

GCSE (9–1)

Examiners' report

GATEWAY SCIENCE BIOLOGY A

J247

For first teaching in 2016

J247/03 Summer 2023 series

Contents

Introduction	4
Paper 3 series overview	5
Section A overview	6
Question 1 and 2	6
Question 4	7
Question 5	7
Question 7	8
Question 8	9
Question 10	9
Question 11 and 13.....	10
Question 14	10
Question 15	11
Section B overview	12
Question 16 (a).....	12
Question 16 (b) (i).....	13
Question 16 (b) (ii)	14
Question 16 (c)	15
Question 17 (a).....	15
Question 17 (b).....	15
Question 17 (c)	16
Question 17 (d).....	16
Question 18 (a).....	17
Question 18 (b).....	17
Question 18 (c)	18
Question 19 (a).....	19
Question 19 (b).....	20
Question 19 (c)	20
Question 19 (d).....	21
Question 19 (e).....	21
Question 20 (a).....	22
Question 20 (b).....	23
Question 21 (a).....	24
Question 21 (b) (i).....	25
Question 21 (b) (ii)	26

Question 21 (c)	27
Question 22 (a)	28
Question 22 (b)	29
Question 22 (c)	29
Question 23 (a)	30
Question 23 (b)	30
Question 23 (c)	31
Question 24 (a)	32
Question 24 (b)	33
Question 24 (c)	34
Question 25 (a)	34
Question 25 (b)	35
Copyright information	36

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.

Would you prefer a Word version?

Did you know that you can save this PDF as a Word file using Acrobat Professional?

Simply click on **File > Export to** and select **Microsoft Word**

(If you have opened this PDF in your browser you will need to save it first. Simply right click anywhere on the page and select **Save as . . .** to save the PDF. Then open the PDF in Acrobat Professional.)

If you do not have access to Acrobat Professional there are a number of **free** applications available that will also convert PDF to Word (search for PDF to Word converter).

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 B4-6.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
<ul style="list-style-type: none"> • performed calculations correctly, including giving their answer to the required number of significant figures (Question 19 (b)) or to the nearest whole number (Question 21 (b) (ii)) • made suitable conclusions when provided with data presented in graphical form (Question 21 (c) and Question 23 (c)) • could use information provided to explain aspects of novel biological processes or procedures (Question 25 (b) and Question 21 (a)) • used their knowledge of the different stages of protein synthesis to explain the consequences of a mutation (Question 24 (a)). 	<ul style="list-style-type: none"> • made errors in calculations, such as using the incorrect method to calculate percentage change or made errors in converting their answer to three significant figures (Question 19 (b)) • gave conclusions that could not be deduced from the information provided in Question 21 (c) and Question 23 (c)) • described the process of protein synthesis without explaining the effect that a mutation would have on the various molecules involved (Question 24 (a)) • confused practical techniques for measuring the rate of photosynthesis with methods to measure the rate of transpiration (Question 22 (c)).

Section A overview

Candidates performed particularly well this series on the multiple-choice section of this paper. Questions 1, 2, 11 and 13 were usually answered correctly. Questions 7, 10 and 14 discriminated between students at different grades well, but were still answered correctly by over half of the candidates. Question 14 was the most challenging question in this section with some candidates missing the fact that the valve had to be at the junction of the heart and blood vessel.

Question 1 and 2

- 1 A person was in an accident and their **memory** is affected.

Which part of the brain is most likely to have been injured?

- A Cerebrum
- B Hypothalamus
- C Medulla
- D Pituitary

Your answer

[1]

- 2 Single-celled algae found in the ocean absorb large amounts of carbon dioxide.

Which process inside the cells of the algae uses this carbon dioxide?

- A Homeostasis
- B Photosynthesis
- C Respiration
- D Temperature regulation

Your answer

[1]

Although the majority of candidates answered correctly, there were a small number that confused respiration with photosynthesis and so answered C.

Question 4

4 Water passes through a plant and is lost in transpiration.

What is the correct route for water to move in this process?

- A From the phloem to the stomata
- B From the stomata to the phloem
- C From the stomata to the xylem
- D From the xylem to the stomata

Your answer

[1]

If candidates answered incorrectly, they tended to reverse the direction of water movement and so gave the answer C.

Question 5

5 How are mineral ions absorbed by plant roots?

- A By active transport
- B By diffusion
- C By osmosis
- D By translocation

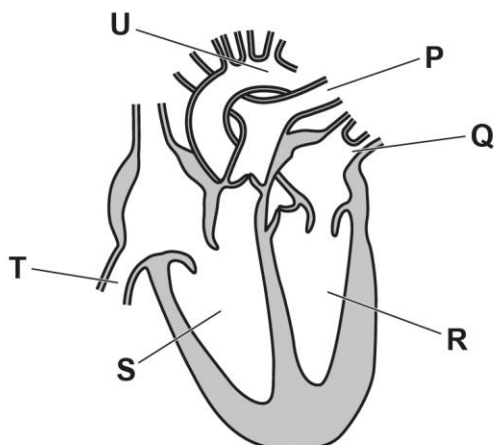
Your answer

[1]

This was one of the more challenging questions with diffusion and osmosis acting as distractors for some candidates.

Question 7

7 The diagram shows the main structures in the heart.



Blood flows from the lungs back to the heart and is then pumped to the body.

Which order of structures does blood go through?

- A Q → R → P
- B T → S → P
- C Q → R → U
- D T → S → U

Your answer

[1]

About two thirds of the candidates answered correctly. The most common incorrect response was B, where candidates followed the passage of blood from vein to ventricle, to artery but did this on the right side of the heart rather than the left.

Question 8

- 8** In an enzyme experiment, a student tries to measure pH by dipping universal indicator paper into a solution.

They then use a pH chart in their textbook.

They find it difficult to compare the indicator paper with the pH chart and cannot read the pH numbers on the chart.

Which statement could explain why?

- A** The student is colour blind.
- B** The student is colour blind and long-sighted.
- C** The student is colour blind and short-sighted.
- D** The student is short-sighted.

Your answer

[1]

If candidates answered incorrectly, then it was nearly always because they confused long and short-sightedness and so choose option C.

Question 10

- 10** A drug is used to treat cancer. The drug stops the formation of microtubules that move chromosomes in cells.

Which statement explains how the drug stops more cancer cells being made?

- A** Chromosomes will be replicated but the chromosomes will not separate in mitosis.
- B** Dividing cells will not replicate their chromosomes.
- C** Four cells will be produced at the end of mitosis.
- D** New cells formed will only have half the number of chromosomes.

Your answer

[1]

The most common incorrect response was B.

Question 11 and 13

11 What is the correct sequence in a reflex arc?

- A Effector → receptor → sensory neurone → relay neurone → motor neurone
- B Motor neurone → sensory neurone → relay neurone → effector → receptor
- C Receptor → sensory neurone → relay neurone → motor neurone → effector
- D Receptor → relay neurone → sensory neurone → effector → motor neurone

Your answer

[1]

13 Which molecules are all polymers?

- A DNA, amino acids and starch
- B Fatty acids, glycerol and amino acids
- C RNA, glucose and fatty acids
- D Starch, protein and DNA

Your answer

[1]

Question 14

14 Which blood vessels have a valve at the junction between the blood vessel and the heart?

- A Aorta and pulmonary artery
- B Aorta and vena cava
- C Aorta, pulmonary artery and pulmonary vein
- D Aorta, pulmonary artery, pulmonary vein and vena cava

Your answer

[1]

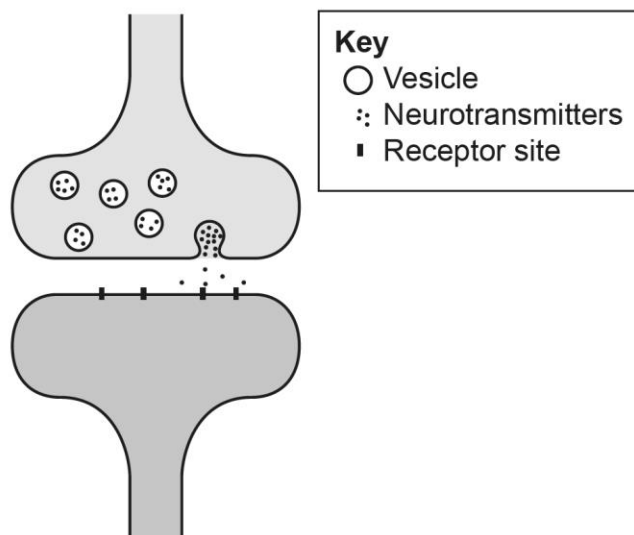
This was the most challenging question with a significant number of candidates choosing option D.

Question 15

15 Synapses are junctions between neurones.

For an impulse to be generated in another neurone, a neurotransmitter chemical diffuses across the gap and binds to receptor sites.

This process is shown in the diagram.



Which direction can an impulse pass across a synapse?

- A Only from the neurone that contains the vesicles to the neurone that contains the receptor sites
- B Only from the neurone that has the receptor sites to the neurone that contains the vesicles
- C Either way across a synapse because the neurotransmitter can diffuse either way
- D Either way across a synapse because the neurotransmitter is produced by both neurones

Your answer

[1]

The majority of candidates answered this question correctly with only a minority being distracted by option C.

Section B overview

Candidates scored well on the first two questions which were common with the foundation tier paper. The only exception was Question 16 (b) (i) where candidates seemed to find the requirement to produce a biological drawing very challenging.

In questions involving practical skills the responses were mixed. In Question 19 (a) there was confusion between the movement of water and the movement of solute in osmosis. In Question 22 (a), candidates answered well when asked about control variables but seemed to find it much more difficult in Question 22 (c) to describe modifications to the experiment.

Question 16 (a)

- 16 (a)** The contents of sub-cellular structures found in eukaryotic cells enable the structure to perform its function.

Draw lines to connect each **sub-cellular structure** to its **contents**.

Then draw lines to join each of the **contents** to its correct **function** within the cell.

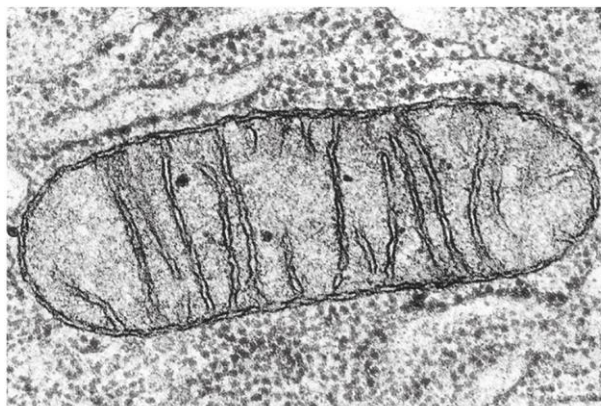
Sub-cellular structure	Contents	Function
cell membrane	chlorophyll	allows communication with other cells
chloroplast	enzymes	catalyses reactions in aerobic respiration
mitochondria	receptors	needed for photosynthesis

[4]

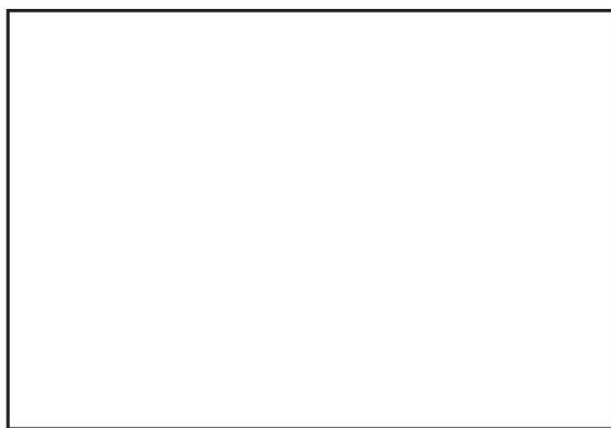
Virtually all the candidates followed the instructions and most scored all 4 marks.

Question 16 (b) (i)

(b) The image is of a mitochondrion.



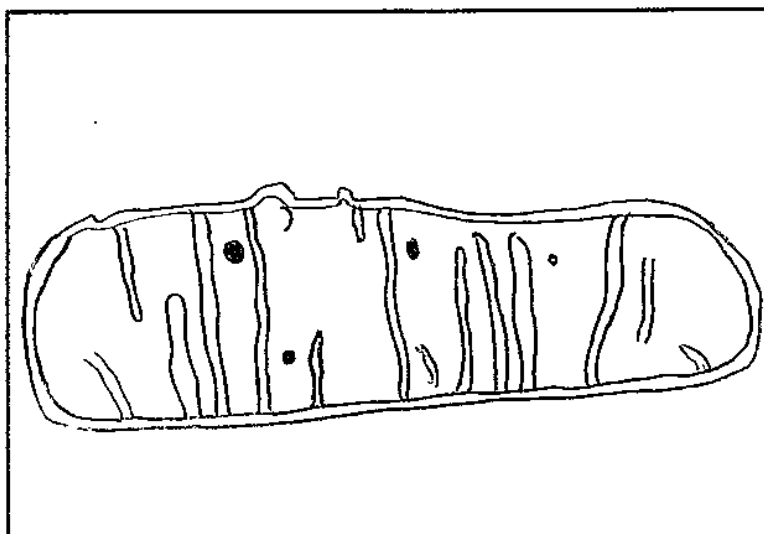
(i) Draw the mitochondrion in the box. Your drawing should be a scientific drawing.



[2]

The ability to make accurate scientific drawings is an important skill highlighted in PAG 1 and in Working Scientifically. It has not been commonly tested on previous papers and that may be one reason why candidates found this question challenging. Their diagrams were often very sketchy, rather than showing clear lines. Others included shading. Some diagrams were clear but were drawn as textbook representations of a mitochondrion rather than the one shown in the micrograph.

Exemplar 1



Exemplar 1 shows a diagram that scored both marking points. The lines are clear, without sketching, and the candidate has attempted to replicate the internal structure of this mitochondrion.

OCR support



The [Practical skills booklet](#) that is available on Teach Cambridge contains instructions for staining cheek cells which can then be used as practice for drawing biological structures.

Question 16 (b) (ii)

(ii) What type of microscope was used to create the image of the mitochondrion?

Explain your answer.

Type of microscope

Reason

.....

[2]

The majority of candidates correctly identified the electron microscope and gave reasons involving the magnification or resolution. There were references to the image being in black and white but these were ignored and did not negate any correct reasons.

Question 16 (c)

(c) Name **one** structure found in both an animal cell and a prokaryotic cell.

..... [1]

A small number of responses stated mitochondria but most candidates answered correctly.

Question 17 (a)

17 (a) Arteries, capillaries and veins are blood vessels found in the human circulatory system.

Put ticks (✓) in each row to identify which blood vessels have each feature.

Feature	Arteries	Capillaries	Veins
Have valves along their length			
Have a very thick muscle wall			
Have a wide lumen			

[3]

Most candidates scored all 3 of the available marks here. If they did lose a mark, it was often on the bottom row. Perhaps the term lumen was not familiar to them, although it is used in the specification.

Question 17 (b)

(b) Chronic venous insufficiency (CVI) is a condition caused by faulty valves found in some blood vessels in the legs.

Describe how CVI will affect the person's blood circulation.
Suggest **one** symptom of this condition.

Effect on blood circulation

.....

Symptom

[2]

Most responses appreciated that CVI could lead to the backflow of blood but the resulting symptoms did not always follow.

Question 17 (c)

- (c) The volume of blood pumped from the left ventricle into the aorta during one contraction is 70 ml.

Calculate the volume of blood that will be pumped into the aorta in one hour if a person has a resting heart rate of 76 beats per minute.

Volume = ml/hour [2]

The correct value of 319200 was the most common response here. Some candidates did not multiply by 60 to convert from minutes to hours and so only scored 1 mark.

Question 17 (d)

- (d) Red blood cells contain haemoglobin to transport oxygen.

Give **one** other feature of red blood cells.
How does this other feature allow the cell to perform its function?

.....

 [2]

The most common features stated were the lack of a nucleus or the biconcave shape of the red blood cell. To score 2 marks they needed to combine the feature with an explanation.

Misconception



A significant number of candidates linked the biconcave shape of the red blood cell to the amount of oxygen that can be transported. A correct response needed to focus on the rate of diffusion of gases.

Question 18 (a)

18 (a) The colour of a person's urine changes depending on the concentration of their blood.

Complete the sentences below to describe why a person will have urine that is dark in colour.

Use the words in the list.

ADH	FSH	glucagon	hypothalamus
medulla	pituitary gland		

If a person has not consumed enough water, the concentration of the blood increases.

This is detected by receptors in the

These receptors send a message to the

This causes more to be released into the bloodstream.

[3]

This question was also well answered with many candidates scoring 3 marks. If a mistake was made, it was often locating the receptors in the medulla rather than in the hypothalamus.

Question 18 (b)

(b) Give **one** factor, other than lack of water intake, that could cause a person to have concentrated urine.

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

Sweating and high salt intake were common correct responses. Some candidates incorrectly referred to the intake of alcohol.

Question 18 (c)

- (c) Nephritis is a condition where part of the kidney tubule becomes inflamed. The result of this is that proteins can enter the tubule and pass out in the urine.

Describe a test that could be used to determine if a patient has nephritis.

.....

.....

.....

..... [2]

Misconception



Testing for biological molecules is the focus of PAG 2. Some candidates show confusion between Benedict's, biuret and iodine tests, including how they are carried out and what they test for.

OCR support



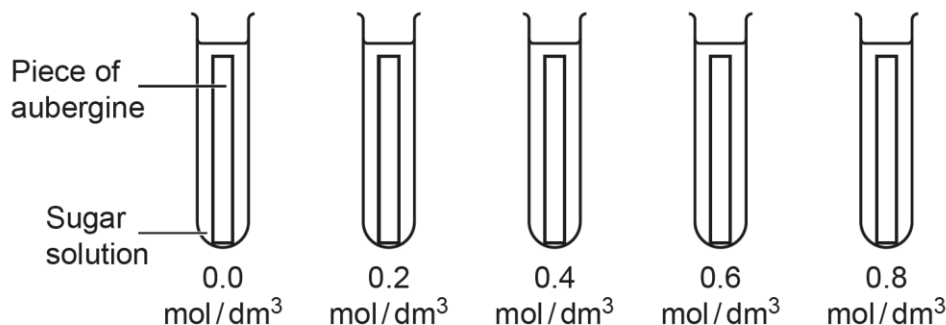
Testing for biological molecules has been tested on a number of previous examination papers. [ExamBuilder](#) can be used to find and use those questions with candidates as practice material.

Question 19 (a)

19 An aubergine is a fruit with a thick, shiny skin.
A student does an experiment to find the solute concentration in the cells of an aubergine.

They follow this method:

- Remove the skin and cut five pieces of aubergine of equal size.
- Weigh each piece before placing into one of 5 different sugar solutions.
- Leave for 4 hours.
- Remove the pieces of aubergine and reweigh.



The table shows their results.

	Concentration of sugar solution				
	0.0 mol/dm ³	0.2 mol/dm ³	0.4 mol/dm ³	0.6 mol/dm ³	0.8 mol/dm ³
Mass before the experiment (g)	5.0	5.2	5.5	5.1	5.3
Mass after the experiment (g)	7.0	6.5	5.8	4.5	3.5
Percentage change in mass (%)	+40.0	+ 25.0	+5.50	-11.8	

(a) Why did the student remove the skin from the aubergine before placing it in the sugar solution?

.....
 [1]

Many candidates appreciated that the aubergine skin is impermeable and this would prevent osmosis from occurring. Some responses then went on to state that the solution, rather than water, would not be able to pass through. This error meant that candidates did not score the mark.

Question 19 (b)

(b) Calculate the percentage change in mass for the piece of aubergine placed in 0.8 mol/dm^3 .

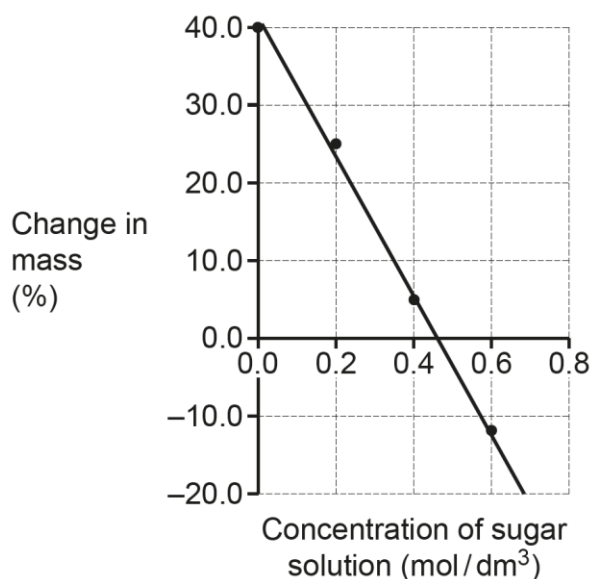
Give your answer to **3** significant figures.

Percentage change in mass = % **[3]**

The majority of candidates scored full marks. The two most common errors here were as follows. Some candidates could not calculate the percentage change as they divided 3.5 by 5.3. Other candidates could calculate the percentage but then made rounding errors.

Question 19 (c)

(c) The student plots a graph to work out the solute concentration of the cells in the aubergine.



The student concludes that the solute concentration of the aubergine cells is 0.46 mol/dm^3 .

Explain why the student is **correct**.

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

This was correctly answered by most candidates.

Question 19 (d)

- (d) Describe how you could improve the method to determine the concentration of the cells in the aubergine with greater accuracy.

.....

.....

.....

..... [2]

A number of candidates correctly stated that including intermediate concentrations in the experiment would improve accuracy. Only the higher scoring papers included reference to these concentrations being focused in the crucial area of 0.4 to 0.6 mol/dm³.

Question 19 (e)

- (e) Another student evaluates the method used in the experiment. This student finds that two errors were made.

For each error, decide if it is a random error or a systematic error.

Tick (✓) **one** box for each error.

Error	Random error	Systematic error
Excess fluid was left on some aubergine pieces which will affect the mass.		
The scale used to weigh the aubergine pieces was not calibrated correctly.		

[1]

The difference between random errors and systematic errors is covered in the Working Scientifically section of the specification. Although it has not been tested many times on these papers, the question was well answered by most candidates.

Question 20 (a)

20 A student makes pineapple jelly using two different methods. Both methods use a protein called gelatin which causes the jelly to set.

Tinned pineapple is fresh pineapple which has been treated with heat.

Method 1
Fresh pineapple is added to the gelatin.
It is left for 2 hours.
The jelly does not set.

Method 2
Tinned pineapple is added to the gelatin.
It is left for 2 hours.
The jelly sets.

Pineapple contains an enzyme called bromelain. Bromelain digests proteins.

(a) Explain why the jelly made with fresh pineapple does **not** set but the jelly made with tinned pineapple does set.

Use your knowledge of enzymes.

.....

.....

.....

.....

.....

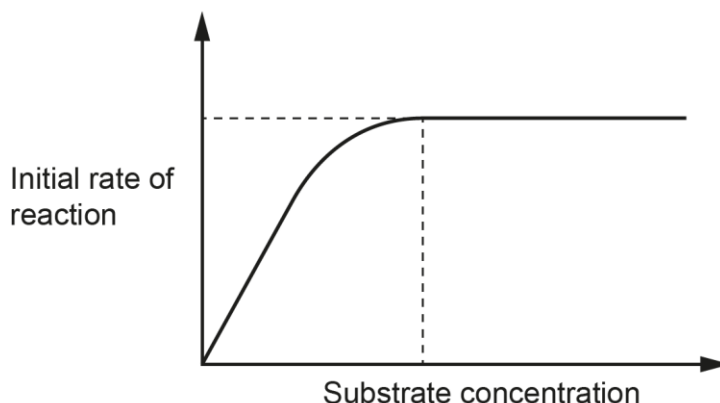
.....

[4]

Responses to this question were rather polarised. Successful answers highlighted that heat treatment of the tinned pineapple would have denatured the enzymes, changing the shape of the active site, resulting in gelatin not being digested. Whereas gelatin is digested by the enzymes in the fresh pineapple. Other answers stated that the heat treatment gave the optimum temperature for the enzymes to work, even though this would not explain why the jelly sets.

Question 20 (b)

(b) The graph shows the rate of an enzyme catalysed reaction as the concentration of substrate is changed.



Draw an **X** on the graph to show where approximately 50% of the enzymes' active sites are occupied with substrate.

Explain your decision.

.....

.....

..... [2]

Candidates that realised that 50% occupation of the active sites would result in half of the maximum rate of reaction managed to put the X in the correct position. However, this question proved quite challenging.

Question 21 (a)

21 IVF is a fertility treatment which involves egg cells being fertilised by sperm in a laboratory before transferring embryos into a female's uterus.

In this procedure a female's natural menstrual cycle is controlled using hormones.

Four hormones are used:

- GnRH α – a hormone that prevents the development of eggs
- hCG – a hormone that triggers the final stage of egg development
- FSH
- progesterone.

(a) Complete the table to identify the hormone that should be used at each stage of this procedure.

One has been filled in for you.

Stage in IVF procedure	Hormone to be used
A hormone is used to stop a female's natural cycle.	
The female is then stimulated to produce a large number of immature eggs.	
The eggs produced by the female are matured 12 hours before they are collected.	hCG
The female's uterus lining is maintained for 14 days after egg collection.	

[2]

Most candidates correctly identified the three hormones although there were a small number of responses where alternative hormones, other than those given, were used.

Question 21 (b) (i)

(b) In IVF, the number of egg cells collected from each female differs.

This table shows the number of eggs collected from 10 females.

Female	Number of eggs collected
1	3
2	8
3	9
4	12
5	24
6	8
7	10
8	10
9	8
10	11

(i) Write down **two** conclusions about the number of eggs produced by females in this process.

1

.....

2

.....

[2]

There were some good responses seen involving calculations of range, mean, mode or median. In many responses candidates came to conclusions that could not be made from this process and indeed did not focus on the number of eggs produced. Some other responses just quoted the data.

Question 21 (b) (ii)

- (ii) Only 60–80% of the eggs collected from a female will be mature and therefore able to be used for IVF.

Of the mature eggs collected, only 70–80% will be fertilised.

Calculate the **maximum** number of eggs that can be fertilised if a female produces 10 eggs in one cycle.

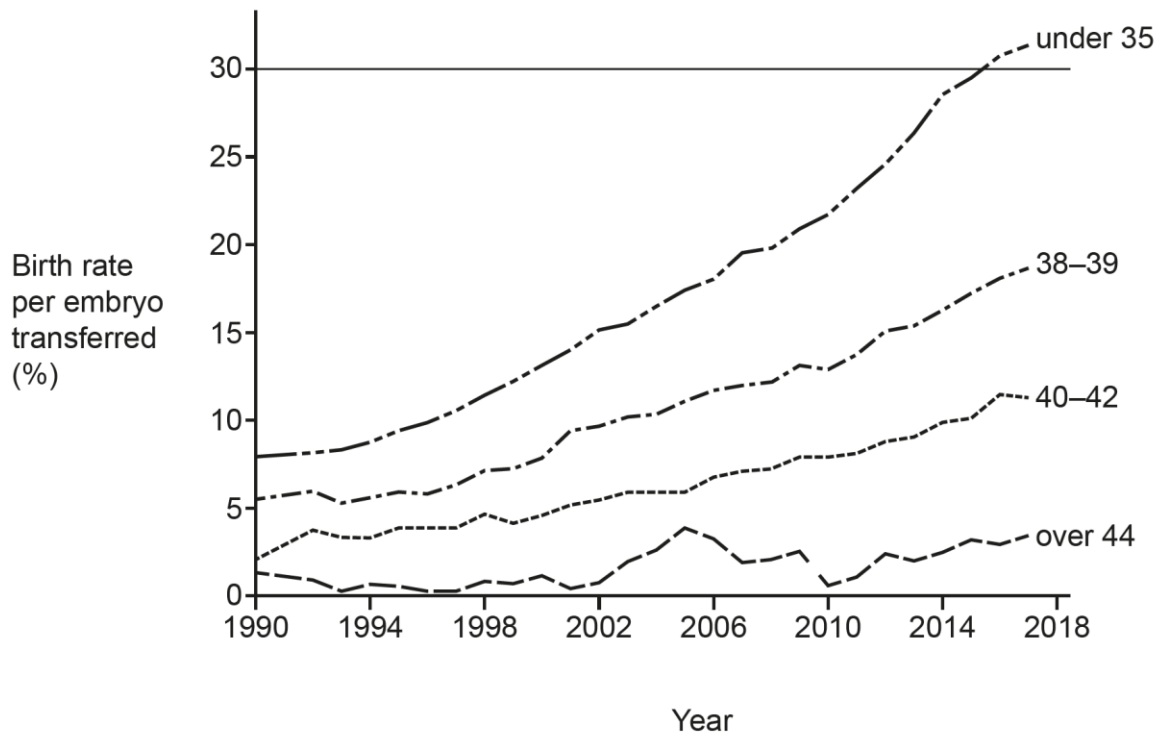
Give your answer to the nearest whole number.

Maximum number of eggs = [2]

The majority of candidates scored full marks here with a correct calculation. In a small number of cases, incorrect percentages were used for the calculation but 1 mark could still be scored if the answers were correctly rounded.

Question 21 (c)

(c) The graph shows the birth rate per embryo transferred for some different age groups of females between 1990 and 2017.



Give **two** conclusions that can be made from the graph.

Conclusion 1

.....

Conclusion 2

.....

[2]

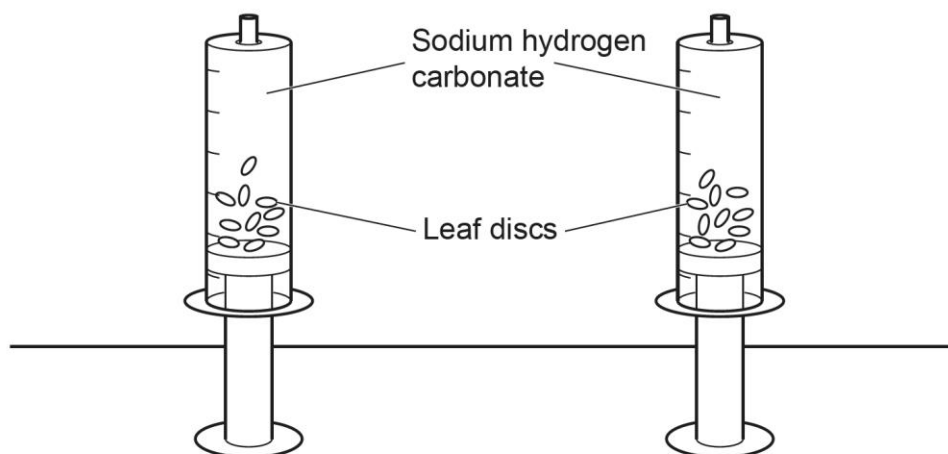
Answers that scored marks concentrated on the increase in birth rate for all groups over time and the difference in the birth rate between different aged females. As was the case in Question 21 (b) (i), some candidates made conclusions that could not be deduced from the graph.

Question 22 (a)

22 A student investigates the rate of photosynthesis in two different species of plant.

The student's method:

- Cut 10 leaf discs from a leaf of one of the plants.
- Place the discs into a syringe containing sodium hydrogen carbonate solution.
- Repeat this using a leaf from the other plant.
- Record the time it takes for the leaf discs to rise to the top of each syringe.



(a) Give **three** variables that the student must control to ensure that data collected for the two species of plant is valid.

- 1
-
- 2
-
- 3
-

[3]

There were many good responses here giving three variables that should be controlled. There were still many vague references to the 'amount' of the solution. Candidates that stated volume and concentration could score 2 marks for those variables.

Question 22 (b)

(b) Explain why the leaf discs rise to the top of the syringes.

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

Most candidates could explain this in terms of oxygen production.

Question 22 (c)

(c) Describe how the student could change their investigation to find the effect of light intensity on the rate of photosynthesis for **one** type of leaf.

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

High scoring responses included reference to the inverse square law. A number of responses described completely new methods involving the counting of bubbles from pondweed, instead of describing how to change the investigation. There was also some confusion between photosynthesis and the use of a potometer to estimate transpiration.

Exemplar 2

The student could have used one leaf from a plant and used an LED lamp at different distances from the plant and measured the rate of oxygen that is released by using a syringe. [3]

Exemplar 2 shows a response that confuses this experiment with the pondweed experiment. It was given 1 mark for the use of a lamp at different distances from the plant material.

Question 23 (a)

23 (a) Hormones are released when an athlete is preparing for and running a marathon.

Complete the sentences below to describe the hormones involved before and during the race.

Use the words from the list.

adrenaline	digestive	endocrine	glucagon	glucose
glycogen	insulin	nervous	thyroxine	

Before the race, the athlete's body needs to prepare for action. The body responds by secreting the hormone

This hormone causes blood to be diverted from the system to the muscles.

During the race, blood sugar levels will decrease, so another hormone called will be released.

This results in stores of being used to maintain the blood sugar levels allowing the athlete to complete the marathon.

[4]

Adrenaline was identified by most candidates but fewer could correctly identify the system in the second gap. As is often the case, there was some confusion between glycogen, glucose and glucagon but very few hybrid spellings were seen.

Question 23 (b)

(b) Hormones are part of the endocrine system.

Describe **two** differences between the endocrine system and the nervous system.

- 1
-
- 2
-

[2]

Exemplar 3

- During protein synthesis DNA unzips and the complementary base pairs attach (no thymine so uracil binds to Adenine) (transcription)
- Due to the mutation caused by Beta Thalassaemia ~~the bases~~ extra bases are inserted onto the mRNA
- The mRNA detaches and the DNA zips back up
- The mRNA leaves the nucleus through the cytoplasm to ribosome for translation
- Ribosome reads the mRNA in codons/triplets each coding for another amino acid
- However, the extra bases inserted ^{on mRNA} means that the ribosome will read it differently than normal person [6] without Beta Thalassaemia.
- As a result, an alternative haemoglobin protein is produced as the amino acids that chain together are different (due to extra bases) (sequence)

Exemplar 3 shows an answer that was given Level 2, 4 marks. The response is well constructed and relevant, explaining how the change in DNA results in a change in mRNA and the protein produced. However, there is no reference to tRNA.

Question 24 (b)

(b) The haemoglobin in the red blood cells of a person with beta thalassaemia does **not** function correctly.

Suggest **one** symptom that a person with beta thalassaemia may have.

.....

..... [1]

References to fatigue or tiredness were the most common correct responses seen here.

Question 24 (c)

- (c) Beta thalassaemia can be treated with stem cells.
Stem cells are taken from a donor and placed in the vein of the patient.

Explain why using stem cells from a donor can be used as a treatment for this disease.

.....

.....

.....

..... [2]

The two aspects to this response were the ability of stem cells to differentiate into red blood cells and the fact that the donor would not have the mutation. Some answers focused on one of these two aspects but the higher scoring scripts contained references to both.

Question 25 (a)

- 25 (a) Two students are discussing respiration.

One student says, 'I know all animals respire but I don't think plants need to.'

Explain why the student's statement is **not** correct.

.....

.....

.....

..... [2]

There was considerable confusion between photosynthesis and respiration in these responses. However, there were correct references to ATP production and processes such as active transport.

Question 25 (b)

(b) Scientists researching how mitochondria produce ATP came up with a theory.

Their theory said:

- Hydrogen ions are transported into the space between the two membranes surrounding the mitochondria, shown in **Fig. 25.1**.
- The ions become concentrated in this space.
- The ions diffuse back into the mitochondria making ATP.

To test this theory the scientists removed the outer membrane of the mitochondria, as shown in **Fig. 25.2**.

Fig. 25.1

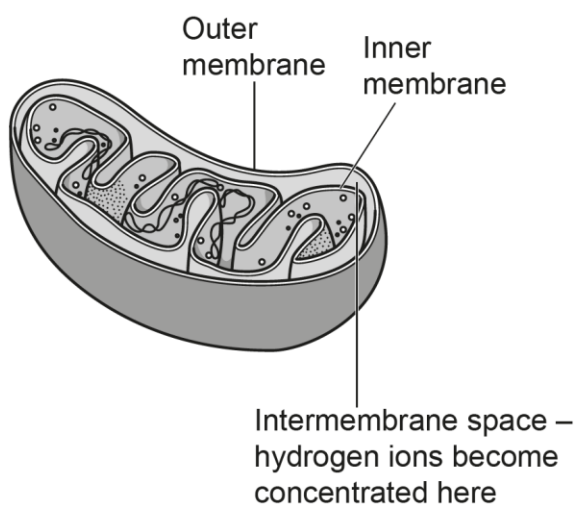
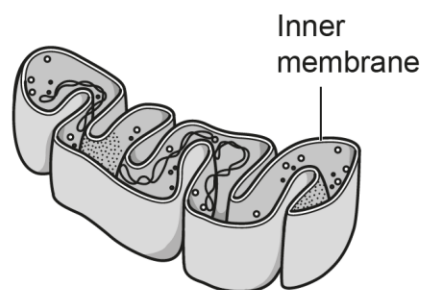


Fig. 25.2



The result of their experiment showed that less ATP is formed.

Explain how this result shows that their theory is correct.

.....

.....

.....

..... [2]

Although this question covered a high-level concept, candidates were provided with plenty of information in the question. Many interpreted this information correctly and gave good responses.

Copyright information

Question 7: Diagram of the heart - © Clipart Library, www.clipart-library.com

Question 16 (b): Image of a mitochondrion - © CNRI / SCIENCE PHOTO LIBRARY, www.sciencephoto.com

Question 21 (c): Graph - HFEA, Fertility treatment 2018: trends and figures, 30 June 2020, www.hfea.gov.uk, UK statistics for IVF and DI treatment, storage, and donation

Supporting you

Teach Cambridge

Make sure you visit our secure website [Teach Cambridge](#) to find the full range of resources and support for the subjects you teach. This includes secure materials such as set assignments and exemplars, online and on-demand training.

Don't have access? If your school or college teaches any OCR qualifications, please contact your exams officer. You can [forward them this link](#) to help get you started.

Reviews of marking

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

Access to Scripts

For the June 2023 series, Exams Officers will be able to download copies of your candidates' completed papers or 'scripts' for all of our General Qualifications including Entry Level, GCSE and AS/A Level. Your centre can use these scripts to decide whether to request a review of marking and to support teaching and learning.

Our free, on-demand service, Access to Scripts is available via our single sign-on service, My Cambridge. Step-by-step instructions are on our [website](#).

Keep up-to-date

We send a monthly bulletin to tell you about important updates. You can also sign up for your subject specific updates. If you haven't already, [sign up here](#).

OCR Professional Development

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

Please find details for all our courses for your subject on **Teach Cambridge**. You'll also find links to our online courses on NEA marking and support.

Signed up for ExamBuilder?

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

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

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

Active Results

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

[Find out more](#).

Need to get in touch?

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

Call us on
01223 553998

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

For more information visit

 **ocr.org.uk/qualifications/resource-finder**

 **ocr.org.uk**

 **facebook.com/ocrexams**

 **twitter.com/ocrexams**

 **instagram.com/ocrexaminations**

 **linkedin.com/company/ocr**

 **youtube.com/ocrexams**

We really value your feedback

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



I like this



I dislike this

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



OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored. © OCR 2023 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered office The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA. Registered company number 3484466. OCR is an exempt charity.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

OCR provides resources to help you deliver our qualifications. These resources do not represent any particular teaching method we expect you to use. We update our resources regularly and aim to make sure content is accurate but please check the OCR website so that you have the most up to date version. OCR cannot be held responsible for any errors or omissions in these resources.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please [contact us](#).

You can copy and distribute this resource freely if you keep the OCR logo and this small print intact and you acknowledge OCR as the originator of the resource.

OCR acknowledges the use of the following content: N/A

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our [Expression of Interest form](#).

Please [get in touch](#) if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.