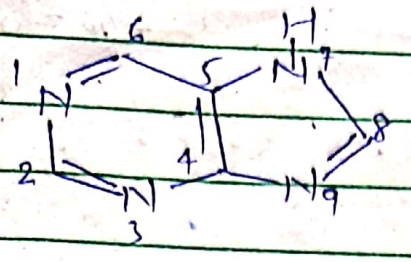
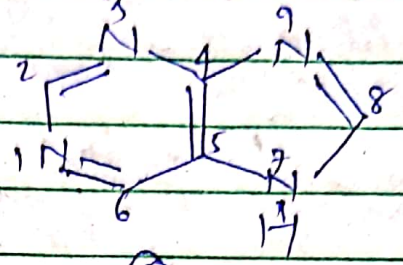


Purin.

(A)

or



(B)

('B' is 'A' turned upside down, there is no change in numbering. P. 784 - Finar II)

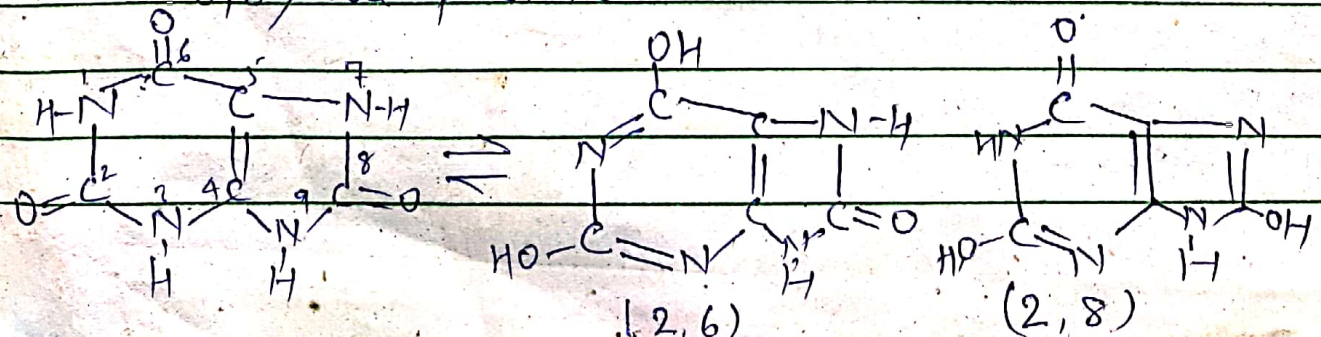
Uric acid: —

1) It is white crystalline ~~powder~~ solid having no sharp m.p., but a high decomposition temperature (>300°C). It is very slightly soluble in water, insoluble in alcohol, but soluble in glycerol, hot alkali ---etc.

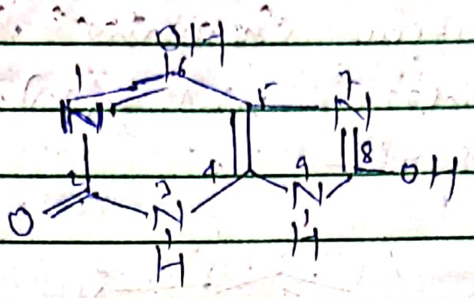
(ii) It is a weak dibasic acid ~~& its acidity is probably due to its enolisation to a dienol~~ & forms two series of salts (e.g. monosodium & disodium urate). The (acidic salt) (neutral salt)

neutral salts are moderately soluble in water but the acid salts are practically insoluble.

Its acidity is probably due to ~~its~~ its enolisation to a ~~dienoly~~ dienol. Three dienolic forms of uric acid (2,6; 2,8 & 6,8) are possible as under



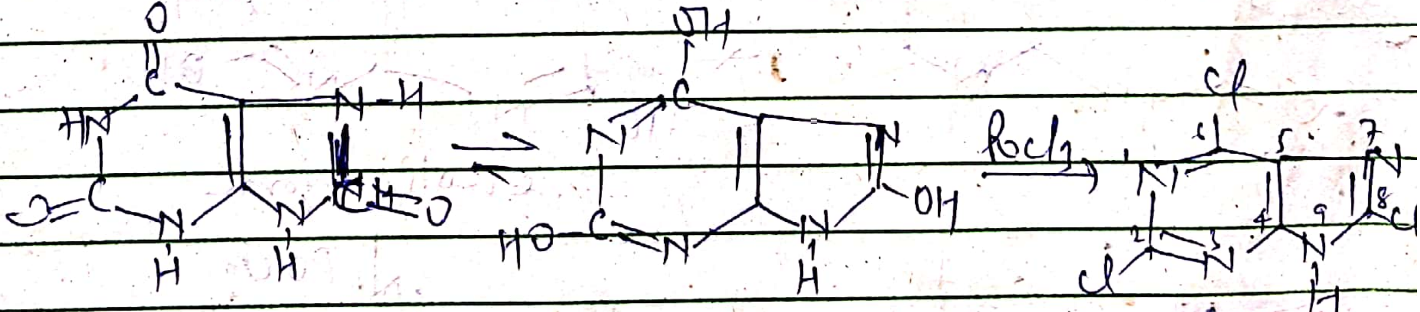
(2,6) (2,8)



(6, 8)

But it is still uncertain that which of the above forms participate in the formation of ~~monosodi~~ monosodium (acid salt) & disodium salt (neutral salt). It may be 2,6, because in this arrangement the pyrimidine ring will be aromatic & so stabilised (by resonance) (2,6 for arrangement is further supported by the fact that the u.v. spectra of purine & pyrimidine derivatives show basic similarities.)

(iii) Uric acid also exists in the trienolic form (but not under the above conditions), which is indicated by the formation of 2,6,8 trichloro purine when uric acid is treated with $POCl_3$.



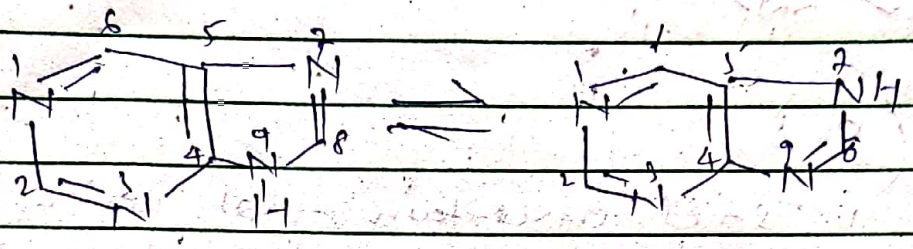
Trienol form   2,6,8-trichloro purine

The reactivity of Cl-atoms towards nucleophilic reagents are

6-Cl > 2-Cl > 8-Cl ← (Five membered ring attached in non-aromatic ~~less electron~~ & the carbon atom attached C Cl is less electron deficient as it is attached C only are sp^2 N atom)

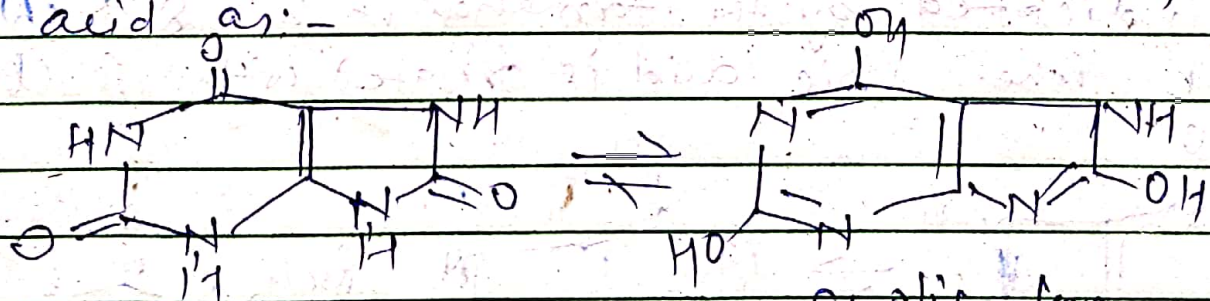
(less sterically hindered) (more hindered)

Purine :→ It is an example of a condensed heterocyclic system consisting of pyrimidine & imidazole ring fused together as shown below :—

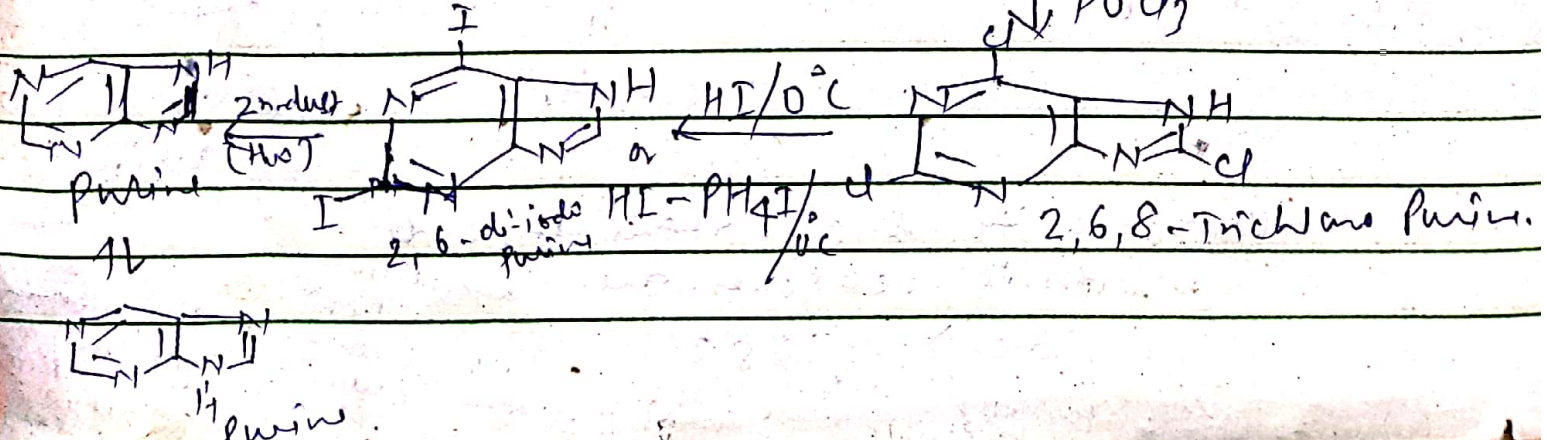


Uric acid (the end product of Nitrogen metabolism in many animals, discovered by Scheele in 1776 in urinary calculi), caffeine, theobromine & Theophyline (responsible for the stimulating action of beverages like, coffee, cocoa & tea); Xanthine, hypoxanthine, adenine & guanine (the decomposition products of nucleic acids)---etc are all Purines & its derivatives.

It can be synthesised from Uric acid as :—



enolic form



So Uric acid contains purine nucleus.

Purine behaves as a weak monoacid base (pKa 8.96). [Diazomethane or $(CH_3)_2SO_4$/OH⁻ methylate purine in the 9-position].

Since in Pyrimidine nucleus both the N-atoms are sp^2, having greater S-character, so lesser tendency to donate its lone pair.

In imidazole nucleus one N- is sp^2 & other is sp^3 which lone pair may involve in resonance to impart its aromatic character, so less basic.

[Like Pyrrole it may easily release $H^{\oplus}$ of the H- attached to Nitrogen in imidazole ring & the lone pair on N may involve more in the formation of aromatic sextet. The -ve charged ion may also be stabilised by resonance as