Qualification Accredited

OCR
Oxford Cambridge and RSA

A LEVEL

Examiners' report

BIOLOGY B (ADVANCING BIOLOGY)

H422

For first teaching in 2015

H422/01 Summer 2022 series

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers are also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our website.

Paper 1 series overview

Paper 1 is worth 110 marks and is split into two sections. Section A is multiple choice and is worth 30 marks and section B comprises short, structured questions involving aspects of problem solving, calculations and questions based on practical. This year the candidates were given an advance notice of the key topics on the paper following government guidelines. This examination was felt to be an appropriate level of difficulty although there were more candidates who gave extended answers containing information not relating to the question.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
• interpreted data and drew conclusions based on that data • showed strong knowledge of practical skills	• not use the space provided as a guide to how much they should be writing • did not use the additional answer pages when needed

Section A overview

This section of the paper consisted of 30 multiple choice questions covering a range of topics across all modules of the Biology B specification. In general candidates seemed to find most of the questions accessible and performed well in this section, particularly on questions requiring recall of knowledge. However, there were a lot of candidates that left some multiple choice questions blank. Candidates should be encouraged to respond to all questions since there is no penalty for an incorrect answer. Candidates should be aware that answers to multiple choice questions should be clearly written and if answers are changed and the intended response is unclear, the mark is not given. In such cases one letter should be crossed out and the new answer written clearly, next to the answer box.

Question 1

1 Stomatal conductance is a measure of the rate of diffusion of water vapour through the stomata of a leaf.

Which of the environmental factors would cause an increase in stomatal conductance?

A Decrease in temperature

B Increase in humidity

C Increase in wind speed

D Reduced light intensity

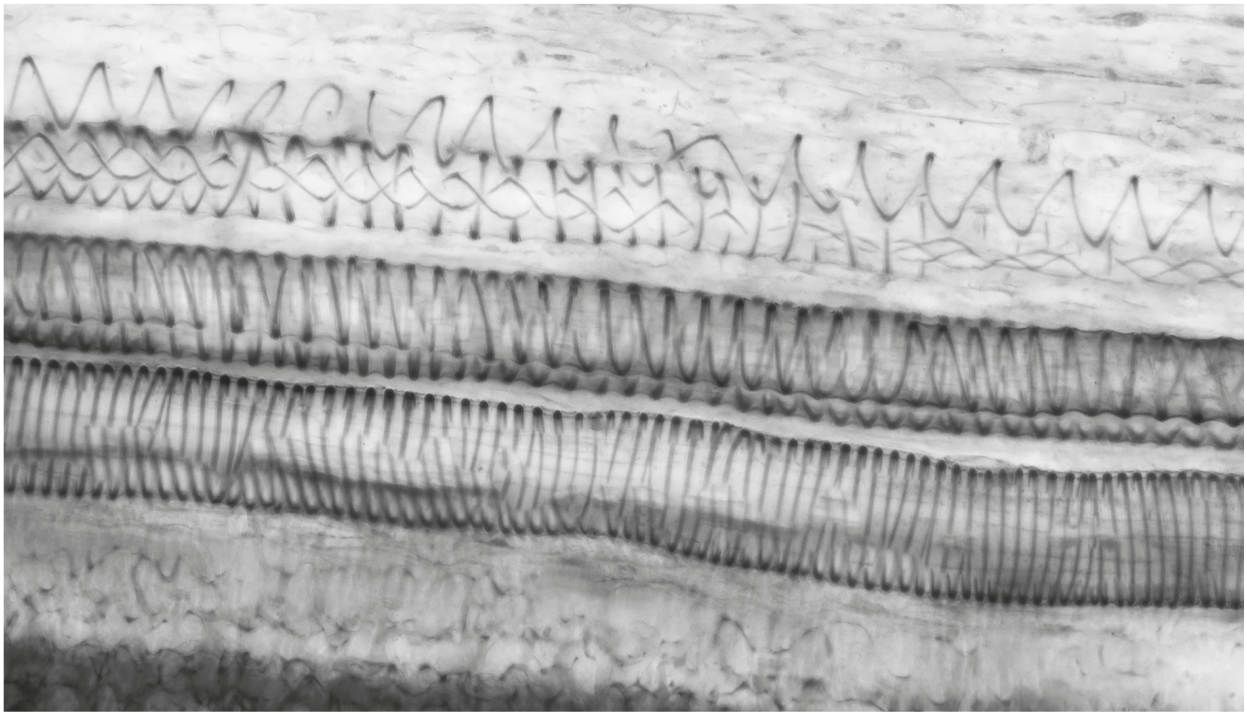
Your answer ☐

[1]

Candidates answered this question well. Some candidates incorrectly stated option B. This mistake by the candidates may have been caused by the term water vapour in the stem of the question. The correct answer is option C.

Question 2

2 The photomicrograph shows a section through the stem of a sunflower, *Helianthus annuus*.



Which of the options correctly identifies what is shown in the photomicrograph?

A It shows phloem tissue in longitudinal section.

B It shows phloem tissue in transverse section.

C It shows xylem tissue in longitudinal section.

D It shows xylem tissue in transverse section.

Your answer

[1]

A number of candidates incorrectly identified the tissue as phloem. The important feature of the image is the spiral lignin allowing it to be identified as the xylem. Candidates also had difficulty understanding the terminology of longitudinal and transverse sections. The correct option was C.

Assessment for learning

It is better to use actual photomicrographs when identifying the tissues in a stem, rather than using representations of the stem which sometimes might be misleading.

Question 8

8 A scientist used a colorimeter during an investigation to measure the concentration of glucose in samples of urine.

Which of the statements is/are correct?

1 The scientist used Benedict's solution as a reagent.

2 The scientist checked the zero value of the colorimeter with distilled water to reduce systematic error.

3 The scientist assessed repeatability by repeating the measurements and calculating a mean.

A 1, 2 and 3 are correct

B Only 1 and 2 are correct

C Only 2 and 3 are correct

D Only 1 is correct

Your answer ☐

[1]

The most common distractor was statement 3. A large number of candidates gave the correct answer as option A. It was well known that statement 1 was true as very few candidates gave option C as their answer. The candidates had some difficulty with the meaning of systematic error in statement 2 which is a consistent error in the results. Many candidates did not know that repeatability is assessed when similar (precise) results are produced by repeating the experiment under the same conditions. Repeating the experiment and calculating the mean helps to reduce random error. Option B is correct.

OCR support

OCR has produced a support resource for 'Language of measurement in biology context':
https://www.ocr.org.uk/Images/577369-language-of-measurement-in-context-biology.docx

Question 9

9 Chelating agents are chemical compounds that target and react with metal ions in the body allowing them to be excreted.

A chelating agent has been shown to reduce tissue damage caused by a protease enzyme in snake venom by preventing zinc ions (Zn^{2+}) binding to the enzyme.

Which of the statements about the protease enzyme is correct?

A The chelating agent is a cofactor for the protease enzyme.

B The chelating agent is a competitive inhibitor of the protease enzyme.

C Zn^{2+} is a cofactor for the protease enzyme.

D Zn^{2+} is a competitive inhibitor of the protease enzyme.

Your answer ☐

[1]

The term chelating agents is explained in the stem of the question as it is not a familiar term to the candidates. This is an unfamiliar context but the more successful candidates were able to apply their knowledge of cofactors and inhibitors and correctly identify option C as the answer.

Question 10

10 The reaction shows the breakdown of ATP to release energy.

$$ATP \longrightarrow ADP + P_i$$

Which type of reaction is involved in the breakdown of ATP?

A Condensation

B Hydrolysis

C Oxidation

D Phosphorylation

Your answer ☐

[1]

The reaction required to breakdown ATP is a hydrolysis reaction. Some candidates incorrectly stated the reaction as phosphorylation. This would be the reaction required for the formation of ATP from ADP and P_i. Phosphorylation would also be a condensation reaction.

Question 13

13 A student investigating the effect of ageing on short-term memory collected data from two groups of adults of different age ranges. Each group contained 15 adults.

The student analysed their data with a Student's unpaired *t*-test and used a critical values table at a 5% significance level to determine whether to reject their null hypothesis.

What is the correct number of degrees of freedom used by the student when using the critical values table?

A 14

B 15

C 28

D 30

Your answer ☐

[1]

Degrees of freedom is calculated by subtracting 1 from the number of observations in each group. For this investigation (15-1)+(15-1)=28. The most common incorrect answer was A

OCR support

OCR has resources to help support students and teachers on statistical tests:

Maths skills Handbook: https://www.ocr.org.uk/Images/294471-biology-mathematical-skills-handbook.pdf

Mathematical skills statistics booklet: https://www.ocr.org.uk/Images/338621-mathematical-skills-statistics-booklet.doc

Maths for Biology website: https://www.ocr.org.uk/subjects/science/maths-for-biology/handling-data/

Question 14

14 Researchers studying a population of mona monkeys, *Cercopithecus mona*, noticed that one of the 490 monkeys had black fur rather than the usual grey and white fur.

The researchers concluded that the monkey with black fur had a homozygous recessive genotype.

What is the correct method to estimate the percentage of the mona monkey population who were heterozygous for fur colour?

A Chi squared test

B Hardy-Weinberg principle

C Spearman's rank correlation coefficient

D Student's paired *t*-test

Your answer ☐

[1]

Candidates' knowledge of statistical tests and when to use them has improved over recent exam series. Many candidates were able to identify option B as the correct answer. Option D was the second most chosen response; candidates may have incorrectly selected option D as the student *t*-test is likely to be the most practised statistical test in class.

Question 21

21 Which hormone is released by the kidney?

A Antidiuretic hormone (ADH)

B Erythropoietin

C Glucagon

D Insulin

Your answer ☐

[1]

Despite the recall of knowledge required for this question many candidates found the question challenging. Option A was a good distractor and the most common, incorrect answer given by the candidates. This suggests that the candidates understood the link between Antidiuretic hormone (ADH) and the collecting duct in the kidney. A number of candidates gave options C and D showing confusion between the kidney and the liver. The correct answer was option B – erythropoietin.

Question 23

23 The table shows drugs used to treat asthma and the mechanisms of action.

	Type of drug	Mechanism of action	Use
A	Beta-agonist	Bronchodilator	Before exercise or for acute asthma
B	Beta-agonist	Reduce inflammation	Long term use
C	Corticosteroid	Bronchodilator	Long term use
D	Corticosteroid	Reduce inflammation	Before exercise or for acute asthma

Which row shows the correct type of drug, its mechanism of action and its use?

Your answer ☐

[1]

Asthma and the treatment of asthma is a topic that has been improved considerably in recent exam series. Candidates were able to answer the question showing they have a good understanding of the drugs used to treat asthma and the mechanism of action for the drug. Option A is the correct answer.

Question 24

24 Which of the options would cause an oxygen dissociation curve to shift to the right?

A Decrease in H^+ ions

B Hyperthermia

C Hypothermia

D Increase in pH

Your answer ☐

[1]

Candidates found Question 24 to be one of the most difficult multiple choice questions on the examination. An oxygen dissociation curve will shift to the left as a result of hypothermia or due to an increase in the alkalinity of the blood. Many candidates did not realise that an increase in pH and decrease in hydrogen ions (H^+) are moves towards a more alkaline environment. An increase in acidity or hyperthermia result in the oxygen dissociation curve shifting to the right. Option B is the correct answer.

Question 27

27 Rod and cone cells are specialised cells (photoreceptors) found in the retina of the eye.

Which of the statements about rod and cone cells is/are correct?

1 Rod cells contain the pigment, iodopsin but cone cells contain the pigment, rhodopsin.

2 The inner segment of both rod and cone cells contains mitochondria.

3 Cone cells need more photons of light than rod cells to generate an action potential.

A 1, 2 and 3 are correct

B Only 1 and 2 are correct

C Only 2 and 3 are correct

D Only 1 is correct

Your answer ☐

[1]

Option C was the correct answer. Rod cells contain the pigment rhodopsin and cone cells contain the pigment iodopsin, therefore statement 1 is incorrect. The most common incorrect answer was A.

Section B overview

This section included questions on a range of topics. The questions had varying levels of demand and assessed a range of exam skills. This gave all candidates the opportunity to gain credit on questions even when the topic area was challenging for them.

Due to the advanced information supplied before the exam series, candidates performed well on those questions stated in the advanced information. Candidates performed less well on the practical skills included in the paper, often the answers lacked detail on how to carry out the investigation and the interpretation of practical data was often one sided. When quoting data from graphs to support an answer candidates need to be more accurate and they need to make sure they include correct units.

Question 31 (a) (i)

31 The size of a human population is determined by the relationship between birth and death rates.

(a) **Fig. 31.1** is a demographic model showing the relationship between birth and death rates for a developed country such as the UK.

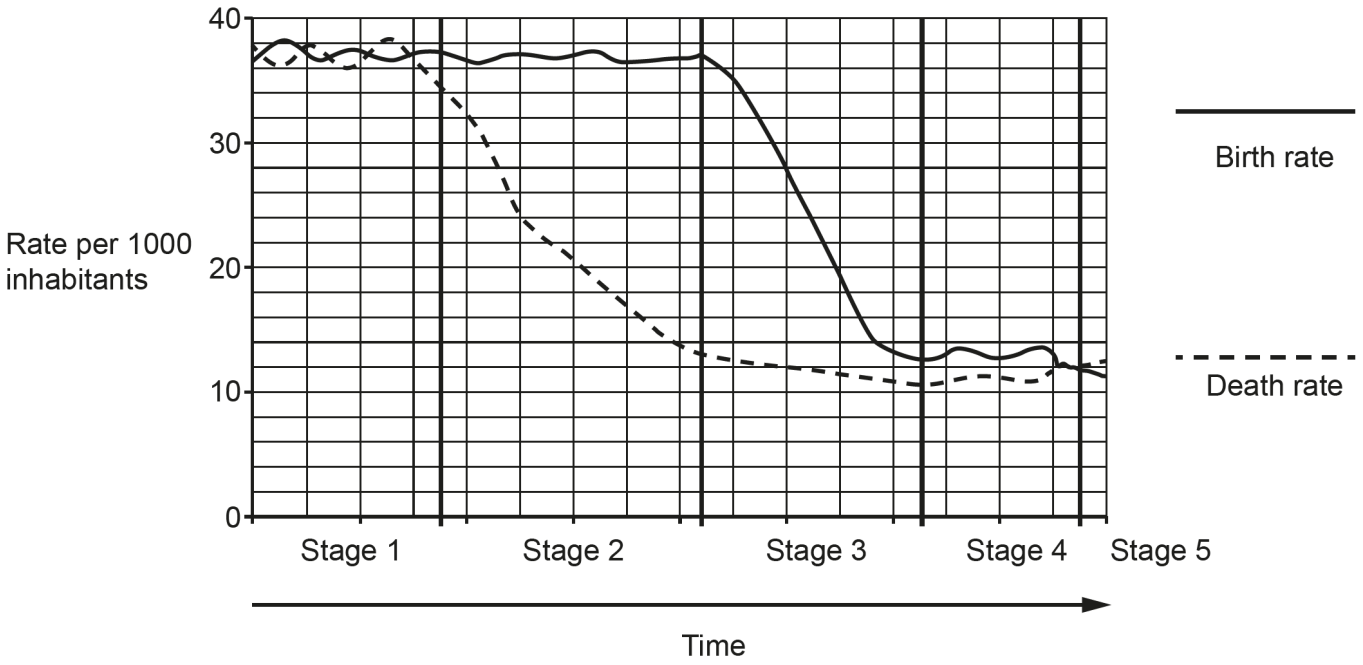


Fig. 31.1

(i) On **Fig. 31.1**, draw a curve to show estimated changes in the size of this population.

Write your answer on Fig. 31.1. **[2]**

Candidates interpreted this question well. Many candidates scored full marks by accurately identifying the rise in population size. Candidates that scored less than full marks often did so because they started the line for the population size at zero.

Question 31 (a) (ii)

(ii) Suggest why there are differences in the birth rates for stages 2 and 3.

.....

.....

.....

.....

.....

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

The question was well answered with many candidates giving at least one answer for each of the stage 2 and 3. The most common answers were the idea of children working to provide an income in stage 2 and the increased use of contraception in stage 3.

Question 31 (b)*

(b)* In 2019 it was estimated that 19.3% of people living in low to middle-income countries were food insecure. Organisations are working towards global food security and have a target of reducing food insecurity to 9.2% by 2029.

Discuss the challenges in reducing food insecurity as the human population continues to rise, including the impact on the environment **and** how organisations could measure success.

.....

.....

.....

.....

.....

..... **[6]**

The responses to this question were very good. Candidates were able to clearly identify the challenges on food production and impact on the environment, giving a range of examples for each. Some candidates did not mention how organisations could measure success, suggesting that they had not read the question fully or lacked the knowledge to respond to this aspect of the question.

Exemplar 1

As the population continues to rise it is increasingly difficult to produce enough food using sustainable practices. In order to meet food demands intensive farming practices must be used Intensive farming reduces bio.diversity as it reduces woodland areas and hedgerows disrupting habitat. Fertilisers used in these farming practices can run into water courses causing eutrophication which can be harmful to aquatic environments and organisms as light is blocked by algae As food insecurity increases so food crime and fraud has also increased leading to reduced consumer trust - it is difficult to produce enough food without compromising quality and safety. Organisations could measure success by calculating the percentage of food insecure people as well as using a Simpsons index of diversity to consider the [6]

Additional answer space if required.

impact of methods used on biodiversity in food production environments.

Exemplar 1 scored 6 marks. It includes the challenge to meet sufficient food demands and the impacts on the environment including intensive farming and eutrophication. This candidate also explained how success could be measured using Simpson's diversity index in support of their response.

Question 31 (c) (i)

(c) The use of antibiotics is a factor that contributed to declining death rates in developed countries during the 20th century.

Daptomycin is an antibiotic that was discovered in the 1980s.

The structure of daptomycin is shown in **Fig. 31.2**.

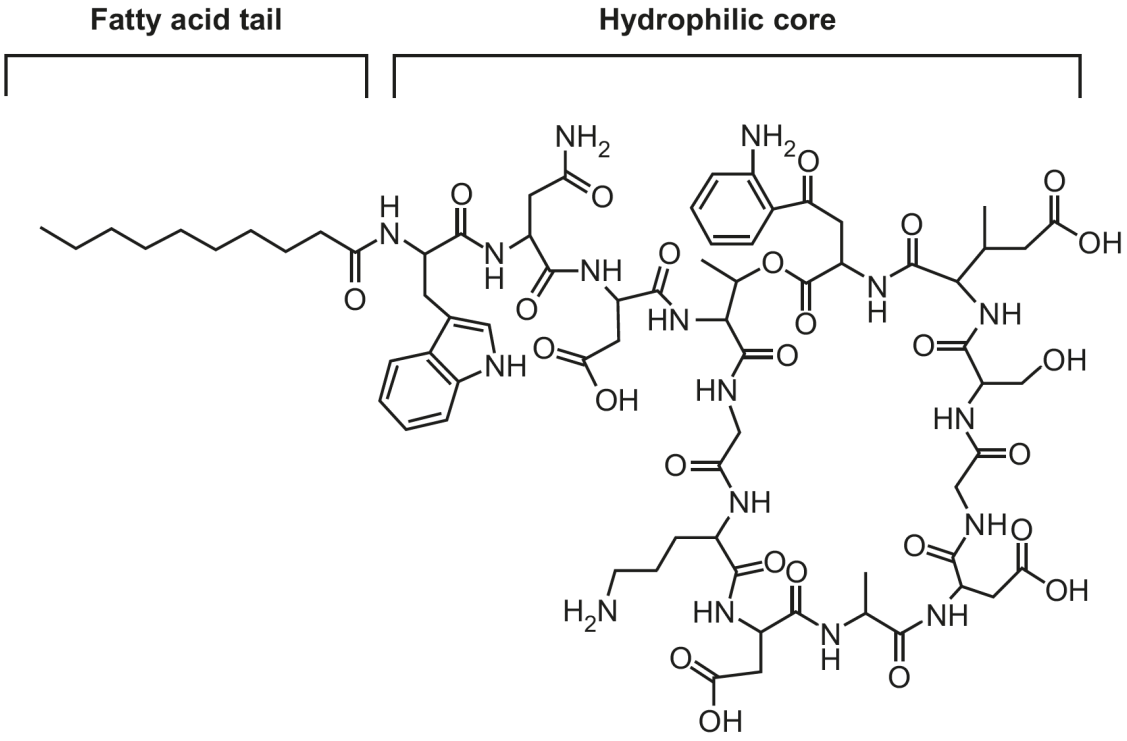


Fig. 31.2

(i) Using the information in **Fig. 31.2**, suggest a type of biological molecule found in the hydrophilic core of daptomycin.

..... **[1]**

Many candidates did not see the NH_2 groups in the daptomycin molecule indicating that the biological molecules found in the hydrophilic core are amino acids.

Question 31 (c) (ii)

(ii) Daptomycin has a bactericidal effect on gram positive bacteria by causing cytosol to leak out of bacterial cells.

Using the information in **Fig. 31.2**, suggest how daptomycin can cause leakage of cytosol from bacterial cells.

.....

.....

.....

.....

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

Many candidates had difficulty with the unfamiliar context of the question. The most common suggestion was that daptomycin 'burst' the cell wall of the bacteria. Very few candidates made the link between the fatty acid tail in daptomycin and how its hydrophobic property would allow it to fit between the phospholipids of the cell surface membrane. One mark was commonly given for the idea that a hole forms in the phospholipid membrane.

Exemplar 2

The fatty acid tail can easily insert itself into the phospholipid bilayer of the cell surface membrane. The relatively large hydrophilic core then causes the phospholipids to be pushed apart from each other, creating gaps in the membrane through which cytosol can leak. [2]

Exemplar 2 scored 2 marks. It includes a correct description of how the fatty acid tail of daptomycin can fit between the phospholipids of the cell surface membrane. The second mark was given for the pushing apart the phospholipids and creating a gap.

Question 31 (c) (iii)

(iii) Suggest **one** reason why daptomycin may **not** be effective against gram negative bacteria.

.....

.....

..... **[1]**

Many of the candidates did not know the structure of gram positive and gram negative bacteria.

OCR support

The most common mistake was that candidates stated that gram negative bacteria have no cell wall or they have an extra cell wall on the outside of the bacteria. Support on this topic is available at:

https://www.ocr.org.uk/qualifications/as-a-level-gce-biology-b-advancing-biology-h022-h422-from-2015/delivery-guide/module-bb03-module-3-cell-division-development-and-disease-control/delivery-guide-bbdg017-controlling-communicable-disease-323

Question 31 (d)

(d) The bactericidal activity of some antibiotics is concentration-dependent which means that the higher the concentration of antibiotic given to a patient, the greater the bactericidal effect.

Fig. 31.3 shows the concentration of antibiotic in the plasma of a patient following one dose.

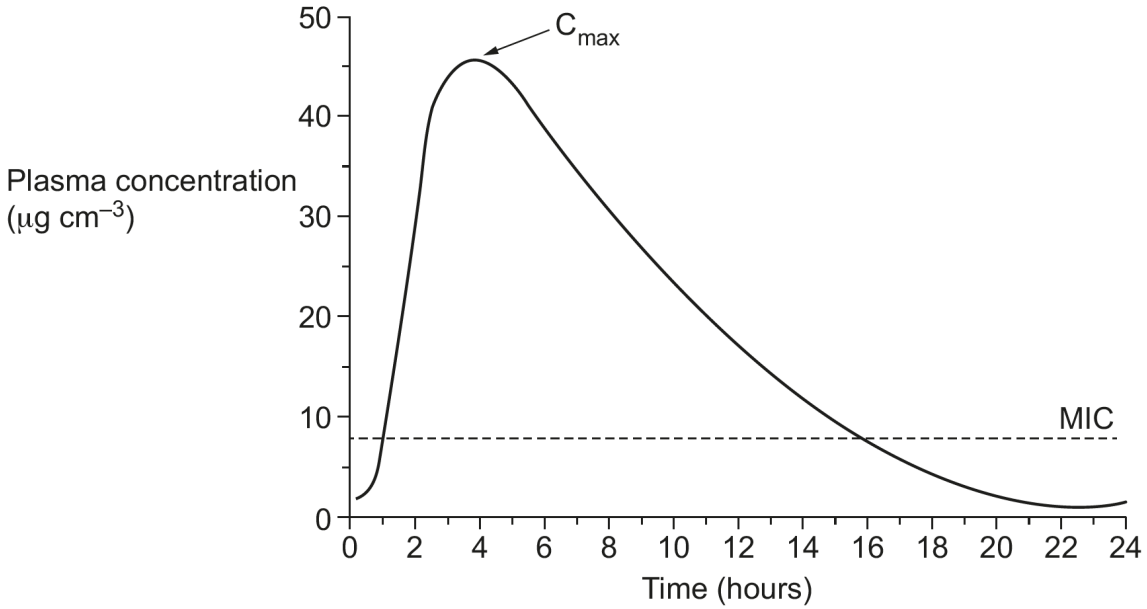


Fig. 31.3

The antibiotic shows optimal bactericidal effect when the dose given to the patient produces a peak concentration (C_{max}) that is 10 times greater than the minimum inhibitory concentration (MIC).

Using the information in **Fig. 31.3**, comment on whether the dose given to the patient is sufficient to kill the bacteria.

.....

.....

.....

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

The C_{max}:MIC ratio of 45:8 was correctly stated by a large number of candidates. Some candidates were then able to correctly state the minimum inhibitory dose required of 80μg cm^{-3}.

Question 32 (a) (i)

32 At the onset of menopause changes occur to hormone levels in women.

(a) (i) Name one hormone that increases **and** one hormone that decreases in concentration during the onset of menopause.

Hormone that increases in concentration .....

Hormone that decreases in concentration .....

[2]

Follicle stimulating hormone (FSH) was the most common answer to the first part of the question and was correctly stated by some candidates. Most candidates correctly identified oestrogen as the hormone that decreases in concentration.

Question 32 (a) (ii)

(ii) Ageing of the reproductive system is the main cause of menopause.

Name **one** other factor that may result in menopause.

..... **[1]**

This question was correctly answered by most candidates who stated chemotherapy or hysterectomy as the correct answer.

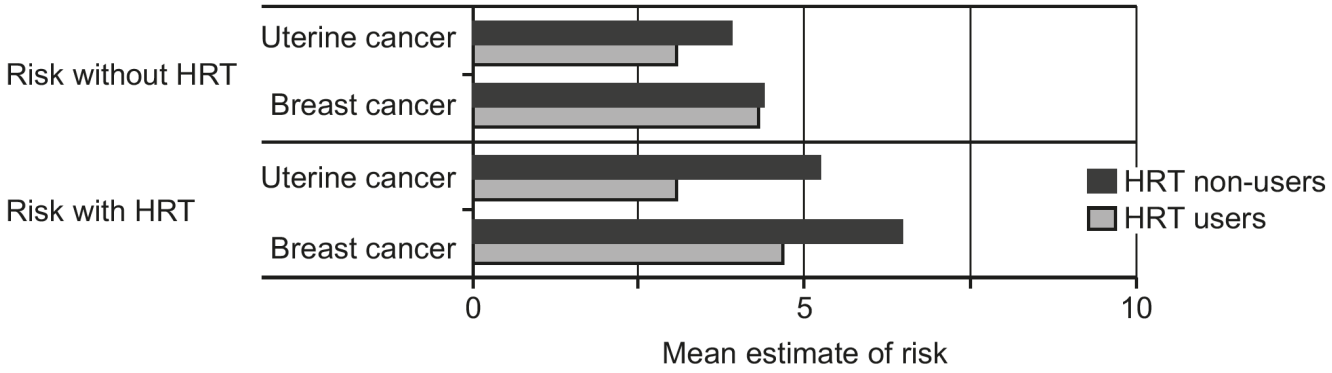
Question 32 (b)

(b) Hormone replacement therapy (HRT) is commonly used to relieve the symptoms of menopause but many women are concerned about the risks.

In one investigation, researchers studied the attitudes of women towards the risks of HRT by using a questionnaire.

- The same questionnaire was given to two groups of women, non-HRT and HRT users.
- All the women were aged 40 or above and there were 150 women in each group.
- The women were asked to estimate what they thought the risk of developing uterine cancer or developing breast cancer were, either without HRT or with HRT.
- They were asked for estimates of risk based on a scale of 1 to 10.

Some of the data from this study are shown in the graph.



Use the data in the graph to draw conclusions **and** suggest reasons for differences in estimates of risk associated with HRT for the two groups of women.

.....

.....

.....

.....

.....

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

This question was one of the most challenging on the examination. A large number of candidates described the information on the graph allowing them to access very few of the potential marks. A number of candidates did not suggest reasons for the differences in the estimates of risk. The highest performing candidates structured their answer to allow them to give conclusions and suggest reasons giving their answer clearly.

Question 32 (c) (i)

(c) The male reproductive system is also affected by ageing. Changes to the prostate gland resulting in benign prostatic hyperplasia (BPH) is thought to occur in approximately 50% of men.

(i) Explain how BPH causes symptoms such as inability to completely empty the bladder.

.....

.....

.....

.....

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

The knowledge shown by the candidates on the effect of ageing on the male reproductive system was very good. Many candidates used correct terminology to correctly explain the symptoms of benign prostatic hyperplasia.

Question 32 (c) (ii)

(ii) Apart from changes to the prostate gland, state **one** other change caused by ageing on the male reproductive system.

..... **[1]**

The answer, erectile dysfunction was correctly stated by the majority of candidates. A small number repeated the stem of the question and gave prostate cancer as their answer which was not given credit.

Question 32 (c) (iii)

(iii) The risk of prostate cancer also increases with age.

Suggest why national screening programmes for prostate cancer are currently not available in the UK.

.....

.....

.....

.....

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

A large number of candidates gained 1 mark on this question for correctly stating that the lack of a prostate cancer screening programme is due to the cost of introducing such a programme. Few candidates gained 2 marks. The most common incorrect answer given was that a screening programme was not required as prostate cancer is not dangerous.

Question 32 (d)

(d) The table compares different methods for treating cancer.

Complete the table by putting a tick (✓) in each box for a statement that applies to each method and a cross (✗) for a statement that does not apply.

The first row has been done for you.

Method	**Statement**			
	Specifically targets cancer cells	Does not destroy healthy cells	Monoclonal antibodies linked to anti-cancer drugs	DNA is damaged by ionising radiation
Complementary therapy	✗	✓	✗	✗
Chemotherapy				
Immunotherapy				
Radiotherapy				

[3]

Many candidates showed a good understanding of chemotherapy but a large proportion of the cohort could not correctly identify the statements associated with immunotherapy.

Question 33 (a) (i)

33 (a) A group of students investigated the effect of different light wavelengths on seed germination using the following method.

1. Five petri dishes labelled **A** to **E** were lined with cotton wool soaked in 25 cm^3 of nutrient solution.
2. Twenty seeds of the species *Vigna unguiculata*, a variety of black-eyed pea, were placed in each petri dish.
3. The petri dishes were placed in boxes containing a different light source.
4. Dish **A** was placed in normal (white) light, dish **B** in red light, dish **C** in yellow light, dish **D** in green light and dish **E** in blue light.
5. The seeds were checked for signs of germination at the same time each day for 5 days.
6. Seeds showing signs of germination were counted and removed from the petri dishes.

The results of the investigation are shown in the table.

Time (hr)	Number of seeds showing signs of germination in each light source				
	Normal (white)	Red	Yellow	Green	Blue
24	2	2	2	0	3
48	6	4	2	0	7
72	8	6	6	0	1
96	2	4	1	0	2
120	1	2	0	1	1

(i) State **two** conclusions that can be drawn from the data.

1 .....

.....

2 .....

.....

[2]

This question was well answered with the idea that green light has the slowest germination and white light had the most seeds germinate. Candidates who did not gain credit gave over generalised statements such as 'white, red, yellow and blue light all cause the most germination'.

Question 33 (a) (ii)

(ii) Describe how the method could have been improved to reduce random error.

.....

.....

.....

.....

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

Most candidates correctly stated 'calculate a mean'. The most common mistake seen was candidates just stating 'repeat'.

OCR support

OCR has produced a support resource for 'Language of measurement in biology context':
https://www.ocr.org.uk/Images/577369-language-of-measurement-in-context-biology.docx

Question 33 (a) (iii)

(iii) Calculate the increase in percentage of seeds that germinated in blue light between 48 and 96 hours.

Increase = ... % **[2]**

Many candidates had difficulty with this question. The question required candidates to count the 14 seeds that germinated in 120 hours, the 10 seeds that germinated after 48 hours and the 13 seeds that germinated after 96 hours. ((13÷14) - (10÷14)) x 100 = 21%.

OCR support

OCR offers support on maths skills here:
https://www.ocr.org.uk/subjects/science/maths-for-biology/

Question 33 (a) (iv)

(iv) The students processed their results and plotted a line graph to show the effect of light wavelength on cumulative percentage germination.

State the labels given to each axis of the graph.

x-axis .....

.....

y-axis .....

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

Most candidates correctly identified the axis as wavelength and total percentage germination. Only a small number of candidates included the units for the axis. The most common mistake was labelling the x-axis as time.

Question 33 (a) (v)

(v) One of the students suggested that weighing the petri dishes each day and calculating the mass of the seeds would be a better method of measuring germination than counting the number of seeds that germinate.

Evaluate this suggestion.

.....

.....

.....

.....

.....

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

Candidates consistently gave a supporting statement and a non-supporting statement allowing them to achieve 2/3 marks. The most common answers given were the idea of less subjective in the supporting statement and the idea of evaporation in the non-supporting statement. Candidates should be encouraged to give the same number of points as the number of marks available on the question.

Question 33 (b) (i)

(b) Germinating seeds need oxygen which they take in from the surrounding soil.

(i) Explain why oxygen is required for germination.

.....

.....

.....

.....

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

This question was well answered by the majority of candidates with aerobic respiration, ATP production and growth being the most common answers. Some candidates lost marks as they only stated, 'respiration', which could refer to aerobic or anaerobic.

Question 33 (b) (ii)

(ii) Suggest the mechanism by which germinating seeds take in oxygen from the soil.

.....

..... **[1]**

Many candidates incorrectly stated that oxygen uptake is the result of active transport. This mistake may be attributed to the fact that oxygen is required in aerobic respiration to produce ATP which is used in active transport.

Question 33 (b) (iii)

(iii) Give **one** reason why, as seedling leaves appear, less oxygen is taken in from the surrounding soil even though the need for oxygen increases.

.....

..... **[1]**

Candidates had difficulty making the link between the oxygen production in photosynthesis and the use of oxygen in respiration for growth of a plant.

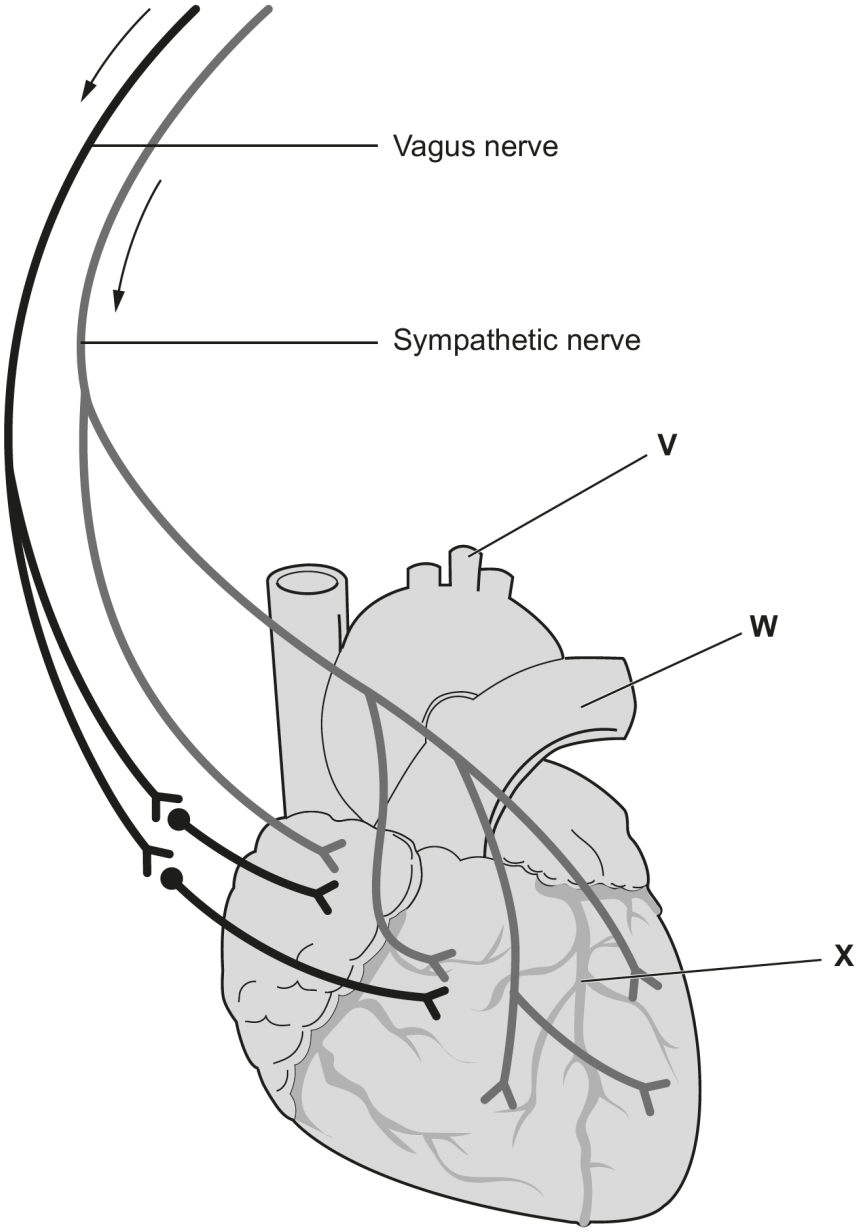
OCR support

The most common misconception was that stomata are used to take in oxygen in order for plants to respire and grow. Plants can take in oxygen through their stomata although this would occur when the plant was in darkness. Support on this topic is available at:

https://www.ocr.org.uk/qualifications/as-a-level-gce-biology-b-advancing-biology-h022-h422-from-2015/delivery-guide/module-bb04-module-4-energy-reproduction-and-populations/delivery-guide-bbdg024-photosynthesis-food-production-and-management-of-the-environment-431

Question 34 (a) (i)

34 This is a diagram of the external structure of a mammalian heart.



(a) (i) Use the diagram to complete the missing structures, letters and function in the table.

Structure	Letter	Function
		Supplies heart muscle with oxygen
	V	Has receptors in its walls that detect changes in pH
Pulmonary artery		

[3]

Candidates correctly identified the structure, letter and function of the coronary artery and pulmonary artery. Only a small number of candidates correctly identified the structure as the carotid artery. The function given for letter V should have allowed candidates to identify it as the carotid artery instead of the most common incorrect answer, aorta.

Question 34 (a) (ii)

(ii) The nerves seen on the diagram originate in cardiovascular centres in the brain.

Name the structure in the brain where the cardiovascular centres are located.

..... **[1]**

The most common answer was correct, medulla oblongata.

Question 34 (b)*

(b)* Adrenaline has a role in controlling heart rate.

Compare the action of the nerves in the diagram with adrenaline in controlling heart rate.

.....

.....

.....

.....

.....

..... **[6]**

Candidates responded to this question well. Knowledge of autonomic nervous system was better than in previous years. A large proportion of the candidates achieved a Level-3 score.

OCR support

The main problem encountered was confusion surrounding how and where adrenaline is released. Some candidates incorrectly stated that adrenaline is released from the medulla oblongata. Support on this topic is available at:

https://www.ocr.org.uk/qualifications/as-a-level-gce-biology-b-advancing-biology-h022-h422-from-2015/delivery-guide/module-bb05-module-5-genetics-control-and-homeostasis/delivery-guide-bbdg030-the-nervous-system-and-the-identification-and-consequences-of-damage-521

Exemplar 3

Compare the action of the nerves in the diagram with adrenaline in controlling heart rate.

Adrenaline is secreted (from a gland, not medulla oblongata) when a person experiences excitement, stress, or shock and increases the heart rate ~~by~~ it binds to receptors on cardiac cells (in SAN) and initiates a secondary messenger system within them. It activates the G protein, which increases cAMP formation. This increases the permeability of Ca^{2+} ion channels and allows cardiac cells to depolarise more quickly due to decreased threshhold for action potentials. The nerves are controlled by the medulla oblongata which sends impulses down them in response to information from chemoreceptors or pressure receptors (which require physical stimuli, unlike adrenaline). This action can increase or decrease heart rate, unlike adrenaline. If there is an decrease in pH or pressure in blood **[6]**

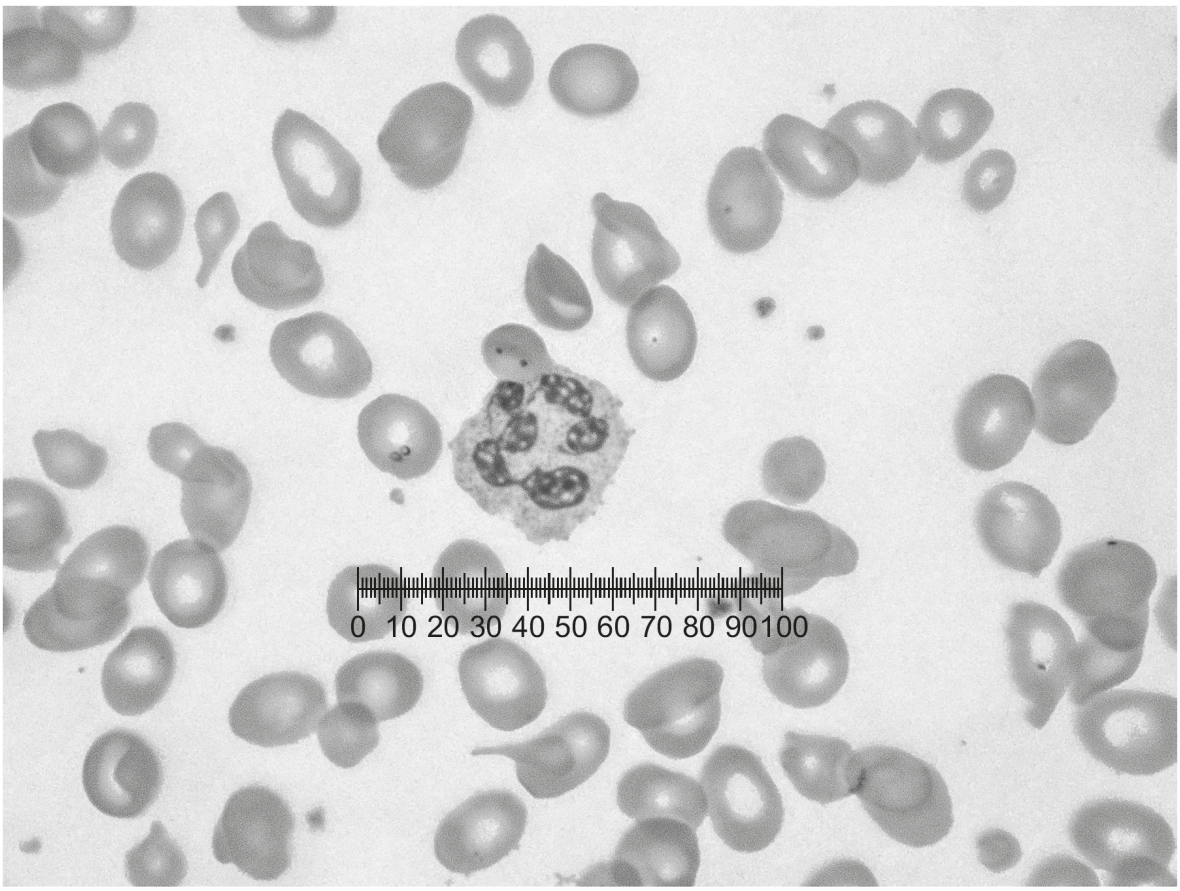
Additional answer space if required.

the medulla oblongata sends impulses via sympathetic or accelerator nerve to SAN, to increase heart rate. Impulses are transmitted along vagus to decrease heart rate.

Exemplar 3 scored 6 marks. It includes a good explanation of the action of adrenaline by including the effect on the heart rate. It also includes a description of how the medulla oblongata controls the nerves and how the action of the accelerator nerve leads to an increase in heart rate and how the vagus nerve leads to a decrease in heart rate.

Question 35 (a) (i)

35 (a) The photomicrograph shows blood components as seen using a light microscope with an eyepiece graticule.



(i) Name the type of leucocyte shown.

..... **[1]**

The most common answer was correct, neutrophil.

Question 35 (a) (ii)

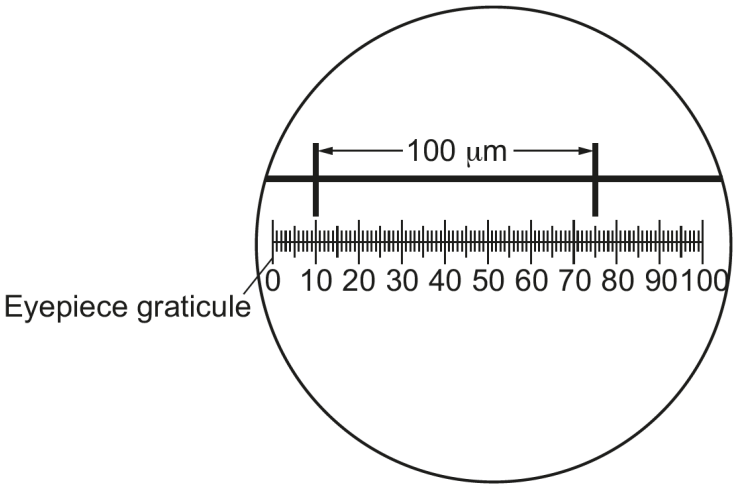
(ii) Make an annotated drawing of the leucocyte.

[2]

The question was well answered with diagrams being well annotated and drawn with clear continuous lines. Some diagrams only slightly resembled the photograph and could be an area for candidates to practice.

Question 35 (a) (iii)

The eyepiece graticule used was calibrated as shown in the diagram.



(iii) Name the apparatus used to calibrate the eyepiece graticule.

..... **[1]**

Most candidates correctly identified the apparatus as a stage micrometer.

Question 35 (a) (iv)

(iv) Calculate the diameter of the leucocyte.

Give your answer to **2** significant figures.

Diameter = ... μm **[2]**

Candidates were very good at recognising the need to use eye piece units (EPU) in their calculation and most correctly counted 43 EPU. Candidates were less effective at using the scale bar to work out 1 EPU as 100μm÷65=1.54μm.

Question 35 (b)

(b) When blood vessels are damaged a clot is formed to prevent excessive blood loss.

Complete the sentences about blood clotting using the most appropriate word or words.

Damage to the blood vessel activates platelets and the enzyme ..... is released.

This enzyme catalyses the conversion of prothrombin into thrombin. Thrombin is an enzyme

that hydrolyses the soluble protein ..... into the insoluble protein

..... .

This hydrolysis reaction requires ..... ions.

[4]

Most candidates showed excellent knowledge of blood clotting and scored highly on this question.

Question 35 (c) (i)

(c) Plasma is a blood product that can be given to treat women who have suffered blood loss during childbirth.

(i) Suggest **one** advantage and **one** disadvantage of using plasma to replace blood lost during childbirth.

Advantage .....

.....

Disadvantage .....

.....

[2]

Many candidates correctly stated the advantage of using plasma as maintaining blood volume/pressure. Fewer candidates stated a correct disadvantage to using plasma. If a correct answer was given it was mainly the idea that an allergic reaction could occur.

Question 35 (c) (ii)

(ii) Apart from replacing lost blood, state **one** other use for donated plasma.

.....

..... **[1]**

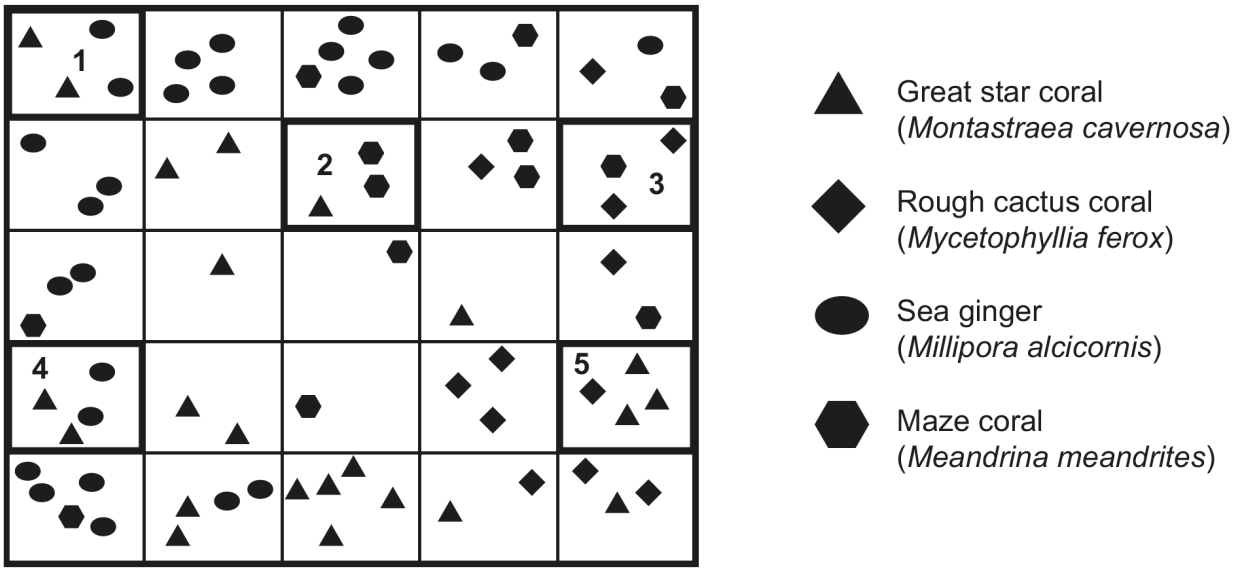
Many candidates found this question challenging. The majority of correct answers given included during cardiac surgery or for the treatment of liver failure. Incorrect answers included its use during dialysis or to increase the nutrient content of the blood.

Question 36 (a) (i)

36 Tobago is an island in the Caribbean sea. The reefs of Tobago represent some of the southernmost reefs still dominated by coral species.

Researchers used the random sampling method shown in the figure to estimate population density and percentage cover of different species of corals and hydrocorals living on one of the reefs.

1. Divers located a 100 m^2 area of the reef for the study.
2. Tape measures were used to form grid lines.
3. Five areas were selected and labelled **1** to **5**.
4. The species were identified using a key and then counted.



(a) (i) Comment on the suitability of using this sampling method in the study.

.....

.....

.....

.....

.....

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

Many candidates stated three or more correct answers to the question. A range of the potential answers were regularly seen suggesting that sampling is a skill that candidates are very familiar with and effective at explaining.

Question 36 (a) (ii)

(ii) Using the method shown, estimate the population density of sea ginger.

Population density = ... m^{-2} **[2]**

Candidates correctly stated the density as $0.2m^{-2}$. The most common incorrect answer was 0.26 which was calculated by dividing the total number of sea ginger in all squares and dividing it by $100m^{-2}$.

Question 36 (b) (i)

(b) Further data collected by the researchers is shown in the table.

Species	Percentage species cover (*n*)	$(n/N)^2$
Round starlet coral (*Siderastrea siderea*)	14	
Mountainous star coral (*Orbicella faveolata*)	30	
Great star coral (*Montastraea cavernosa*)	16	
Sea ginger (*Millipora alcicornis*)	15	
Brain coral (*Diploria strigosa*)	13	
Rough cactus coral (*Mycetophyllia ferox*)	5	
Maze coral (*Meandrina meandrites*)	7	

(i) Calculate the Simpson's index of diversity of the reef.

Use the formula: $D = 1 - \left(\sum \left(\frac{n}{N}\right)^2\right)$

D = ... **[2]**

Candidates showed a thorough understanding of Simpson's index of diversity with many calculating the correct answer of 0.818. Candidates that did not score on this question normally rounded their answers to various decimal places throughout the calculation event resulting in an incorrect number.

OCR support

There is support on common rounding errors in OCR Mathematical Skills Handbook, page 17:
https://www.ocr.org.uk/Images/294471-biology-mathematical-skills-handbook.pdf

Question 36 (b) (ii)

(ii) Due to their proximity to the South American coastline, freshwater run off from the Amazon river reaches the reefs of Tobago.

Using your answer to **(b)(i)**, suggest the likely impact of freshwater run off on the coral reef and give a reason for your suggestion.

.....

.....

.....

.....

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

Candidates answered this question well. Many were able to recognise the high diversity index of 0.818 and then suggested a reason why it was so high. The most common reason given was the idea that freshwater run off supplies nutrients to the coral reef. Candidates that did not do well on the question suggested that the freshwater run off would decrease the biodiversity implying that the runoff from the Amazon River was a new event.

Supporting you

Post-results services

If any of your students' results are not as expected, you may wish to consider one of our post-results services. For full information about the options available visit the OCR website.

Keep up-to-date

We send a weekly roundup to tell you about important updates. You can also sign up for your subject specific updates.
If you haven't already, sign up here.

OCR Professional Development

Attend one of our popular CPD courses to hear directly from a senior assessor or drop in to a Q&A session. Most of our courses are delivered live via an online platform, so you can attend from any location.

Please find details for all our courses on the relevant subject page on our website or visit OCR professional development.

Signed up for ExamBuilder?

ExamBuilder is the question builder platform for a range of our GCSE, A Level, Cambridge Nationals and Cambridge Technicals qualifications. Find out more.

ExamBuilder is **free for all OCR centres** with an Interchange account and gives you unlimited users per centre. We need an Interchange username to validate the identity of your centre's first user account for ExamBuilder.

If you do not have an Interchange account please contact your centre administrator (usually the Exams Officer) to request a username, or nominate an existing Interchange user in your department.

Active Results

Review students' exam performance with our free online results analysis tool. It is available for all GCSEs, AS and A Levels and Cambridge Nationals.

It allows you to:

- review and run analysis reports on exam performance
- analyse results at question and/or topic level
- compare your centre with OCR national averages
- identify trends across the centre
- facilitate effective planning and delivery of courses
- identify areas of the curriculum where students excel or struggle
- help pinpoint strengths and weaknesses of students and teaching departments.

Find out more.

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on
01223 553998

Alternatively, you can email us on
support@ocr.org.uk

For more information visit
ocr.org.uk/qualifications/resource-finder
ocr.org.uk
/ocrexams
/ocrexams
/company/ocr
/ocrexams

We really value your feedback

Click to send us an autogenerated email about this resource. Add comments if you want to. Let us know how we can improve this resource or what else you need. Your email address will not be used or shared for any marketing purposes.


I like this


I dislike this

Please note – web links are correct at date of publication but other websites may change over time. If you have any problems with a link you may want to navigate to that organisation's website for a direct search.