President :
Shri. Amrishbhai R. Patel
M.L.C.

Principal :
Dr. S. B. Bari
M.Pharm. Ph.D., D.I.M.F.I.C.

Assignments

(Based on problem-solving ability)

Modern Pharmaceutical Analytical Techniques

M. Pharm First Year (2023-2024)

Question:

1. Explain the principle of UV-spectroscopy and Beers-Lambert law.
2. Instrumentation of UV spectrophotometer and function of each component.

OFFICE SEAL

Subject in charge

Dr. Z. G. Khan

Criterion 2 - Teaching learning and evaluation

Key Indicator 2.3.1 - Teaching learning process

Metric No. 2.3.3 -Assignments

Assignments

(Based on problem-solving ability)

Instrumental Method of Analysis

Final Year B. Pharm (2023-2024)

Question:

1) Give the principle and instrumentation of UV Spectroscopy.
2) Give the principle and instrumentation of fluorimetry.

OFFICE SEAL

Subject in charge

Dr. Z. G. Khan

President :
Shri. Amrishbhai R. Patel
M.L.C.

Principal :
Dr. S. B. Bari
M.Pharm. Ph.D., D.I.M.F.I.C.

Assignments

(Based on problem-solving ability)

Pharmaceutical Organic Chemistry-III

Second Year B. Pharm (2023-2024)

Question:

1. Solve all the mcqs given below.
2. Give the synthesis, reaction, and medicinal uses of pyrazole.
3. Give the synthesis, reaction, and medicinal uses of imidazole.
4. Give the reaction of synthesis of metal hydride reduction (NaBH4, LiAlH4).
5. Give the synthesis, and uses of quinolone.
6. Give the reaction of Isoquinoline.
7. Give the synthesis and the reaction of indole.

H.R.Patel Institute Of Pharmaceutical Education & Research Shirpur OFFICE SEAL

Subject in charge

Mr. M. R. Mahajan

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Shirpur, Dist. Dhule (MS) 425 405

Continuous mode activities sheet 2023 -2024

Class	final yr	Name of Student	Kanchan Atul Nandwalkar
Sem.	7th	Roll No. (In Figure)	B-03
Division	B	Roll No. (In Words)	B - Three
Subject	Instrumental method of analysis.		
Name & Signature of Examiner:			

→Q1. Principle of UV spectroscopy:-

- Based on measurement of a spectrum of a sample.
- Based on the graph between absorbed or emitted radiation versus frequency or wavelength.
- Spectrophotometer is an instrument used to measure the absorption of radiation.

It includes two types of spectroscopy:-

i) Absorption spectroscopy ii) emission spectroscopy.

1) Absorption Spectroscopy:-

An analytical technique concerned with the measurement of absorbed EMR by a sample.

2) Emission spectroscopy:-

An analytical technique concern with measurement of emitted radiation.

The principle of UV works under the Beer lambert's law:-

1) Lambert's Law:-

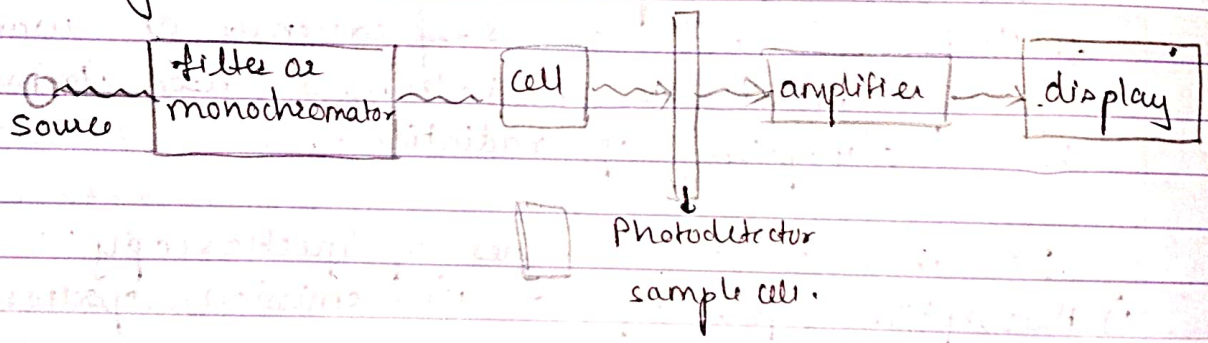
When a beam of monochromatic light is allowed to pass through the homogenous absorbing medium where the rate of decrease of intensity of radiation with thickness of absorbing medium is directly proportional to the Intensity of incident radiation.

2) Beer's Law:-

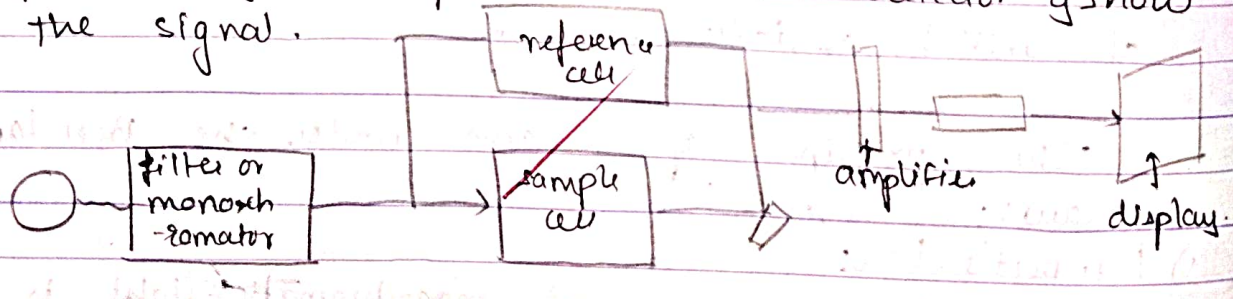
When a beam of monochromatic light passes through the homogenous absorbing medium where the rate of change of intensity with thickness of absorbing medium is directly proportional to the intensity of the incident radiation & conc. of sample.

$$\log\left(\frac{I}{I_0}\right) = \varepsilon . c . l = A$$

* Single Beam spectrophotometer:- A beam of radiation is pass through a single cell. the reference cell is used to set the absorbance scale at zero for the wavelength.



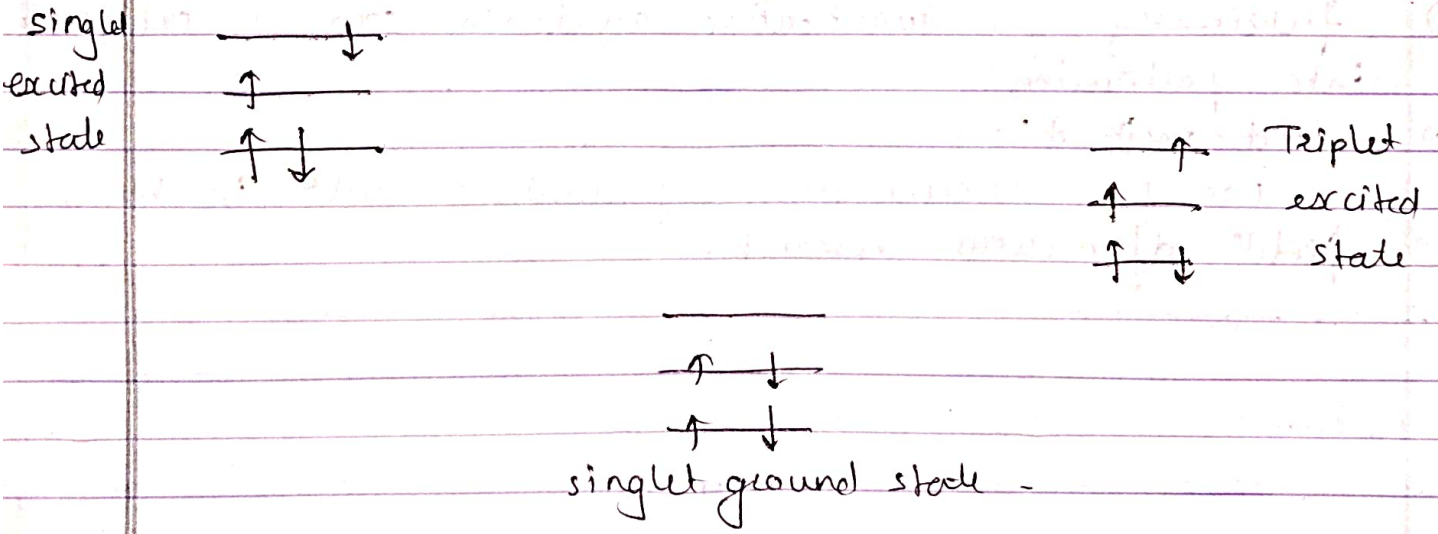
* Double Beam Spectrophotometer:- In double beam spectrophotometer a one beam is passed through reference solution to photodetector & second beam pass through sample to reach the detector & show the signal.



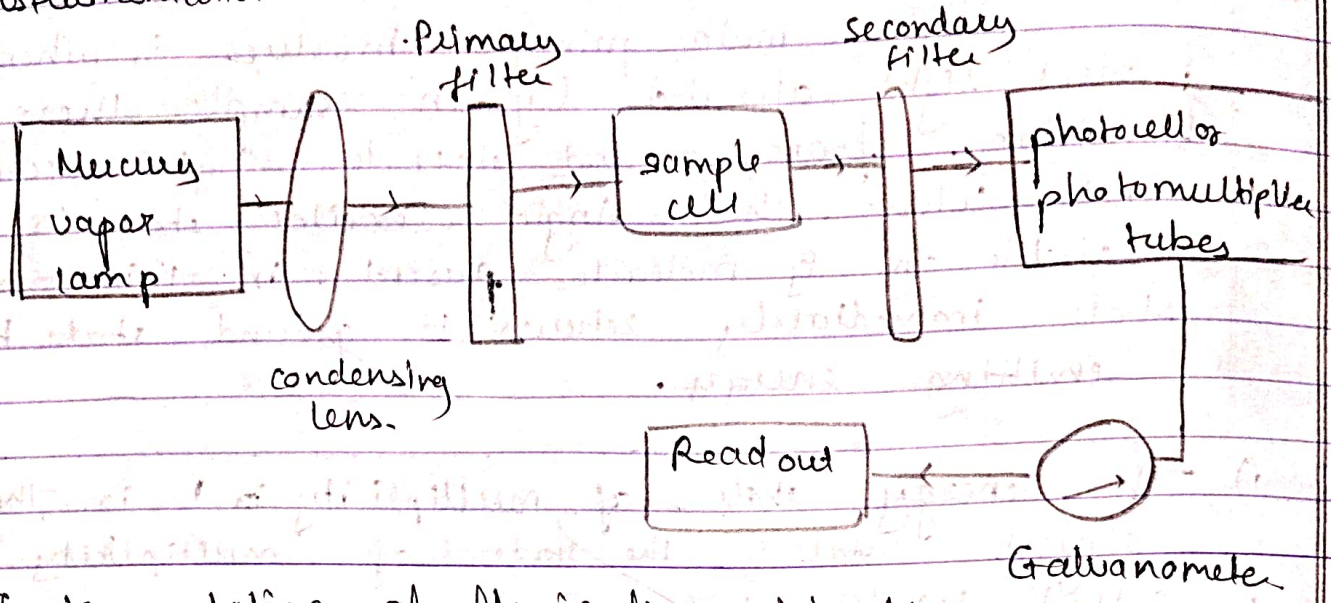
→ Q2. **Principle :-**

The main principle involves is when an incident light absorbed by an sample there is an transition from ground state to singlet excited state. Where the singled excited state is not stable one & molecule present in this excited state immediately returns to ground state by emitting energy.

1) The energy state of multiplicity is 1 is the singlet state & the state of multiplicity 3 is called triplet state.
2) The ground electronic state is usually a singlet state.
3) If electronic spin is represented as an arrow with its orientation, direction of sign of spin quantum no. - The ground state, first excited singlet, first excited to triplet state can be represented as follows.



→3) Instrumentation:-



Instrumentation of fluorimetry consist of:-

1) Source of radiation
2) Condensing lens
3) filter or monochromator
4) a sample holder
5) Detector
6) Readout system

Application:-

1) fluorimetry for quantitative analysis can be categorized into following:-

a) Direct method:-

Use for determination of uranium salt in the field of nuclear research.

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Continuous mode activities sheet 2023 -2024.

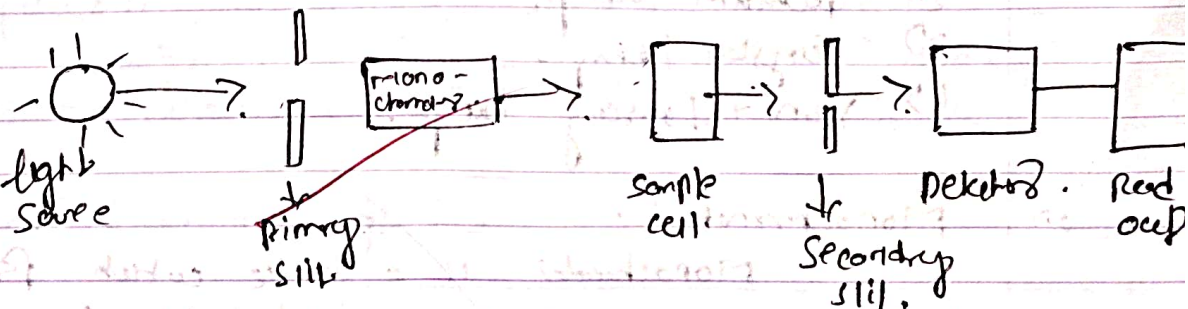
Class	final y. B.pharm	Name of Student	Nikumbh Sanket Anil
Sem.	VII th.	Roll No. (In Figure)	04.
Division	B	Roll No. (In Words)	four.
Subject	Instrumental Method of Analysis.		
Name & Signature of Examiner:			

→ Answers.

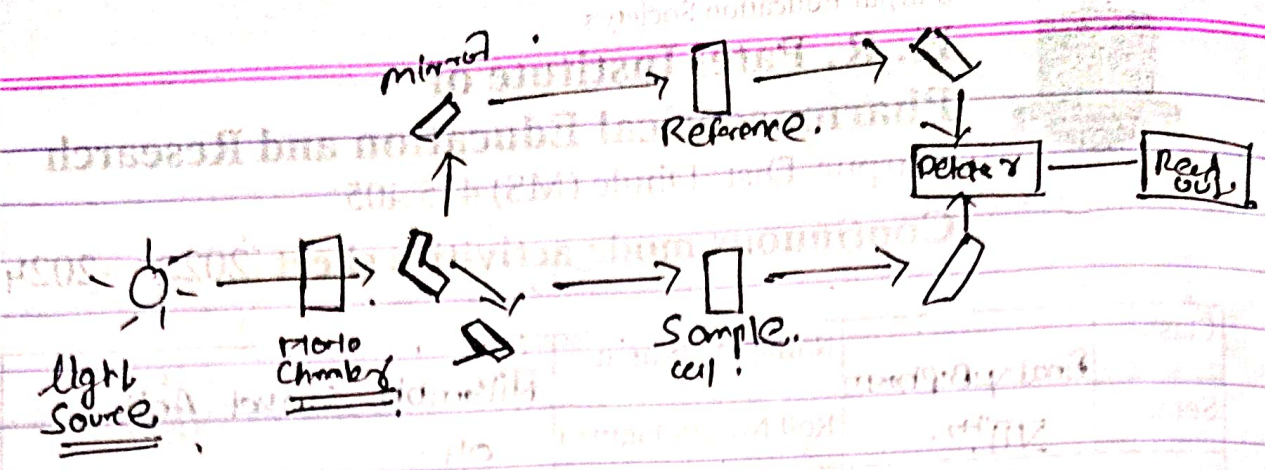
Ans 1) Principle :

When a beam of incident light of wavelength. blw UV region fall on the sample. It leads to change the electronic transition from ground state to excited state.

Instrumentation :



Single beam Spectrophotometer.



Double beam spectrometer.

Components:

1) Light source.
2) Monochromator.
3) Cuvette / sample cell.
4) Detector.
5) Read out / display.

1) Light source:

Light source is a major component of the UV spectroscopy it provide luminous and UV visible wavelength which is required for radiation. Various light sources are available which are as follow.

1) Hydrogen lamp.
2) Deuterium lamp.
3) Tungsten lamp.
4) Xenon / mercury lamp.

2) Monochromator:

Monochromator is a device which isolate a specific wavelength of light to pass forward. It absorb the other range of wavelength and pass the UV-visible radiation further. It is consist of primary slit & secondary slit.

3) Cuvette / Sample cell.

It is a piece of tube which is used to place sample. The cuvette which need to; identify or quantify is placed in a cuvette. which are generally made up of fused silica glass, quartz, etc. type of material.

4) Detector.

The radiolent signal which are travelled through the sample is then detail the signal are converted into electronic signal which further help to display.

Different type of detector used are.

1) Barrier cell.
2) Photo-emmisive detector.
3) Photo-multiplier.
4) Photodiode detector.

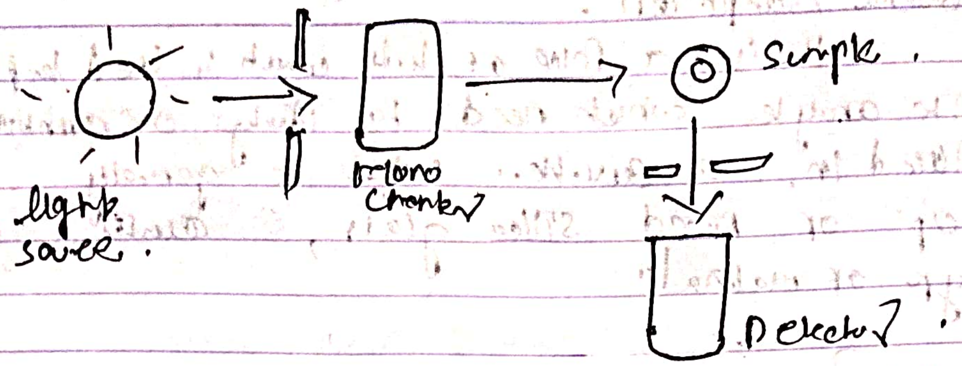
Single beam spectrophotometer.

Single beam spectrophotometer it consist of only sample cell here is no, reference cell which is to ID. light travel through sample cell. to display, to the detector.

Double beam spectrophotometer.

It is consist of reference cell & sample cell the beam split in two to two halves. one travel through the reference another travel through the sample when covered to detector. other filter interpole.

Ans-3)



Principle.

when an beam or incident light fall on substance it is get absorb and it emit radiation in form of light such a phenomenon is called as flurosence.

It get stop when the light source is cut off.

Instrumentation.

1) light source.
2) Monochromator.
3) sample holder.
4) Detector.

1) light source :-

light source.. help in illuminate to the sample by provide the wavelength radiation for Visulation or sample.

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Continuous mode activities sheet 2023 -2024

Class	F.Y. mpharm	Name of Student	Bagale Kuldip Mudidhar
Sem.	I	Roll No. (In Figure)	MPH 01
Division		Roll No. (In Words)	One
Subject	Modern Pharmaceutical Analytical Techniques.		
Name & Signature of Examiner:			

Q-1 Explain principle of UV-visible spectroscopy & derive lambeets. Beer's law with its limitations.

Principle of UV-visible spectroscopy -

The range of UV is 10-200nm and visible upto 400 - 800nm

Near UV region - 10-200nm

far UV region - below 200nm.

- It is the measurement of spectrum of sample containing atoms & molecule.
- spectrometer is an instrument to design spectrum in compound.
- UV spectroscopy studied under vaccume condition

Lambeets law →

When a monochromatic radiation passes through solution the decrease in the intensity of radiation with thickness is directly proportional to the Intensity of the incident radiation. We can derive as followes.

$$-\frac{dI}{dx} = KI$$

where - I is the incident radiation which passes thickness (x).

$\frac{dI}{dx}$ is the decrease in intensity of radiation

$\frac{-dI}{dx}$ rate of decrease in intensity of radiation.

$$\int_{I_0}^{I} \frac{dI}{I} = \int_{x=0}^{x=x} -K\,dx$$

Converting natural log

$$\ln \frac{I}{I_0} = -Kx$$

converting ln to log to the base ten

$$2.303 \frac{I}{I_0} = -Kx$$

$$\log \frac{I}{I_0} = \frac{-K}{2.303} x$$

multiplying with -1

$$-\log \frac{I}{I_0} = \frac{+K}{2.303} x$$

$A = -\log (I/I_0)$

$E = K/2.303.$

$$\boxed{A = E.x}$$ Lambert's eq?

Beers law :-

When a monochromatic radiation passed through solution the decrease in intensity of radiation with thickness of the solution is directly proportional to the intensity of incident radiation and concentration.

let I be the intensity of incident radiation
x be the thickness of soln
c be the concn of soln

we get

$$\frac{-dI}{dx} = K' cI$$

Q.2 Discuss the choice of solvent & effect of solvent on absorption maximum of compound in UV

Beers law continued..

after Intigrating we get.

$$\int_{I_0}^{I} \frac{dI}{I} = \int_{x=0}^{x} k' c x$$

converting to natural log

$$\ln \frac{I}{I_0} = -k'cx$$

log to the base ten

$$2.303 \log \frac{I}{I_0} = -k'cx$$

$$\log \frac{I}{I_0} = -\frac{k'}{2.303} cx$$

multiplying with -1

$$-\log \frac{I}{I_0} = \frac{k' cx}{2.303}$$

$$A = -\log \frac{I}{I_0}$$

$$E = k/2.303$$

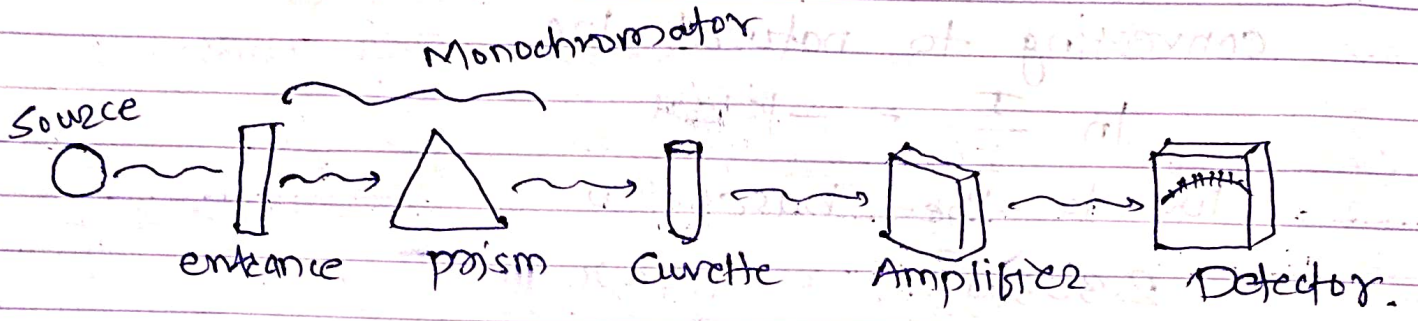
$$\boxed{A = E.cx}$$ Beer's equation..

Dr. S. B. Bari
Principal

PRINCIPAL
H R Patel Institute of Pharmaceut
Education & Research
Shirpur Dist Dhule

Q.3 Discuss in Detail Instrumentation of UV-visible spectrophotometer & function.

Instruments.
1) Light source
2) wavelength selector
   a) prism b) Monochromator
3) Sample holder (Cuvette)
4) Amplifier
5) Detector.



① Light source →
There are 5 type of light source as followes.

ⓐ Hydrogen discharge lamp :-
- In single glass tube two electrodes are fixed one is anode & another is cathod.
- With high pressurized Hydrogen gas filled.
- When high electricity passes to electrod hydrogen atom get excited.
- after that due to high electron movement, excited hydrogen emitte the light.

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Continuous mode activities sheet 2023 -2024

Class	F.Y.MQA	Name of Student	Borse Kalpesh Aba
Sem.	I	Roll No. (In Figure)	MQA - 02
Division		Roll No. (In Words)	TWO
Subject	Morndern Pharmaceutical Analytical Teq.		
Name & Signature of Examiner:			

Q1) Explain principle of UV- spectroscopy and derived the lambert's beart's law?

→

The principle of UV- spectroscopy is based on the absorption of ultravoilet light or visible light by chemical compound. which result in production of distinct Spetra spectroscopy is based on interaction between light and matter. when the matter absorb the light, it undergoes excitation and derexicitation, reswling in production of a specrum.

Lambert's law.

when monochromatic light paised to the absorbing substance. the decrease in the intensity of radiation with thickness of the solution is direchy proportional to intensity of incident light.

Let I be intencity of incident radiation

x be thickness of solution

Then

Lambert's law

$$-\frac{dI}{dx} \propto I$$

So, $$-\frac{dI}{dx} = kI$$

Integrated eqⁿ between limit

$I = I_0$ at $x = 0$ and

$I = I$ at $x = l$

weger.

$$\ln \frac{I}{I_0} = -kI$$

$$2.303 \log \frac{I}{I_0} = -kI$$

$$\log \frac{I}{I_0} = \frac{-k}{2.303} I$$

where $\log \frac{I_0}{I} = A$, $\frac{k}{2.303} = E$ absorption coefficient

$A = E \cdot I$. lambert's law.

Beer's law

when monocromatic radiation is passed through a solution, the decressed inksity of radiation with thickness of solution is direchy prop. to inksity of incident light.

Beer's law

$$-\frac{dI}{dx} \propto C \cdot I$$

So, $$-\frac{dI}{dx} = kC \cdot I$$

Integrated eqⁿ between limit

$I = I_0$ at $x = 0$ &

$I = I$ at $x = 1$

we get, $\ln \frac{I}{I_0} = -K \cdot C \cdot I$

$$2.303 \log \frac{I_0}{I} = K C \cdot I$$

$$\log \frac{I_0}{I} = \frac{K}{2.303} C \cdot I$$

where $\log \frac{I_0}{I} = A$

$$\frac{K}{2.303} = k \qquad A = E \cdot C \cdot I.$$

$$T = \frac{I}{I_0} \quad \text{or} \quad -\log T = \log \frac{I}{I_0} = A$$

2) Instrumentation of U.V spectrophotometer and f'n of each comp.?

→ Instrumentation

1) Source
   - Source should be stable.
   - source provide continous radiation
   - It must be of sufficent intensity for transmitted energy to be detected at the end of optical path.
   - There are diffrant part of light source
1) Hydrogen - discharge lamp.
2) Deuterium lamp
3) mercury arc lamp.
4) Tungstann Lamp
5) xenon arc lamp

2) Filters.
   - It is frequently necessary to filter or remove wide banas of radiation from signal
   - filters isolate a wider band than the monochromators

Two type of Filters

1) Absorption filter.
2) Interferance filter.

3) monochromators.
- The monochromator is useful to convert polychromatic light into monochromatic light.
- made up from quartz for ultraviolet
- Normal glass for visual range.

i) Prism
- made up from glass, quartz or fused silica
- Quartz or fused silica is choice of material of UV spectrum.
- Two type of prism.
  1) cornu type
  2) littrow type

ii) Grating monochromator.

3) sample & cuvette holders.
- cleaning is carried our washing with distilled water or with dilute alcohol

5) Detector -
Requirment of ideal detector
- It should give quantative response
1) Barrier layer cell
2) photoemissive tube
3) photomultiplayer tube

Name:- Vaishnavi Dnyaneshwar Sonawane
Class:- SYBPharm DIV:-B Roll No. 49

Page No.
Date

1) Which of the following is an example of heterocylic compound ?
(a) Benzene (b) Cyclohexane
(c) Pyridine (d) Ethanol

2) Which heterocyclic compound found in caffeine?
(a) Pyrimidine (b) Pyrazine
(c) Pyridine (d) Pyrrole

3) Which heterocyclic compound is commonly found in DNA ?
(a) Thiazole (b) Imidazole
(c) Purine (d) Pyrrole

4) The structure of furan contains how many carbon atoms ?
(a) 4 (b) 5
(c) 6 (d) 7

5) Which heterocyclic compound is an important component of Vit. B12 ?
(a) Pyrimidine (b) Porphyrin
(c) Corrin (d) Pyrrole

6) Which of the following is not a heterocyclic compound ?
(a) Benzene (b) Pyridine
(c) Thiophene (d) furan

7) How many Nitrogen atoms are present in heterocyclic compound pyrimidine ?
(a) 1 (b) 2 (c) 3 (d) 4

8) Which heterocyclic Compound is found in DNA and RNA?
(a) Pyridine
(b) Furan
(c) Pyrimidine
(d) Thiophene

9) Which of the following heterocyclic Compound is aromatic?
(a) Pyrrole
(b) Piperidine
(c) Tetrahydrofuran
(d) Imidazole

10) Which heterocyclic Compound is known for its use as a solvent and in the Synthesis of pharmaceuticals?
(a) Pyrrole
(b) Tetrahydrofuran
(c) Pyridine
(d) Thiophene

11) What is the primary function of metal hybrid reduction in organic Synthesis?
(a) Oxidation
(b) Reduction
(c) Hydrolysis
(d) Esterification

12) Which metal is Commonly used in metal hybrid reduction reactions?
(a) Iron
(b) Nickel
(c) Palladium
(d) Lithium

13) Clemmensen reduction is used to Convert which functional group into an alkane?
(a) Aldehyde
(c) Carboxylic acid
(b) ketone
(d) Ester

14) Which reagent is Commonly used in Clemmensen Reduction?

Page No.
Date

(a) Zinc amalgum & HCl (b) Sodium borohydride
(c) Lithium aluminum hydride (d) Sodium cyanoborohydride

15) Birch Reduction is used to Convert which functional group into an alkane?
(a) Alkene (b) Alkyne
(c) Aromatic ring (d) Carbonyl.

16) Which reagent is Commonly used in Birch reduction?
(a) $LiAlH_4$ (b) $NaBH_4$
(c) Li (d) Na/Hg

17) Wolff–Kishner reduction is used to Convert which functional group into an alkane?
(a) Alkene (b) Aldehyde
(c) ketone (d) Carboxylic acid.

18) Which reagent is Commonly used in Wolff-Kishner reduction?
(a) Zn & HCl (b) $NaBH_4$
(c) Hydrazine hydrate & base (d) Na/Hg

19) The product of Claisen–Schmidt Condensation
(a) Alcohol (c) Alkene
(b) Ether (d) α,β-unsaturated ketone / Aldehyde

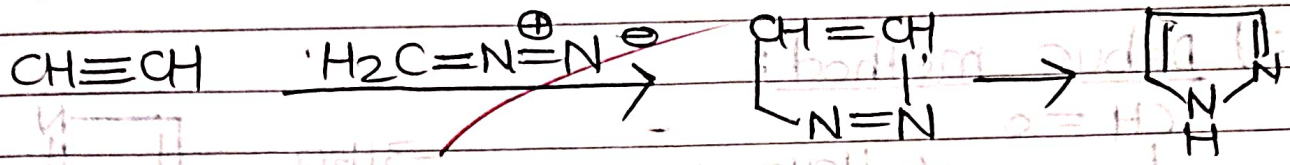
20) Claisen–Schmidt Condensation is a reaction between:
(a) An aldehyde and an ether.
(b) An alcohol and an ketone.
(c) Two aldehydes or ketones.
(d) A Carboxylic acid and an amine

Q.1 Give Synthesis, Reactions and medicinal uses of Pyrazole.

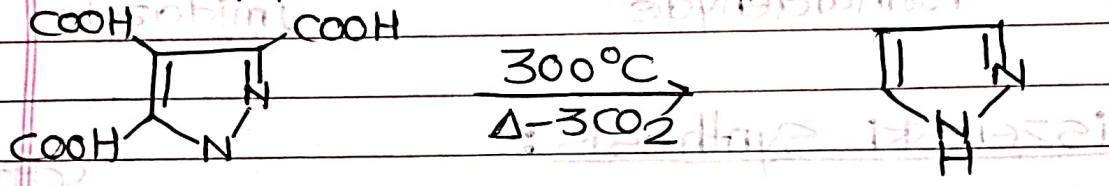
→

- **Synthesis :-**

1) **From acetylene:** Acetylene is passed through a cold Soln of diazomethane to yield Pyrazole.



2) **From pyrazole Carboxylic acids:**

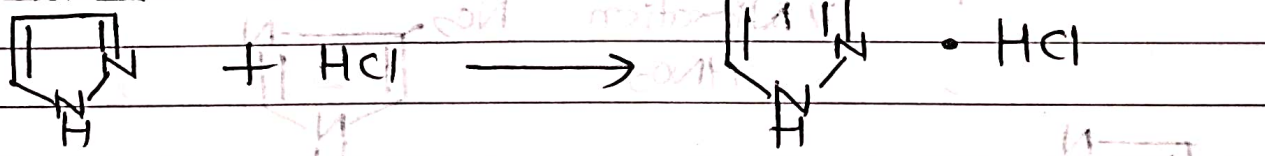


Pyrazole-3,4,5 tricarboxylic acid

Pyrazole

- **Reactions :-**

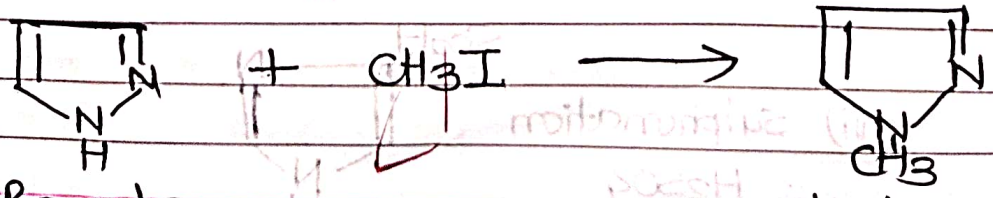
1) **Rean with acids:**



Pyrazole

Pyrazole hydrochloride

2) **Alkylation:**



Pyrazole

N-methyl pyrazole

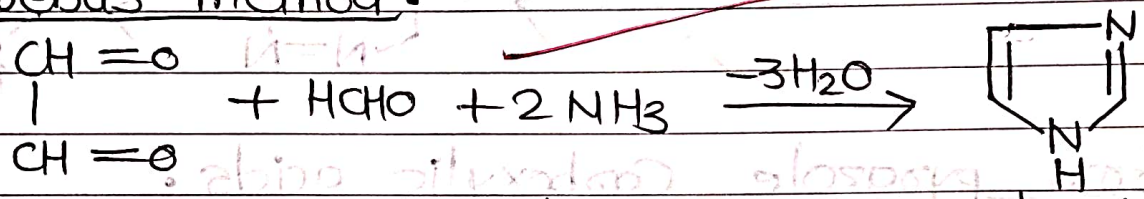
• **Medicinal Uses :-**

1) Celecoxib → Anti- Inflammatory & analgesic
2) Sulfaphenazole → Anti- bacterial
3) Phenylbutazone → Anti- inflammatory
4) Oxyphenbutazone → Analgesic

Q.2. Give Synthesis & reaction of Imidazo

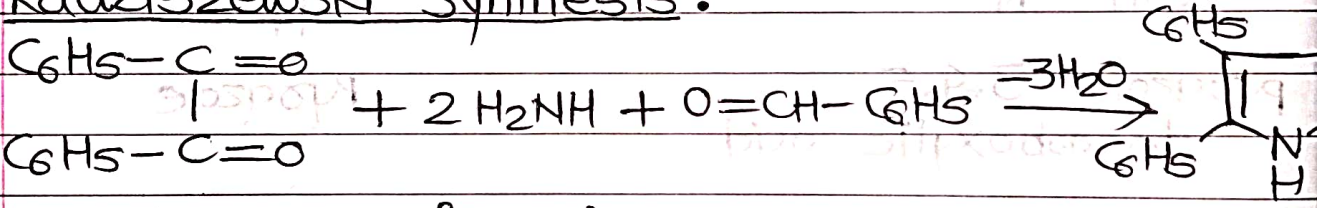
→ • **Synthesis** →

1) **Debus method :**



Glyoxal formaldehyde Imidazole

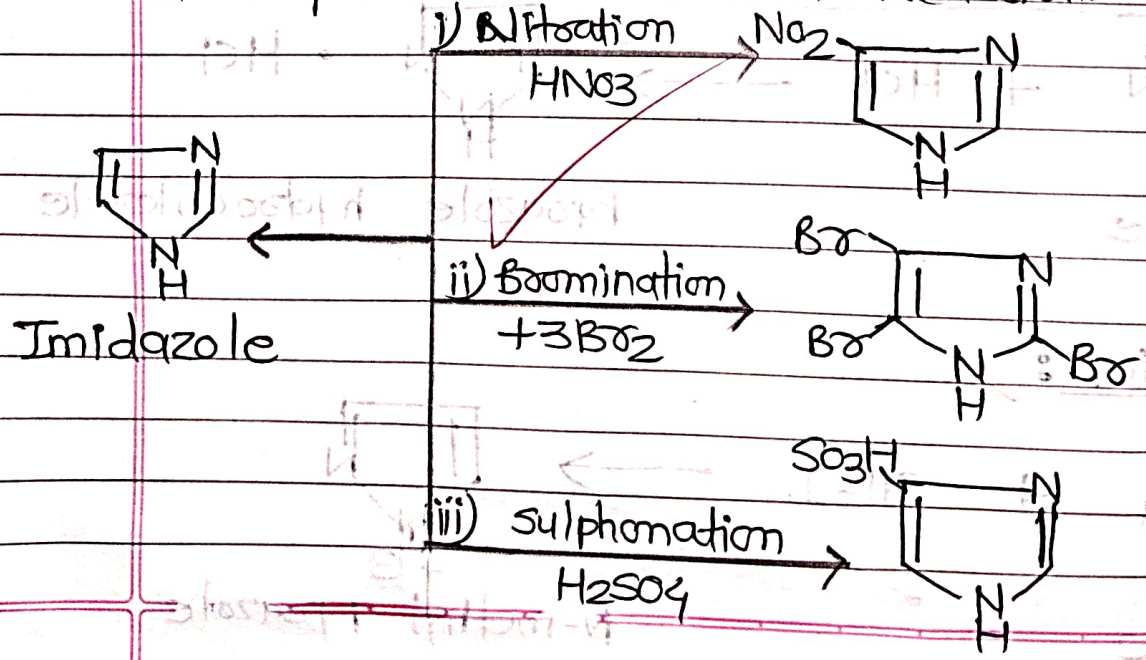
2) **Radziszewski synthesis :**



α-Diketone Ammonia

• **Reaction →**

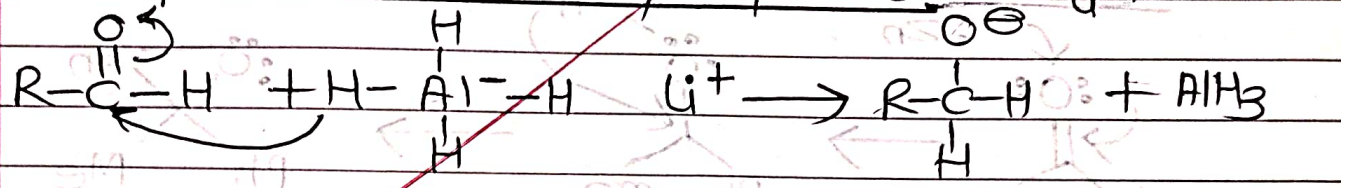
Electrophilic Substitution Reaction.



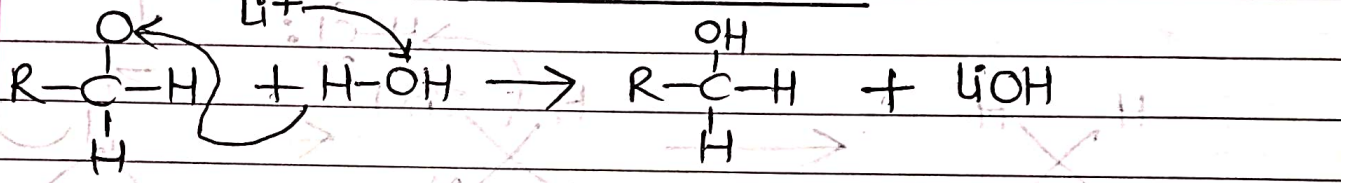
Q.3. Explain Rean mechanism of metal hybride reduction (NaBH4 & LiAlH4)

→ • Mechanism of Metal hybride Redn by LiAlH4

1) Nudeophilic attack by hybride:

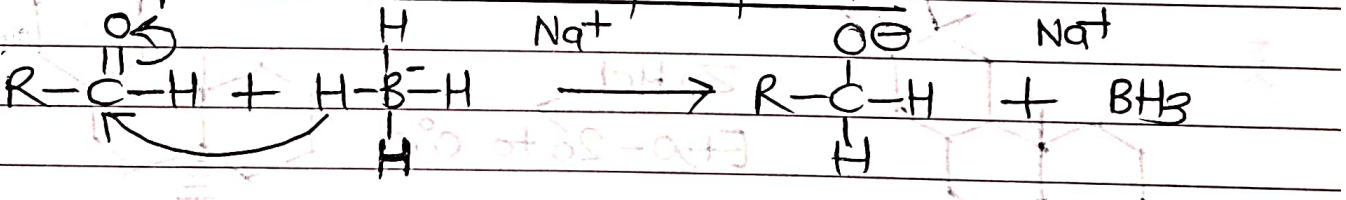


2) Protonation of Alkoxide ion:

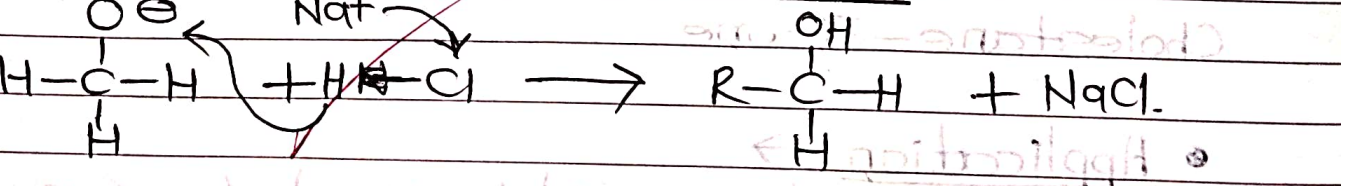


• Mechanism of Metal hybride Redn by NaBH4

1) Nudeophilic attack by hybride:



2) Protonation of Alkoxide ion

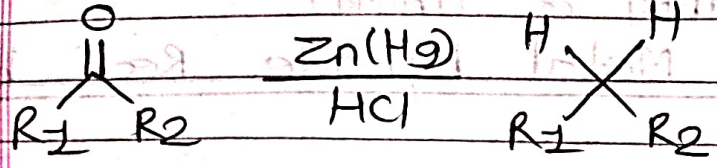


Q.4. Explain Clemmensen Redn Rean.

→ • Clemmensen Redn:→

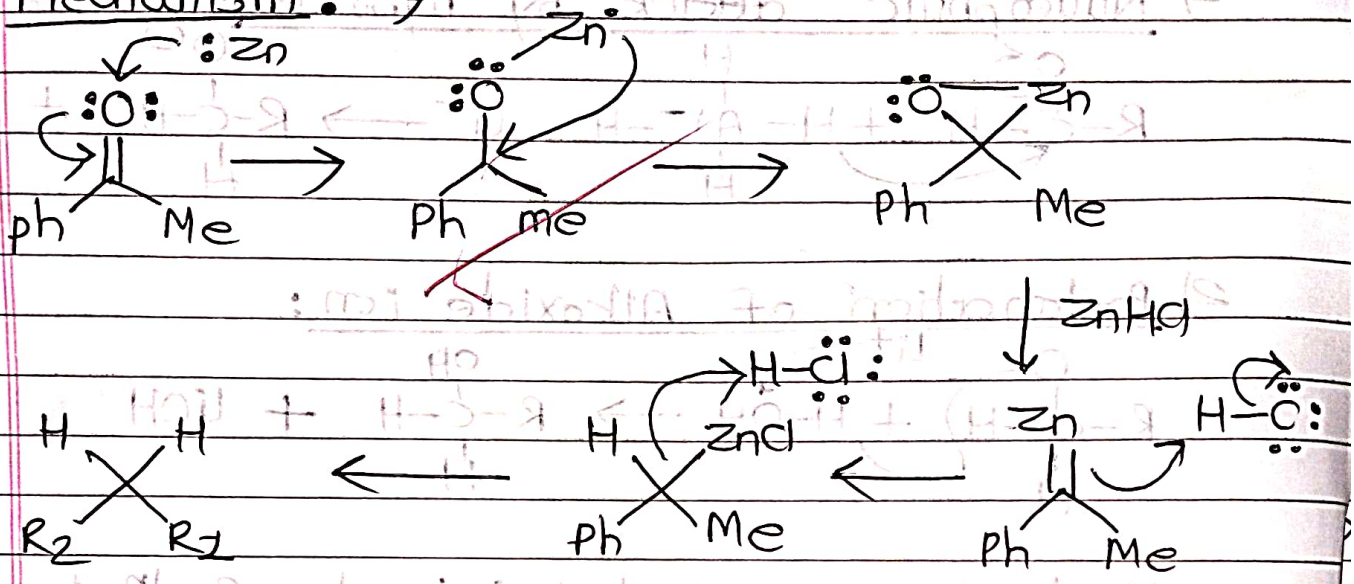
The Conversion of Carbonyl group to a methylene group is done by clemmensen Redn

- **General Reaction:→**

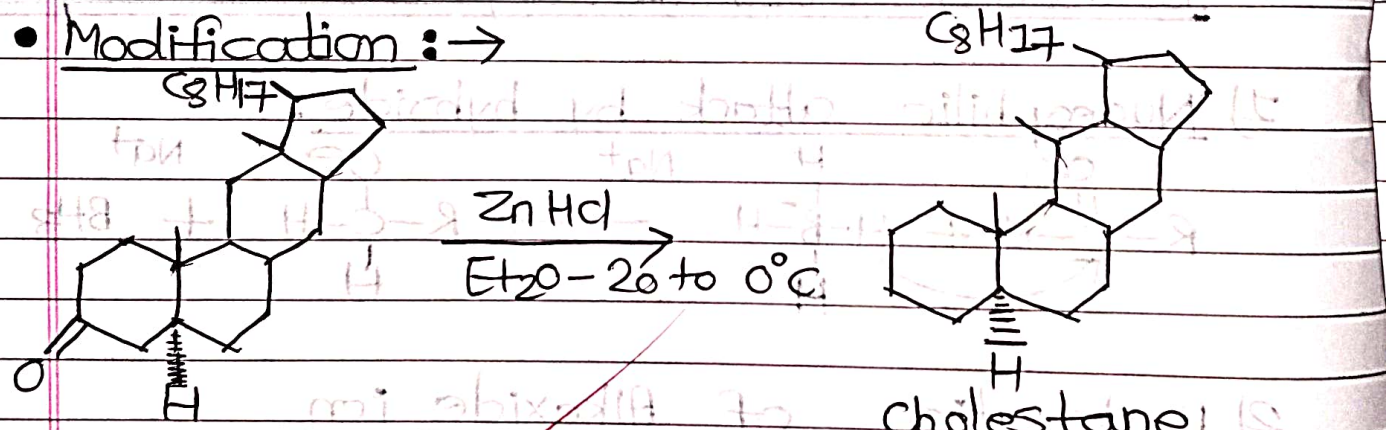


R_1 = Alkyl, Aryl
R_2 = H Alkyl, Aryl

- **Mechanism:→**



- **Modification:→**



Cholestane-3-one

Cholestane

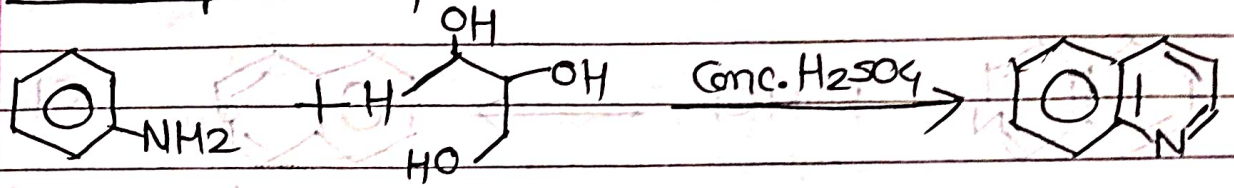
- **Application →**

– This Rean has widely used to convert a Carbonyl group into a methylene group.

Q.1. Synthesis & Uses of Quinoline

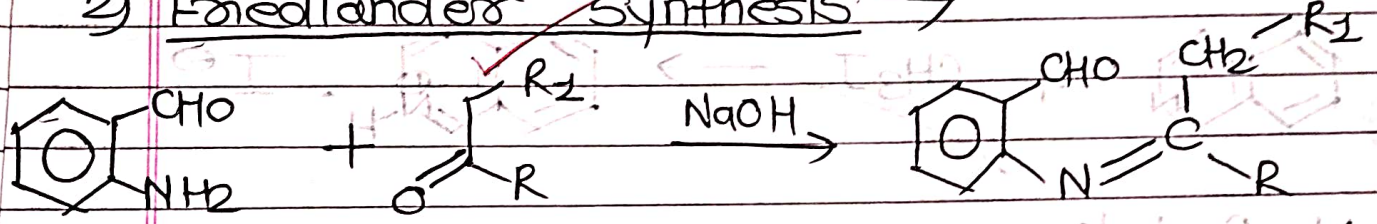
→ • Synthesis :→

1) Skraup's Synthesis →



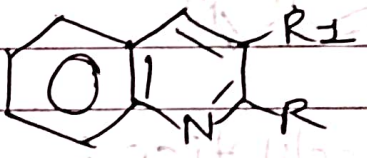
Aniline glycerol Quinoline

2) Friedlander Synthesis →



X-amino benzaldehyde

↓ Knoevenagel Condensation



Quinoline derivative

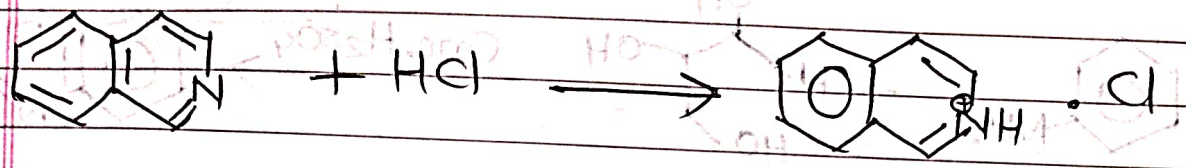
• Medicinal Uses:→

- Quinoline is used alone to treat malaria.
- Quinidine is a class IA Antiarrhythmic drug used to treat or prevent many type of irregular heart beats.
- 8- aminoquinolines such as Primaquine are antimalarial drug.
- Oxamniquine is an Anthelmintic drug

Q.2 Reactions of Isoquinoline

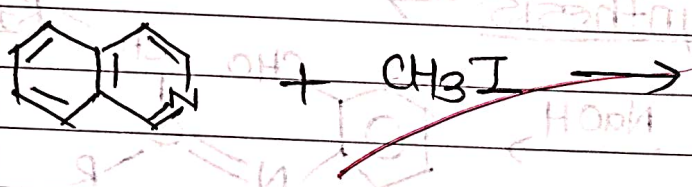
→

1) Protonation:

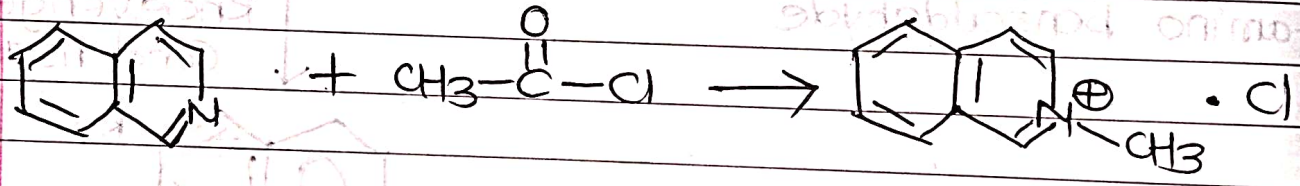


Isoquinolinium chloride

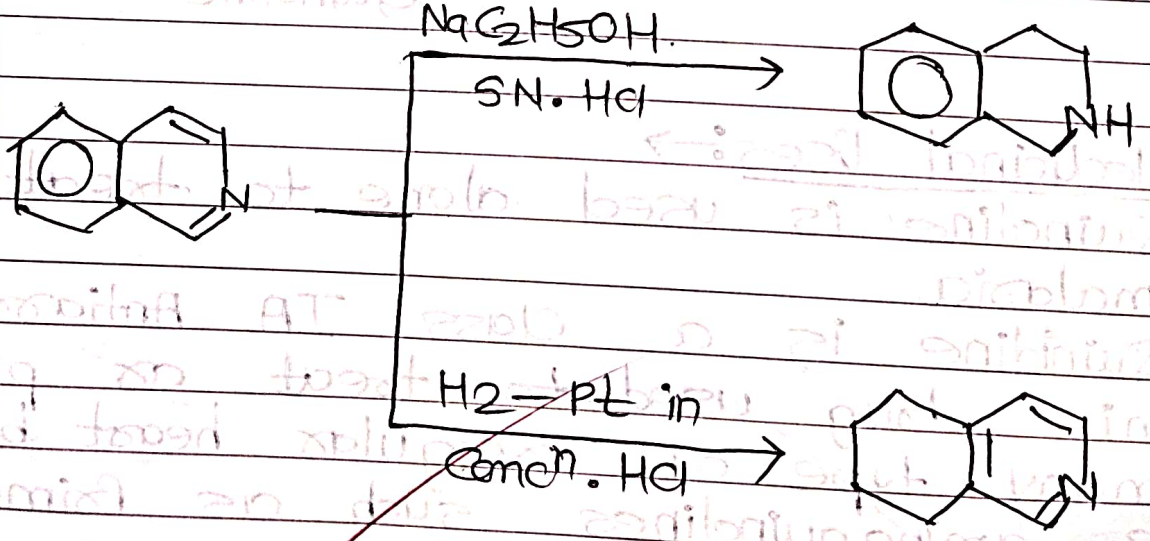
2) N-Alkylation:



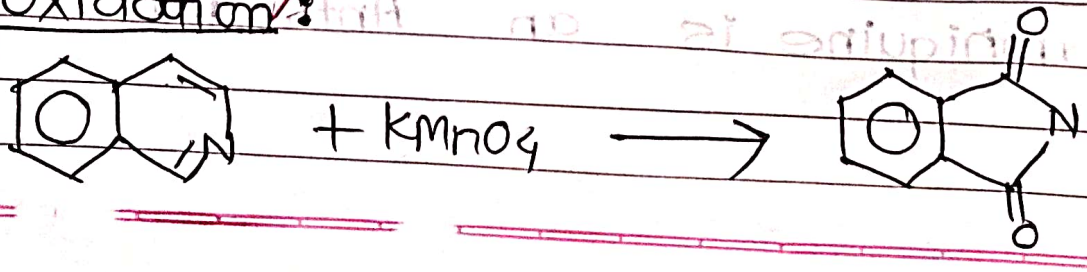
3) N-Acylation:



4) Reduction:



5) Oxidation:



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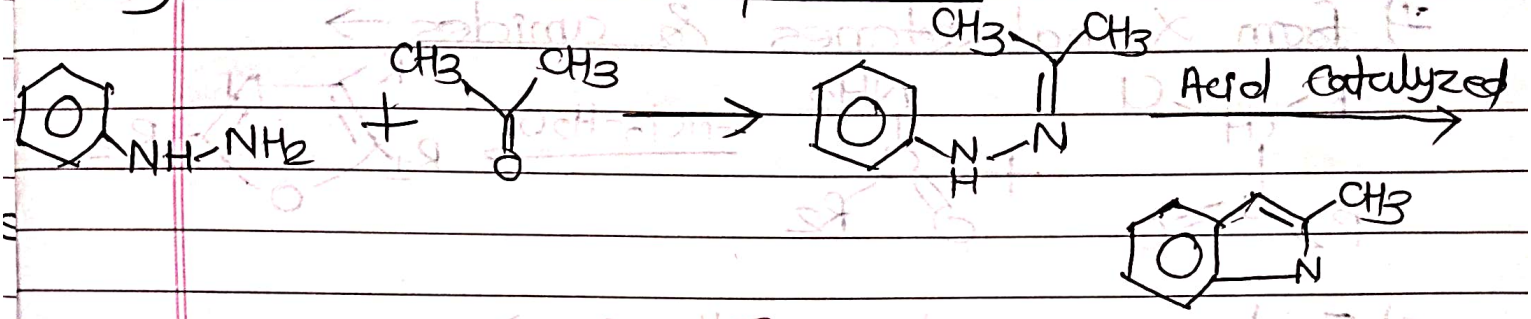
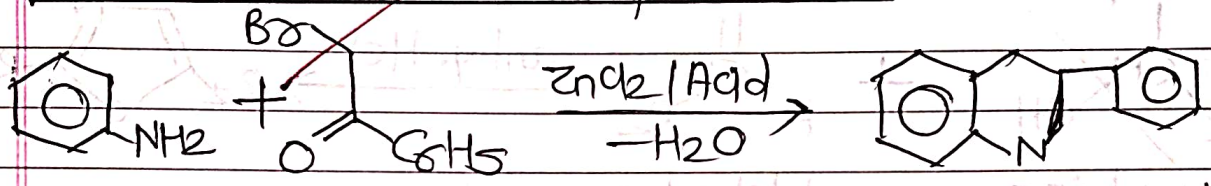
Q.3. Synthesis & Reaⁿ of Indole

→ • **Synthesis →**

1) fischer indole Synthesis



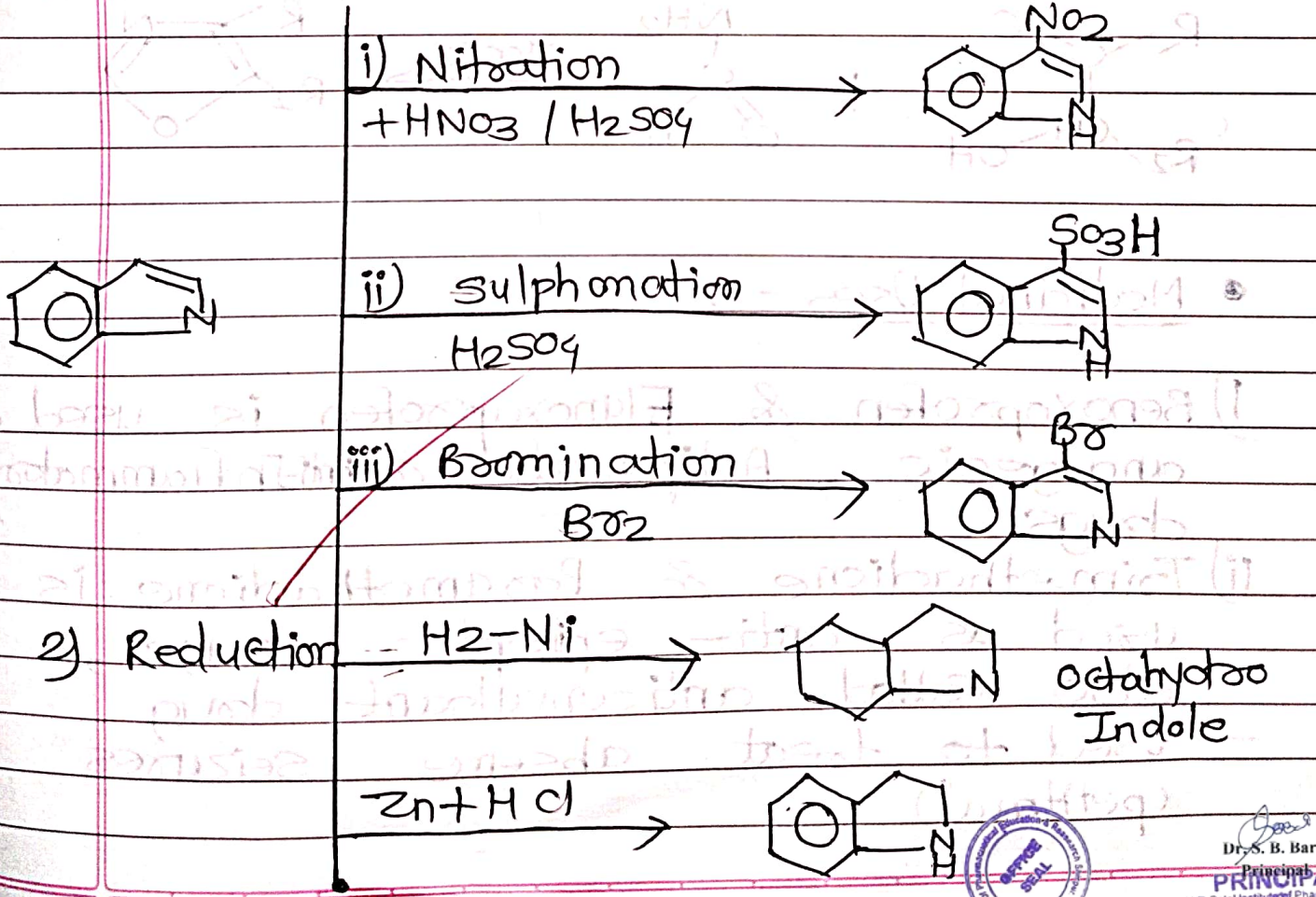
2) Bischler Indole synthesis



2-aryl amine + Bromoacetophenone → 2-aryl indole

• **Reaⁿ →**

1) Electrophilic Aromatic Substitution Reaction



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