



COMPILED AND CIRCULATED BY DR. POULAMI ADHIKARY MUKHERJEE, ASSISTANT  
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# **DERIVATIVES OF CARBOHYDRATES**

**BY**

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ZOOLOGY: SEM- III, PAPER- C7T: FUNDAMENTALS OF BIOCHEMISTRY, UNIT 1: CARBOHYDRATES



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**Carbohydrate derivatives are sugar molecules that have been modified with substituents other than hydroxyl groups.**

**Examples include glycosylamines, sugar phosphates, and sugar acetates. Most sugar derivatives occur naturally and have important biological functions. For instance, chondroitin sulfate is an important structural component of cartilage and provides much of its resistance to compression.**

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## **Derivatives of Monosaccharides:**

**Derivatives of monosaccharides are found in nature. One example of a monosaccharide derivative is vitamin C, also called ascorbic acid, which is derived from glucose. Sugar substitutes, such as sorbitol and mannitol, are used as sweeteners, and they form naturally in plants and berries from monosaccharides like glucose and mannose. Amino sugars, such as**



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**glucosamine, a derivative of glucose, produce  
cartilage, connective tissue and chitin, a component of  
an insect's exoskeleton.**



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## **Some important derivatives of monosaccharides are as follows:**

### **(a) Deoxyribose:**

The deoxygenation of ribose at C-2 position produces deoxyribose. It is important component of deoxyribonucleotides of DNA.

### **(b) Phosphorylated sugars:**

The transfer of phosphorylated group from ATP to -OH group of a sugar produces phosphorylated sugar, e.g. glucose-6-phosphate.



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The phosphorylated sugars are anionic which prevent their escape from cell and also acts as reactive intermediates.

### **(c) Sugar alcohol:**

It is formed by reduction of aldehyde and ketone group of sugar, e.g., mannitol, glycerol, sorbitol etc. Mannitol is a sugar alcohol in brown algae, some fruits and honey. It is used as a medicine for patients with brain edema. Glycerol required in fat synthesis. Sorbitol, a sugar alcohol commercially obtained from reduction of glucose and fructose, is used in diets of diabetics because it is



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absorbed very slowly and metabolized after conversion to glucose, but it does not raise blood sugar.

#### **(d) Sugar acids:**

Ascorbic acid or vitamin-C is a sugar acid required for collagen synthesis. Glucouronic acid and iduronic acid are components of mucopolysaccharides.

#### **(e) Amino sugars (hexosamines):**

Glucosamine forms chitin and hyaluronic acid.



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Some more Carbohydrate Derivatives are:

### **Glucose Family:**

- i.  $\beta$ -D-Glucose
- ii.  $\beta$ -D-Glucose-6-Phosphate
- iii.  $\beta$ -D-Glucosamine
- iv. N-Acetyl- $\beta$ -D-Glucosamine
- v. N-Acetylmuramic Acid
- vi.  $\beta$ -D-Glucuronate
- vii.  $\beta$ -D-Gluconate





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## **Artificial Sweeteners:**

- i. Aspartame
- ii. Saccharin
- iii. Sucralose

## **Amino Sugars:**

- i. N-Acetylglucosamine
- ii. Galactosamine
- iii. Glucosamine
- iv. Sialic acid



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L-Daunosamine

## **Deoxy Sugars:**

- i. Deoxyribose
- ii. Fucose
- iii. Rhamnose



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A large number of biologically important modified monosaccharides exist:

**Amino sugars such as:**

- I. galactosamine
- II. glucosamine
- III. sialic acid
- IV. N-acetylglucosamine



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## **Sulfosugars such as:**

sulfoquinovose

## **Others such as:**

ascorbic acid

mannitol

glucuronic acid



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## Carbohydrate Derivatives containing drugs are:

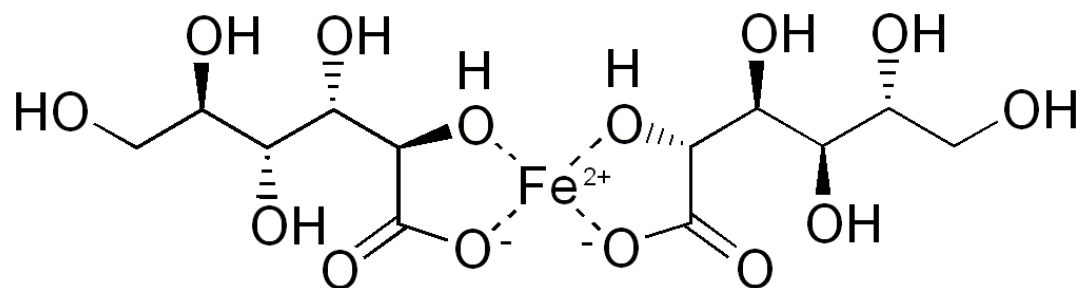
### Fergon:

Generic Name: Iron(II) gluconate, or Ferrous gluconate

It is the iron(II) salt of gluconic acid.

Brand Name: FE-40 and Fergon

General Formula:  $C_{12}H_{24}FeO_{14}$





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## Uses of Fergon:

1. It is effectively used in the treatment of hypochromic anemia.
2. It is used as an iron supplement to treat or prevent low blood levels of iron (such as those caused by anemia or pregnancy) since iron is an important mineral that the body needs to produce red blood cells and keep you in good health.
3. Fergon is also an essential body mineral.



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**THANK YOU**

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