

## Unit 3 Biology

### Revision Booklet 2 - Solutions

#### 2011 – Qn 7

##### Question 7a.

Marks	0	1	Average
%	44	56	0.6

Either of:

- glucose + oxygen → carbon dioxide + water
- $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2$

Energy/ATP was not required to gain the mark. Some students did not have the correct products and reactants.

##### Question 7b.

Marks	0	1	2	Average
%	44	25	31	0.9

Both of:

- the electron transport chain would be unable to provide larger amounts of ATP
- there would be insufficient energy available to maintain life.

An answer such as 'There would be no energy available to the cell' was incorrect as glycolysis, anaerobic respiration and the Krebs's cycle would produce some ATP. Writing 'this would result in death of the cell' was simply repeating the stem of the question.

##### Question 7c.

Marks	0	1	2	Average
%	50	14	36	0.9

Two of:

- water is split to form oxygen gas
- water is split to form  $H^+$  or NADPH is formed
- ATP is formed (from ADP and  $P_i$ ).

Students who did not describe chemical changes were not awarded any marks.

##### Question 7d.

Marks	0	1	2	Average
%	69	23	8	0.4

##### Question 7di.

The amount of carbon dioxide being released in cellular respiration equals the amount of carbon dioxide used in photosynthesis.

The question asked 'in terms of chemical reactions', therefore students were required to make statements about photosynthesis, cellular respiration and there being no  $CO_2$  used as indicated by the graph. While the term 'compensation point' suitably described Point M, it did not answer the question.

##### Question 7dii.

There is a limiting factor (other than light) such as:

- lack of  $CO_2$
- lack of water
- lack of enzymes
- inability of chlorophyll to absorb any more light.

##### Question 7e.

Marks	0	1	2	Average
%	45	30	25	0.8

Either of:

- Increase the rate of photosynthesis and therefore greater production of glucose/growth
- Reduce the production of hydrogen peroxide and ammonia and these are toxic and could harm the plant.

## 2010 – Question 3

### Question 3a.

Marks	0	1	Average
%	26	74	0.8

Glucose or  $C_6H_{12}O_6$

### Question 3b.

Marks	0	1	2	3	Average
%	53	9	14	25	1.1

Suitable answers included:

- glycolysis: glucose is converted to pyruvate, 2 ATP produced
- Krebs (cycle): pyruvate is converted to carbon dioxide, 2 ATP produced
- electron transport chain: hydrogen combines with oxygen to produce water, 32–34 ATP produced.

The question required a brief description of three stages of cellular respiration. Answers could also include the inputs or outputs of each stage, where each stage occurred or the amount of ATP produced.

Many students, however, described different stages of photosynthesis and did not gain any marks. Some students wrote large amounts of information for each part; this was unnecessary and wasted valuable examination time. Some students gave contradictory information.

Errors included:

- $O_2$  being a part of glycolysis
- NADPH rather than NADH in the Krebs cycle
- $CO_2$  being an output of the electron transport chain and 36–38 ATP being produced.

### Question 3c.

Marks	0	1	Average
%	88	12	0.1

The oxygen produced in photosynthesis can be used in cellular respiration.

Few students were able to answer this question correctly.

### Question 4a.

Marks	0	1	2	Average
%	37	31	32	1

Strain Z has the most plasma cells; therefore, more antibodies can be produced against the influenza virus.

## 2009 – Question 3

### Question 3a.

Marks	0	1	Average
%	49	51	0.5

ATP or NADPH

### Question 3b.

Marks	0	1	Average
%	19	81	0.8

Any of:

- carbon dioxide
- temperature
- water.

### Question 3c.

Marks	0	1	Average
%	58	42	0.4

To absorb different wavelengths of light

A common incorrect answer was 'to absorb more light'.

### Question 3d.

Marks	0	1	2	Average
%	36	59	6	0.7

Both of:

- X sheds its leaves
- the leaves change colour as the pigments are broken down or moved out of the leaves.

This question was not well answered. Often students incorrectly stated that the decrease in pigments was due to the loss of leaves, yet the data given was for the amount of pigments per leaf.

### Question 3e.

Marks	0	1	2	Average
%	33	50	17	0.9

Both of:

- the higher the light intensity, the more light can be absorbed and the rate of photosynthesis is greater
- at higher temperatures, enzymes are denatured.

## 2008 – Question 3

### Question 3

Many answers to this question demonstrated students' knowledge and understanding of photosynthesis and cellular respiration.

#### Question 3a.

Marks	0	1	Average
%	51	49	0.5

Light is necessary for photosynthesis, and where light absorption was high so was the rate of photosynthesis.

It was important for students to make a comparative statement between the two graphs. Some students incorrectly stated that the chlorophyll was absorbed, not the light. Other students described the graphs rather than giving an explanation as requested by the question.

#### Question 3b.

Marks	0	1	2	Average
%	24	35	40	1.2

##### 3bi.

Any one of:

- water
- NADP
- ADP and Pi.

##### 3bii.

Any one of:

- oxygen
- NADPH
- ATP.

#### Question 3c.

Marks	0	1	Average
%	40	60	0.6

36 ATP

Responses between 34 and 38 ATP were accepted due to the variation in yield in different tissues.

#### Question 3d.

Marks	0	1	2	3	Average
%	34	26	21	19	1.3

##### 3di.

Cristae (of the mitochondria)

##### 3dii.

Product (either of):

- water
- ATP.

Description

- Electrons are passed along electron acceptors/a series of cytochromes.
- Oxygen captures electrons, which are combined with hydrogen.
- Carrier molecules give up hydrogen as it is passed along.

Many students correctly identified the site of the reaction and the product, though very few stated that 'product Z is...'. This was satisfactory, as long as students indicated in some other way what was formed. Students' descriptions of the events which occurred in the electron transport stage ranged from complete, highly advanced descriptions to many which demonstrated no knowledge of this process.

## 2007 – Question 4

### Question 4

This question required students to have an understanding of the various stages of photosynthesis, in particular, the relationship between structure and function. Students demonstrated a good understanding of the structure of the chloroplast but some had trouble explaining the function.

#### Question 4a.

Marks	0	1	Average
%	50	50	0.5

Part Y

Name

- grana
- thylakoid
- stacks of grana or thylakoids

Some students correctly labelled all parts; however, they were not awarded the mark as the question specifically asked for the part which **absorbed the light**. As long as the word was not ambiguous, it was awarded the mark.

#### Question 4b.

Marks	0	1	2	Average
%	45	23	32	0.9

Drawing B is from a plant living in a shaded rain forest as it has many more grana (as indicated by the information that there are dark green fronds) and this gives a greater ability to absorb any available light.

It is important that students always carefully read the information. Too often, students incorrectly stated that the diagrams indicated the presence of chloroplasts inside of the cell and did not realise the diagrams were of chloroplasts.

#### Question 4c.

Marks	0	1	Average
%	63	37	0.4

Either of:

- osmosis (of water)
- diffusion (of water/carbon dioxide).

When students are asked to name something, it is important that they do so. It is not necessary to elaborate and students must be aware that if incorrect information is given in their elaboration, the mark cannot be awarded.

#### Question 4d.

Marks	0	1	Average
%	76	24	0.3

Ribosomes synthesise protein to:

- produce the enzymes required for photosynthesis
- assist in the production of chlorophyll
- make the membranes of the chloroplast or within it.

Most students mentioned that ribosomes synthesise proteins; however, few could then relate this to their importance to the chloroplasts.

#### Question 4e.

Marks	0	1	Average
%	81	19	0.2

Possible answers included:

- both contain DNA and are capable of self-replication
- both have ribosomes, which indicates they can make their own proteins
- both have a double membrane, one of the prokaryote and one of the host.

To gain the mark here, students had to give information that supported the endosymbiotic theory.

#### Question 4f.

Marks	0	1	Average
%	57	43	0.5

Carbon dioxide

**Question 4g.**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	78	22	<b>0.2</b>

The source of these carriers is:

- the light dependent stage
- the electron transport chain of photosynthesis
- the splitting of water.

Any one of the above answers was acceptable.

**Question 4h.**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	63	37	<b>0.4</b>

Glucose or water

Students who successfully answered this question were able to correctly apply their knowledge to the diagram. As stated in the stem, the diagram summarises the light-independent reaction. Some students obviously thought that the diagram was anaerobic respiration and hence pyruvate was a common incorrect answer for part h.