

Student Name: \_\_\_\_\_



# **BIOLOGY 2020**

## **Unit 3**

### **Key Topic Test 6 – Cellular respiration**

Recommended writing time\*: 45 minutes

Total number of marks available: 45 marks

## **QUESTION BOOK**

\* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

**Conditions and restrictions**

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.
- No calculator is allowed in this test

**Materials supplied**

- Question and answer book of 9 pages.

**Instructions**

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.**

**SECTION A – Multiple-choice questions**

**Instructions for Section A**

Select the response that is **correct** for the question. A correct answer scores 1; an incorrect answer scores 0. Marks are not deducted for incorrect answers. If more than 1 answer is completed for any question, no mark will be given.

**Question 1**

Organisms undergo cellular respiration to

- A. create a coenzyme which carries energy
- B. produce carbon dioxide for photosynthesis
- C. turn light energy into chemical energy
- D. make carbon dioxide by rearranging ATP molecules

**Question 2**

The first step in both aerobic and anaerobic respiration is

- A. Acetyl CoA production
- B. fermentation
- C. glycolysis
- D. Krebs cycle

**Question 3**

Glucose is a high energy molecule in part due to its many bonds. These bonds make the molecule hard to break apart and some ATP must be expended to initiate the first step of cellular respiration. Once glucose is broken, two 3 carbon molecules are formed. These 3 carbon molecules are

- A. pyruvate
- B. NADPH
- C. ATP
- D. FADH<sub>2</sub>

**Question 4**

Cellular respiration occurs in 3 locations. The first stage of cellular respiration occurs in the

- A. matrix
- B. cytosol
- C. cristae
- D. mitochondria

**Question 5**

Mitochondria is the site for aerobic respiration in eukaryotic cells. Once the first stage has occurred, Acetyl CoA moves into mitochondria to initiate the second stage. The second stage occurs in the

- A. cristae
- B. matrix
- C. stroma
- D. cytosol

**Question 6**

Mitochondria are thought to have arisen in eukaryotic cells by a cell joining with an energy producing bacterial cell. Evidence of this process includes binary fission, a form of asexual reproduction that mitochondria undergo before cell division. Another example of evidence for this is

- A. circular DNA
- B. ribosomes that transcribe proteins
- C. endosymbiosis
- D. mitochondria being passed down the maternal line

**Question 7**

The Krebs cycle occurs in the mitochondria to further break down pyruvate into smaller molecules releasing energy and freeing hydrogen ions for use in the third part of cellular respiration. Outputs from the Krebs cycle include

- A. 32 ATP
- B.  $\text{NADH}_2$
- C. Acetyl CoA
- D. carbon dioxide

**Question 8**

The Krebs cycle is a multi-step biochemical pathway that requires unloaded carrier molecules to pick up protons, electrons and energy. These unloaded carrier molecules include

- A.  $\text{ADP} + \text{Pi}$ ,  $\text{NADH}$ ,  $\text{FADH}_2$
- B.  $\text{NADH}$ ,  $\text{ATP}$ ,  $\text{FAD}$
- C.  $\text{FAD}$ ,  $\text{NAD}^+$ ,  $\text{ADP} + \text{Pi}$
- D.  $\text{ADP} + \text{Pi}$ ,  $\text{NAD}^+$ ,  $\text{FADH}$

**Question 9**

After the Krebs cycle, ATP synthase enzymes found on the inner membrane of the mitochondria cycle hydrogen ions through the membrane to build ATP molecules. The outputs from this process include

- A. water
- B. 36 to 38 ATP
- C. oxygen
- D.  $\text{FADH}_2$  and NADH

**Question 10**

Various disease can affect the mitochondria which has a profound effect on the ability of cells to function and can lead to death. Mutations in mitochondrial DNA can lead to the production of highly inefficient proteins in the electron transport chain (ETC). Without the ATP produced by the ETC the remaining amount of ATP produced in aerobic respiration would be

- A. 4
- B. 32
- C. 36 to 38
- D. 2

**Question 11**

The number of mitochondria vary in cells throughout the body. By undertaking high intensity interval training, athletes can train to increase the number of mitochondria through a process known as mitochondrial biogenesis. The result of mitochondrial biogenesis may be

- A. more mitochondria in fat tissue
- B. higher amounts of NAD and FAD
- C. less mitochondria in muscle cells as the muscle cells become more efficient
- D. an increase in the number of ATP produced by each mitochondrion from 36 to 38

**Question 12**

Anaerobic respiration occurs in the cytosol and involves

- A. pyruvate from glycolysis
- B. Acetyl CoA from the Krebs cycle
- C. oxygen from the ETC
- D. mitochondria

**Question 13**

Yeast are a microorganism that have mitochondria however when observing yeast in low oxygen conditions, scientists found that the yeast produced

- A. ethanol and carbon dioxide
- B. lactic acid
- C. 36 ATP
- D. water and carbon dioxide

**Question 14**

Bacteria such as Acidophilus are used for many different food related processes. Bacterial cultures are used in yoghurt and cheese making due to the production of a chemical produced during anaerobic conditions which modifies milk proteins. This chemical is

- A. ethanol
- B. lactic acid
- C. carbon Dioxide
- D. lactobacillus

**Question 15**

Cellular respiration rates are affected by changes in the environment. If temperature increases, it would be expected that there would be

- A. an increase in glucose produced
- B. a decrease in oxygen used
- C. an increase in carbon dioxide produced
- D. a decrease in ATP production

**SECTION B – Short-answer questions**

**Instructions for Section B**  
 Answer **all** questions in the space provided. Write using a blue or black pen.

**Question 1**

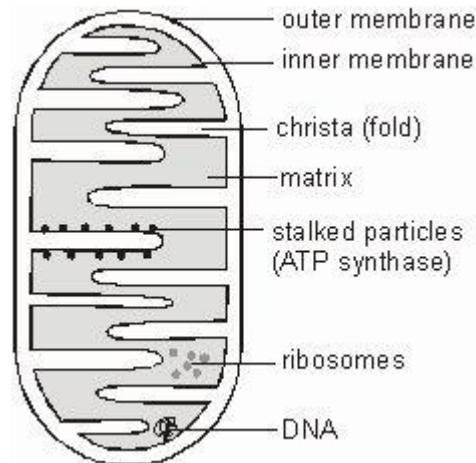
Mitochondria are the site for aerobic respiration. Mitochondria have specialised structures that support parts of aerobic respiration.

a. Complete the table below

Stage	Number of ATP produced	Loaded carrier molecule/s produced	Site in cell
Glycolysis			
Krebs cycle			
Electron transport chain			

9 marks

b. On the diagram below circle 3 pieces of evidence that support the theory of endosymbiosis. Explain why the evidence selected supports the theory.




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6 marks  
 Total 15 marks

**Question 2**

As antibiotic resistance is increasing scientists are researching new varieties of antibiotics to kill resistant bacteria. Once such antibiotic, Oligomycin is found to act on mitochondria by binding to ATP synthase in the cristae membrane. This effectively stops production of large amounts of ATP however it does not kill the bacteria

- a. Explain why bacteria are not killed by Oligomycin

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3 marks

- b. To make Oligomycin more effective scientists placed the bacteria in low oxygen conditions. Would this have made the antibiotic more effective? Explain

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3 marks

- c. When Oligomycin was added to bacteria, scientists had to decide what to measure to identify which parts of cellular respiration were affected. The bacteria were kept at room temperature with adequate glucose and oxygen for aerobic respiration. Water, carbon dioxide and pyruvate levels were measured. For each indicate if the levels would increase or decrease after Oligomycin was added and explain why?

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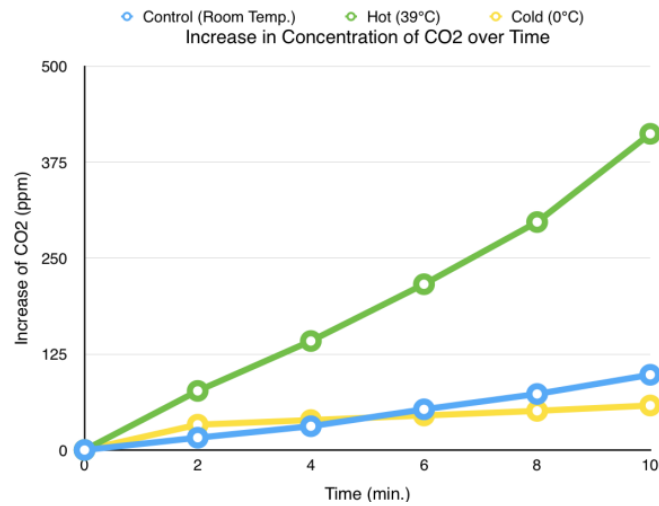
6 marks

Total 12 marks



**Question 3**

The effect of temperature on the rate of respiration in mealworms was investigated by measuring the amount of carbon dioxide over time. The following graph was produced from the results



- a. Describe the effect of changing temperature on the increase in CO<sub>2</sub> using data from the graph

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2 marks

- b. Why would an increase in temperature change the rate of respiration?

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1 mark

Total 3 marks

**END OF KEY TOPIC TEST**