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Examiners' report

TWENTY FIRST CENTURY BIOLOGY B

J257
For first teaching in 2016

J257/01 Summer 2018 series

Version 1

Contents

Introduction 4
Paper J257/01 series overview....5
Question 1(a) 6
Question 1(b) (i)....7
Question 1(b) (ii)....7
Question 1(b) (iii)....8
Question 1 (b) (iv)....8
Question 1 (b) (v)....9
Question 1 (b) (vi)....9
Question 1 (c)....10
Question 2 (a) (i)....10
Question 2 (a) (ii)....10
Question 2 (b)....11
Question 3 (a) (i)....11
Question 3 (a) (ii) 12
Question 3 (a) (iii)....12
Question 3 (a) (iv)....12
Question 3 (a) (v)....13
Question 4 (a)....13
Question 4 (b) 14
Question 4 (c) 14
Question 4 (d) (i) 15
Question 4 (d) (ii)....16
Question 4 (d) (iii)....16
Question 4 (d) (iv)....17
Question 4 (e) (i)....17
Question 4 (e) (ii)....18
Question 4 (e) (iii)....18
Question 5 (a) (i)....19
Question 5 (a) (ii)....19
Question 5 (a) (iii)....20
Question 5 (a) (iv)....20
Question 5 (b)....20
Question 6 (a) (i)....21

Question 6 (a) (ii) 21
Question 6 (b) 21
Question 7 (a) (i) 22
Question 7 (a) (ii) 23
Question 7 (a) (iii) 23
Question 7 (a) (iv) 23
Question 7 (b) (i) 24
Question 7 (b) (ii) 24
Question 8 (a) (i) 25
Question 8 (a) (ii) 25
Question 8 (b) (i) 25
Question 8 (b) (ii) 26
Question 8 (c) (i) 26
Question 8 (c) (ii) 27
Question 8 (c) (iii) 27
Question 8 (c) (iv) 28
Question 9 (a) 29
Question 9 (b) 29

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. 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 can be downloaded from OCR.

Paper J257/01 series overview

J257/01 is one of two examination components for the new revised GCSE examination for Biology B (Twenty First Century Science) assessed at Foundation Tier. This component assesses content from all eight chapters of the specification and links together different areas of biology within different contexts, some practical, some familiar and some novel.

The entry for this Foundation Tier paper was low in comparison to the Higher Tier paper however, it appeared that most candidates were entered for the correct tier. It was evident that almost all candidates engaged fully with the paper and made a good attempt at answering the majority of the questions, with a wide spread of marks being obtained. There was no evidence of shortage of time being an issue and there were few examples of specific questions being left blank. Responses indicated that in general, candidates understood the instructions for each question.

Candidates were able to respond particularly well to certain specification areas, whilst other areas proved more problematic. These will be highlighted in the next section.

Most successful specification areas	*Least successful specification areas*
• B1.2.1 and B1.2.2 explaining how genetic information is inherited Q3(a)(i) and (ii) • B2.1.2, B4.3.1a, B4.3.2 knowledge of cancer Q4(a) • B2.2.2 and B5.1.6 knowledge of functions of blood components Q4(d)(iii) • B 4.3.4 knowledge of sources of stem cells Q5(a)(iii)	• B3.3.1b knowledge and application of knowledge of qualitative tests for biological molecules Q7(b)(i) • B3.4.2 application of knowledge of techniques used to determine population size Q9(a) • B6.1.5 and B6.1.6 application of knowledge of species Q6(b) • B6.1.5 knowledge of Darwin's theory of evolution by natural selection Q8(a)(ii)

Candidate performance overview

Candidates who did well on this paper generally did the following.

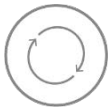
- used appropriate mathematical skills to confidently perform calculations such as calculating mean 1(b)(i) deducing a ratio 3(a)(iii) calculating a percentage 4(b) scale bar ratio 8(c)(ii) and calculating a percentage reduction 8(c)(iii)
- correctly and concisely interpreted graphs 7(a)(i)
- analysed quantitative or graphical data to draw plausible conclusions supported by evidence 8(c)(iv) 7(a)(i) and 4(d)(i)
- demonstrated mostly accurate and appropriate knowledge and understanding 1(a) 4(d)(ii) 4(e)(iii), 5(a)(i) and 5(a)(iv)
- applied their knowledge and understanding to familiar and unfamiliar contexts, using accurate scientific terminology 1(c), 8(c)(i), 6(a)(i) and 5(b)
- demonstrated sound knowledge and application of practical techniques 7(b)(i) and 9(a)

Candidates who did less well on this paper generally did the following.

- did not demonstrate secure scientific knowledge e.g. 1(a), 3(a)(iv), 4(e)(iii), 5(a)(iv), 7(a)(iii)
- produced responses that lacked accurate use of scientific terminology e.g. 4(d)(ii)
- did not carry out calculations such as calculating a mean e.g.1(b)(i) or working out a percentage 4(b) or percentage reduction 8(c)(ii)

Candidate performance overview

- found it difficult to follow the instructions in the question e.g. describe and explain in 7(a)(i) and use information from the graph in 4(d)(i)
- did not have a confident grasp of the knowledge and application of practical techniques 7(b)(i) and 9(a)



AfL

Questions 4(d)(i) and 8(c)(iv) both assessed candidates' ability to draw conclusions based on information given but 8(c)(iv) required them to choose one out of four possible options and 4(d)(i) asked them to draw conclusions by explaining in their own words. Candidates of all abilities scored better on 8(c)(iv) than on 4(d)(i) so it may be of benefit to give candidates as many opportunities as possible to practise describing the information presented in a table or graph and drawing conclusions from it in their own words.

Question 1(a)

1 The eye is a sense organ.

(a) Each part of the eye is adapted to its specific function.

The table describes the functions of different parts of the eye.

Complete the table by writing the **part of the eye** that matches each **description**.
Choose from the words below:

ciliary muscle **cornea** **iris** **lens**

Part of the eye	Description
	A ring of tissue that changes size to alter the diameter of the pupil, to control the amount of light entering the eye.
	A thin layer of transparent tissue in front of the pupil which bends light as it enters the eye.
	A thick layer of transparent tissue behind the pupil which bends light so it focusses on the retina.
	Changes the thickness of the lens to focus light from far and near objects.

[3]

This question assessed AO1 knowledge in isolation. Most candidates were able to score two marks for identifying the function of the iris and ciliary muscle. There was confusion over the function of the lens and cornea which prevented full marks being credited to more candidates.

Question 1(b) (i)

(b) Amir is investigating what happens to pupil size when a person moves from an area of bright light to an area of darkness.

He measures the size of his friend's pupil in bright light.

His results are shown in the table below.

Experiment number	Pupil size (mm)
1	4.0
2	3.8
3	6.0

(i) Calculate the mean pupil size.

Mean pupil size = ... mm **[2]**

This question assessed objective AO2. Most candidates were able to correctly calculate the mean, although some demonstrated a correct approach (adding the three values and dividing by 3) without arriving at the correct answer, highlighting the need to check calculations. Some candidates did not know what the term mean meant and gave the median value instead.

Question 1(b) (ii)

Amir reads an article that suggests the average pupil size in bright light should be in the range of 2–4 mm.

(ii) Amir thinks one of his results is an anomalous result.

Which result is most likely to be the anomalous result?

Give a reason for your choice.

.....

.....

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

Three quarters of candidates were able to gain one mark for identifying the anomalous result, and around half of candidates were able to give a correct reason, the most common explanation referring to the value of 6.0 mm being outside the range. Some candidates misinterpreted the question and attempted to explain why the anomalous result could have happened. This question assessed objective AO3.

Question 1(b) (iii)

(iii) What can Amir do to make his results more precise?

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

Just over a third of candidates were able to answer this question, assessing AO3, successfully, and these candidates were often the ones who went on to score the highest total marks on the paper. Candidates who did not answer correctly suggested that Amir should do his experiment on different people or simply do "more experiments" without making it clear they meant him to repeat this experiment.

Question 1 (b) (iv)

(iv) To create dark conditions Amir asks his friend to put on sunglasses.

Amir draws two diagrams (**Fig. 1.1** and **Fig. 1.2**) to show how the pupil changes when the light conditions change.

Fig. 1.2 is incomplete.

Complete **Fig. 1.2** to show the pupil in dark conditions.

Pupil in bright light

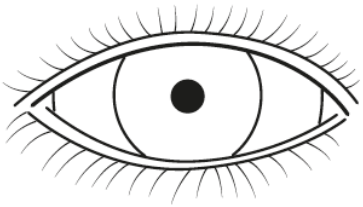


Fig. 1.1

Pupil in the dark

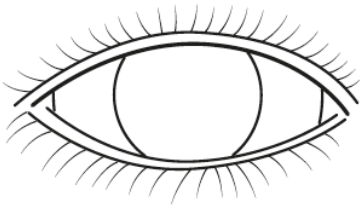


Fig. 1.2

[1]

This question assessing AO2 was answered particularly well and attempted by almost all candidates.

Question 1 (b) (v)

(v) The change in pupil size is an example of a reflex.

Which statement best describes a reflex?

Tick (✓) **one** box.

A rapid and involuntary response. ☐

A rapid and voluntary response. ☐

A slow and involuntary response. ☐

A slow and voluntary response. ☐

[1]

This question assessed AO1. Almost all candidates knew that a reflex action is a rapid response, but approximately a quarter did not know what voluntary and involuntary meant in terms of a reflex action and therefore were not able to gain the mark.

Question 1 (b) (vi)

(vi) What name is given to the structure that transmits electrical impulses from the eye to the central nervous system?

Put a (ring) around the correct answer.

effector **receptor** **relay neuron** **sensory neuron**

[1]

This question also assessed AO1. Around half of candidates correctly identified sensory neuron, but many thought that the answer was receptor.

Question 1 (c)

(c) Amir is reading a newspaper but the words look blurry.

When he looks out the window he can see everything outside clearly.

Explain to Amir why the words in the newspaper look blurry and explain how this defect could be corrected.

Explanation .....

.....

.....

Correction .....

.....

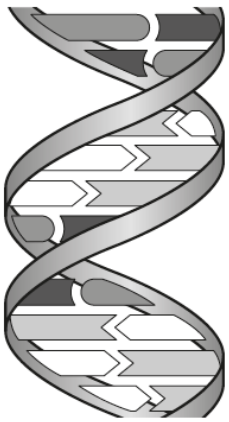
..... **[3]**

Half of candidates gained one or more marks here with more achieving one mark (for identifying Amir as long sighted) than two or three marks. Although some candidates could suggest a correction for the defect, very few were able to explain why Amir was long sighted. Most candidates who did not obtain any marks wrote about wearing glasses or contact lenses or visiting the optician. This question assessed objective AO2.

Question 2 (a) (i)

2 DNA is a polymer made of nucleotides. A nucleotide is made of a sugar, a phosphate and a base.

The diagram shows the structure of DNA.



(a) (i) On the diagram label the location of a base. **[1]**

Question 2 (a) (ii)

(ii) On the diagram label the location of the sugar and phosphate group. **[1]**

On this AO1 question, base was better recognised than the sugar phosphate backbone. Candidates should be encouraged to label using straight lines rather than arrows and take care that their lines touch the diagram. They should also be advised that unless instructed otherwise, only a single line is necessary to identify a feature and that circling large parts of a diagram should be avoided.

Question 2 (b)

(b) DNA has four different bases.

A always pairs with T.
C always pairs with G.

A scientist is analysing a sample of DNA. She works out that 23% of DNA is made up of the base A.

Which **two** statements about the sample are correct?

Tick (✓) **two** boxes.

- 23% of the sample will be the base T. ☐
- 23% of the sample will be the base C. ☐
- 27% of the sample will be the base T. ☐
- 27% of the sample will be the base C. ☐
- 77% of the sample will be the base T. ☐

[2]

Two thirds of candidates obtained one or more marks on this AO1 question. Although many could identify that 23% of the sample would be base T, far fewer were able to use this information to correctly calculate the percentage of C.

Question 3 (a) (i)

3 **(a)** Jack dislikes the taste of sprouts. He thinks they taste bitter. His partner Nina loves the taste of sprouts.

Jack reads that a gene affects how people taste sprouts. There are several variants of this gene.

An individual with the dominant variant, T, can taste a bitter substance in sprouts.

(i) Jack is homozygous for this gene.

What is Jack's genotype?

Tick (✓) **one** box.

- TT ☐
- Tt ☐
- tT ☐
- tt ☐

[1]

This AO2 question was attempted by all candidates, with two thirds selecting the correct answer indicating that they knew the meaning of the term homozygous.

Question 3 (a) (ii)

(ii) Jack wants to know if any of his children will be able to taste the bitter substance.

Nina has the genotype tt.

Complete the Punnett square to show the possible genotypes of any children Jack may have with Nina.

[2]

Candidates were not penalised if they did not correctly identify Jack's genotype, as the punnet square was marked using the genotype identified in 3(a)(i). Many candidates were successfully able to complete the punnet square, although not all of them were then able to correctly derive the probability based on their genetic cross. This question assessed objectives AO2 and AO3.

Question 3 (a) (iii)

(iii) What is the probability that any children born will be able to taste the bitter substance.

Probability = ... **[1]**

Question 3 (a) (iv)

(iv) Jack and Nina have two children, one boy and one girl.

Describe how sex is determined in humans.

.....

.....

.....

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

This AO1 question assessed knowledge in isolation. Candidates who achieved lower overall marks did not understand what they were being asked to do in this question. Some thought it was asking about the physical features which determine a male or a female. A significant number of candidates thought that this question related to the choices individuals make in personal relationships.

Question 3 (a) (v)

(v) Jack and Nina do not want any more children.

They have considered different forms of contraception.

Suggest a form of contraception that would be suitable for them and justify your choice.

.....

.....

.....

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

A large number of candidates could suggest a method of contraception using correct biological terminology. However, they found it more difficult to justify their choice using biological reasons. Many said simply the method would stop Nina becoming pregnant, or referred to the availability, cost or percentage efficacy of the method chosen. This question assessed objective AO1.

Question 4 (a)

4 Cancer of the ovaries is a common type of cancer in women.

(a) Complete the following sentences about cancer.

Put a (ring) around the correct option in each sentence.

Cancer is a **communicable** / **non-communicable** / **sexually-transmitted** disease.

It is caused by changes in the **cell membranes** / **DNA** / **mitochondria**.

The changes cause cells to divide many times by

asexual reproduction / **meiosis** / **mitosis**.

This uncontrolled growth and division creates **an infection** / **fatty deposits** / **a tumour**.

[4]

This question assessed AO1. Almost all candidates scored at least one mark on this question, with many scoring three or four marks. Candidates commonly knew what type of disease cancer is, and what a tumour was. Those who did not score full marks were less confident in equal measures as to the cause of cancer and the type of cell division involved.

Question 4 (b)

(b) The table shows the number of women diagnosed with cancer of the ovaries between 2012–2014.

Age range (years)	Number of cases
Below 20	56
20–29	208
30–39	333
40–49	766
50–59	1300
60–69	1818
70–79	1685
80–89	1020
90+	213

Calculate the percentage of cases seen in women aged 60 and over.

Percentage of cases = ... % **[2]**

The calculation proved a challenge for many, with a third of candidates calculating the answer correctly. Many just added up the women over 60 and divided by 100.

Question 4 (c)

(c) Most women diagnosed with cancer of the ovaries will have an operation to remove their ovaries.

Before the operation, the doctor will discuss the risks of the operation with the patient.

Give **one** example of a risk to the patient.

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

This AO2 question was designed to test how candidates applied their understanding of the Ideas about Science chapter B7. Candidates, including those who obtained higher marks overall, found this question difficult. The majority suggested the risk to be the inability to have children or that the cancer could spread.

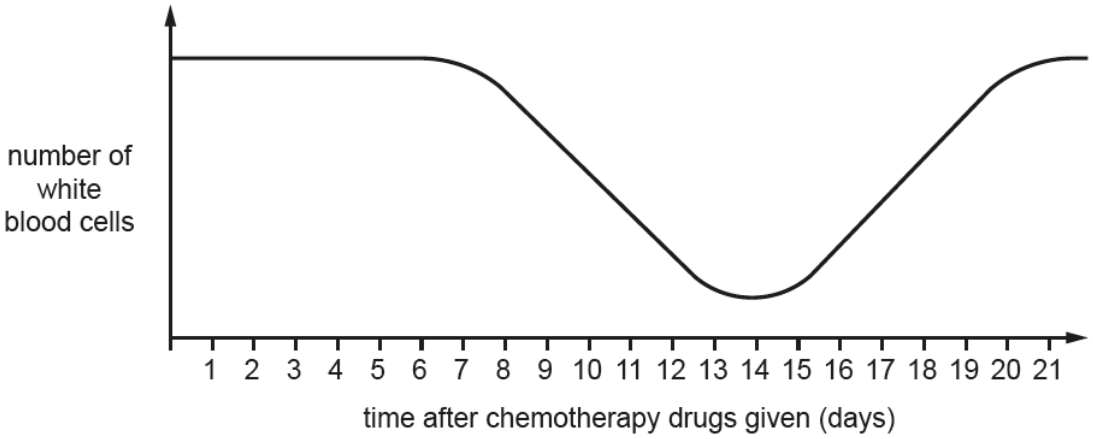
Question 4 (d) (i)

(d) After surgery the patient may be given chemotherapy drugs to kill any remaining cancer cells.

Chemotherapy also affects the number of white blood cells in a patient.

The graph shows what happens to the number of white blood cells during chemotherapy.

The patient receives the chemotherapy drugs on day 1.



(i) Describe what happens to the number of white blood cells after chemotherapy.
Use information from the graph in your answer.

.....

.....

.....

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

Candidates found this AO3 question challenging because they mis-read what they were asked to do. Half of candidates were able to score one or both marks by using information from the graph to describe what happened to the number of white blood cells after chemotherapy. Marks were lost for a number of reasons, namely

- not using information from the graph to describe the trend

- attempting to identify key days on the graph but drawing slanting or inaccurate lines from the line to the x axis

- attempting to explain why the number of white blood cells changed

- using vague descriptions such as "after a couple of weeks the white blood cells slowly start to increase to a suitable amount"

Question 4 (d) (ii)

(ii) Explain how white blood cells protect us from disease **and** how they are adapted for this function.

.....

.....

.....

.....

.....

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

This is an AO1 question. It was clear that candidates had been taught about white blood cells but because they did not use scientific language they lost marks. There were many references to "fighting" and "attacking" pathogens and some candidates were confused between the terms antigen and antibody and on occasion between antibody and pathogen. Very few candidates knew how white blood cells are adapted to their function and were therefore limited to two marks.

Question 4 (d) (iii)

(iii) White blood cells are one component of the blood.

There are three other major components of the blood, which all have specific functions.

Draw a line to link each **blood component** to its **function**.

Blood component	Function
Plasma	Cell fragment that helps the blood clot at injury sites and helps seal wounds.
Red blood cell	Transports dissolved substances such as hormones, urea and food molecules.
Platelet	Contains haemoglobin and transports oxygen around the body.

[2]

This is an AO1 questions. Candidates scored well on this question with most scoring full marks.

Question 4 (d) (iv)

(iv) A chemotherapy patient is told to go to accident and emergency if they feel ill and have a temperature above 38 °C.

Some students have a discussion about why this is important.

Which **two** students made the best suggestions?

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

Almost all candidates were able to score at least one mark here (most often for identifying Eve), with many correctly identifying both candidates. This question assessed objective AO2.

Question 4 (e) (i)

(e) A clinical trial investigated the effect of different combinations of chemotherapy drugs on survival rates of cancer patients.

Two groups of cancer patients were given different combinations of drugs.

- Patients in group **A** were given two drugs: 1 and 2.
- Patients in group **B** were given two drugs: 3 and 4.

(i) A placebo was not used in the trial.

Explain why.

.....

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

Candidates found this AO3 question difficult. They did not seem to realise that the lack of active drug in a placebo would mean the cancer would get worse, or that withholding treatment would be unethical. Most answers centred around the idea that the researchers wanted to compare how the pairs of drugs would work (relative to each other) so didn't need to bother with a placebo.

Question 4 (e) (ii)

(ii) The results of the trial are shown in the table.

	Group A (Drugs 1 and 2)	Group B (Drugs 3 and 4)
Number of people in the trial	**305**	**314**
Number of people still alive two years after treatment	**247**	**222**

What conclusion could be made from these results?

Tick (✓) **one** box.

The drugs given to the patients in Group **A** cured their cancer. ☐

The combination of drugs given to Group **B** was not effective. ☐

The combination of drugs given to Group **A** was the most effective. ☐

The patients in Group **B** were given a placebo. ☐

[1]

Most candidates were able to correctly conclude that the drugs given to Group A were the most effective. This question assessed objective AO3.

Question 4 (e) (iii)

(iii) New drugs are tested to see how safe they are to use and how well they work (their effectiveness).

Put a tick (✓) in **one** box in each row of the table to show what each stage of the drug development process tests for.

Clinical trial stage	Tests for both safety and effectiveness	Tests only for safety	Tests only for effectiveness
Preclinical trial using human cells and animals			
Clinical testing – using healthy human volunteers			
Clinical trials – using humans with the disease			

[3]

This question assessed AO1. Most candidates scored at least one mark on this question, with the majority scoring two marks for identifying the purpose of preclinical trials and trials involving healthy humans. Candidates were less able to correctly identify why clinical trials on humans with a disease are carried out.

Question 5 (a) (i)

5 Jane's dog has arthritis in its hip joint. This makes the joint stiff and painful.

(a) Jane reads an article in a magazine. Here is the article's headline:

Stem cell therapy to help dogs with arthritis

(i) Explain what a stem cell is and why they are used in medicine.

.....

.....

.....

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

After correctly saying that stem cells are unspecialised many candidates did not get the second mark as they did not fully answer the question and explain why the cells are used in medicine. Although the term unspecialised was widely used, candidates did not seem to realise that this means that stem cells are able to specialise into cells that are needed. Some candidates were able to illustrate their answers with excellent examples of when stem cells are used in medicine and therefore did score the second mark. This question assessed objective AO1.

Question 5 (a) (ii)

(ii) The article explains that stem cells were removed from a dog's fat tissues and were then grown in a laboratory.

Explain why a vet would have used aseptic techniques when growing the stem cells.

.....

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

Less than half of candidates scored the mark here, mainly because they did not know what aseptic meant. Incorrect responses commonly suggested aseptic techniques are faster, safer or cleaner. This question assessed objective AO1.

Question 5 (a) (iii)

(iii) Which of the following are also sources of stem cells?

Tick (✓) **two** boxes.

- Bone marrow ☐
- Embryos ☐
- Hair ☐
- Nerve cells ☐
- Red blood cells ☐

[2]

This AO1 question was very well answered with almost all candidates at least one mark (for embryos mainly). A common incorrect response was red blood cells.

Question 5 (a) (iv)

(iv) The use of stem cells in veterinary medicine is increasing but there are no peer reviewed case studies.

Describe the peer review process and explain why peer review is important.

.....

.....

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

This AO1 question was answered correctly by around a third of candidates. Some candidates scored one mark, for being able to explain the purpose of peer review but few were able to describe the process of peer review, often re-wording the question for example "peer review is when a scientist's work is reviewed by a peer".

Question 5 (b)

(b) Dogs have 78 chromosomes.

Complete the table to show the number of chromosomes in different cells of a dog.

Cell	Number of chromosomes
Nerve	78
Skin	
Sperm	

[2]

Half of candidates scored one or two marks here, but many found it difficult to apply their knowledge of the numbers of chromosomes in body cells and gametes. Candidates who did not gain marks either gave the numbers they would expect in human cells or seemed to guess. This question assessed objective AO2.

Question 6 (a) (i)

6 Bulldogs are an example of a breed of dog that has been selectively bred.

(a) (i) Describe how dogs are selectively bred.

.....

.....

.....

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

This AO2 question discriminated well and around two thirds of candidates were able to gain at least one mark, for most often writing about animals with desirable characteristics being chosen by humans. More able candidates then went on to say that these animals were bred together – less able candidates did not develop their ideas sufficiently.

Question 6 (a) (ii)

(ii) Explain the impact of selective breeding on domesticated animals such as dogs.

.....

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

This AO1 question assessed knowledge in isolation. Candidates commonly suggested that certain breeds of dog would become extinct due to selective breeding. Few recognised the impact of selective breeding on the health of domesticated animals.

Question 6 (b)

(b) A cockapoo is a dog that results from the mating of two different breeds of dog; a cocker spaniel and a poodle.

The cockapoo is not a new species.

Explain why.

.....

.....

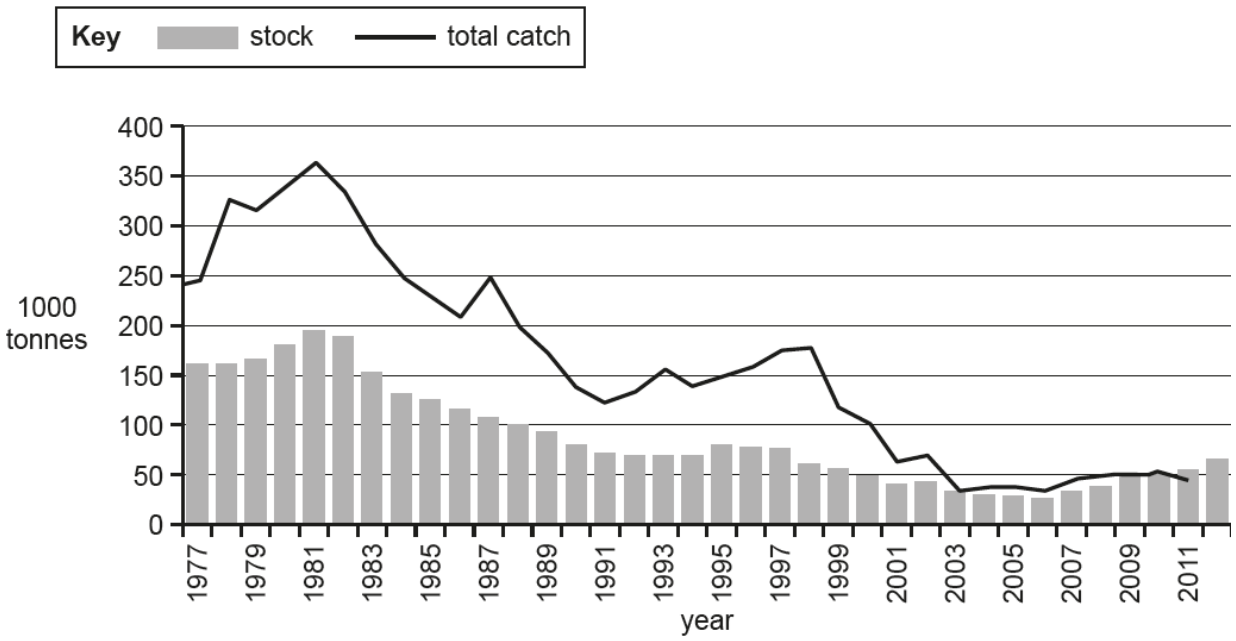
..... **[2]**

Very few candidates, including the higher ability candidates, seemed to understand this AO2 question which required them to apply their scientific knowledge rather than simply recall the definition of a species. They often stated a cockapoo is still a dog and didn't relate this to the definition of a species. A few candidates did realise that cockerpoos can still breed with other dogs to produce fertile offspring.

Question 7 (a) (i)

7 Cod is a type of fish that is served in fish and chip shops. Much of the cod sold in fish and chip shops is caught in the North Sea.

The graph shows the stocks of cod in the North Sea off the coast of Britain and the amount of cod caught (total catch).



(a) (i) Describe and explain the trend shown in the graph.

.....

.....

.....

.....

.....

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

Candidates found this AO3 question very challenging and two thirds of them did not score any marks. There were three problem areas. Firstly, candidates did not start to describe the trend from the beginning of the graph, starting instead around 1981 and therefore saying just that the numbers of fish decreased (without linking this to appropriate dates in the graph). Secondly, candidates were distracted by the fluctuations in the graph with some describing almost every rise and fall. Finally, many candidates used up most of the answer space describing the graph with very few realising that they also had to explain the trend. Candidates that did attempt to explain the trend were confused by the term stock. Many believed that the stock meant that on shop shelves and that it was dependant on the catch. They explained at length how catching less fish meant that there was less stock to sell.

Question 7 (a) (ii)

(ii) In 2002 very little cod was served in fish and chip shops, instead haddock was used.

Use the graph to explain why cod was removed from the menu.

.....

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

Again, candidates misunderstood the word "stock" in this AO3 question which led to answers suggesting cod was removed because there wasn't enough being caught, and therefore "in stock" in the shops.

Question 7 (a) (iii)

(iii) Human activities are having an impact on the biodiversity of the Earth.

Explain why it is important to conserve biodiversity.

.....

.....

.....

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

This AO1 question discriminated between higher and lower ability candidates. Some were able to express ideas about interdependence and mentioned the link with finding new medicines. Other candidates seemed to have only a limited understanding of what the term biodiversity means. Candidates lost marks because their answers focused on how biodiversity can be conserved rather than why is should be. Answers were often vague and referred to pollution and other human influences on the environment, global warming and protecting habitats, ecosystems and species. Few referred to genetic diversity.

Question 7 (a) (iv)

(iv) Fish such as cod reproduce sexually.

Give **one** advantage of cod reproducing sexually.

.....

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

Candidates misinterpreted this AO1 question, not realising the main advantage of sexual reproduction is causing genetic variation. Candidates often believed that this type of reproduction would quickly replace cod.

Question 7 (b) (i)

(b) Fish are an important source of protein in our diet.

Ben wants to show that fish contain protein.

He uses the following method:

1. He adds a small sample of fish to a test tube.
2. He adds a small amount of Benedict's solution to the sample.
3. He observes a colour change.

(i) Ben's friend thinks he has made a mistake in his method.

Describe the mistake Ben has made and how he should correct it.

Mistake .....

.....

Correction .....

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

Candidates found this AO1/AO2 question challenging and most did not score any marks. It appeared that they had either not carried out practical work, or not recognised the importance of revising practical techniques. Candidates who recognised a different test was needed for protein often picked the wrong one. Many were looking for an improvement to the method that was used rather than realising that it was using the wrong test. Centres are advised that it is compulsory that candidates complete at least eight practical activities as set out in Chapter 8 of the specification.

Question 7 (b) (ii)

(ii) What change would Ben observe when using the correct method?

Tick (✓) **one** box.

- Colourless to cloudy white emulsion ☐
- Light blue to lilac/purple ☐
- Red-brown precipitate formed ☐
- Pale brown to blue-black ☐

[1]

A third of candidates were able to give the correct response with other incorrect responses given with a similar frequency. This question assessed objective AO1.

Question 8 (a) (i)

8 The Galapagos Islands are a group of 13 islands found in the Pacific Ocean.

(a) Charles Darwin visited the Galapagos Islands during the 19th century.

He collected samples and made many observations.

This work helped Darwin to develop a new explanation for the evolution of species.

(i) Which of the following are observations made by Darwin?

Tick (✓) **two** boxes.

There are differences between fossils and living examples of similar organisms.	☐
Pea plants with red flowers can produce offspring with white flowers.	☐
There is usually extensive variation within a population of a species.	☐
Some bacteria have become resistant to antibiotics.	☐
Isolated populations of the same species living in different places have different characteristics.	☐

[2]

Most candidates scored one or both marks on this AO1 question. A common incorrect response was that Darwin observed extensive variation within a population of a species.

Question 8 (a) (ii)

(ii) Darwin suggested a theory to explain his observations.

Write down the name of the theory he suggested.

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

This question also assessed objective AO1. Many candidates incorrectly named the theory as evolution with no reference to natural selection.

Question 8 (b) (i)

(b) Algae live in the marine environment around the Galapagos Islands.

Photosynthesis takes place in the cells of algae.

(i) In which cell structure does photosynthesis take place?

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

This question assessed AO1. A third of candidates gave the correct answer. Incorrect responses included plant, cell, cell membrane and mitochondria.

Question 8 (b) (ii)

(ii) Many factors can limit the rate of photosynthesis.

Which factor will **not** limit the rate of photosynthesis in the algae?

Put a (ring) around the correct answer.

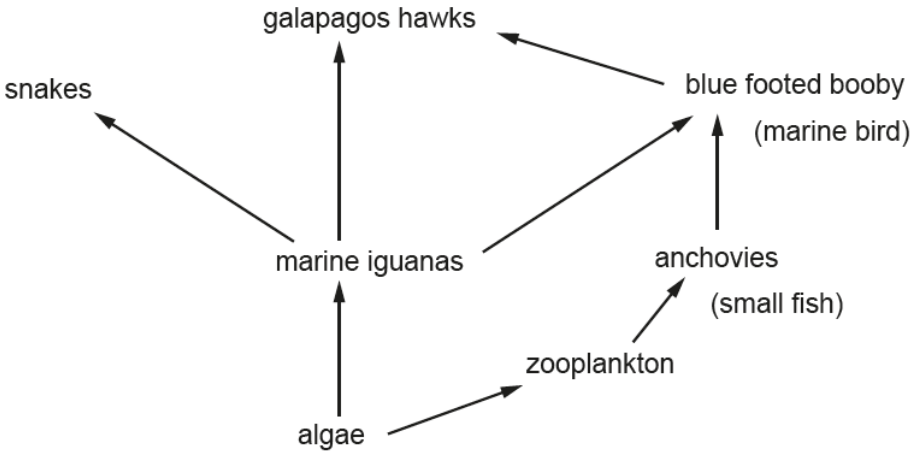
carbon dioxide concentration **light intensity** **temperature** **water availability**

[1]

Just over a third of candidates correctly identified water availability as the factor that would not limit the rate of photosynthesis in the algae in this AO1 question.

Question 8 (c) (i)

(c) The food web shows the feeding relationships of some Galapagos Islands species.



(i) A weather event called El Niño occurs every three years. This causes the population of algae to decrease.

Explain what effect this could have on the population of marine iguanas.

.....

.....

.....

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

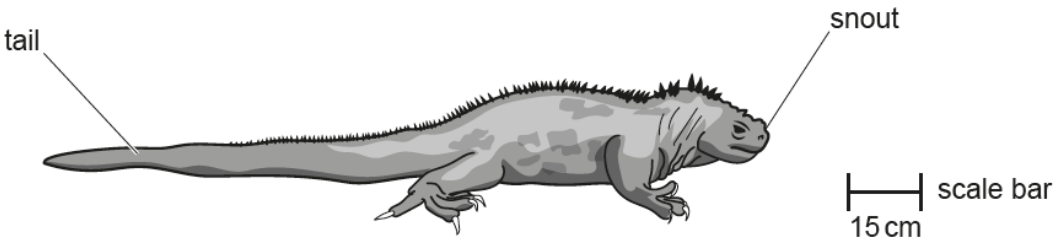
Three quarters of candidates scored at least one mark here and examination technique was the most common reason for lost marks. For example, rather than writing that if the algae decreased the iguana population would decrease because of less food, some candidates used absolutes such as "no food" and "the iguanas would become extinct". Other candidates misunderstood the food web and thought that the algae ate the iguanas, and a significant number of candidates wasted time writing about the effect on all of the other species and not the one that they were asked about. This question assessed objective AO2.

Question 8 (c) (ii)

Scientists have discovered that during this event the marine iguanas can shrink in size.

(ii) The length of the marine iguana is determined by measuring the distance from the snout to the end of the tail.

Below is a drawing of a marine iguana.



Use the scale bar to calculate the actual length of this marine iguana in metres.

Length of marine iguana = ... m **[2]**

This question was assessing mathematical skill M1c. Almost all candidates were able accurately measure the length of the iguana in cm. 10% of candidates were able to work out the length of the animal in cm but not convert this to m, and around half of candidates could complete the second part of the calculation and convert cm into m. Those who did not score any marks were unable to use the scale bar.

Question 8 (c) (iii)

(iii) Some marine iguanas can shrink by up to 20% of their original length.

Calculate the length of this marine iguana after maximum shrinkage.

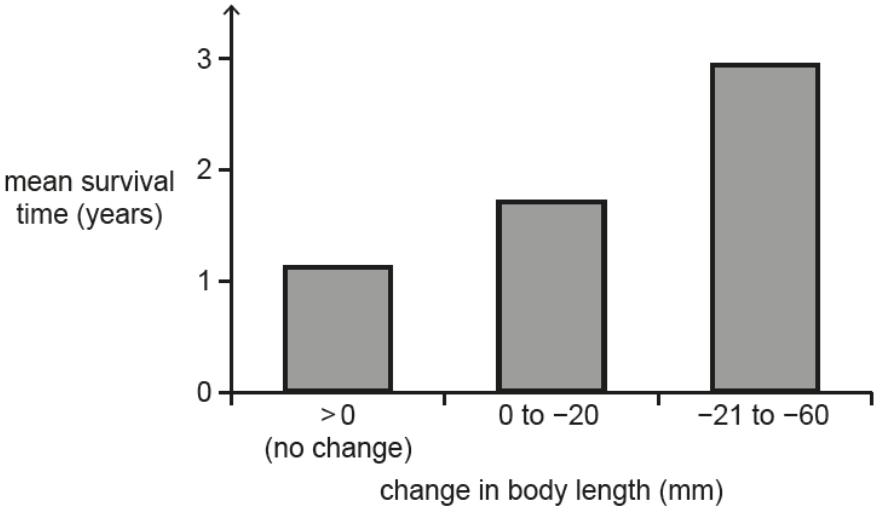
Length after maximum shrinkage = ... m **[1]**

As with 8 (c) (ii) this question assessed mathematical skill M1c and half of candidates were able to calculate the length after 20% reduction. A common error was to calculate 20% of the length of the iguana and not subtract this from the original length.

Question 8 (c) (iv)

Scientists calculated the change in body length of the iguanas and measured how long they survived during the El Niño event.

The results are shown in the graph.



(iv) What can be concluded from the data?

Tick (✓) **two** boxes.

- The marine iguanas that decreased in size the least survived longer. ☐
- The change in body length made no difference to the survival time of the marine iguanas. ☐
- The marine iguanas that decreased in size the most on average lived for a greater length of time. ☐
- The marine iguanas that did not decrease in size survived for approximately 2 years less than the marine iguanas that decreased in size by up to 60 mm. ☐
- The marine iguanas that decreased in size by 20 mm survived more than double the length of time than those that did not change in size. ☐

[2]

Candidates scored well on this question with almost all obtaining at least one mark on this AO3 and mathematical skills question, and half scoring two marks.

Question 9 (a)

9 A student is carrying out a field investigation to determine the population of woodlice in the school's wildlife garden.

(a) Describe a method the student could use to determine the population size of woodlice.

.....

.....

.....

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

Candidates found this AO2 question challenging. Most candidates did not give the expected answer of the capture-mark-recapture method, but some were able to obtain one or two marks by referring to the alternative of using a quadrat. Candidate responses gave the impression that practical fieldwork techniques are not always being explicitly taught and candidates are not consistently given the opportunity to carry out techniques for themselves. Marks were lost by spelling quadrat incorrectly e.g. quadrant and suggesting that the quadrat is thrown rather than placed randomly. Candidates who went on to score higher marks overall recognised the need to repeat counts and calculate a mean, and a few were able to explain how to calculate an estimate of the population based on the area of the quadrat and the area of the garden.

Question 9 (b)

(b) Woodlice are often found under logs and bark where it is damp.

Suggest why woodlice prefer damp places.

.....

.....

.....

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

A minority of candidates answered this AO2 question correctly. Many incorrect responses were given because candidates had not recognised the importance of the word damp - often interpreting it as dark - and had explained that woodlice were found under logs so they could hide from predators.

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