BIOLOGY 2020

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: A

Explanation:
B is incorrect as the purpose of cellular respiration is to synthesise ATP. C is incorrect as this describes photosynthesis. D is incorrect as ATP is not made by the rearrangement of ATP into carbon dioxide.

Question 2

Answer: C

Explanation:
Glycolysis involves the splitting of glucose into pyruvate in the cytoplasm in both aerobic and anaerobic respiration

Question 3

Answer: A

Explanation:
A is correct as a six-carbon glucose molecule is broken into two three carbon molecules, pyruvate

Question 4

Answer: B

Explanation:
The first stage of respiration, glycolysis, occurs in the cytoplasm

Question 5

Answer: B

Explanation:
The matrix is the liquid part of the mitochondria inside of the cristae where the second stage (Krebs cycle) of aerobic respiration occurs

Question 6

Answer: A

Explanation:
Mitochondria have circular DNA similar to bacterial DNA. B is incorrect as while mitochondria have ribosomes, they don't transcribe proteins. C is incorrect as endosymbiosis is the theory not the evidence. D is incorrect as while mitochondrial DNA is passed down the maternal line that is not evidence for endosymbiosis.

Question 7

Answer: D

Explanation:
Carbon dioxide, NADH, FADH2 and 2 ATP are all outputs from the Krebs cycle.

Question 8

Answer: C

Explanation:
Unloaded carrier molecules do not contain hydrogen ions or carry electrons as energy reserves so FAD, NAD+, ADP +Pi

Question 9

Answer: A

Explanation:
Water, 32 ATP and unloaded carriers are outputs from the ETC

Question 10

Answer: A

Explanation:
A is correct as 2 ATP is produced is produced in glycolysis and 2 ATP in the Krebs cycle

Question 11

Answer: B

Explanation:
An increase in the number of mitochondria would lead to an increase in the amount of ATP produced in muscle cells. To generate more ATP higher amounts of carrier molecules NAD+ and FAD must be produced.

Question 12

Answer: A

Explanation:
Anaerobic respiration occurs in the cytosol where pyruvate is produced by glycolysis.

Question 13

Answer: A

Explanation:
Yeast produce ethanol and carbon dioxide because of anaerobic respiration. Lactic acid and lactate are produced in animal cells, so A and C are incorrect

Question 14

Answer: B

Explanation:
B is correct as bacteria produce lactic acid via anaerobic respiration under low oxygen conditions

Question 15

Answer: C

Explanation:
An increase in temperature would increase the rate of respiration leading to an increase in carbon dioxide produced as a waste product of aerobic respiration

SECTION B: Short-answer questions

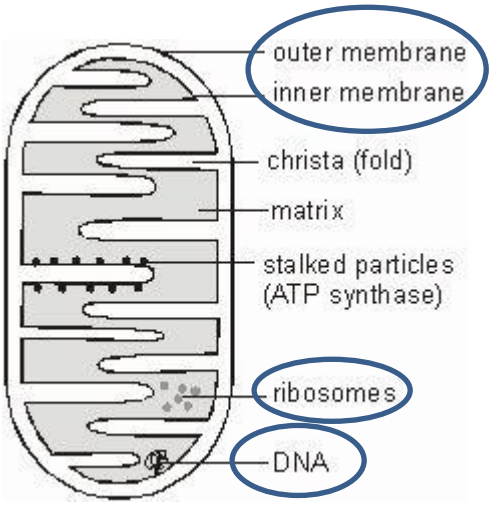
Question 1

a. .

Stage	Number of ATP produced	Loaded carrier molecule/s produced	Site in cell
Glycolysis	2	NADH	Cytosol
Krebs cycle	2	NADH, FADH2	Matrix (Mitochondria)
Electron transport chain	32	Nil	Cristae (Mitochondria)

9 marks

b. .



The double membrane is an indication of the merging of 2 cells with the inner membrane like a bacterial cell and the outer like a cell membrane (1)
Ribosomes are similar in size to bacterial ribosomes (1)
Circular DNA is the same shape as bacterial DNA (1)
Correct features circled, 1 mark each (3)

6 marks

Question 2

a. Aerobic respiration produces 2 ATP from glycolysis, 2 ATP from the Krebs cycle and 32 ATP from the ETC (1). As Oligomycin affects the ETC only 4 ATP are produced through the other processes (1) 4 ATP is sufficient for the bacteria to survive however cell functioning would be affected (1)

3 marks

b. No, it would not be more effective (1) The Oligomycin would not be more effective as oxygen is only required in the ETC (1) so the Krebs cycle and glycolysis would continue to produce small amounts of ATP which is enough to keep the bacteria alive (1)

3 marks

c. Water levels would decrease (1) as Oligomycin stops ETC where water is produced as a byproduct (1). Carbon dioxide levels would increase (1) as the Krebs cycle is unaffected by the antibiotic and carbon dioxide is produced as a byproduct (1). Pyruvate levels would increase (1) as glycolysis is still occurring in the presence of the antibiotic (1)

6 marks

Question 3

a. As the temperature increases above room temperature the concentration of $C0_2$ produced increases from 0ppm to 400ppm (1). As the temperature decreases below room temperature the amount of $C0_2$ increases from 0ppm to 60 ppm (1)

2 marks

b. Increasing temperature increases the movement of molecules as energy is added to the process. As respiration is an enzyme catalyzed pathway, extra molecular movement would increase collisions between enzyme active sites and substrates increasing the rate of respiration.

1 mark

Total 45 marks