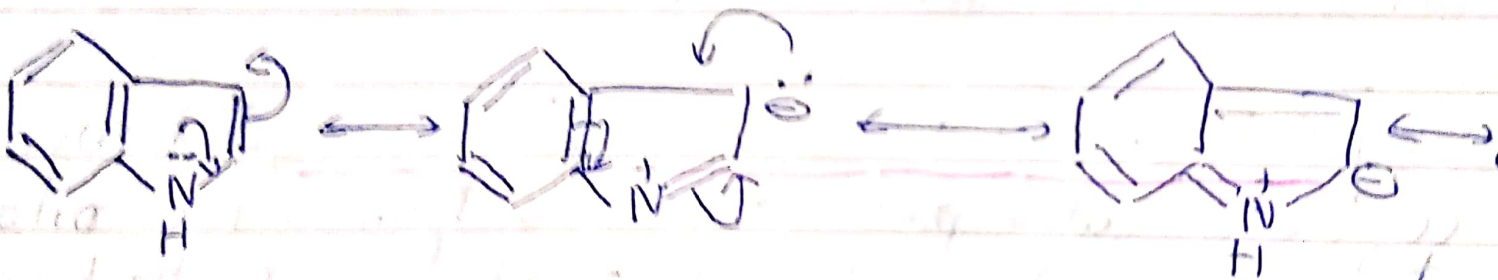


## PROPERTIES - CHEMICAL

Indole is considered to be resonance hybrid of several canonical structures.



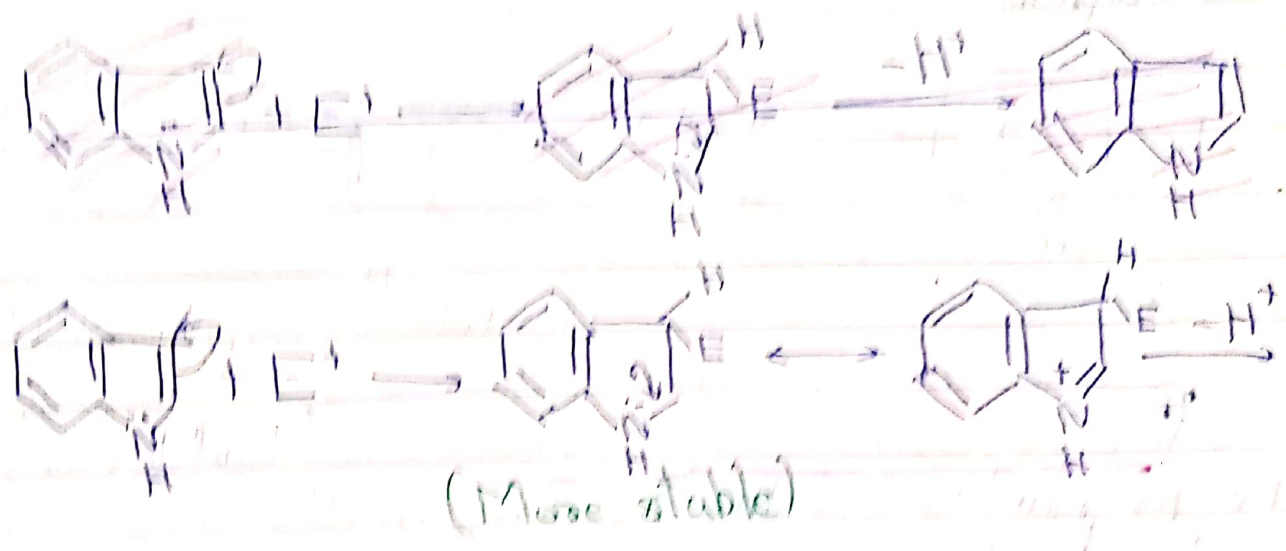
The resonance energy is of the order of 47-49 Kcal/moles.

(1) BASIC AND ACIDIC CHARACTER - Like pyrrole and indole is a weak base and also a weak acid. It is polymerised by strong acid and react with potassium hydroxide and  $\text{CrO}_3$  reagent.

# 11. ELECTROPHILIC SUBSTITUTION REACTION

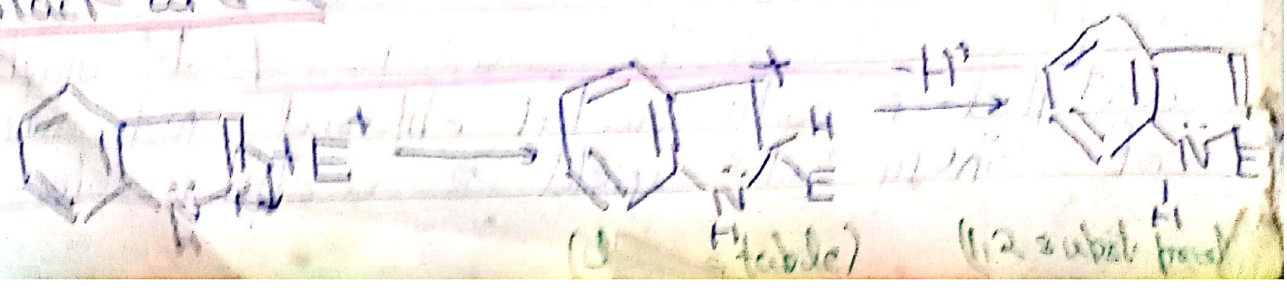
Unlike pyridine which undergoes electrophilic substitution at C-3. This is because two resonance forms can be written for intermediate cation obtained from attack at C-3 (without disturbing the benzene ring) whereas only one such form is possible for substitution at C-2. Consequently the former intermediate is more stable than the latter.

## Attack at C-3



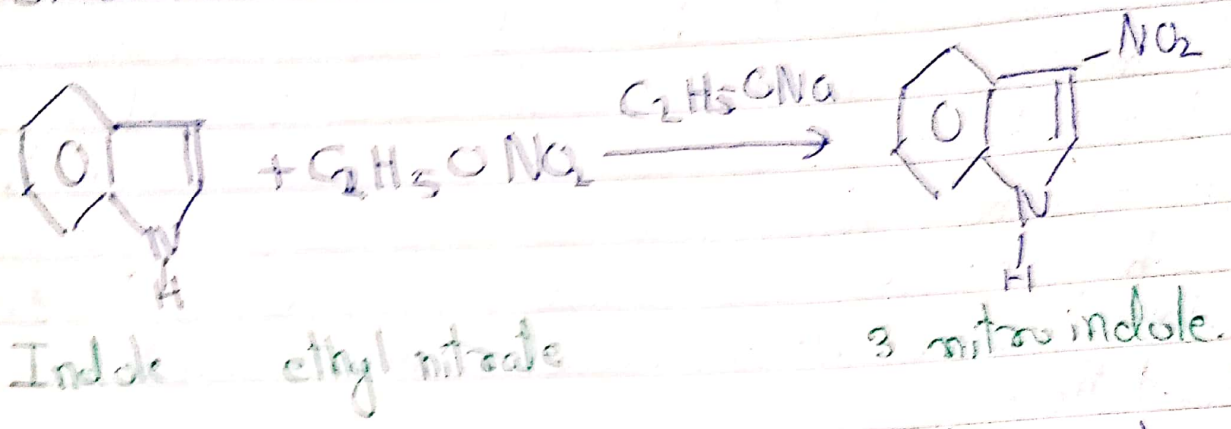
(3 substituted product).

## Attack at C-2

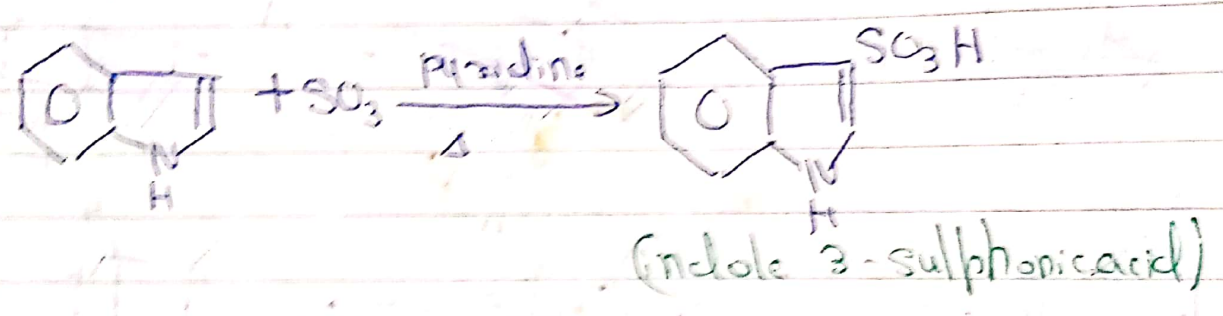




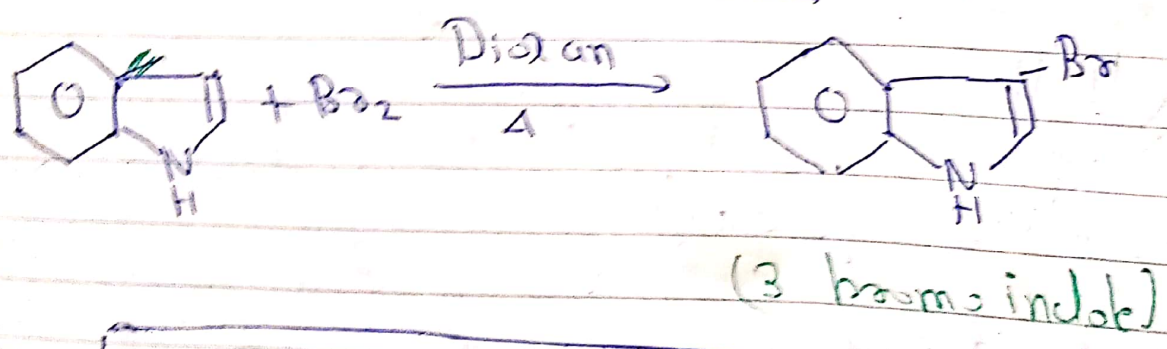
(b) NITRATION → It may be nitrated at low temp with ethyl nitrate in the presence of sodium ethoxide.



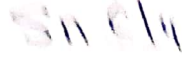
(c) SULPHONATION → Indole undergoes sulphonation with  $SO_3$  in pyridine at  $110^\circ$  to give indole 3-sulphonic acid.



(c) HALOGENATION (Bromination) → Indole can be brominated with bromine in dioxane at  $0^\circ C$  to form 3-bromo indole.



(d) FRIEDEL CRAFTS REACTION → It may be acetylated with acetyl chloride in presence of  $SnCl_4$  to yield 3-acetyl indole.

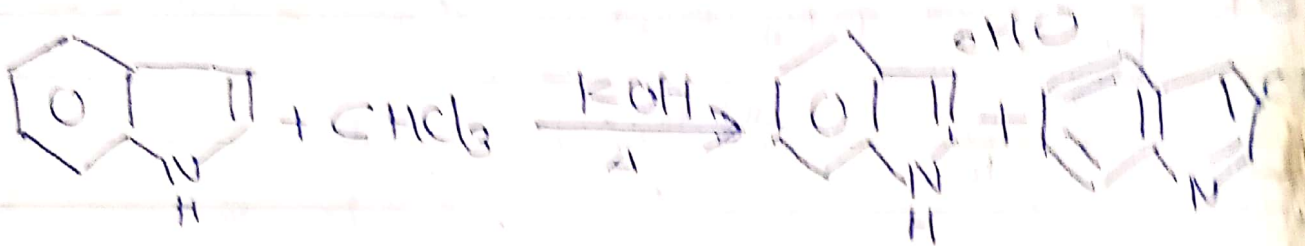


Indole

Acetyl chloride

Acetyl indole

(2) REIMER-TIEMER REACTION: Indole reacts with chloroform in the presence of alkali to yield indole 3 aldehyde and 3 chloroquinoline.

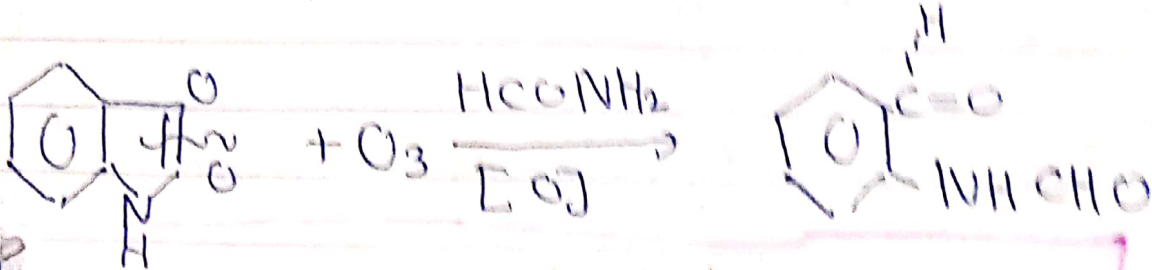


Indole 3 aldehyde

3 chloroquinoline

(3) OXIDATION

Indole may be oxidised by ozone in R. Passamide to give R. Passamide benzaldehyde.



Indole

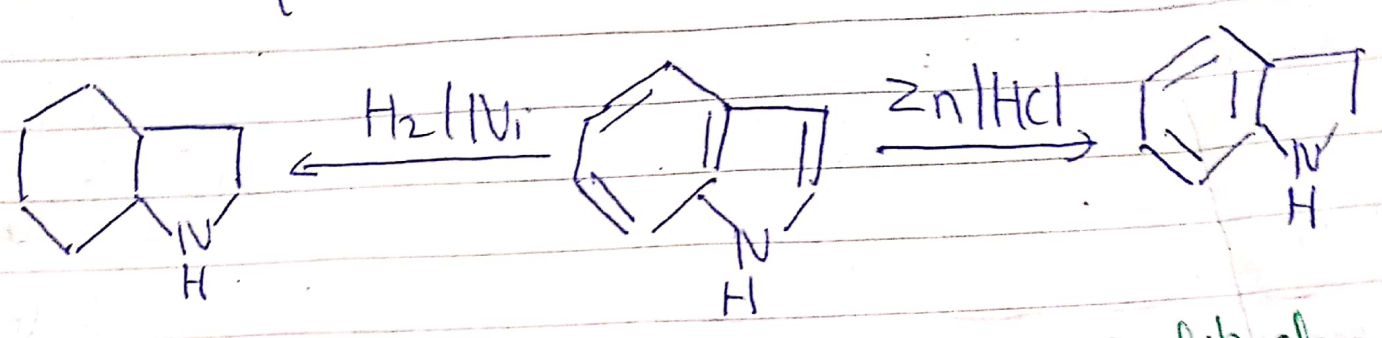
R. Passamide benzaldehyde

(4) REDUCTION

Indole reduction of indole with zinc and hydrochloric acid yields



2,3 dihydroindole. Catalytic reduction hydro-  
 -genates both rings and product obtained  
 is octahydroindole.



2,3 dihydro-  
 -indole

