Contents

Introduction 3
Question 1 4
Question 2 4
Question 3 5
Question 4 5
Question 5 6
Question 6 7
Question 7 8
Question 8 9
Question 9 10
Question 10 11
Question 11(a) 12
Question 11(b) 13
Question 11(c)(i) 13
Question 11(c)(ii) 14
Question 11(c)(iii) 15
Question 12(a) 16
Question 12(b)(i) 17
Question 12(b)(ii) 18
Question 13(a) 18
Question 13(b) 19
Question 13(c) 19
Question 14(a) 20
Question 14(b)(i) 20
Question 14(b)(ii) 21
Question 15(a) 22
Question 15(b) 23
Question 15(c)(i) 24
Question 15(c)(ii) 25
Question 15(c)(iii) 26
Question 15(d) 26
Question 16(a)(i) 27
Question 16(a)(ii) 27
Question 16(b)(i) 28
Question 16(b)(ii) 29
Question 17(a)(i) 29
Question 17(a)(ii) 30
Question 17(b) 30
Introduction

These exemplar answers have been chosen from the summer 2018 examination series.

OCR is open to a wide variety of approaches and all answers are considered on their merits. These exemplars, therefore, should not be seen as the only way to answer questions but do illustrate how the mark scheme has been applied.

Please always refer to the specification https://www.ocr.org.uk/qualifications/gcse/gateway-science-suite-combined-science-a-j250-from-2016/ for full details of the assessment for this qualification. These exemplar answers should also be read in conjunction with the sample assessment materials and the June 2018 Examiners’ report or Report to Centres available from Interchange https://interchange.ocr.org.uk/Home.mvc/Index

The question paper, mark scheme and any resource booklet(s) will be available on the OCR website from summer 2019. Until then, they are available on OCR Interchange (school exams officers will have a login for this and are able to set up teachers with specific logins – see the following link for further information http://www.ocr.org.uk/administration/support-and-tools/interchange/managing-user-accounts/).

It is important to note that approaches to question setting and marking will remain consistent. At the same time OCR reviews all its qualifications annually and may make small adjustments to improve the performance of its assessments. We will let you know of any substantive changes.
**Question 1**

**Exemplar 1**

1. Which substances are used in the synthesis of lipids?

   A. Amino acids and glucose  
   B. Amino acids and glycerol  
   C. Fatty acids and glucose  
   D. Fatty acids and glycerol

   Your answer: D

**Examiner commentary**

Fatty acids and glycerol are used in the synthesis of lipids. The correct answer is D.

**Question 2**

**Exemplar 1**

2. The drawing shows some of the structures found in an animal cell.

![Diagram of an animal cell with labeled structures A, B, C, and D.]

Which labelled structure contains enzymes for cellular respiration?

Your answer: B

**Examiner commentary**

Enzymes for cellular respiration are found in the mitochondria (C). However, because some enzymes for cellular respiration are also found in the cytoplasm, B is also an allowable answer. Here, the candidate has written both answers, but simply scores 1 mark.
Question 3

Exemplar 1 1 mark

3 Photosynthesis is a process that occurs in plants.

<table>
<thead>
<tr>
<th>Type of reaction</th>
<th>Substrates</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Endothermic</td>
<td>Carbon dioxide and water</td>
<td>Oxygen and glucose</td>
</tr>
<tr>
<td>B Exothermic</td>
<td>Carbon dioxide and water</td>
<td>Oxygen and glucose</td>
</tr>
<tr>
<td>C Endothermic</td>
<td>Oxygen and glucose</td>
<td>Carbon dioxide and water</td>
</tr>
<tr>
<td>D Exothermic</td>
<td>Oxygen and glucose</td>
<td>Carbon dioxide and water</td>
</tr>
</tbody>
</table>

Which row describes photosynthesis?

Your answer A [1]

Examiner commentary

Photosynthesis is an endothermic reaction, in which the substrates are carbon dioxide and water, and the products oxygen and glucose. The correct answer is A. Thinking about photosynthesis as endothermic may challenge some candidates. It may be helpful for teachers to contrast photosynthesis with respiration, which releases energy (exothermic).

Question 4

Exemplar 1 1 mark

4 Which substances are transported in the phloem vessels?

A Sucrose only
B Water and mineral ions
C Water and sucrose
D Water only

Your answer C [1]

Examiner commentary

Water and sucrose are transported in the phloem vessels. The answer A was sucrose only. The answer D was water only. The correct answer was answer C: water AND sucrose. Many candidates learn that the phloem transports sucrose, without teachers reinforcing the fact that sucrose is transported in solution.
Question 5

Exemplar 1

5  The diagram shows a potometer.

Examiner commentary

The correct answer is C. Structure X is needed to return the air bubble to its original position.
Question 6

Exemplar 1 1 mark

6 Look at the diagram of a potometer.

How can the apparatus be changed to increase the rate of water uptake?

A Add more water to the beaker
B Place an electric fan next to the apparatus and switch the fan on
C Place a plastic bag over the plant
D Remove half of the leaves from the plant

Your answer [B] [1]

Examiner commentary

To increase the rate of water uptake, candidates need to understand that the rate of water loss from the leaves must increase. A plastic bag (C) would slow such water loss. Removing half the leaves (D) would remove surface area across which water is lost, and hence also slow water loss. Adding water to the beaker (A) would have no effect. The correct answer is B (place an electric fan next to the apparatus and switch the fan on), which would blow away evaporated water, and hence maintain a diffusion gradient.
Question 7

Exemplar 1

1 mark

A student investigates osmosis. They place potato chips in different sugar solutions.

The table shows their results.

<table>
<thead>
<tr>
<th>Sugar solution</th>
<th>Mass of potato chip (g)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At start</td>
<td>After one hour</td>
</tr>
<tr>
<td>X</td>
<td>2.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Y</td>
<td>2.0</td>
<td>1.9</td>
</tr>
<tr>
<td>Z</td>
<td>2.0</td>
<td>1.7</td>
</tr>
</tbody>
</table>

What is the percentage change in mass for the potato chip in sugar solution Z?

A  -7
B  -15
C  -18
D  -30

Your answer [B] [1]

Examiner commentary

The percentage change in mass of the potato chip in solution Z is -15%. The correct answer is B \(100 \times \frac{(1.7-2.0)}{2.0}\).
Question 8

Exemplar 1

8 The level of some hormones change during the menstrual cycle.

The graph shows how the level of one hormone changes during the menstrual cycle.

Fertilisation has not taken place after ovulation.

Which hormone is represented in the graph?

A FSH
B Oestrogen
C Progesterone
D Testosterone

Your answer C [1]

Examiner commentary

Progesterone is the hormone represented in the graph. Answer C is correct.
Question 9

Exemplar 1

1 mark

9  A student investigates an enzyme controlled reaction. She collects the gas produced during the reaction in a gas syringe.

The diagrams show the amount of gas in the gas syringe at the start and after five minutes.

What is the rate of the reaction?

A  0.625 cm$^3$/min
B  1.6 cm$^3$/min
C  3.6 cm$^3$/min
D  8 cm$^3$/min

Your answer  B

Examiner commentary

Candidates must read from the scales on the gas syringe, and use the readings to calculate how much gas is produced in five minutes (18-10 = 8) and then how much is produced per minute (8/5). The correct answer is B (1.6 cm$^3$/min).
Question 10

Exemplar 1  1 mark

10 Which of these carbohydrates is a polymer?
   A Glucose
   B Maltose
   C Starch
   D Sucrose

Your answer  [C]  [1]

Examiner commentary

The only polymer in the list of possible answers is starch. The correct answer is C.
Question 11(a)

Exemplar 1

11 The picture shows plant cells as seen using a light microscope.

Examiner commentary

This candidate’s drawing took up at least one half of the height or width of the space provided (1). However, they did not gain credit against the other two marking points.

- The candidate’s drawing did not resemble cell X in shape or distribution of chloroplasts (they had simply drawn what they could remember of a ‘standard’ diagram of a plant cell). The question asked them to draw the cell itself.
- They had not labelled the cell wall AND chloroplast correctly. The chloroplast label went to an incorrect destination. The cell wall label did not touch the cell wall. Label lines must touch the structures intended.
Question 11(b)

Exemplar 1

(b) The plant cells shown in Fig. 11.1 are not root cells.

Explain how you can tell this from the picture.

because the root cells don't have chloroplast
since photosynthesis happens in the leaves. [2]

Examiner commentary

The candidate has recognised that root cells do not have chloroplasts (1) and has recognised that photosynthesis happens in the leaves, an allowable alternative marking point to no light being available underground (1).

Question 11(c)(i)

Exemplar 1

(c) Plants take mineral ions from the soil. The availability of mineral ions for plants growing in soil is affected by the pH of the soil.

The chart shows the availability of mineral ions in soils of different pH. The thicker the bar, the more available the mineral ion.

![Diagram showing availability of mineral ions at different pH levels]

(i) A plant is growing in a soil of pH 4.

Which mineral ion will be most available to the plant?

iron [1]

Examiner commentary

The thickest bar at pH4 is that of iron, which the candidate has correctly recognised (1).
Exemplar 1

Question 11(c)(ii)  

1 mark

(ii) Magnesium is required by plants for photosynthesis. Growing plants in very alkaline soils may result in less biomass. 

Use the chart to explain why.

The plants growing in very alkaline soils may result in less biomass because if the pH goes down and becomes more alkaline the less available magnesium is [2]

Examiner commentary

The candidate has correctly recognised that magnesium is in short supply (1). However, the candidate did not gain credit against the other two marking points, failing to recognised that:

- Low magnesium is responsible for less photosynthesis.
- Less photosynthesis results in less biomass.
Exemplar 1

Question 11(c)(iii)  

1 mark

(iii) The picture shows a root growing from a seed.

Explain how the structures seen on the root help with the uptake of minerals.

It has long hair cells that can reach... and take in minerals...

........................................................................................................................................ [2]

Examiner commentary

The candidate has recognised the presence of hairs (1). The marking point only requires 'hairs', although 'root hairs' and 'hair-like structures' would also have gained credit. The candidate does not gain credit against the second marking point, as there is no reference to increased or large surface area.
Question 12(a)

Exemplar 1

12 (a) The diagram shows a motor neurone.

Label 1 and 2 on the diagram. [2]

Examiner commentary

‘1’ is correctly labelled as ‘dendrites’ (1) and ‘2’ is correctly labelled as cytoplasm (1). The candidate gained full marks.
Question 12(b)(i)

Exemplar 1

1 mark

(b) Nerve impulses can travel along axons at different speeds.

The graph shows the relationship between the speed of a nerve impulse and the diameter of the axon.

Examiner commentary

The candidate correctly states that as the speed of impulse increases, the diameter increases (1).
**Question 12(b)(ii)**

Exemplar 1 

1 mark

(ii) The data was measured as part of an investigation by a scientist. The scientist made this statement.

‘The data collected is mostly precise.’

What evidence is there in the graph to support this statement?

...line... of... best... fit... goes... through... many... plots... of... data...

and... none... of... the... data... is... too... far... away... which... means... it... is... acceptable.

**Examiner commentary**

The candidate states that the line of best fit goes through many plots of data and none of the data is too far away (from the line). This is equivalent to the marking point: points/data being close to the line (1).

**Question 13(a)**

Exemplar 1 

1 mark

13 The table compares type 1 and type 2 diabetes.

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usual age of onset</td>
<td>Childhood</td>
<td>Adult</td>
</tr>
<tr>
<td>Development of symptoms</td>
<td>Very quick</td>
<td>May appear over several months</td>
</tr>
<tr>
<td>Percentage of diabetic population</td>
<td>About 10%</td>
<td>About 90%</td>
</tr>
<tr>
<td>Linked to obesity</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Cause</td>
<td>Beta cells (β cells) destroyed so no insulin production</td>
<td>Body cells may not react to insulin or not enough insulin is produced</td>
</tr>
</tbody>
</table>

(a) State the usual age of onset for **Type 1** diabetes.

Write your answer in the table. [1]

**Examiner commentary**

Correct answers include childhood/adolescence/teenage/young, or any answer equivalent to ages 1-20. The candidates answer of 'child' therefore gains credit (1).
Question 13(b)

Exemplar 1

1 mark

(b) Which organ in the body contains beta cells (β cells)?

Pancreas

Examiner commentary

The candidate correctly states that the organ in the body which contains beta cells is the pancreas (1).

Question 13(c)

Exemplar 1

3 marks

(c) Write about the different treatments for the two types of diabetes.

For type 1 diabetes, it can be treated by injections of insulin (usually after a meal when blood glucose levels are high) or having a low-glucose diet. Type 2 diabetes can be treated by exercising more and having a healthier diet.

Examiner commentary

To gain full marks in this question, treatments must be linked to the correct type of diabetes. The candidate has done this successfully, stating that type 1 requires insulin (1), and that type 2 can be treated with exercise, an allowable alternative to weight loss (1) and with diet (1).
Question 14(a)

Exemplar 1  

1 mark

14 Amino acids are found in the food we eat. Different diets will contain different amounts of amino acids.

The table shows some of the amino acids we need in our diet. It also shows the mean daily intake of one adult male and the recommended daily allowance (RDA) for the same man.

<table>
<thead>
<tr>
<th>Amino acid</th>
<th>Mean intake (g/day)</th>
<th>RDA (g/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Histidine</td>
<td>1.5</td>
<td>0.9</td>
</tr>
<tr>
<td>Leucine</td>
<td>3.9</td>
<td>2.8</td>
</tr>
<tr>
<td>Lysine</td>
<td>2.2</td>
<td>2.5</td>
</tr>
<tr>
<td>Threonine</td>
<td>2.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Valine</td>
<td>2.8</td>
<td>1.6</td>
</tr>
</tbody>
</table>

(a) Which amino acid has the lowest RDA?

Histidine ........................................ [1]

Examiner commentary

The candidate correctly recognises histidine as having the lowest RDA (1).

Question 14(b)(i)

Exemplar 1  

2 marks

(b) (i) Calculate the mean intake as a percentage of the RDA for lysine.

\[
\frac{2.2}{2.5} \times 100 = 0.88 \times 100 = 88\%
\]

Answer = 88% [2]

Examiner commentary

The mean intake of lysine as a percentage of RDA is 88% (2.2/2.5 x 100), for which the candidate gained 2 marks.
Question 14(b)(ii)

Exemplar 1

Examiner commentary

The candidate noted that the man did not get enough lysine, an allowable alternative to ‘less than the RDA’ (1). The candidate says that the man isn’t eating enough protein. But the correct answer for the second marking point builds on the idea that without enough lysine, he cannot make the correct proteins. Hence, the candidate did not gain credit against the second marking point.
Question 15(a)

Exemplar 1

15 Two students investigate the effect of temperature on respiration in yeast.

This is what they do:

• Put some yeast and sugar solution into a boiling tube
• Put the boiling tube into a water bath at 10°C
• Connect the boiling tube to a delivery tube
• Put the other end of the delivery tube into a boiling tube filled with water
• Count the number of gas bubbles released in one minute
• Warm the water bath to 20°C and count the bubbles again for one minute
• Repeat the last step until they have results for five different temperatures.

(a) Which gas makes the bubbles?

\[ \text{carbon dioxide} \] [1]

Examiner commentary

The candidate correctly states that the bubbles are made from carbon dioxide (1).
**Question 15(b)**

**Exemplar 1**

4 marks

(b) The students think they could improve their method.

They will count the bubbles three times at each temperature. This would show up any anomalous results.

Describe other ways they could improve their method to obtain more precise and repeatable results.

For each improvement explain why it is needed.

- They should use the same amount of yeast and sugar solution, since different amounts will produce more or less bubbles. Make sure the temperatures measured have the same intervals so that they can work out the constant rate. Repeat the experiment a few times so they can take an average result from each temperature. They could time the bubbles for longer than a minute to get a more precise answer. Make sure the water in the boiling tube has the delivery tube in has the same amount of water in it. Make sure when they take the reading on the thermometer it is at eye level. So the reading is more precise.

**Examiner commentary**

The candidate described one way to improve the repeatability (using a set volume of yeast and sugar solution) and explained why the improvement was needed (because different amounts would produce more or less bubbles). This qualified the answer for Level 2. The answer was clear and logically structured, and so gained 4 marks. Although they made a relevant suggestion for improving precision (take the thermometer reading at eye level), they did not provide a meaningful explanation (to make it more precise), and hence did not qualify for Level 3, which required improvement and explanation for both repeatability and precision.
Question 15(c)(i)

Exemplar 1

2 marks

(c) The students count the bubbles three times at each temperature. They then calculate the mean number of bubbles at each temperature.

The table shows their results.

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Mean number of bubbles per minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>11</td>
</tr>
<tr>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>50</td>
<td>2</td>
</tr>
<tr>
<td>60</td>
<td>1</td>
</tr>
</tbody>
</table>

(i) Plot the results on the grid.

Examiner commentary

A suitable scale was chosen, using at least half of the available X and Y axis (1). Points are plotted accurately to within half a square (1).
Examiner commentary

The line of best fit is well drawn, being smooth, passing through the points, and being a single line with no overlapping lines. The peak of the curve does not reach a sharp point.
Exemplar 1

Question 15(d)

3 marks

Examiner commentary

The candidate correctly asserts that over the optimum temperature the enzyme denatures (1), above the optimum temperature the production of bubbles goes down (1), and that the optimum temperatures is 30°C (1).
Question 16(a)(i)

Exemplar 1 2 marks

16 This question is about circulatory systems.

(a) The picture shows three different blood vessels X, Y and Z, seen using a light microscope.

Examiner commentary

The candidate correctly states that X has a smaller lumen than Z (1) and that X has a thicker wall than Z (1).

Question 16(a)(ii)

Exemplar 1 1 mark

(ii) Blood vessel Y is a capillary. Explain how the structure of a capillary is adapted to its function.

Examiner commentary

The candidate correctly states that a capillary has a thin wall (1). However, they make no reference to quicker or easier diffusion, revealing confusion about the need for a thin wall. They suggest it is for blood cells to break through more easily, which is not correct.
Question 16(b)(i)

Exemplar 1

1 mark

(b) Lungfish are fish that have both gills and a lung.

When in water, the blood flows through the gills. When on land, blood flow to the gills is stopped and the blood enters the lung instead.

The diagram shows the circulatory system of a lungfish.

The lungfish circulatory system is different to that of humans.

Blood in the lungfish can flow through gills and lungs, humans only have lungs.

(i) Write down one other way the structure of the lungfish circulatory system is different to that of humans.

If only has one ventricle, while the humans have a left and a right ventricle.

Examiner commentary

The candidate correctly states that there is only one ventricle in the lungfish circulatory system (1).
Question 16(b)(ii)

Exemplar 1  

(ii) When lungfish and humans are on land, the human circulatory system is more efficient than that of lungfish.

Suggest why the human circulatory system is more efficient.

Because the humans os been made/spécialised just for land while the lungfish is both and we’ll need to be equally efficient in water as it does on land. [2]

Examiner commentary

The candidate did not gain credit. The candidate made some unjustified assertions about adaptation, without recognising that the question was asking how the human circulatory system is more efficient. Creditable answers included oxygenated and deoxygenated blood being kept separate (1) and more oxygen being carried around the body/supplied to cells (1).

Question 17(a)(i)

Exemplar 1  

17 (a) The diagram shows a cell during one stage of mitosis.

(i) Describe two things that happen to the chromosomes in the next stage of mitosis.

The cell splits from one cell into two cells. The chromosomes move to either opposite ends of the cell in pair. The cell restarts itself to split in half and become two cells. [2]

Examiner commentary

The candidate correctly refers to movement to the opposite ends of the cell (1) but does not refer to chromosomes splitting (0).
Question 17(a)(ii)

Exemplar 1

(ii) Chromosomes are made of DNA.

Describe the structure of DNA.

DNA is in the shape of a double helix and has four bases which are A, T, and G. A is always with T and G always with C. [2]

Examiner commentary

The candidate explicitly refers to the double helix (1) and the bases A, T, G and C (1).

Question 17(b)

Exemplar 1

(b) After mitosis, cell differentiation takes place.

What is meant by the term cell differentiation?

When undifferentiated cells become specialised cells. [1]

Examiner commentary

The candidate correctly refers to cells becoming specialised (1).
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