble in water, and alcohol; insoluble in ether.

3. Procedure for Identification tests

- A. Dissolve 5 mg of drug in 2 ml of sulphuric acid and allow to stand for 5 minutes; a red colour is produced
- B. Dissolve 0.3 mg in a mixture of 3 ml of water and 2 ml of sodium hydroxide solution; shake with three portions each 3 ml of solvent ether. Add to the aqueous solution 2 ml of bromine solution. Warm on water bath for ten minutes, then heat to boiling, cool and add two drops of a solution of 10 mg of resorcinol in 3 ml of sulphuric acid; a bluish –black colour develops on heating for fifteen minutes in a water-bath.
- C. Determination of melting point: The drug melts between 198°C and 203°C.

8.0 Observation Table:

Report on Identification tests on sample of Prochlorperazine Maleate

Sr. No.	Test	Observation	Inference*
1.	Description		
a)	Nature	.....	.....
b)	Colour	.....	.....
c)	Odour	.....	.....
d)	Taste	.....	.....
2.	Solubility		
a)	Water	.....	.....
b)	Alcohol	.....	.....
c)	Ether	.....	.....
3.	Identification Tests		
a)	Test A	.....	.....
b)	Test B	.....	.....
c)	Test C	.....	.....

*If observation is as per given in the procedure, then write, “complies the test “; if not then write, “does not comply the test”.

9.0 Result:

The given sample of Prochlorperazine Maleate complies the tests __ __ __, (student shall write tests number from observation table) and does not comply the tests __ __ __ (student shall write tests number from observation table) for Identification as per I.P.

10.0 Pharmaceutical Category:

Tranquillizer; anti-emetic

11.0 Questions:

Note: Write answers of the following Q., Q., Q. Q.
(Question numbers to be allotted by the teacher)

1. Write chemical name of the drug.
2. Write functional groups present in the drug.
3. Give mechanism of action of the drug.
4. State meaning of term 'Tranquillizer'.
5. Give uses of prochlorperazine maleate.
6. List two marketed preparations of prochlorperazine maleate.
7. List two official preparations of prochlorperazine maleate.
8. Write two drugs having same category.
9. Write dose of prochlorperazine maleate.

12.0 Reference:

Indian Pharmacopoeia 1985, Page No.417.

(Space for Answers)

(Space for Answers)

Experiment No. 21

1.0 Title:

To perform and report identification test on the given sample of Quinine Sulphate as per Indian Pharmacopoeia (I.P.)

2.0 Prior Concepts:

Indian Pharmacopoeia, Drug, Monographs of drugs in I.P. Compliance with I.P. test

3.0 New Concepts:

Proposition 1: Organoleptic Description

It is the information in respect of nature, odour and taste of drug.

Proposition 2: Solubility

Statements of solubility's are indicated by a descriptive terms and are intended to apply at 20^o C to 30^oC. The following table indicates the meaning of the terms used in statements of approximate solubility's.

Table for approximate solubility

Description Term (Statement of approximate solubility)	Approximate volume of solvent in milliliters per gram of solute
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble	From 1000 to 10,000
Insoluble or practically insoluble	More than 10,000

Proposition 3: Identification Tests

These are tests to verify that the article being examined is in accordance with the label on container. Failure of an article, taken from a labeled container, to meet the requirements of a prescribed identification test indicates that the article may be mislabeled or substituted. These tests are not necessarily sufficient to establish absolute proof of identity.

Proposition 4: Pharmaceutical Category

Pharmaceutical category of a drug deals with its pharmaceutical and medicinal uses like pharmaceutical aid, analgesic etc.

General concept structure:

Sample complies/ does not comply
the tests as per I.P.



Identification tests as per I.P.



Solubility in different solvents



Description of the drug

4.0 Learning Objectives:**4.1 Intellectual Skills:**

1. To understand concept of the experiment.
2. To analyse and interpret the observations.

4.2 Motor Skills:

1. Ability to write systematic analytical report.
2. Ability to handle equipment, take and record observations.
3. Ability to refer standard literature/Indian Pharmacopoeia

5.0 Apparatus:

1. Glass wares: Test tubes, Thiel's tube, Capillary.
2. Chemicals: Alcohol, Chloroform, Ether, Bromine water, Dilute ammonia solution, Dilute sulphuric acid, Barium chloride solution.

6.0 Structural formula of the drug:

(Student shall refer to I.P. and write)

7.0 Stepwise Procedure:**1. Procedure for Description:**

Observe the given drug critically for the following description. The drug is white or almost white niddle like crystals or crystalline powder.

2. Procedure for Solubility:

Perform solubility test in the different solvents. The drug is free soluble in a mixture of two volumes of chloroform and one volume of ethanol, sparingly soluble in boiling water and in alcohol (95%), slightly soluble in water, very slightly soluble in chloroform and practically insoluble in ether.

3. Procedure for Identification Tests:

- A. To 5 ml or 0.1% w/v solution of drug, add 2 to 3 drops of bromine solution and 1 ml of dilute ammonia solution, an emerald green colour is produced
- B. To saturated solution of drug add one drop of dilute sulphuric acid; a strong blue fluorescence is produced.

8.0 Observation Table:**Report on Identification tests on sample of Quinine Sulphate**

Sr. No.	Test	Observation	Inference*
1.	Description		
a)	Nature	.....	.....
b)	Colour	.....	.....
c)	Odour	.....	.....
2.	Solubility		
a)	Water	.....	.....
b)	Alcohol	.....	.....
c)	Chloroform	.....	.....
d)	Ether	.....	.....
e)	Mixture of Chloroform & Alcohol (2:1)	.....	.....
3.	Identification Tests		
a)	Test A	.....	.....
b)	Test B	.....	.....

*If observation is as per given in the procedure, then write “complies the test “; if not then write “does not comply the test”.

9.0 Result:

The given sample of Quinine Sulphate complies the tests __ __ __, (student shall write tests number from observation table) and does not comply the tests __ __ __ (student shall write tests number from observation table) for Identification as per I.P.

10.0 Pharmaceutical Category:

Anti-malarial

11.0 Questions:

Note: Write answers of the following Q., Q., Q. Q.,
(Question numbers to be allotted by the teacher)

1. Give chemical name of the drug.
2. Name the functional groups present in the drug.
3. Write two aspects of official monograph of quinine sulphate.
4. What are sources of quinine?
5. Define the term anti malarial
6. What is causative agent of malaria?
7. Give reason – Why quinine is 4- amino quinoline?
8. How malaria is treated?
9. Write four brand names of quinine sulphate
10. Write dose of quinine sulphate.
11. Explain the term “Drug resistance”.

12.0 Reference:

Indian Pharmacopoeia 1996, Page No.653.

(Space for Answers)

(Space for Answers)

Experiment No. 22

1.0 Title:

To synthesize Acetanilide from aniline and to find out its percentage practical yield and melting point.

2.0 Prior Concepts:

Basic organic reactions, Crude product, Melting point, Aromatic organic compounds.

3.0 New Concepts:

Proposition 1: Acetylation

Acetylation is a process in which the reactive hydrogen atom is replaced by $(-\text{COCH}_3)$ acetyl group.

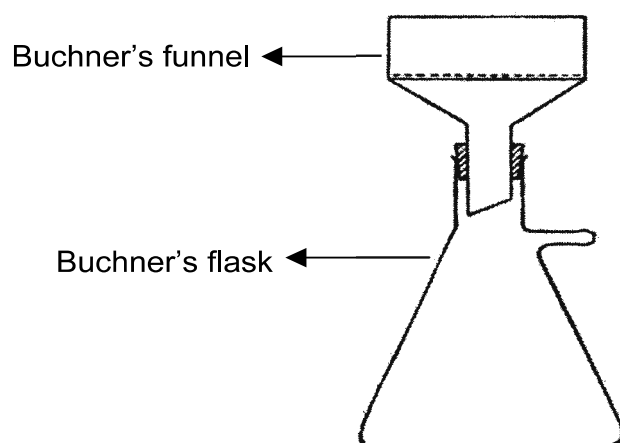
Primary amines react readily upon warming with acetic anhydride to give mono acetyl derivative. If heating is prolonged and excess of acetic anhydride is employed, variable amount of di-acetyl derivative are formed. However, di-acetyl derivatives are unstable in presence of water and undergo hydrolysis to mono acetyl derivative. Therefore when the mixture of mono and di-acetyl derivative is crystallized from an aqueous solvent like dilute alcohol, only the mono derivative is obtained.

Proposition 2: Synthesis

It is a process in which new product with unique structural formula, molecular weight, and melting point is produced with chemical reaction.

Proposition 3: Purification

Purification is the process of removing impurities from the product. Purification of product includes application of recrystallization, washing and drying the product in oven at a definite temperature for a desired period of time. Assembly of Buchner's funnel and flask:



Proposition 4: Recrystallization

Recrystallization is the process in which the compound is dissolved in selected solvent with heating and then cooled slowly to a saturated solution from which pure compound is crystallised out.

Proposition 5: Yield

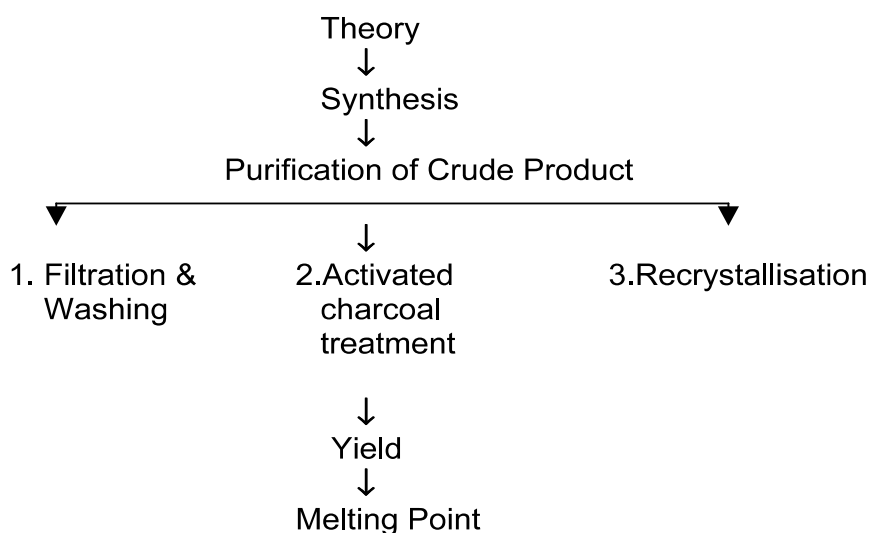
It is the quantity of the product obtained in the synthesis. They are: Theoretical yield, Practical yield and Percentage yield.

Theoretical Yield is the weight of the product that one should get based on the stoichiometric quantities of the reagents, assuming 100% completion of the reaction.

Practical Yield is the weight of the product actually obtained after purification of the product.

Percentage yield is calculated from the formula given below:

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

General Concept Structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand the concept of experiment.
2. To understand the precautions.
3. To plan the experiment.
4. To perform calculations.

4.2 Motor Skills:

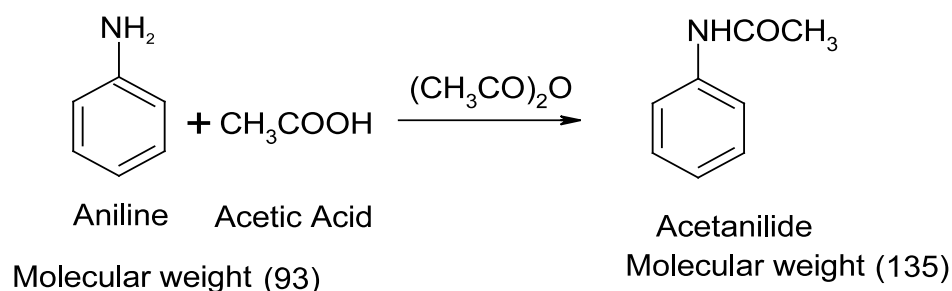
1. Ability to handle equipments, take and record observations.
2. Ability to work according to plan of the experiment
3. Ability of group working.

5.0 Apparatus:

1. Glassware: Round bottom flask (100 ml), Reflux condenser, Beaker (250 ml) Beaker (500 ml), Buchner's flask and funnel; Vacuum Pump, 100 ml measuring cylinder.
2. Chemicals: Aniline, Acetic acid, Acetic anhydride, Zinc dust, Ethyl alcohol.

6.0 Chemical Reaction:

Reaction Type: Acetylation



7.0 Stepwise Procedure:

1. Take 5.1 g (5 ml) of aniline in a 100 ml round bottom flask.
2. Add to it 5 ml of acetic acid, 5 ml of acetic anhydride and pinch of zinc dust.
3. Fix reflux condenser to the flask and reflux gently for 30 minutes.
4. Pour the mixture in about 100 ml of cold water with continuous stirring.
5. Filter and obtain white precipitate at filter pump and wash the precipitate with little cold water.
6. Carry out recrystallization by adding the product to about 120 ml of water containing 2 ml of rectified spirit or alcohol and boil till it dissolves and allow cooling.
7. Filter the product at pump and dry in oven at about 60°
8. Weigh accurately the yield of acetanilide obtained and determine melting point of the same.

Note : 1) Zinc reduces coloured impurities in aniline.

2) It helps to prevent oxidation of aniline during reaction.

8.0 Observations:

1. Amount of Aniline taken for synthesis = 5.1g
2. Practical yield of the recrystallised product = _____
3. Melting point of the product = _____

9.0 Calculations:

1. Theoretical Yield of the product: From the reaction,
As 93 g of Aniline gives 135 g of Acetanilide
5.1 g of Aniline will give 7.40 g of Acetanilide
2. Percentage Practical yield

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

$$= \text{_____} \%$$

10.0 Result:

1. Percentage yield of Acetanilide _____ %
2. Melting point of Acetanilide _____

11.0 Question:

Note: Write answers of the following Q., Q., Q....., Q.....
(Question numbers to be allotted by the teacher)

1. What is acetylation?
2. State the action of acetic anhydride on aniline?
3. Define "Theoretical yield."
4. Define "Practical Yield"
5. What is recrystallization?
6. What is purpose of recrystallization?
7. What are the reagents used for acetylation?
8. What is the significance of acetylation in organic synthesis?
9. State whether aniline is acidic/basic or neutral compound? State reason.
10. Give the function of zinc dust in the synthesis of acetanilide.

(Space for Answers)

(Space for Answers)

Experiment No. 23**1.0 Title:**

To synthesize Benzoic acid from benzamide and to find out its percentage practical yield and melting point

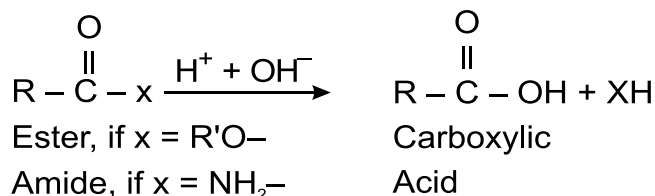
2.0 Prior Concepts:

Basic Organic reactions, Crude product, Melting point, Aromatic organic compounds.

3.0 New Concepts:**Proposition 1: Hydrolysis**

Hydrolysis is a process of breaking of a bond with addition of water molecule.

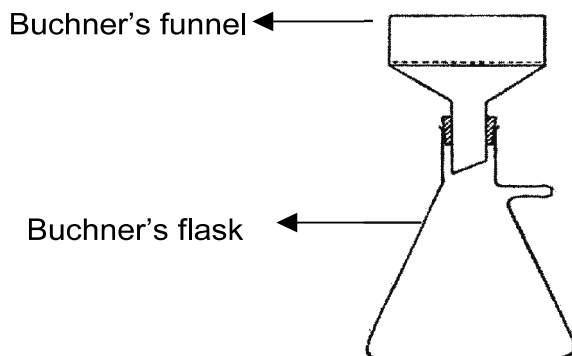
Functional derivatives of carboxylic acid like amides or esters can be hydrolysed in acidic or alkaline media to yield the carboxylic acid (in the form of salt) and ammonia/amine or alcohol/phenol. Hydrolysis of functional derivative of carboxylic acid is an example of nucleophilic substitution reaction.

**Proposition 2: Synthesis**

It is a process in which new product with unique structural formula, molecular weight, and melting point is produced with chemical reaction.

Proposition 3: Purification

Purification is the process of removing impurities from the product. Purification of product includes application of recrystallization, washing and drying the product in oven at a definite temperature for a desired period of time. Assembly of Buchner's funnel and flask:



Proposition 4: Recrystallization

Recrystallization is the process in which the compound is dissolved in selected solvent with heating and then cooled slowly to a saturated solution from which pure compound is crystallised out.

Proposition 5: Yield

It is the quantity of the product obtained in the synthesis. They are: Theoretical yield, Practical yield and Percentage yield.

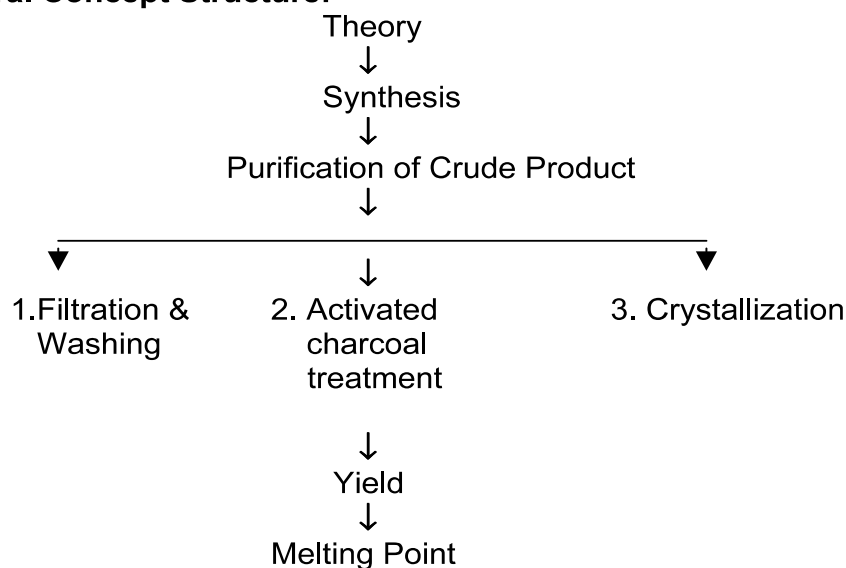
Theoretical Yield is the weight of the product that one should get based on the stoichiometric quantities of the reagents, assuming 100% completion of the reaction.

Practical Yield is the weight of the product actually obtained after purification of the product.

Percentage yield is calculated from the formula given below:

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

General Concept Structure:



4.0 Learning Objectives:

4.1 Intellectual Skills:

1. To understand the concept of experiment.
2. To understand the precautions.
3. To plan the experiment.
4. To perform calculations..

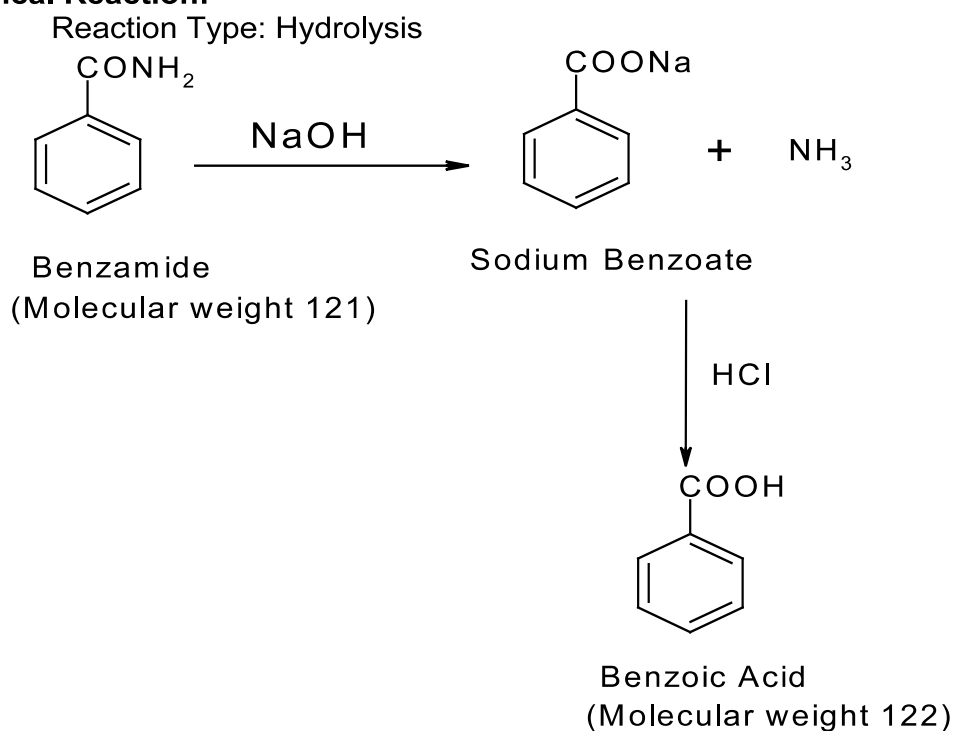
4.2 Motor Skills:

1. Ability to handle equipments, take and record observations.
2. Ability to work according to plan of the experiment
3. Ability of group working.

5.0 Apparatus:

1. Glassware: Round bottom flask (250 ml), Reflux condenser, Beaker (250 ml) Beaker (500 ml), Buchner's flask and funnel; Vacuum pump, 25 ml measuring cylinder.
2. Chemicals: Benzamide, Sodium hydroxide (10%) solution, Hydrochloric acid.

6.0 Chemical Reaction:



7.0 Stepwise Procedure:

1. Place 5 g of Benzamide and 75 ml of sodium hydroxide solution in 250 ml round bottom flask fitted with a reflux condenser.
2. Add few pieces of unglazed porcelain into the reaction mixture.
3. Boil the mixture gently for 30 minutes.
4. Cool the solution in ice-water mixture and add slowly conc. hydrochloric acid till the mixture is strongly acidic. A white product separates out immediately.
5. Cool the mixture in ice water for about 10 minutes and collect the product at Buchner funnel at pump.
6. Wash with cold water and drain.
7. Recrystallize by dissolving the product in minimum quantity of boiling water, filter the hot solution if necessary.

8. Allow to cool to room temperature. Practically colourless crystals of benzoic acid are obtained.
9. Collect the product at pump and dry.
10. Weigh accurately the yield obtained and determine melting point of the same.

8.0 Observations:

1. Amount of Benzamide taken for synthesis = 5 g
2. Practical yield of the recrystallised product= _____
3. Melting point of the product = _____

9.0 Calculations:

1. Theoretical Yield of the product.
From the reaction,

121 g of benzamide gives 122 g of benzoic acid
5 g of benzamide will give 5.04 g of benzoic acid

2. Percentage Practical Yield

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

$$= \text{_____} \%$$

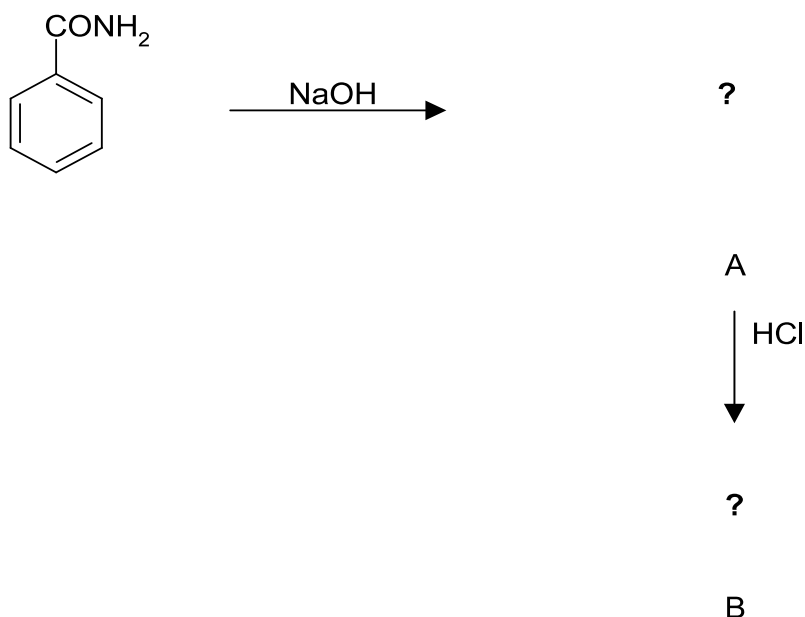
10.0 Result:

1. Percentage yield of Benzoic acid _____ %
2. Melting point of Benzoic acid is _____

11.0 Questions:

Note: Write answers of the following Q., Q., Q., Q.
(Question numbers to be allotted by the teacher)

1. What is Hydrolysis?
2. Complete the reaction



Name A & B. Write their structures.

3. Define the following terms.
 1. Theoretical yield
 2. Practical yield
 3. Percentage practical yield.
4. What is purpose of using reflux condenser?
5. Name the method used for purification of benzoic acid.
6. Name the organic reaction involved in preparation of benzoic acid. Write chemical reaction involved?
7. List official preparations of benzoic acid.
8. What are the uses of benzoic acid?
9. What is the use of sodium salt of benzoic acid i.e., sodium benzoate?
10. Give reason for addition of unglazed porcelain into the reaction mixture.

(Space for Answers)

(Space for Answers)

Experiment No. 24

1.0 Title:

To synthesize Phenyl benzoate from phenol and to find out its percentage yield and melting point.

2.0 Prior Concepts:

Basic organic reactions, Crude Product, Melting point. Aromatic organic compounds

3.0 New Concepts:

Proposition 1: Esterification

Esterification is the reactions of alcohols or phenols with acids or acid chlorides.

Reactions of acid chloride with phenols or alcohols are rapid, irreversible, while with acid, it is reversible and slow. The reaction of aromatic acid chloride with alcohol or phenol is carried out using Schotten- Baumann reaction. Acid chloride added in portions following by vigorous shaking to a mixture of hydroxyl compound and base (Sodium hydroxide) or pyridine.

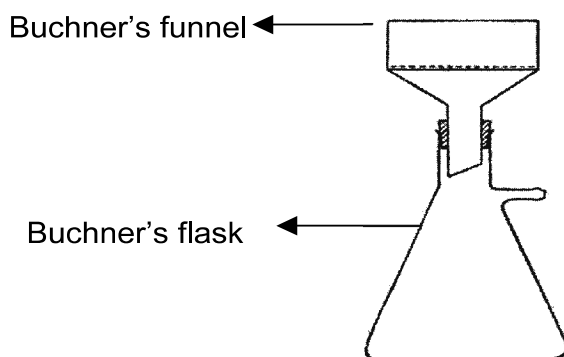
Although the function of base is not clear, it seems not only to neutralize the hydrochloric acid that would otherwise be liberated but also to catalyze the reaction.

Proposition 2: Synthesis

It is a process in which new product with unique structural formula, molecular weight, and melting point is produced with chemical reaction.

Proposition 3: Purification

Purification is the process of removing impurities from the product. Purification of product includes application of recrystallization, washing and drying the product in oven at a definite temperature for a desired period of time. Assembly of Buchner's funnel and flask:



Proposition 4: Recrystallization

Recrystallization is the process in which the compound is dissolved in selected solvent with heating and then cooled slowly to a saturated solution from which pure compound is crystallised out.

Proposition 5: Yield

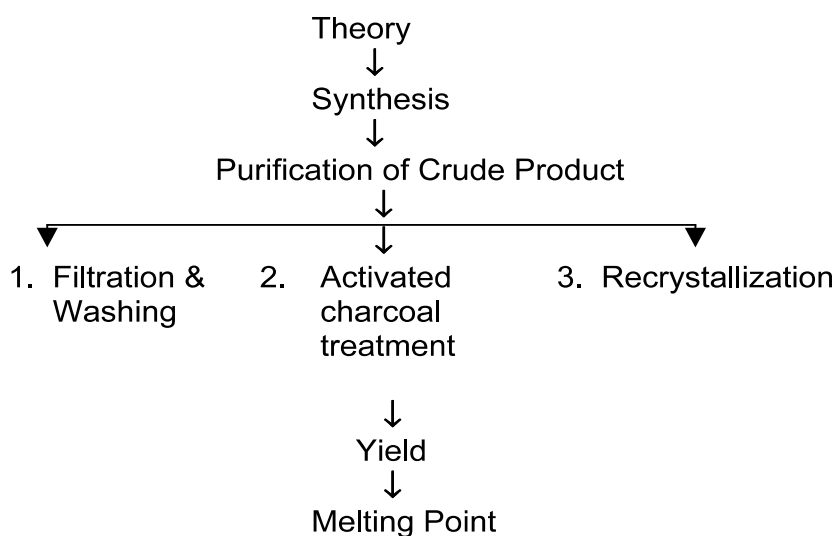
It is the quantity of the product obtained in the synthesis. They are: Theoretical yield, Practical yield and Percentage yield.

Theoretical Yield is the weight of the product that one should get based on the stoichiometric quantities of the reagents, assuming 100% completion of the reaction.

Practical Yield is the weight of the product actually obtained after purification of the product.

Percentage yield is calculated from the formula given below:

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

General Concept Structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand the concept of experiment.
2. To understand the precautions.
3. To plan the experiment.
4. To perform calculations.

4.2 Motor Skills:

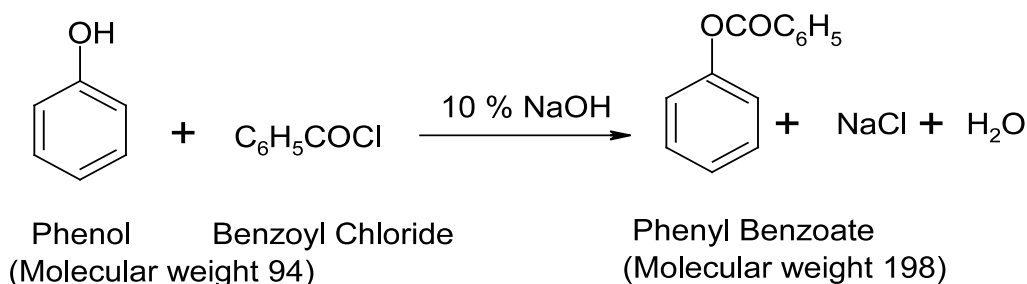
1. Ability to handle equipments, take and record observations.
2. Ability to work according to plan of the experiment
3. Ability of group working.

5.0 Apparatus:

1. Glass wares: 100 ml stoppered conical flask, Buchner's flask and funnel, Beakers, Theils tube, Capillary.
2. Chemicals: Phenol, Benzoyl chloride, Sodium hydroxide solution (10%), Alcohol.

6.0 Chemical Reaction:

Reaction Type: Esterification (Benzoylation)

**7.0 Stepwise Procedure:**

1. Place 2 g of phenol (or 2.5 ml of liquefied phenol) and 30 ml of sodium hydroxide solution in 100 ml stoppered conical flask.
2. Add 4 ml of Benzoyl chloride.
3. Stoppered the flask and shake vigorously for 15-20 minutes.
4. Collect the product on funnel at vacuum pump, wash with water and drain.
5. Recrystallise the product from alcohol, dry in air, weigh it and determine melting point.

Precautions:

1. Phenyl benzoate is lacrimating and irritating, in case of irritation wash eyes with water.
2. Addition of Benzoyl chloride should be done in fume cupboard.
3. Phenol is corrosive, handle it carefully.

8.0 Observations:

1. Amount of phenol taken for synthesis = 2 g
2. Practical yield of the recrystallised product= _____g
3. Melting point of the product = _____.

9.0 Calculations:

1. Theoretical Yield of the product.

From the reaction,

94 g of phenol gives 198 g of phenyl benzoate

2 g of phenol will give 4.21 g of phenyl benzoate

2. Percentage Practical Yield

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

$$= \underline{\hspace{2cm}} \%$$

10.0 Result:

1. Percentage yield of Phenyl benzoate is _____ %
2. Melting point of Phenyl benzoate is _____.

11.0 Questions:

Note: Write answers of the following Q....., Q....., Q., Q.
(Question numbers to be allotted by the teacher)

1. List the possible impurities in the crude product.
2. What is crude product?
3. Is it possible to get 100% percentage yield? Why?
4. What is the importance of this preparation?
5. How will you test presence of phenol in the crude product?
6. If the melting point of the product is not matching with that of phenyl benzoate, what inference will you draw?
7. What is the purpose of recrystallization?
8. What is Schotten-Baumann technique?
9. Give the reason of using sodium hydroxide in the reaction for the synthesis of phenyl benzoate?
10. Why stoppered conical flask is used in the synthesis?

(Space for Answers)

(Space for Answers)

Experiment No. 25

1.0 Title:

To synthesis of p- Bromoacetanilide from acetanilide and to find out its percentage practical yield and melting point.

2.0 Prior Concepts:

Basic organic reactions, Crude product, Melting Point, Aromatic organic compounds.

3.0 New Concepts:

Proposition 1: Bromination

Bromination is the process in which the reactive H atom is replaced by bromine atom.

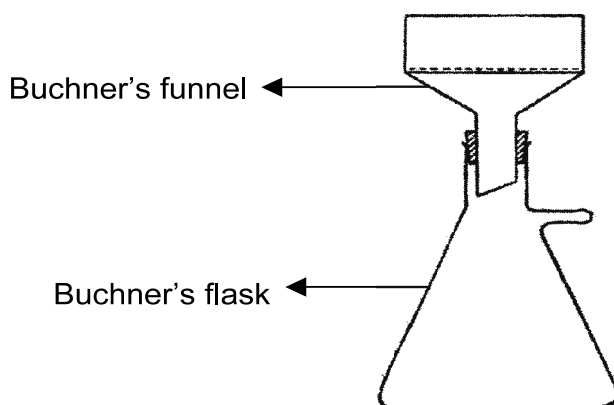
It is an electrophilic aromatic substitution. Monosubstituted product of primary aromatic amine cannot be easily obtained by direct addition of reagent for e.g. Bromination of aniline yields 2, 4, 6-tribromo derivatives. If amino group is protected as in acetanilide, mono-substitution can occur. Thus in a Bromination reaction with acetanilide, p-bromoacetanilide is main product. Very small quantity of ortho isomer is simultaneously formed. Hydrolysis of p-bromoacetanilide gives p-bromoaniline.

Proposition 2: Synthesis

It is a process in which new product with unique structural formula, molecular weight, and melting point is produced with chemical reaction.

Proposition 3: Purification

Purification is the process of removing impurities from the product. Purification of product includes application of recrystallization, washing and drying the product in oven at a definite temperature for a desired period of time. Assembly of Buchner's funnel and flask:



Proposition 4: Recrystallization

Recrystallization is the process in which the compound is dissolved in selected solvent with heating and then cooled slowly to a saturated solution from which pure compound is crystallised out.

Proposition 5: Yield

It is the quantity of the product obtained in the synthesis. They are:

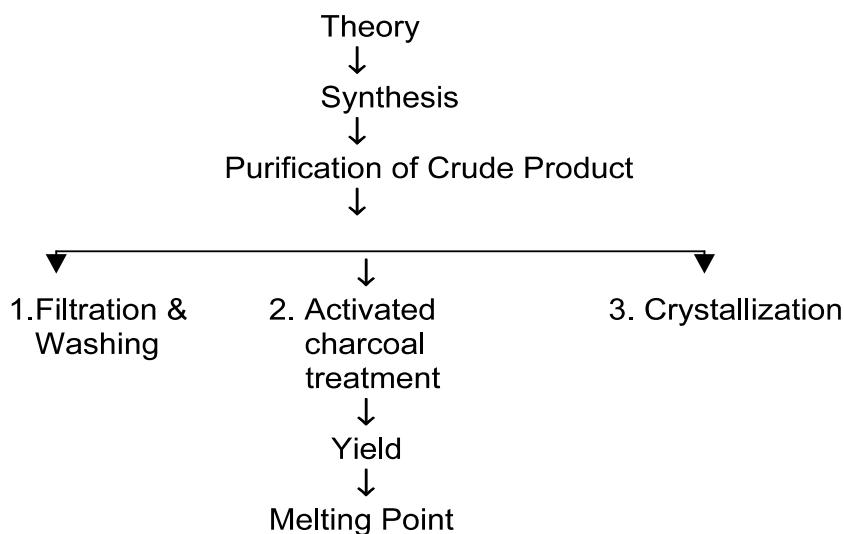
Theoretical yield, Practical yield and Percentage yield.

Theoretical Yield is the weight of the product that one should get based on the stoichiometric quantities of the reagents, assuming 100% completion of the reaction.

Practical Yield is the weight of the product actually obtained after purification of the product.

Percentage yield is calculated from the formula given below:

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

General Concept Structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand the concept of experiment.
2. To understand the precautions.
3. To plan the experiment.
4. To perform calculations.

4.2 Motor Skills:

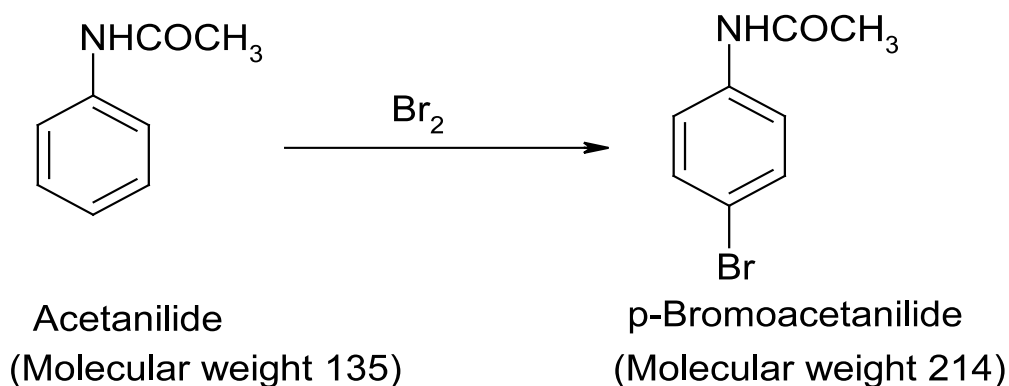
1. Ability to handle equipments, take and record observations.
2. Ability to work according to plan of the experiment.
3. Ability of group working.

5.0 Apparatus:

1. Glass wares: 2 Conical flasks, Beaker, Buchner's flask, Burette, Measuring cylinder, Rubber gloves.
2. Chemicals: Acetanilide, Bromine, water, Glacial acetic acid, Sodium sulphite, Alcohol.

6.0 Chemical Reaction

Reaction Type: Bromination



7.0 Stepwise Procedure:

1. In a Conical flask take 22.5 ml of glacial acetic acid and dissolve in it 6.7 g of finely powdered acetanilide.
2. In another conical flask take 12.5 ml of glacial acetic acid and dissolve in it 8.5 g (2.65 ml) of bromine. Fill this solution in burette.
3. Place the conical flask containing acetanilide solution in cold water.
4. From burette add gradually bromine solution to the conical flask containing acetanilide with constant stirring.
5. After adding all bromine solution, kept the final reaction mixture at room temperature for 30 minutes with occasional shaking.
6. Add the reaction mixture in conical flask in a beaker containing 200ml of water. Rinse the flask with 50 ml of water.
7. If the reaction mixture is coloured (yellow or orange) add sodium sulphite in small amount.
8. Filter the precipitate using Buchner's flask, wash thoroughly with cold water, press and dry with filter paper to remove as much water as possible.
9. Recrystallise synthesized drug from alcohol.
10. Determine the melting point of p-Bromoacetanilide and calculate yield.

8.0 Observation:

1. Quantity of Acetanilide taken for synthesis = 6.7 g
2. Practical yield of the recrystallised product= _____
3. Melting point of the product = _____

9.0 Calculations:

1. Theoretical Yield of the product.
From the reaction,

135 g of Acetanilide gives 214 g of p-Bromoacetanilide
6.7 g of Acetanilide will give 10.62 g of p-Bromoacetanilide

2. Percentage Practical Yield

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

$$= \text{_____} \%$$

10.0 Result:

1. Percentage yield of p-Bromoacetanilide is _____%
2. Melting point of p-Bromoacetanilide is _____⁰ C.

11.0 Questions:

Note: Write answers of the following Q., Q....., Q., Q.....
(Question numbers to be allotted by the teacher)

1. Why glacial acetic acid is used?
2. Why bromine solution added gradually?
3. State the name of reaction.
4. What is the purpose of addition sodium sulphite during synthesis?
5. List the possible impurities in the crude product.

(Space for Answers)

(Space for Answers)

Experiment No. 26

1.0 Title:

To synthesize Picric acid from phenol and to find out its percentage yield and melting point.

2.0 Prior Concepts:

Basic Organic reactions, Crude Product, Melting point. Aromatic organic compounds.

3.0 New Concepts:

Proposition 1: Nitration

Nitration is the process in which hydrogen atom is replaced by nitro group. (NO_2)

Phenol being an activated nucleus towards Electrophilic aromatic substitution the nitration, sulphonation or halogenation reaction occurs very easily. It undergoes nitration with dilute nitric acid even at room temperature.

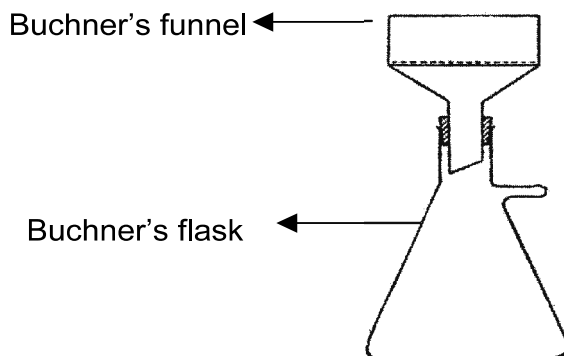
Phenols when treated with concentrated nitric acid in presence of concentrated sulphuric acid, undergoes nitration at both ortho and para position to give picric acid. It is better if phenol is first converted to phenol sulphonic acid by treatment with sulphuric acid and then nitrated with concentrated nitric acid, when the $-\text{SO}_3\text{H}$ (sulphonic acid) groups are replaced by $-\text{NO}_2$ (nitro) groups.

Proposition 2: Synthesis

It is a process in which new product with unique structural formula, molecular weight, and melting point is produced with chemical reaction.

Proposition 3: Purification

Purification is the process of removing impurities from the product. Purification of product includes application of recrystallization, washing and drying the product in oven at a definite temperature for a desired period of time. Assembly of Buchner's funnel and flask:



Proposition 4: Recrystallization

Recrystallization is the process in which the compound is dissolved in selected solvent with heating and then cooled slowly to a saturated solution from which pure compound is crystallised out.

Proposition 5: Yield

It is the quantity of the product obtained in the synthesis. They are:

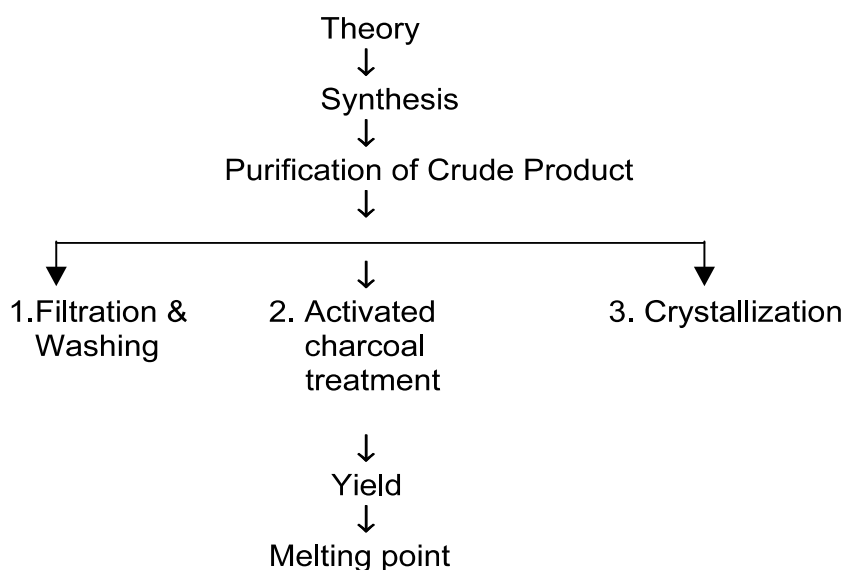
Theoretical yield, Practical yield and Percentage yield.

Theoretical Yield is the weight of the product that one should get based on the stoichiometric quantities of the reagents, assuming 100% completion of the reaction.

Practical Yield is the weight of the product actually obtained after purification of the product.

Percentage yield is calculated from the formula given below:

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

General Concept Structure:**4.0 Learning Objectives:****4.1 Intellectual Skills:**

1. To understand the concept of experiment.
2. To understand the precautions.
3. To plan the experiment.
4. To perform calculations.

4.2 Motor Skills:

1. Ability to handle equipments, take and record observations.
2. Ability to work according to plan of the experiment
3. Ability of group working.

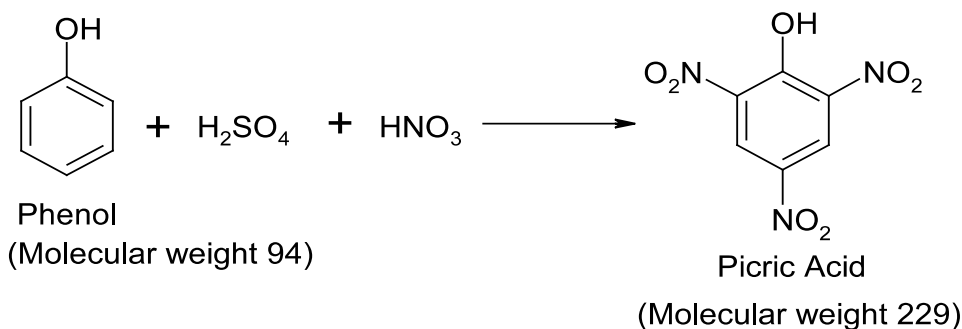
5.0 Apparatus:

1. Glassware: Flat bottom flask (500 ml), Condenser, Beaker (250 ml) Beaker (500 ml), Buchner's flask and funnel; Vacuum pump, 25 ml measuring cylinder, 10 ml graduate pipette, Thiel's tube, Capillary.

2. Chemicals: Phenol, Con. Sulphuric acid, Con. Nitric acid, Alcohol : Water mixture (2:1), Ice.

6.0 Chemical Reaction:

Reaction Type: Nitration



7.0 Stepwise Procedure:

1. Weigh 4 g of phenol (or take 5.0 ml of liquefied phenol) and place in 500 ml flat bottom flask.
2. Add 5.0 ml Con. sulphuric acid and mix thoroughly. As the reaction is exothermic, mixture becomes warm.
3. Heat the flask on water bath for 30 minutes to complete the formation of phenol sulphonic acid. Cool the flask thoroughly in ice-water mixture.
4. Place the flask on wooden surface in fume cupboard and add immediately 15 ml of con nitric acid and mix thoroughly by shaking for few seconds.
5. A vigorous reaction take place and harmless red nitrous fumes comes out from the flask.
6. After the reaction subsides, heat the flask on boiling water bath for 1-2 hours with constant shaking. Initially a heavy oily layer is formed, which gets converted to crystalline mass.
7. Add about 50 ml cold water and chill the mixture in ice-cold water.
8. Collect the product on Buchners funnel by vacuum filtration, wash thoroughly with cold water till free from acidity and drain completely.
9. Recrystallise the product from alcohol water mixture (2:1) (about 50 ml solvent is required).
10. Filter off the crystalline material at pump and dry by pressing between filter paper.

- Precautions:**
1. Sulphuric acid and nitric acid are very strong acids and corrosive; therefore handle them carefully to avoid acid burns.
 2. Perform the reaction in fume cupboard.
 3. Do not dry the product in oven.

8.0 Observations:

1. Amount of phenol taken for synthesis = 4 g
2. Practical yield of the recrystallised product = _____
3. Melting point of the product = _____

9.0 Calculations:

1. Theoretical Yield of the product.
From the reaction,

94 g of phenol gives 229g of picric acid
4 g of phenol will give 9.74 g of picric acid

2. Percentage Practical Yield

$$\% \text{ Yield} = \frac{\text{Practical Yield}}{\text{Theoretical Yield}} \times 100$$

$$= \text{_____} \%$$

10.0 Result:

1. Percentage yield of Picric acid _____ %
2. Melting point of Picric acid is _____

11.0 Questions:

Note: Write answers of the following Q., Q, Q, Q.....
(Question numbers to be allotted by the teacher)

1. What is the chemical name of the product?
2. Give use of picric acid.

3. What is the use of sulphuric acid in nitration process?
4. What is electrophilic substitution?
5. How phenol is activated nucleus for nitration?
6. Give the product of nitration of phenol with dilute nitric acid at room temperature?
7. Phenols are acidic/basic or neutral? Give reason.
8. What is nitronium ion? How it is produced in the nitrating mixture (nitric acid+sulphuric acid)
9. Why nitration is usually carried out at lower temperature?
10. What care shall be taken while handling concentrated sulphuric acid and nitric acid?
11. What is electrophile? Mention two more electrophiles.

(Space for Answers)

Experiment No.27**1.0 Title :**

To visit chemical/analytical laboratory and to write report of it.

2.0 Prior Concepts:

Chemical/Analytical Laboratory, Chemicals, Equipments/Instruments

3.0 New Concepts:**Proposition : Chemical/analytical laboratory visit**

It is an educational visit made to chemical/analytical laboratory with learning objectives which helps to correlate theoretical knowledge

4.0 Learning Objectives:**4.1 Intellectual Skills:**

- 1) To understand concept of laboratory visit.
- 2) To plan the visit.

4.2 Motor Skills:

- 1) Ability to write systematic visit report.
- 2) Ability to handle equipment, take and record observations.
- 3) Ability to work according to the plan of the visit.
- 4) Ability of group working.

5.0 Procedure:

Students shall learn and report on the following aspects:

1. Name of Laboratory
2. Address & year of establishment
3. Layout of Laboratory
4. Organisation Chart
5. Qualification of staff
6. Services/Processes delivered by Laboratory
7. Equipments/Instruments with specifications and uses
8. Chemical/Reagents used in Laboratory
9. Standard Operating Procedures
10. Good Laboratory Practices
11. Documentation/Reports
12. Library/Books
13. Use of Computers

- 14. Safety arrangements
- 15. First-Aid care
- 16. Foreign collaboration/Export.
- 17. Certification-ISO etc.

6.0 Result (report):

Date of visit: -

Name of Laboratory:-

Signature and Name of Student

Experiment No.28**1.0 Title**

To prepare and submit computerized report of Expt No..... (any one organic compound from D1 to D10) of Systematic Qualitative Analysis.

2.0 Prior Concepts:

Analytical Report

3.0 New Concept :**Proposition :Computerized Analytical Report**

Report of analysis of unknown organic compound done by Systematic Qualitative Analysis is prepared with the help of computer.

4.0 Learning objectives:**4.1Intellectual Skills:**

- 1) To understand concept of the experiment.
- 2) To understand test procedure.

4.2Motor Skills:

- 1) Ability to write systematic analytical report.
- 2) Ability to handle equipment, take and record observations.

5.0 Apparatus

Computer

6.0 Procedure:

Student shall write the report with the help of computer in the following format and attach it after this page

1) Compound Code

2) Analytical Report:

A)Preliminary Test: (Student should report only positive tests)

- a)
- b)
- c)
- d)
- e)
- f)
- g)

B) Physical Constant: Melting / Boiling Point.....

C) Elemental Analysis: The compound contains C, H, [O] andelements.

D) Functional Group Analysis: The compound containsandfunctional groups.

E) Confirmative Test

Result:

Therefore the given compound with code _____ is confirmed as _____.

Date:

Signature and Name of Analyst

GUIDELINES FOR ANNUAL PRACTICAL EXAMINATION

Sub: Pharmaceutical Chemistry-II
Class: S.Y.D.Pharm

Max Marks: 80
Time: 3 Hrs.

Note: Students should take signature of the examiner on the observations and conclusions immediately after performing the tests.

Q. No. 1 Synopsis

Marks: 20
Time: 20 Min.

(Details are given on the next page)

Q.No.2 Major Experiment:

Marks: 30
Time: 1½ Hrs.

Perform and report Systematic Qualitative Analysis of the given organic compound, supplied to you in _____ a bearing your Exam Seat No./Table No.

Carry out characteristic tests, specific colour reactions or prepare derivative of the given compound.

(Details are given on next page)

Q.No.3 Minor Experiment:

Marks: 20
Time: 1 Hr.

Perform and report official tests for identification for the given drug, supplied do you in a _____ bearing your Exam Seat No. / Table No.

(Details are given on next page)

OR

Prepare and submit _____

Report I) Practical yield of the recrystallised product.

II) Percentage yield of the recrystallised product.

III) Melting range/temperature of the recrystallised product.

(Details are given on next page)

Q.No. 4 Viva-voce

Marks: 10

Details of Q. No. 1 Synopsis

- I) In the synopsis five questions should be asked, each carrying four marks.
- II) Guidelines for questions for synopsis:
- a. One question should be based on detection of elements e.g. Give procedure and equations for the detection of I) Nitrogen & II) Sulphur.
OR
Give theory and procedure for sodium fusion test.
 - b. Write structure of functional group and give tests for detections of the functional groups (Two functional groups)
OR
Explain the following chemical reactions (Four reactions)
I) Diazotisation II) Barfoed's Test III) Nitration IV) Acetylation etc.
 - c. Give structure and uses of drugs (Two drugs)
OR
Define category of drug and give structure of the drug belonging to the category (Two category)
 - d. Give theory and reactions involved in the synthesis of the compound.
OR
Give reaction for the synthesis of _____ and calculate theoretical yield for the synthesis of the compound from _____ gm of _____
 - e. Give structure and one chemical test for identity for _____.

Details of Q. No. 2 Major Experiment

List of organic compounds for Q. No. 2 is given on page No. xiii

Details of Q. No. 3 Minor Experiment

Test for Identification: -

- i) Report whether the given sample of drug complies or does not comply the tests as per I.P.
- ii) Following aspects of official test should perform from I.P. Monograph of the given drug.
 - a) Description b) Solubility & c) Identification tests including physical constant, wherever applicable.

List of drugs/chemical substances for identification test is given on page No. xiii

Simple Preparations: -

List of simple preparations to be prepared is given on Page No.xiii

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) |

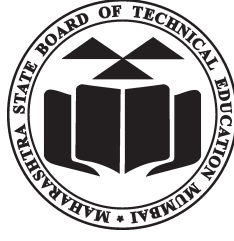
Second Year

- | | |
|-----------------------------------|--------|
| 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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