GLYCOLYSIS

- carbohydrates are the most abundant macromolecules
- 1 mole of glucose can release 2840Kj
- When glucose is not needed it is easy for our cells to store it in polymeric forms: glycogen & starch

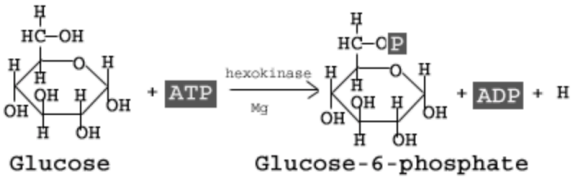
Ways to store glucose

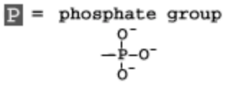
1. Store glucose as glycogen and starch
2. Energy production by oxygenation of glucose
3. Produce pentoses (to make DNA & RNA) and NADPH
4. Structure carbohydrate production [cell walls of fungi and bacteria]

Step 1: phosphorylation of glucose

From Glucose to Glucose 6 phosphate

- enzyme: *hexokinase*
- ΔG'°= -16.7 Kj/mol
- Carbon 6 is the most accessible since it remains outside of the plane
- This process uses the energy of **ATP** + Mg2+
- Nucleophile oxygen at C6 of glucose attacks the last gamma phosphate of ATP
- HIGLY FAVOURABLE/ IRREVERSIBLE

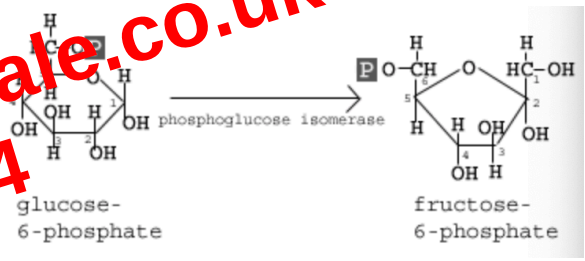




Step 2: phosphohexase isomerization

From glucose 6-phosphate to fructose 6-phosphate

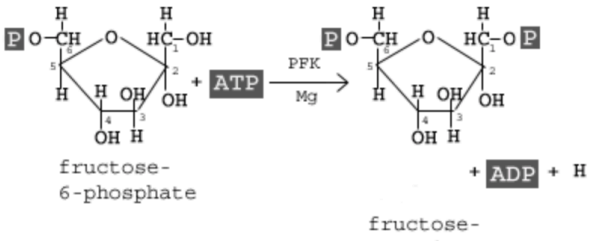
- enzyme: *phosphoexose isomerase*
- ΔG'°= 1.7 Kj/mol
- G6P is asymmetric so F6P will be easier to phosphorylate by PFK1, allowing symmetrical cleavage by aldolase: cleavage of step 3 happens between alpha carbon and beta carbon carbonyl C1 in glucose would be C2/C3 while in fructose [which is a ketone] carbonyl carbone is on C2 so the C3/C4 which are isomers when they're cut.



Step 3: 2nd priming phosphorylate

From fructose 6 phosphate to fructose 1,6-biphosphate

- enzyme: *phosphofructokinase-1 PFK1*
- ΔG'°= -14,2 Kj/mol
- Addition of a P to C1
- This process uses the energy of **ATP** and Mg2+
- HIGLY FAVOURABLE/ IRREVERSIBLE
- PFK1 is highly regulated by ATP, F2,6-BP



Step 4: aldol cleavage of F-1,6-BP

From F1,6-BP to dihydroxyacetone phosphate and glyceraldehyde 3-phosphate

- enzyme: *Aldolase* [uses covalent catalysis]
- ΔG'°= 23.8Kj/mol
- Dihydroxyacetone is a ketone: C1 of F1,6BP. Will be immediately converted in Glyceraldehyde
- Glyceraldehyde is an aldehyde: C3 of Fi,6BP