

Student Name: _____



BIOLOGY 2017

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

Materials supplied

- Question book of 11 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

Answer **all** questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Which statement best describes one of the events taking place in the chemical reaction



- A. energy is being stored as a result of aerobic respiration.
- B. fermentation is taking place, resulting in the synthesis of ATP.
- C. energy is being released for metabolic activities.
- D. photosynthesis is taking place, resulting in the storage of energy.

Question 2

The main result of aerobic respiration is the

- A. conversion of radiant energy into chemical energy.
- B. production of lactic acid as an end product.
- C. storage of energy in a polysaccharide.
- D. production of ATP from the breakdown of glucose.

Question 3

Which substance is needed for aerobic cellular respiration to occur?

- A. oxygen.
- B. carbon dioxide.
- C. nitrogen.
- D. methane.

Question 4

What is the term used for the metabolic pathway in which glucose is degraded to carbon dioxide and water?

- A. cellular respiration.
- B. glycolysis.
- C. fermentation.
- D. citric acid cycle.

Question 5

Where does glycolysis take place?

- A. mitochondrial matrix.
- B. mitochondrial outer membrane.
- C. mitochondrial inner membrane.
- D. cytosol.

Question 6

Which process in eukaryotic cells will proceed normally whether oxygen is present or absent?

- A. electron transport.
- B. glycolysis.
- C. the citric acid cycle.
- D. oxidative phosphorylation.

Question 7

In addition to ATP, what are the end products of glycolysis?

- A. CO₂ and H₂O.
- B. CO₂ and pyruvate.
- C. NADH and pyruvate.
- D. CO₂ and NADH.

Question 8

Where are the proteins of the electron transport chain located?

- A. cytosol.
- B. mitochondrial outer membrane.
- C. mitochondrial matrix.
- D. mitochondrial inner membrane.

Question 9

In which cell type would you see a high level of mitochondria?

- A. muscle cells.
- B. skin cells.
- C. red blood cells.
- D. stomach cells.

Question 10

At what stage of respiration is carbon dioxide released as a by-product?

- A. The light-independent stage.
- B. The light-dependent stage.
- C. During the Calvin cycle.
- D. During the Krebs cycle.

SECTION B - Short-answer questions

Instructions for Section B

Answer **all** questions in the spaces provided. Write using black or blue pen.

Question 1

All organisms, with the exception of Archaea, an ancient group of bacteria, use glucose as the primary source of energy to drive cellular metabolism. The chemical bonds in glucose are broken resulting in the release of free energy. This is called cellular respiration.

- a. Write the word equation for the process of cellular respiration that occurs in the presence of oxygen.

_____ 1 mark

- b. Aerobic cellular respiration can be divided into three different stages.

- i. Name these three stages.

_____ 3 marks

- ii. The first stage of respiration can occur in the absence of oxygen. Describe where this stage occurs and the outputs of the stage.

_____ 2 marks

- iii. In the absence of oxygen what is the main product of respiration in animal cells?

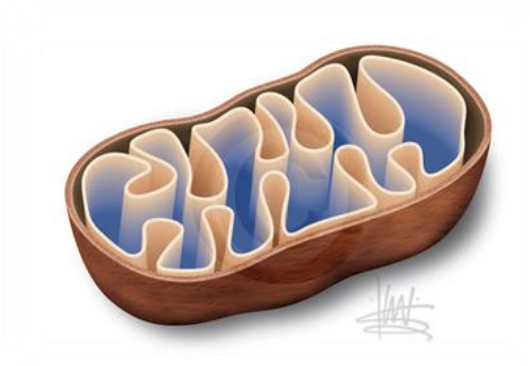
_____ 1 mark

- c. Both aerobic and anaerobic respiration produce ATP for cellular metabolism. Contrast the amount of ATP produced during each process.

_____ 2 marks
Total 9 marks

Question 2

Below is an image of a mitochondrion.



- a. It is now almost certain that an ancestral eukaryotic cell engulfed an aerobic eubacteria that managed to escape digestion. The eubacteria would have evolved with the eukaryotic cell, receiving protection and organic molecules, such as sugar, in return for the ATP molecules they produced for their hosts.
 - i. Explain three characteristics of mitochondria that form the evidence that led scientists to believe that mitochondria were once free living organisms.

- ii. Why was it advantageous for eukaryotic cells to retain the eubacteria that eventually became mitochondria?

3 + 1 = 4 marks

- b. Describe how the inner mitochondrial membrane maximises the efficiency of the mitochondria.

1 mark

- c. Aerobic cellular respiration occurs in the mitochondria. Complete the following table for each stage occurring in the mitochondria.

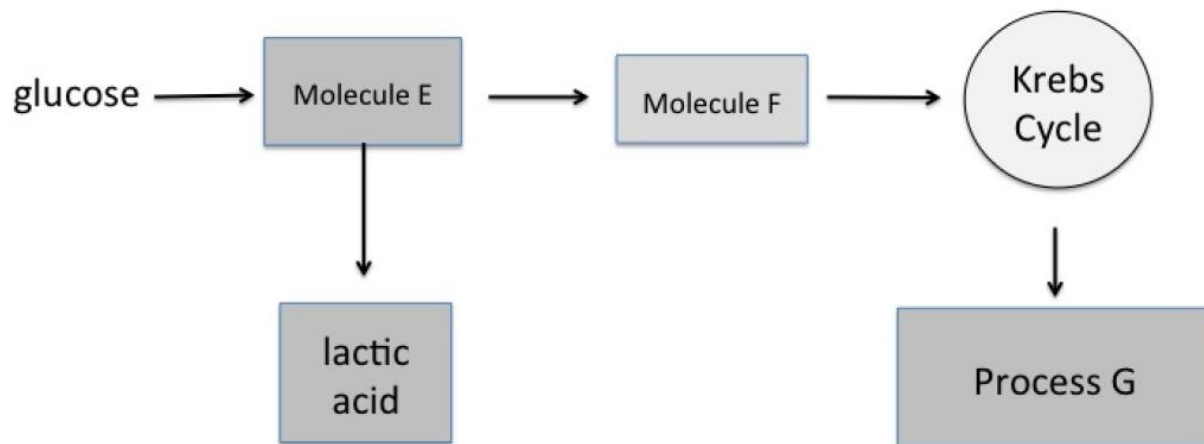
Stage	Inputs	Outputs
1.		
2.		

6 marks

Total 11 marks

Question 3

The following diagram is a representation of the process of cellular respiration.



- a. Where in the cell does the Krebs cycle occur?

1 mark

b. Identify molecule E.

_____ 1 mark

c. What is the name given to process G?

_____ 1 mark

d. What is produced in process G?

_____ 1 mark

e. What is the name of the process that results in the production of lactic acid?

_____ 1 mark

f. Under what conditions will this process proceed?

_____ 1 mark

Total 6 marks

Question 4

A group of scientists set up an experiment to test the rate of aerobic cellular respiration.

This experiment involved the use of four sealed conical flasks. Distilled water, two drops of ammonia, different concentrations of oxygen and phenol red indicator were placed into flasks 1, 2, 3 and 4. A mouse was placed into each flask. If carbon dioxide is produced during the course of the experiment it dissolves in the water producing carbonic acid.

Phenol red is an indicator that is yellow under acidic conditions and pink under basic conditions. The fluid in the four flasks containing water is initially pink. The time taken for the solution to change colour was measured.

The results of the experiment are shown below.

concentration of oxygen (%)	Time for indicator to change colour (mins)
0.2	20
0.4	12
0.8	9
1.2	6
1.6	5
2	5

- a. Describe what is occurring at the cellular level in the mouse that causes the indicator to change from pink to yellow.

2 marks

- b. What was the effect of increasing the oxygen concentration from 0.2 to 0.4%?

1 mark

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- c. At what concentration of oxygen was the rate of cellular respiration highest? Explain your response.

3 marks

- d. When the concentration of oxygen was increased from 1.6 to 2.0% the time taken for the indicator to change was the same. Explain why this is so.

2 marks

- e. Name a factor other than oxygen concentration that influences the rate of cellular respiration.

1 mark

Total 9 marks

END OF KEY TOPIC TEST