Glycolysis in the cytoplasm

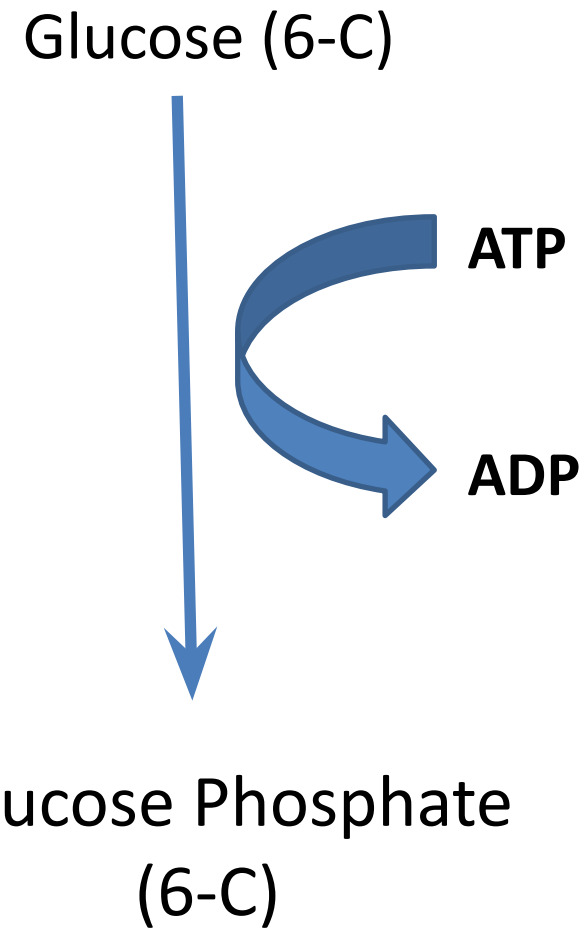
The breakdown of a hexose sugar (usually glucose) into the 3-C compound pyruvate (pyruvic acid)

Where?

- Glycolysis occurs in every cell.
- In aerobic respiration it is the FIRST stage.
- In anaerobic respiration it is the ONLY stage.

Stage 1

- Glucose is insufficiently reactive and must be phosphorylated to become more reactive
- The phosphate molecule comes from the conversion of ATP to ADP
- This is ACTIVATION



Stage 2

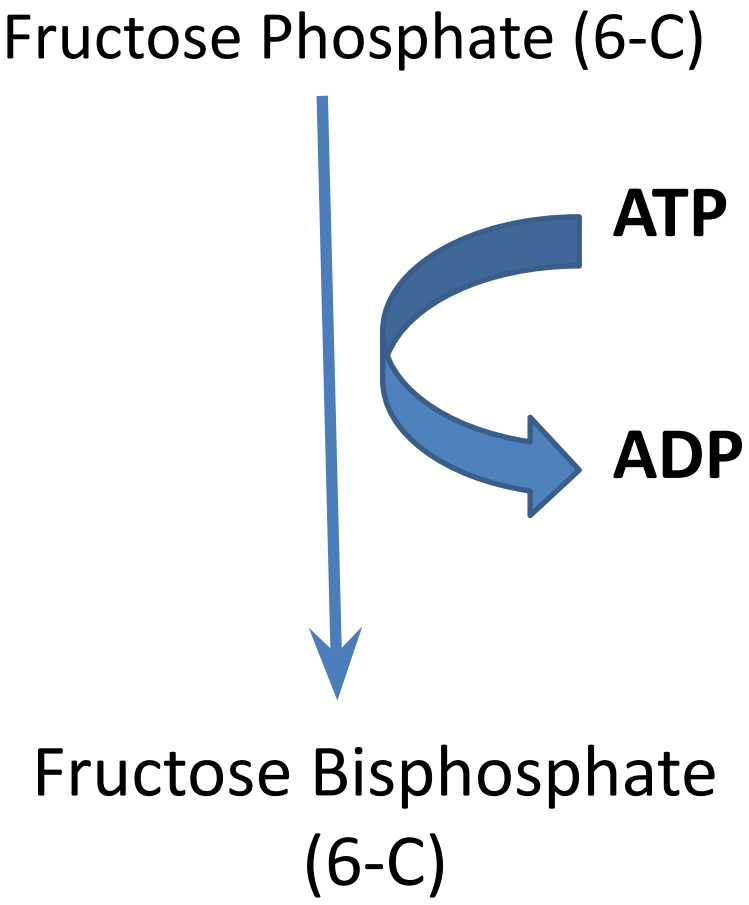
- The glucose molecule is rearranged into its isomer, fructose phosphate

Glucose Phosphate (6-C)

Fructose Phosphate (6-C)

Stage 3

- Further phosphorylation takes place
- The phosphate molecule comes from the conversion of ATP to ADP
- The sugar becomes even more reactive



Stage 4

- 6-C Fructose Bisphosphate is split into 2 x 3-C sugars called Glyceraldehyde 3-phosphate

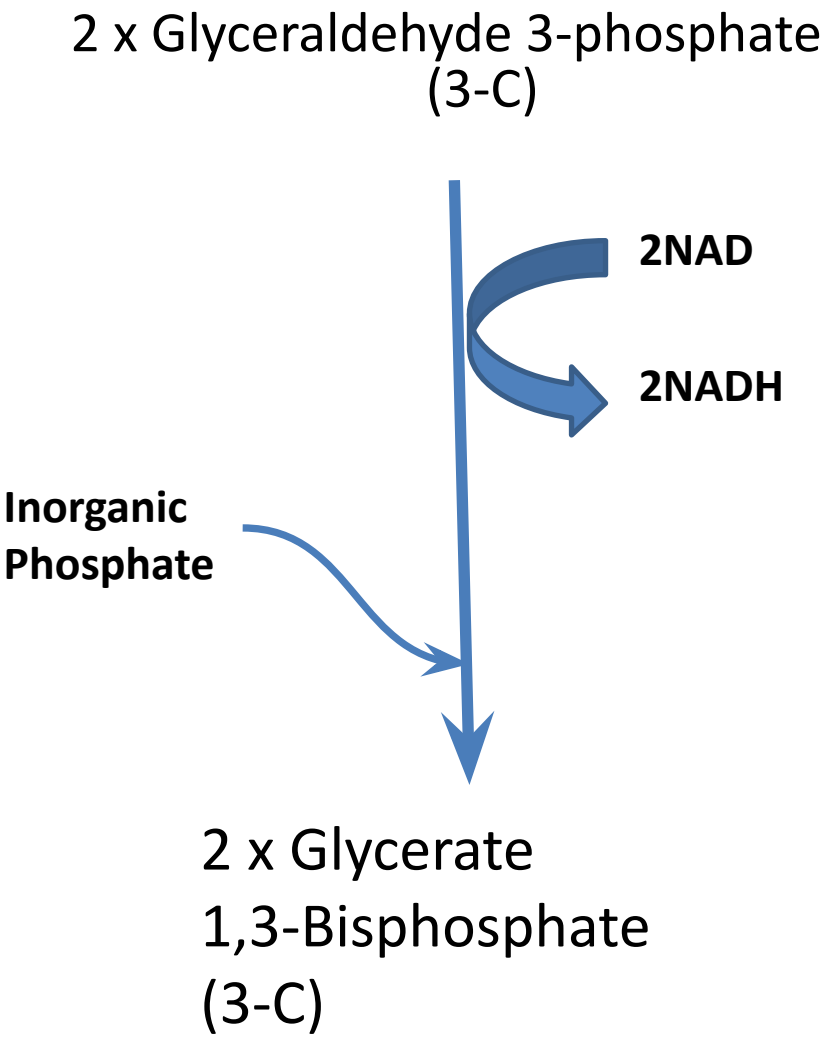
- This is SPLITTING

Fructose Bisphosphate
(6-C)

2 x Glyceraldehyde 3-phosphate
(3-C)

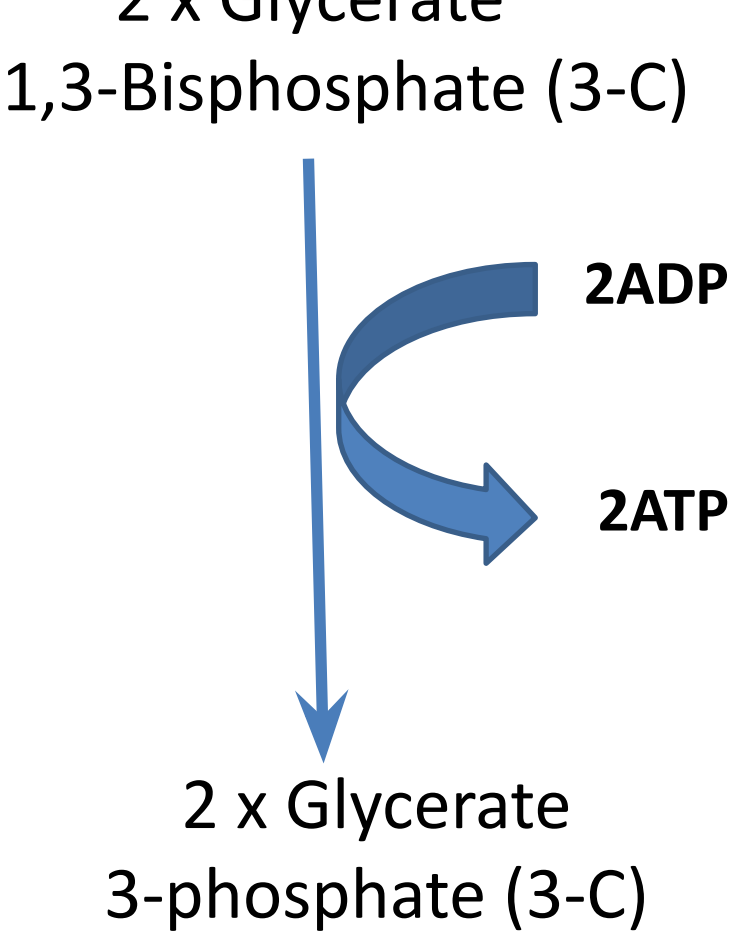
Stage 5

- 2 pairs of hydrogen atoms are removed
- This is OXIDATION
- Further phosphorylation occurs
- The source of the phosphates is inorganic and <u>not</u> ATP
- 2 x Glycerate 1,3-Bisphosphate (3-C) are formed



Stage 6

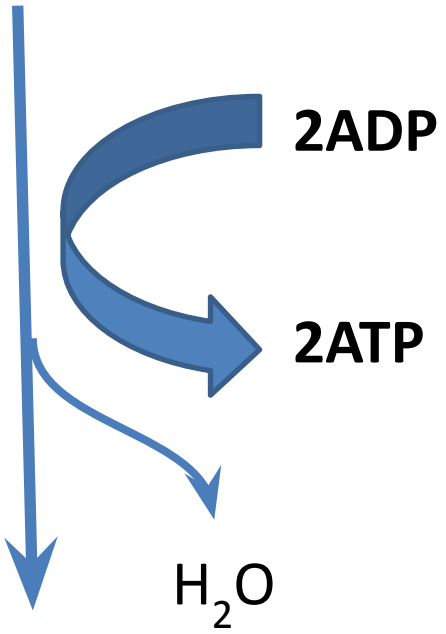
- Both molecules of Glycerate 1,3-bisphosphate lose a phosphate molecule
- 2 molecules of ATP are generated from ADP



Stage 7

- A further pair of phosphates are removed
- 2ATP are generated from ADP
- Each glycerate 3-phosphate molecule also has a H_2O molecule removed from it
- This is CONVERSION
- 2 x pyruvate are produced

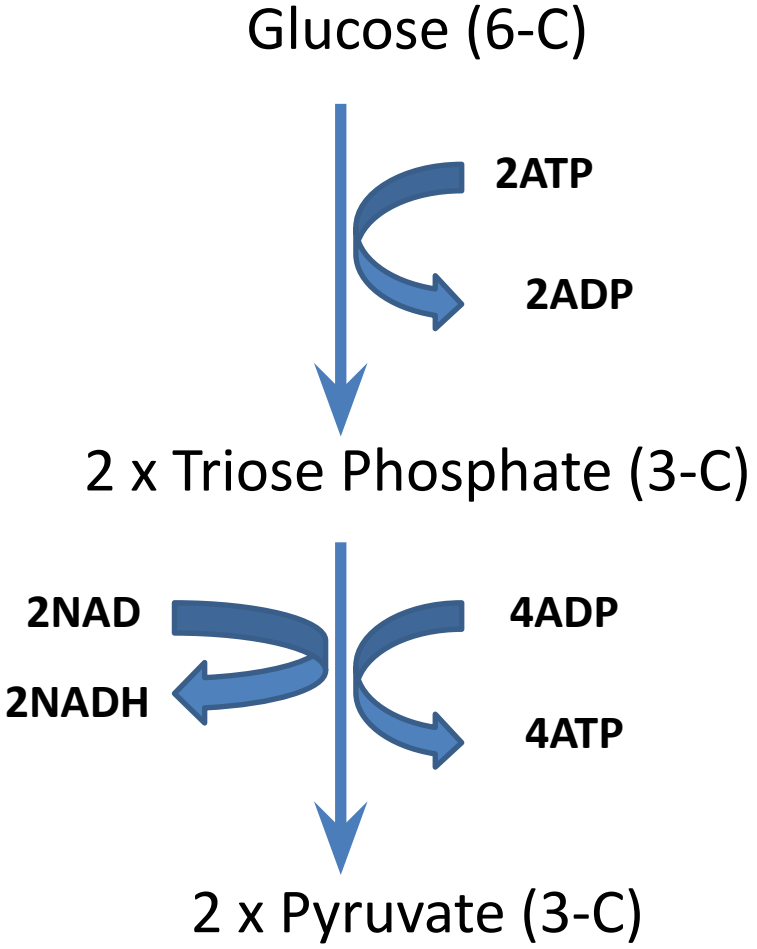
2 x Glycerate 3-phosphate(3-C)



2 x Pyruvate (3-C)

Minimum you must know…

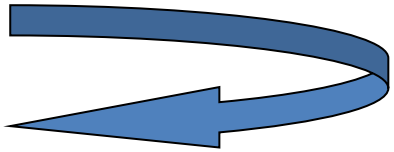
- Occurs in cytoplasm
- Glucose is made reactive by ATP
- Net gain of 2ATP
- 2NADH go to ETC
- 2 Pyruvate go to Link Reaction



- Glucose (6C)

2 x ATP

2 x ADP



"Activation"

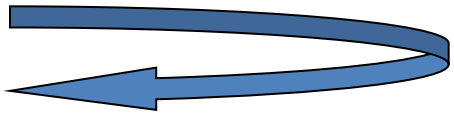
- Phosphorylated Glucose (6C)

"Splitting"

2 x 3C sugars
Triose Phosphate

2 NAD

2 NADH (reduced NAD)



"Oxidation"

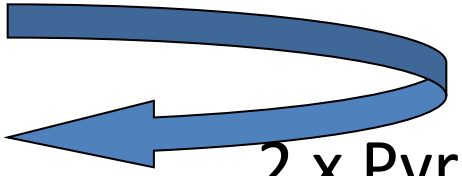
NAD oxidises the 3C sugar by removing H+ + e. It is in turn reduced

2 x oxidised 3C sugars

From Cytoplasm 4Pi

+ 4 ADP

4ATP



"Conversion"

4 x Pi taken from cytoplasm

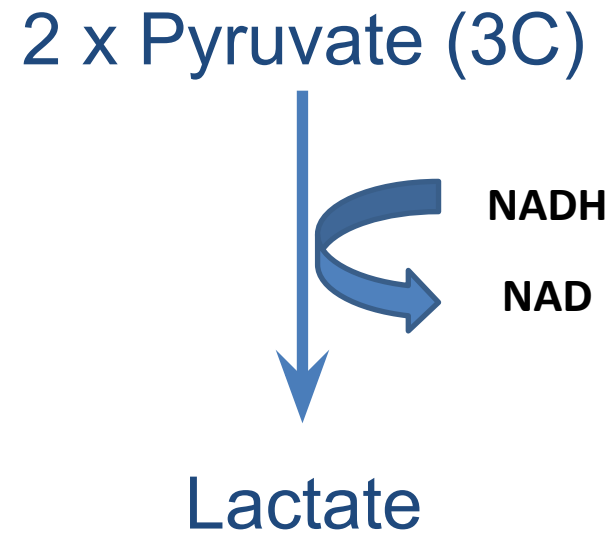
2 x Pyruvate (3C)

What Happens Next???

Aerobic Respiration

2 x Pyruvate go into the Link Reaction

Anaerobic Respiration



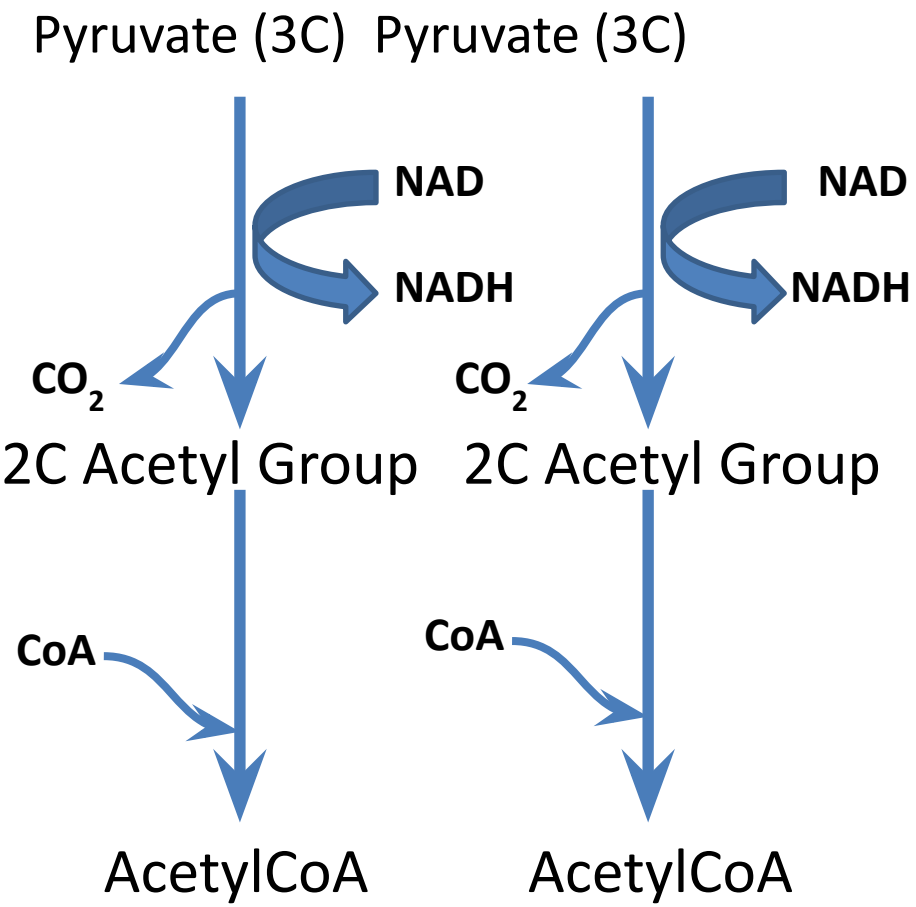
'Dead-end': NADH from Glycolysis is used up!!!

Only 2 x ATP made – not much.

The Link Reaction

(Linking Glycolysis to the Kreb's Cycle)

- Each pyruvate is oxidised by removing hydrogen
- Hydrogen is accepted by NAD to form reduced NAD (which is used later to produce ATP)
- CO_2 is removed from each pyruvate
- 2 x 2C acetyl groups are formed
- Each acetyl group combines with a molecule of coenzyme A
- 2 x acetylcoenzyme A are formed



Your Task: Make each piece of the process to use for learning/revision

You need to draw and cut out:

- All molecules involved
- Arrows
- Processes