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GCSE (9–1)

Examiners' report

# GATEWAY SCIENCE BIOLOGY A

J247

For first teaching in 2016

## J247/03 Summer 2024 series

Version 1

ocr.org.uk/science

# Contents

# Introduction

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

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers 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 OCR.

# Paper 3 series overview

J247/03 is the first Higher Tier paper in the J247 Gateway Biology suite. J247/03 assesses content from specification topics B1-B3 and B7. Therefore, to perform well on this paper candidates need to have a sound knowledge of the theory covered in topics B1-B3 and be able to apply the skills and understanding that they have developed in the practical activities covered in topic B7. There are also questions involving the assessment of key mathematical requirements from Appendix 5e of the specification. This paper is not synoptic and so does not contain any material covered by topics B4-B6.

Comparisons with the previous series indicated that candidates produced better answers to questions based on practical tasks and linked to PAGs. This may be due to increased practical experience in the classroom. There were also many good answers to questions testing the mathematical requirements of the specification. However, candidates would benefit from greater practice at converting values between different SI units.

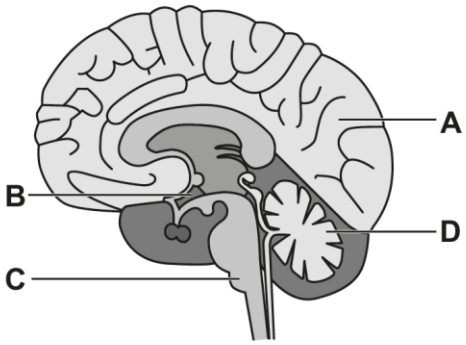
| Candidates who did well on this paper generally: | Candidates who did less well on this paper generally: |
|---|---|
| • could explain osmosis in terms of differences in water potential (Question 16 (d))<br>• correctly manipulated data in percentage calculations (Question 17 (c)), and to generate a ratio (Question 19 (c) (i))<br>• understood the structure of DNA (Question 7) and how a mutation can change the order of amino acids in a protein (Question 24 (a))<br>• could recall the purpose of the biuret test (Question 5) and could also suggest how the Benedict's test could be used in a semi-quantitative way (Question 24 (b))<br>• understood the concepts of limiting factors (Question 14), accommodation (Question 11 and Question 19 (b)) and the action of ADH (Question 12). | • explained increases in mass in terms of the movement of a solution rather than water by osmosis (Question 16 (d))<br>• found it difficult to convert millimetres to micrometres (Question 21 (b)) or to convert litres to millilitres (Question 9)<br>• could not recall the function of the biuret test (Question 5) and confused the colours produced by the Benedict's test with the colours produced by other reagents (Question 24 (b))<br>• confused control variables with the independent and dependent variables (Question 16 (b))<br>• explained the function of DNA in terms of the production of different amino acids (Question 24 (a)). |

# Section A overview

Section A contains 15 multiple choice questions targeting Assessment Objectives 1 and 2 (AO1 and AO2). Candidates performed well on this section of this paper with many scoring more than 10 marks out of a possible 15 marks. Questions 2, 4, 5, 2, 10 and 13 were answered correctly by the majority of candidates. Questions 3, 12 and 14 seemed to be the most challenging questions but were still answered correctly in about half of cases. Examiners are still reporting difficulties in interpreting candidates' responses when the candidates try to change one letter to another. Encourage candidates to cross out the letter and write their new response next to the box, making it clear that is their answer.

## Question 2

**2** The diagram shows the structure of the human brain.




Which part of the brain is highly folded into two hemispheres and controls language and memory?

Your answer ☐ **[1]**

## Question 3

**3** Sensory neurones conduct impulses towards the central nervous system.

Which row is correct about what is included in the structure of a sensory neurone?

| | Axon | Dendron |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

Your answer ☐ **[1]**

Approximately half of the responses to this question were correct. Most candidates knew that sensory neurones possessed axons but a significant number thought they lacked a dendron and so incorrectly chose option B.

## Question 4

**4** Which statement describes how the body responds to cold temperatures?

**A** Shivering and vasoconstriction

**B** Shivering and vasodilation

**C** Sweating and vasoconstriction

**D** Sweating and vasodilation

Your answer ☐ **[1]**

Shivering was usually associated with cold temperatures but incorrect responses usually confused the terms vasodilation and vasoconstriction.

## Question 5 and 7

**5** Which substance in urine does the biuret test identify?

**A** Glucose

**B** Ions

**C** Protein

**D** Red blood cells

Your answer ☐ **[1]**

**7** Which statement about DNA is correct?

**A** DNA codes for the production of amino acids.

**B** DNA contains specific sequences of amino acids and bases.

**C** DNA is a polymer made of three different nucleotides.

**D** DNA nucleotides consist of a base, a sugar and a phosphate.

Your answer ☐ **[1]**

Although the majority of responses were correct, some candidates thought that DNA contained amino acids, rather than coding for them, and so chose option B as their response.

## Question 9

**9** Most people have two kidneys.
The two kidneys filter 200 litres of blood every day.

How much blood does **one** kidney filter per hour?

**A** 0.417 litres

**B** 8.33 litres

**C** 4170 millilitres

**D** 8333 millilitres

Your answer ☐ **[1]**

This question was correctly answered by the majority of candidates, but the most common incorrect response was A.

## Question 10

**10** Which hormones are used in the female contraceptive pill?

**A** FSH and LH

**B** LH only

**C** Oestrogen only

**D** Progesterone and oestrogen

Your answer ☐ **[1]**

Again, this question was very well answered by most candidates. A small number responded incorrectly with option A, presumably confusing fertility treatment with contraception.

## Question 11

**11** A person focuses on a distant object.

Which row describes the ciliary muscles and suspensory ligaments in their eye?

| | Ciliary muscles | Suspensory ligaments |
|---|---|---|
| **A** | contracted | loose |
| **B** | contracted | tight |
| **C** | relaxed | loose |
| **D** | relaxed | tight |

Your answer ☐ **[1]**

Many candidates seem to find the process of accommodation challenging, often thinking that the ciliary muscles need to contract to stretch the lens. However, about half answered this correctly.

## Question 12

**12** Alcohol reduces the release of ADH.

Which statement describes the effect on urine from drinking alcohol?

**A** Concentrated urine with a higher volume

**B** Concentrated urine with a lower volume

**C** Diluted urine with a higher volume

**D** Diluted urine with a lower volume

Your answer ☐ **[1]**

Most candidates appreciated that drinking alcohol leads to a higher volume of urine but a significant number thought that the urine would also be more concentrated, and so incorrectly chose option A.

## Question 13 and 14

**13** What is the balanced equation for photosynthesis?

**A** $3CO_2 + 3H_2O \rightarrow C_6H_{12}O_6 + 3O_2$

**B** $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

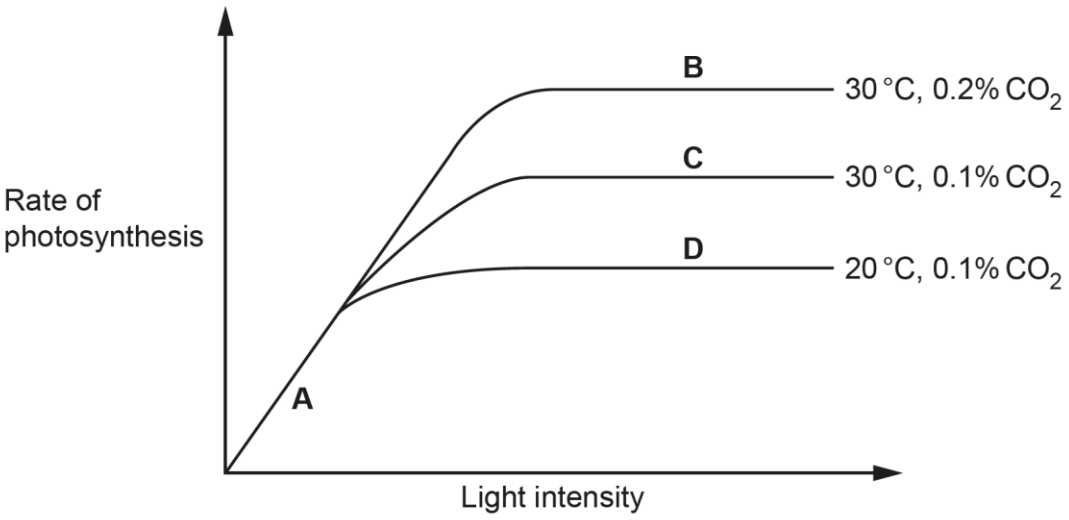
**C** $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2$

**D** $6H_2O + 6O_2 \rightarrow C_6H_{12}O_6 + 6CO_2$

Your answer ☐ **[1]**

**14** The graph shows the effect of light intensity, carbon dioxide concentration and temperature on the rate of photosynthesis.

At which point, **A**, **B**, **C** or **D** is light the limiting factor for photosynthesis?

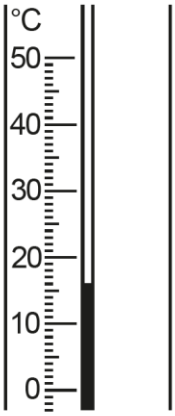



Your answer ☐ **[1]**

Understanding the concept of limiting factors is often challenging. Many candidates did not appreciate that at point A an increase in light intensity results in an increase in rate and so light must therefore be the limiting factor.

## Question 15

**15** In an experiment to investigate the effect of temperature on transpiration, a student measures the air temperature with a thermometer.




They use a thermometer that has a scale with 1 °C divisions.
The student measures the temperature as 16 °C.

What is the degree of uncertainty of the measurement?

**A** +/– 0.5 °C

**B** +/– 1 °C

**C** +/– 2 °C

**D** +/– 5 °C

Your answer ☐ **[1]**

Candidates' understanding of uncertainty in measurements is improving, with many answering this question correctly. The majority of incorrect responses were where candidates chose B, not appreciating that on an analogue scale, the uncertainty is half of the smallest graduation.

### OCR support

A useful guide to the concept of uncertainty can be found in the OCR publication Language of measurement in context.

# 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 24 (a)). The questions between them cover all three Assessment Objectives AO1, AO2 and AO3.

Candidates scored well on Questions 16 and 17, which were common with the Foundation Tier paper. Question 16 was based on PAG 8 and many candidates demonstrated a good understanding of this osmosis experiment and could differentiate between reliability and repeatability. An increasing number of candidates are using water potential terminology and this is improving the clarity of their responses. Testing biological molecules (PAG 2) was tested in Question 24 (b) and candidates produced some good responses.

In questions testing mathematical skills, many candidates could tackle percentage calculations (Question 17 (c)) and also ratios (Question 19 (c) (i)). Interconversion of SI units in Question 21 (b) proved more challenging for a number of candidates.

## Question 16 (a)

**16** A student investigates the effect of different concentrations of sugar solution on cubes of beetroot.

This is the method that they use:

**Step 1** Cut four cubes of beetroot tissue.

**Step 2** Place each beetroot cube in a test tube containing a different concentration of sugar solution.

**Step 3** Leave the beetroot cubes in the sugar solutions for 3 hours.

**Step 4** Remove the beetroot cubes from the sugar solutions.

**(a)** The student wants to calculate the percentage change in mass for each beetroot cube.

They want to use the method above to collect the data they need, but have missed some steps from the method.

Describe the **additional** steps needed in the method to find the data.

.....

.....

.....

.....

.....

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

Most candidates appreciated the need to measure the mass of the cubes before and after immersion. The higher scoring candidates also understood that excess solution should be removed from the surface of the cubes after immersion.

## Question 16 (b)

**(b)** State **two** variables that the student should control in this investigation.

1 .....

2 .....

**[2]**

There were plenty of correct references to the surface area of the cubes, the duration of immersion and the temperature. However, some candidates thought that it was important to control the dependent and the independent variables, i.e. the mass of the cubes and the concentration of the solutions.

## Question 16 (c)

**(c)** Describe how the student could find out if their data is both repeatable and reproducible.

Repeatable .....

.....

.....

Reproducible .....

.....

.....

**[3]**

This was well answered by most candidates with only limited confusion between the terms repeatable and reproducible.

## Question 16 (d)

**(d)** Two of the beetroot cubes increased in mass.

Explain why some of the beetroot cubes will increase in mass.

.....

.....

.....

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

**Misconception**

There were many excellent answers including correct references to water potentials. However, although most candidates appreciated that osmosis was occurring, they incorrectly explained this in terms of the movement of the solution into the tissue rather than the movement of water.

## Question 17 (b) (i)

**(b)** Results from the research showed that the 18 rodents regained an average of 46% of their hearing.

**(i)** One of the scientists claims 'this research shows that our method will cure people who have a similar hearing problem'.

State **three** reasons why this scientist's claim is **incorrect**.

1 .....

.....

2 .....

.....

3 .....

.....

**[3]**

Many candidates could analyse the scientists' methodology and pointed out that the sample size was low, that it only included rodents and only gave a 46% improvement rather than a full cure. However, some missed the phrase 'similar hearing problem' in the question and referred to human hearing defects being more varied.

## Question 17 (b) (ii)

**(ii)** Suggest **one** way the scientists could extend their research.

.....

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

Most candidates correctly referred to extending the research to include other animals or humans.

## Question 17 (c)

**(c)** The scientists discover that a different technique could one day be used to successfully treat 15% of the 10 million people who have hearing loss.

Calculate how many of the 10 million people with hearing loss could benefit from this technique.

Number of people = ..... million **[2]**

The majority of candidates scored both marks here with an answer of 1.5 million. A small minority did not notice the million on the answer line and gave their answer as 1 500 000, thereby only scoring 1 mark.

## Question 18 (b)

**(b)** The substances transported around the organism enter cells either by active transport, diffusion or osmosis.

For each substance indicate which method of transport is used.

Tick (✓) **one** box in each row.

| Substance | Active transport | Diffusion | Osmosis |
|---|---|---|---|
| Water moving into guard cells | | | |
| Mineral ions moving into root hair cells against a concentration gradient | | | |
| Oxygen entering red blood cells | | | |

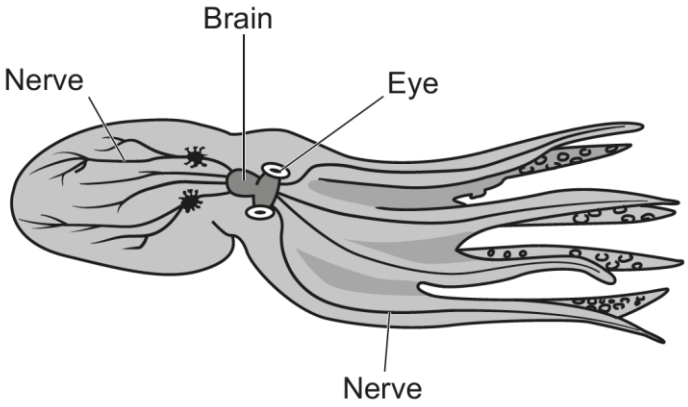
**[3]**

Virtually all candidates followed the instruction of only ticking one box in each row and most put their ticks in the correct boxes.

## Question 19 (a)

**19** **Fig. 19.1** shows the nervous system of an octopus.

**Fig. 19.1**




**(a)** Compare the nervous system of the octopus in **Fig. 19.1** to that of a human.

.....

.....

.....

.....

.....

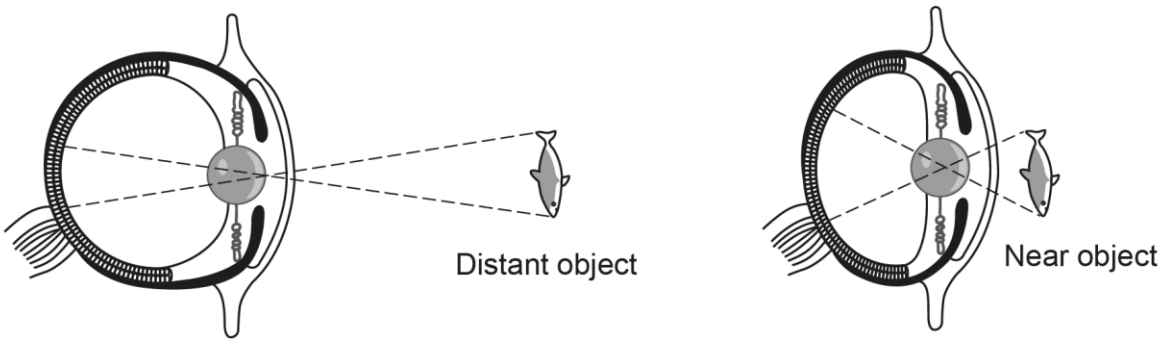
..... **[3]**

This question targeted AO2, requiring candidates to use their knowledge of the human nervous system to make comparisons with the novel system shown. The lack of a spinal cord in the octopus was highlighted by many and therefore so was the fact that the nerves entered the brain directly.

## Question 19 (b)

**(b)** **Fig. 19.2** shows changes in an octopus's eye when it adjusts from focusing on a distant object to focusing on a near object.

**Fig. 19.2**




Give **two** differences, shown on the diagram, between this process in the octopus compared to in a human.

1 .....

.....

2 .....

.....

**[2]**

There were some good responses seen to this question, with candidates appreciating that the octopus eye changes shape rather than the lens changing. However, some candidates did not realise that the two light rays shown on each diagram were starting from different points on the fish and not the same point. They therefore thought that in the octopus, light rays were not focused on the retina.

## Question 19 (c) (i)

**(c)** The table shows some data from three species.

| Species | Eye size (mm) | Body mass (g) | Eye size : body mass ratio |
|---|---|---|---|
| **Human** | 24 | 64 008 | 1:2667 |
| **Octopus** | 20 | 200 | |
| **Owl** | 28 | 784 | 1:28 |

**(i)** Calculate the eye size : body mass ratio for the octopus.

Ratio = ..... **[2]**

Most candidates could correctly calculate the ratio.

## Question 19 (c) (ii)

**(ii)** Owls hunt at night.

Explain how their eye size : body mass ratio makes them adapted to hunt at night.

.....

.....

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

The main issue for some candidates was the interpretation of the ratios. Some stated that the ratio in the octopus (1:10) was smaller than in the human (1:2667) rather than larger. Therefore, stating that this results in a larger eye did not make sense. However, these candidates could still access the second marking point by stating that a large eye means that more light could enter the eye.

## Question 20 (a)

**20** Plant hormones have a variety of effects on plants.

**(a)** Plant hormones control many processes in plants.

Complete these sentences by writing the correct plant hormones in the gaps.

Each hormone can be used more than once.

Flowers are sometimes sprayed with ..... to produce fruits without seeds.

After fruits are picked, they can be exposed to ..... to make them ripen.

Flowers are stimulated to open, and seeds made to break dormancy by the hormone

..... .

Selective weedkillers and rooting powders usually contain ..... .

**[4]**

Some of the lower scoring candidates confused plant hormones with human hormones but there were many fully correct answers to this question. Spellings of gibberellins varied considerably but credit was given if the attempt was phonetically close.

## Question 20 (b)

**(b)** Plant hormones are also responsible for controlling the growth of stems.

Describe how cells are produced to allow stems to grow.

.....

.....

.....

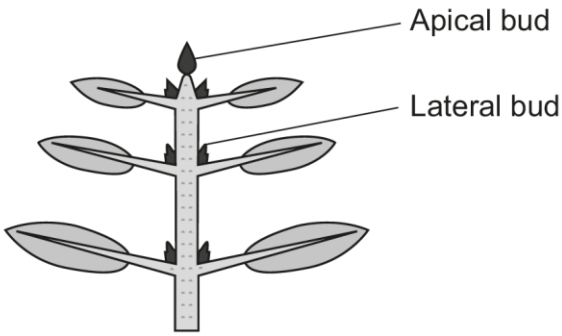
..... **[2]**

This question proved to be one of the more challenging questions with many candidates focusing on the role of plant hormones in tropisms rather than describing how cells are produced. The terms mitosis and meristems were only seen in responses from candidates who were given high marks throughout the paper.

## Question 20 (c)

**(c)** **Fig. 20.1** shows buds growing on a plant.

**Fig. 20.1**

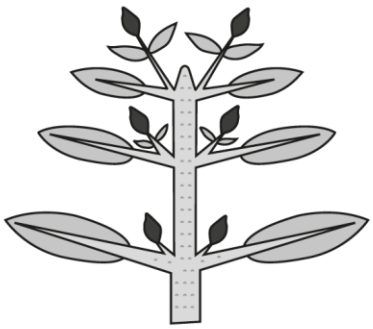



The apical bud affects the growth of the lateral buds. This effect is called apical dominance.

A scientist investigates how auxin produced in the apical bud prevents the growth of the lateral buds.

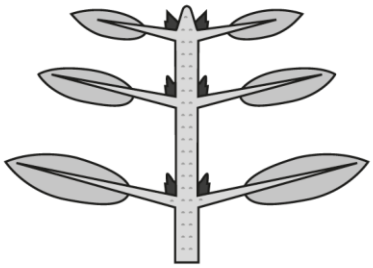
The results of the experiment are shown in **Fig. 20.2** and **Fig. 20.3**.

**Fig. 20.2**



The apical bud is cut off and the plant is left to grow for two weeks.

**Fig. 20.3**



The apical bud is cut off and auxin is applied to the top. The plant is left to grow for two weeks.

Explain how the results of the experiment support the theory that auxin from the apical bud prevents the growth of lateral buds.

.....

.....

.....

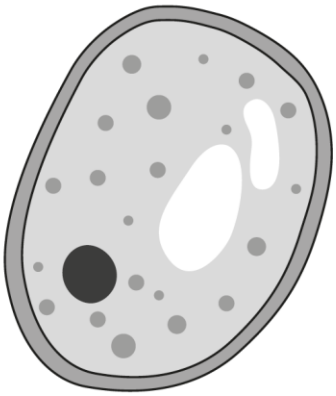
..... **[2]**

Some candidates scored both marks here by correctly linking the presence or absence of the apical bud and auxin to the extent of growth of the lateral buds. Marks were often lost by confusion between the apical buds and the lateral buds or by omitting the presence or absence of auxin from the explanations.

## Question 21 (a) (i)

**21** Yeast is a fungus.

**(a)** The diagram shows a yeast cell.



**(i)** Name **two** sub-cellular structures the yeast cell has in common with both animal and plant cells.

1 .....

2 .....

**[2]**

Most candidates gave correct features, although there were a small number of incorrect references to cell walls.

## Question 21 (a) (ii)

**(ii)** Yeast is classified as a fungus and not as a plant or animal.

Explain why fungi are **not** classified as plants or as animals.

Use the diagram.

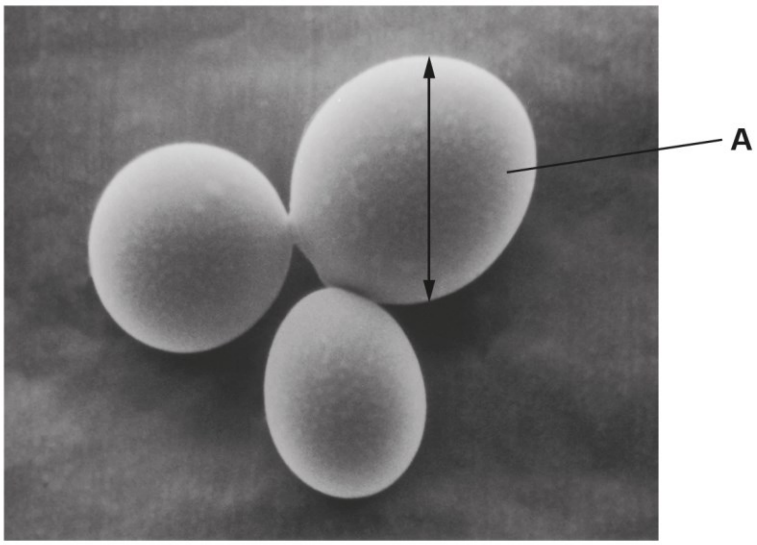
.....

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

This question proved to be the most challenging on the paper. A small number of higher performing candidates did realise that the absence of chloroplasts meant that fungi were not plants but in addition, the presence of a cell wall meant that they were not animals. Many responses concentrated on the presence or absence of mitochondria or ribosomes.

## Question 21 (b)

**(b)** The image is of some yeast cells taken using an electron microscope.




The actual diameter of the yeast cell labelled **A** is 2.8 μm.

(1 mm = 1000 μm)

Calculate the magnification used to produce this image.

Give your answer to **3** significant figures.

Magnification = ..... **[4]**

This calculation consisted of four main steps:

- the correct measurement of the yeast cell
- the conversion from millimetres or centimetres to micrometres
- the calculation of the magnification
- the adjustment of the answer to 3 significant figures.

Candidates may have made a mistake in one of these steps but were still given credit if the other steps were completed correctly. A range of sizes of the yeast cell from 31 mm to 33 mm was allowed.

The most common error seen in responses was an incorrect conversion of the measurement to micrometres.

## Question 21 (c)

**(c)** The cells in the image are baker's yeast.

Baker's yeast is used to make bread. The yeast respires anaerobically.

Which product of this process will help the bread rise?

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

Most candidates correctly stated carbon dioxide but a small number gave ethanol as the answer.

## Question 22 (a)

**22** Some people have a condition called varicose veins.

This condition is caused when the valves in veins do not shut properly.

**(a)** Describe the effect that this condition will have on blood flow.

.....

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

There were some references to the speed of blood flow which were not credited but most candidates correctly highlighted the possibility that blood could flow backwards.

## Question 22 (b)

**(b)** Suggest **one** symptom someone with varicose veins can have.

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

Blood clots or fatigue were the most common correct responses. Some candidates discussed the level of oxygenation of the blood which was not credited.

## Question 22 (c)

**(c)** The data in the table shows the results from a study by scientists on varicose veins.

| Age group | Number of people with varicose veins | Percentage of people with varicose veins who are male (%) |
|---|---|---|
| < 30 | 3 659 | 37.1 |
| 30–39 | 9 691 | 27.2 |
| 40–49 | 11 343 | 32.1 |
| 50–59 | 9 922 | 39.6 |
| 60–69 | 5 671 | 43.9 |
| 70+ | 3 438 | 33.3 |

Give **two** conclusions that can be made from the data in the table.

Conclusion 1

.....

.....

Conclusion 2

.....

.....

**[2]**

Most candidates correctly concluded that females were more likely to have varicose veins as the percentages that were males were all under 50%. The other marking points were also regularly awarded. Some candidates did not score marks due to incorrectly expressing themselves, such as stating that 'most people aged 40-49 have varicose veins'.

## Question 22 (d) (i)

**(d)** The study was investigating a potential link between varicose veins and other circulatory conditions.

The study recorded how many of **43 724 people with varicose veins** had three other circulatory conditions. The results are shown in **Table 22.1**.

**Table 22.1**

| Circulatory condition | Number of people with varicose veins |
|---|---|
| Deep vein thrombosis | 458 |
| Heart attack | 1434 |
| Stroke | 1116 |

The study also recorded how many of **18 491 people without varicose veins** had the three other circulatory conditions. The results are shown in **Table 22.2**.

**Table 22.2**

| Circulatory condition | Number of people without varicose veins |
|---|---|
| Deep vein thrombosis | 79 |
| Heart attack | 638 |
| Stroke | 472 |

**(i)** The scientists stated this conclusion from the study:

> Individuals with varicose veins were at a greater risk of deep vein thrombosis. However, they were not at a greater risk of the other circulatory conditions.

Explain how they came to this conclusion.

You will need to use calculations to compare the data in **Table 22.1** and **Table 22.2**.

.....

.....

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.....

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

Many candidates realised that it was necessary to take into account the two differing sample sizes and so calculated percentages, ratios or fractions so that they could compare the data in the two tables. Candidates who did not score marks often just compared the raw data from each table.

## Question 22 (d) (ii)

**(ii)** The results of this study were published in a peer reviewed journal.

What are **two** benefits of reading information that has been peer reviewed?

1 .....

.....

2 .....

.....

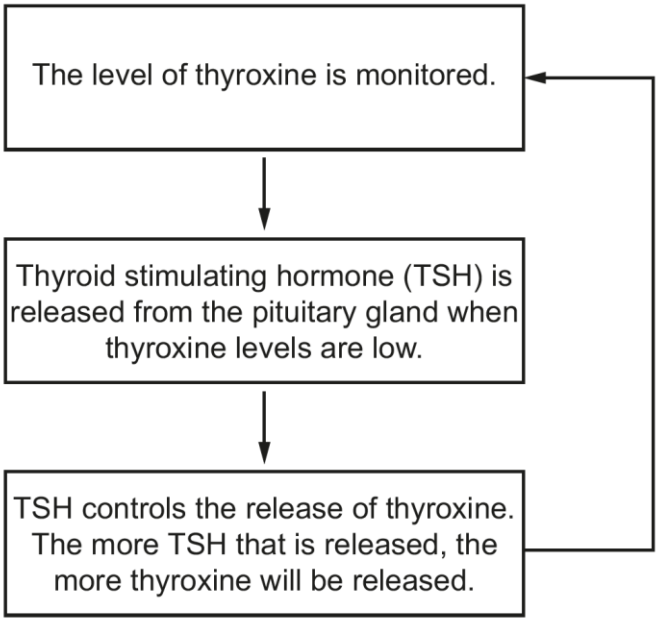
**[2]**

The importance of peer review is covered in Working Scientifically (1.1i) in the appendix of the specification. Many candidates were clearly aware of the function of peer review in checking aspects of the work and for increasing reliability or validity. However, some candidates thought that peer review simply involved repetition of the experiment.

## Question 23 (a)

**23** Thyroxine is a hormone that regulates metabolism.

The diagram outlines how the release of thyroxine is controlled by the body.




**(a)** Explain the processes involved in negative feedback and how they are used in the control of thyroxine.

.....

.....

.....

.....

.....

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

The most successful responses to this question applied the principles of negative feedback to thyroxine and included:

- the monitoring of thyroxine to see if levels deviated from the norm
- the production of TSH to alter production of thyroxine from the thyroid gland
- the returning to normal of the thyroxine levels.

Some candidates were not credited marks because they gave generic responses about negative feedback or simply repeated the information from the flow diagram.

## Question 23 (c)

**(c)** Describe how hormones are transported around the body to their targeted organs.

.....

.....

.....

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

This question discriminated well between candidates at different grades. High performing candidates were more precise in their answers, stating the plasma of the blood, rather than just in the bloodstream.

## Question 24 (a)*

**24** Glycogen storage disease is caused by a mutation in the DNA that codes for an enzyme (a protein) that converts glycogen into glucose.

The mutation changes the triplet codes in the DNA.

**(a)*** Describe how a change to the triplet codes in the DNA can prevent the enzyme working and how this can affect the person's blood glucose level.

.....

.....

.....

.....

.....

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

This question was the 6-mark Level of Response question on this paper. Candidates were expected to focus on three main ideas in their responses:

- the effect of a mutation on the amino acid sequence of a protein
- the resulting change in the shape of the active site and ability to bind with the substrate
- the failure to be able to elevate blood glucose levels.

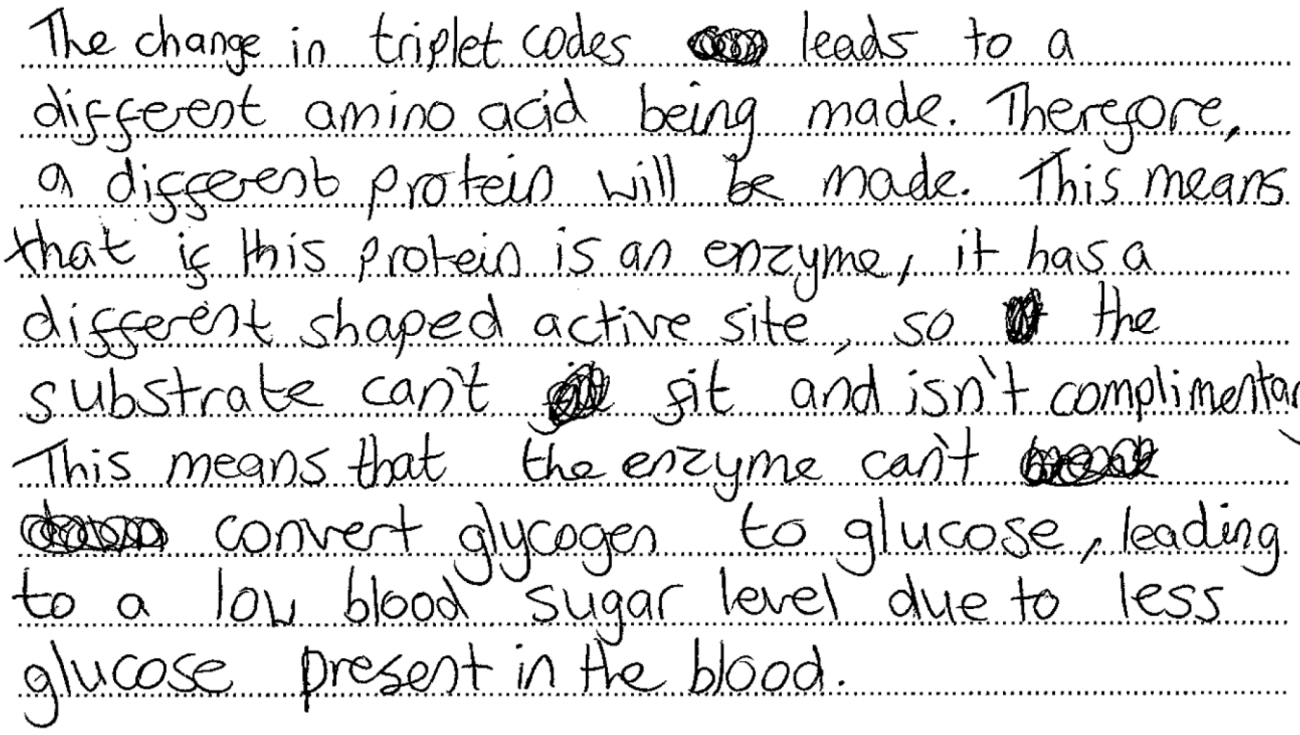
Some candidates produced concise, accurate Level 3 responses concentrating on each of these areas. Others gave long descriptions of the process of protein synthesis, without covering the implications of a mutation. There were also many examples of confusion between glucagon and glycogen in candidates' responses. Another misconception that was often seen was that DNA codes for the production of amino acids rather than the production of proteins. Some of these points are seen in the following two exemplars.

## Exemplar 1

A mutation in the DNA ~~can~~ leads to a change in the triplet codes which could lead to a change in the amino acid sequence of the protein. This could change the shape and structure of the protein causing the active site to be ~~a~~ a different shape. This means that the enzyme would not be able to break glycogen down into glucose ~~causing the levels of glucose in the blood to drop~~. because glycogen wouldn't fit in the active site of the enzyme. This would cause the levels of glucose in the blood to drop.

This response was awarded Level 3, 6 marks. It is a complete, concise response, highlighting the change to the amino acid sequence, leading to a possible change in the shape of the active site and the consequence for the blood sugar level. The response is clear and logically structured.

## Exemplar 2




This response was awarded Level 2, 4 marks. It clearly outlines the possible effect of a mutation on the activity of the enzyme and the resulting failure to be able to raise blood sugar levels. However, the misconception of DNA producing amino acids, rather than coding for their order, is seen in the first sentence. This limits the response to Level 2.

## Question 24 (b)

**(b)** Glucose is often found in the urine of people who have diabetes.

Benedict's solution is used to detect glucose in the urine.

It is also used to give a measure of the concentration of glucose in a sample.

Describe how the results of the Benedict's test can give a measure of the concentration of glucose in a sample.

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

Candidates were expected to apply their knowledge of the results of the Benedict's test for glucose to suggest a way of using it to give a semi-quantitative measure of glucose concentration. Many candidates realised that there was a range of colour changes from blue to green to orange and red and could relate these to different glucose concentrations. The highest scoring candidates also suggested a way of judging these colours, such as the use of colour charts.

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