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A LEVEL

Exemplar Candidate Work

BIOLOGY A

H420
For first teaching in 2015

H420/01 Summer 2018 series

Version 1

Contents

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/as-a-level-gce/biology-a-h020-h420-from-2015/ 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 2

2 The following are a series of organic molecules and the chemical processes that occur to convert them into different molecules.

Which of the rows, **A** to **D**, is correct?

A nucleic acid —hydrolysis→ nucleotide —hydrolysis→ polynucleotide

B α-glucose —condensation→ amylopectin —hydrolysis→ α-glucose

C amino acid —condensation→ dipeptide —hydrolysis→ polypeptide

D β-glucose —condensation→ cellulose —condensation→ maltose

Your answer ☐ [1]

Exemplar 1 1 mark

✗ **A** nucleic acid —hydrolysis→ nucleotide —hydrolysis→ polynucleotide

✓ **B** α-glucose —condensation→ amylopectin —hydrolysis→ α-glucose

✗ **C** amino acid —condensation→ dipeptide —hydrolysis→ polypeptide

✗ **D** β-glucose —condensation→ cellulose —condensation→ maltose

Your answer B ✓ [1]

Examiner commentary

To achieve the correct response for this question candidates had to apply knowledge of both hydrolysis and condensation reactions and understand the involvement of these reactions in the formation and breakdown of different biological molecules.

The exemplar shows how the candidate has used annotation technique to eliminate incorrect options to select option B as the correct response. This demonstrates knowledge and understanding of a condensation reaction being used to form the polysaccharide amylopectin from the monosaccharide α-glucose and then hydrolysis being used to break down amylopectin back into α-glucose.

Question 3

3 The following table describes the approximate percentage mass of different chemical elements in organic polymers.

	Polymer	N (%)	C (%)	O (%)	H (%)	P (%)
A	nucleic acid	20.0	30.0	20.0	10.0	20.0
B	carbohydrate	0.0	33.3	33.3	33.3	0.0
C	protein	30.0	10.0	10.0	0.0	50.0
D	lipid	0.0	50.0	49.0	1.0	0.0

Which of the rows, **A** to **D**, is correct?

Your answer ☐ [1]

Exemplar 1 1 mark

	Polymer	N (%)	C (%)	O (%)	H (%)	P (%)
A	nucleic acid	20.0	30.0	20.0	10.0	20.0
B	carbohydrate	0.0	33.3	33.3	33.3	0.0
C	protein	30.0	10.0	10.0	0.0	50.0
D	lipid	0.0	50.0	49.0	1.0	0.0

Which of the rows, **A** to **D**, is correct?

Your answer A [1]

Examiner commentary

A knowledge of the constituents and structure of biological molecules was required for this question.

Focussing on the percentage hydrogen (H) content was a good way of eliminating incorrect rows. Rows C and D could be eliminated as proteins contain H (not 0%) and lipids have more than 1%. Knowledge of the fact that carbohydrates contain a higher percentage of H than oxygen (O) allows the elimination of row B.

The exemplar shows how some candidates used this technique of eliminating rows and achieved the correct response by circling cells in the table which they knew to be either correct or incorrect, thereby identifying row A as correct.

Question 7

7 Which of the statements, **A** to **D**, explains why diastole follows systole in the mammalian heart?

A Cardiac muscle is myogenic.

B Cardiac muscle takes a short time to repolarise after being stimulated.

C The aorta is capable of maintaining the pressure generated by the left ventricle.

D The SAN receives impulses from the AVN.

Your answer [ ] [1]

Exemplar 1 1 mark

7 Which of the statements, **A** to **D**, explains why diastole follows systole in the mammalian heart?

relax contract

A Cardiac muscle is myogenic.

(B) Cardiac muscle takes a short time to repolarise after being stimulated.

C The aorta is capable of maintaining the pressure generated by the left ventricle.

D The SAN receives impulses from the AVN.

Your answer [B] [1]

Examiner commentary

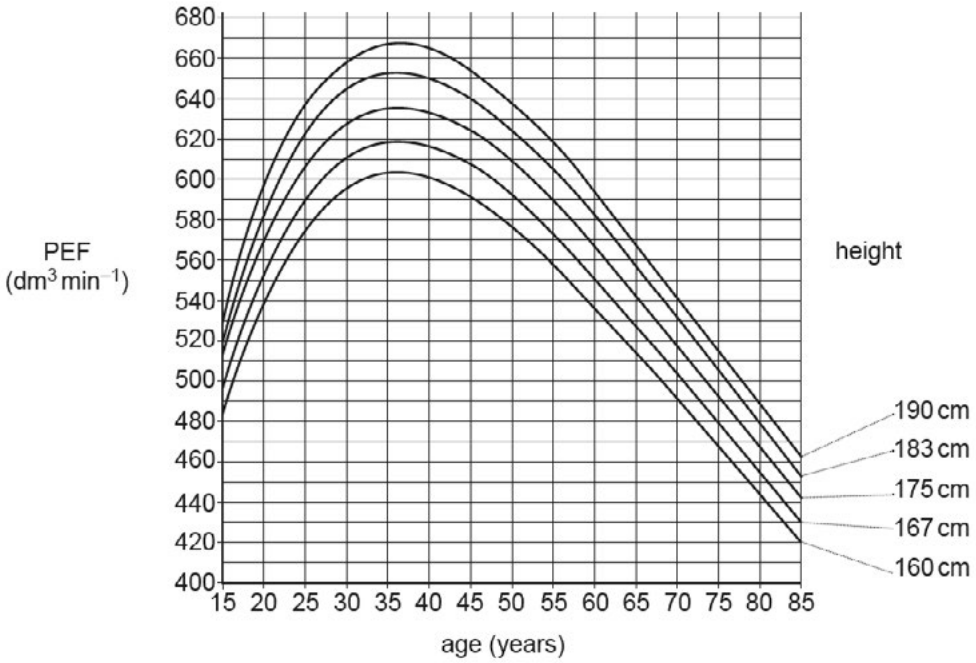
This exemplar shows two different examination techniques that can be used to good effect by candidates.

Firstly, underlining text which draws attention to the question being asked and secondly simplifying terms as, in this exemplar, the candidate has simplified the terms diastole and systole which can aid recall, understanding and application of knowledge.

Question 9

9 Peak expiratory flow (PEF) is a measure of the maximum rate at which a person can exhale.

The graph below shows the typical PEF values for men of different ages and heights.



Which of the following is the percentage increase from the PEF of a 20 year old man of 175 cm to the PEF of a 45 year old man of 183 cm?

A 19.4%

B 10.9%

C 12.3%

D 8.1%

Your answer [ ] [1]

Exemplar 1 1 mark

Which of the following is the percentage increase from the PEF of a 20 year old man of 175 cm to the PEF of a 45 year old man of 183 cm?

A 19.4%

B 10.9%

C 12.3%

D 8.1%

$\frac{640}{570} \times 100 = 112.28\%$

$= 12.3\% \uparrow$

Your answer [C] ✓ [1]

Examiner commentary

This question required candidates to read data from a graph and then use the data to calculate percentage increase.

In this first exemplar the candidate has achieved the correct response by using the correct method of calculating percentage increase between the two values.

Exemplar 2

0 marks

Which of the following is the percentage increase from the PEF of a 20 year old man of 175 cm to the PEF of a 45 year old man of 183 cm?

A 19.4%

B 10.9%

C 12.3%

D 8,1%

45 year old = 640

20 year old = 570

$\frac{640 - 570}{640} \times 100 = 10,94$

Your answer B

[1]

Examiner commentary

In this second exemplar the candidate has identified the correct data on the graph but has used an incorrect denominator when calculating percentage change. This is a common mistake with candidates using the final value as the denominator i.e. 640 in this case rather than the original value i.e. 570.

Using this calculation gave a value of 10.9% shown by option B which was the most common incorrect response.

Question 16(a)(i)

16 (a) Gestational diabetes is a medical condition that affects pregnant women. It results in high levels of glucose in the blood, even though the woman produces normal levels of insulin.

(i) Gestational diabetes is most similar to which **other** type of diabetes?

Explain your answer.

.....

.....

.....

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

Exemplar 1 — 2 marks

Explain your answer.

Type 2 diabetes. Person is producing normal levels of insulin but cells ~~are~~ are not responding. Reduced sensitivity of cells to normal insulin levels. Not an autoimmune disease. β-cells are healthy and not damaged. **[2]**

Examiner commentary

Good responses to this part of the question identified the type of diabetes most similar to gestational diabetes and used their knowledge to give a clear explanation. In this exemplar more than one explanation has been provided but all are correct and clearly expressed.

Question 16(a)(ii)

(ii) Suggest **two** ways a woman with gestational diabetes can manage her condition.

1 .....

.....

2 .....

.....

[2]

Exemplar 1

2 marks

(ii) Suggest **two** ways a woman with gestational diabetes can manage her condition.

1 ~~Eating~~ Controlling her diet and glucose intake ✓

.....

2 Regular low level exercise (e.g. walking ✓

.....

[2]

Examiner commentary

A list of options was available for candidates to achieve 2 marks for this part of the question. The condition in the question was diabetes which is linked to intake of carbohydrate, therefore vague responses such as 'controlling the diet' without reference to carbohydrates would not have gained credit. In this exemplar, credit can be given as the response includes reference to controlling glucose intake as part of the diet.

Question 16(b)(ii)

(ii) Explain why glucose is required for the contraction of skeletal muscle.

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..... [3]

Exemplar 1 3 marks

ATP is required to release energy to provide energy for myosin heads to move to pull actin filaments and to break myosin-actin cross bridges to reform further along the actin filament to shorten the sarcomere contracting the muscle. ATP is produced primarily by respiration which requires glucose (for aerobic or anaerobic). Thus glucose is required for muscle contraction. [3]

Examiner commentary

A good response, as shown by this first exemplar, demonstrated the ability to explain that glucose was required to produce ATP and then how this was linked to muscle contraction. Many good responses gave clearly explained examples of using of ATP to break actin-myosin cross bridges or in the active transport of calcium ions.

Exemplar 2 0 marks

Glucose is required for the contraction of skeletal muscle because it is an active process. Also, nutrients are required for the process. Glucose is required for respiration so muscle [illegible]

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..... [3]

Examiner commentary

Low level and zero responses had confused ideas or did not fully explain the need for glucose in muscle contraction. In this exemplar, there is a statement that recognises that muscle contraction is an active process, but the response does not give further detail or explain why this would require glucose.

Question 16(c)

(c) During late pregnancy, women find ventilation more difficult, as the developing foetus reduces the volume of the thorax. This can lead to tiredness and difficulty breathing.

A student used a spirometer to measure ventilation in a woman who was 36 weeks pregnant.

Fig. 16.1 shows the trace produced.

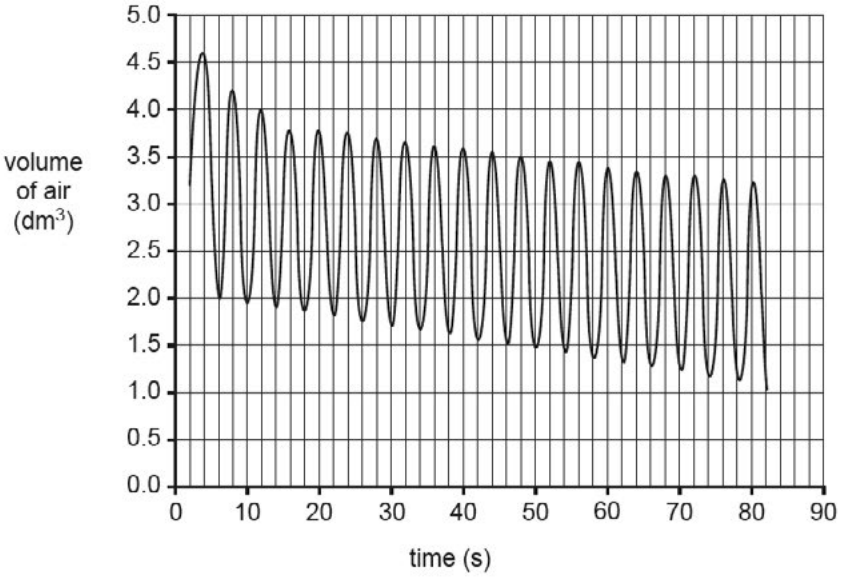

Fig. 16.1

Mean oxygen uptake rate at rest in women is around 0.020 $dm^3 s^{-1}$.

Using these data, the student made the following conclusion:

My data show that being pregnant reduces rate of oxygen uptake by up to 20%.

Evaluate this claim, using the data in Fig. 16.1.

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..... **[3]**

Exemplar 1

3 marks

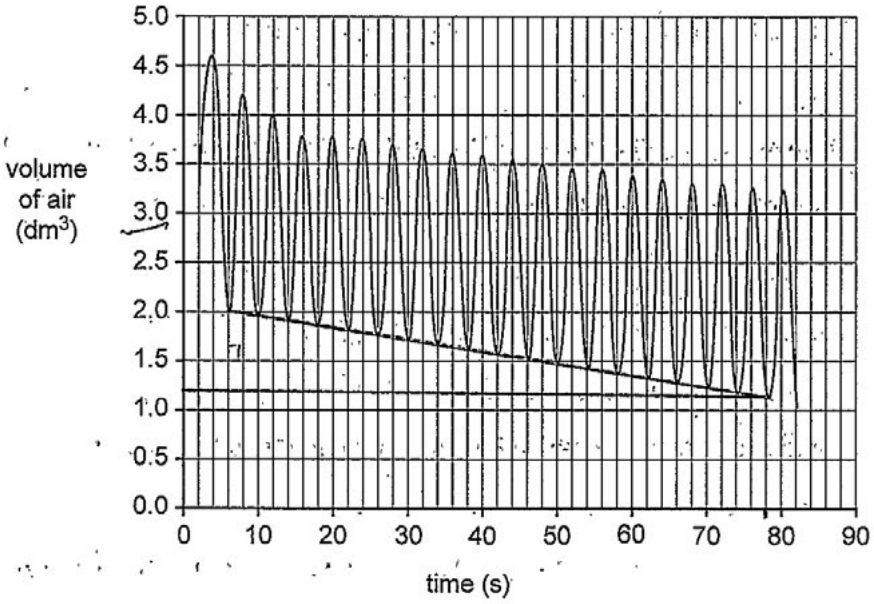

Fig. 16.1

Mean oxygen uptake rate at rest in women is around 0.020 $dm^3 s^{-1}$.

Using these data, the student made the following conclusion:

My data show that being pregnant reduces rate of oxygen uptake by up to 20%.

Evaluate this claim, using the data in Fig. 16.1.

Rate of oxygen uptake = $\frac{2.0 - 1.2}{6 - 78.1} = -0.011\,095\,700\,42\ldots$

$\simeq -0.011\ dm^3\ s^{-1}$ ✓

Rate of oxygen loss from respirometer $= -0.011\ dm^3\ s^{-1}$ (3 d.p.)

so rate of oxygen use in pregnant ~~##~~ women $= 0.011\ dm^3 s^{-1}$

Percentage decrease $= \frac{0.011 - 0.020}{0.020} \times 100\%$ ✓

$= -45\%$

Therefore, claim is wrong because data shows that being pregnant reduces rate of oxygen uptake by 45%. which is more than 20% ✓ [3]

Examiner commentary

Generally, this question proved challenging. Good responses showed mathematical skill in using data from graphs (in this case a spirometer trace) to perform a calculation and then use this to comment on a statement to achieve full marks. A range of data readings taken from the trace were accepted. In this first exemplar, the reduction in total volume (of air) shown on the Y-axis and the time taken for this reduction to occur has been clearly identified on the trace and the correct calculation then used to determine the rate of oxygen uptake. Further processing of the data to calculate percentage reduction in oxygen uptake then allows the candidate to evaluate the conclusion with either supporting or validity statements. Mean oxygen uptake at rest in the question was given as 0.020 $dm^3\ s^{-1}$ and good practice in providing their response to the same number of decimal places i.e. 0.011 $dm^3\ s^{-1}$ is also shown in this exemplar.

Exemplar 2

0 marks

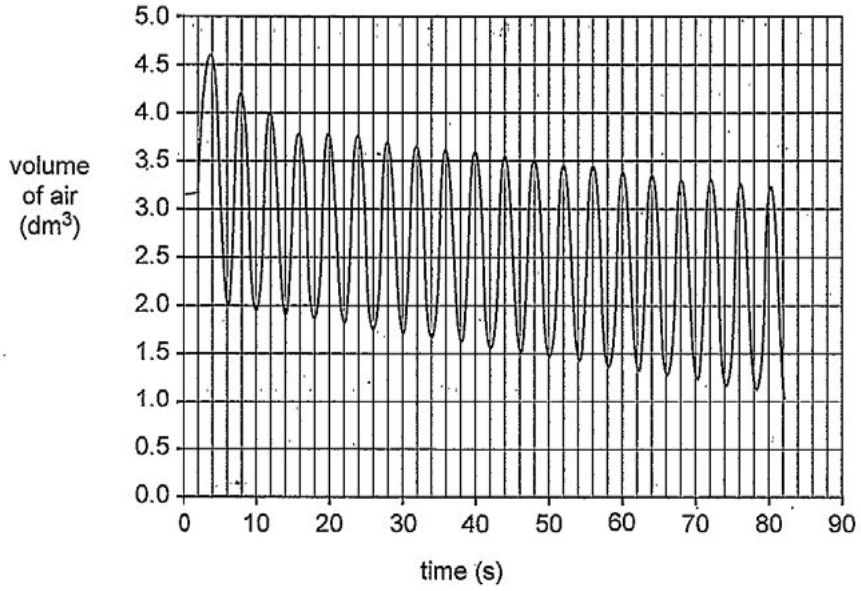

Fig. 16.1

Mean oxygen uptake rate at rest in women is around 0.020 $dm^3 s^{-1}$.

Using these data, the student made the following conclusion:

My data show that being pregnant reduces rate of oxygen uptake by up to 20%.

Evaluate this claim, using the data in Fig. 16.1.

The data does not support this claim as the student did not calculate the mean oxygen uptake of the pregnant women. The trace only shows the volume of air inhaled and exhaled. Therefore no conclusions can be made about oxygen uptake as there is no calculated value to compare to the mean oxygen uptake of a women at rest. It is also not clear whether the women was at rest or whether she was doing exercise when ventilation measured. **[3]**

Examiner commentary

The question stem included the wording *'using the data in Fig.16.1'.* In low level or zero responses, there appeared to be some uncertainty as to how to extract the appropriate readings from the trace or how to calculate the rate of oxygen uptake. In this exemplar the candidate identified that there was no calculated value for oxygen uptake but did not recognise that they were required to perform the calculation by *'using the data...'* as in the question stem.

Question 17(a)(i)

17 (a) Chromista are photosynthetic protoctists that live in water.

Chromista are different from other photosynthetic organisms because they contain the pigment chlorophyll *c*.

Chlorophyll *c* is not found in plants.

(i) Outline the importance of photosynthetic pigments in photosynthesis.

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..... [4]

Exemplar 1 — 4 marks

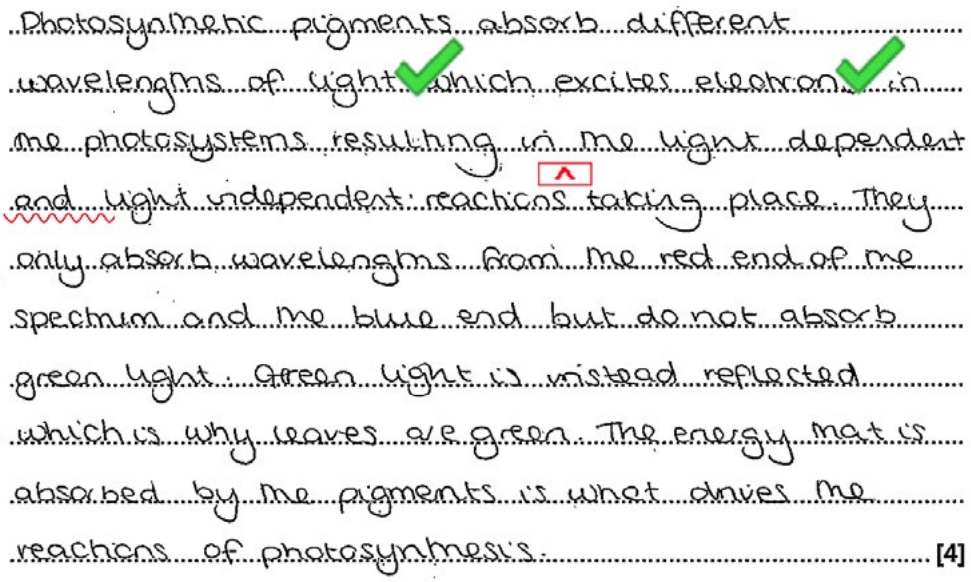
Photosynthetic pigments such as carotenoids and chlorophyll b are accessory pigments. Accessory pigments form part of the antennae complex of the light harvesting system, and absorb energy from photons of light. Accessory pigments then transmit the light energy to the primary pigment (chlorophyll a). Accessory pigments absorb light of different wavelengths to maximise energy absorbed. ~~Prim~~ The primary pigment in a light harvesting system is chlorophyll a, which absorbs energy from photons of light and uses the energy to excite electrons. The ~~photosyste~~ chlorophyll a then releases the excited electron into the electron transport chain. [4]

Examiner commentary

Good responses showed clear knowledge of photosynthetic pigments and achieved full marks, as shown in this exemplar, by outlining the roles of accessory and primary pigments.

Exemplar 2

2 marks


Photosynthetic pigments absorb different wavelengths of light which excites electron in the photosystems resulting in the light dependent and light independent reactions taking place. They only absorb wavelengths from the red end of the spectrum and the blue end but do not absorb green light. Green light is instead reflected which is why leaves are green. The energy that is absorbed by the pigments is what drives the reactions of photosynthesis. [4]

Examiner commentary

Some roles are common to both accessory and primary pigments, such as light absorption. This exemplar indicates how candidates could achieve at least 2 marks by outlining the roles relevant to all photosynthetic pigments. The exemplar also indicates the need for candidates to give unambiguous and non-contradictory statements as it was important to outline that pigments absorb light, resulting in the light-dependent reactions **not** light-independent reactions.

Question 17(a)(ii)

(ii) The wavelengths of light absorbed by chlorophyll *c* are different from those wavelengths absorbed by chlorophyll *a* and chlorophyll *b*.

Suggest why Chromista need pigments that are different from those of other photosynthetic organisms.

.....

.....

..... [1]

Exemplar 1 — 1 mark

Chromista is found in water as a result it needs pigments that can absorb the wavelengths of light that can pass through the water and reach the plant ✓ [1]

Examiner commentary

The mark scheme allowed candidates to offer *ideas* to suggest why *Chromista* needs different photosynthetic pigments. A good response to this question is shown in this first exemplar where a clear idea is shown in a concise statement.

Exemplar 2 — 1 mark

Because they live in another environment so they will have it harder for ~~other~~ same wavelength [1]
to hit in the same place and be absorbed. The same wavelength won't be able ✓ to penetrate the water as deeply so it need another chlorophyll that will absorb it at this different lengths. BOD ^

Examiner commentary

This second exemplar also shows a correct response but in this case not as succinct leading to the candidate writing outside the lines provided.

Question 17(b)

(b) Fig. 17.1 is a diagram of the chloroplast found in a Chromista cell.

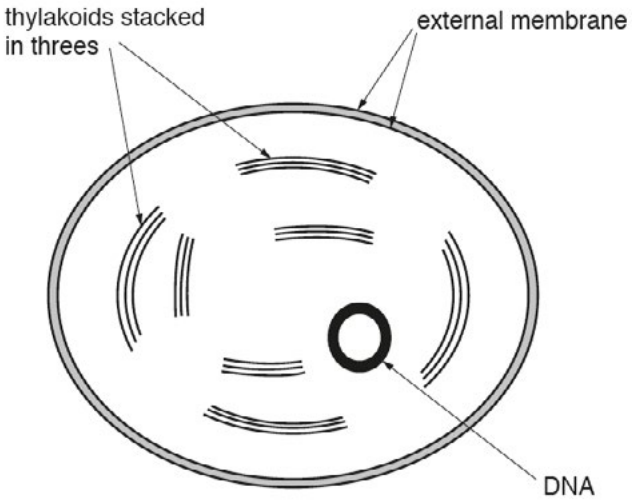


Fig. 17.1

Outline the structural differences between the Chromista chloroplast in Fig. 17.1 and the chloroplasts found in flowering plants.

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

Exemplar 1

2 marks

(b) Fig. 17.1 is a diagram of the chloroplast found in a Chromista cell.

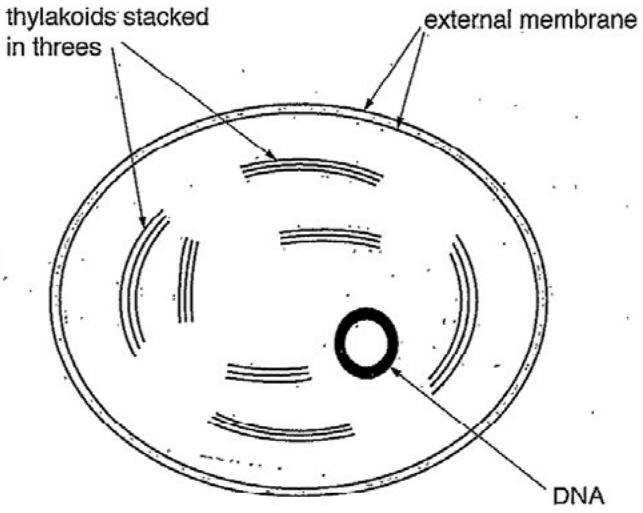

Fig. 17.1

Outline the structural differences between the Chromista chloroplast in Fig. 17.1 and the chloroplasts found in flowering plants.

In the Chromista chloroplast, there are no intergranal ~~are~~ lamellae ✓ whereas in flowering plants the chloroplasts have intergranal lamellae. In Chromista chloroplasts thylakoids are always stacked in threes, whereas in flowering plants thylakoids may be stacked in different numbers to form ~~granum~~. grana. ✓ [2]

Examiner commentary

This exemplar shows a good response for this part of the question in which the candidate has demonstrated the ability to recall the structure of a plant chloroplast and applied this knowledge to outline differences to the *Chromista* chloroplast shown in the diagram.

Exemplar 2

0 marks

(b) Fig. 17.1 is a diagram of the chloroplast found in a Chromista cell.

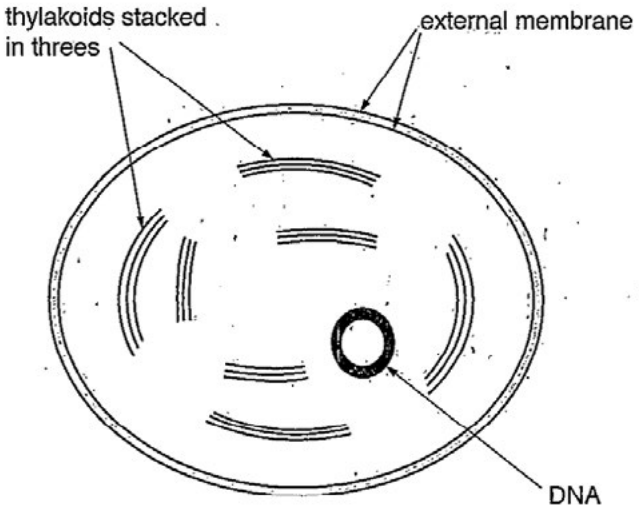

Fig. 17.1

Outline the structural differences between the Chromista chloroplast in Fig. 17.1 and the chloroplasts found in flowering plants.

Thylakoids are stacked in the granum (grana plural) rather than in 3's

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

Examiner commentary

Low level or zero responses often showed incomplete statements or statements in which the chloroplast being described was not identified. This second exemplar indicates the importance for candidates to show clarity when responding to this style of question. Credit could not be given as there is ambiguity as to whether the candidate is referring to the plant chloroplast or the *Chromista* chloroplast in their response.

Question 17(c)(i)

(c) Fig. 17.2 is a diagram of part of the plasma membrane of a Chromista cell.

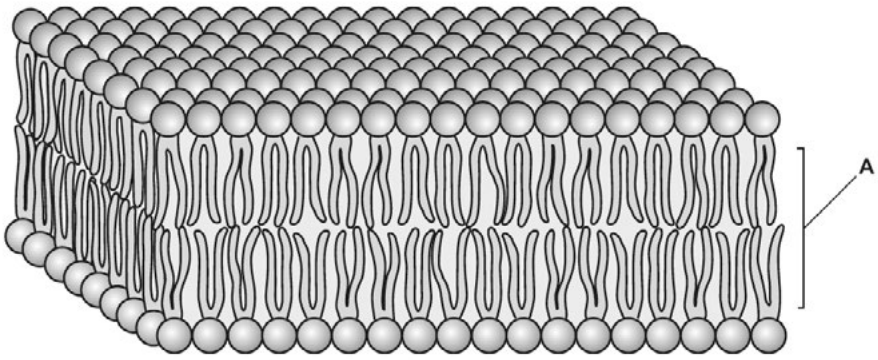

Fig. 17.2

(i) State and explain how **one** property of region **A** in Fig. 17.2 contributes to the stability of the plasma membrane.

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..... [2]

Exemplar 1

2 marks

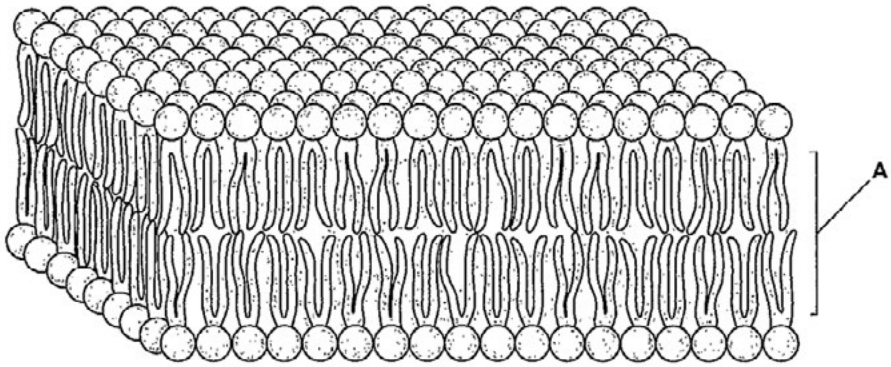

Fig. 17.2

(i) State and explain how **one** property of region **A** in Fig. 17.2 contributes to the stability of the plasma membrane.

region A is the hydrophobic tail of the phospholipids, which repels water. Therefore, the hydrophobic tails always point inwards in the membrane to form a hydrophobic core. Because the surrounding of the BOD cell is water, and the inside of the cell is also water. [2]

Examiner commentary

Good responses achieved both marks by stating a property of section A and explaining how it contributed to membrane stability. The exemplar shows a high level response in which the candidate has identified that section A contains the 'tails' of the phospholipids and therefore has hydrophobic properties that could separate aqueous environments. Alternative high level responses were credited where candidates stated that section A contained cholesterol so could regulate the fluidity. Some responses identified a property of section A but did not explain how this would contribute to the stability of the membrane. Low level or zero responses often referred to section A as the whole phospholipid or incorrectly stated that the 'tails' were hydrophilic.

Question 17(c)(ii)

(ii) There are differences between the plasma membrane and membranes within cells.

Outline the role of membranes **within** cells.

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

Exemplar 1

2 marks

The membranes within cells compartmentalise the organelles from the cytoplasm ensuring that the correct conditions for reactions within organelles are met. The membranes also controls what enters and leaves the organelle.

.....

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

Examiner commentary

The exemplar shows a good response to this relatively straightforward question. It is worthwhile noting that some candidates did not distinguish internal membranes from the plasma membrane. Credit could not be given to responses that referred to the roles of the plasma membrane such as **cell** signalling and controlling the movement of substances into and out of **cells**.

Question 18(a)

18 (a)* Plants lose water by transpiration.

The rate of transpiration varies between different species of plant.

The rate of transpiration can be measured using a potometer.

Plan an investigation into the rate of transpiration in two species of plant that would allow valid data to be collected.

Details of how to set up a potometer are not required.

..... [6]

Exemplar 1

Level 3, 6 marks

Independent variable: species of plant (A and B)

Dependant variable: rate of transpiration (cm^3/min)

To be a valid investigation there must be only 1 independent variable and all other variables controlled. This ensures that the effect of change on the dependent variable is only due to the independent variable and no other factors.

Control variable example: light intensity (ambient room light maintained at same lux); temperature (room temperature maintained at 25°C); air flow (all windows etc. closed); humidity (repeat in same room etc); same age of plant; same surface area of leaf etc

1) Pick a cutting of each plant, measuring surface area of leaves on graph paper and ensuring that they are the stems for both species. That both of the same age species are healthy and don't have anything covering leaves eg. mould.

2) Set up the potometer under water to ensure there are no air bubbles, using vaseline to cover joints if required to be air tight.

3) Cut the stem of the cuttings chosen at a 45° angle to increase surface area. Do this under water to ensure no bubble bubbles enter the xylem. Allow to stand in conditions in potometer for 10 minutes to stabilise + adjust [6]

4) Start the timer for both, and record how far the bubble has moved after 10 minutes (in cms) using a ruler.

5) Calculate the volume of water used by finding the density of the capillary tube eg. $\pi r^2 l$, where l = length measured that bubble moved.

6) Divide by 10 to obtain rate in cm^3/min. Compare speeds

7) Repeat 3 times, including other cuttings, take a mean of results and remove any anomalous readings. This is may be where other factors (unknown) affected rate so must be removed to maintain validity. L3

Examiner commentary

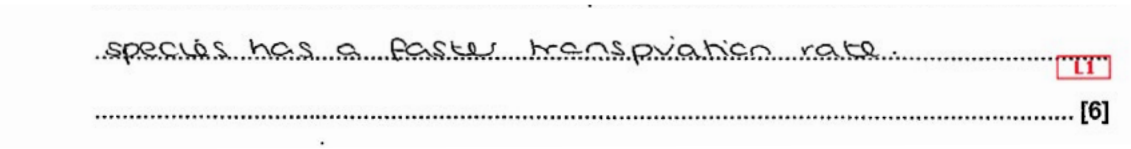
As in 2017, the key points for improving responses for this style of questioning would be to ensure that candidates have the confidence to complete their response within the allocated answer space without feeling that they must write as much as possible and also to encourage candidates to read the question carefully to ensure that they only include relevant information. This Level 3 exemplar demonstrates the use of a stepwise approach to provide a succinct plan for the investigation into the rate of transpiration. The response includes all the relevant detail to ensure that valid data could be collected such as the need to control named variables and obtain replicates. Good responses also gave clear indication of the need to measure distance moved by an air bubble or change in mass of the plant for a set period of time to provide data that would enable rate to be calculated.

Exemplar 2 Level 1, 2 marks

Hypothesis - rate of transpiration will vary between plant species.

Materials - Select two species of plant and obtain 5 plants from each species (for CSO 3 repeats can be carried out). Potometer equipment needed.

Procedure - set up potometer. Place first plant into equipment. Leave plant for 10 minutes to climatise then for 30 minutes recording transpiration rate every 5 minutes. Repeat procedure for other species of plant. Repeat experiment 4 more times with remaining plants. Calculate an average transpiration rate for each species and compare values to see which



Examiner commentary

This exemplar shows a lower level response where information is limited to repetition with no detail regarding variables or how to measure rate of transpiration using the potometer.

Question 18(b)

(b) Plant cell walls are made of cellulose. Cellulose is a polymer of β-glucose.

Give **three** properties of cellulose that make it suitable as the basis of plant cell walls.

1 .....

2 .....

3 .....

[3]

Exemplar 1 2 marks

1 it is insoluble ✓

2 it is strong to provide support eg from H bond cross links.

3 it has some flexibility / not rigid so doesn't easily crack under pressure. ✓

[3]

Examiner commentary

There was some confusion and misconception here with some candidates describing properties of the cellulose cell wall rather than a cellulose polymer as required by the question. The exemplar shows a good response where two of the properties gained credit. All 3 marks could have been achieved if the statement had been clear that the 'H bond crosslinks' would form between neighbouring molecules of cellulose and not within the polymer.

Question 18(c)

(c) Cellulose cannot be digested by animals. Some mammals have bacteria in their stomachs that produce enzymes that can digest cellulose.

Explain whether the action of these enzymes is intracellular or extracellular.

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.....

..... [1]

Exemplar 1 1 mark

(c) Cellulose cannot be digested by animals. Some mammals have bacteria in their stomachs that produce enzymes that can digest cellulose.

Explain whether the action of these enzymes is intracellular or extracellular.

extracellular as enzymes secreted by bacteria to the reactants products. Reaction does not take places in bacteria cytoplasm as cellulose is too large and unable to transport across the plasma membrane ✓ [1]

Examiner commentary

A good response, as shown by the exemplar, demonstrated understanding of the term extracellular when applied to the context of cellulose-digesting bacteria within mammalian stomachs.

Question 19(a)

19 Honeypot ants belong to several different genera. Some specialised individuals are used as food storage vessels. These individuals have swollen abdomens that store various foods, which can be given to members of the colony when required.

One such individual is shown in Fig. 19.1.

Fig. 19.1

An investigation was carried out into the respiratory substrate of three different genera of honeypot ant, by measuring oxygen uptake and carbon dioxide production.

The data are shown in Table 19.1.

Genus	CO_2 produced ($mm^3 s^{-1}$)	O_2 consumed ($mm^3 s^{-1}$)
Camponotus	0.89	0.88
Melophorus	0.59	0.66
Cataglyphis	1.01	1.47

Table 19.1

(a) Use the data in Table 19.1 to suggest the likely diet of each genus of honeypot ant.

Justify your answer.

Genus	Diet	Justification
Camponotus	mainly carbohydrate	....
Melophorus	....	....
Cataglyphis	....	....

[3]

Exemplar 1

3 marks

(a) Use the data in Table 19.1 to suggest the likely diet of each genus of honeypot ant.

Justify your answer.

* The respiratory substrate is carbohydrates

Genus	Diet	Justification
Camponotus	mainly carbohydrate	The RQ value is close to 1 (1.01) (ap)
Melophorus	Mainly proteins	The RQ value has decreased. The RQ value is 0.89 which is close to 0.9 which is the RQ value for proteins as the respiratory substrate
Cataglyphis	Mainly lipids ✓	The RQ value is 0.69 which RQ is when the respiratory substrate is lipids. ✓✓

[3]

Examiner commentary

This exemplar shows a good response for this part of the question in which the candidate has demonstrated the ability to analyse data provided to formulate a response. In this case, from the data provided in Table 19.1, candidates could calculate respiratory quotients (RQ) that would then enable them to suggest which respiratory substrates (diets) were being used by different ants.

Exemplar 2

1 mark

(a) Use the data in Table 19.1 to suggest the likely diet of each genus of honeypot ant.

Justify your answer. Respiratory substrate = RS

Genus	Diet	Justification
Camponotus	mainly carbohydrate	The RS value is 1.01.
Melophorus	mainly lipid	RS value is 0.89
Cataglyphis	mainly protein ✗	RS value is 0.687. ✓

[3]

Examiner commentary

There were some responses where candidates had analysed the data but could not recall the correct respiratory substrate, as shown in this exemplar. If the diets suggested by candidates were incorrect some credit could still be credited for calculating RQ values. There were also some incorrect responses where candidates had mistakenly referred to Rf or Rs values instead of respiratory quotients. This is also shown by this exemplar.

Question 19(b)

(b) Chitin is a polysaccharide found in insects. It is used to form the hard outer casing of their bodies.

Fig. 19.2 shows the chemical structure of chitin.

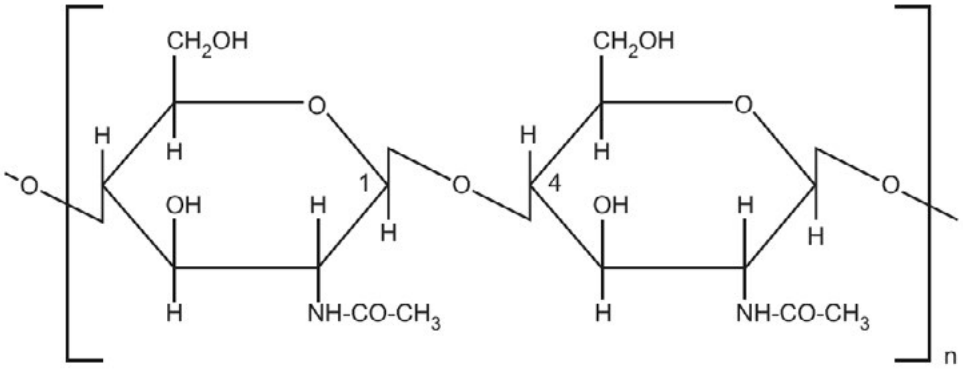


Fig. 19.2

Using information from Fig. 19.2, state **two** similarities and **two** differences between the structures of chitin and glycogen.

Similarity 1 .....

.....

Similarity 2 .....

.....

Difference 1 .....

.....

Difference 2 .....

.....

[4]

Exemplar 1

4 marks

(b) Chitin is a polysaccharide found in insects. It is used to form the hard outer casing of their bodies.

Fig. 19.2 shows the chemical structure of chitin.

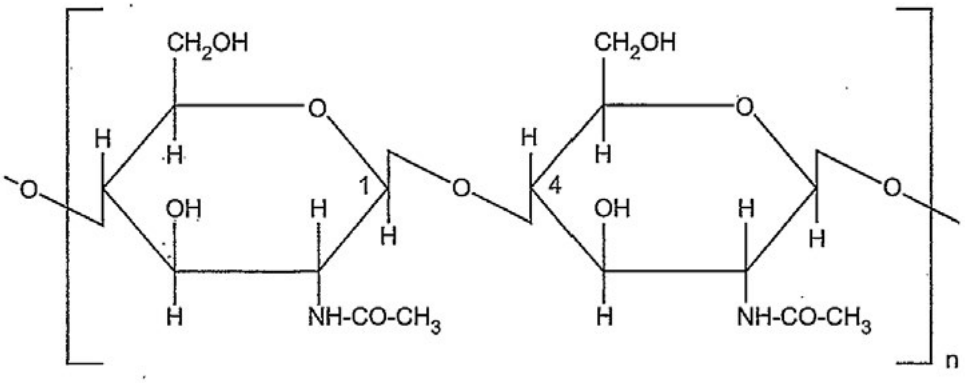


Fig. 19.2

Using information from Fig. 19.2, state **two** similarities and **two** differences between the structures of chitin and glycogen.

Similarity 1 1-4 glycosidic links used to form main chain.

Similarity 2 formed of repeat unit of 1 monomer like glycogen (a glucose). thus both polysaccharides

Difference 1 chitin monomers contain nitrogen, not in glycogen and are not hexose sugars monomer of glucose. They contain less oxygen.

Difference 2 chitin monomers are not hexose sugars like glycogen monomer of glucose. No 1-6 glycosidic links forming side chain in chitin, but are in glycogen [4]

Examiner commentary

Good responses to this part of the question demonstrated the ability to recall the structure of glycogen and could apply their knowledge to compare its structure with that of chitin. Many candidates, as shown by this exemplar, used the prompt lines to good effect. In stating differences, this candidate also shows good practice in clearly referring to either chitin or glycogen in their response, thereby removing any ambiguity.

Exemplar 2

1 mark

(b) Chitin is a polysaccharide found in insects. It is used to form the hard outer casing of their bodies.

Fig. 19.2 shows the chemical structure of chitin.

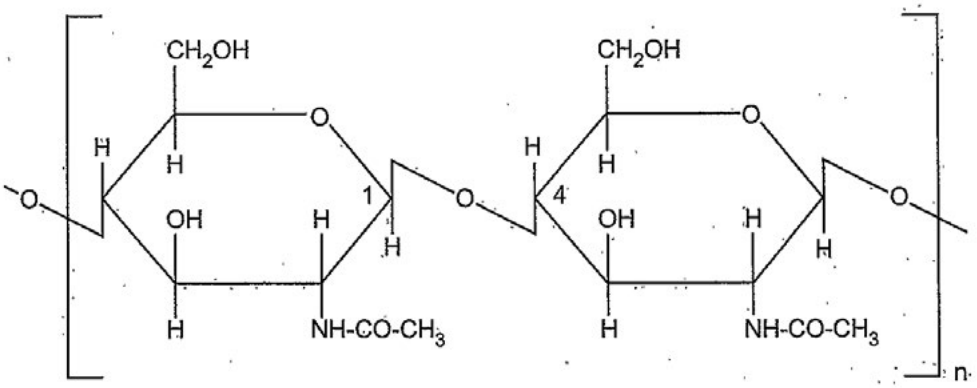


Fig. 19.2

Using information from Fig. 19.2, state **two** similarities and **two** differences between the structures of chitin and glycogen.

Similarity 1 Both chitin and glycogen have the monosaccharides bonded by glycosidic bons

Similarity 2 The monosaccharides are joined in a condensation reaction that releases water

Difference 1 Chitin has NH-CO-CH3 bonded to it carbon 2 but but glycogen has OH bonded to it instead

Difference 2 Chitin has more hydrogen, oxygen and carbon extra atoms than glycogen. Also, the bond is different when drawn.

[4]

Examiner commentary

Responses with insufficient detail about glycosidic bonds, as shown in this exemplar, were not credited as these two polymers had similarities **and** differences based on the type of glycosidic bond. There was also some misconception about what constituted a polymer and the prompt here was in the annotation on the representation of chitin shown in Fig.19.2. Candidates should understand that the brackets followed by ***n*** can be used to indicate the number of repeating units in the polymer. Some responses compared the numbers of the different types of atom in chitin and glycogen, which could not be credited as this would depend on how many repeating units (n) were present in the final polymer.

Question 19(c)

(c)* Insects use glucose to generate ATP.

Outline the processes involved in the generation of ATP through **chemiosmosis**.

..... [6]

Exemplar 1

Level 3, 6 marks

(c)* Insects use glucose to generate ATP.

Outline the processes involved in the generation of ATP through **chemiosmosis**.

Throughout Aerobic respiration, NAD and FAD molecules reduced. At the final stage: oxidative phosphorylation; these NADH and $FADH_2$ molecules are reoxidised, producing H atoms. This happens mainly at the inner mitochondrial membrane, in the matrix. The H atoms dissociate, forming $H^+ + e^-$. The electrons enter the ETC (electron transport chain) in the inner mitochondrial membrane, where it is passed between the electron carrier proteins, down energy levels to then form H_2O with H^+, reacting (bonding) to the final hydrogen acceptor: Oxygen. The energy released by the electron going down energy levels is used to actively transport the H^+ from the mitochondrial matrix into the inter membrane

space across the inner mitochondrial membrane, against the H^+ concentration gradient. This build up of H^+ in the inner membrane space forces them through ATP synthase down the electrochemical gradient, back into the matrix (as the inner membrane is otherwise impermeable to H^+). For every $3H^+$ that pass through ATP synthase, turning its [6] projecting rotating head, one ATP molecule is formed by phosphorylating an ADP molecule. Thus $ADP + P_i \rightarrow ATP$ in that process by chemiosmosis.

L3

Examiner commentary

Level of Response questions are designed to enable candidates to express their knowledge in a succinct manner and candidates must be encouraged to maintain a concise response within the answer lines provided. This question was relatively straightforward and it was important for candidates not to be side-tracked into describing other stages in respiration as only details regarding chemiosmosis were required. The exemplar shows a Level 3 response in which the candidate clearly focuses on the question being asked and most of the response is maintained within the lines provided.

Exemplar 2 Level 2, 2 marks

(c)* Insects use glucose to generate ATP.

Outline the processes involved in the generation of ATP through **chemiosmosis**.

inner Mt.

① During oxidative phosphorylation, NADH donates an electron ~~the~~ to the first electron ~~acceptor~~ carrier protein in the electron transport chain, and releases a proton into the mitochondrial matrix. ② $FADH_2$ donates an electron to the second electron carrier protein in the electron transport chain, and releases its protons into the mitochondrial matrix. ③ ~~Ele~~ Electron cavrier proteins are ~~intea~~ intrinsic membrane proteins in inner mitochondrial matrix, and use energy from electrons ~~to~~ from NADH and $FADH_2$ to actively transport protons into the intermembrane space. This creates a ~~high~~ higher concentration of protons in the intermembrane space compared to the mitochondrial matrix. ○ Electrons are meanwhile passed down electron transport chain ~~as~~ until they are accepted by oxygen (the final electron acceptor) which ~~then~~ then combines with protons to form H_2O. ○ Protons diffuse down their concentration gradient by chemiosmosis from the intermembrane space to the mitochondrial matrix through the enzyme ATP synthase. ATP synthase then catalyses the phosphorylation of ADP to form ATP. [6]

L2

Examiner commentary

This exemplar shows a good Level 2 response in which there is some irrelevant detail about the electron transport chain and also some misconception about how protons are transported from the matrix into the intermembrane space.

Question 20(a)(i) and (a)(ii)

20 (a) A student carried out an investigation into the effect of ethanol on the permeability of cell membranes in beetroot.

The student's method comprised the following five steps:

1. Cut equal sized pieces of beetroot using a cork borer.
2. Wash the pieces in running water.
3. Place the pieces in 100 cm^3 of different concentrations of ethanol.
4. After 5 minutes, remove samples from each of the ethanol solutions.
5. Place each of the samples into a colorimeter to collect quantitative data.

(i) Each step in the student's method relies on certain assumptions.

For each assumption listed below, select the **numbered step** from the student's method that relies upon that assumption.

*Assumption **A***

Pigment will only leak into the solution if membranes are disrupted.

*Assumption **A** relates to step* .....

*Assumption **B***

Absorbance is proportional to concentration of pigment.

*Assumption **B** relates to step* .....

*Assumption **C***

Pigment will be released when the beetroot is sliced.

*Assumption **C** relates to step* .....

[3]

(ii) The student kept the ethanol solutions at a constant temperature. State **two other** variables which need to be controlled in this investigation to ensure the data collected are valid.

1 .....

2 .....

[2]

Exemplar 1 — 3 marks

(a)(i)

1. Cut equal sized pieces of beetroot using a cork borer.
2. Wash the pieces in running water.
3. Place the pieces in 100 cm^3 of different concentrations of ethanol.
4. After 5 minutes, remove samples from each of the ethanol solutions.
5. Place each of the samples into a colorimeter to collect quantitative data.

(i) Each step in the student's method relies on certain assumptions.

For each assumption listed below, select the **numbered step** from the student's method that relies upon that assumption.

Assumption A

Pigment will only leak into the solution if membranes are disrupted.

Assumption A relates to step ...2 3...

Assumption B

Absorbance is proportional to concentration of pigment.

Assumption B relates to step ...1 5...

Assumption C

Pigment will be released when the beetroot is sliced.

Assumption C relates to step ...2.....

[3]

Exemplar 1 — 1 mark

(a)(ii)

(ii) The student kept the ethanol solutions at a constant temperature. State **two other** variables which need to be controlled in this investigation to ensure the data collected are valid.

1 Equal sized pcs Humidity.....

2 pH.....

[2]

Examiner commentary

Any question relating to practical procedures often proves challenging and this was evident in Q20ai where many candidates struggled to relate assumptions to the numbered steps in the method. The exemplar shows the correct responses required to achieve full marks. In Q20aii candidates were required to demonstrate understanding of *appropriate* controlled variables. In this exemplar, only 1 mark was credited as humidity would not be considered as a variable that needed to be controlled in this particular investigation.

Question 20(b)(i) and (b)(ii)

(b) Fig. 20.1 shows the graph plotted by the student.

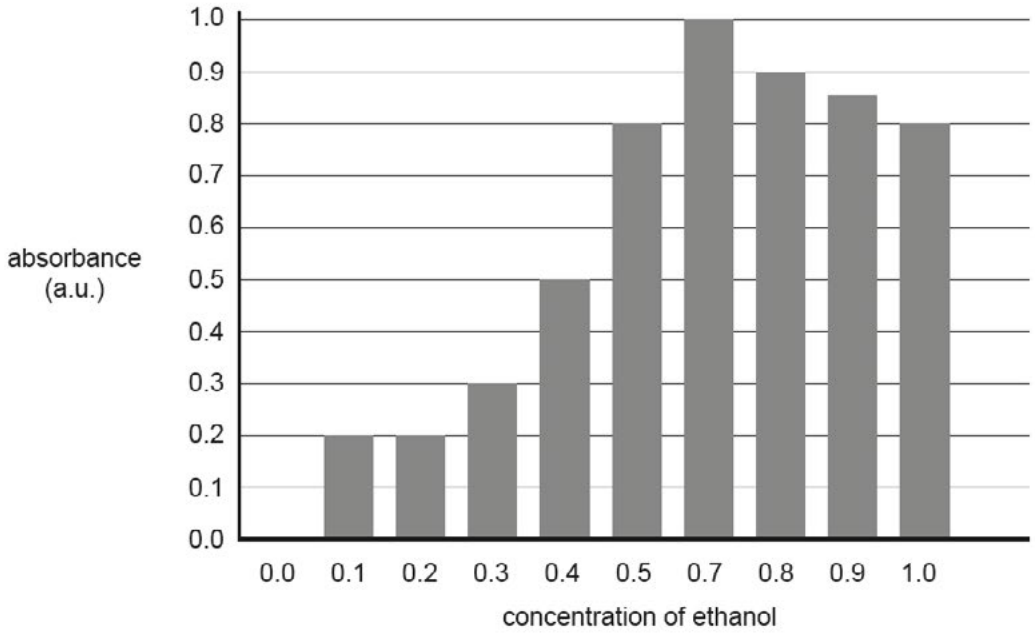


Fig. 20.1

(i) Make **three** criticisms of the way the student has displayed these results.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) Explain how carrying out replicates would improve this investigation.

.....

.....

.....

.....

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

Exemplar 1 — 3 marks

(b)(i)

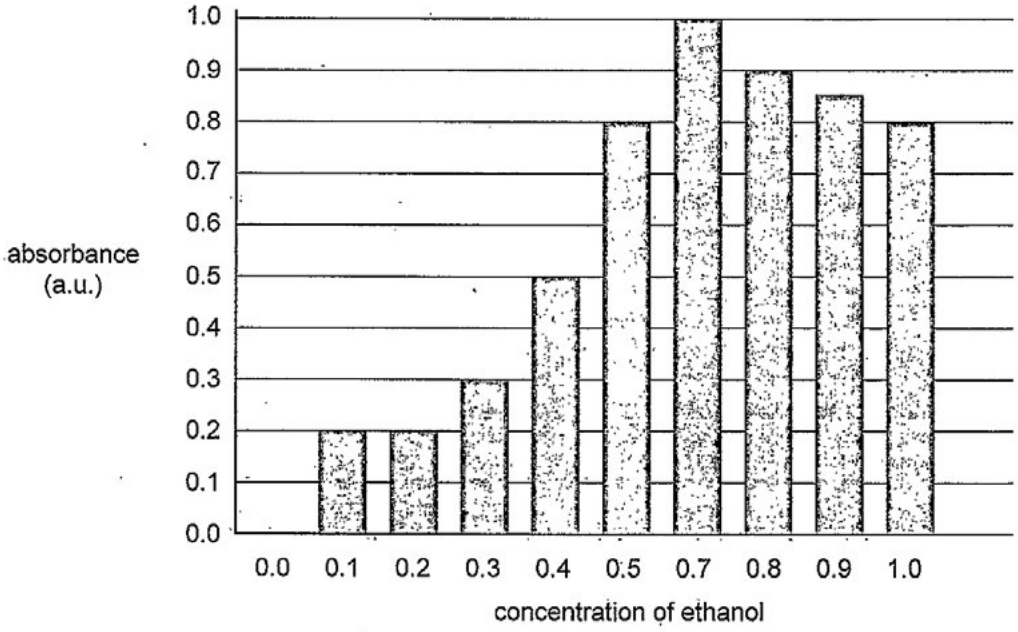


Fig. 20.1

(i) Make **three** criticisms of the way the student has displayed these results.

1 Student has not written down the units for the concentration of ethanol. ✓

2 Concentrations of ethanol is continuous data (not discrete data) so a bar chart should not be used (use line graph instead. ✓ scatter with line of best fit)

3 The x-axis is missing 0.6 so the intervals in the x-axis are not consistent. ✓

[3]

Exemplar 1 — 2 marks

(b)(ii)

(ii) Explain how carrying out replicates would improve this investigation. ✓

Replicates can be used to calculate a mean value, which will help decrease the effect of anomalies on the data produced. Anomalies can be identified ✓ by comparing data from replicates.

[2]

Examiner commentary

Q20bi required clear understanding of how to offer effective 'criticism' and the ability to comment on the suitability of the graph in Fig.20.1 in presenting the data. This exemplar shows a high level, concise response. The candidate has recognised the fact that the data is continuous and that, therefore, a line graph would have been more appropriate. They were also able to comment on the fact that the x-axis has an incorrect scale, i.e. 0.6 is missing and does not have units for concentration of ethanol.

Examiner commentary continued

In Q20bii it was important for candidates to use correct terminology. Many candidates are still referring to reliability when questioned about the need to carry out replicates during an investigation rather than the correct term, repeatability. Some candidates were also using the term 'average' instead of the correct term, 'mean' which was not credited. Misconception when using the term 'anomaly' was also evident with some candidates incorrectly stating that replicates can *prevent* anomalies. The exemplar shows a good response that demonstrates understanding of how obtaining replicates can be used to calculate a **mean** value and enable the **identification** of anomalies.

Question 21(a)(i)

21 (a) The greater blue-ringed octopus, *Hapalochlaena lunulata*, is one of the most venomous of all animals.

Its bite contains tetrodotoxin (TTX), a neurotoxin that can cause paralysis and death within minutes.

(i) The following information has been discovered about the effects of TTX on nerve cells:

- TTX binds to the external surface of the voltage-gated sodium ion channels in the axon membrane.
- Binding of TTX changes the tertiary structure of the channel.
- This means the channel cannot open.

Using the information provided, explain how TTX affects the activity of neurones.

..... [4]

Exemplar 1 — 4 marks

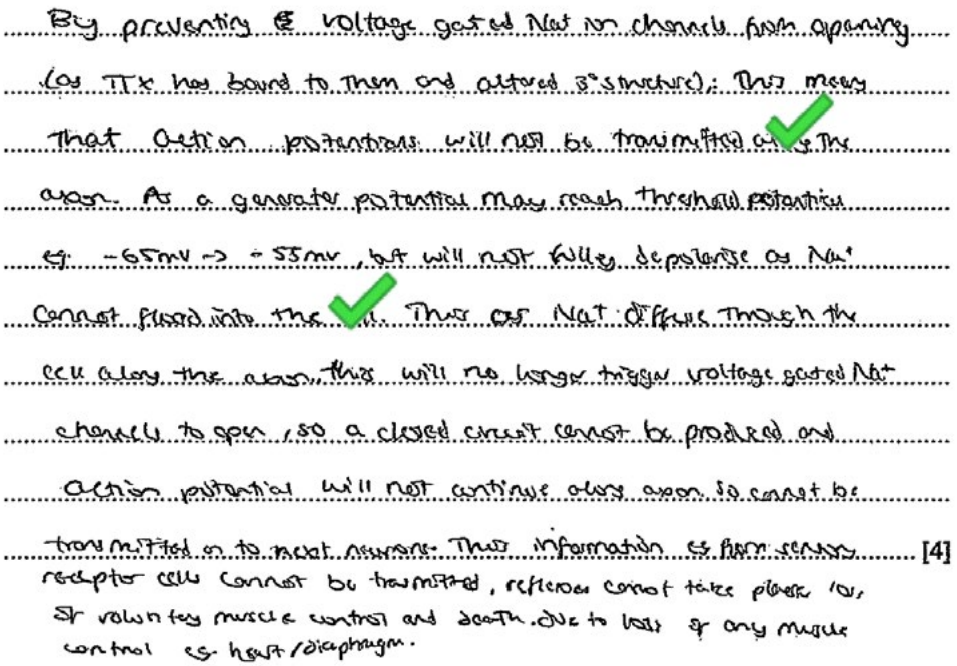
For a neurone to work correctly, depolarisation must occur. Due to the channels being unable to open, when the a action potential reached these gates, the sodium ions would be unable to enter and flood the axon membrane, unable to cause depolarisation. This means acetylcholine wouldn't be release released and the action potential couldn't carry on and no changes would occur. [4]

Examiner commentary

This exemplar shows a concise response achieving full marks.

Exemplar 2

2 marks


By preventing the voltage gated Na+ ion channels from opening (as TTX has bound to them and altered 3° structure). This means that action potentials will not be transmitted across the axon. As a generator potential may reach threshold potential eg. -65mV -> +55mV, but will not fully depolarise as Na+ cannot flood into the cell. This as Na+ cannot flow through the ccu along the axon, this will no longer trigger voltage gated Na+ channels to open, so a closed circuit cannot be created and action potential will not continue along axon. It cannot be transmitted on to next neurone. This information is then received by receptor cells cannot be transmitted, reflexes cannot take place for, ex voluntary muscle control and death due to loss of any muscle control eg. heart/diaphragm. [4]

Examiner commentary

It is worth noting that there were some responses where candidates repeated information relevant to the same marking point as shown in this second exemplar which repeats detail about action potentials not being transmitted. Some responses, as also shown by this exemplar, lacked detail, for example, 'depolarisation' without reference to the axon membrane.

Question 21(a)(ii)

(ii) A common cause of death from TTX poisoning is suffocation (not getting enough oxygen) as a result of paralysis of the diaphragm.

Explain how paralysis of the diaphragm could lead to suffocation.

.....

.....

.....

.....

..... [2]

Exemplar 1

2 marks

Diaphragm cannot contract and move downwards.
Volume of thorax does not increase, so a region of
low pressure not created in thorax. Air does not
diffuse into lungs because no pressure gradient present,
so person cannot inhale. Inhaling is an active process. [2]

Examiner commentary

There was some confusion about the movement of the diaphragm and whether its contraction would lead to increase or decrease in volume of the thorax. A good response, as shown by this exemplar, demonstrated understanding of the fact that a paralysed diaphragm would prevent the thorax from increasing in volume and decreasing in pressure.

Exemplar 2

0 marks

Because the diaphragm won't be
able to contract or relaxed when
inhaling or exhaling this means that
air won't be able to pass through the
thorax rib diaphragm and out so [2]
breathing will become really difficult.

Examiner commentary

Low level and zero responses, as shown by this exemplar, often stated that the paralysed diaphragm would not be able to contract without **explaining** how this would then lead to suffocation as required by the question.

Question 21(a)(iii)

(iii) TTX is also known to reduce the speed of conduction in the Purkyne fibres of the heart.

Suggest and explain what effect this would have on the heart rate.

.....

.....

.....

.....

.....

.....

.....

..... [3]

Exemplar 1

2 marks

This would slow the heart rate down ✓ and cause it to become irregular. This is because the wave of excitation moves from the AVN to the SAN at the bottom of the heart, and moves through the Purkyne fibres up through the heart + ventricles. When this slows down, the atria would still beat normally but [3]

21.a.iii the ventricles wouldn't contract as fast as normal ✓ so the space between contractions of the atria and ventricles would get too large, NBOD and the ~~atria~~ ventricles may eventually contract at the same time as the atria when they get out of sync. causing an irregular or eptopic heart beat.

Examiner commentary

This exemplar shows how candidates sometimes write responses that extend on to the additional page but fail to achieve full marks. In this case, the candidate starts by correctly suggesting that the heart rate would slow down, and credit is also given for the idea that the ventricles would not 'contract as fast as normal'. However, their explanation also contains irrelevant or incorrect detail that prevents them from gaining further marks.

Question 21(b)

(b) Molluscs such as *H. lunulata* have unmyelinated neurones. Saltatory conduction cannot occur in these neurones.

Why is transmission of action potentials along the axon slower in the absence of saltatory conduction?

.....

..... [1]

Exemplar 1 — 0 marks

Because the axons are non myelinated ^

..... [1]

Examiner commentary

Candidates needed to apply their knowledge of the role of the myelin sheath to this part of the question involving the novel context of the unmyelinated neurones in molluscs. Good responses included statements about how there would be no nodes of Ranvier or that action potentials would be generated throughout the whole axon. The question was challenging and low level or zero responses often repeated information from the question stem, as shown by this exemplar.

Question 22(a)(i)

22 (a) A scientist used a respirometer to investigate the rate of respiration and photosynthesis of maize in different light intensities.

- The scientist placed ten maize seedlings in a respirometer and kept it in the dark for three hours.
- The respirometer contained soda-lime to remove any CO_2 produced by the seedlings.
- The scientist placed ten maize seedlings in a separate respirometer without soda-lime and placed it in different light intensities for three hours at a time.

Light intensity (lux)	Distance moved by fluid in respirometer (mm)
0	–3.7
1020	–0.8
1510	0.0
1700	1.2
2000	2.9

Table 22.1

(i) The diameter of the capillary tubing was 0.1 mm.

The volume of a cylinder can be calculated using the following formula:
volume of cylinder = $\pi r^2 l$

Calculate the **rate of oxygen uptake** by the seedlings in the dark. Give your answer to **two** significant figures. Show your working.

Answer = ... $mm^3 h^{-1}$ **[3]**

Exemplar 1

3 marks

$\pi \times \left(\frac{0.1}{2}\right)^2 \times 3.7 = 0.029\ mm^3$

$\frac{0.029}{3hrs} = 9.6866 \times 10^{-3}$

$= 0.0097\ mm^3/h$

Answer = 0.0097 ..... $mm^3 h^{-1}$ **[3]**

Examiner commentary

The exemplar shows a good response with all stages in the calculation clearly shown. The candidate has chosen the correct data from the table, applied the volume of cylinder equation and finally divided this value by the time of three hours. The formula for calculating the volume of the cylinder was given but a common error was to substitute diameter i.e. 0.1mm into the equation rather than the radius i.e. 0.5mm (= diameter 0.1 ÷ 2). It was also common for candidates to omit final stage and give their response as 0.029mm^3.

Question 22(a)(ii)

(ii) 1700 lux is a typical light intensity on a cloudy day in the UK. Calculate the percentage increase in gas production between 1700 and 2000 lux. Show your working.

Answer = ... % [2]

Exemplar 1

1 mark

(ii) 1700 lux is a typical light intensity on a cloudy day in the UK. Calculate the percentage increase in gas production between 1700 and 2000 lux. Show your working.

new old

~~old~~ - ~~new~~ / old x100

2.9 - 1.2 / 1.2 x100 = 6.416

Answer = 6.4 % [2]

Examiner commentary

This exemplar shows the process for calculating the correct percentage increase. Despite using the correct values there is an error in the final response and it is worthwhile noting that as the candidate has shown their working they can still achieve 1 mark.

Question 22(a)(iii)

(iii) Suggest why soda-lime was **not** placed in the respirometer with the seedlings grown in the light.

.....

.....

..... [1]

Exemplar 1 1 mark

As this would remove any CO_2 produced by photosynthesis and respiration that would be used in photosynthesis, thus photosynthesis would not have been able to take place otherwise. [1]

Examiner commentary

This exemplar shows a good response to a fairly straightforward question.

Question 22(b)

(b) The scientist made the following claim:

> These results suggest that, in maize seedlings, the rate of photosynthesis only exceeds the rate of respiration when the light intensity is above 1510 lux.

Use the data in Table 22.1 to explain why the scientist made this claim.

.....

.....

.....

.....

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

Exemplar 1

2 marks

When the light intensity is at 1510 lux, the fluid moved no distance ✓ This means that rate of oxygen uptake was equal to the rate of gas production at that light intensity. So the rate of photosynthesis was equal to the rate of respiration ✓ **[2]**

Examiner commentary

This exemplar shows a good, succinct response where the candidate had noticed that at 1510 lux there was no movement of fluid that would indicate that the rates of respiration and photosynthesis were equal.

Question 23(a)

23 (a) A student looked at slides of different tissues under a light microscope.

The four viewed images are labelled **W**, **X**, **Y** and **Z** in Fig. 23.1, **on the insert.**

Identify tissues **W**, **X** and **Y**.

W .....

X .....

Y .....

[3]

Exemplar 1 3 marks

23 (a) A student looked at slides of different tissues under a light microscope.

The four viewed images are labelled **W**, **X**, **Y** and **Z** in Fig. 23.1, **on the insert.**

Identify tissues **W**, **X** and **Y**.

W liver hepatocyte.

X pancreatic acini and islet of langerhans.

Y Skeletal muscle.

[3]

Examiner commentary

This exemplar shows a good response where the candidate had correctly identified all three tissues. Some candidates recognised that tissue **Y** was muscle, but it was a common error for it to be identified as *cardiac* muscle. It was also a common error for candidates to identify **Y** as skeletal tissue, which could not be credited as 'skeletal' could also apply to bone.

Question 23(b)

(b) The student wrote the following summary about the control of heart rate.

When the heart rate is too low the level of carboxylic acid in the blood becomes higher than normal. The vagus nerve sends action potentials to the AVN to increase the contraction rate of the heart muscle. The baroreceptors in the walls of the blood vessels then detect that the pH of the blood is normal, so heart rate can return to resting.

The endocrine system can also change heart rate. Release of the hormone adrenaline from the adrenal medulla causes the smooth muscle of the heart to contract more frequently.

Identify **and** correct any biological errors in the student's summary.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

Exemplar 1 — 4 marks

(b) The student wrote the following summary about the control of heart rate.

When the heart rate is too low the level of carboxylic acid in the blood becomes higher than normal. The vagus nerve sends action potentials to the AVN to increase the contraction rate of the heart muscle. The baroreceptors in the walls of the blood vessels then detect that the pH of the blood is normal, so heart rate can return to resting.

The endocrine system can also change heart rate. Release of the hormone adrenaline from the adrenal medulla causes the smooth muscle of the heart to contract more frequently.

Identify **and** correct any biological errors in the student's summary.

When the heart rate is too low the carbonic acid in the blood is higher than normal. The heart does not respond to levels of carboxylic acid in the blood. The vagus

nerve is not responsible for increasing the heart rate. The accelerans accelerans (or accelerator) nerve sends action potentials to the SAN. Furthermore, the AVN doesn't increase the heart rate. The SAN (sino atrial node) increases the heart rate. Also, baroreceptors don't detect the pH of the blood. Chemoreceptors (or chemoreceptors?) detect the pH of the blood. The hormone adrenaline does not cause the smooth muscle in the heart to contract instead. [4]

Adrenaline binds to the SAN causing it to send more waves of excitation more frequently. Adrenaline binds to the cells of SAN causing it send out more waves of excitation

Examiner commentary

There were different acceptable techniques used by candidates when providing a good response to this part of the question. This first exemplar shows how the candidate chose to write out each biological error in the text and then provide a statement correcting the error achieving all 4 marks.

Exemplar 2 3 marks

(b) The student wrote the following summary about the control of heart rate.

When the heart rate is too low the level of carboxylic acid in the blood becomes higher than normal. The vagus nerve sends action potentials to the AVN to increase the contraction rate of the heart muscle. The baroreceptors in the walls of the blood vessels then detect that the pH of the blood is normal, so heart rate can return to resting.

The endocrine system can also change heart rate. Release of the hormone adrenaline from the adrenal medulla causes the smooth muscle of the heart to contract more frequently.

Identify **and** correct any biological errors in the student's summary.

The vagus nerve sends action potentials to the SAN to increase the contraction rate.

The chemoreceptors, not baroreceptors detect the change in pH of the blood. The pH receptors aren't in the blood vessels but are in the hypothalamus.

The heart muscle is cardiac muscle, not smooth muscle.

[4]

Examiner commentary

In this second exemplar the candidate uses the technique of circling the biological errors and then writing statements replacing these with the correct terms. Although in this case, only three errors were correctly identified for 3 marks. It is worthwhile noting that ambiguous statements, where errors or correct terms had not been clearly identified, could not be credited.

Question 23(c)(i)

(c) Reflex actions are rapid responses that protect the body from harm.

The Moro reflex is found in babies up to five months of age, and occurs when the baby feels its head is suddenly no longer supported. The Moro reflex is made up of the following responses:

- The baby spreads out its arms then brings them together rapidly.
- The baby cries.

(i) Suggest how the Moro reflex helps to prevent harm to a newborn baby.

.....

.....

.....

.....

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

Exemplar 1

1 mark

The baby cries to alert it's mother ✓ that it is in danger / isn't comfortable. Babie's heads are not fully dereloped and the skull bones need to fuse together to protect the brain, so this prevents brain damage. [2]

23.c.i The baby spreads out its arms and moves them in suddenly to pratect itself from falling – if it falls then its internal organs are more protected.

Examiner commentary

For this 'suggest' style question, candidates were required to demonstrate the ability to apply their knowledge of reflex actions to the Moro reflex in new born babies. Two statements were given about the Moro reflex and, as shown in this exemplar, most candidates were able to suggest that crying would alert a parent for 1 mark. There were some confused or vague ideas as to why the baby would bring their arms together and many responses suggested that this would help the baby lift its head rather than enable the baby to grab onto something. There were few succinct responses with many candidates using additional pages to continue their response, as also shown by this exemplar.

Question 23(c)(ii)

(ii) The Moro reflex gradually disappears and usually stops completely after babies reach nine months. Other reflexes develop as children grow older.

Describe a reflex response a 3-year-old child would make to an object moving towards their eyes **and** explain the advantage of this response.

.....

.....

.....

.....

.....

.....

..... **[3]**

Exemplar 1

2 marks

When an object moves towards ~~these~~ their eyes ~~their~~ eyes will rapidly close to prevent the object entering their eye. The advantage of this response is that it protects the sensitive organ from any damage that could be caused by foreign objects hitting or entering it.

[3]

Examiner commentary

As shown by this exemplar, many candidates correctly described blinking or rapid closing of the eyes as the reflex and then explained that this would prevent the object from entering the eyes, to achieve 2 marks. Good responses achieved all 3 marks by including that this reflex response is involuntary which would also be an advantage to the child.

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