

Edexcel (A) Biology A-level

7.3 to 7.7 - Respiration

Flashcards



State the purpose of aerobic respiration.



State the purpose of aerobic respiration.

Produces ATP, which can be hydrolysed to ADP + Pi.

To release energy for metabolic reactions / phosphorylate compounds to make them more reactive.



Describe the overall reaction during aerobic respiration.



Describe the overall reaction during aerobic respiration.

A respiratory substrate is broken down to release a large amount of energy. Hydrogen combines with atmospheric oxygen to produce water. Carbon dioxide is released as a waste product.

Multi-step process. Specific intracellular enzymes catalyse each stage.



Name the 4 main stages in aerobic respiration and where they occur.



Name the 4 main stages in aerobic respiration and where they occur.

Glycolysis: cytoplasm

Link reaction: mitochondrial matrix

Krebs cycle: mitochondrial matrix

Oxidative phosphorylation via electron transfer chain:
membrane of cristae



Outline the stages of glycolysis.



Outline the stages of glycolysis.

1. Glucose (a hexose sugar) is phosphorylated to hexose bisphosphate by 2x ATP.
 2. Hexose bisphosphate splits into 2x triose phosphate (TP).
 3. 2 molecules of TP are oxidised to 2x pyruvate.
- Net gain of 2x reduced NAD & 2x ATP per glucose.



How does pyruvate from glycolysis enter the mitochondria?



How does pyruvate from glycolysis enter the mitochondria?

Via active transport



What happens during the link reaction?



What happens during the link reaction?

1. Complete oxidation of **pyruvate to acetate**.

Per pyruvate molecule: net gain of **1xCO₂** (decarboxylation) & 2H atoms (used to **reduce 1xNAD**).

2. Acetate combines with coenzyme A (CoA) to form **Acetyl Coenzyme A (Acetyl CoA)**.



Give a summary equation for the link reaction.



Give a summary equation for the link reaction.



What happens in the Krebs cycle?



What happens in the Krebs cycle?

Series of redox reactions produces:

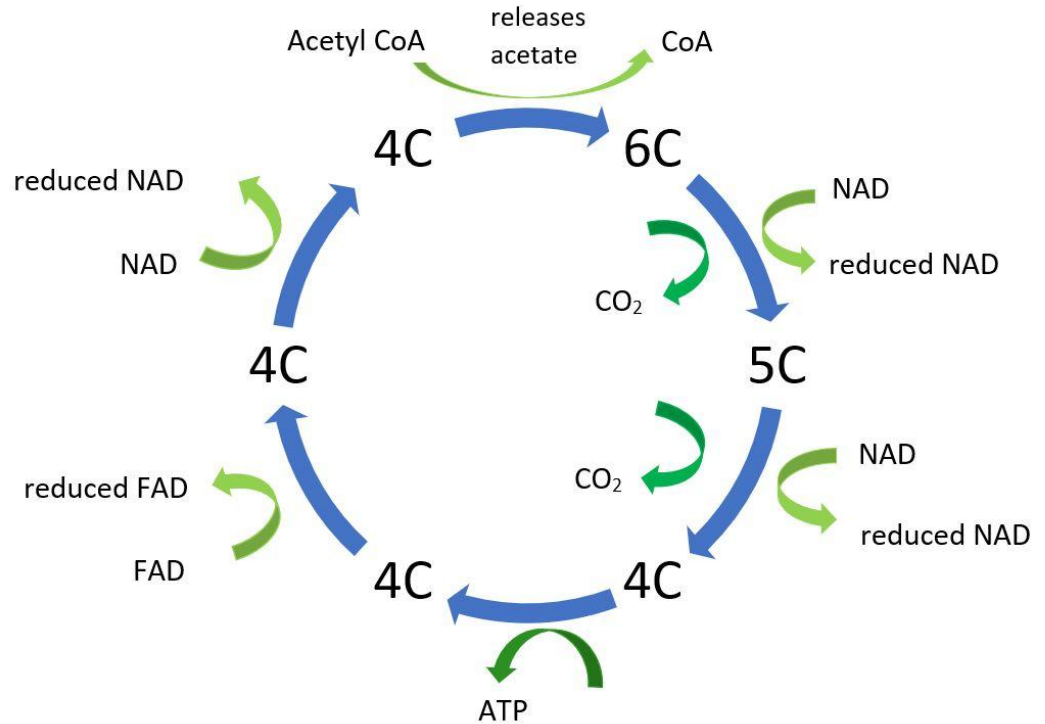
- ATP by substrate-level phosphorylation.
- Reduced coenzymes e.g. NADH.
- CO₂ from decarboxylation.



Outline the stages of the Krebs cycle.



Outline the stages of the Krebs cycle.



What is the electron transfer chain?



What is the electron transfer chain?

A series of carrier proteins embedded in membrane of the cristae of mitochondria.



Name the process that the electron transfer chain uses to produce ATP in aerobic respiration.



Name the process that the electron transfer chain uses to produce ATP in aerobic respiration.

Oxidative phosphorylation via chemiosmosis.



What happens in the electron transfer chain (ETC)?



What happens in the electron transfer chain (ETC)?

Electrons released from reduced NAD & FAD undergo successive redox reactions.

The energy released is coupled to maintaining proton gradient or released as heat.

Oxygen acts as final electron acceptor.



How is a proton concentration gradient established during chemiosmosis in aerobic respiration?



How is a proton concentration gradient established during chemiosmosis in aerobic respiration?

Some energy released from the ETC is coupled to the active transport of H^+ ions (protons) from the mitochondrial matrix into the intermembrane space.



How does chemiosmosis produce ATP during aerobic respiration?



How does chemiosmosis produce ATP during aerobic respiration?

H⁺ ions (protons) move down their **concentration gradient** from the **intermembrane space** into the **mitochondrial matrix** via the channel protein **ATP synthase**.

ATP synthase catalyses $\text{ADP} + \text{P}_i \rightarrow \text{ATP}$.



State the role of oxygen in aerobic respiration.



State the role of oxygen in aerobic respiration.
Final electron acceptor in electron transfer chain (produces water as a byproduct).



What is anaerobic respiration?



What is anaerobic respiration?

Partial breakdown of hexose sugars (glucose) in oxygen-deprived conditions to produce a limited ATP yield.



What happens during anaerobic respiration in animals?



What happens during anaerobic respiration in animals?

only glycolysis continues

reduced NAD + pyruvate



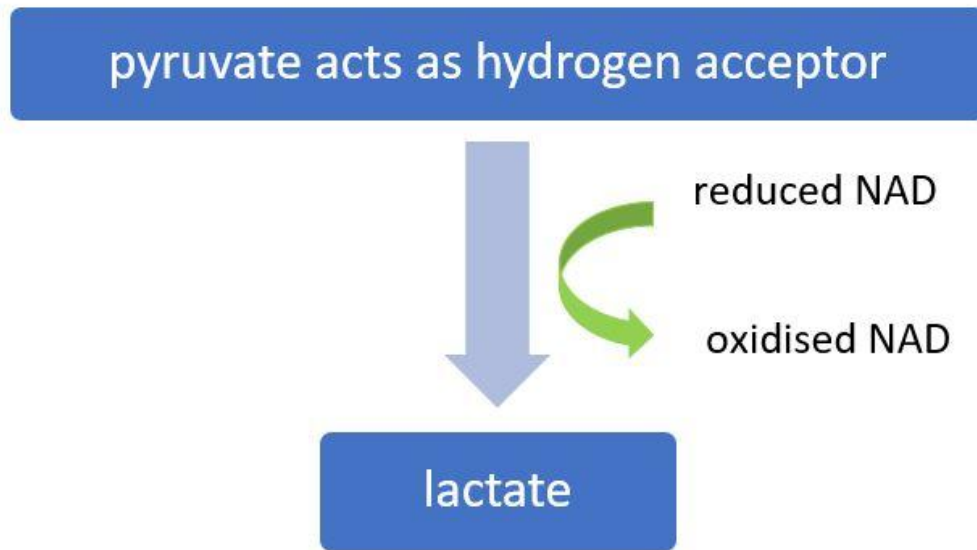
oxidised NAD (for further glycolysis) + lactate



Draw a flowchart to show how lactate is produced in anaerobic respiration.



Draw a flowchart to show how lactate is produced in anaerobic respiration.



What happens to the lactate produced in anaerobic respiration?



What happens to the lactate produced in anaerobic respiration?

Transported to liver in bloodstream. Oxidised to pyruvate by lactate dehydrogenase. Involves conversion of NAD to reduced NAD.

Enters link reaction in liver cells or is converted to glycogen.



How does lactate affect muscle contraction in mammals?



How does lactate affect muscle contraction in mammals?

Acidic, so decreases pH.

Results in muscle fatigue.



What is the advantage of producing lactate during anaerobic respiration?



What is the advantage of producing ethanol/ lactate during anaerobic respiration?

Converts reduced NAD back into NAD so glycolysis can continue.

