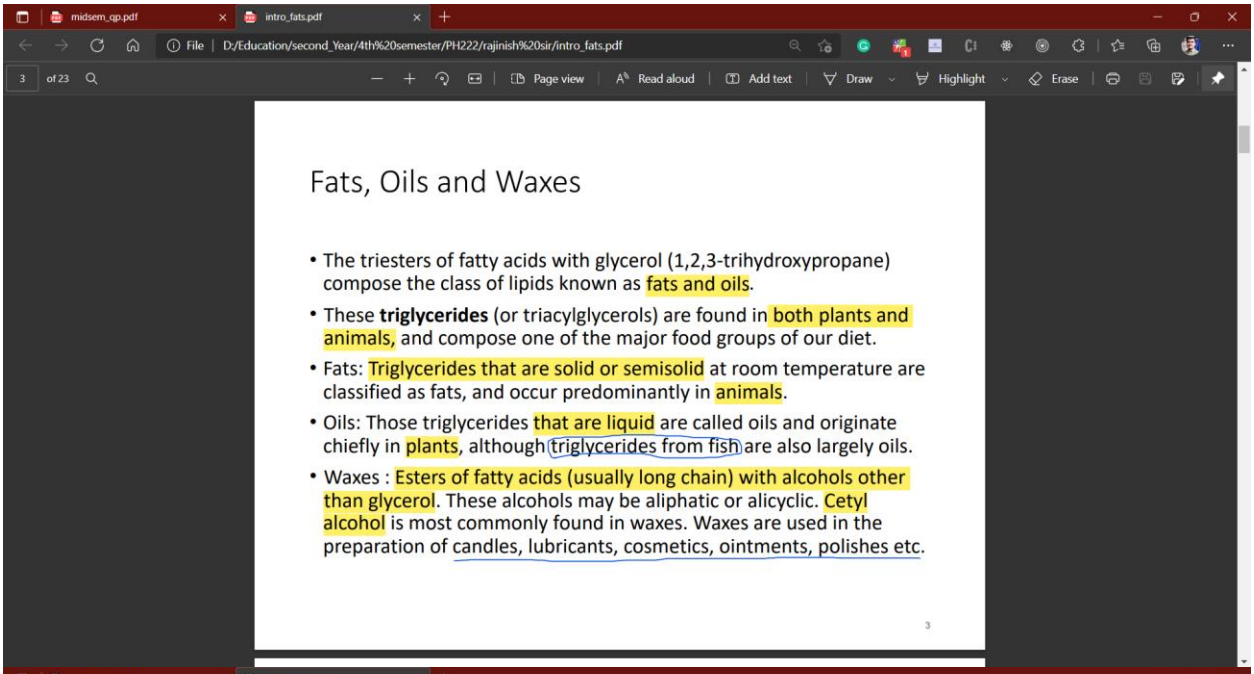
SECTION-A

Q1)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Fats, Oils and Waxes
• The triesters of fatty acids with glycerol (1,2,3-trihydroxypropane) compose the class of lipids known as fats and oils.
• These triglycerides (or triacylglycerols) are found in both plants and animals, and compose one of the major food groups of our diet.
• Fats: Triglycerides that are solid or semisolid at room temperature are classified as fats, and occur predominantly in animals.
• Oils: Those triglycerides that are liquid are called oils and originate chiefly in plants, although triglycerides from fish are also largely oils.
• Waxes : Esters of fatty acids (usually long chain) with alcohols other than glycerol. These alcohols may be aliphatic or alicyclic. Cetyl alcohol is most commonly found in waxes. Waxes are used in the preparation of candles, lubricants, cosmetics, ointments, polishes etc.
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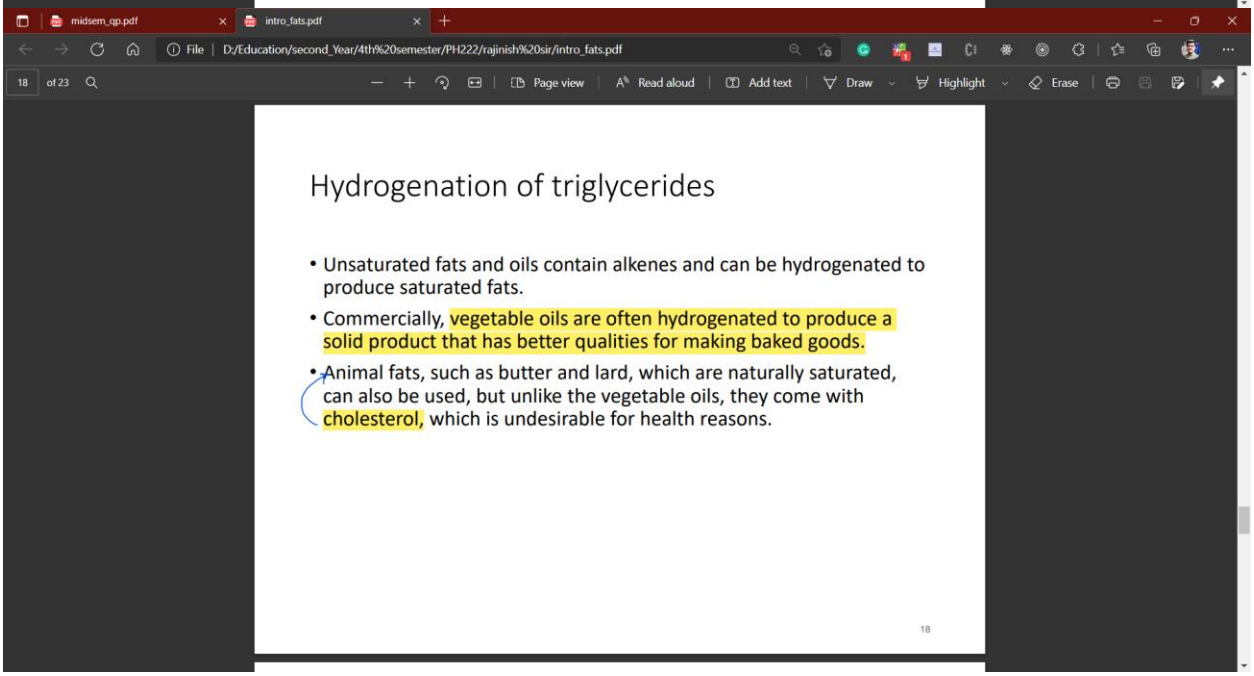
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Hydrogenation of triglycerides
• Unsaturated fats and oils contain alkenes and can be hydrogenated to produce saturated fats.
• Commercially, vegetable oils are often hydrogenated to produce a solid product that has better qualities for making baked goods.
• Animal fats, such as butter and lard, which are naturally saturated, can also be used, but unlike the vegetable oils, they come with cholesterol, which is undesirable for health reasons.
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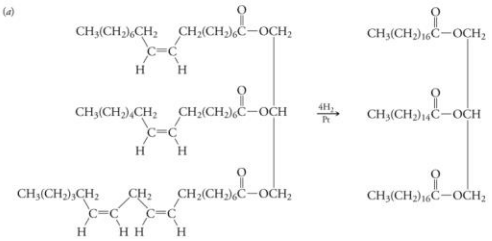
Triglycerides

- Hydrogenation of triglycerides
- Total hydrogenation



liquid solid

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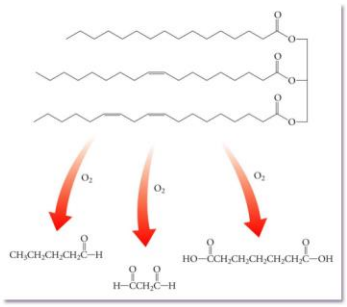
Oxidation

- Unsaturated triglycerides can react with oxygen to produce small change fatty acids another small molecules.
- These often do not smell very good.
- This is what happens when butter goes rancid.
- This makes solid fats and oils more stable than liquid oils and is why the solid fats are preferred for deep frying.



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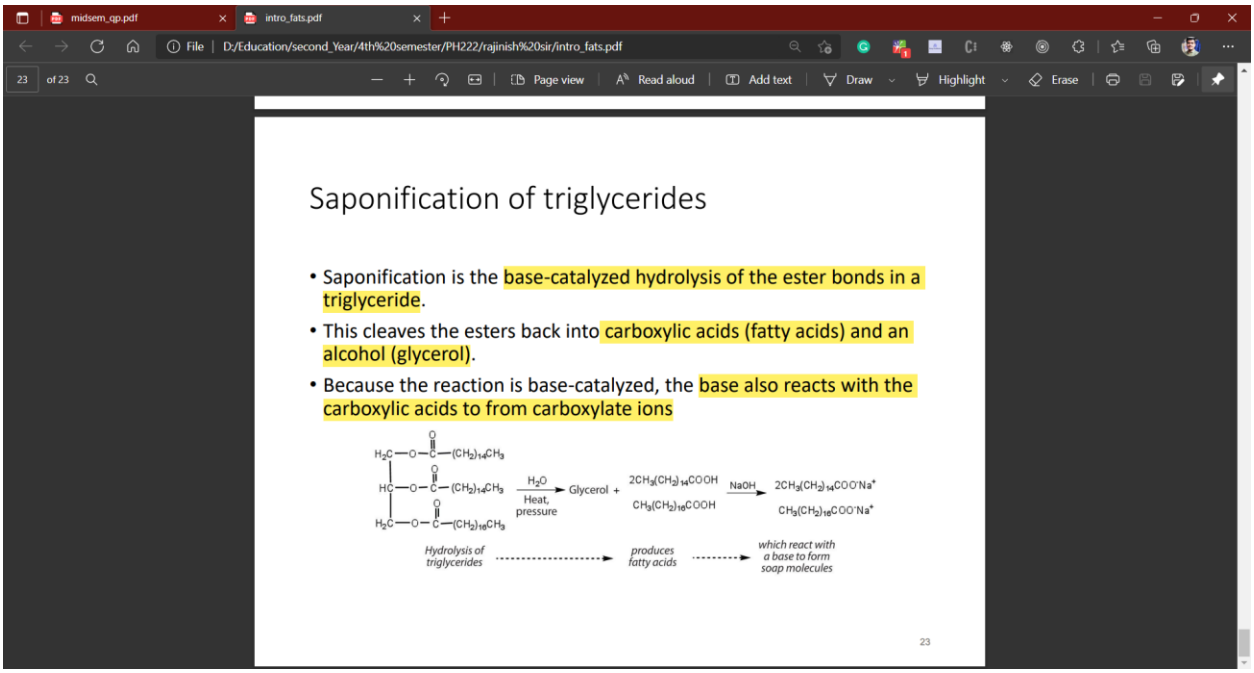
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Saponification of triglycerides
• Saponification is the base-catalyzed hydrolysis of the ester bonds in a triglyceride.
• This cleaves the esters back into carboxylic acids (fatty acids) and an alcohol (glycerol).
• Because the reaction is base-catalyzed, the base also reacts with the carboxylic acids to from carboxylate ions
H2O
Heat, pressure
Glycerol +
NaOH
Hydrolysis of triglycerides
produces fatty acids
which react with a base to form soap molecules
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(b)

Iodine Value

- The iodine value of an oil/fat is the number of grams of iodine absorbed by 100g of the oil/fat, when determined by using Wijs solution.
- Principle: The oil/fat sample taken in carbon-tetrachloride is treated with a known excess of iodine monochloride solution in glacial acetic (Wijs solution). The excess of iodine monochloride is treated with potassium iodide and the liberated iodine estimated by titration with sodium thiosulfate solution.
- Analytical importance: The iodine value is a measure of the amount of unsaturation (number of double bonds) in a fat.

Calculation:

$$\text{Iodine value} = \frac{12.69\ (B - S)\ N}{W}$$

Where,

B = volume in ml of standard sodium thiosulphate solution required for the blank.

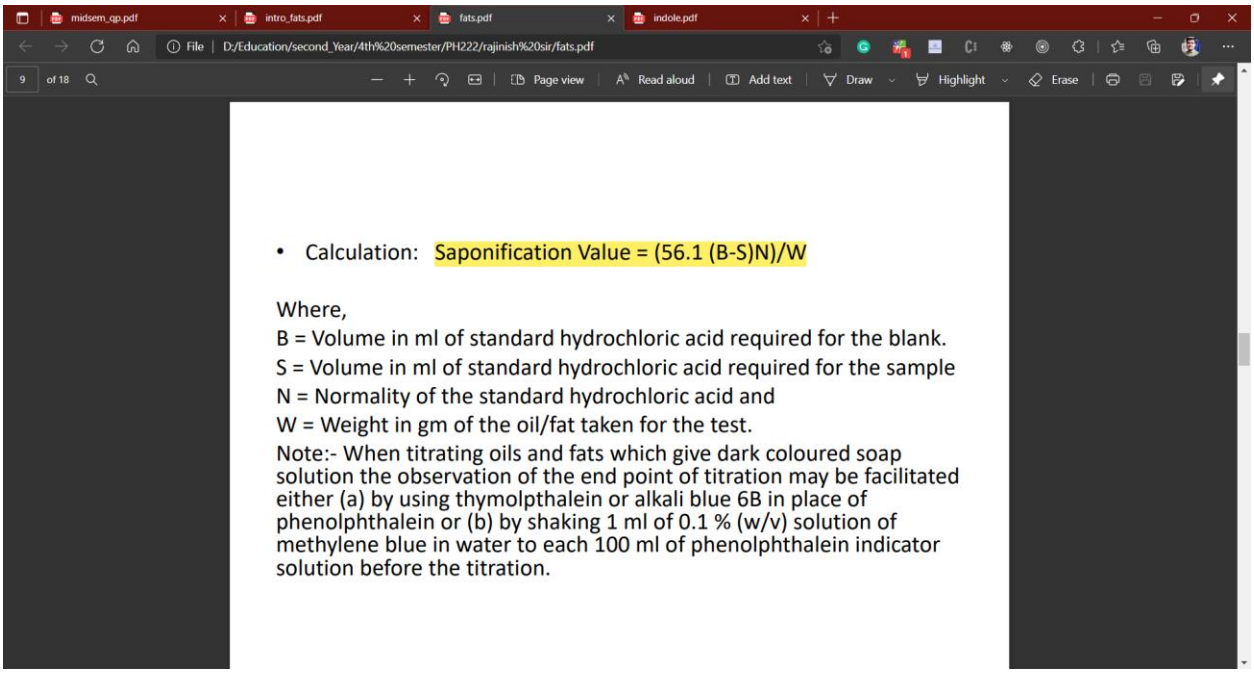
S = volume in ml of standard sodium thiosulphate solution required for the sample.

N = normality of the standard sodium thiosulphate solution.

W = weight in g of the sample.

Saponification Value

- The saponification value is the number of mg of potassium hydroxide required to saponify 1 gram of oil/fat.
- Principle: The oil sample is saponified by refluxing with a known excess of alcoholic potassium hydroxide solution. The alkali required for saponification is determined by titration of the excess potassium hydroxide with standard hydrochloric acid.
- Analytical importance: The saponification value is an index of mean molecular weight of the fatty acids of glycerides comprising a fat. Lower the saponification value, larger the molecular weight of fatty acids in the glycerides and vice-versa.
- Procedure: Melt the sample if it is not already liquid and filter through a filter paper to remove any impurities and the last traces of moisture. Make sure that the sample is completely dry. Mix the sample thoroughly and weigh about 1.5 to 2.0 g of dry sample into a 250 ml Erlenmeyer flask. Pipette 25 ml of the alcoholic potassium hydroxide solution into the flask. Conduct a blank determination along with the sample. Connect the sample flasks and the blank flask with air condensers, keep on the water bath, boil gently but steadily until saponification is complete, as indicated by absence of any oily matter and appearance of clear solution. Clarity may be achieved within one hour of boiling. After the flask and condenser have cooled somewhat wash down the inside of the condenser with about 10 ml of hot ethyl alcohol neutral to phenolphthalein. Titrate the excess potassium hydroxide with 0.5N hydrochloric acid, using about 1.0 ml phenolphthalein indicator.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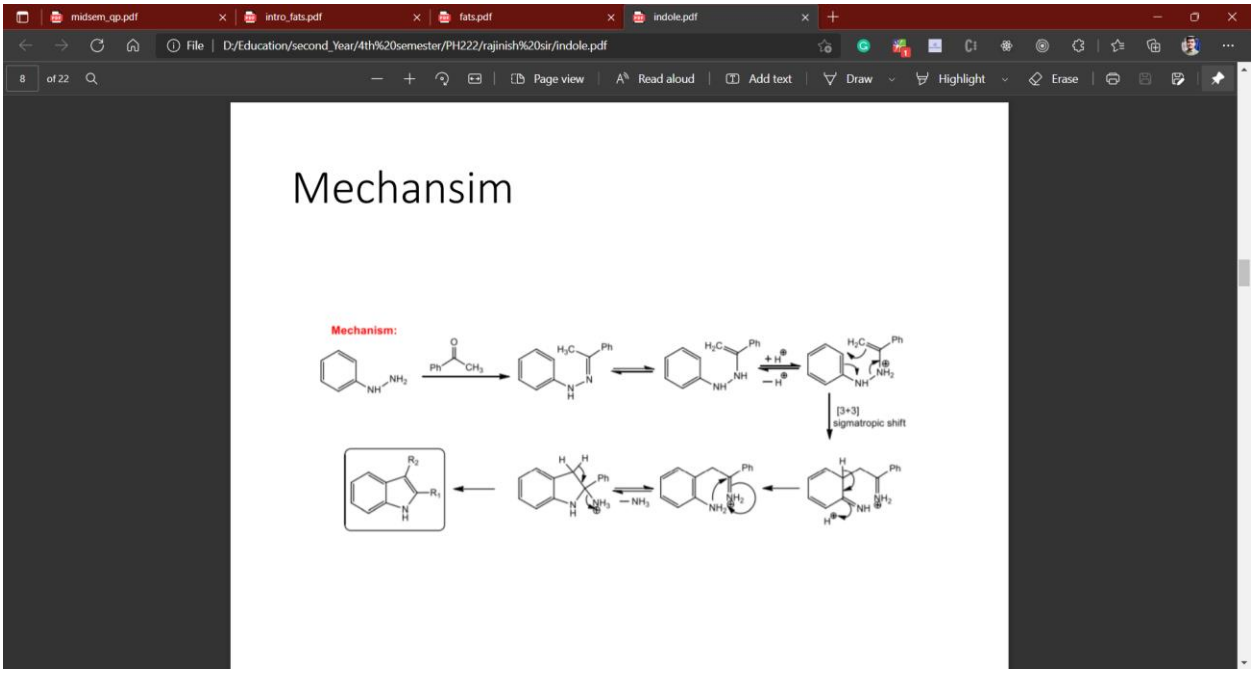
• Calculation: Saponification Value = (56.1 (B-S)N)/W
Where,
B = Volume in ml of standard hydrochloric acid required for the blank.
S = Volume in ml of standard hydrochloric acid required for the sample
N = Normality of the standard hydrochloric acid and
W = Weight in gm of the oil/fat taken for the test.
Note:- When titrating oils and fats which give dark coloured soap solution the observation of the end point of titration may be facilitated either (a) by using thymolpthalein or alkali blue 6B in place of phenolphthalein or (b) by shaking 1 ml of 0.1 % (w/v) solution of methylene blue in water to each 100 ml of phenolphthalein indicator solution before the titration.

Q2)

(a)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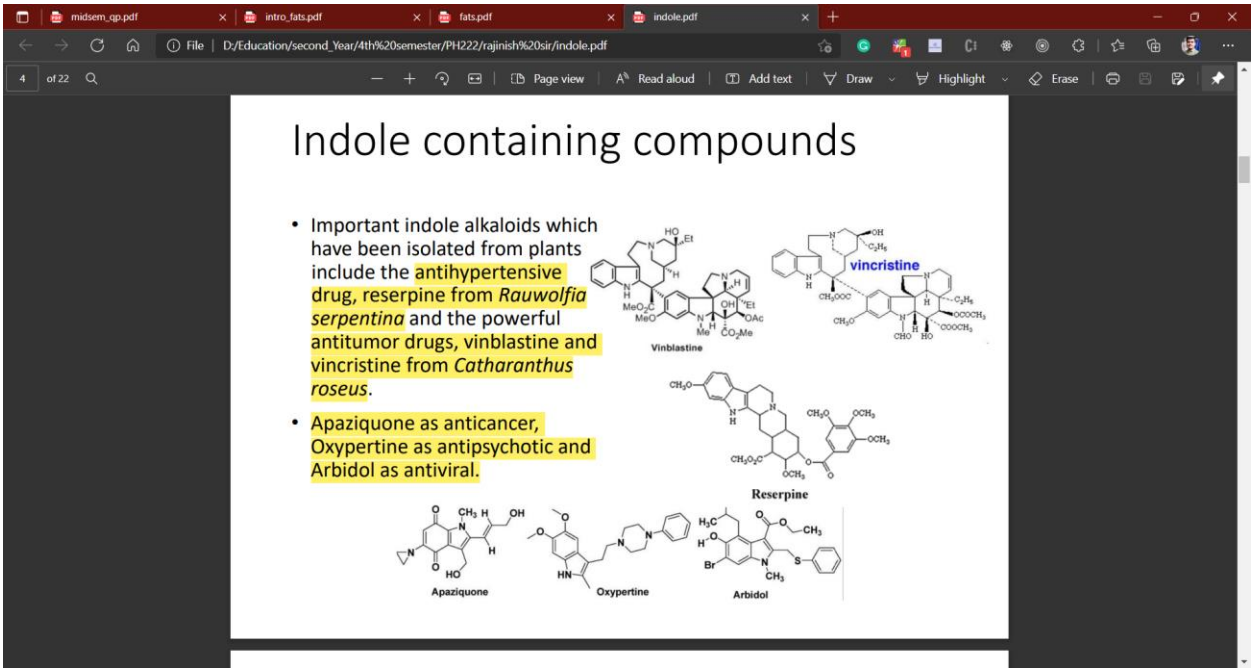
Mechanism:
[3+3] sigmatropic shift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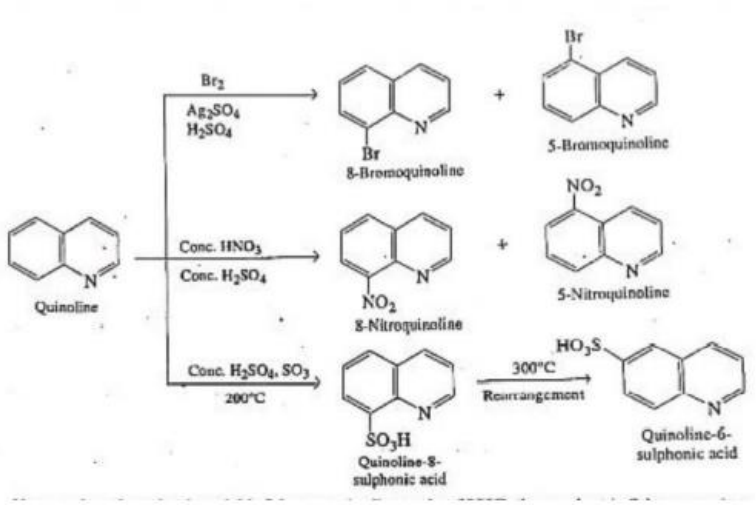
Indole containing compounds
Important indole alkaloids which have been isolated from plants include the antihypertensive drug, reserpine from Rauwolfia serpentina and the powerful antitumor drugs, vinblastine and vincristine from Catharanthus roseus.
Apaziquone as anticancer, Oxypertine as antipsychotic and Arbidol as antiviral.
vincristine
Vinblastine
Reserpine
Apaziquone
Oxypertine
Arbidol

(b)


Br
Br2
Ag2SO4
H2SO4
+
8-Bromoquinoline
5-Bromoquinoline
NO2
Conc. HNO3
Conc. H2SO4
+
Quinoline
NO2
8-Nitroquinoline
5-Nitroquinoline
HO3S
Conc. H2SO4, SO3
200°C
300°C
Rearrangement
SO3H
Quinoline-8-sulphonic acid
Quinoline-6-sulphonic acid