East Point College of Pharmacy

East Point Campus, Jnana Prabha, Virgo
Nagar PostBengaluru – 560049, Karnataka

Approved
by
Pharmacy Council of India, New Delhi

Affiliated
to
Rajiv Gandhi University of Health SciencesKarnataka
Bengaluru – 560041 India

LAB MANUAL

MEDICINAL CHEMISTRY-I

B. PHARM 4th SEMESTER

EAST POINT COLLEGE OF PHARMACY
East Point Campus, Jnana Prabha, Virgo Nagar Post,
Bengaluru – 560049, Karnataka

B Pharmacy

Program Outcomes (PO's)

PO 1- Pharmacy Knowledge
Possess knowledge and comprehension of the core and basic knowledge associated with theprofession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.
PO 2- Planning Abilities
Demonstrate effective planning abilities including time management, resource management,delegation skills and organizational skills. Develop and implement plans and organize workto meet deadlines.
PO 3- Problem analysis
Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, whilesolving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions
PO 4- Modern tool usage
Learn, select, and apply appropriate methods and procedures, resources, and modernpharmacy-related computing tools with an understanding of the limitations.
PO 5- Leadership skills
Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
PO 6- Professional Identity
Understand, analyse and communicate the value of their professional roles in society (e.g.health care professionals, promoters of health, educators, managers, employers, employees).
PO 7- Pharmaceutical Ethics
Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability in values,communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions
PO 8- Communication
Communicate effectively with the pharmacy community and with society at large, such as,being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions
PO 9- The Pharmacist and society
Apply reasoning informed by the contextual knowledge to assess societal, health, safety andlegal issues and the consequent responsibilities relevant to the professional pharmacy practice.
PO 10- Environment and sustainability
Understand the impact of the professional pharmacy solutions in societal and environmentalcontexts, and demonstrate the knowledge of, and need for sustainable development.
PO 11- Life-long learning
Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Programme Specific Outcomes (PSO's)	
PSO 1	Acquire a thorough foundational knowledge in pharmaceutical sciences, including pharmacology, pharmaceutics, medicinal chemistry, and pharmacognosy, to excel in further academic pursuits
PSO 2	Gain expertise in the application of contemporary pharmaceutical techniques and technologies, enhancing employability across various sectors including the pharmaceutical industry, academia, and research institutions.
PSO 3	Equip with entrepreneurial skills and knowledge of pharmaceutical business management, including market analysis, product development, regulatory affairs, and financial planning, to initiate and run successful ventures in the pharmacy sector

Course Outcomes (CO's)	
Code: BP406P Medicinal Chemistry-I	
CO 1	To know the principle, reaction, and procedure involved in the preparation of medicinal compounds and the assay of medicinal compounds with their uses and properties.
CO 2	Synthesize medicinal compounds and able to calculate the percentage of yield in synthesis.
CO 3	Able to calculate the normality, molarity, percentage purity in the assay.
CO 4	Oral assessment of principle, the reaction involved in the preparation of medicinal compounds and an assay of medicinal compounds with its uses and properties.

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EXPERIMENTS INVOLVING DETERMINATION OF PERCENTAGE PURITY

EAST POINT COLLEGE OF PHARMACY
East Point Campus, Jnana Prabha, Virgo Nagar Post,
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Experiment No:1

ASSAY OF ASPIRIN

Aim: To carry out the assay of Aspirin.

REFERENCE:

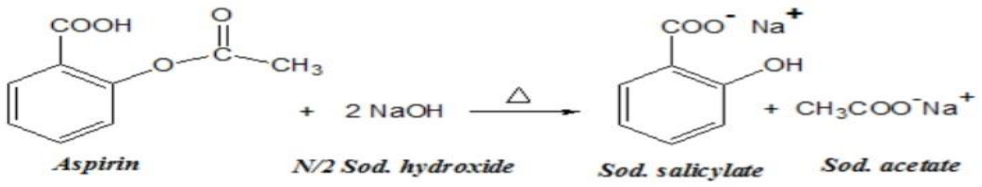
1. A textbook of Medicinal Chemistry-I, Pragi Arora, Varun Arora, Davinder Kumar, Page no:282,283.
2. Indian Pharmacopoeia Volume I 1996, Page No:69,70.
3. Pharmaceutical titrimetric analysis theory and practical, A.A Napoleon, Page No:11-17.

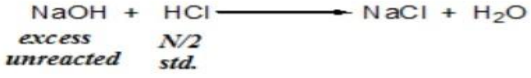
REQUIREMENTS:

Aspirin, Sodium hydroxide solution (0.5N), Hydrochloric acid (0.5N), Phenol red indicator, Burette, Conical flask, Funnel, Beaker, etc.

PRINCIPLE

Aspirin or Acetyl salicylic acid is an example of analgesic and antipyretic, which is widely used in the management of pain. It is estimated by acidimetry and alkalimetry. Its determination depends upon the alkaline hydrolysis of aspirin to acetic acid and salicylic acid, followed by back titration of the excess alkali using phenol red as indicator. A blank determination is needed in this assay.





PROCEDURE:

a) STANDARDIZATION OF 0.5M HYDROCHLORIC ACID

Weighed accurately 0.75g of Anhydrous sodium carbonate previously heated at 270^0C. Dissolve in 100 ml of water and added 0.1ml of methyl red solution. Added the titrant slowly from the burette with constant stirring until the solution becomes faintly pink. Heated the solution. Cool and continue.If pink colour fades on heating continue this process until a faint pink colour is no longer affected by continous boiling.

Each ml of 0.5N HCl = 0.026495g of Na_2CO_3

b) ASSAY OF ASPIRIN

Weighed accurately 1.5g of aspirin and dissolved in 15ml ethanol added 50ml of 0.5N sodium hydroxide boil gently for 10 minutes, cool, and titrated the excess alkali with 0.5N HCl using phenol red solution as indicator. Perform a blank determination of the difference between the titration represent the volume of sodium hydroxide consumed.

Each ml of 0.05N NaOH = 0.04504g of C_9H_8O

Report:

The normality of HCl was found to be .....N

The percentage purity of Aspirin was found to be .....%

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Experiment No:2

ASSAY OF PHENOBARBITONE

Aim: To perform the Assay of Phenobarbitone.

REFERENCE:

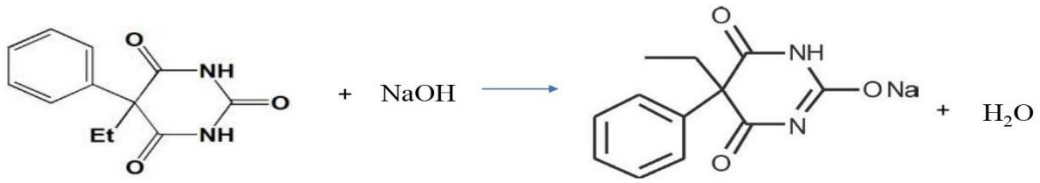
1. A textbook of Medicinal Chemistry-I, Pragi Arora, Varun Arora, Davinder Kumar, Page no:282,283.
2. Indian Pharmacopoeia Volume III 2018, Page No:2899,2900.

REQUIREMENTS:

Sodium hydroxide, aldehyde-free ethanol, benzoic acid, thymolphthalein solution, silver nitrate, pyridine and ether, conical flask, burette, beaker, pipette etc.

PRINCIPILE:

Phenobarbitone is assayed by non-aqueous titration. In this method, drug is dissolved in the pyridine and titrated with sodium hydroxide solution using thymolphthalein as an indicator.



Phenobarbital — Phenobarbitone sodium

PROCEDURE:

a) STANDARDISATION OF SODIUM HYDROXIDE SOLUTION

Weighed 0.6g of benzoic acid and dissolved in a mixture of 30 ml of ethanol and 6ml of water and titrated with ethanolic sodium hydroxide solution using 0.2ml of thymolphthalein as an indicator.

b) ASSAY OF PHENOBARBITONE

Weighed and powdered 20 tablets. Weighed a quantity of the powder containing about 0.1g (100 mg) of phenobarbitone in 5ml of pyridine added 0.25 ml of thymolphthalein solution

and 10 ml of silver nitrate pyridine reagent and titrated with 0.1M ethanolic sodium hydroxide until a purely blue colour is obtained. Repeated the operation without the substance under examination. The difference between the titrations represents the amount of sodium hydroxide required.

Equivalent factor: 1ml of 0.1M ethanolic sodium hydroxide=0.01161g of $C_{12}H_{12}N_2O_3$

CALCULATION

a) Standardization of 0.1M Sodium hydroxide solution

$$\textbf{Molarity of NaOH} = \frac{\textbf{Weight (W)}}{\textbf{Mol weight of benzoic acid (122.12) X Volume (V)}}$$

Where,

W = Weight of benzoic acid (g)

V = Volume of NaOH solution consumed

b) Determination of Phenobarbitone

$$\% \text{ purity of phenobarbitone} = 0.01161 \times \frac{V \times \text{Molarity (Calculated)} \times 100}{\text{Molarity (given)} \times W}$$

Where,

Molarity (calculated) = Molarity obtained from step (a)

V= Volume of Sodium hydroxide used

0.01161 is the equivalent factor

Molarity (given) = 0.1M

Weight of the sample -X g

Report

The normality of NaOH was found to be .....N

The percentage purity of Phenobarbitone was found to be .....

Experiment No:3

ASSAY OF FUROSEMIDE

Aim: To carry out the Assay of furosemide tablets.

REFERENCE:

1. A textbook of Medicinal Chemistry-I, Pragi Arora, Varun Arora, Davinder Kumar, Page no:288,289.
2. Indian Pharmacopoeia Volume III 2018,Page No:2899,2900.

REQUIREMENTS:

Furosemide, dimethyl formamide, sodium hydroxide, bromothymol blue indicator,0.1N oxalic acid, Phenolphthalein indicator, conical flask, burette, beaker, funnel, etc.

PRINCIPLE

It is assayed by aqueous acid-base titration between weak acid furosemide and strong alkali sodium hydroxide. In this assay, protophilic solvent dimethyl formamide is used which enhances the acidity of furosemide so that it can be titrated with sodium hydroxide. To make the effect of acid impurities present negligible a solvent blank determination is carried out.

PREPARATION AND STANDARDIZATION OF STANDARD SOLUTIONS

a) SODIUM HYDROXIDE, XM

Solutions of any molarity xM may be prepared by dissolving 40x g of Sodium hydroxide in sufficient water to produce 1000ml.

b) STANDARDIZATION OF 0.1M SODIUM HYDROXIDE SOLUTION

Weighed accurately about 5g of potassium hydrogen phthalate previously dried at 120^0C for two hours dissolved in 75ml of carbon dioxide-free water. Added 0.1ml of phenolphthalein solution and titrate with the sodium hydroxide until a permanent pink color is produced.

Each ml of 0.1M NaOH is equivalent to 0.02042g of potassium hydrogen phthalate.

PROCEDURE:

ASSAY METHOD BY (NEUTRALIZATION TITRATION)

Weighed and powdered 20 tablets and accurately a quantity of powder equivalent to 0.5g and dissolved in 40ml of dimethyl formamide and titrated with 0.1M sodium hydroxide using bromothymol blue as an indicator the end point shows the colour change from yellow to blue. Carry out a blank titration.

Report

The normality of NaOH was found to be .....N

The percentage purity of Furosemide was found to be .....%

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Experiment No: 4

ASSAY OF IBUPROFEN

Aim: To carry out the assay of Ibuprofen tablet

REFERENCE:

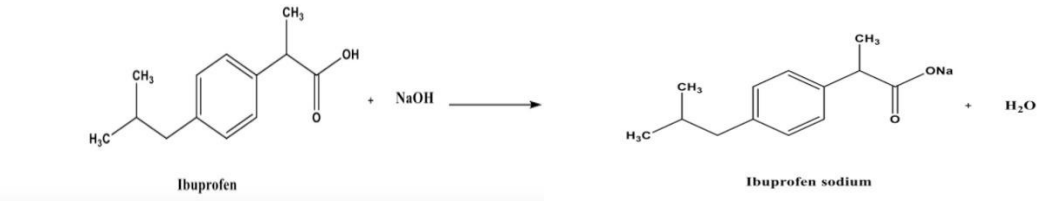
1. Indian Pharmacopoeia 2018 page no:2261-65.

REQUIREMENTS:

Ibuprofen,0.1N sodium hydroxide solution, phenolphthalein indicator, 0.1N oxalic acid solution, conical flask, burette, beaker etc.

PRINCIPLE:

Ibuprofen is determined by neutralization titration in which free carboxylic group is titrated with sodium hydroxide solution using phenolphthalein indicator. The amount of sodium hydroxide consumed in the reaction indicates the amount of ibuprofen present in the sample.



Ibuprofen Ibuprofen sodium

PROCEDURE:

PREPARATION AND STANDARDIZATION OF STANDARD SOLUTIONS

SODIUM HYDROXIDE,XM

Solutions of any molarity xM may be prepared by dissolving 40x g of Sodium hydroxide in sufficient water to produce 1000ml.

STANDARDIZATION OF 0.1M SODIUM HYDROXIDE SOLUTION

Weighed accurately about 5g of potassium hydrogen phthalate previously dried at 120^0C for two hours dissolve in 75ml of carbon dioxide free water. Added 0.1ml of phenolphthalein solution and titrate with the sodium hydroxide until a permanent pink color is produced.

Each ml of 0.1M NaOH equivalent to 0.02042g of potassium hydrogen phthalate.

Phenolphthalein solution

A 1.0%w/v solution of phenolphthalein in Ethanol (95%).

PROCEDURE:

Weighed and powdered 20 tablets. Weighed a quantity of powder containing about 0.4g of ibuprofen, dissolve in 100ml of ethanol (95%) and titrated with 0.1M sodium hydroxide using 0.2ml of phenolphthalein solution as indicator. Perform a blank determination and make necessary correction.

Each ml of 0.1 M sodium hydroxide is equivalent to 0.02063 g of $C_{13}H_{18}O_2$

Report

The normality of NaOH was found to be .....N
The percentage purity of ibuprofen was found to be.....%

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Experiment No: 5

ASSAY OF CHLORPROMAZINE

Aim: To carry out the Assay of Chlorpromazine.

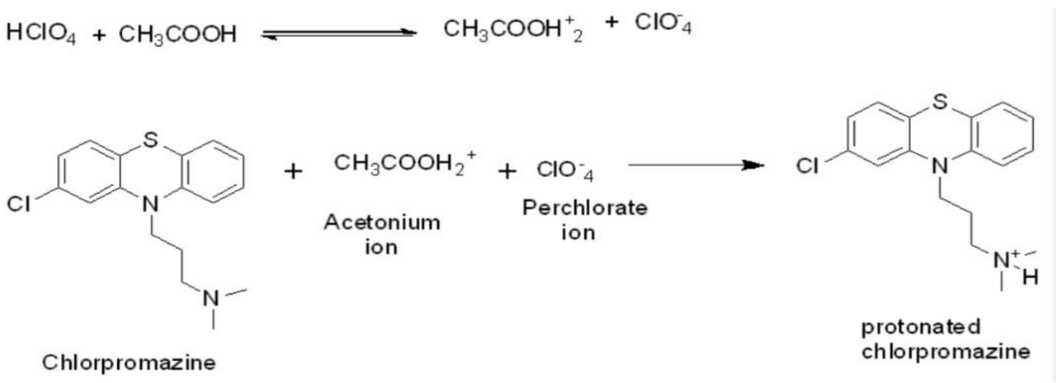
REFERENCE: Indian Pharmacopoeia 2018 page no:1600-01.

REQUIREMENTS:

Perchloric acid (0.1M), Chlorpromazine, mercuric acetate solution (5% w/v in acetic acid),crystal violet solution (0.2%w/v in acetic acid), acetone, methyl orange indicator, conical flask, burette, beaker, potassium hydrogen phthalate, glacial acetic acid, crystal violet indicator.

PRINCIPLE:

Chlorpromazine is estimated by non-aqueous titration which is suitable for titration of weak acid and weak base. In this non-aqueous solvent like perchloric acid is utilized as a titrant and methyl orange is used as an indicator. Mercuric acetate is added in the non-aqueous titration in order to remove the chloride ions. So as to prevent the interference of the chloride ion released by the titrant. The mercuric acetate replaces the halide ion in chlorpromazine with acetate ion which is a strong base. The endpoint is indicated by the appearance of blue colour.



PROCEDURE:

a) STANDARDISATION OF PERCHLORIC ACID (0.1N)

Dissolved 0.5g of potassium hydrogen phthalate in 25ml of glacial acetic acid and added few drops of 5%w/v crystal violet indicator. Titrated the solution with 0.1N perchloric acid till blue green colour appears.

b) ASSAY OF CHLORPROMAZINE

Weighed accurately about 0.6g and dissolved in 200 ml of acetone. Added 15ml of mercuric acetate solution. Titrated with 0.1M perchloric acid, using a saturated solution of methyl orange in acetone as indicator. Perform a blank determination and make a necessary correction.

Each ml of 0.1M perchloric acid equivalent to 0.03553g of $C_{17}H_{19}ClN_2S,HCl$

Report

The normality of NaOH was found to be .....N
The percentage purity of ibuprofen was found to be.....%

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Experiment No: 6

ASSAY OF ATROPINE

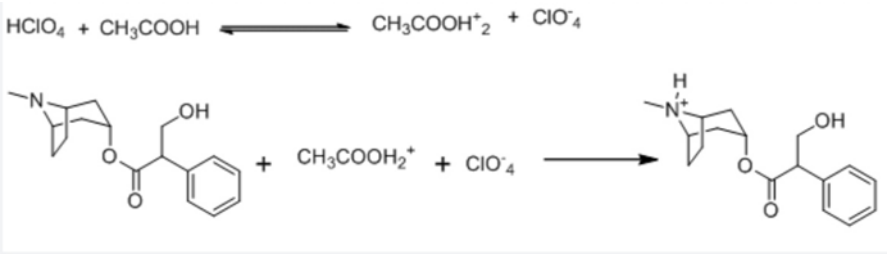
Aim: To carry out the assay of atropine.

REFERENCE:

1. Indian Pharmacopoeia 2018 page no:1600-01.
2. A textbook of Medicinal Chemistry-I, Pragi Arora, Varun Arora, Davinder Kumar, Page no:281,282

REQUIREMENTS:

Perchloric acid (0.1M), Atropine, glacial acetic acid, crystal violet solution (0.2%w/v in acetic acid), acetone, methyl orange indicator, conical flask, burette, beaker.



PRINCIPLE:

Atropine is assayed by non-aqueous titration which is generally used for the titration of weak acid with weak base. In this titration non-aqueous solvent perchloric acid is used and crystal violet is used as an indicator. At the endpoint, the blue colour is obtained.

PROCEDURE:

a) **STANDARDISATION OF PERCHLORIC ACID (0.1N)**

Dissolved 0.5g of potassium hydrogen phthalate in 25 ml of glacial acetic acid and a few drops of 5%w/v crystal violet indicator. Titrated the solution with 0.1N perchloric acid till a green colour appears.

b) ASSAY OF ATROPINE

Weighed accurately 400mg of atropine dissolved in 50ml of glacial acetic acid and added a drop of crystal violet indicator. Titrated this solution with 0.1N perchloric acid until the green color is obtained endpoint.

1 ml of 0.1M perchloric acid is equivalent to 0.06768 g of ($C_{17}H_{23}NO_3$), H_2SO_4

Report

The molarity of perchloric acid was found to be.....M

The percentage purity of Atropine was found to be.....%

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DETERMINATION OF PARTITION COEFFICIENT

Experiment No:7

DETERMINATION OF PARTITION COEFFICIENT OF BENZOIC ACID BETWEEN BENZENE AND WATER

Aim : To determine partition coefficient of benzoic acid between benzene and water.

REFERENCE:

1. Medicinal chemistry – I, Mrs Sheethal V.Patil, Mrs.Swati G.Patil, Dr.Sunila T.Patil, Dr.Md.Rageeb, Md.Usman page no:270-272.
2. Textbook of Practical chemistry 2008,K.S mukherjee, Page no:293.

REQUIREMENTS:

Separating funnel(250ml),conical flask ,pipette, burette, stoppered bottle, Saturated solution of benzoic acid in benzene,benzene,0.01N NaOH, 0.1N NaOH and distilled water.

PRINCIPLE:

When a solute is shaken with two immiscible solvents it gets distributed between the solvents. This distribution of solute in two solvents depends on the solubility of the solute in two solvents. At the distribution equilibrium, the ratio of concentration of the solute in the two solvents is constant at a given temperature. The constant is called partition coefficient (K) or the distribution coefficient of the solute between the two solvents.

PROCEDURE:

Prepared the following mixtures in separating funnels:

Set I: 25ml water + 25ml of saturated solution of benzoic acid in benzene.

Set II: 25ml water + 20 ml saturated solution of benzoic acid in benzene + 5ml benzene.

Set III: 25ml water + 15ml saturated solution of benzoic acid in benzene + 10ml benzene.

Shake the mixture in the separating funnel vigorously for about 30 minutes so that the benzoic acid gets distributed between the two solvents and the distribution equilibrium is reached.

Allowed the flasks to stand for 10 minutes to separate into two clear layers (removed the stopper of the separating funnel and keep its mouth open during this period to facilitate the separation). Drain off the lower aqueous layers in 3 different stoppered dry bottles. (Discard the intermediate layer between the two phases).Benzene layer remains in the separating funnels. Using a dry pipette take 5ml of organic layer (Benzene) into a conical flask containing 10ml of water and titrate against 0.1N NaOH using Phenolphthalein as an indicator. The end point is indicated by the color change from colorless to pink. Pipette out 10ml of the aqueous layer using dry pipette and titrate it against NaOH solution using phenolphthalein as an indicator. End point is indicated by the color change from colorless to pink.

OBSERVATION

Set No.	V_{org}	V_{aq}	$N_{org} = C_{org}$	$N_{aq} = C_{aq}$	K	$\log C_{org}$	$\log C_{aq}$

Mean partition coefficient (K) =

Where,

V_{org} = Volume in ml of 0.1N Sodium hydroxide per 5ml of organic layer

V_{aq} = Volume in ml of 0.1N Sodium hydroxide per 5ml of aqueous layer

N_{org} = Normality of organic layer

N_{aq} = Normality of aqueous layer

C_{org} = Concentration of organic layer in g mole/lit

C_{aq} = Concentration of aqueous layer in g mole/lit

$K = C_{aq} / (C_{org})^{1/2}$ = Partition coefficient of benzoic acid in water and benzene

CALCULATIONS

Set I:

For organic layer

Normality of NaOH (N_1=0.1N)

The volume of Organic layer pipetted (V_2) = 5ml

N_1V_1 (Sodium hydroxide) = N_2V_2 (Organic layer)

$$N_2 = \frac{0.1 \times V_1}{5} = N_{org}$$

Similarly, calculate concentration of benzoic acid in organic layer of sets II and III

For aqueous layer

Normality of NaOH (N_1=0.01N)

Volume of aqueous layer pipetted (V_2) = 5ml

N_1V_1 (Sodium hydroxide) = N_2V_2 (aqueous layer)

$$N_2 = \frac{0.1 \times V_1}{5} = N_{aq}$$

Similarly calculate concentration of benzoic acid in aqueous layer of sets II and III

Graph

Plot the graph of logC_{aq} Vs log C_{org}

Partition coefficient (K) = $\frac{C_{aq}}{C_{org\,1/2}}$

$\log C_{aq} = 1/n \log C_{org} + \log K$

The above equation is the equation of a straight line (y = mx +c)

Result from graph

Slope (m) =1/n

Therefore n is nearly =

Substituting the value of slope of line in the equation

$\log C_{aq} = 1/n \log C_{org} + \log K \log C_{aq} = \log C_{org} +$

log K

log K = K

Report

The partition coefficient of benzoic acid between distilled water and benzene is…….. by calculation and ..... by graph.

1. Since $C_{aq} / C_{org}^{1/2}$ is practically constant benzoic acid exists as a dimer (n=2) in benzene.
2. The molecular condition of benzoic acid in benzene is 1/slope = n
   = ... molecules of benzoic acid associate with benzene.

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SYNTHESIS OF VARIOUS MEDICINAL COMPOUNDS

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Experiment No:8

PREPARATION OF BENZIMIDAZOLE

Aim: To prepare and submit benzimidazole from o-phenylenediamine.

REFERENCE:

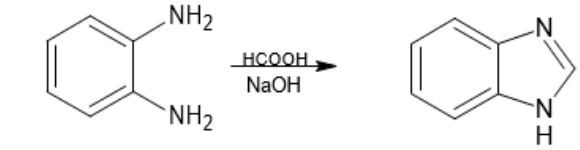
1. Medicinal chemistry – I, Mrs Sheethal V.Patil, Mrs.Swati G.Patil, Dr.Sunila T.Patil, Dr.Md.Rageeb, Md.Usman page no:233-235.

REQUIREMENTS:

Round bottom flask, Beaker, Measuring cylinder, water bath, Buchner funnel, O-phenylene diamine, Formic acid(90%), Sodium hydroxide (10%)

PRINCIPLE:

The preparation of benzimidazole can be done by a reaction between O-phenylene diamine with formic acid in the presence of a base i.e. sodium hydroxide. It is a condensation type of reaction in which o-phenylene diamine condensed with formic acid to give benzimidazole with the removal of two molecules of water.



O-phenylene diamine Benzimidazole

PROCEDURE:

Placed 27g of O-phenylenediamine in a round-bottomed flask of 250ml and added 17.5g (16ml) of 90% formic acid. Heated the mixture in a water bath at 100^0C for 2 hours. Cooled and added 10% sodium hydroxide solution slowly, with constant rotation of the flask, until the mixture is just alkaline to litmus. Filter off the synthesized crude benzimidazole by using the pump wash with ice-cold water.

Recrystallization: Dissolve the synthesized product in 400ml of boiling water, add 2g of decolorizing carbon, and digest for 15 minutes. Filter rapidly through the Buchner funnel and a

flask at the pump. Cool the filtrate to about 10^0C, filter off the benzimidazole, wash with 25ml of cold water, and dry at 100^0C. The yield of pure benzimidazole is 25g (85%), m.p 171- 172^0C.

CALCULATION

Here limiting reagent is O-phenylene diamine; hence yield should be calculated from the amount taken.

The molecular formula of O-phenylene diamine = $C_6H_8N_2$

Molecular formula of benzimidazole = $C_7H_6N_2$

Molecular weight of O-phenylene diamine = 108g/mole

Molecular weight of benzilidazole = 118g/mole

108g of O-phenylene diamine forms 118g benzimidazole

Therefore, 27g O-phenylene diamine will form……(X) g benzimidazole

X = (118 X 27)/108 = 29.5g

Theoretical yield = 29.5g

Practical yield = ... g

% yield = (practical yield) X 100

(theoretical yield)

Report

Benzimidazole was synthesized from O-phenylene diamine and submitted.
The percentage yield was found to be .....%

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Experiment No: 9

SYNTHESIS OF BENZOTRIAZOLE

Aim: To synthesize and submit benzotriazole from o-phenylene diamine and report its percentage yield.

REFERENCE:

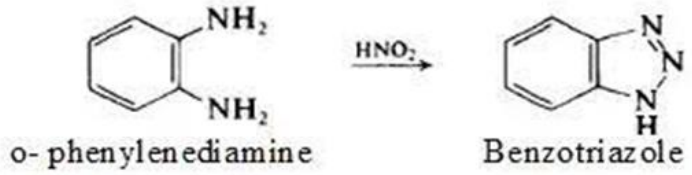
1. Practical medicinal chemistry by Dr. Devala Rao, page no:35.
2. Comprehensive practical organic chemistry by V. K. Ahluwalia and Renu Aggarval, page no:121.

CHEMICAL REQUIREMENTS:

o-phenylenediamine, glacial acetic acid, sodium nitrite

PRINCIPLE:

The sodium nitrite reacts with glacial acetic acid and liberates nitrous acid. The o-phenylene diamine reacts with nitrous acid and produces diazonium ions. When the structure and stereochemistry of diazonium ions are stable, intramolecular nitrogen coupling occurs and forms benzotriazole directly.



o- phenylenediamine Benzotriazole

CALCULATIONS

Molecular weight of o-phenylene diamine =

Molecular weight of benzotriazole =

---- g of o-phenylene diamine gives ----- g of benzotriazole

1g of o-phenylene diamine =

=

---- g of o-phenylene diamine =

Theoretical yield =

Practical yield =

Percentage yield = $\frac{Practical\ yield}{theoretical\ yield}$ x 100

PROCEDURE:

Dissolve 1.3g of o-phenylenediamine in a mixture of 1.5 ml of glacial acetic acid and 5 ml of water in a beaker. Stir until the solid dissolves, warm gently if necessary. Cool the solution to 15^0C. Stir well and add a solution of 2g of sodium nitrite in 2ml water. The reaction mixture becomes warm within 2-3 minutes and reaches a temperature of about 85^0C and then begins to cool. Colour changes from deep red to pale brown. Continue stirring for 15 minutes till the temperature falls about 35-40^0C. Thoroughly chill in an ice bath for 30 minutes. Filter the product and wash it with cold water.

USE:

Used in the bulk drug industry as an important intermediate compound.

It is the basic nucleus present in anthelmintic drugs like mebendazole, thiabendazole, etc.

Report

Benzotriazole was prepared and submitted.
The percentage yield was found to be --------- %

EAST POINT COLLEGE OF PHARMACY
East Point Campus, Jnana Prabha, Virgo Nagar Post,
Bengaluru – 560049, Karnataka

Experiment No: 10

SYNTHESIS OF 2,3-DIPHENYL QUINOXALINE

Aim: To synthesize and submit 2,3-diphenyl quinoxaline from o-phenylenediamine and report its percentage yield.

REFERENCE:

1) Vogel's textbook of practical organic chemistry,5th edition, page no:90.
2) Comprehensive practical organic chemistry by V. K. Ahluwalia and Renu Aggarwal, page no:123.

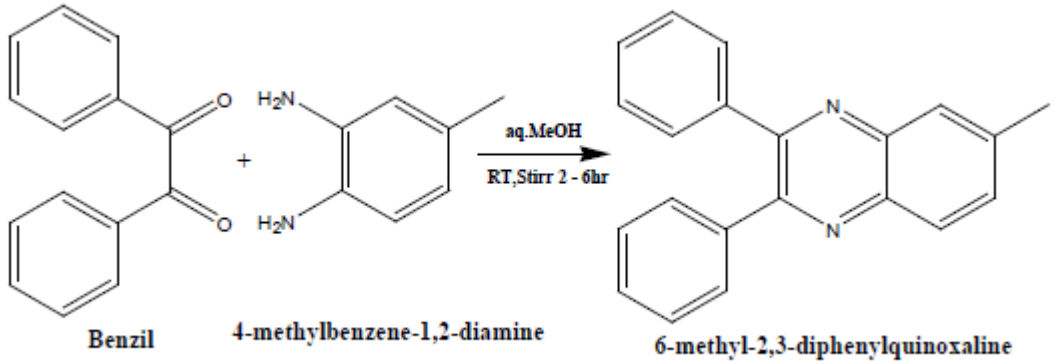
CHEMICAL REQUIREMENTS:

o-phenylenediamine, Benzil, Rectified spirit.

PRINCIPLE:

Quinoxalines are a type of heterocyclic compounds. They are also known as benzopyrazines. Generally, quinoxaline is formed by the condensation of o-phenylenediamine with diketones.

Here 2,3-diphenyl quinoxaline is prepared by treating o-phenylenediamine with benzil.



Benzil 4-methylbenzene-1,2-diamine 6-methyl-2,3-diphenylquinoxaline

CALCULATIONS

The molecular weight of 2, 3-diphenyl quinoxaline =

The molecular weight of o-phenylene diamine =

----- g of o-phenylene diamine gives ----- g of 2, 3-diphenyl quinoxaline

1g of o-phenylene diamine =

=

----- g of o-phenylene diamine =

Theoretical yield =

Practical yield =

Percentage yield = $\frac{Practical\ yield}{theoretical\ yield}$ x 100

=

PROCEDURE:

Add a solution of 1.1g of o-phenylenediamine in 8ml rectified spirit to a warm solution of 2.1g of benzil in 8ml rectified spirit. Warm the mixture for 30 minutes in a water bath. Add water dropwise until slight cloudiness persists. Cool the solution and filter the product.

USE:

Quinoxaline derivatives are used as antimicrobial agents like levomycin.
They are also used in dyes.

Report

2,3-diphenyl quinoxaline was prepared and submitted.

The percentage yield was found to be --------- %

EAST POINT COLLEGE OF PHARMACY
East Point Campus, Jnana Prabha, Virgo Nagar Post,
Bengaluru – 560049, Karnataka

Experiment No:11

SYNTHESIS OF PHENYTOIN

Aim: To prepare and submit recrystallized dried product of phenytoin and calculate

(i) Percentage yield
(ii) Melting point

REFERENCE:

Medicinal chemistry theory and practical by and practical by Prof:K.Narayanan,Dr.Avjit Muzumder,Dr.L.K.Ghosh page no:9

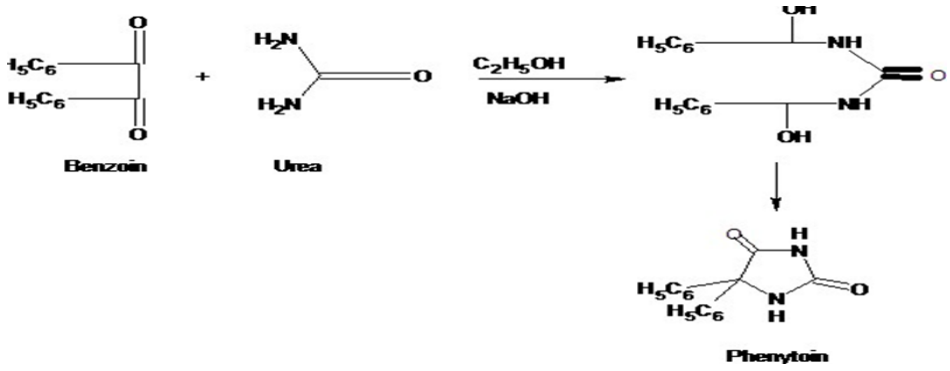
REQUIREMENTS:

Chemicals used**:** Urea, Nitric acid, Benzoin, Sodium hydroxide, ethanol, conc:HCl

Apparatus used**:** Round bottom flask ,reflex condenser, funnel, beaker, filter paper, glass rod.

PRINCIPLE:

Phenytoin is 5,5-diphenyl imidazoline 2,4-dione.Benzil react with urea in the presence of alkali and alcohol to give phenytoin by pinacolone rearrangement.



PROCEDURE:

a) Preparation of Benzil from Benzoin:
Place 2g of benzoin and 5ml of concentrated HNO_3 in a round bottom flask and heat on a boiling water bath till crystalline benzoin is replaced by oily benzil.Pour the mixture in to beaker of cold water with stirring the oily benzil crystallize in to yellow salt.

b) Preparation of phenytoin from benzil:

Place 1g benzil, 1g urea ,5ml 30% aqueous sodium hydroxide and 20ml ethanol in a round bottom flask which is attached to reflux condenser and boil for 2hours.Cool the mixture to attain room temperature.Pour the mixture to 100ml water and,mix and allow to stand for 15minutes.Filter to remove insoluble biproducts.Render the filtrate strongly acidic with concentrated HCl .Cool the filtrate in ice cold H_2O.Filter the precipitate product dry and submit.

IDENTIFICATION

Experiment	Observation	Inference
To the sample solution add hydrochloric acid	White precipitate	Presence of phenytoin
To the sample add pyridine and copper sulphate solution	Blue colour	Presence of phenytoin

Report

Phenytoin was prepared and submitted.

The percentage yield was found to be --------- %

EAST POINT COLLEGE OF PHARMACY
East Point Campus, Jnana Prabha, Virgo Nagar Post,
Bengaluru – 560049, Karnataka

Experiment No:12

SYNTHESIS OF BENZOCAINE [ETHYL PARA AMINO BENZOATE]

Aim:To synthesize the recrystallized product of benzocaine from para amino benzoic acid and calculate

(i) Percentage yield
(ii) Melting point

REFERENCE:

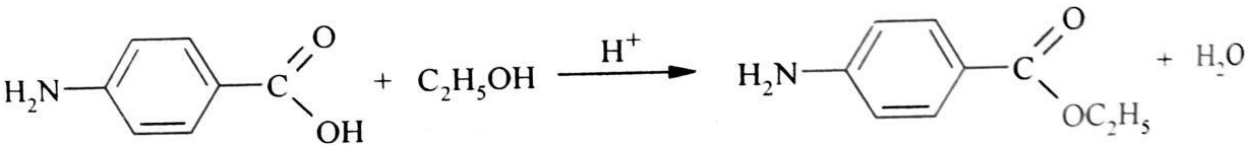
Medicinal chemistry theory and practical by and practical by Prof: K. Narayanan, Dr. Avjit Muzumder, Dr. L.K. Ghosh page no:22

REQUIREMENTS:

PABA, Conc: sulphuric acid, ethanol, reflux condenser, RB flask, beaker

PRINCIPLE:

Benzocaine is the ethyl ester of para amino benzoic acid (PABA). It can be prepared from PABA and ethanol by Fischer esterification.



p-Amino benzoic acid Benzocaine

PROCEDURE:

To a 100 RB flask, add 8ml of ethanol, 4.12g of para amino benzoic acid(PABA), and 1.2ml of conc: H_2SO_4 keep the mixture under reflux for 1hour up on cooling reaction mixture sets to a solid mass of hydrochloride of ethyl para aminobenzoate. Pour the hot solution in to excess of

water(no hydrochloride) add Na_2CO_3 to the clear solution until it is neutral to litmus. Filter wash and dry the product.

IDENTIFICATION

EXPERIMENT	OBSERVATION	INFERENCE
To the sample solution add sodium nitrite and con.HCl and cool the mixture. To this add a solution of beta naphthol in sodium hydroxide. Maintain the temperature at 0 to 5°	Deep red colour	Benzocaine confirmed

CALCULATIONS

The molecular weight of para-aminobenzoic acid =

The molecular weight of Benzocaine =

----- g of para-aminobenzoic acid gives ----- g of benzocaine

4.12 g of o-phenylene diamine gives ----- g of benzocaine

Theoretical yield =

Practical yield =

Percentage yield $= \frac{Practical\ yield}{theoretical\ yield} \times 100$

Report

Benzocaine was prepared and submitted.

The percentage yield was found to be --------- %

EAST POINT COLLEGE OF PHARMACY
East Point Campus, Jnana Prabha, Virgo Nagar Post,
Bengaluru – 560049, Karnataka

Experiment No: 13

SYNTHESIS OF PHENOTHIAZINE

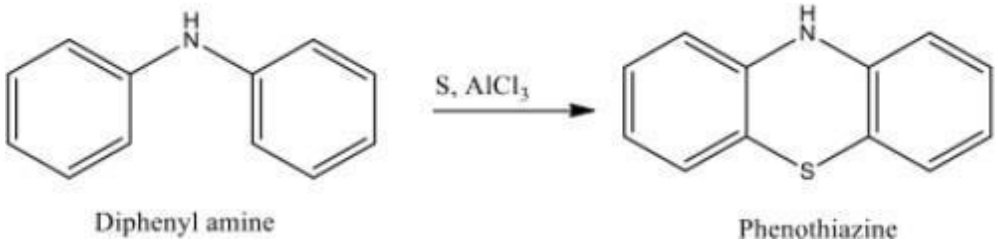
Aim: To perform synthesis of Phenothiazine

Reference:

P. Mondal, S. Mondal, Handbook of Practical, Pharmaceutical Organic, Inorganic and Medicinal Chemistry, Educreation Publishing, New Delhi, 2019, 189-190.

Principle:

Diphenylamine undergoes a cyclization reaction with sulphur and anhydrous aluminum chloride at 140-150°C and forms a melted mass with the evolution of hydrogen sulfide gas. Further, the melted mass is extracted with distilled water and followed by dilute alcohol pure phenothiazine separates out a residue.



Diphenyl amine Phenothiazine

Reaction:

Requirements:

Chemicals: Diphenylamine, Sulphur, Anhydrous Aluminium chloride, Alcohol

Apparatus: Round bottom flask, Beaker, Glass rod, Funnel, Measuring cylinder, Thermometer.

Procedure:

22 gm of diphenylamine, 8.2 gm of sulphur, and 3.2 gm of anhydrous aluminium chloride was melted together. The reaction temperature sets 140-150°C with the rapid evolution of hydrogen sulfide, by lowering the temperature, a few degrees the reaction rate was decreased. When the reaction had moderated, the temperature was raised to 160°C for a time. The melted mass, when cool, was ground up and extracted, first with water and then with dilute alcohol. The residue consisted of almost pure yellowish leaflets crystals of phenothiazine. It was recrystallized from alcohol.

Observation:

Practical yield= ----------gm.

Calculation:

The molecular formula of Diphenylamine =

The molecular formula of Phenothiazine =

The molecular weight of Diphenylamine =

The molecular weight of Phenothiazine =

Theoretical yield:

……. gm of diphenylamine gives ..... gm of Phenothiazine.

Therefore, ….. gm diphenylamine will form ..... (X) gm Phenothiazine

Theoretical yield = …….

Practical Yield

Percentage (%) Yield = ---------- × 100

Theoretical yield

Percentage yield = ……. %

Report

Phenothiazine was prepared and submitted.

The percentage yield was found to be --------- %

EAST POINT COLLEGE OF PHARMACY
East Point Campus, Jnana Prabha, Virgo Nagar Post,
Bengaluru – 560049, Karnataka

Experiment No:14

Synthesis of 4-benzylidene-2-phenyl oxazole-5-one

Aim: To perform synthesis of 4-benzylidene-2-phenyl oxazole-5-one

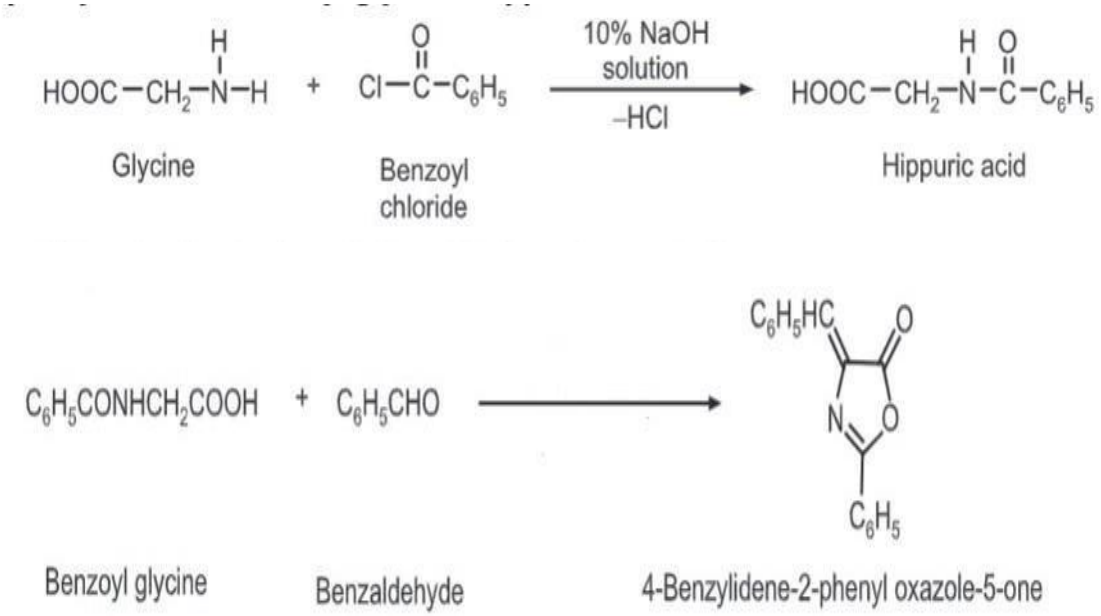
Reference:

A. Tiwari, R. Kumar, A practical book of Medicinal Chemistry, Nirali Prakashan, Pune, 2019, 5-6.

Principle:

The principle involved in the preparation of 4-benzylidene-2-phenyl oxazole-5-one is dehydration followed by the cyclization method. The active methylene group reacts with aromatic aldehydes. Benzoyl glycine reacts with benzaldehyde followed by dehydration giving 4- benzylidene-2-phenyl oxazole-5-one. The hippuric acid is formed by reacting glycine with benzoyl chloride.

Reaction:



Requirements:

Chemicals: Glycine, Sodium hydroxide, Benzoyl chloride, Concentrated hydrochloric acid, Benzaldehyde, Acetic anhydride, Anhydrous sodium acetate, Ethanol

Apparatus: Round bottom flask, Reflux condenser, Beaker, Glass rod, Funnel, Measuring cylinder

Procedure:

About 1 gm of glycine was dissolved in aqueous sodium hydroxide solution (10 ml) in a flask and it 1.5 ml of benzoyl chloride was added. The mouth of the flask was plugged with cotton and was shaken vigorously. Then 1-2 drops of conc. HCl was added. The product was filtered, washed with water and recrystallized.

A mixture of benzaldehyde, benzoyl glycine, acetic anhydride and anhydrous sodium acetate was taken in a conical flask and the contents were heated on sand/oil bath till the mixture had liquified completely. Now, the contents were heated on a water bath for two hours. Then it was cooled, and to it 25 ml ethanol was added slowly. The product was filtered, washed with hot water, dried, and recrystallized.

Observation:

Practical yield= ----------gm.

Calculation:

Molecular formula of 4-benzylidene-2-phenyl oxazole-5-one =

The molecular weight of 4-benzylidene-2-phenyl oxazole-5-one =

The molecular formula of Benzoyl glycine =

The molecular weight of Benzoyl glycine =

Theoretical yield:

……. gm of Benzoyl glycine forms …… gm 4-benzylidene-2-phenyl oxazole-5-one.

Therefore, ….. gm Benzoyl glycine will form.....(X) gm 4-benzylidene-2-phenyl oxazole- 5-one. Theoretical yield = …….

$$\textbf{Percentage (\%) Yield} = \frac{\text{Practical Yield}}{\text{Theoretical yield}} \times 100$$

Percentage yield = _____%

Report

4-benzylidene-2-phenyl oxazole-5-one is prepared and submitted.

The percentage yield was found to be ----------%

EAST POINT COLLEGE OF PHARMACY
East Point Campus, Jnana Prabha, Virgo Nagar Post,
Bengaluru – 560049, Karnataka

Experiment No: 15

Synthesis of 3-methyl-1-phenyl pyrazole-5-one

Aim: To perform synthesis of 3-methyl-1-phenyl pyrazole-5-one

Reference:

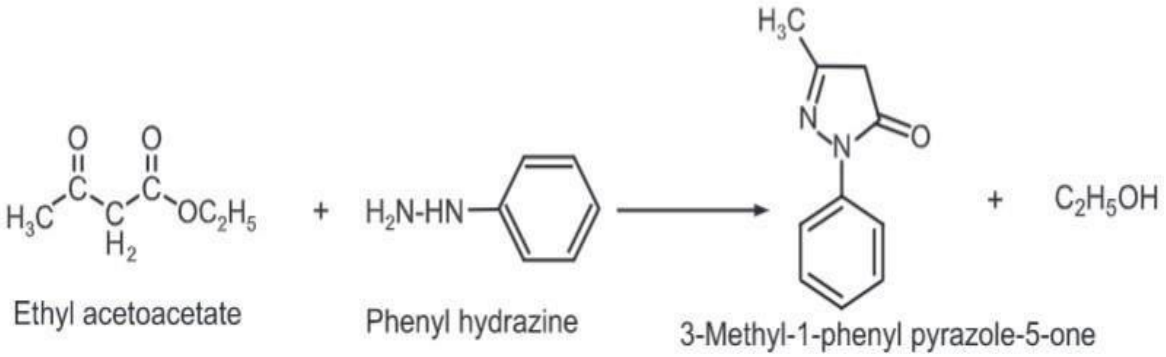
A. Tiwari, R. Kumar, A practical book of Medicinal Chemistry, Nirali Prakashan, Pune, 2019, 1.

Principle:

3-methyl-1-phenyl pyrazole-5-one is synthesized by condensation of phenyl hydrazine and ethyl acetoacetate. It is an example of an intermediate used in the bulk drug industry. In this synthesis, ethyl acetoacetate is used along with hydrazine. Ethyl acetoacetate is heated with an equal quantity of phenyl hydrazine. On further heating, ring formation occurs with the loss of ethanol.

The resultant compound is methyl phenyl pyrazolone.

Reaction:



Requirements:

Chemicals: Phenyl hydrazine, Ethyl acetoacetate, Ether, Ethanol

Apparatus: Round bottom flask, Reflux condenser, Beaker, Glass rod, Funnel, Measuring cylinder

Procedure:

A mixture of phenyl hydrazine (3.65 ml) and ethyl acetoacetate (4.9 ml) were heated in a round bottom flask on a boiling water bath for 2 hours. The reaction mixture was stirred with the help of a glass rod. Then, the reaction mixture was cooled and to it was added 20 ml ether with stirring. The separated product was filtered, washed with ether and recrystallized with dilute ethanol.

Observation:

Practical yield= ----------gm.

Calculation:

Molecular formula of 3-methyl-1-phenyl pyrazole-5-one =

Molecular formula of Ethyl acetoacetate =

Molecular weight of 3-methyl-1-phenyl pyrazole-5-one =

Molecular weight of Ethyl acetoacetate =

Theoretical yield:

……. gm of Ethyl acetoacetate forms …… gm 3-methyl-1-phenyl pyrazole-5-one.

Therefore, ….. gm Ethyl acetoacetate will form.....(X) gm 3-methyl-1-phenyl pyrazole-5- one.

Theoretical yield = …….

$$\textbf{Percentage (\%) Yield} = \frac{\text{Practical Yield}}{\text{Theoretical yield}} \times 100$$

Percentage yield = _____%

Report

3-methyl-1-phenyl pyrazole-5-one was prepared and submitted.

The percentage yield was found to be --------- %

Vision and Mission of the Institution

Vision

The East Point College of Pharmacy aspires to be a globally acclaimed institution, **recognized** for **excellence in** pharmaceutical education, research and nurturing students for **holistic development.**

Mission

M1 Create pharmacy graduates through **quality education**

M2 Promote innovation, **creativity**, and excellence **in teaching**, learning, and **research**

M3 **Inspire** integrity, teamwork, critical thinking**, personal** development, and ethics in **students** and lay **the** foundation for lifelong learning

M4 **Serve** the **healthcare, technological, scientific**, and **economic** needs of then **society**.