AP BIOLOGY • EXERCISE SHEET

3.5 Cellular Respiration

Name: _____ Class: _____ Date: _____ **Total: 13 marks**

Objective

Build the skills to answer exam questions on **cellular respiration**.

You must be able to:

- write the overall equation
- name the three stages (**glycolysis** 糖酵解, **Krebs cycle** 克雷布斯循环, **electron transport chain** 电子传递链)
- state where most ATP is made and the role of oxygen

1 Worked examples

Study these first. Each one shows the method for a question type used later —follow the steps and you can do the Practice and Exam-style questions yourself.

The overall reaction

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{ATP}.$$

Cells break down glucose with oxygen to release energy as ATP.

The three stages

- **Glycolysis** (cytoplasm) —splits glucose into pyruvate, makes a little ATP.
- **Krebs cycle** (mitochondrial matrix) —releases CO_2, makes electron carriers.
- **Electron transport chain** (inner mitochondrial membrane) —makes **most** of the ATP.

Oxygen's role

Oxygen is the **final electron acceptor** in the electron transport chain, forming water. Without it, the chain stops and little ATP is made.

A worked link

Most ATP comes from the electron transport chain, powered by electrons carried from glycolysis and the Krebs cycle, using a proton gradient across the inner membrane.

2 Practice

Now apply the methods above.

2.1 Write the overall equation for cellular respiration. [2]

2.2 Name the three stages of respiration. [3]

2.3 What is the role of oxygen in respiration? [1]

3 Exam-style questions

3.1 Most of the ATP in cellular respiration is made in the [1]

- **A** glycolysis stage
- **B** Krebs cycle
- **C** electron transport chain
- **D** cytoplasm

3.2 A cell is respiring aerobically.

(a) State where glycolysis occurs and its main product. [2]

(b) Explain what happens to ATP production if oxygen runs out. [2]

3.3 Explain the relationship between photosynthesis and respiration in terms of their reactants and products. [2]

4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **3.5 Cellular Respiration** lesson on the **Learn** page;
- read the **Cellular Respiration** section of the AP Biology handout on the **Know** page.

Solutions

2.1 $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ ATP).

2.2 Glycolysis, the Krebs cycle, the electron transport chain.

2.3 It is the final electron acceptor in the electron transport chain.

3.1 C —the electron transport chain.

3.2 (a) Glycolysis occurs in the cytoplasm; its product is pyruvate. (b) Without oxygen the electron transport chain stops, so most ATP production halts and the cell relies on the small amount from glycolysis (fermentation).

3.3 They are opposites —photosynthesis uses CO_2 and water to make glucose and O_2; respiration uses glucose and O_2 to make CO_2 and water —so the products of one are the reactants of the other.