Knowledge Organiser – Bioenergetics/Respiration

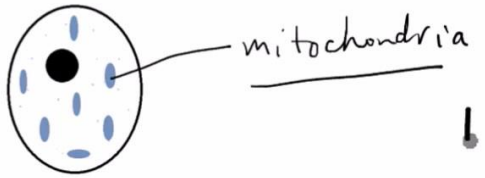
Key Terms

Respiration	**The process by which living things release energy from glucose. Happens in mitochondria**
Aerobic	In the presence of oxygen
Oxidation	A reaction that uses oxygen
Exothermic reaction	A reaction that gives out thermal energy
Anaerobic	In the absence of oxygen
Oxygen debt	The amount of extra oxygen the body needs after exercise to break down lactic acid
Fermentation	The chemical breakdown of glucose into ethanol and carbon dioxide by respiring micro-organisms such as yeast
Metabolism	The sum of all the chemical reactions that happen in an organism

Aerobic Respiration

Glucose + Oxygen ⟶ Carbon Dioxide + Water + Energy

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$ + Energy



Anaerobic Respiration in animals

If oxygen is not delivered to muscles quickly enough, anaerobic respiration occurs

Glucose ⟶ Lactic Acid + 2 ATP (energy)

Oxygen Debt The amount of oxygen needed to remove the lactic acid when oxygen becomes available

Lactic Acid + Oxygen ⟶ CO2 + Water

Anaerobic Respiration in Plants and Microorganisms

Anaerobic respiration in plant and yeast cells is represented by the equation:

glucose ⟶ **ethanol + carbon dioxide**

Anaerobic respiration in yeast cells is called **fermentation**

Key Questions

1. What does aerobic mean?
2. Name the 2 reactants of aerobic respiration
3. Name the 2 products of aerobic respiration
4. What happens to the rate of respiration during exercise?
5. Why does respiration increase during exercise?
6. Where does aerobic respiration take place?
7. What does anaerobic mean?
8. What is the product of anaerobic respiration in humans?
9. What is the product of anaerobic respiration in plants?
10. What is an oxygen debt?

Key Questions	Answers
1. What does aerobic mean?	With oxygen
2. Name the 2 reactants of aerobic respiration	Glucose and oxygen
3. Name the 2 products of aerobic respiration	Carbon dioxide and water
4. What happens to the rate of respiration during exercise?	It increases
5. Why does respiration increase during exercise?	To provide muscles with more energy
6. Where does aerobic respiration take place?	In mitochondria of cells
7. What does anaerobic mean?	Without oxygen
8. What is the product of anaerobic respiration in humans?	Lactic acid
9. What is the product of anaerobic respiration in plants?	Ethanol/Alcohol
10. What is an oxygen debt?	The amount of oxygen needed to remove lactic acid

Learning journey Yr. 10 Respiration

Crucial learning in this unit:

Respiration in cells can take place aerobically (using oxygen) or anaerobically (without oxygen), to transfer energy.

Organisms need energy for: • chemical reactions to build larger molecules • movement • keeping warm.

Aerobic respiration is represented by the equation: glucose + oxygen carbon dioxide + water

Anaerobic respiration in muscles is represented by an equation. As the oxidation of glucose is incomplete in anaerobic respiration much less energy is transferred than in aerobic respiration.

Anaerobic respiration in plant and yeast cells is represented by an equation

Anaerobic respiration in yeast cells is called fermentation and has economic importance in the manufacture of bread and alcoholic drinks.

During exercise the human body reacts to the increased demand for energy. The heart rate, breathing rate and breath volume increase during exercise to supply the muscles with more oxygenated blood.

If insufficient oxygen is supplied anaerobic respiration takes place in muscles. The incomplete oxidation of glucose causes a build-up of lactic acid and creates an oxygen debt. During long periods of vigorous activity muscles become fatigued and stop contracting efficiently.

Metabolism is the sum of all the reactions in a cell or the body. The energy transferred by respiration in cells is used by the organism for the continual enzyme controlled processes of metabolism that synthesise new molecules.

Key vocabulary:

Aerobic **Anaerobic** **Fermentation**

Lactic acid **Glucose**

Specification reference: 4.4.2.1

Helpful resources: GCSE Bitesize

Previous learning	Future learning
Yr7 Need for energy – respiration MRS GREN **Yr8** Respiration circus for aerobic respiration Anaerobic respiration practical in yeast **Yr9** Cell structure including mitochondria. Effect of exercise on heart rate and circulatory system	**Yr11 – To help understand:** **Ecology revision – production of protein by anaerobic respiration of fusarium.** **Trophic levels and energy loss**