

## Mutarotation.

When a freshly prepared solution of glucose, crystallized from water or alcohol at low temperature, exhibits a specific rotation of  $+112^\circ$ . But a solution of glucose, crystallized from water above  $98^\circ\text{C}$  or from boiling pyridine, has a specific rotation of  $+19^\circ$  only. When either of the solutions is kept for some time, the rotation generally changes to  $52.5^\circ$  and remains constant there. This change in optical rotation is known as mutarotation.

The mutarotation exhibited by the above solution can be explained by the existence of two optical isomers of glucose, namely  $\alpha$ -D-glucose with a specific rotation of  $+112^\circ$  and  $\beta$ -D-glucose with a specific rotation of  $+19^\circ$ .

$\alpha$ -D-glucose has a configuration of  $\text{HCOH}$  in the first carbon and  $\beta$ -D-glucose has a configuration of  $\text{HOCH}$  in the first carbon.

This is made possible by the  $-\text{CHO}$  group taking on a  $\text{H}$  from the fourth or fifth carbon and forming a ring structure instead of a straight chain. The first carbon has therefore become asymmetric and can exist in two isomeric

forms In solution both form exists in equilibrium with the chain form in the ratio of 2 parts  $\beta$  forms and one part  $\alpha$  form and traces of chain form.

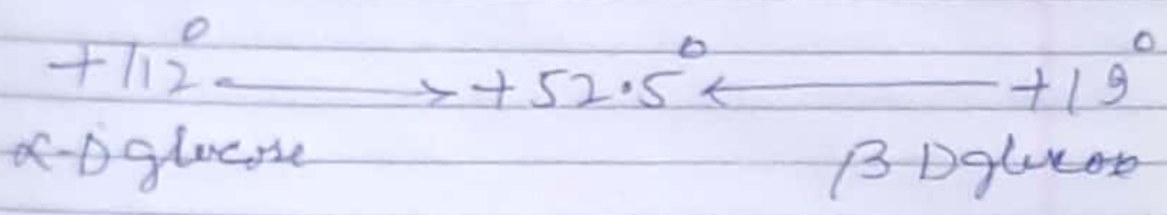


Fig. Mutarotation of  $\alpha$  &  $\beta$  glucose.

The above reactions clearly show that glucose does not exist in straight chain structure. The straight chain structures are convenient to write, but they do not represent the actual molecular structure of the sugars. However such structures are correct for the trioses and tetroses. But pentoses and hexoses usually occurs in solution as cyclic or ring structure in which the carbonyl group is not free.

Thus the mutarotation i.e term given to the change in the observed optical rotation of a substance with time.