



GCSE (9-1)

Examiners' report

GATEWAY SCIENCE BIOLOGY A

J247

For first teaching in 2016

J247/01 Summer 2022 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 answers are 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.

Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our <u>website</u>.

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Paper 1 series overview

J247/01 is the first paper candidates take for the foundation tier Gateway GCSE Biology suite. It assesses content from specification topics B1-3 and B7 practical skills. Therefore, for candidates to perform well on this paper they will need to have a sound knowledge of the theory covered in B1-3 and be able to apply this to novel situations. The J247/01 component includes a multiple choice question section and a short answer question section that also includes one Level of Response type question. The Level of Response question assesses the quality of communication as well as knowledge and understanding. They also need to apply the skills and understanding that they have developed in the practical activities covered in B7. There are also questions that involve the assessment of key mathematical requirements from Appendix 5f of the specification.

This is the first examination of the GCSE Gateway Specification A since examinations have resumed after an absence of two series. The candidates have been given advance information of the key areas of the specification which was assessed since their education has been disrupted over the last two years.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
 performed calculations in Questions 17 (b), 19 (a) (i), 19 (a) (ii), 22 (a) and 22 (b) apply knowledge and understanding in generating a bar chart from given data in Question 24 (a) (i) demonstrated knowledge and understanding of how to prepare a slide in Question 16 (a) (i), properties of veins in Question 17 (d), differences between prokaryotic and eukaryotic cells in Question 18 (c), examples of homeostasis in Question 19 (a) (iv) and treatments of diabetes in Question 22 (e) demonstrated and applied knowledge and understanding a reflex action in Question 21 applied their knowledge of experimental skills novel situations in Question 23 (a) (ii) analysed information and ideas to draw conclusions in Questions 24 (a) (i) and Q24 (b) relating to the menopause. 	 could not recall knowledge and understanding and analyse information to draw conclusions in Questions 17 (c) and 22 (c) found it difficult to perform calculations in Questions 17 (b), 19 (a) and 22 (a) could not recall knowledge and understanding of a reflex action in Question 21 could not demonstrate knowledge and understanding of photosynthesis in Question 18 (b), thermoregulation in Question 19 (a) (iii) and diabetes treatment in Question 22 (e) did not analyse experimental procedures in Questions 24 (a) (ii) and 22 (d).

Section A overview

Candidates coped well with selecting choices, however there were some instances where candidates used lower case letters in their response. This should be discouraged as it can be difficult due to handwriting styles to distinguish the desired letter.

Assessment for learning

There were occasionally some candidates who had 'no response' answers which could be easily overcome through developing examination technique.

OCR support

These <u>multiple choice questions</u> can be used to check knowledge and practice examination technique, such as only using upper case letters in answers.

Question 2

- 2 Which molecule is produced in **both** aerobic and anaerobic respiration in animals?
 - A ATP
 - **B** Glucose
 - C Lactic acid
 - D Oxygen

Your answer

[1]

Most candidates were not able to recall that ATP is produced in both aerobic and anaerobic respiration. This demonstrated a lack of understanding of respiration a key chemical reaction. Answers ranged between all options A-D.

- 4 Which blood vessels have valves along their length?
 - A Arteries and capillaries
 - B Arteries, veins and capillaries
 - **C** Capillaries
 - **D** Veins

Your answer

[1]

The candidates were challenged by this question, which demonstrated a lack of knowledge and understanding of key adaptations of blood vessels. Most answers which were not mark worthy answered C Capillaries instead of D Veins

Question 6

- 6 What word describes the amino acids that join to make a protein molecule?
 - **A** Enzymes
 - **B** Monomers
 - C Nucleotides
 - **D** Polymers

Your answer

[1]

Candidates again could not factually recall that monomers join together to form polymers and amino acids are an example of a monomer. Candidate's answers ranged equally from A-D.

7 A student investigates the effect of light intensity on the rate of photosynthesis.

They count the number of gas bubbles released by a plant under water. The table shows their results.

Light intensity	Number of gas bubbles			
Light intensity	Repeat 1	Repeat 2	Repeat 3	
Low	6	7	8	
Medium	10	10	11	
High	13	19	14	

Which number could be classed as anomalous (an outlier)?

- **A** 6
- **B** 8
- **C** 11
- **D** 19

Your answer		[1]

This question was the most accessible questions in the multiple choice Section A, with most candidates correctly answering D by correctly identifying the anomalous result.

12 The diagram below shows the distribution of auxin in a shoot.



What will happen to the shoot?

- A The shoot will bend to the left.
- **B** The shoot will bend to the right.
- **C** The shoot will grow upwards and will not bend.
- **D** The shoot will not grow.

Your answer



[1]

This question proved to be the most challenging question in Section A. Many candidates did not recognise that the shoot would bend to the left due more auxin collected on the shaded side of the shoot which would cause more cell elongation. The most common incorrect answer was the shoot will bend to the right, answering B instead of A.

Section B overview

Candidates coped well with completing a bar chart with scales, simple calculations, working out percentages, extracting data from a graph. In addition, knowledge and understanding of photosynthesis, cellular structure and microscopes were answered well. However, candidates found it challenging to respond to questions that targeted practical skills especially in correctly identifying independent, dependent and control variables. Candidates should also further develop their ability in AO2 assessment objectives to applying their knowledge and understanding of scientific ideas and scientific enquiry.

Assessment for learning

There were some candidates who had 'no response' answers frequently throughout Section B which could be easily overcome through developing examination technique. For example, where a 'Letter' response needs to be added to a diagram, there should always be a response from a candidate, even where uncertainty exists in the candidate, as there is still an opportunity to gain a mark.

Question 16 (a)

16 A student observes the stages of cell division in cells taken from the root tips of garlic.

They cut a small amount of root tip and squash it onto a microscope slide.

(a) Complete each sentence to describe what they do next. Use words from the list.

coverslip	eyepiece	focus	light
objective	stage	stain	water

To make the chromosomes more visible, the student adds a few drops of

The slide is then placed on the microscope

The student first chooses the low power lens.

The student twists a knob on the side of the microscope to bring the image into

[4]

The majority of candidates achieved full marks here for correctly completing each sentence from the list of words about how to prepare a slide.

Question 16 (b) (i)

(b) The image shows some of the cells observed by the student.



(i) Identify one cell in the image that shows the chromosomes starting to move apart.Draw an arrow to this cell on the image. Label the arrow A.

This question challenged many of the candidates and the majority did not apply their understanding of mitosis to the cell images.

Assessment for learning

Centres could use real microscope images to illustrate cell division when teaching this part of the syllabus.

Question 16 (b) (ii)

(ii) Draw a second arrow to identify one nucleus in the image. Label this arrow N. [1]

The majority of candidates scored this mark. Those who didn't gain the mark did a 'no response' and did not attempt the question.

[1]

Question 16 (c)

(c) Give one reason why the tissue for the sample was taken from root tips.

.....[1]

This question was challenging for the candidates. The majority of candidates gave generic answers like 'it's more visible'. They did not demonstrate their understanding that root tips are where meristem cells are located for cell division.

Question 17 (a) (i)

17 (a) Fig. 17.1 shows a section through a human heart.



(i) On Fig. 17.1 draw an arrow to identify one valve. Label the arrow V.

[1]

The majority of candidates did not score this mark. Those who didn't gain the mark pointed to the blood vessels.

Question 17 (a) (ii)

(ii) On Fig. 17.1 draw a second arrow to identify one atrium. Label this arrow A. [1]

The majority of candidates did not score this mark. Those who didn't gain the mark pointed to the ventricles or blood vessel.

Question 17 (a) (iii)

(iii) The left ventricle has more muscle than the right ventricle.

Explain why.

This was a well differentiated question. The more successful candidates gained at least one mark. The majority of less successful responses gave generalised answers such as 'it pumps blood'. The most common mark scored demonstrated their knowledge that the left ventricle pumped blood to the body.

Question 17 (b)

(b) The heart circulates blood around the body three times every minute.

Calculate how many times blood will circulate around the body in **one** hour.

Number of times[2]

The majority of candidates achieved full marks here for correctly calculating how many times the blood circulated around the body in one hour.

Question 17 (c)

(c) A scientist compares the time spent exercising each week with the resting heart rates of a number of individuals.

Fig. 17.2 shows their results.

Fig. 17.2



Time spent exercising each week/hours

Write down **one** conclusion the scientist can make from the data.



Over half of the candidates could correctly identify the trend from the graph. A small number of candidates described the trend the wrong way round.

Question 17 (d)

(d) A student writes some notes about veins:

Veins are large blood vessels that carry blood towards the heart. They have a smooth lining and a narrow lumen.

The student has made **one** mistake in their notes. Identify the mistake they have made.

......[1]

More successful responses correctly identified that veins do not have a narrow lumen. The most common incorrect answer identified that veins did not have a smooth lining or carried blood back to the heart.

Question 17 (e)

(e) The human circulatory system is described as a double circulatory system. Explain why.

[2]

This question was challenging for the candidates. The majority could not explain the double circulatory system. Many candidates just referred to blood circulation and seemed to be unaware of the double circulatory system.

Question 18 (a)

- **18** Photosynthesis, transpiration and translocation are three processes occurring in plants.
 - (a) Draw three lines to connect each description to its correct process.

Then draw **three** lines to connect each **process** to the **structure** where that process takes place.

Description	Process	Structure
sunlight is used to make food for the plant	photosynthesis	xylem and stomata
the method of moving sugars around the plant	transpiration	phloem
the loss of water from the leaves of a plant	translocation	chloroplasts
		[4]

The majority of candidates achieved 3 or maximum marks, correctly identifying the description and structures involved in photosynthesis, transpiration and translocation. This tested their AO1 knowledge and understanding.

Question 18 (b)

(b) Complete the word equation for photosynthesis.

carbon dioxide + ____ glucose + [2]

Roughly half of the candidates could correctly complete the word equation for photosynthesis. The most common incorrect answer was getting the water and oxygen the wrong way round.

Question 18 (c)

(c) Plant cells are eukaryotic cells and bacteria are prokaryotic cells.

Plant cells and bacterial cells have similarities and differences between their structures.

Give **one** similarity and **one** difference.

milarity	
fference	
	[2]

This was a good differentiator, with more successful responses scoring both marks. The main points scored were identifying that they both had a cell wall and that bacteria do not have a nucleus. Some candidates did not refer to bacteria or plants for the difference so the examiner would not be able to know which cell had or did not have the structure to award the mark.

Question 19 (a) (i)

19 A boat with ten people onboard capsizes and all ten people are found in the sea.

The first aiders at the scene take the body temperature of each of the ten people.

Rescued person	Body temperature after rescue (°C)
1	35.2
2	35.0
3	34.9
4	34.8
5	35.1
6	35.1
7	34.8
8	34.9
9	35.0
10	34.9

(a) (i) Calculate the mean temperature of the ten people rescued.

Give your answer to **1** decimal place.

Mean temperature =°C [2]

This question differentiated well between candidates. The majority of lower performing candidates were able to calculate the mean and more successful responses gained full marks for correctly rounding to 1.d.p

Question 19 (a) (ii)

(ii) If a person's body temperature is below 35 °C, they are classed as hypothermic.What percentage of those rescued would be classed as hypothermic?

Percentage hypothermic =% [2]

The majority of candidates achieved full marks here for correctly calculating the percentage.

Question 19 (a) (iii)

(iii) Describe how the body responds to hypothermia.

The candidates found the application of their knowledge and understanding of hypothermia difficult. The most common scored mark was shivering response. A lot of candidates did not write vasoconstriction as an import response or how it works. Less successful responses gave answers such as cold hands/feet and go blue.

Question 19 (a) (iv)

(iv) The body needs to maintain a constant body temperature.

Write down **one** other feature of the internal environment of the body that should be kept constant.

.....[1]

A small number of candidates know examples of homeostatic control. The most common answer that was given a mark was blood glucose. A lot of candidates identified heart rate under homeostatic control rather than pH of the blood.

Question 19 (b) (i)

(b) A study in the British Medical Journal looked at 35488 people to see if there were differences in individuals' normal body temperatures.

They found the following:

- the mean body temperature was 36.6 °C
- 95% of the population had a body temperature between 35.7 °C and 37.3 °C.

The study did **not** include people with infections or severe illnesses.

(i) The British Medical Journal is a peer-reviewed journal. Explain why scientists publish their results in peer-reviewed journals.

This question challenged many of the candidates and the majority did not gain full marks. The most given mark was for the idea of checking the results are correct. Some candidates did get confused with the difference between reproducible and repeatable data.

OCR support

Our <u>Language of Measurement in context</u> resource can be used with candidates to help familiarise them with terms such as reproducible and repeatable, and where they are applicable in a given context.

Question 19 (b) (ii)

(ii) Explain why the study did **not** include people with infections or severe illnesses.

Most candidates were able to gain one mark for recognising that the body temperature would be altered while you have an infection. Very few candidates were able to state that this would affect the mean temperature.

Question 19 (b) (iii)

(ii) Explain why the study did **not** include people with infections or severe illnesses.

.....[2]

The ability to analyse information from experimental procedures proved challenging for candidates. A large number of candidates who did not gain any marks stated that you repeat an experiment to gain a mean.

Question 20 (a) (i)

- **20** (a) A person is finding it difficult to read road signs at a distance whilst driving.
 - (i) Describe the eye defect this person could have.

More successful candidates could recognise the defect was short sightedness. Only a small number of candidates could describe the cause. Most candidates just repeated the stem of the question.

Question 20 (a) (ii)

(ii) Suggest how this eye defect can be corrected.

......[1]

Only the more successful candidates knew the correct lens to use. Most candidates gave a generic answer of 'glasses'

Question 20 (b)

(b) Write down the role of the ciliary body in the eye.

[1]

This was a very challenging question for the candidates to gain marks. It's AO1 knowledge and understanding. It had the highest 'no response' attempts to answer this question.

Question 20 (c)

- (c) A condition called dry eye can be caused by damage to the corneal cells in the eye.
 - Dry eye can now be treated using stem cells.
 - The stem cells are taken from the patient's own tissues and not from a donor.

Suggest why the stem cells used in this treatment are taken from the patient's own tissues.

.....[1]

This question was challenging for the candidates. The most common none scoring response was that the stem cells are their own cells.

21^{*} When a fly lands on a horse, the horse's skin shivers.

This response to the fly is a reflex action.

Describe the sequence of events that occurs in the body of the horse to produce this response.

Use ideas about reflex arcs in your answer.

[6]

In this Level of Response question, examiners were looking for a detailed description of a reflex arc and applying it to this specific reflex. Candidates did find this challenging and those that did not get above a Level 1 was due to either not having sufficient knowledge of what a reflex was or included that the brain is involved in the response.

Misconception

A majority of candidates incorrectly identified the brain involved in a reflex action. This is AO1 knowledge and understanding. Candidates could benefit with revisiting co-ordinated response versus reflex action to improve their understanding.

Exemplar 1

When a fly lands on the borse the a Change in its ervironment (a Stimulus). A Veceptor Senses the Stimulus. The Veceptor then Sends Signals to the Sensory neurone. The Sensory neurone then sluds Pelay herone nals to the Velay neurone. motor neurone. The motor nu triggers the Sends Signals to the effector. effector t Cause the Vesponse. In this example t Vesponse was the horses skin Sh reving. <u>, 10 -</u> called a Vellex ardi laction.

Exemplar 1 shows a Level 3 response which gained 6 marks. The candidate has correctly identified the fly as the stimulus and the response is the skin shivering which identifies structures involved in this specific reflex arc. In addition, there is a detailed description of a reflex arc - stimulus detected by receptors, then signals along sensory to relay to motor neurone to effector for the response.

Question 22 (a)

22 The graph shows the number of patients with diabetes in the UK and the USA from 1980 to 2015.



Number = million [1]



Question 22 (b)

(b) Calculate the difference between the number of patients with diabetes in the UK and the number with diabetes in USA for the year 2000.

Number = million [2]

This question differentiated well between candidates. A number of candidates did not show their workings. There were errors carried forward applied to this question which could have allowed some candidates gain an extra mark.

Question 2	2 (c)
(c)	Describe how the number of patients with diabetes has changed in both countries from 1980 to 2015.
	[2]
The vast m the graph t candidates differences	ajority of candidates scored at least 1 mark here for correctly being to identify the trend from hat diabetes patients have increased in both the USA and UK. Only the more successful could describe the differences between the USA and UK with greater detail, such as between rates, gradients or fluctuations.
Question 2	2 (d)
(d)	The numbers presented in this graph may not be accurate.
	Suggest why.
	[1]
The lower that there v estimates/r	performing candidates found this question challenging. The main none scoring answer stated was something wrong with the graph such as errors in scales or numbers are means.
Question 2	2 (e)
(e)	Diabetes can be Type 1 or Type 2.
	Describe two differences between the treatments for Type 1 and Type 2 diabetes.
	1
	2
	[2]

There were some good responses demonstrating their knowledge and understanding of treatments for Type 1 and Type 2 diabetes. The most common answers which were given no marks were those which mixed up with the causes and treatments. Less successful responses did not reference which treatment was for Type 1 or Type 2.

Question 23 (a) (i)

- 23 Lipase is an enzyme produced in the human digestive system. It breaks down lipids.
 - (a) Fig. 23.1 shows the steps in lipid digestion.
 - Fig. 23.1



(i) Complete the labels in **Fig. 23.1**.

[3]

The question required the candidates to have knowledge and understanding of the process digestion of fats by lipase. The majority of candidates did not seem confident in this area of the specification but did attempt the question.

Question 23 (a) (ii)

(ii) Lipase is found in the small intestine where the pH is alkaline.

Draw a curve on **Fig. 23.2** to show the effect the pH will have on the rate of reaction for the digestion of lipids by lipase.



There were some good curves drawn by the candidates which gained full marks. Most candidates either got the 2 marks or did not get any and showed a decrease in rate of reaction as the pH increases.

Question 23 (b)

(b) Phenolphthalein is an indicator that turns pink in an alkaline solution of pH10.

When lipase breaks down lipids, the indicator goes colourless.

A group of students investigate how temperature affects the enzymes that break down lipids found in milk.

Describe an experiment that the students could use to investigate the effect of temperature on the breakdown of the lipids found in milk.

In your description include:

- how the independent variable could be changed
- the observations that should be made
- two variables that need to be controlled.

[5]

This tested candidates AO3 skills for identifying control, dependent and independent variables. The vast majority of candidates could not do this. Many of the responses which were not given a mark had mixed up the temperature as a control variable. The most given mark was for temperature identified as the independent variable. This question had a high no response by candidates.

OCR support

Our <u>Language of Measurement in context</u> resource can be used with candidates to help familiarise them with terms such as control variables, and where to identify them in a practical.

Exemplar 2

To change the independent variable, I will Change 1 will Stain
······
The observations I make will be to
·····
i will need to control
Exemplar 2 demonstrates the mix up of temperature as a control variable.

Question 24 (a) (i)

- **24** The female menstrual cycle is regulated by hormones. As women get older, they go through a stage called menopause when their periods stop.
 - Doctors can determine if a woman is going through menopause by measuring the level of FSH in their blood.
 - If the FSH level goes above 30 ml U/mL, this indicates that menopause may have started.

A patient has her FSH levels measured each month for six months as shown in the table.

Month	FSH level (mIU/mL)
January	31
February	28
March	30
April	32
May	30
June	33

(a) (i) Complete the bar chart for the remaining values from the table.

Finish the scales for both axes.



Month

[2]

Most candidates could produce a bar chart with the given data scoring maximum marks. If they were only given 1 mark, it was because they forgot to add the months on the x axis for April, May and June.

Question 24 (a) (ii)

(ii) What evidence is there to suggest this patient may have started menopause?

Only the more successful candidates were able to analyse the information from the experimental data to answer this question correctly. Most answers were not specific enough, such as 'they are reading above 30'.

Question 24 (a) (iii)

(iii) The doctor decides they need more evidence to confirm if the patient has started menopause.

Suggest what further evidence the doctor should collect.

Very few candidates were given full marks here but a significant number scored a mark for measure frequency/change in periods. This was testing their skills in developing experimental procedures.

Question 24 (b)

(b) The doctor discusses a treatment called hormone replacement therapy (HRT) with the patient.

The doctor gives the patient a leaflet about HRT.



[3]

This discriminated well among the candidates with a good range of marks given. The question was testing the skill and analysis. The most common given mark was identifying that she is overweight and at an increased risk of blood clots, increased risk of breast cancer if taken longer than a year or her age and risk to heart disease.

Exemplar 3

Because she is onerweight she will have hoks of blot dots. However because she is inder the age of 60 she is less likely to be at risk of bein heart disease. ••••• Her syntoms can be heduced when taking ART- [3]

Exemplar 3 demonstrates a response which gained full marks.

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