Chapter 4 – Respiration

Where does glycolysis fit into the overall process of respiration?

Cellular respiration is the conversion of glucose into ATP, a manageable store of energy. There are 2 types of respiration:

- **Aerobic respiration** – occurs in the mitochondria, in the presence of oxygen and uses glucose to produce CO_2, water and large quantities of ATP
- **Anaerobic respiration** – occurs in the cytoplasm, without oxygen and uses glucose to produce lactic acid (animals) or ethanol and CO_2 (plants), and small quantities of ATP

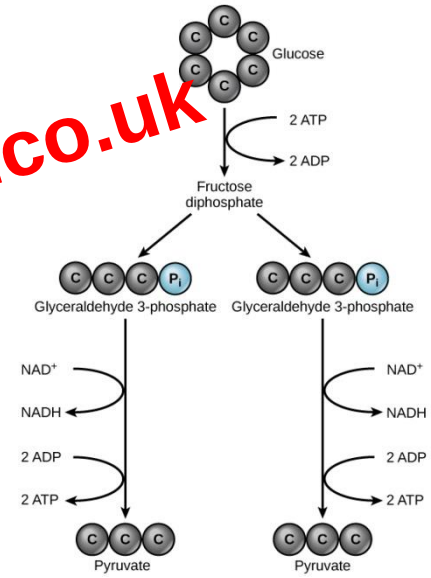
Glycolysis happens in the **cytoplasm** and involves the **splitting of glucose** into 2 x 3C molecules. It occurs at the **beginning of both aerobic and anaerobic respiration.**

What are the main stages of glycolysis? What are the products of glycolysis?

1. **Glucose is activated** with the addition of 2 x Pi molecules from the conversion of 2 molecules of ATP to ADP + Pi. This **increases the reactivity** of glucose, lowering the activation energy of the subsequent enzyme controlled reactions. The product is **phosphorylated glucose**.

2. Phosphorylated glucose is split into 2 x 3C molecules known as **triose phosphate.**

3. **A hydrogen atom is removed** from each triose phosphate molecule (oxidation) and are donated to 2 x NAD molecules to **produce 2 x molecules of reduced NAD.**



4. The 2 x molecules of oxidised triose phosphate are converted **into 2 x molecules of pyruvate**, an acid. This process regenerates 2 x ATP molecules from ADP and Pi.

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The products of glycolysis are therefore, 2 molecules of pyruvate, 2 molecules of ATP (4 were produced overall, but 2 were used in the activation of glucose) and 2 molecules of reduced NAD.

Glycolysis **does not require any cell membrane or organelles** (as it occurs in the cytoplasm) and can function **without the presence of oxygen.**

The pyruvate can then be converted into lactic acid/ethanol and CO_2 in anaerobic respiration or used in the Krebs cycle in aerobic respiration. These are necessary to