

MODEL ANSWERS ON CARBOHYDRATE CHEMISTRY

PHYSIOLOGY HONOURS/SEMESTER -1/CC2

Qs. (1) what do you mean by aldose-ketose isomerism?

Answer: An aldose (monosaccharides with aldehyde group at C1) and a Ketose (Monosaccharides with ketone group at a position other than C1) are isomer to each other because they have same molecular formula but different functional group in their structure. For Eg., Glucose (Aldose) and Fructose (Ketose) are ‘aldo-keto’ isomer to each other,

Qs. (2) What is epimerism? Give example.

Answer: Epimerism is a kind of stereoisomerism in which two molecules have same molecular formula but have different spatial arrangement of groups around a single asymmetric carbon. For example, Glucose and galactose are 4-epimer to each other.

Qs. (3) What is D-L stereoisomerism?

Answer: D-L stereo-isomerism is based on spatial orientation of H and OH groups on penultimate carbon (the asymmetric carbon farthest from aldehydic or ketonyl carbon) of a molecule. If H and OH groups on the penultimate carbon of a monosaccharide are oriented like the H and OH groups of the middle carbon of D-glyceraldehyde, that monosaccharide is called D-isomer. Similarly, If H and OH groups on the penultimate carbon of a monosaccharide are oriented like the H and OH groups of the middle carbon of L-glyceraldehyde, it is called L-isomer. D-isomer and L-isomer are said to be mirror image to each other. For Eg., D-glucose and L-glucose.

Qs. (4) Define anomerism.

Answer: In Pyranose and Furanose forms, the aldehyde carbon (C1 in aldose) or the ketonyl carbon (C2 in ketose) becomes a new asymmetric carbon. This new asymmetric carbon bears an OH group called ‘anomeric OH’. An additional stereoisomerism is created by spatial arrangement of H and OH groups around this anomeric OH group. The new asymmetric carbon is also referred as ‘anomeric carbon’.

If the OH-group of anomeric carbon is oriented close to the terminal CH₂OH at the other end of the molecule (or above the plane of Haworth’s ring) it is called β-anomer. If the OH-group of anomeric carbon is oriented furthest from the terminal CH₂OH at the other end of the molecule (or below the plane of Haworth’s ring) it is called α-anomer.

Qs. (5) What is the difference between glycosamine and glycosyl amine?

Answer: These are two different types of amino sugar. In glycosamine, an alcoholic –OH of the monosaccharide is replaced by a basic amino (-NH₂ group). Example: Glucosamine, Galactosamine etc. In glycosylamine, the anomeric –OH of a monosaccharide is replaced by a basic amino group. For example, Ribosylamine. Its phosphoryl derivative (5-phospho ribosylamine) is required for purine nucleotide synthesis.