

CHAPTER - 14

BIOMELECULES INTEXT

SOLUTIONS

Question 14.1:

Glucose or sucrose are soluble in water but cyclohexane or benzene (simple six membered ring compounds) are insoluble in water. Explain.

Answer

A glucose molecule contains five –OH groups while a sucrose molecule contains eight –OH groups. Thus, glucose and sucrose undergo extensive H-bonding with water.

Hence, these are soluble in water.

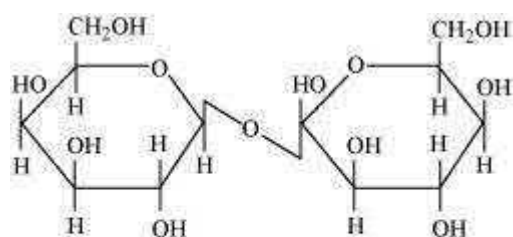
But cyclohexane and benzene do not contain –OH groups. Hence, they cannot undergo H-bonding with water and as a result, are insoluble in water.

Question 14.2:

What are the expected products of hydrolysis of lactose?

Answer

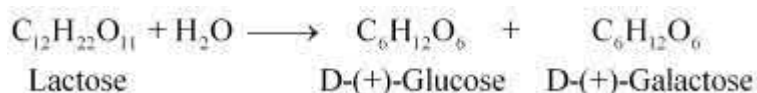
Lactose is composed of β -D galactose and β -D glucose. Thus, on hydrolysis, it gives β -D galactose and β -D glucose.



β -D-galactose

β -D-glucose

Lactose

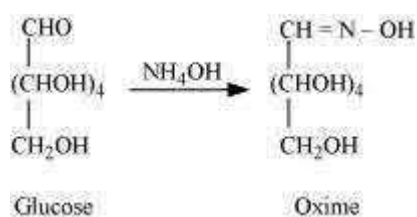


Question 14.3:

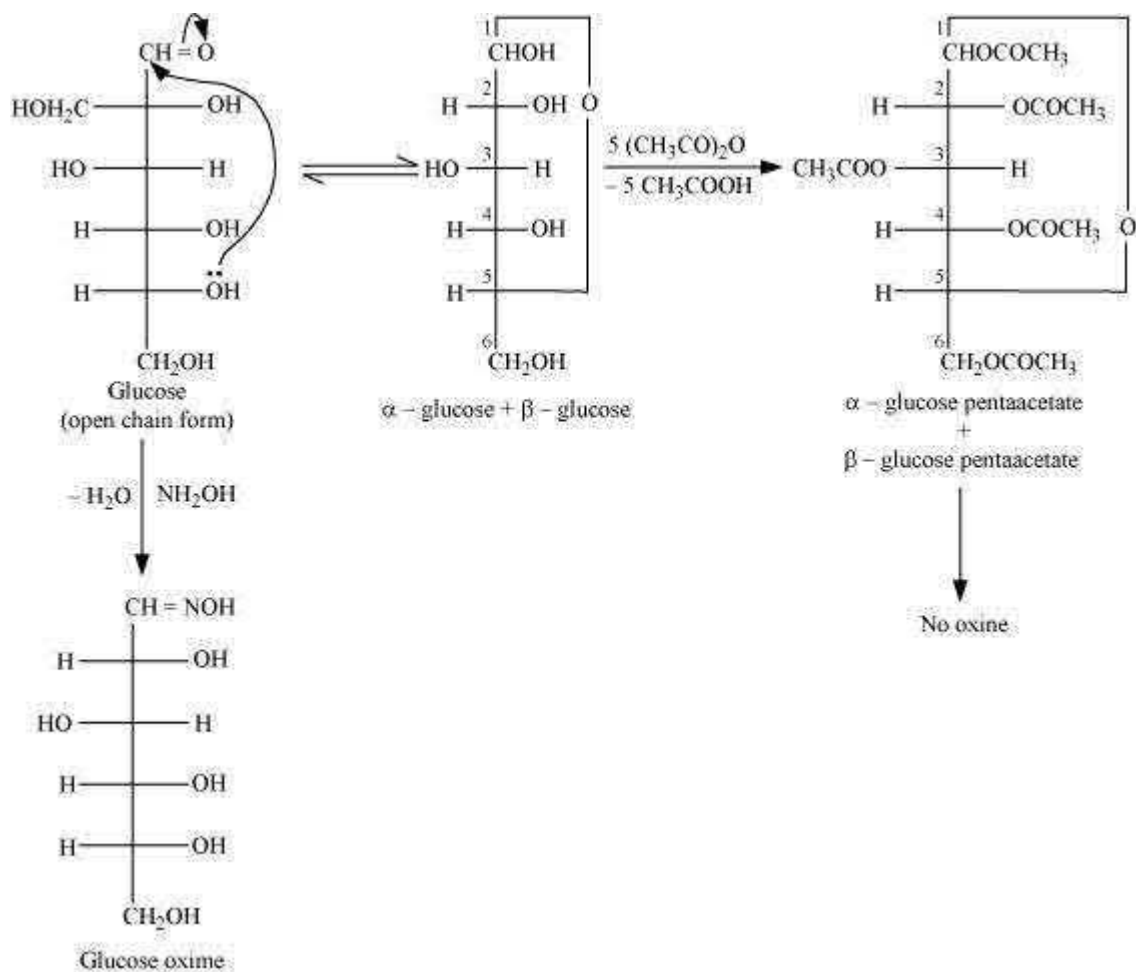
How do you explain the absence of aldehyde group in the pentaacetate of D-glucose?

Answer

D-glucose reacts with hydroxylamine (NH₂OH) to form an oxime because of the presence of aldehydic (-CHO) group or carbonyl carbon. This happens as the cyclic structure of glucose forms an open chain structure in an aqueous medium, which then reacts with NH₂OH to give an oxime.



But pentaacetate of D-glucose does not react with NH₂OH. This is because pentaacetate does not form an open chain structure.

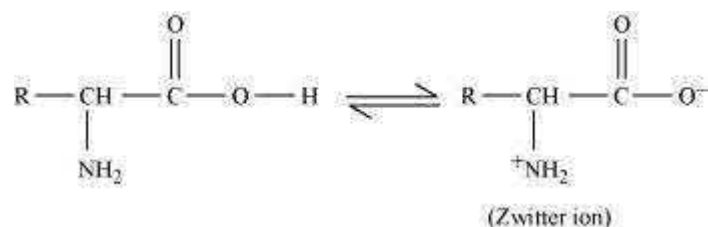


Question 14.4:

The melting points and solubility in water of amino acids are generally higher than that of the corresponding halo acids. Explain.

Answer

Both acidic (carboxyl) as well as basic (amino) groups are present in the same molecule of amino acids. In aqueous solutions, the carboxyl group can lose a proton and the amino group can accept a proton, thus giving rise to a dipolar ion known as a zwitter ion.



Due to this dipolar behaviour, they have strong electrostatic interactions within them and with water. But halo-acids do not exhibit such dipolar behaviour.

For this reason, the melting points and the solubility of amino acids in water is higher than those of the corresponding halo-acids.

Question 14.5:

Where does the water present in the egg go after boiling the egg?

Answer

When an egg is boiled, the proteins present inside the egg get denatured and coagulate. After boiling the egg, the water present in it is absorbed by the coagulated protein through H-bonding.

Question 14.6:

Why cannot vitamin C be stored in our body?

Answer

Vitamin C cannot be stored in our body because it is water soluble. As a result, it is readily excreted in the urine.

Question 14.7:

What products would be formed when a nucleotide from DNA containing thymine is hydrolysed?

Answer

When a nucleotide from the DNA containing thymine is hydrolyzed, thymine β -D-2deoxyribose and phosphoric acid are obtained as products.

Question 14.8:

When RNA is hydrolysed, there is no relationship among the quantities of different bases obtained. What does this fact suggest about the structure of RNA?

Answer

A DNA molecule is double-stranded in which the pairing of bases occurs. Adenine always pairs with thymine, while cytosine always pairs with guanine. Therefore, on hydrolysis of DNA, the quantity of adenine produced is equal to that of thymine and similarly, the quantity of cytosine is equal to that of guanine.

But when RNA is hydrolyzed, there is no relationship among the quantities of the different bases obtained. Hence, RNA is single-stranded.