

MYCT Revision

Cellular respiration

Learner's outcome:

- Outline uses of energy in the body of humans
- Explain that energy is stored in the ATP molecule in the human body
- Describe aerobic and anaerobic respiration and be able to quote the full equation on energy output
- Compare aerobic respiration, in which energy is released, to photosynthesis, in which energy is stored

Key Understandings

- Organisms need usable energy to maintain cells and carry out their activities and functions.
- Respiration is an energy releasing process. (definition: oxidation of food molecules with the release of energy)
- Some organisms can respire aerobically as well as anaerobically.
- The processes of aerobic respiration and photosynthesis are similar in certain ways and are opposites in others.

LO 1: Outline uses of energy in the human body

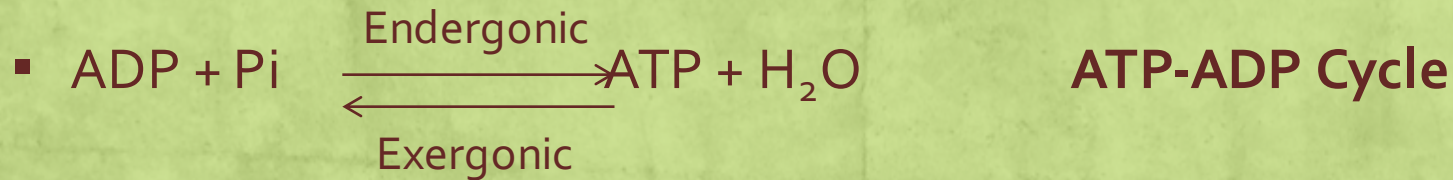
Key understanding: Organisms need usable energy to maintain cells and carry out their activities and functions.

- Muscle contraction
- Protein synthesis
- Cell division
- Active transport Cell transport / transport of materials across cell membranes/ movement of materials ... is not specific
- Generation (or passage) of nerve impulses
- Maintenance of constant body temperature (** in warm-blooded animals)

LO 2: **Explain** that energy is stored in the ATP molecule in the human body

Key understanding: Respiration is an energy releasing process.

- Energy released is stored in the form of ATP



- Energy released from ATP hydrolysis into ADP (**exergonic**) is used by many other **endergonic** metabolic reactions
- **Delivers energy in small amounts**
- Respiration is the major source of energy input for ADP phosphorylation to ATP
- Aerobic respiration produces more energy than anaerobic respiration

LO 3: Describe aerobic and anaerobic respiration and be able to quote the full equation on energy output

Aerobic respiration

- Occurs in presence of oxygen Not "Occurs all the time" !!!
- Takes place in mitochondria (singular: mitochondrion)
- Glucose + Oxygen \rightarrow Carbon dioxide + Water + **large amounts of energy** Not ATP !!!
- $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{large amounts of energy}$ Not ATP !!!

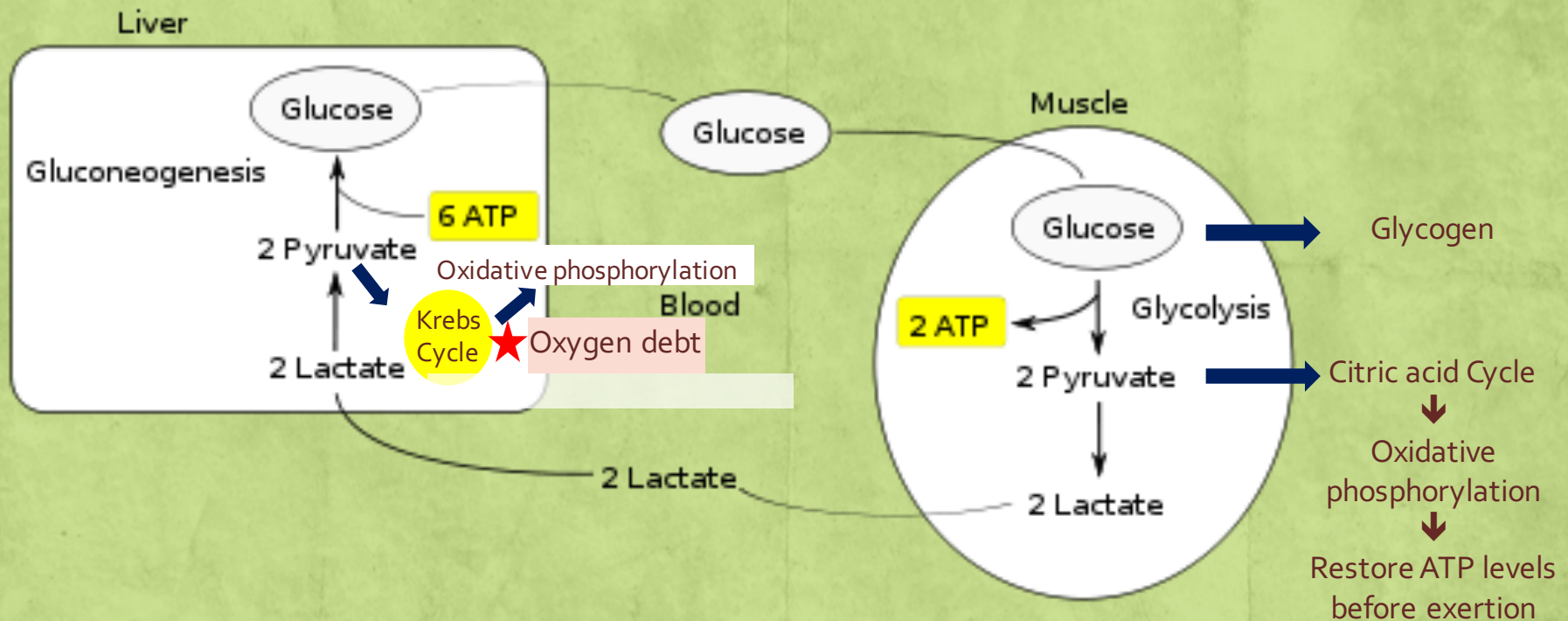
Anaerobic respiration

- Occurs in the absence of oxygen
- Produces **ethanol and carbon dioxide** as waste-products in yeast
- Produces **lactic acid** as waste product in muscle cells

LO 3: Describe aerobic and anaerobic respiration and be able to quote the full equation on energy output

- Accumulation of ethanol will kill yeast cells
- Accumulation of lactic acid in muscle cells cause muscle fatigue
- Site of lactic acid removal: Liver
- Oxygen debt → explains for panting after exercise
- Oxygen debt: the amount of oxygen required to oxidize the lactic acid produced in muscles during anaerobic respiration
- Oxidation of the lactic acid produces energy used to convert remaining lactic acid into glucose → transported back to muscle cells → oxidized for energy OR stored as glycogen (**oxygen debt paid**)

LO 3: Describe aerobic and anaerobic respiration and be able to quote the full equation on energy output



LO4: Compare **aerobic** respiration, in which energy is released, to photosynthesis, in which energy is stored

Anaerobic respiration	Aerobic Respiration	Photosynthesis
Small amounts of energy is liberated	Energy is liberated (in large amounts)	Energy is stored in carbohydrate molecules
By-products are lactic acid (muscles) OR carbon dioxide and ethanol in yeast	Oxygen is used. carbon dioxide and water are released (as by-products)	Carbon dioxide and water are used; oxygen is given off
	Catabolic process in which glucose is broken down	Anabolic process in which glucose is formed
Occurs when there is no oxygen	Occurs all the time when oxygen is available	Occurs only in cells with chlorophyll and in presence of sunlight
	Results in loss of dry mass	Results in gain of dry mass