

Examiners' report

GCSE

TWENTY FIRST CENTURY SCIENCE BIOLOGY B

**OCR Level 1/Level 2 GCSE (9-1) in
Biology B (Twenty First Century Science)**

J257

For first teaching in 2016

J257/01 Summer 2025 series

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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 responses is 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 [Teach Cambridge](#).

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Paper 1 series overview

Two foundation tier papers assess Biology B (21st Century Science) and J257/01 is the first of these papers. The specification content of J257 Biology B is divided into eight chapters. Chapters 1-6 describe the Science content of the specification. Chapter 7 describes 'Ideas about Science' and covers the requirements of 'Working Scientifically'. Chapter 8 sets out the requirements for practical skills. The Breadth in Biology paper assesses content from across the whole specification. The paper comprises short answer questions generally worth up to three marks, such as structured questions, calculations and questions based on practical skills. There are no Level of Response questions on J257/01.

Candidates appeared to have been entered for the correct tier and had sufficient time to answer questions to the best of their ability. Engagement with the paper seemed high, with some candidates producing exemplary answers full of detail and depth. Most questions were attempted, including the more difficult ones and a very wide spread of marks was obtained.

Candidates generally understood and followed the instructions for each question, including command words. However, it appeared that not all information given in a question (for example Question 8 (c) and 4 (b) (ii)) was noted – perhaps it was skimmed over – which impacted on the quality of some answers.

Candidates continued to demonstrate greater confidence in mathematical skills, and it was particularly apparent this year that candidates recognised the importance of showing their working in calculations.

Questions common to the foundation and higher tier papers were Questions 9 and 10.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• applied their knowledge to unfamiliar situations, e.g. Question 4 (c) • interpreted a wide variety of data correctly,, e.g. Question 4 (b) (i) and 6 (d) • read questions carefully taking note of the command words and engaged fully with the content, e.g. Question 8 (c) • gave relevant and focused, rather than generic, responses, e.g. Question 5 (b) (ii) • demonstrated a range of mathematical skills and showed their working, e.g. Question 4 (a) (i) • used scientific terminology accurately, especially specialist biological terminology, e.g. 7(b)(i) and terminology associated with quantities, e.g. Question 10 (d)	• demonstrated limited knowledge of practical work, e.g. Question 4 (b) (iii) and 9 (d) • did not use scientific terminology, e.g. used the word amount rather than mass or volume in Question 10 (d) • omitted to attempt some questions. • demonstrated a lack of knowledge of basic ideas such as the structure and function of cells, organs, and organ systems, e.g. Question 3 and food webs, e.g. Question 2

Question 1 (a)

1 This question is about health.

(a) Which statements about health and disease are **true** and which are **false**?

Tick (✓) **one** box in each row.

	True	False
A healthy person has good mental and physical health.		
An unhealthy person always shows symptoms of disease.		
An unhealthy person is more likely to get other diseases.		
Only pathogens cause disease.		

[3]

All candidates answered this question. For those who did not obtain all three marks, the most common error was that candidates believed the statement 'a healthy person has good mental and physical health' to be false. The next most common misconception was 'only pathogens cause disease', which candidates incorrectly identified as true.

Question 1 (b)

(b) Draw lines to connect each **treatment** to the correct **named disease** it is used to treat.

Treatment	Named disease
	Cardiovascular disease
Antibiotics	HIV
Insulin	<i>Salmonella</i>
	Type 1 diabetes

[2]

Most candidates were able to obtain at least one mark on this question. The treatment of Type 1 diabetes was well known, but HIV was often thought to be treated with antibiotics. A minority of candidates drew multiple lines from a treatment to several diseases.

Question 1 (c)

(c) Which **two** of these diseases are communicable?

Tick (✓) **two** boxes.

Cardiovascular disease

☐

HIV

☐

Salmonella

☐

Type 1 diabetes

☐

[2]

Most candidates were able to successfully identify the two communicable diseases. Some candidates only ticked one box, and therefore only obtained one mark. Others correctly selected HIV but also incorrectly identified cardiovascular disease as a communicable disease.

Question 1 (d) (i)

(d)

(i) Complete the sentences to describe the cause and transmission of malaria.

Use words from the list.

bacteria

blood

mosquito

protist

urine

virus

Malaria is caused by a type of pathogen called a

It is transmitted when an infected person is bitten by a

The organism sucks from the infected person and passes the pathogen to another person when it bites them.

[3]

In this question, mosquito for the second sentence and blood for the third were frequently selected. The pathogen that causes malaria was less well known, with virus and bacteria given as answers.

Question 1 (d) (ii)

(ii) Suggest **one** way that the transmission of malaria can be prevented.

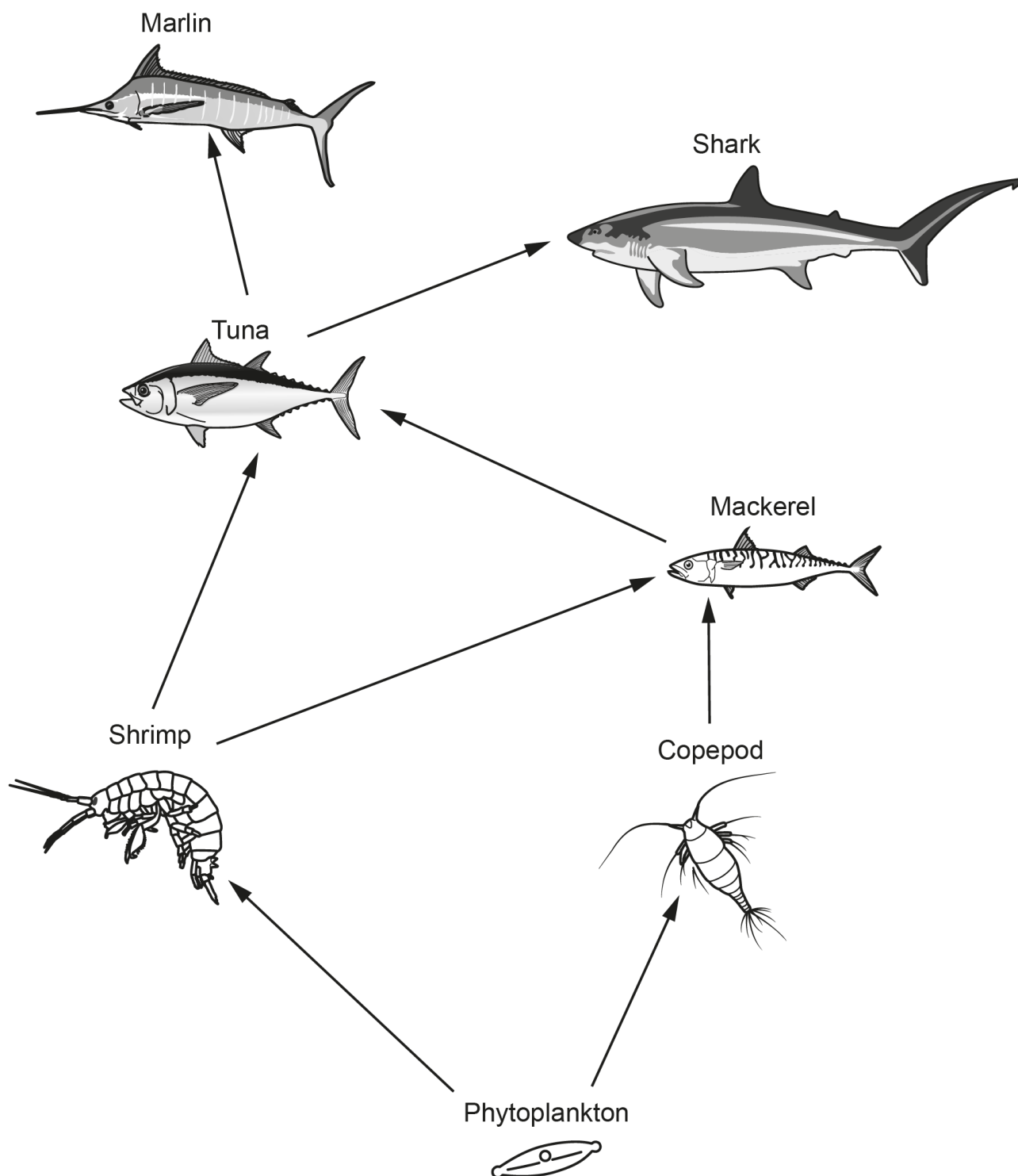
.....
..... [1]

This question was well answered. Suggestions were relevant to the disease and rarely generic.

Question 2 (a)

2 Fig. 2.1 shows part of a food web for a marine ecosystem.

Fig. 2.1



(a) Complete the sentences to describe the organisms in **Fig. 2.1**.

Use words from the list.

copepod	mackerel	primary consumers
producers	secondary consumers	tuna

Phytoplankton are

Shrimp are

An organism that feeds at two different trophic levels is the

[3]

Most candidates obtained two marks on this question. They were confident in identifying phytoplankton as producers, and shrimp as primary consumers. Candidates found it more difficult to identify the organism that feeds at two different trophic levels. Secondary consumers was frequently selected for the third sentence.

Question 2 (b) (i)

(b) Mercury is a heavy metal that can enter the water.

The mercury is absorbed by the smaller organisms which are at the start of the food web.

(i) Complete the food chain to show how the mercury that enters the body of a copepod can enter a tuna fish.

Phytoplankton → Copepod → →

[2]

Almost all candidates answered this question correctly.

Question 2 (b) (ii)

(ii) Mackerel, marlin and tuna will accumulate different amounts of mercury in their bodies.

Write these **three** fish in order from the one that contains the **most** mercury to the one that contains the **least** mercury.

Use words from the list.

mackerel	marlin	tuna
----------	--------	------

Most mercury

.....

Least mercury

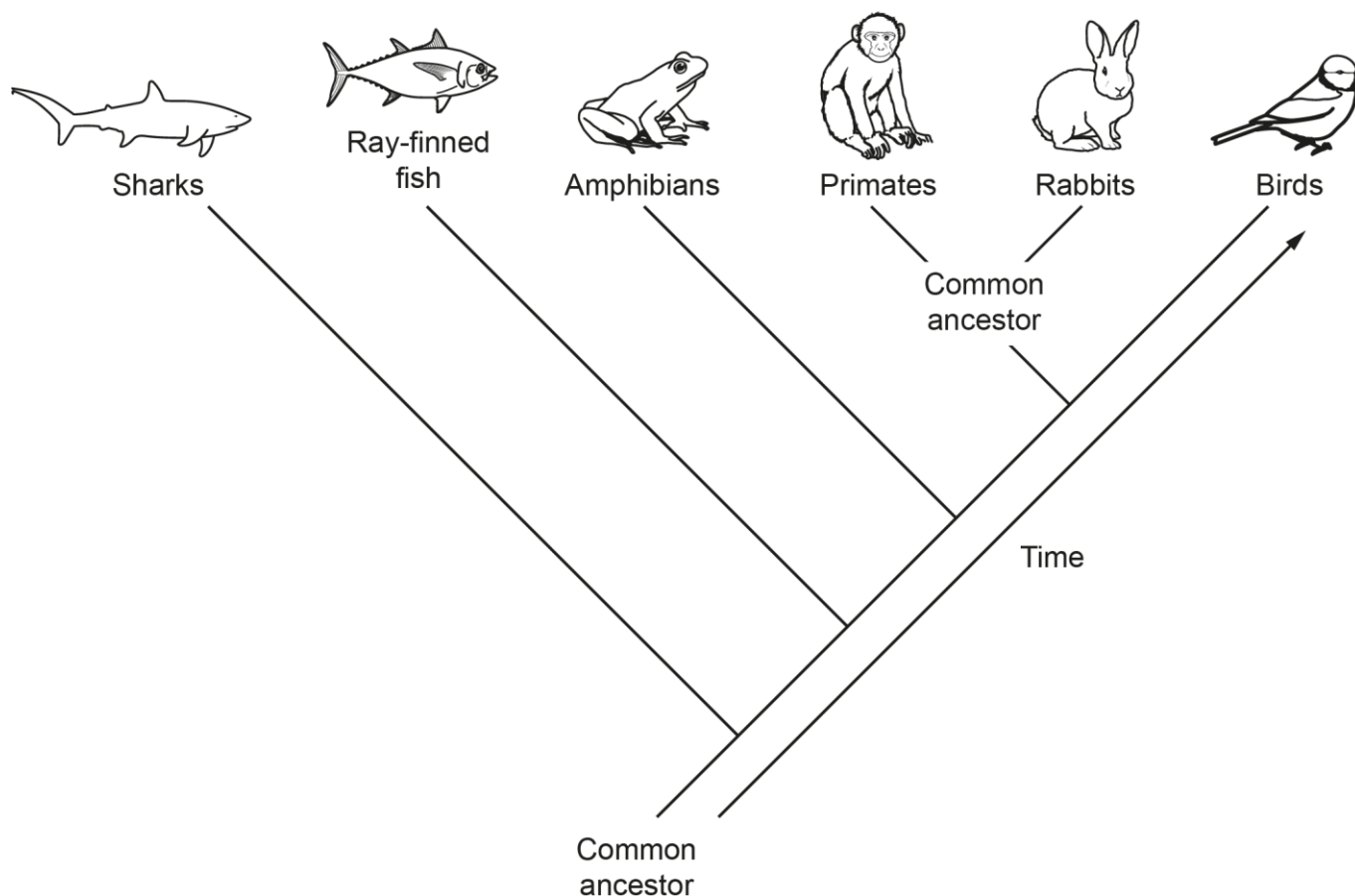
[2]

Most candidates obtained at least one mark, for placing tuna in the middle of the order. Many candidates incorrectly identified that mackerel had the most mercury and marlin the least. This could be because they muddled up most and least. However, a potential misconception was identified in notes in the answer space. It was written that as biomass decreases as you move from one trophic level to the next, then because there is less biomass, there is less mercury.

Question 2 (c) (i)

(c) Fig. 2.2 shows the evolutionary relationship of sharks to other organisms.

Fig. 2.2



(i) Which organism from Fig. 2.2 are sharks **most** closely related to?

..... [1]

Almost all candidates answered this question correctly.

Question 2 (c) (ii)

(ii) Which organism from **Fig. 2.2** are primates **most** closely related to?

Tick (✓) **one** box.

Amphibians

☐

Birds

☐

Rabbits

☐

[1]

Almost all candidates answered this question correctly, with no particular incorrect organism selected.

Question 3 (a)

3 To survive, organisms must detect and respond to changes in their internal and external environment.

The human body has two systems that coordinate responses:

- The nervous system.
- The hormonal system.

(a) Which of these statements apply to the **nervous system** and which apply to the **hormonal system**?

Tick (✓) **one** box in each row.

	Nervous system	Hormonal system
Response is faster.		
Response is longer lasting.		
Response is the result of an electrical impulse.		

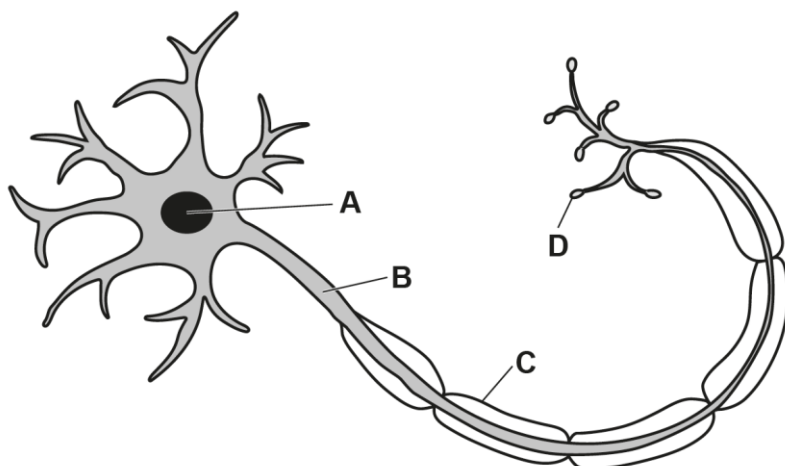
[2]

Candidates demonstrated a sound knowledge of the features of the nervous and hormonal system, with most obtaining both marks.

Question 3 (b) (i)

(b) Fig. 3.1 shows a diagram of a neuron.

Fig. 3.1



(i) Which labelled structure, **A**, **B**, **C** or **D** is the axon?

..... [1]

Candidates who did not answer this question correctly often selected D as the axon, followed by A.

Question 3 (b) (ii)

(ii) Which labelled structure **A**, **B**, **C** or **D** is the fatty sheath?

..... [1]

Most candidates were able to identify C as the fatty sheath.

Question 3 (b) (iii)

(iii) What is the function of the fatty sheath?

.....
 [1]

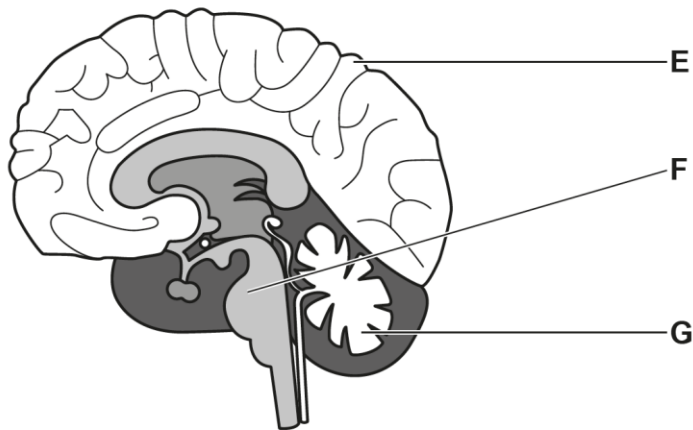
On the whole, candidates did not appear to be confident in their knowledge of the function of the fatty sheath. Many suggested that the role of the fatty sheath is simply 'protection' with no further elaboration, and did not refer to the role of the fatty sheath in increasing impulse transmission speed.

Question 3 (c)

(c) The brain consists of billions of neurons.

Fig. 3.2 shows a diagram of the brain.

Fig. 3.2



Which labelled structure **E**, **F** or **G** is the cerebellum?

..... [1]

Around half of all candidates successfully identified the cerebellum. There was no particular other letter selected.

Question 3 (d) (i)

(d) During surgery, patients may be given medication or a nerve block.

(i) A patient is given some medication. Their breathing and heart rate slow down.

Which part of the brain must the medication be affecting?

Tick (✓) **one** box.

Brain stem	☐
Cerebellum	☐
Cerebral cortex	☐

[1]

Just under half of all candidates successfully identified the brain stem. Cerebellum and cerebral cortex were incorrectly selected in equal measure.

Question 3 (d) (ii)

- (ii) A nerve block is injected into the space around the spinal cord of another patient. The patient is then unable to move their legs.

Which type of neuron must the nerve block be blocking?

Tick (✓) **one** box.

Motor

☐

Relay

☐

Sensory

☐

[1]

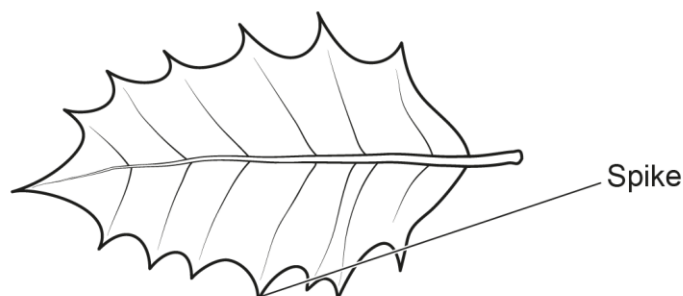
More than half of all candidates deduced that the nerve block impacted the motor neuron. Almost all incorrect responses chose sensory.

Question 4 (a) (i)

4 Holly is a species of plant found in woodlands in the UK.

Holly leaves are eaten by sheep and deer.

The diagram shows a holly leaf.



- (a)** A student collects five holly leaves from the same part of a holly plant. They count the number of spikes on each leaf.

Table 4.1 shows the data they collect.

Table 4.1

Holly leaf	Number of spikes
A	5
B	7
C	7
D	6
E	7

- (i)** Calculate the mean number of spikes for the holly leaves shown in **Table 4.1**.

Give your answer to the nearest **whole number**.

Mean = **[3]**

The majority of candidates correctly calculated the mean and expressed this value as a whole number. Most candidates showed their working and were able to be given one or two marks even if their final answer was incorrect.

Question 4 (a) (ii)

(ii) State the mode for the number of spikes on the holly leaves shown in **Table 4.1**.

Mode = [1]

Almost all candidates correctly stated the mode as 7.

Question 4 (b) (i)

(b) The student observes that the number of spikes on a holly leaf changes depending on the position of the leaf on the plant.

The student investigates this further by following this method:

- Collect five leaves from seven different positions on the plant.
- Measure how high each position is from the ground.
- Calculate the mean number of spikes on the five leaves collected from each position.

Table 4.2 shows the data they collect.

Table 4.2

Height from ground (m)	Mean number of spikes per leaf
0.25	8
0.50	7
0.75	7
1.00	5
1.25	3
1.50	2
1.75	0

(i) Describe the pattern shown by the results in **Table 4.2**.

.....
 [1]

The majority of candidates successfully described the pattern, expressing themselves succinctly and clearly, with no imprecise language.

Question 4 (b) (ii)

(ii) Suggest an explanation for the pattern shown by the data in **Table 4.2**.

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

Candidates found this question challenging. It would appear that they missed some of the key information from earlier in the question i.e. holly is eaten by sheep and deer. It was evident that some candidates had underlined or highlighted this key information, and their approach helped them to focus on important points and not lose sight of them later on.

Incorrect responses that occurred regularly included the following:

- repeating the answer given in Question 4 (b) (i)
- the plant grew more spikes closer to the ground because it obtained more minerals or water
- the wind blew the spikes off leaves higher up
- the rain on leaves higher up caused fewer spikes
- more sunlight higher up meant fewer spikes

Question 4 (b) (iii)

(iii) Describe how the student could investigate whether the results are repeatable.

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

Candidates frequently answered simply 'repeat the investigation' with no further explanation. Given that the term 'repeatable' was already in the question, this type of answer was not sufficiently detailed enough to gain credit.

OCR support



The [Language of measurement in context](#) exemplifies key terminology such as repeatability. It defines key terms used in practicals, as well as showing them in use in the context of a specific practical.

Question 4 (c)

(c) Holly bushes do **not** lose their leaves in winter. The leaves stay green all year round.

Explain how this is an advantage to the plant.

.....

.....

.....

..... [2]

Although many candidates found this question challenging, there were some very good answers that demonstrated candidates had made the link between staying green (retaining chlorophyll) and being able to photosynthesise all year round.

Question 4 (d)

(d) Which vessel in the holly plant transports water and mineral ions to the leaf?

Tick (✓) **one** box.

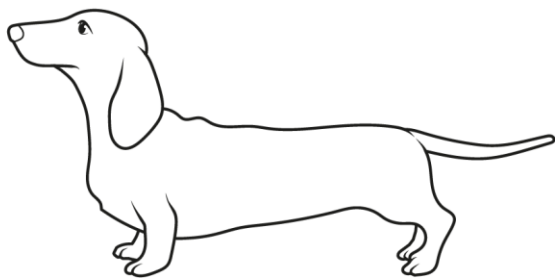
Artery	☐
Capillary	☐
Phloem	☐
Xylem	☐

[1]

Over half of all candidates correctly selected xylem, the remainder for the most part incorrectly selected phloem.

Question 5 (a) (i)

5 The diagram shows a breed of small dog that has been selectively bred.



(a) These dogs with short legs have been bred from taller hunting dogs.

(i) The statements describe the steps in the process.

They are **not** in the correct order.

- A Select the offspring with short legs and breed again.
- B Breeders select a male and a female hunting dog with short legs.
- C Continue to do this for many generations.
- D Breed the two selected individuals together.

Write the letters in the boxes to show the correct order of the steps.

--	--	--	--

[3]

Candidates demonstrated sound knowledge of the process of selective breeding, with the majority obtaining all three marks on this question.

Question 5 (a) (ii)

(ii) There are 39 chromosomes in the **gametes** of a dog.

How many chromosomes are in the **body cells** of a dog?

Tick (✓) **one** box.

156	☐
78	☐
46	☐
39	☐

[1]

The majority of candidates correctly identified that the body cells of a dog would contain 78 chromosomes. 39 was the most common option selected in error which might suggest that some candidates are unsure as to the meaning of the term gamete.

Question 5 (a) (iii)

(iii) When two dogs are mated a zygote will form. The zygote will divide to form an embryo.

What type of cell division will produce the cells of the embryo?

..... [1]

Around a third of candidates correctly stated that the cells of the embryo are produced by mitosis. Meiosis was the most common incorrect response given.

Question 5 (a) (iv)

(iv) The cells of the embryo will become specialised and form tissues with particular functions.

What causes the cells to become specialised?

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

While a relatively small number of candidates suggested differentiation, almost no one stated that cells specialise by genes switching on/off. Responses offered ranged from 'stem cells' to 'meiosis' but at least candidates attempted an answer rather than leaving the space blank.

Question 5 (b) (i)

(b) Some breeds of dogs are more susceptible to cataracts which affect their vision.

(i) Which part of the eye do cataracts affect?

Tick (✓) **one** box.

Cornea	☐
Iris	☐
Lens	☐
Retina	☐

[1]

Lens was selected by approximately half of all candidates. The distractors were selected relatively equally.

Question 5 (b) (ii)

(ii) Dogs can have surgery for cataracts.

Give **one** benefit and **one** risk of this treatment.

Benefit

.....

Risk

.....

[2]

Candidates engaged very well with this question. There was a wide variety of sensible suggestions that were relevant to the question and not just 'generic' answers such as writing 'side effects' as a risk. The majority of candidates were given at least one mark, with around two thirds obtaining both marks.

Some candidates wrote that surgery would stop the dog being affected – this answer was not specific enough. *How* would the dog not be affected? It may be worth mentioning here the use by candidates of the word 'effect' in their answers. An effect can be a good or a bad thing so candidates should be advised that they should always qualify the word effect and explain what the effect would be. Affect or effect can be used without further explanation in a question as candidates may be expected to deduce what the effect might be.

Question 6 (a) (i)

6 It is important that the human body maintains blood plasma at the correct concentration.

(a) Blood plasma can become too concentrated.

(i) Complete the sentence to explain what happens to body cells if the blood plasma becomes too concentrated.

Use words from the list.

active transport

burst

into

osmosis

out of

shrink

If the blood plasma becomes too concentrated, water will move body cells by and the cells will

[2]

Candidates found this question relatively challenging. Around half were able to obtain one or two marks. There was no particular trend identifiable regarding the selection of words in the list.

Question 6 (a) (ii)

(ii) Suggest what can cause blood plasma to become too concentrated.

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

A variety of incorrect responses were commonly given in response to this question such as drinking too much, too much water in the blood, poor diet, blood clots and infection. Most candidates were unable to obtain a mark here.

Question 6 (b) (i)

(b) The kidneys filter excess water from the blood.

(i) State the name of **one other** substance filtered from the blood by the kidneys.

..... [1]

Urea was the intended answer, but credit was given for plausible and physiologically correct alternatives so approximately a third of candidates obtained a mark. Incorrect responses included water (already given in the question), food, urine, various gases and red blood cells.

Question 6 (b) (ii)

(ii) Kidneys filter around 180 litres of blood plasma a day.

The volume of blood plasma in an average person is approximately 3 litres.

Calculate how many times per day an average person's blood plasma is filtered by the kidneys.

Number of times per day blood plasma is filtered = [2]

Most candidates correctly calculated the number of times per day the plasma is filtered. Those that didn't tended to multiply 180 by 3 rather than divide.

Question 6 (c)

(c) Some people have kidney disease. This stops their kidneys from working efficiently.

One solution for these people is to have a kidney transplant. A kidney is taken from a donor and put into the body of the person with kidney disease.

Suggest why it is common for kidneys to be donated by **living relatives** of the person receiving the kidney.

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

Candidates understood well the concept of organ compatibility and rejection and there were many sensible and well thought out answers suggested, which meant that the majority of candidates obtained a mark on this question. Some candidates incorrectly suggested that the size and shape of kidneys would be more similar in relatives, or that relatives would be healthier, or that the procedure would be safer.

Question 6 (d)

(d) The graph shows information about organ transplants.

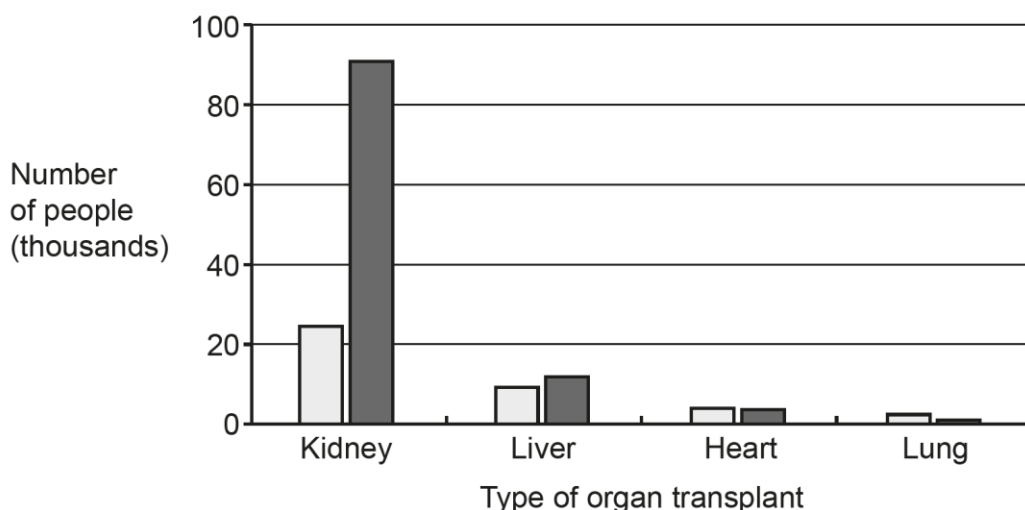
It shows:

- the number of people who received one of four types of transplant in a year
- the number of people remaining on the waiting lists for these transplants.

Key:

 Organ transplants received

 Patients remaining on the waiting list



Which conclusions from the graph are **true** and which are **false**?

Tick (✓) **one** box in each row.

	True	False
The number of kidney transplants received each year is greater than the number of liver, heart and lung transplants received altogether.		
The proportion of transplants received compared to the number of people remaining on the waiting list is smallest for kidney transplants.		
The waiting list is highest for kidney transplants.		
The waiting list is lowest for heart transplants.		

[2]

Most candidates obtained one mark on this question for correctly classifying three, rarely two, conclusions.

Question 7 (a) (i)

7 An organism is found preserved in some wetlands.

The organism stopped living over 2000 years ago but was **not** decomposed by microorganisms.

(a) The wetlands the organism is found in are acidic and the oxygen content is low.

(i) Complete the sentences to explain why the organism was **not** decomposed.

Use words from the list.

active site

breathe

photosynthesise

product

respire

substrate

The acidic conditions of the wetlands caused the of the enzymes produced by the microorganisms to change shape so the did not fit.

This slowed down the enzyme catalysed reactions.

Without oxygen the microorganisms were unable to

[3]

For candidates who did not obtain all three marks, substrate was given for sentence one and active site for sentence two. This suggests that candidates' knowledge of enzyme and substrate structure is not well known. Photosynthesise was often selected for the third sentence.

Question 7 (a) (ii)

(ii) Enzymes are proteins.

Which small molecules are used to make proteins?

Tick (✓) **one** box.

Amino acids

☐

Fatty acids

☐

Glucose

☐

Glycerol

☐

[1]

Most candidates knew that amino acids are used to make proteins. There was no particular other incorrect answer selected.

Question 7 (b) (i)

(b) There are many types of wetlands which are all habitats with unique biodiversity.

(i) Explain what is meant by the term biodiversity.

.....

.....

.....

..... [2]

A small number of candidates did not attempt this question and most found it challenging. Some issues and misconceptions were evident in their responses - mainly that biodiversity only relates to animals and/or plants, it includes non-living factors or that it means conservation.

Question 7 (b) (ii)

(ii) State **two** reasons why conserving biodiversity is important.

1

.....

2

.....

[2]

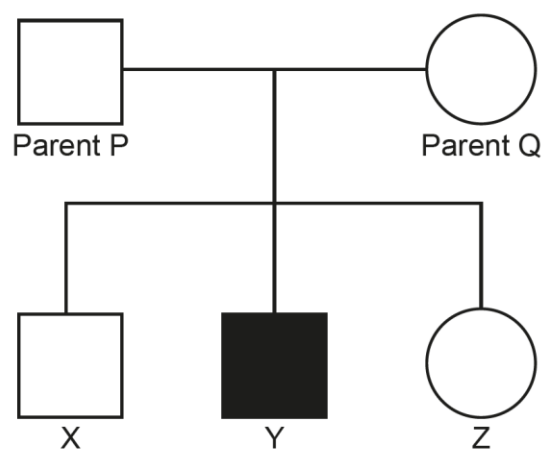
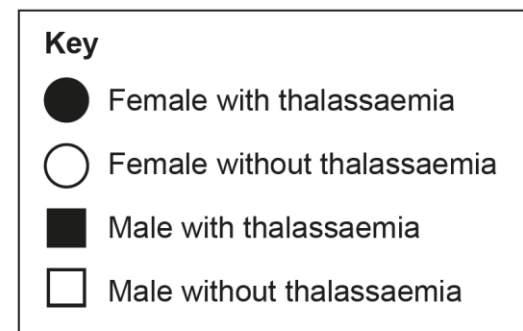
A large range of reasons were accepted, but candidates still found this question challenging. Answers tended to be vague and rooted in everyday life rather than Science – such as protect or benefit nature or keep the world alive.

Question 8 (a)

- 8 Thalassaemia is an inherited genetic disorder caused by a recessive allele.

The diagram shows a family tree.

It includes two parents and their three children.



- (a) How many of the three children have thalassaemia?

Number of children with thalassaemia = [1]

Most candidates correctly identified that there was one child with thalassaemia.

Question 8 (b) (i)

(b) Both parents have one recessive allele and one dominant allele.

(i) Which of the following describes the parents' genotype?

Tick (✓) **one** box.

Heterozygous

☐

Homozygous dominant

☐

Homozygous recessive

☐

[1]

Around half of candidates identified that the parents were heterozygous.

Question 8 (b) (ii)

(ii) The parents decide to have another child.

Complete the Punnett square to find the probability that the child will have thalassaemia.

Use **T** to represent the dominant allele and **t** to represent the recessive allele.

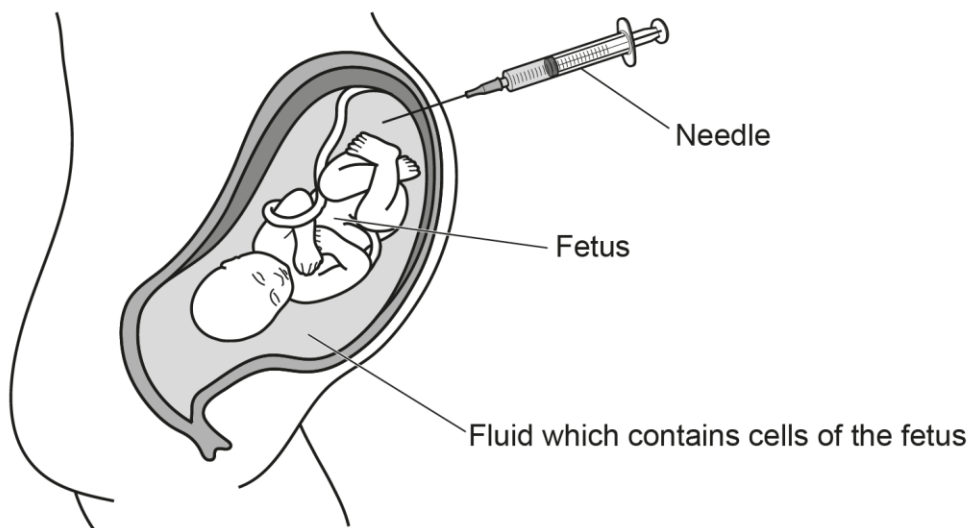
		Male	
Female			

Probability that the child will have thalassaemia = [3]

Candidates answered this question very well, almost all obtained at least one mark, and many obtained two or three marks. More candidates demonstrated that they knew gametes only have one allele for a particular gene. In previous series, some candidates expressed gamete genotypes as TT, Tt or tt rather than T or t – this was rarely seen this year. Candidates also derived the probability from four squares, rather than eight, which has been an issue in the past. Centres are to be commended for the work they clearly have done in these areas.

Question 8 (c)

- (c) The diagram shows a procedure that can be used during pregnancy to find out if a fetus has thalassaemia.



A small sample of fluid from around the fetus is removed.

Explain how testing the sample of fluid allows doctors to diagnose thalassaemia in an unborn fetus.

.....

.....

.....

.....

.....

..... [3]

Candidates engaged with this challenging question and gave some good explanations of how testing the fluid around the foetus allows doctors to diagnose thalassaemia. They read the information and studied the diagram carefully which allowed them to use the information that foetal cells would be found in the fluid. Some developed this idea further, to state that the cells would contain foetal DNA. A small number of candidates made the final link between DNA and the presence of the inherited disorder. The main issue in incorrect responses was that candidates believed that the inherited disorder was caused by a pathogen. Some did not note that foetal cells would be in the fluid, and others thought that the fluid was foetal urine.

Question 9 (a)

9 There are approximately 350 000 African savannah elephants.

(a) 130 000 of these elephants live in Botswana, a country in southern Africa.

Which of these is the closest approximation to the fraction of African savannah elephants that live in Botswana?

Tick (✓) **one** box.

$\frac{1}{2}$ ☐

$\frac{1}{3}$ ☐

$\frac{1}{4}$ ☐

$\frac{1}{5}$ ☐

[1]

Most candidates were able to work out that the fraction is $\frac{1}{3}$.

Question 9 (b)

(b) The African savannah elephant is an endangered species.

Conservation efforts have been successful in increasing the number of elephants.

Suggest **one** method that may have been used to help conserve this species.

.....

..... [1]

A large number of candidates answered this question correctly. Answers that did not obtain the mark tended to be brief and too vague. For example, some candidates just said 'reproduction' without further explanation. We were looking for the idea humans were encouraging/assisting more elephants to breed, or breed more, as reproduction on its own would still happen in the wild but wouldn't necessarily increase the number of elephants.

Question 9 (c) (i)

(c) In May 2020, many elephants were found dead in a region of Botswana.

Scientists discovered that their death was caused by a bacterium that only causes disease once in the blood of an elephant.

The bacterium usually lives in the nose of some elephants where it does **not** cause disease.

Scientists think a rise in environmental temperature caused the bacteria to enter the blood of these elephants.

(i) Suggest why the scientists may be concerned about this bacterium.

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

Candidates suggested a variety of creditworthy reasons why scientists might be concerned about the bacterium. Two points were identified in their responses. As with Question 5(b)(ii), candidates sometimes use the word effect/affect without saying what the effect would be. For example, they wrote 'it could affect humans' as a concern. It is always good practice to avoid the use of the word 'it' and be specific, but credit could not be given for 'affect' here due to lack of further explanation. If the candidate had said 'it could harm' humans, the mark would have been given because the nature of the effect is clear. The other point relates to the use of 'climate change', as candidates are using this term to be the same as global warming, which it isn't. Candidates did, however, use the word extinct much more effectively, referring to extinction of a species rather than an individual.

Question 9 (c) (ii)

(ii) Which of these will ingest and digest the bacterium?

Tick (✓) **one** box.

Antibodies	☐
Platelets	☐
Red blood cells	☐
White blood cells	☐

[1]

(iii) Which of these will tag the bacterium for attack?

Tick (✓) **one** box.

Antibodies	☐
Platelets	☐
Red blood cells	☐
White blood cells	☐

[1]

Candidates appeared to confuse the role of white blood cells and antibodies on this question and 9(c)(iii), so tended to get 9(c)(ii) and (iii) either both correct or both incorrect.

Question 9 (d)

- (d) To identify the type of bacterium responsible for the death of the elephants, the scientists cultured the bacteria.

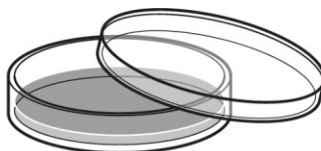
They poured some of the bacteria onto agar jelly in a Petri dish and spread it with a glass spreader.

Then they incubated the Petri dish.

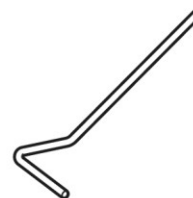
The diagram shows the equipment they used.



Glass bottle containing the sample of bacteria



Petri dish containing agar jelly



Glass spreader

Suggest **two** ways the scientists could improve their method to make sure the technique was aseptic.

- 1
-
- 2
-

[2]

Candidates appeared to be unsure of what aseptic technique involves. They suggested repeating the test, and also suggested a selection of control variables, e.g. use the same volume of bacteria. For those that understood the concept of aseptic technique, they used 'clean' to mean sterile and therefore were unable to obtain credit. Other words used interchangeably with sterile were sanitise, decontaminate and disinfect. Candidates should be encouraged just to use the word sterilise/sterile for the equipment and the agar gel. Other candidates who did not obtain any marks, simply wrote an account of how to prepare an agar plate, including things like taping the plate, storing it upside down, and labelling. While important steps in microbiological technique, these were not relevant to this question.

Question 9 (e)

(e) Some bacteria have evolved to become resistant to antibiotics.

The statements describe the steps in this process.

They are **not** in the correct order.

- A Bacterium survives.
- B Bacterium has a selective advantage.
- C Bacterium passes resistance gene to offspring.
- D Bacterium reproduces.
- E Mutation occurs in the DNA of a bacterium creating a gene for antibiotic resistance.

Write the letters in the boxes to show the correct order of the steps.

One of the steps has been done for you.

		A		
--	--	---	--	--

[2]

There was no particular trend in selection of incorrect statements for this question, around half of candidates obtained one or both marks.

Question 9 (f)

(f) Bacteria evolve by natural selection.

Darwin was one of the scientists who originally developed the theory of natural selection.

Who was the **other** scientist?

..... [1]

Few were able to state Wallace as the scientist. Many gave the names of the scientists involved in the development of atomic theory.

Question 10 (a) (i)

- 10** Yeast produce ethanol during fermentation.
A scientist investigated how temperature affects ethanol production.

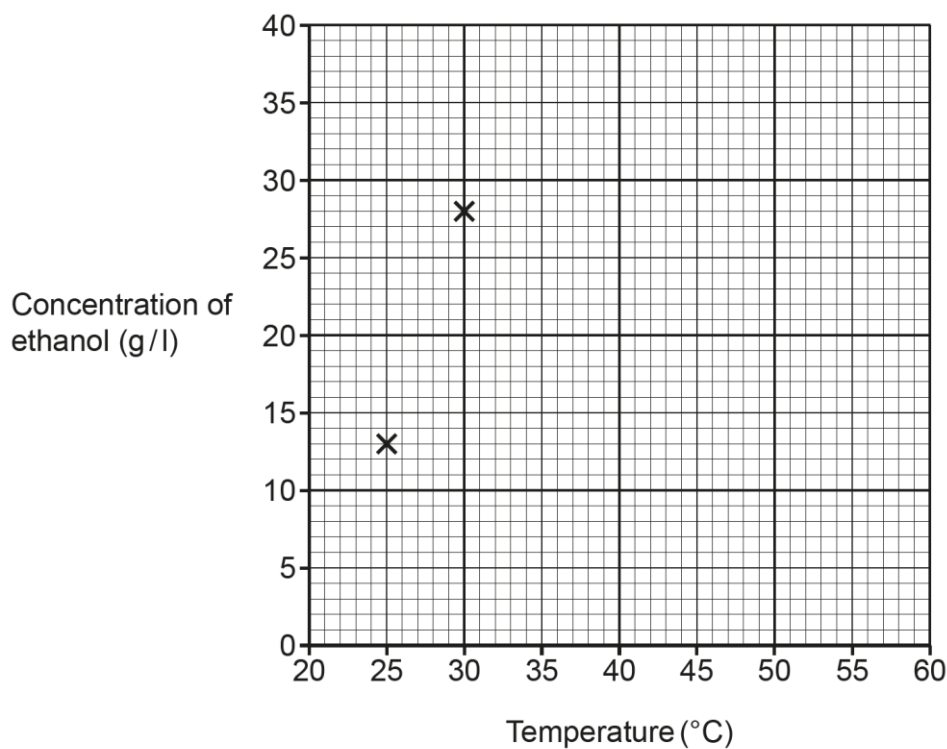
The scientist measured the concentration of ethanol in a yeast solution at six different temperatures.

The table shows their results.

Temperature (°C)	Concentration of ethanol (g/l)
25	13
30	28
35	30
40	35
45	33
50	30

- (a)
(i) Plot the results from the table on the graph.

Two points have been plotted for you.



[1]

Most candidates plotted all four points correctly.

Question 10 (a) (ii)

(ii) Draw a curve of best fit on the graph.

[1]

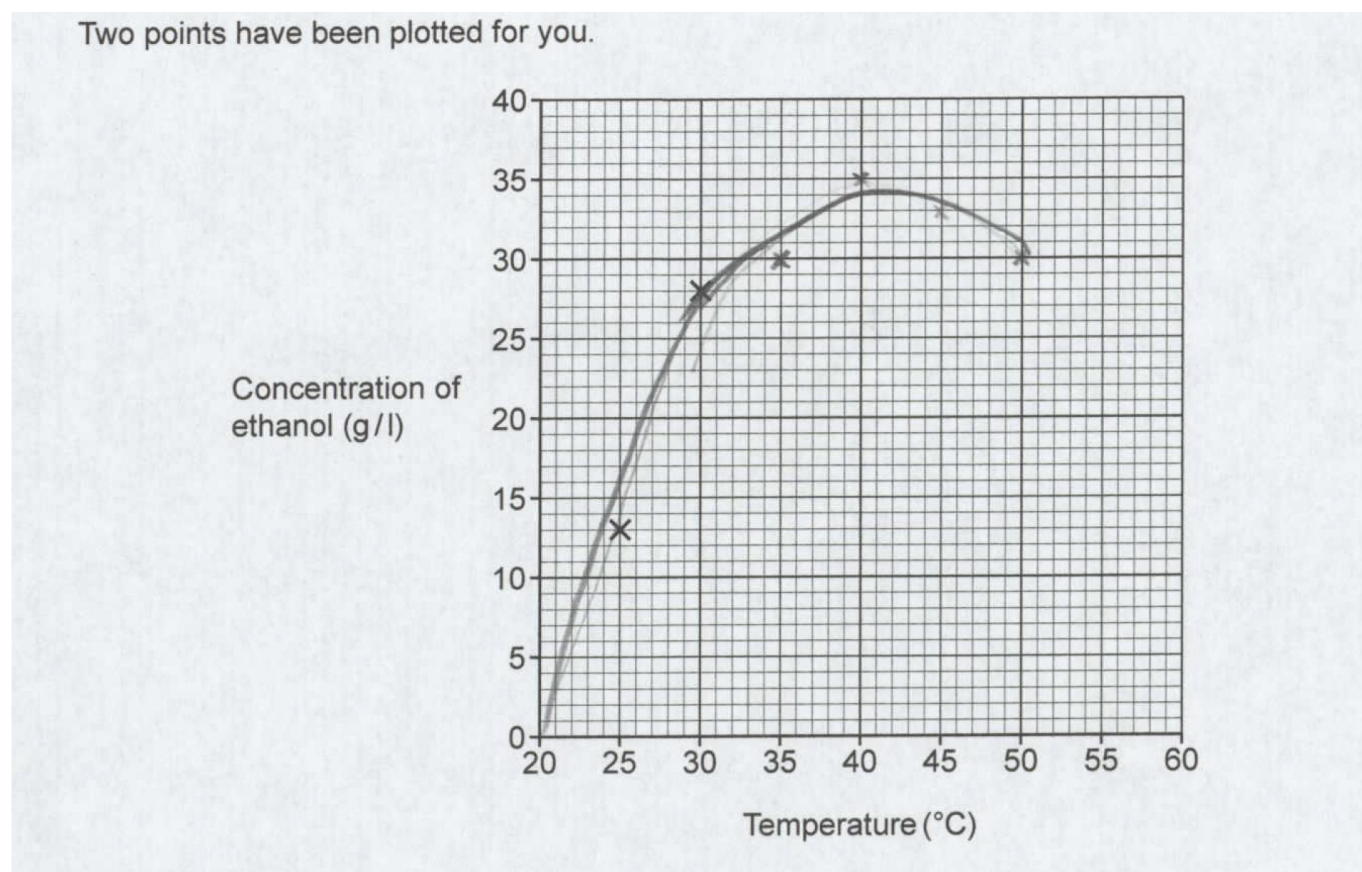
Few candidates correctly drew a curve of best fit. Centres should encourage candidates to draw graphs with a sharp pencil as there were instances of lines of best fit being incorrectly drawn in pen, with attempts made to draw another curve next to the incorrect one. Plot-to-plot lines were not appropriate and therefore not given, nor was extrapolation.

Assessment for learning



A curve of best fit should be a smooth, single, continuous, clear line drawn with a sharp pencil – not a pen – with the same number of data points either side of the curve. Care should be taken to avoid extrapolating the line beyond the plotted points if this is not appropriate.

Exemplar 1



In the example shown, while the candidate has attempted to show the pattern in the data, the line is not continuous and does not pass appropriately through/between the data points (within tolerance). Furthermore, the candidate has extended the curve back to 0 g/l of ethanol, which would suggest that there is no ethanol produced at 20°C – not something we can say will be true. This example was not given any marks.

Question 10 (b)

(b) State **two** conclusions that can be made from these data.

- 1
- 2

[2]

Around half of candidates obtained at least one mark on this question, identifying that 40 °C was the optimum. Although many candidates stated that as the temperature increased the concentration of ethanol increased, they did not notice that the concentration then decreases beyond the optimum.

Question 10 (c)

(c) Fermentation is another name for anaerobic respiration in yeast.

Complete the equation for **anaerobic** respiration in yeast.

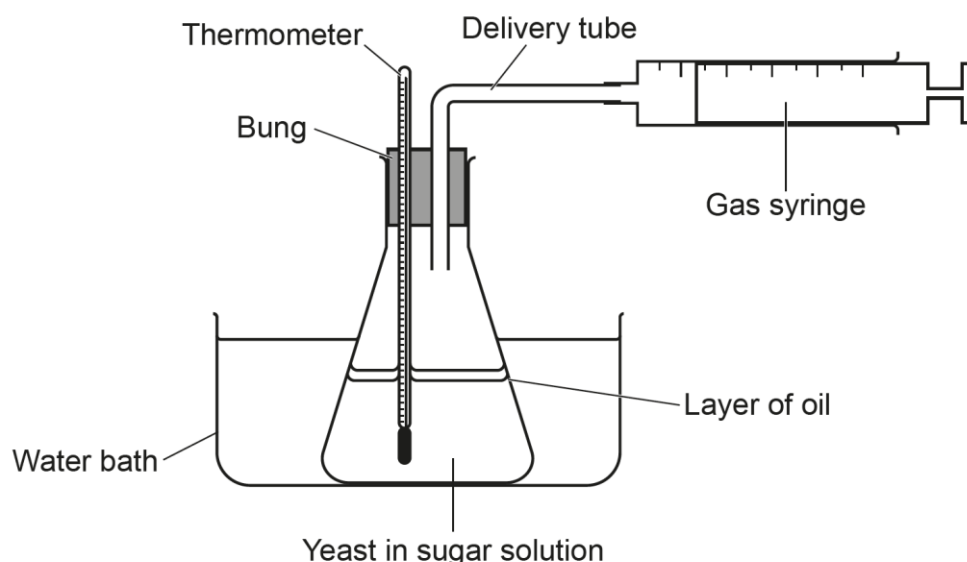
sugar $\longrightarrow$ ethanol +

[1]

A minority of candidates knew that the gas produced in anaerobic respiration in yeast is carbon dioxide.

Question 10 (d)

- (d) The diagram shows the equipment used to investigate the effect of different sugars (sucrose, glucose and galactose) on the rate of respiration in yeast.



For this investigation, describe:

- the dependent variable
- the independent variable
- a control variable that should be kept constant.

Dependent variable

.....

Independent variable

.....

Control variable

.....

[3]

Candidates found this last question challenging but are to be commended for attempting to answer it. They rarely obtained the first marking point as they gave a control variable for the dependent variable. For those who did correctly identify the dependent variable (thanks to some great mnemonics written down next to the diagram!) they often said amount rather than volume of gas and therefore did not obtain the mark. A wide variety of control variables were available for the third marking point. Specific language – mass, concentration, volume etc rather than amount was required throughout apart from the water in the water bath where amount was accepted because it was thought most water baths would be filled by eye.

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