

Examiners' report

GCSE

COMBINED SCIENCE A (GATEWAY SCIENCE)

**OCR Level 1/Level 2 GCSE (9-1) in
Combined Science A (Gateway Science)**

J250

For first teaching in 2016

J250/02 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 2 series overview

J250/02 is the second biology Foundation Tier paper in the GCSE Combined Science A (Gateway Science) suite. This paper assesses content from specification topics B4-B6 and CS7. To perform well on this paper, candidates need to have a sound knowledge of the theory covered in topics B4-B7. They also need to apply the skills and understanding that they have developed in the practical activities covered in topic CS7. In addition, this paper also contains questions that have elements of synopticity, drawing on material covered by topics B1-3. There are also questions that involve the assessment of key mathematical requirements from Appendix 5f of the specification.

In this series, candidates performed well on the multiple-choice questions but could also write some relevant extended response answers on the Level of Response Question 14 (a). Graph plotting skills were often sound but drawing a line of best fit seemed more challenging. The main difficulties were experienced in suggesting improvements to validity in Question 16 (a) (ii) and in explaining the spread of antibiotic resistance in Question 16.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
- could identify the body's non-specific defence mechanism (Question 6) and describe the immune response (Question 16 (b)) - used or defined scientific terms such as parasitic/mutualistic (Question 11 (c)) and anaerobic (Question 13 (a) (iii)) - explained important biological processes such as antibiotic resistance (Question 16 (d)) and the role of decomposers in the carbon cycle (Question 13 (a) (ii)) - could plot points accurately on a grid and draw a smooth curve of best fit.	- could identify the different trophic levels in a food chain (Question 11 (a) (i)) but could not fully describe the role of producers (Question 11 (b)) - answered questions by repeating information provided in the question and not adding to it (Question 11 (c)) and (Question 16 (b)) - could calculate a mean (Question 15 (a) (i)) but found percentage calculations more challenging (Question 16 (c) (i)) - could identify the action of HIV on the human immune system - confused fossilisation with decomposition (Question 13 (a) (ii))

Section A overview

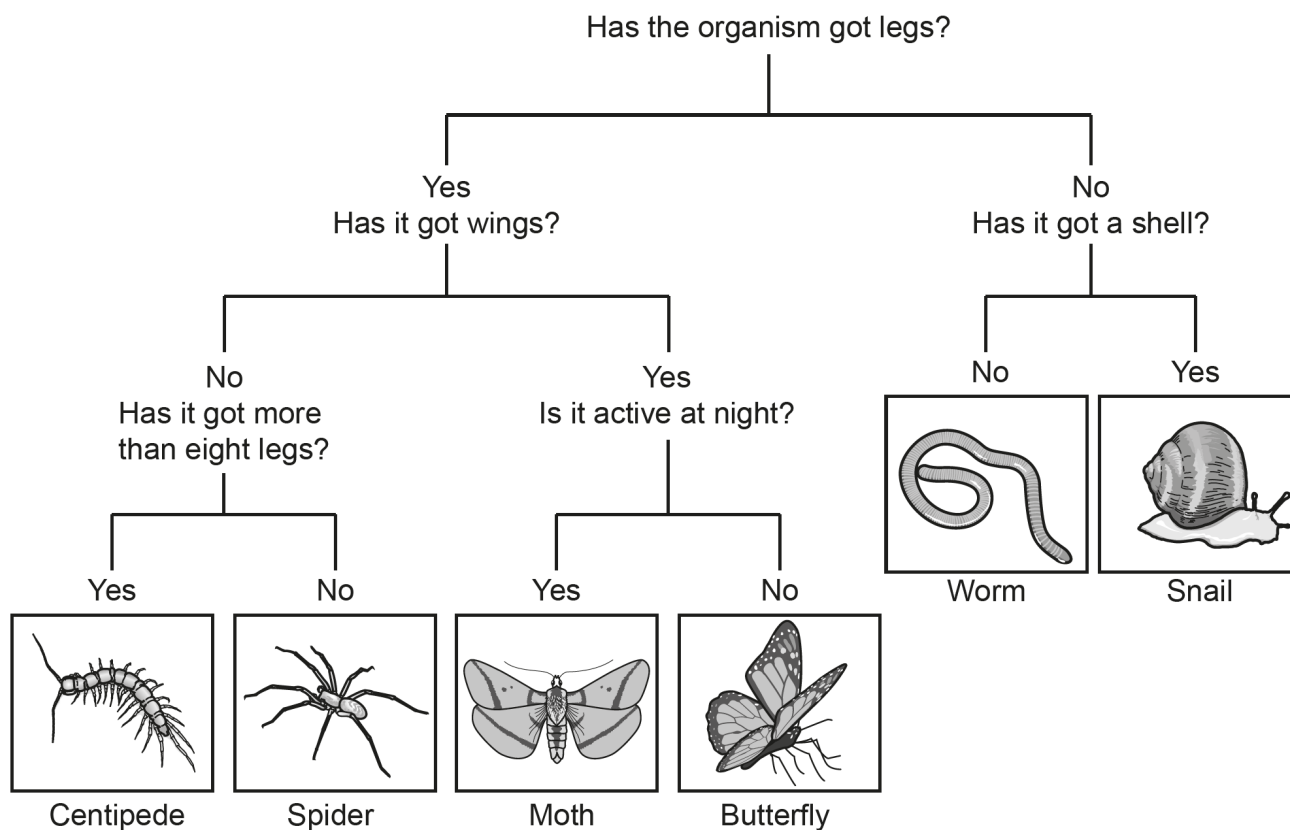
Section A contains 10 multiple choice questions targeting Assessment Objectives 1 and 2 (AO1 and AO2). For many candidates this was their most mark yielding part of the paper with a significant number scoring 7, 8 or 9 out of the ten marks.

- Questions 1 and 4 were by far the most accessible questions, answered correctly by most of candidates.
- Questions 6 and 8 proved to be the most challenging questions but there were still candidates who answered correctly.
- In some cases, candidates tried to amend answers, and this made it difficult for examiners to decide on the letter written by the candidate. In these situations, it is far better for the candidate to cross out the incorrect letter in the box and write the new answer by the side.

Question 1

1 The diagram shows a key for identifying organisms.

Identify the organism that has **wings** and is **active at night**.



- A Butterfly
- B Centipede
- C Moth
- D Snail

Your answer

[1]

Question 2

2 What is the correct treatment for a disease caused by viruses?

- A Antibiotics
- B Antivirals
- C Progesterone
- D Insulin

Your answer

[1]

Approximately two-thirds of candidates correctly identified antivirals, possibly helped by the composition of the term. Of the incorrect responses, A was by far the most common, presumably triggered by the candidates' knowledge of disease treatment.

Question 3

3 Which of these is an example of **genetic engineering**?

- A Captive breeding programmes for endangered species
- B Farmers applying pesticides on their crops
- C Scientists developing crops that are drought resistant
- D Selecting pigs with high quality meat to breed together

Your answer

[1]

The most common error here was to select option D. This confusion of genetic engineering with selective breeding has been seen before on this paper in previous series.

Question 4

4 Cardiovascular diseases are treated in different ways.

The table shows some treatments for cardiovascular disease.

	Treatment	Description
A	Heart bypass	A new blood vessel is inserted when the coronary artery is blocked.
B	Heart transplant	A new heart from a donor is inserted.
C	Statins	A pill is ingested which reduces cholesterol in the blood.
D	Stent	A small tube is inserted to open up a blocked blood vessel.

Which treatment does **not** involve surgery?

Your answer

[1]

Question 5

5 Which of these could be used to group living organisms in a natural classification system?

- A DNA sequence
- B Number of legs
- C Presence of shell
- D Size of tail

Your answer

[1]

The majority of candidates correctly identified DNA sequence as the correct response. Of the incorrect responses, B was the most chosen.

Question 6

6 Which of these is a non-specific defence mechanism of the human body against pathogens?

- A** Making red blood cells
- B** Pancreas producing insulin
- C** Pupil changing size
- D** Stomach producing acid

Your answer

☐

[1]

There seemed to be two issues that resulted in this question being the most challenging in this section. Firstly, candidates needed to appreciate the nature of a non-specific response, therefore ruling out the action of blood cells. Secondly, as was seen in Question 16(b), many candidates confused the action of red blood cells and white blood cells. This led to option A being the most common incorrect choice.

Question 7

7 Scientists have developed a detailed understanding of the human genome.

Which of these is a benefit from developing this understanding?

- A** Discovering new antibiotics
- B** Explaining why antibiotic resistant bacteria have evolved
- C** Predicting whether a person will develop a genetic condition
- D** Using embryonic stem cells for transplants

Your answer

☐

[1]

Approximately two-thirds of candidates responded correctly. Of the incorrect responses, A was the most chosen.

Question 8

8 Many non-communicable human diseases are caused by an interaction with a lifestyle factor.

Which of these is **not** an example of this type of interaction?

- A Allergies and exercise
- B Cardiovascular disease and stress
- C Skin cancer and UV light
- D Type 2 diabetes and diet

Your answer

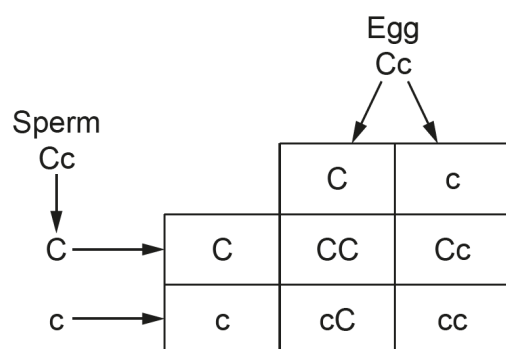
[1]

Slightly less than half the candidates responded correctly. Candidates should have been aware of the links between the diseases and lifestyle factors in options B, C and D. Incorrect responses included one of these distractors to an equal extent.

Question 9

9 The diagram shows a genetic cross for inheriting cystic fibrosis.

Cystic fibrosis is a recessive inherited condition.



What percentage of the offspring will have cystic fibrosis?

- A 0%
- B 25%
- C 75%
- D 100%

Your answer

[1]

Although two-thirds of candidates responded correctly, most of the other candidates responded C, presumably assuming that cystic fibrosis is caused by a dominant allele.

Question 10

10 Which pathway shows how nitrates are used by plants to make proteins?

- A** Nitrates → amino acids → proteins
- B** Nitrates → carbohydrates → proteins
- C** Nitrates → DNA → proteins
- D** Nitrates → fatty acids → proteins

Your answer

[1]

Incorrect responses here were split equally between B, C and D.

Section B overview

Section B of this paper contains a mixture of short answer questions, questions requiring longer responses and one 6-mark Level of Response question (Question 14 (a)). The questions between them cover all three Assessment Objectives AO1, AO2 and AO3.

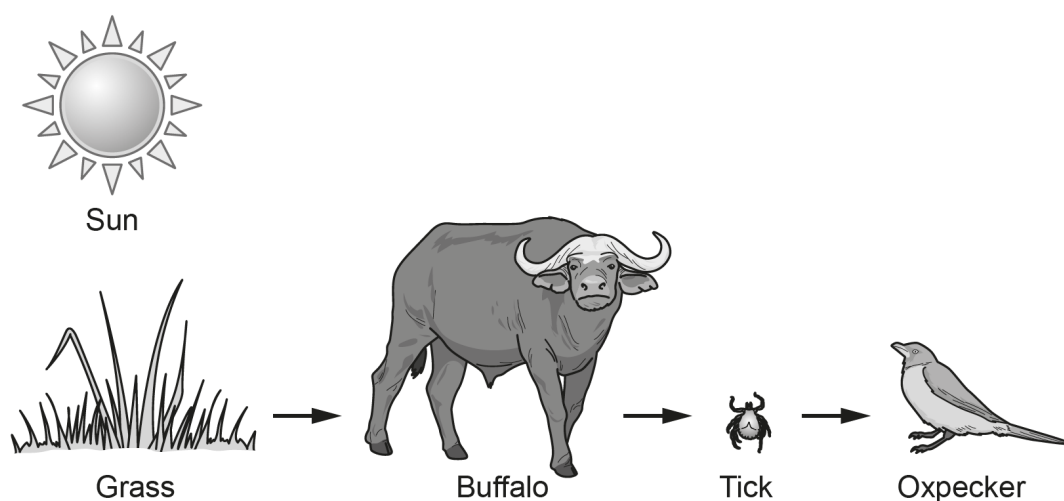
Question 11 was intended to be an accessible start to this section, covering topics such as food chains and interdependence. However, a lack of knowledge of terms such as parasitic, mutualistic and abiotic restricted some candidates' performances. Some candidates scored highly on the genetics in Question 12 but Question 13 (c) proved more of a challenge, especially the role of decomposers. Question 16 was a common question with the Higher Tier paper and provided candidates with the most difficulties on this Foundation Tier paper.

Question 11 (a) (i)

11 The grasslands of Africa are an example of an ecosystem.

Fig. 11.1 shows a food chain within this ecosystem.

Fig. 11.1



(a) Name an example of each of the following in the food chain shown in **Fig. 11.1**.

(i) A primary consumer.

..... [1]

Most candidates could correctly identify the buffalo as the primary consumer.

Question 11 (a) (ii)

(ii) An abiotic component.

..... [1]

This question proved far more challenging than part (i), with many candidates stating that grass was the abiotic component.

Question 11 (b)

(b) Describe the role of **grass** as a producer in this food chain.

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

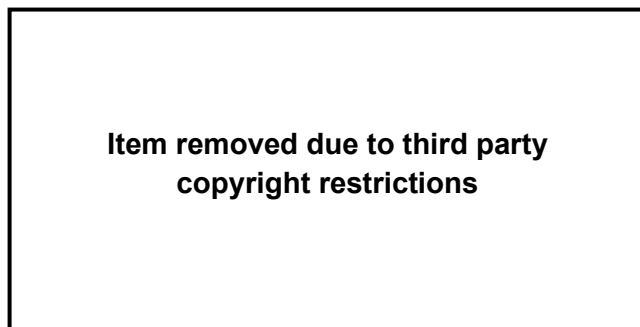
Many candidates simply described the flow of food through the food chain without focussing on the production of food by the grass.

Question 11 (c)

- (c) Organisms depend on each other for survival. This is called **interdependence**.

Fig. 11.2 shows a buffalo and some oxpeckers.

Fig. 11.2



Ticks are small organisms that feed on, live on and harm the buffalo.

Oxpeckers sit on the buffalo eating the harmful ticks. They also warn the buffalo if danger is nearby.

Identify the type of relationship between these organisms using ideas about interdependence.

Ticks and buffalo

Oxpeckers and buffalo

[2]

Some candidates were aware of the terms parasitism and mutualism and used them correctly to identify the relationships. Others just repeated information from the question to describe the relationship, often using the term interdependence.

Question 12 (a)

12

- (a) Name the sub-cellular structure which stores the genetic material in an animal cell.

..... [1]

Although the spelling was poor, many candidates gave a response that could be identified as the nucleus.

Question 12 (b)

(b) Complete the sentences to describe the genetic material.

Use words from the list.

diploid	genes	genome	genotype
haploid	heterozygous	homozygous	variation

The entire genetic material of an organism is called the

Human body cells have 23 pairs of chromosomes because they have two copies of each chromosome. These cells are called

Human gametes have only 23 chromosomes. These cells are called

Most observable characteristics are the result of multiple

[4]

There were two main sources of confusion in this question. For the first gap, genotype was often used rather than genome. Then the terms diploid and haploid were often reversed in the second and third gaps.

Question 12 (c)

(c) Phenotypes, such as height, are determined by genetics, the environment or a combination of both.

State a phenotype that is determined by each of the following.

Genetic only

Environmental only

Both genetics and the environment

.....

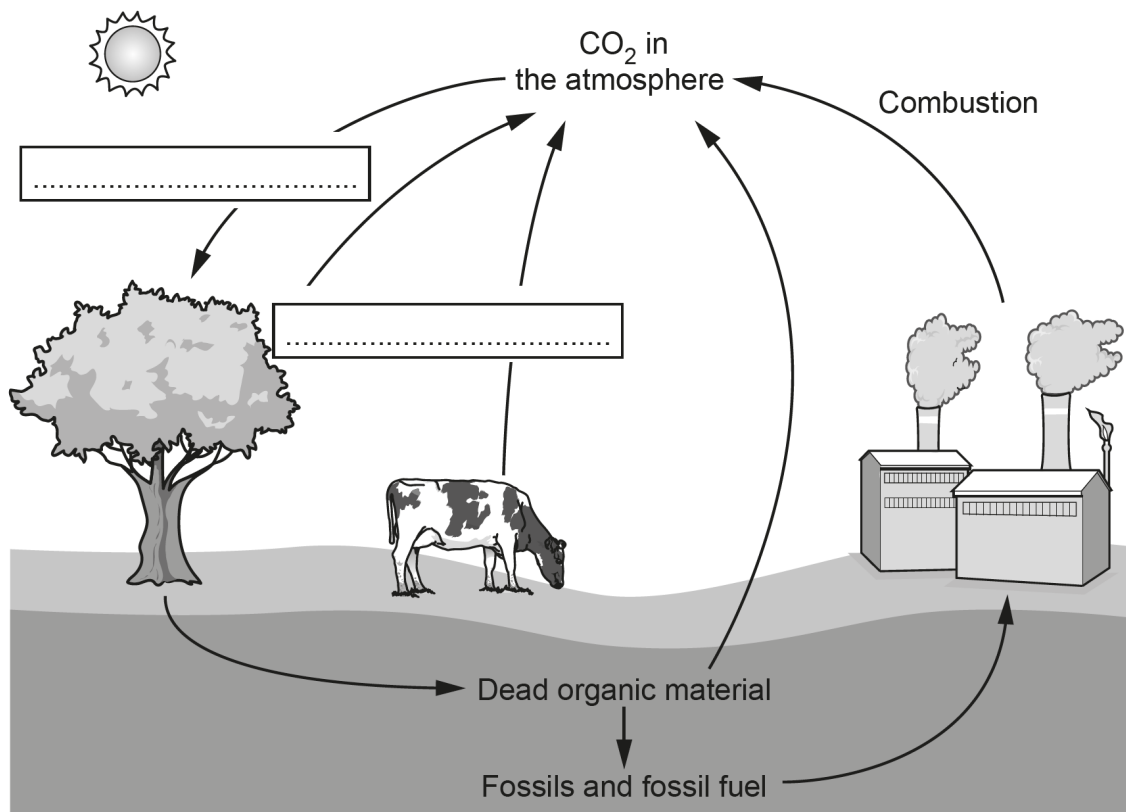
[3]

There were many good responses to this question covering a range of characteristics. The most common errors were to allocate height or weight to genetic only or environment only.

Question 13 (a) (i)

13

(a) The diagram shows the carbon cycle.

(i) Complete the **two** labels in the diagram to identify the processes involved in the carbon cycle.

[2]

Many candidates identified the two processes, but some incorrect responses concentrated on substances such as oxygen and carbon dioxide, rather than processes.

Question 13 (a) (ii)

(ii) Explain the role of **decomposers** in the carbon cycle.

.....

.....

.....

..... [2]

The most common misconception was to link the action of decomposers to the production of fossil fuels.

Misconception

Many candidates think that decomposers break down dead organic material to produce fossil fuels rather than fossil fuels being produced by a lack of decomposition. This type of misconception is seen in exemplar 1 which did not score a mark.

Exemplar 1

- (ii) Explain the role of **decomposers** in the carbon cycle.

They break down dead matter such as plants and animals and turn them into fossils which turn into fossil fuels which can be used for combustion.

Question 13 (a) (iii)

- (iii) Decomposition can take place aerobically or anaerobically.

What is meant by the term **anaerobically**?

..... [1]

Approximately a third of all candidates knew that this term meant without oxygen. Incorrect responses focused on a wide array of different definitions.

Question 13 (c)

(c) Human activity has led to rising carbon dioxide levels in the atmosphere.

This contributes to global warming and reduces global biodiversity.

Describe **two** ways in which human activity can reduce **local** biodiversity.

1

.....

2

.....

[2]

A significant number of candidates did not gain credit on this question because they misread the question. Instead of giving factors that reduce biodiversity, they gave ways that biodiversity could be increased. An example is seen in exemplar 2.

Exemplar 2

1 Human activity can reduce local biodiversity by using public transport.

2 Human activity can reduce local biodiversity by planting more trees.

[2]

Question 14 (a)*

14

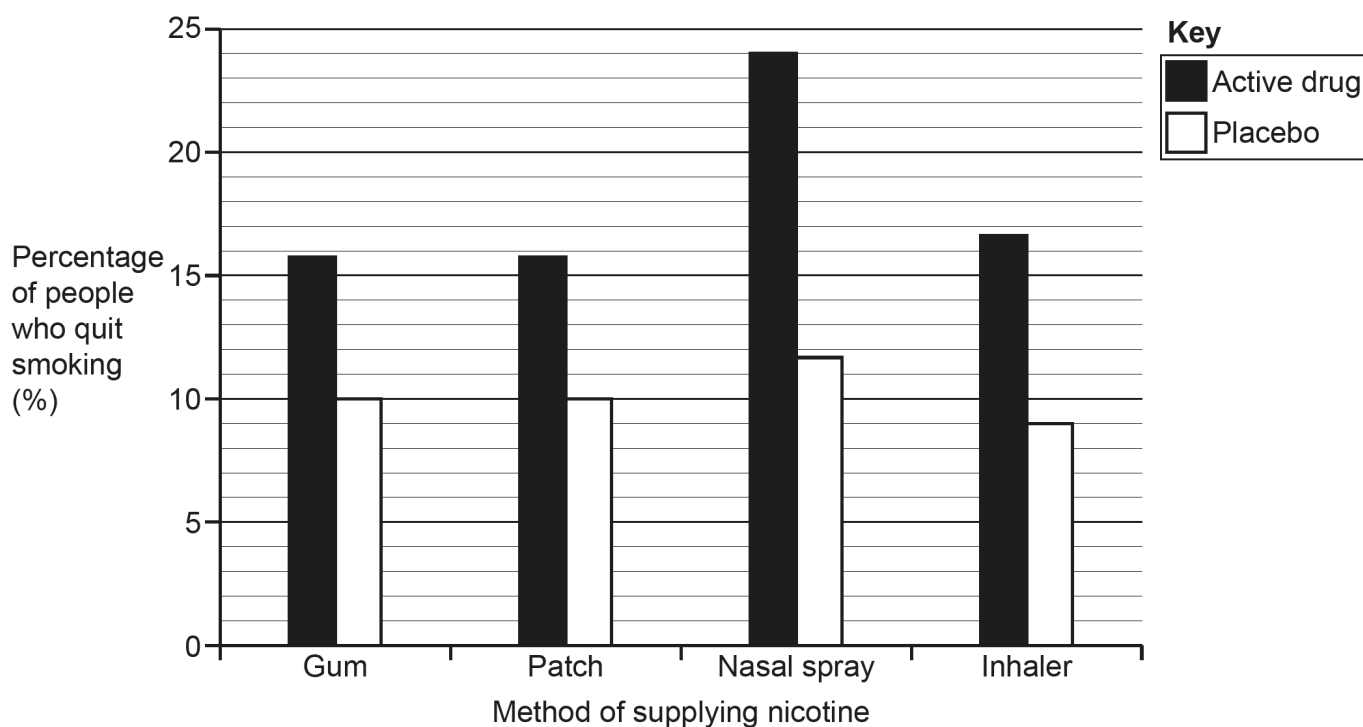
(a)* Smoking is a risk factor for lung cancer.

Nicotine is given to people to help them quit smoking. The nicotine is supplied using different methods.

A study looked at the effectiveness of four of these methods.

A placebo was given to some people as part of the study. A placebo looks like the drug being tested but has no medical effect.

The bar chart shows the results.



What does the study show about the effectiveness of the different methods to help people to give up smoking?

In your answer:

- Compare the effectiveness of different methods.
- Explain the role of the placebo and what its results show.
- Use data to support your conclusions.

.....

.....

.....

.....

.....

..... [6]

This question was the six mark Level of Response question on the paper. Candidates were expected to focus on three main ideas in their response:

- some comparison of the effectiveness of the different methods in giving up smoking with data
- an explanation of the role of the placebo in the study
- what the results with the placebo show.

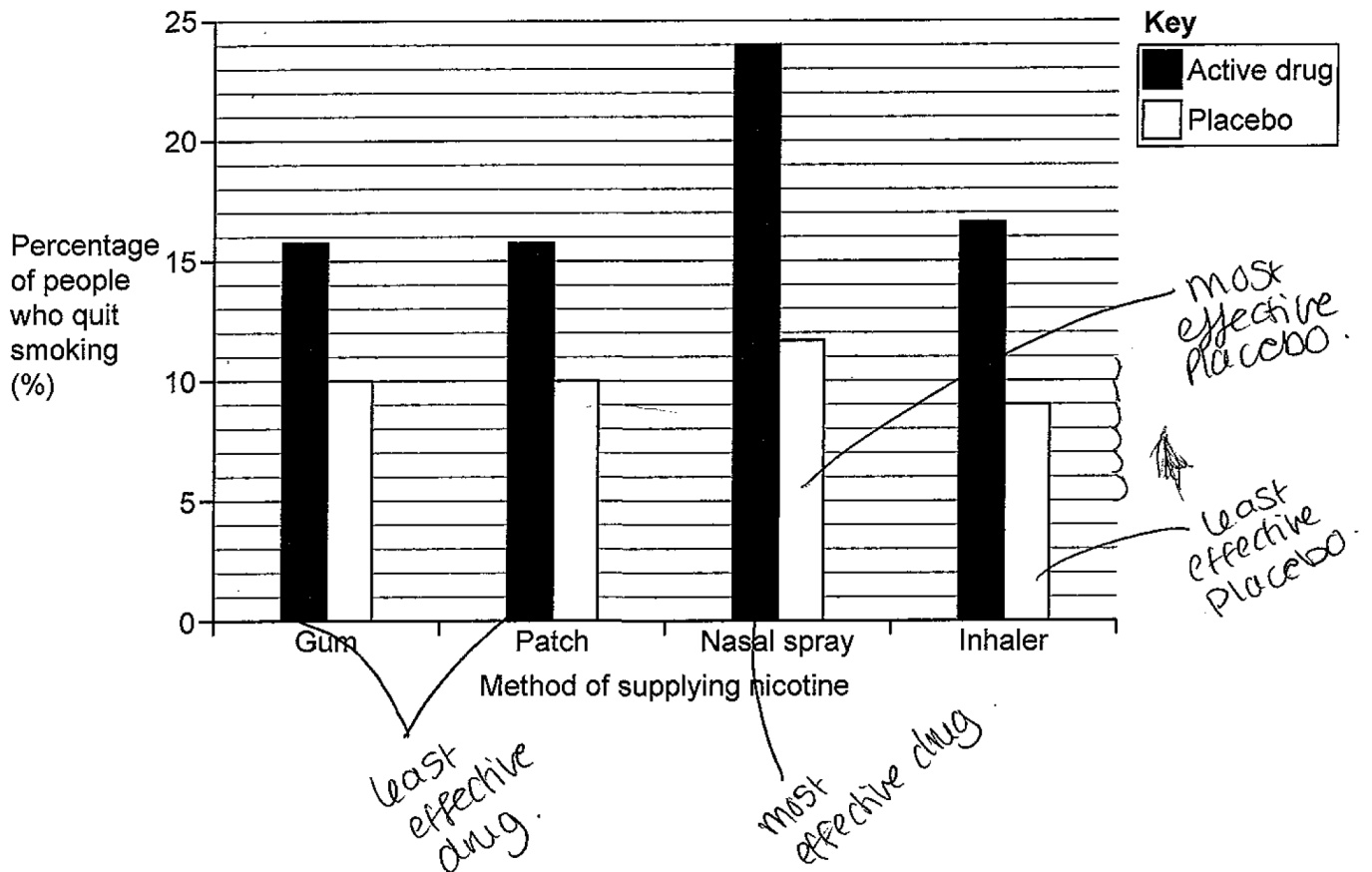
Many responses commented on the relative effectiveness of the methods, with the nasal spray being the highest at 24%. These statements on their own achieved Level 1.

Some candidates went further and explained the role of placebos in determining any subconscious effect in using the treatments. These responses achieved Level 2.

Far fewer candidates then went on to use their understanding of the role of the placebo to analyse what the percentages with the placebo indicated. An example of a Level 3 response is shown in exemplar 3.

The candidate has noted that the placebos have a positive effect because the people think they have taken the actual drug but also goes on to say that the actual drug still worked better than the placebo.

Exemplar 3



On the bar chart, it shows the nasal spray was the most effective drug and placebo. With the percent of people who quit smoking who took the active drug being 24% and who took the placebo and quit is 11.5%. The gum and patch was the least effective drug, both at 15.5%. However, the least effective placebo is the inhaler with 9% people who quit. The role of the placebo is to test whether people can quit smoking on their own, even though they think they've taken the actual drug. The results show that whilst this is possible and the placebo has a positive effect, the active drug still worked better and helped more people quit smoking. Although the gum and patch actual drug results was at 15.5% (being the lowest) the inhaler was only 1% more effective, with 16.5% of people quitting.

Please mark this too.

Question 14 (b)

(b) Smoking cigarettes can cause lung cancer.

Complete the sentences to explain why.

Use words from the list.

cell division

meiosis

mutation

protein synthesis

reduction

Cigarettes contain cancer causing chemicals which can cause DNA

This leads to uncontrolled

[2]

Many candidates responded correctly with mutation and cell division. However, a small number of candidates reversed these choices.

Question 15 (b)

(b) Plot a graph of the student's mean results. Choose appropriate scales.

[3]

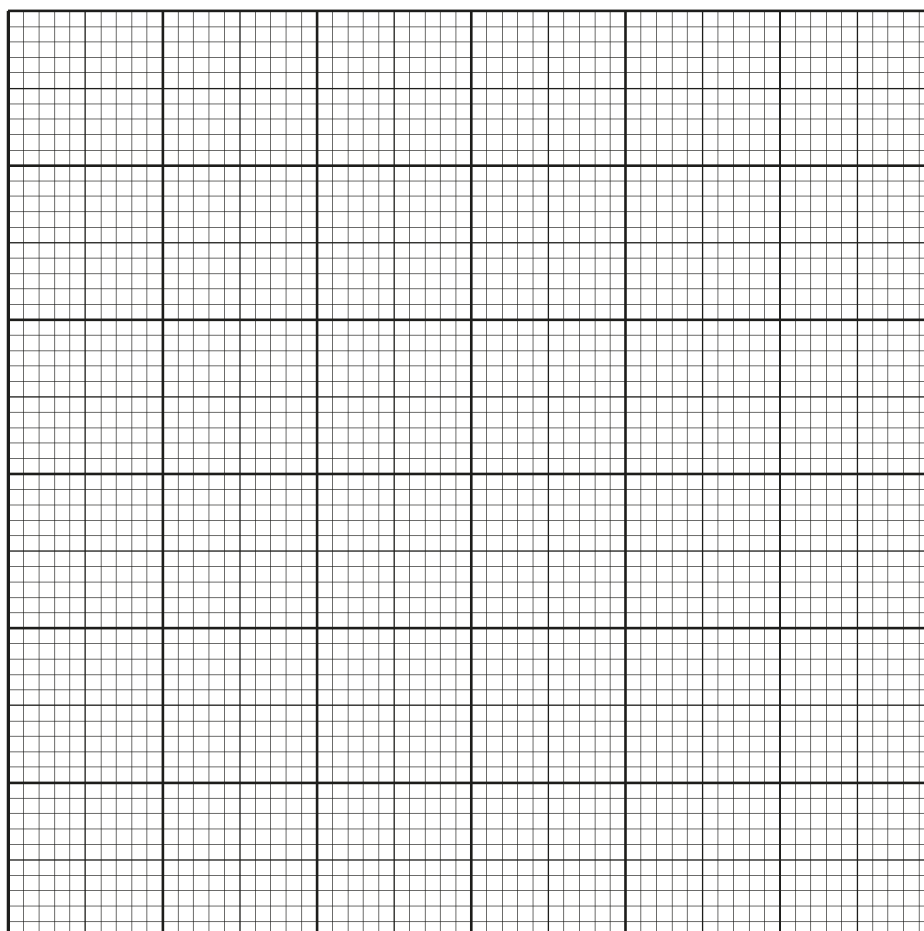
Most candidates drew linear scales and used more than half of the graph paper. There were errors made in plotting but plenty of candidates were credited the maximum three marks.

Question 15 (c)

(c) Draw a curve of best fit.

[1]

Mean
dandelion
height
(cm)



Soil pH

Candidates found drawing a curve of best fit more challenging than plotting the points. Common errors included drawing double lines, omitting the plot at pH 6 or, if including this point, drawing a very pointed curve.

Question 15 (d)

(d) What conclusions can be made from the student's results?

Include **data** in your answer.

.....

.....

.....

..... [2]

A number of candidates did not appreciate the pattern shown in the data and just identified the value at pH6 as an outlier. The increase and then decrease in the height was given one mark and the identification of pH6 as the optimum given a second mark.

Question 16 (a) (i)

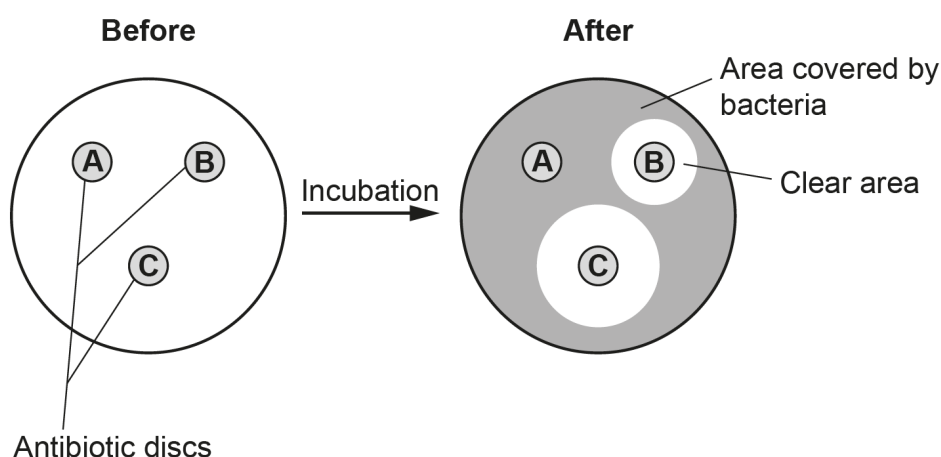
16

(a) A student wants to find how effective three antibiotics are for treating a range of bacterial infections.

This is their method:

- Spread bacteria across an agar plate.
- Soak discs with different antibiotics (**A**, **B** and **C**) and place them on the surface of the agar plate.
- Leave the plate to incubate for 5 days.

The student's results are shown in the diagram.



(i) Which antibiotics are the most and least effective at inhibiting bacteria growth?

Put a ring around the correct answers.

Most effective antibiotic

A

B

C

Least effective antibiotic

A

B

C

Explain your answers. Use the diagram.

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

Most candidates correctly identified C as the most effective and A as the least effective and then correctly referred to the size of the clear areas. In a small number of cases, the letters were reversed as a result of the incorrect explanation.

Question 16 (a) (ii)

(ii) Suggest **two** improvements to the method to increase **validity** of the investigation.

- 1
- 2
- [2]

Although the term validity was emboldened in the question, very few candidates concentrated on this specific term and did not give responses highlighting the importance of controlling variables. Most responses referred to repeatability and reproducibility by suggesting the experiment was repeated or the results compared to others.

OCR support



The document Language of Measurement in Context available on the OCR website contains definitions of important practical terms such as accuracy, precision, validity, repeatability and reproducibility.

Question 16 (b)

(b) Bacteria are one cause of communicable disease.

Outline the role of the immune system of the human body in defence against disease.

-
-
-
-
- [2]

Answers to this question varied considerably. There were some good descriptions of the action of the immune system involving white blood cells, antibodies, phagocytosis and even memory cells. However, many candidates just referred to the immune system fighting off pathogens. There was also confusion between the roles of white blood cells and red blood cells.

Question 16 (c) (i)

- (c) Tuberculosis (TB) is caused by bacteria. The bacteria usually attack the lungs.

It is estimated that 8.7 million people develop TB worldwide each year.

1.1 million of these people are estimated to have HIV.

- (i) Calculate the percentage of people who develop TB worldwide each year who are estimated to have HIV.

Percentage % [2]

Some candidates incorrectly tried to perform some type of percentage change calculation but there were many correct responses. In some cases, candidates did not gain a mark due to incorrect rounding.

Question 16 (c) (ii)

- (ii) Infection with HIV makes you more likely to develop TB.

State **one** reason why having HIV makes you more likely to develop TB.

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

This question was well responded to, with many candidates knowing the effect of HIV on the immune system.

Question 16 (d)

(d) Antibiotics are developed to kill bacteria.

Bacteria have appeared that antibiotics can not kill.

Explain how bacteria could have evolved to become antibiotic resistant.

Use ideas about **natural selection**.

.....

.....

.....

.....

..... [3]

There were a number of different types of error in responses to this question:

- some responses simply referred to 'strong' bacteria fighting off antibiotics
- other responses used references to immunity rather than resistance
- there were responses implying Lamarckism with bacteria mutating in response to the antibiotics
- other responses gave generic explanations of natural selection without reference to this specific example.

Good responses were usually only seen on scripts that scored highly for the whole paper.

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