BIOLOGY 2017

Unit 3
Key Topic Test 6 – Cellular respiration

Recommended writing time*: 45 minutes
Total number of marks available: 45 marks

SOLUTIONS

SECTION A: Multiple-choice questions (1 mark each)

Question 1

Answer: C

Explanation:

The breakdown of ATP to form ADP and inorganic phosphate releases energy for metabolic activities

Question 2

Answer: D

Explanation:

The main result of aerobic respiration is the production of ATP from the breakdown of glucose.

Question 3

Answer: A

Explanation:

Oxygen is required for aerobic respiration to occur.

Question 4

Answer: A

Explanation:

Cellular respiration is the term used for the metabolic pathway in which glucose is degraded to carbon dioxide and water.

Question 5

Answer: D

Explanation:

Glycolysis takes place in the cytosol of cells.

Question 6

Answer: B

Explanation:

Glycolysis proceeds whether oxygen is present of absent although the amount of ATP is significantly less then via aerobic respiration.

Question 7

Answer: C

Explanation:

The products of glycolysis are ATP, NADH and pyruvate.

Question 8

Answer: D

Explanation:

The proteins of the electron transport chain are located on the inner membrane of the mitochondria (also known as the cristae)

Question 9

Answer: A

Explanation:

Muscle cells require a constant supply of oxygen in order to produce energy, especially during periods of exercise. For this reason they usually contain higher numbers of mitochondria in comparison to other cell types.

Question 10

Answer: D

Explanation:

Carbon dioxide is released as a by-product during the Krebs Cycle.

SECTION B: Short-answer questions

Question 1

a. glucose + oxygen → carbon dioxide + water

1 mark

b.

i. Glycolysis, Krebs cycle and electron transport chain

3 marks

ii. Occurs in the cytosol (1 mark) and produces ATP, NADH and pyruvate (1 mark)

2 marks

iii. Lactic acid

1 mark

c. Aerobic respiration produces 36 – 38 molecules of ATP (1 mark) whereas anaerobic respiration produces 2 molecules of ATP (1 mark).

2 marks

Total 9 marks

Question 2

a.

i. **Membranes** — Mitochondria have their own cell membranes, just like a prokaryotic cell does.
DNA — Each mitochondrion has its own circular DNA genome, like a bacteria's genome, but much smaller. This DNA is passed from a mitochondrion to its offspring and is separate from the "host" cell's genome in the nucleus.
Reproduction — Mitochondria multiply by pinching in half — the same process used by bacteria. Every new mitochondrion must be produced from a parent mitochondrion in this way; if a cell's mitochondria are removed, it can't build new ones from scratch.
Ribosomes— The ribosomes of mitochondria resemble those of prokaryotes rather than those found in eukaryotes.

1 mark for any three of the above points

ii. The eukaryote provided protection and nutrients to the prokaryote, and in return, the prokaryotic endosymbiont provided additional energy to its eukaryotic host through its respiratory cellular machinery.

3 + 1 = 4 marks

b. The multiple foldings of the inner mitochondrial membrane increases the surface area of the membrane, increasing the rate at which aerobic respiration can be carried out.

1 mark

c. 1 mark for each correctly completed box.

Stage	Inputs	Outputs
1. Krebs Cycle	Pyruvate NADH	CO_2 ATP $NADH/FADH_2$
2. Electron Transport Chain	Oxygen $NADH/FADH_2$	Water ATP

6 marks

Total 11 marks

Question 3

a. Mitochondrial matrix

1 mark

b. Pyruvate

1 mark

c. Electron transport chain

1 mark

d. 36 – 38 molecules of ATP and water

1 mark

e. Anaerobic respiration.

1 mark

f. In the absence of oxygen.

1 mark

Total 6 marks

Question 4

a. Carbon dioxide is being produced (1 mark) via the process of cellular respiration (1 mark)

2 marks

b. It decreased the time taken for the indicator to change colour.

1 mark

c. 1.6 and 2% concentration of oxygen (1 mark) the indicator only took 5 mins to change colour at these concentrations (1 mark) indicating that the rate of respiration was the highest at these concentrations (1 mark)

3 marks

d. There must be some other limiting factor (1 mark) such as the availability of other substances required for cellular respiration (1 mark).

2 marks

e. The number of mitochondria present/amount of other energy demanding activities/any other reasonable response.

1 mark

Total 9 marks