
BIOLOGY VCE UNITS 3&4 DIAGNOSTIC TOPIC TESTS 2017

TEST 3: PHOTOSYNTHESIS AND CELLULAR RESPIRATION

SUGGESTED SOLUTIONS AND MARKING SCHEME

SECTION A – MULTIPLE-CHOICE QUESTIONS

Question 1 C

The X is pointing to the infolding of the inner membrane which is the cristae.

Question 2 A

Green organisms growing in the sunlight will be undergoing photosynthesis at a higher rate than cellular respiration, therefore the gas must be oxygen.

Question 3 A

Chlorophyll a is a green pigment. β carotene is a vitamin. Photosystem II is part of the process of photosynthesis. Chlamydia is a bacterium.

Question 4 C

The process of photosynthesis uses carbon dioxide to combine with hydrogen to manufacture glucose which is a high-energy organic compound.

Question 5 B

At the compensation point (B on the graph), the amount of oxygen produced by photosynthesis equals the amount of oxygen used in aerobic cellular respiration.

Question 6 B

In the light-dependent reaction, light energy is used to split water into oxygen and hydrogen. The hydrogen is picked up by the carrier molecule NADP to become NADPH at the same time some ATP is formed.

Question 7 C

ATP is the form of usable energy available for cells to carry out normal functioning.

Question 8 **D**

Cellular respiration is really a very complex multi-step process which results in a net yield of ATP. Although inhalation of oxygen is necessary for aerobic cellular respiration and exhalation of carbon dioxide is a by-product result of cellular respiration, they are not in fact cellular respiration.

Question 9 **A**

There are three main stages for aerobic cellular respiration with some of the products of each step being reactant for the next step.

Question 10 **A**

ADP is an input to produce ATP. NADH is a charged carrier molecule; it is carrying hydrogen. NAD⁺ is an uncharged carrier molecule as it has no hydrogen.

Question 11 **C**

Carbon dioxide, heat and water are all by-products of aerobic cellular respiration.

Question 12 **C**

Anaerobic cellular respiration involves the production of lactic acid, whereas in both aerobic and anaerobic cellular respiration ATP is a product.

Question 13 **C**

The Krebs cycle and citric acid cycle both describe the second step of aerobic cellular respiration.

Question 14 **A**

Although these pigments absorb light, they do so at specific wavelengths.

Question 15 **A**

The primary function of photosynthesis is not to produce ATP but to produce glucose. The primary function of cellular respiration is not to break down ATP, but to produce ATP.

SECTION B – SHORT-ANSWER QUESTIONS

Question 1 (3 marks)

- ATP is a form of usable energy for cells. 1 mark
- ATP is manufactured in the cytosol (2 molecules) and in the mitochondria (34 or 36 molecules). 1 mark
- ATP is used within the cell in which it is manufactured. 1 mark

Question 2 (3 marks)

Any three of:

- light intensity – how bright the light is
- wavelength of light – different photosynthetic pigments function best at different wavelengths of light
- amount of water present – water is an input for the light dependent reaction of photosynthesis
- amount of carbon dioxide present – carbon dioxide is an input for the light independent reaction of photosynthesis
- temperature – all plants have different optimum temperatures at which they function best

3 marks

1 mark for each correct response.

Question 3 (1 mark)

Energy is converted from light energy into chemical energy during photosynthesis.

Question 4 (4 marks)

Stage 1, the light-dependent reaction, occurs in the grana/thylakoids of the chloroplast.

1 mark

Water molecules are split into oxygen and hydrogen. The oxygen is released. The hydrogen is picked up by a carrier – NADP to become NADPH.

1 mark

Stage 2, the light-independent reaction, occurs in the stroma of the chloroplast.

1 mark

Carbon dioxide combines with hydrogen from NADPH in a series of reactions to form glucose and water.

1 mark

Question 5 (2 marks)

a. phase I

1 mark

b. *Any one of:*

- amount of water available
- temperature
- wavelength of light
- light intensity

1 mark

Question 6 (4 marks)

a. *Any two of:*

- You can control the temperature
- You can control the light intensity.
- You can control the wavelength of light.
- You can control the carbon dioxide concentration.

2 marks

Note: Any two suitable responses are acceptable.

b. In a greenhouse, there are no natural pollinators.

1 mark

- c. Carbon dioxide is an input for photosynthesis, therefore increasing the amount of carbon dioxide present increases the photosynthetic rate and so more tomatoes can be produced. 1 mark

Question 7 (1 mark)

Aerobic respiration is more efficient than anaerobic respiration as aerobic yields 36 or 38 molecules of ATP whereas anaerobic yields 2 molecules of ATP.

Question 8 (2 marks)

Aerobic respiration occurs in the mitochondria. 1 mark

Anaerobic respiration occurs in the cytosol. 1 mark

Question 9 (2 marks)

Krebs cycle occurs in the matrix of the mitochondria. 1 mark

Electron transport occurs on the cristae of the mitochondria. 1 mark

Question 10 (1 mark)

Different cells require different amounts of energy depending on their specific function. Therefore, cells requiring more energy will contain more mitochondria.

Question 11 (2 marks)

Heat is a by-product of metabolic activity. 1 mark

As tuna are active hunters, they require lots of energy and therefore undergo many reactions of aerobic cellular respiration and producing lots of heat. 1 mark