**Carbohydrates**

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| **Monomer** | Monosaccharides |
| **Molecular Formulas** | **General:** CH2O  **Triose:** C3H6O3  **Pentose:** C5H10O5  **Hexose:** C6H12O6 |
| **Common Functional Groups** | **Carbonyl:**  https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcRBw0Yz_tPAgdq_vw7x8spoopWhjkiOAe4f0qkNwgBEZ9laZacxQ0Qzlrs9Jw  **-Ketone:**  http://upload.wikimedia.org/wikipedia/commons/thumb/4/40/Ketone-group-2D-skeletal.svg/1024px-Ketone-group-2D-skeletal.svg.png  **-Aldehyde:**  http://t2.gstatic.com/images?q=tbn:ANd9GcTM95CbrXv-OG5JxY1hC65b3BJjjvgr0k_Y5Hhvy6BisIFcU-8-  **Hydroxyl:**  http://www.livingintherealworld.net/healthy/wp-content/uploads/2011/07/hydroxylfunctional.png |
| **Disaccharide:** 2 covalently bound monosaccharides  GLU + GLU = Maltose  GLU + GAL = Lactose  GLU + FRU = Sucrose | **Polysaccharide:** polymer, many covalently bound monosaccharides |
| **Type of Reaction to form bond between Monomers** | **Dehydration Synthesis**: water molecule removed (-OH from one, -H from the other)  **This type of bond is called:** glycosidic linkage  **These bonds are named based on:**  - alpha or beta orientation of the hydroxyl groups on the anomeric carbon atoms  - the two carbon atoms that bind the oxygen holding the molecules together, C-1 and C-4, respectively |
| **Type of Reaction to Break bond between Monomers** | **Hydrolysis**: Addition of a water molecule, -OH to one monomer and -H to the other, to sever the bond between them |
| **Functions of polysaccharides** | **1)** Storage (energy, parts for synthesis of other molecules)  **2)** Structure |
| **Structural polysaccharides (glucose)**  **(type of bond, distinct features, digestible by humans?)** | **1) Cellulose**: beta- 1, 4 linkage, straight shape, plant cell walls, paper, cotton, not digestible in organisms without proper gut microbes  **2) Chitin**: beta- 1, 4 linkage, straight shape, arthropod exoskeletons and fungi cell walls, have an N-acetyl group attach to each monomer, not digestible in organisms without proper gut microbes |
| **Storage polysaccharides (glucose)**  **(type of bond, distinct features, digestible by humans?)** | **1) Starch**: alpha- 1, 4 linkage, used in plants to store glucose, helical shape, digestible  -2 forms: amylose (unbranched), amylopectin (branched, attachments 1-6 linkages)  **2) Glycogen**: alpha- 1, 4 linkage, used in humans to store glucose, highly branched (attachments 1-6 linkages), helical shape |
| **Linear structure of B-Glucose** | **Ring Structure of B-Glucose** |