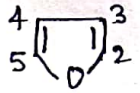
SUBJECT - CHEMISTRY
CLASS - B.Sc(Hons) PART - II
PAPER - IV
TOPIC - Ring Size in glucose

Dr. Hasi Mohan prasad Singh
Department of Chemistry
Dr. L.K.V.D College Tajpur Samastipur

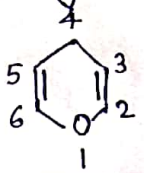
Ring Size in glucose: The cyclisation of C_1 and C_2 glucose gives 3-membered ring and the cyclisation of C_1 and C_3 gives 4-membered ring in glucose but 3 or 4- membered ring is very unstable and hence, we expect 5 or 6-membered ring in glucose.

The 5-membered heterocyclic ring Containing one oxygen atom is called furanose ring because it resembles furan -



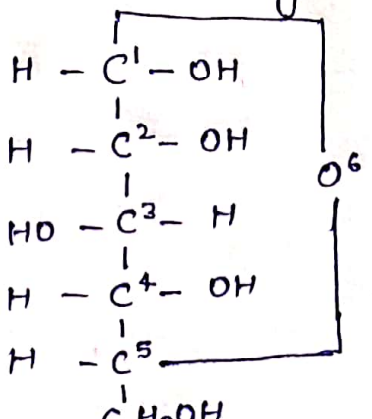
(Furan)

The 6-membered heterocyclic ring Containing one oxygen atom is called pyranose ring because it resembles pyran -



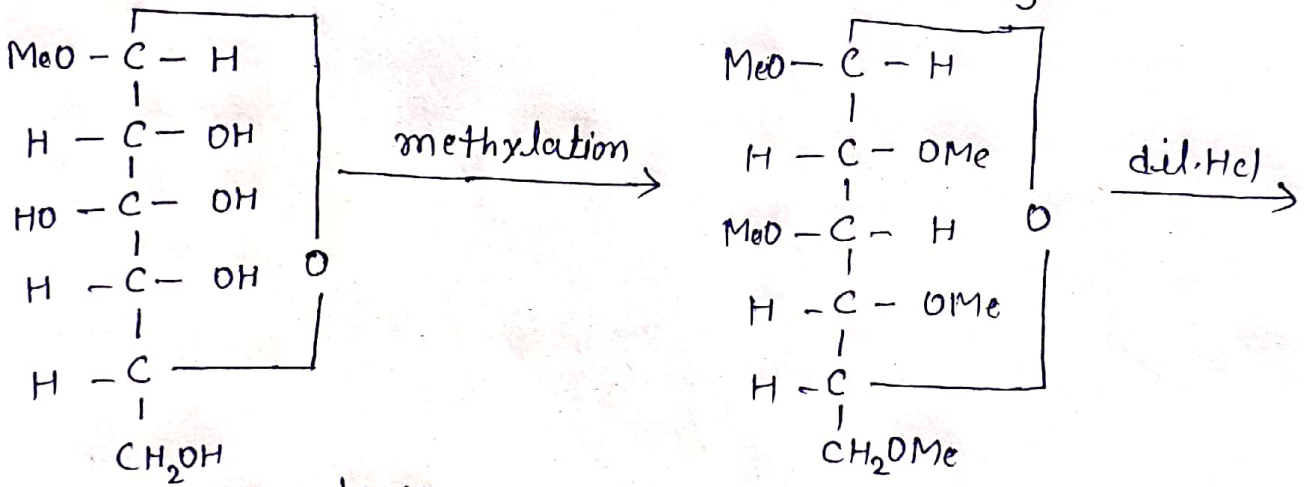
(Pyran)

Both 5 and 6-membered heterocyclic ring have Similer Stability But the X-ray data Show that the glucose has pyranose ring and not the furanose ring.

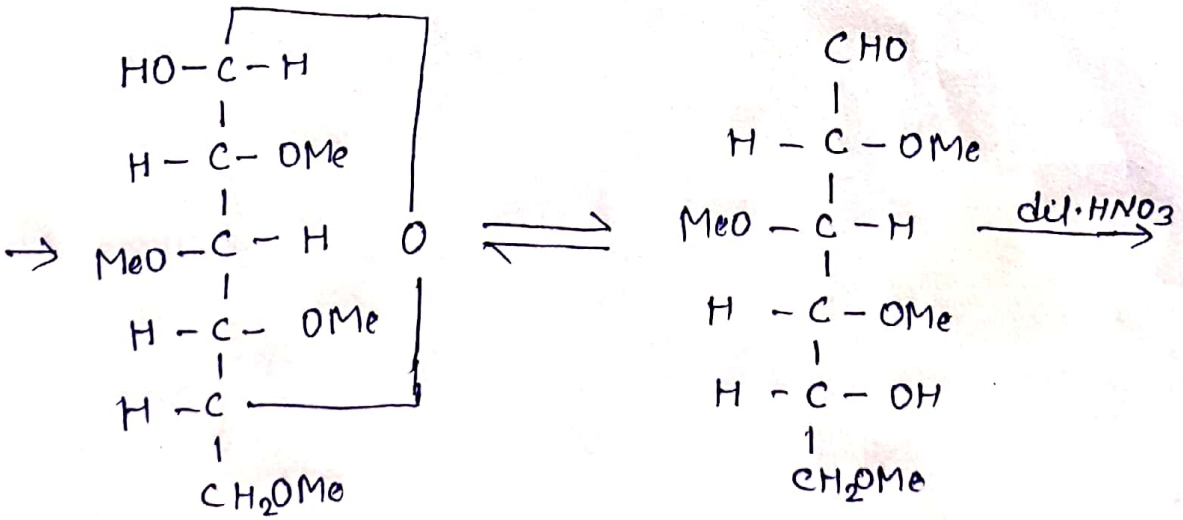


α - D-glucose (pyranose structure)

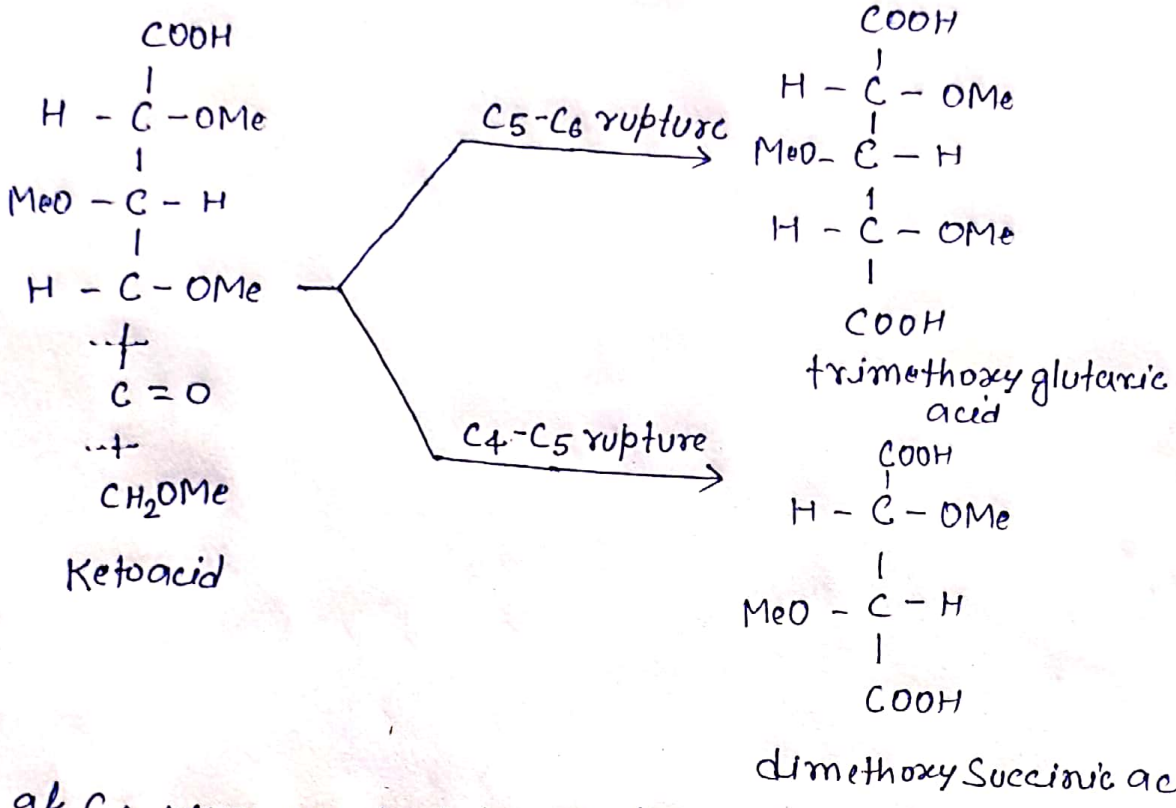
The pyranose ring in glucose is further confirmed by the following degradation reaction: methyl β-glucose given methyl β-2, 3, 4 tetra-O-methyl-D glycoside when treated with Me_2SO_4 in presence of alkali followed by hydrolysis by dilute HCl. This tetra-derivative is then oxidised by HNO_3 to trimethoxy glutaric acid and a dimethoxysuccinic acid formed presumably by the cleavage on either side of C_5 of the intermediate keto acid showing the keto group at C_5 and so the OH group in tetra-O-methyl-D-glucose. Hence, the acetal ring in methyl glucoside must be present between C_1 and C_5 -



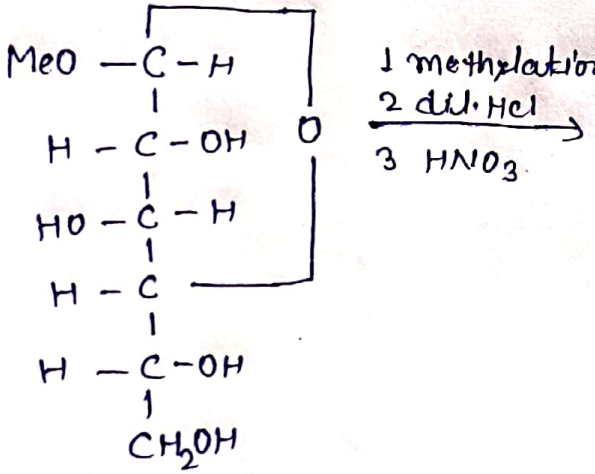
methyl β-D glucose



methyl β-2 3, 4 tetra-O-methyl D-glucoside



If C_4 were involved in the formation of the acetal ring of methyl β-D-glucose, trimethoxy glutaric acid would not have formed –



methyl β-D-glucose