Glucose Structure Questions with Solutions

Q1: Are Glucose and Diabetes the same?

Answer: No, while Glucose is the only type of sugar that mixes with the blood and moves to all parts of the body, Diabetes is caused when there is an excess of such sugar in the blood. Glucose provides energy to the cells in our body.

Q2. Give some examples of the natural sources of Glucose.

Answer: Glucose is a monosaccharide found in some foods, such as dates, apricots, raisins, figs and mangoes. Honey contains Glucose in the most concentrated amount.

Q3. Write one health benefit of consuming Glucose.

Answer: Glucose is the main energy source for all the living cells in our body. Most importantly, Glucose acts as food for our brain. The nerve cells and the chemical messengers in the brain need Glucose for proper functioning and to process information. The brain will not work properly in the absence of Glucose.

Q4. Is Glucose a ringed structure or an open-chain structure?

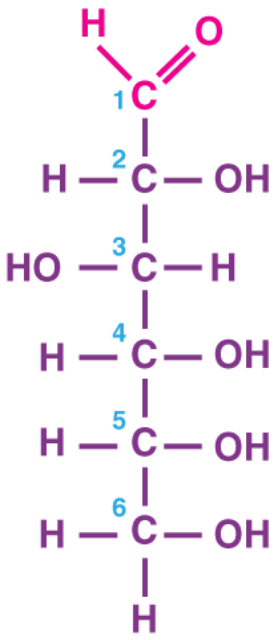
Answer: Glucose exists as a six-membered ring structure.

Q5. Who discovered the Glucose Structure?

Answer: The Glucose Structure was discovered by Emil Fischer.

Q6. Describe the open-chain structure of Glucose.

Answer: The open-chain structure of Glucose consists of an unbranched backbone of six carbon atoms, named from C_1 to C_6. The C_1 carbon atom is a part of an aldehyde group. All the rest other carbon atoms are attached to one hydroxyl group each. The valencies of all these carbons are satisfied by the hydrogen atoms.
The open-chain structure of Glucose is given below:



Q7. What are the different types of Glucose molecules?

Answer: Naturally, Glucose occurs only in two different arrangements, i.e. the laevorotatory or (L) Glucose and the dextrorotatory or (D) Glucose.

Q8. What is the major difference between L-Glucose and D-Glucose?

Answer: The D-Glucose rotates the plane-polarised light in the right direction. At the same time, the L-Glucose rotates the plane-polarised light in the left direction.

Q9. Which elements are present in the Glucose molecule?

Answer: The Glucose molecule is made up of the six-carbon atoms chain backbone. A molecule of Glucose consists of three elements, i.e. carbon, hydrogen and oxygen.

Q10. Where is Glucose naturally found in nature?

Answer: Glucose is naturally found in some sugar-containing fruits, vegetables and honey. Honey is the most concentrated source of Glucose found in nature.

Q11. Which of the following is a Monosaccharide?
a. Lactose
b. Sucrose

c. Maltose
d. Galactose

Answer: (d)

Explanation: Galactose is a monosaccharide having the Molecular Formula $C_6H_{12}O_6$.

Q12. Maltose is made by the combination of _____.
a. Glucose and Fructose
b. Glucose and Glucose
c. Glucose and Galactose
d. Fructose and Galactose

Answer: (b)

Explanation: Maltose is a disaccharide made from two Glucose molecules bonded together via an α-linkage.

Q13. Glucose in animals is stored in the form of _____.
a. Glycogen
b. Cellulose
c. Starch
d. Dextrins

Answer: (a)

Explanation: Glucose is stored in the liver and the skeletal muscles in the form of Glycogen.

Q14. Which of the following is not a Glucosan (Polymer of Glucose)?
a. Cellulose
b. Inulin
c. Glycogen
d. Starch

Answer: (b)

Explanation: Cellulose, Glycogen, and Starch are the Polymers of Glucose.

Q15. The α-D-Glucose and the β-D-Glucose are _____.
a. Optical isomers
b. Keto-Aldose isomers
c. Epimers
d. Anomers

Answer: (d)

Explanation: The α-D-Glucose and the β-D-Glucose differ in the spatial arrangement of groups/atoms. They are Anomers.

Practice Questions on Glucose Structure

Q1. The positive test for Sucrose is _____.
a. Benedict
b. Barfoed
c. Seliwanoff
d. Osazone

Answer: (c)

Explanation: Sucrose gives a positive Seliwanoff test, as it is a disaccharide of Glucose and Fructose.

Q2. Due to having four asymmetric carbon atoms, Glucose has _____ isomers.
a. Four
b. Eight
c. Twelve
d. Sixteen

Answer: (d)

Explanation: As Glucose has four asymmetric or chiral carbons, we get n = 4. So, the number of optical isomers of Glucose = $(2)^4 = 16$
Therefore, Glucose has 16 isomers.

Q3. What are Structural Isomers? What are the Structural Isomers of Glucose?

Answers: The Structural Isomers have the same Molecular Formula but different connectivities of atoms. The Molecular Formula of Glucose is $C_6H_{12}O_6$. The Structural Isomers of this Molecular Formula (or Glucose) are Fructose, Glucose and Galactose.

Q4. Explain why Glucose is soluble in water.

Answer: The Glucose Structure is small and consists of many polar hydroxyl groups (OH). The hydroxyl groups attached to the carbon atoms provide polarity to the molecule on all sides. Hence, as a result, the Glucose Molecule becomes soluble in water.

Q5. Is Glucose more reactive than water? Give two reasons to support your answer.

Answer: Yes, Glucose is much more reactive than water. This can be explained by the following two reasons:
1. Glucose has more hydroxyl groups attached per molecule than water.
2. The hydroxyl group of water is inhibited by the hydrogen atom, while the hydroxyl group in Glucose is attached to carbon and is not inhibited.