

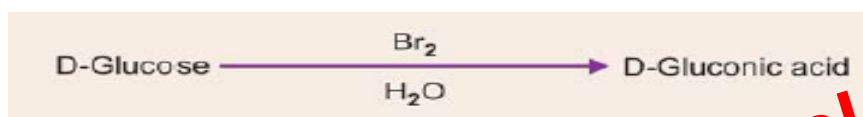
- Monosaccharides are reducing agents, this reducing ability is due to free rotating hemiacetal or hemi-ketal-group. Monosaccharides are easily oxidized by mild oxidizing agents such as Cu^{2+} in alkaline solution which thus convert them to mixtures of carboxylic acids

BIOLOGICALLY IMPORTANT DERIVATIVE OF MONOSACCHARIDE (GLUCOSE)

These are important monosaccharides (especially of glucose) derivative in which the $-\text{OH}$ group of parent skeleton is either substituted or modified. These are:

- Sugar acid:

Oxidation of aldehyde functional group of monosaccharides using bromine oxidizes the functional group to COOH and produces ALDONIC ACIDS.



Oxidation of terminal alcohol group to COOH produces URONIC ACID.



Concentrated nitric acid oxidizes both the aldehyde functional and terminal $-\text{OH}$ group to COOH , yielding ALDARIC or SACCHARIC ACID



- Sugar alcohols (polyols)

Reduction of aldose and keto groups of sugar with reducing agent as sodium-amalgam produces polyhydroxy alcohols or polyols. These polyols are intermediates of metabolic reactions. Other sugar alcohols are glycerol and inositol. The alcohols formed from glucose, galactose and fructose are sorbitol, galactitol and sorbitol, respectively

- Deoxy-sugars

The substitution of a hydrogen for the hydroxyl group at C6 of galactose or mannose produces fucose or rhamnose, respectively; these deoxy sugars are found in plant polysaccharides and in

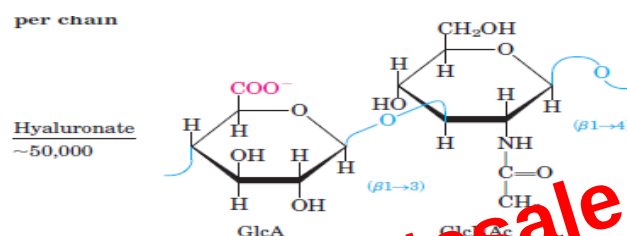
Glycosaminoglycans (GAG) often have dense negative charge due to COO^- and OSO_3^- groups. Also sulfated GAG are often covalently attached to integral membrane proteins to form proteoglycans

Important heteropolysaccharides include:

- **Hyaluronic acid:** this is a GAG with repeating disaccharide unit of D-glucuronic acid and N-acetylglucosamine, with intra-disaccharide link of $\beta(1\rightarrow3)$ oligosidic bond and inter-disaccharide link of $\beta(1\rightarrow4)$.

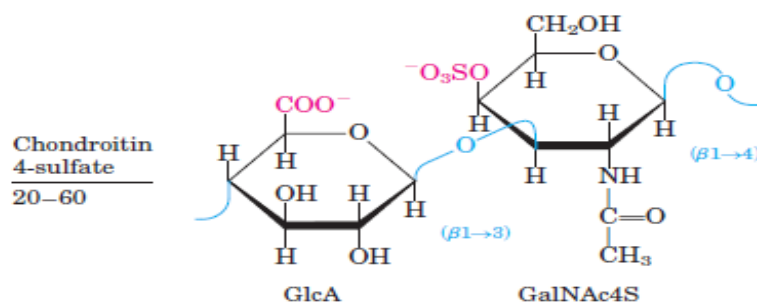
Hyaluronic acid function as a lubricant in synovial fluid, it gives the vitreous humor glassy translucent appearance, it contribute tensile strength and elasticity to connective tissues as collagen and elastin, helps also in aggregation of tissue repairing cells.

It is often destroyed by hyaluronidase secreted by some pathogens



- **Chondroitin sulphate:** the repeating disaccharide unit of chondroitin sulphate consist of glucuronic acid and N-acetylgalactosamine which is sulphated at position 4 or 6, with intra-disaccharide link of $\beta(1\rightarrow3)$ oligosidic bond and inter-disaccharide link of $\beta(1\rightarrow4)$.

Chondroitin sulphate help in contributing tensile strenght to connective tissues as cartilage, tendon, ligament, they are also seen in the cornea and retina of the eye



- **Dermatan sulphate:** this GAG is structurally and functionally similar to chondroitin sulphate, main different being that it replaces glucuronic acid with induronic(glucuronic acid epimer atC5) acid in its make up
- **Heparin:** the repeating disaccharide of heparin consist of D-glucosamine and either L-induronic acid or glucuronic acid. The glucosamine of heparin is sulphated at its C2 –