ALIZARIN (1,2-dihydroxy anthraquinone) It is the most important MORDANT DYE belonging to the anthraquinone group. It is the chief constituent of the madder roots in which it occurs as a glycoside (ruberythric acid) which on acidic or enzymatic hydrolysis gives ALIZARIN, glucose and xylose. $C_{25}H_{26}O_{13} \xrightarrow{H_2O} C_{14}H_8O_4 + C_6H_{12}O_6 + C_5H_{10}O_5$

Structure of ALIZARIN:

(1) Molecular formula $C_{14}H_8O_4$.

(2) $\xrightarrow[\text{distillation}]{Zn}$ Anthracene, this indicates the presence of Anthracene in ALIZARIN.

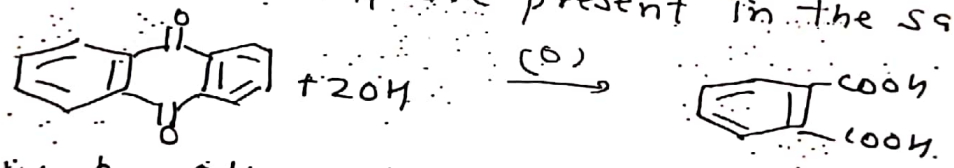
(3) $\xrightarrow{Ac_2O}$ Diacetate, indicates the presence of two hydroxyl groups.

(4) $\xrightarrow[2 \text{ moles}]{Br_2}$ Dibromoanthraquinone $\xrightarrow[\text{fuse}]{KOH}$ Dihydroxy anthraquinone

Thus alizarin is a dihydroxy anthraquinone

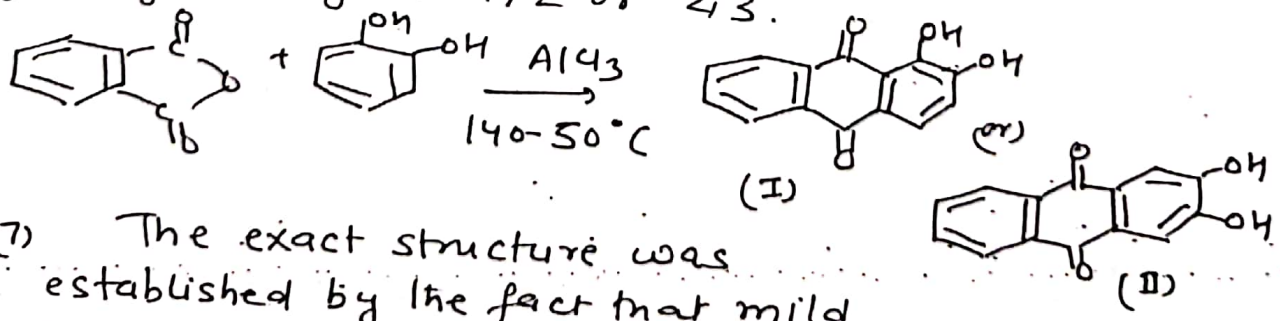
(5) Position of hydroxyl groups:

Vigrous oxidation of alizarin form phthalic acid proving that both OH are present in the same ring.

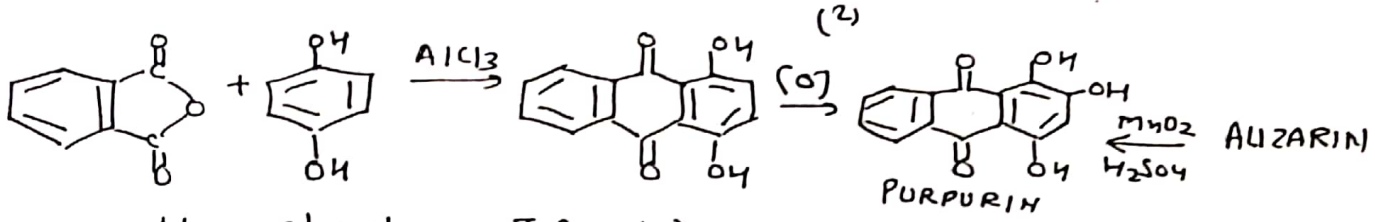


Thus, the OH must be at 1,2 ; 1,3 , 2,3 or 1,4.

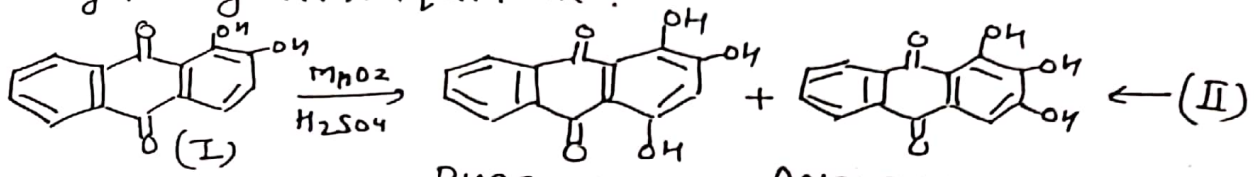
(6) ALIZARIN is obtained when catechol is condensed with phthalic anhydride indicating that the two hydroxyls are present in ortho positions, so the hydroxyls may be 1,2 or 2,3.



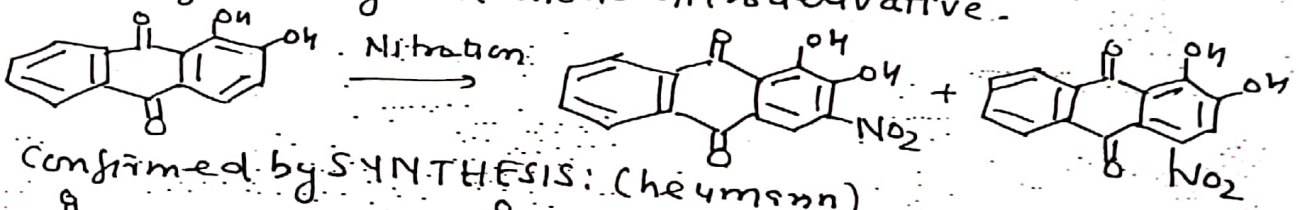
(7) The exact structure was established by the fact that mild oxidation of Alizarin with MnO_2/H_2SO_4 gives purpurin which was shown to be 1,2,4-trihydroxy anthraquinone by synthesis.



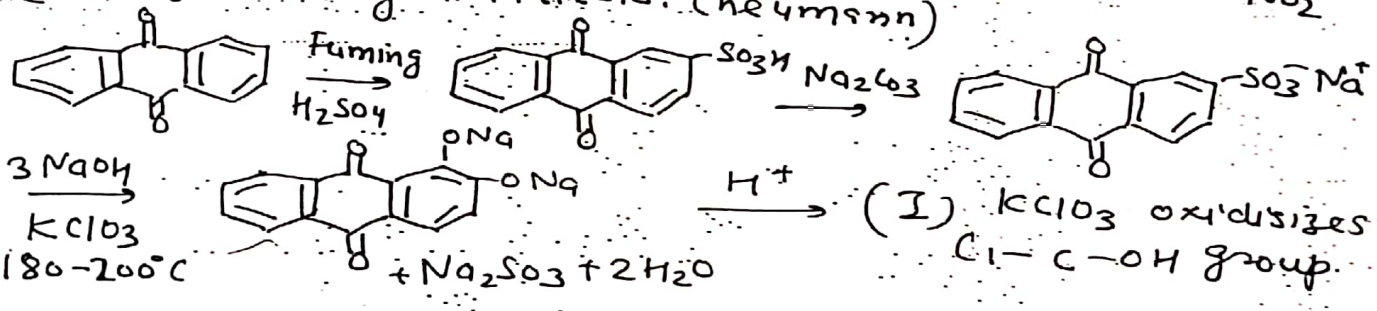
Now structure I (only) can explain the formation of PURPURIN whereas structure II form only 1,2,3-trihydroxy anthraquinone.



(8) So ALIZARIN is I which is further proved by its conversion into two isomeric mono nitro derivatives whereas II will give only one mono nitroderivative.



(9) Confirmed by SYNTHESIS: (Heumann)



PROPERTIES: It forms Ruby Red crystalls, m.p 290°C and dissolves in alkali to give purple solution. This dye is applied to the fibre or cloth that has been pretreated with metal salt in the presence of a mild alkali and wetting agent. Strongly coloured insoluble metal complexes lakes thus formed, are precipitated within the fibre. The colour of lake deepens on the metal used. Cr^{+3} → Brown black Ba^{+2} = Blue. Al^{+3} → TURKEY RED; Fe (+3) → Violet Black, Aluminium and iron lakes are widely used for cotton dying and for printing and Aluminium and chromium lakes for wood dying.