

GCSE (9-1)

Examiners' report

GATEWAY SCIENCE BIOLOGY A

J247

For first teaching in 2016

J247/01 Summer 2018 series

Version 1

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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. 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 can be downloaded from OCR.

Paper J247/01 series overview

This is the first examination of the GCSE Gateway Specification A. 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. Throughout the paper there are some questions that are designed to assess candidates' knowledge and understanding of practical skills used in the specification. These questions demand responses that identify a candidate's awareness of the skills required to successfully complete practical activities and investigations.

Candidate performance overview

Candidates who did well on this paper generally did the following:

- Performed standard calculations following the required rubric (e.g. clear working, units, significant figures) relating to magnification: 17b(i), estimating measurements: 17b(ii), calculating mode: 18a(i); calculating mean 21d(i).
- Produced clear and concise responses for the Level of Response question: 20d.
- Identified the correct eye defects and the lenses needed to correct these conditions 22b(i)(ii).
- Completed and balanced the equation for photosynthesis reactions 17c(i).
- Applied knowledge and understanding to questions set in a novel context.

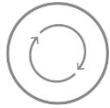
Candidates who did less well on this paper generally did the following:

- Found it difficult to apply what they had learnt to unfamiliar situations.
- Found the naming of cell types, specific organ structures and anatomy in general, particularly challenging.
- Gave the reverse argument for an observation of the structures of blood vessels, assuming this would count as an alternative marking point 16d(i).
- Lacked knowledge in identifying reactants and products in the photosynthesis equation and showed little understanding when balancing the equation 17c(i).
- Questions designed to assess candidates' practical abilities were challenging and indicated a lack of awareness of the skills involved in practical activities and investigations.

There was no evidence that any time constraints had led to a candidate underperforming.

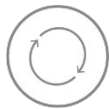
Section A overview

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.



Also, there were occasionally some candidates who had 'No Response' answers which could be easily overcome through developing examination technique.

Key:



AfL Guidance to offer for future teaching and learning practice.

Question 4

- 4 A student uses a microscope to look at plant cells on a slide.

Which of these methods should they use first?

- A Highest power objective lens and focus moving the lens away from the slide
- B Highest power objective lens and focus moving the lens towards the slide
- C Lowest power objective lens and focus moving the lens away from the slide
- D Lowest power objective lens and focus moving the lens towards the slide

Your answer

[1]

The question assessed AO2.2 practical skills needed for using a microscope. Candidates did not demonstrate an awareness of skills in using a microscope. Few candidates identified the correct response. All distractors were seen in significant numbers. This is clearly an area where candidates could develop application of skills in a practical situation.

Question 5

- 5 The microscope used by the student has an eyepiece lens with a magnification of $10\times$.

Which objective lens would give an image magnification of $200\times$?

- A $10\times$
- B $20\times$
- C $30\times$
- D $200\times$

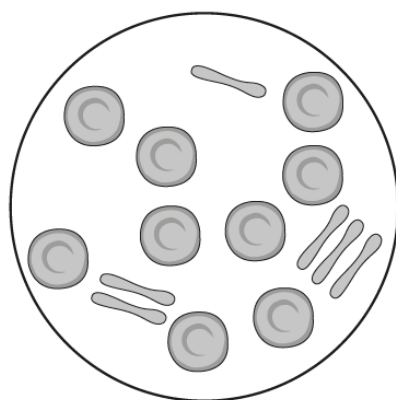
Your answer

[1]

The question assessed AO2.2 mathematical and practical skills needed for using a microscope. Most candidates were able to calculate the correct magnification for the objective lens. The most common distractor chosen by candidates was $200\times$. This indicates these candidates seemed unaware of the combined magnification power of the eyepiece and objective lenses to the overall magnification which the question was assessing.

Question 6

- 6 Which type of human cell is shown in this diagram?



- A Egg cells
- B Red blood cells
- C Sperm cells
- D White blood cells

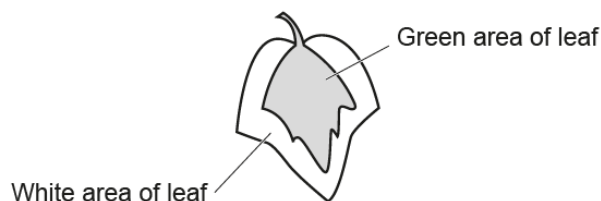
Your answer

[1]

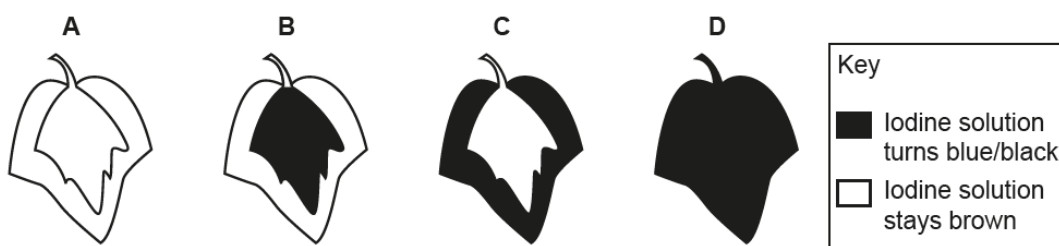
This is an AO1.1 question testing recall of cell types. In general, this was successfully done, however, the number of candidates who thought the cells were sperm cells indicates a lack of knowledge of cells.

Question 7

- 7 The diagram shows a variegated leaf.



Which diagram shows the correct starch test results for the variegated leaf?



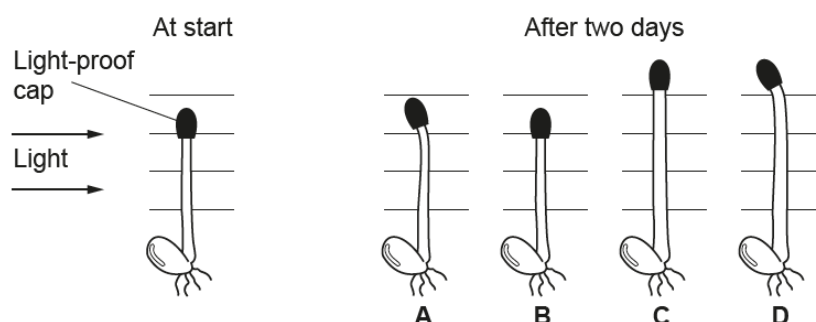
Your answer

[1]

This question tested AO2.2, with candidates' awareness of the role of chlorophyll in photosynthesis and practical skills of interpreting results from a starch test are needed to successfully answer the question. Candidates frequently made the choice between B and C and occasionally D was seen. Higher ability candidates were able to select the correct response, clearly distinguishing between the area that contains chlorophyll being the area that can photosynthesise in a variegated leaf.

Question 9

- 9 Seedlings were grown with a light-proof cap over the tip. The seedlings had light from one direction only.



Which diagram shows the correct growth of the seedling after two days in these conditions?

Your answer

[1]

The question assessed understanding of results from practical experiments on phototropism and the way light affects the tip of a growing shoot. Most candidates made a choice between A and D. Clearly there is a misconception that plants will show phototropic responses even when the tip is covered. Alternatively, they may have misunderstood the purpose of the light-proof cap. This could be used as a focus when teaching about phototropism.

Question 10

10 A student wants to test for **protein**.

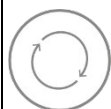
What would they use to test for protein?

- A Benedict's reagent
- B Biuret reagent
- C Iodine solution
- D Ethanol

Your answer

[1]

The assessment was designed to assess candidates' practical knowledge, AO2.2. By far the most common response was 'A' Benedict's reagent. Clearly candidates are used to using this reagent, but it is evident that few had any recognition of using Biuret reagent.



Candidates had a lack of knowledge of how to test for protein and this needs to be developed.

Question 11

11 Which of these can be used to treat type **2** diabetes but **not** type **1**?

- A Diet and exercise
- B Exercise only
- C Insulin and diet
- D Insulin, diet and exercise

Your answer

[1]

Although some candidates identified diet and exercise, most candidates chose an option that included insulin. Candidates need to be careful to take note of emboldened words in the question.

Question 12

12 Why do plant root hair cells use active transport to take in minerals?

- A** Minerals are dissolved in water in the soil.
- B** Minerals are needed by the plant in very low concentrations.
- C** Minerals are present at very high concentrations in the soil.
- D** Minerals are present at very low concentrations in the soil.

Your answer

[1]

Very few candidates were aware of the reasons for active transport on this recall question. Many opted for 'A'. Others that had more of an awareness that concentration was involved chose the high concentrations, clearly unsure about the reason why active transport is needed.

Section B overview

Candidates coped well with interpreting graphical information and demonstrated a sound understanding of mean and mode measurements. However, there were some instances where candidates found it challenging to respond to questions that targeted practical skills. Candidates should further develop their ability in applying their knowledge and understanding of practical skills in questions set in the context of practical activities and investigations.



Also, 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.

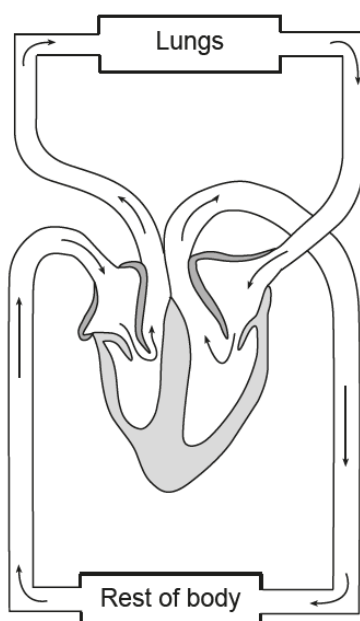
Key:



AfL Guidance to offer for future teaching and learning practice.

Question 16(a)(i)

16 Look at the diagram of the human circulatory system.



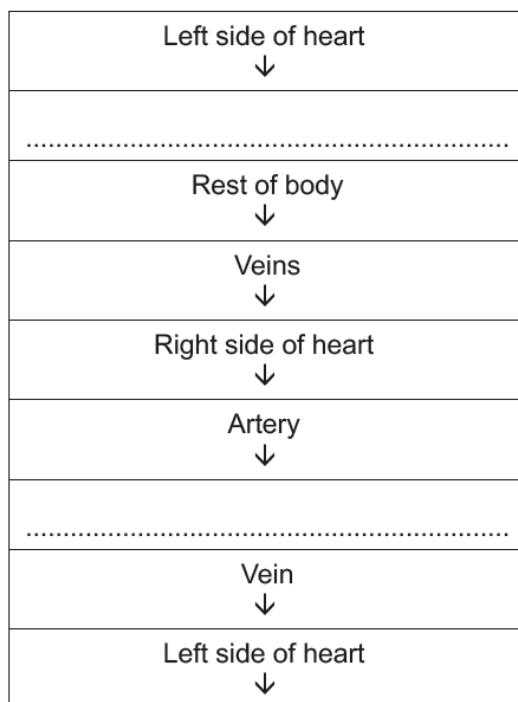
(a) (i) Write the letter **X** on the diagram to show the position of the left ventricle.

[1]

The question required candidates to demonstrate a knowledge of the structure of the heart AO1.1. Candidates made responses in all four chambers in almost equal numbers. Lower ability candidates put their response inside blood vessels or in some cases did not respond at all. Candidates should be encouraged to attempt all questions, especially those that can be answered using, for example, a choice of placing a letter on a diagram or completing sentences using words from a list.

Question 16(a)(ii)

(ii) Complete the sequence to show the flow of blood through the circulatory system.



[2]

This question targeted knowledge of the circulatory system AO1.1. Generally, the sequence of blood circulating the body was a well understood with many getting maximum marks. In some cases, either the artery/aorta or lungs were identified but not both.

Question 16(b)(i)

(b) The blood travels through the heart twice on one complete circuit of the body.

(i) What is the name of this type of circulation?

..... [1]

This AO1.1 question assessed if candidates can recall the name of the circulation if blood travels through the heart twice in one circuit. Some candidates correctly identified double circulation but many just referred to blood circulation and seemed to be unaware of double circulatory systems.

Question 16(b)(ii)

- (ii) Suggest **two** advantages of blood travelling through the heart twice in each complete circuit of the body.

1

.....

2

..... [2]

This AO2.1 question required an understanding of the advantages of a double circulatory system. Increased flow rate was the most common correct response. Some candidates were able to identify the increased pressure, or materials will be able to be transported faster/ in greater amounts. Only higher ability candidates gained maximum marks. A common misconception is that it allows more blood to travel around. Candidates do not seem to be aware that it is the same volume of blood but travelling faster.

Question 16(c)

- (c) How is the **thickness** of the heart wall on the left side different to the right side?

Write down **two** reasons for the difference.

.....

.....

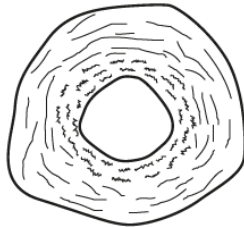
..... [2]

In this AO1.1 question, there were some candidates who mistakenly identified the right side of the heart, however, these were in the minority. The main issue was candidates linking the thickness of the heart wall to resisting pressure, rather than to needing to generate pressure.

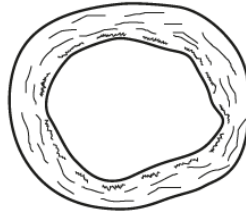
Question 16(d)(i)

(d) Look at the diagram.

It shows a section of an artery and a vein.



Artery



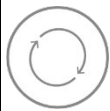
Vein

(i) Describe **two** differences in structure between the artery and the vein shown in the diagram.

- 1
- 2
- [2]

The AO2.1 diagram specifically directed candidates to consider applying their knowledge of the structures of the blood vessels to the diagrams. The main reason for not gaining marks was candidates not referring to the structure. Many just said the artery was thicker, without identifying which part of the artery. More able candidates were able to refer to differences in the wall and the lumen.

Candidates often limit the mark gained in multiple mark questions by repeating their initial response in a different way.



Examination technique can be developed to encourage candidates to avoid this.

Exemplar 1

- 1 Arteries have a smaller lumen ✓
- 2 Veins have a bigger lumen [2]

This candidate has assumed they have given two separate differences. However, their response covers the same marking point so only scores 1 mark. It is clear with the way the response is set out that the candidate thought they were giving two separate marking points but had just described the difference in size of lumen.

Question 16(d)(ii)

- (ii) Write down **one** difference between arteries and veins that is **not** shown in the diagram.

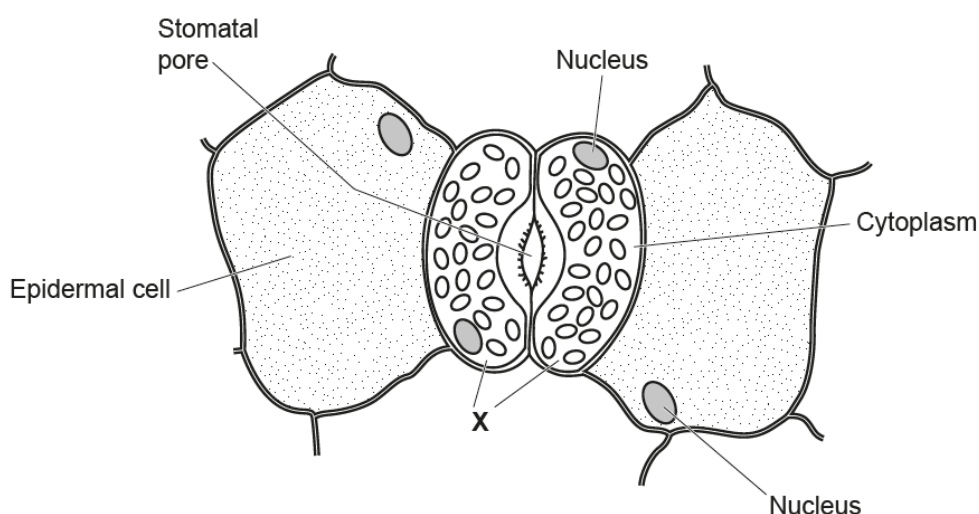
..... [1]

This recall AO1.1 question was well answered. Most candidates identified that arteries carried blood away from the heart or veins back to the heart. Some candidates identified veins having valves.

Question 17(a)(i)

- 17 Stomata are found on the surface of leaves.

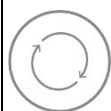
The diagram shows some of the surface cells of a leaf.



- (a) (i) Write down the name of the cell labelled X.

..... [1]

This AO1.1 question assessing recall of knowledge of guard cells proved challenging. Very few candidates could name the guard cell. Most candidates referenced organelles such as chloroplasts and mitochondria. Some responded with cell membrane and even cytoplasm (already labelled).



The question did ask for the name of the cell and candidates need to check carefully that they have responded to the question.

Question 17(a)(ii)

- (ii) Describe
- two**
- functions of stomata.

.....

.....

..... [2]

These two marks were assessing AO1.1. Most candidates seemed to be confused with the role of stomata. The most common misconception was that the function of stomata was to let water **into** the leaves.

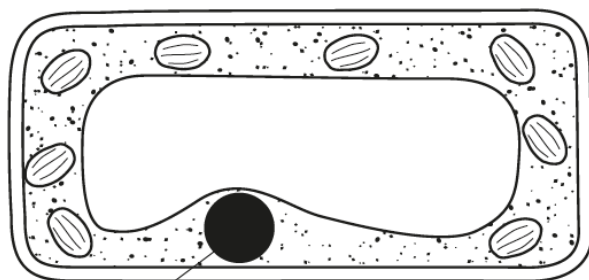


The role of gas exchange seemed poorly understood as only a limited number of candidates were able to show an understanding of the gases that move through the stomata.

**Misconception**

Question 17(b)(i)

- (b) Look at the diagram showing a plant cell.



Nucleus

- (i) The diameter of the nucleus in the diagram is 10 millimetres. The actual size of the nucleus is 10 **micrometres**.

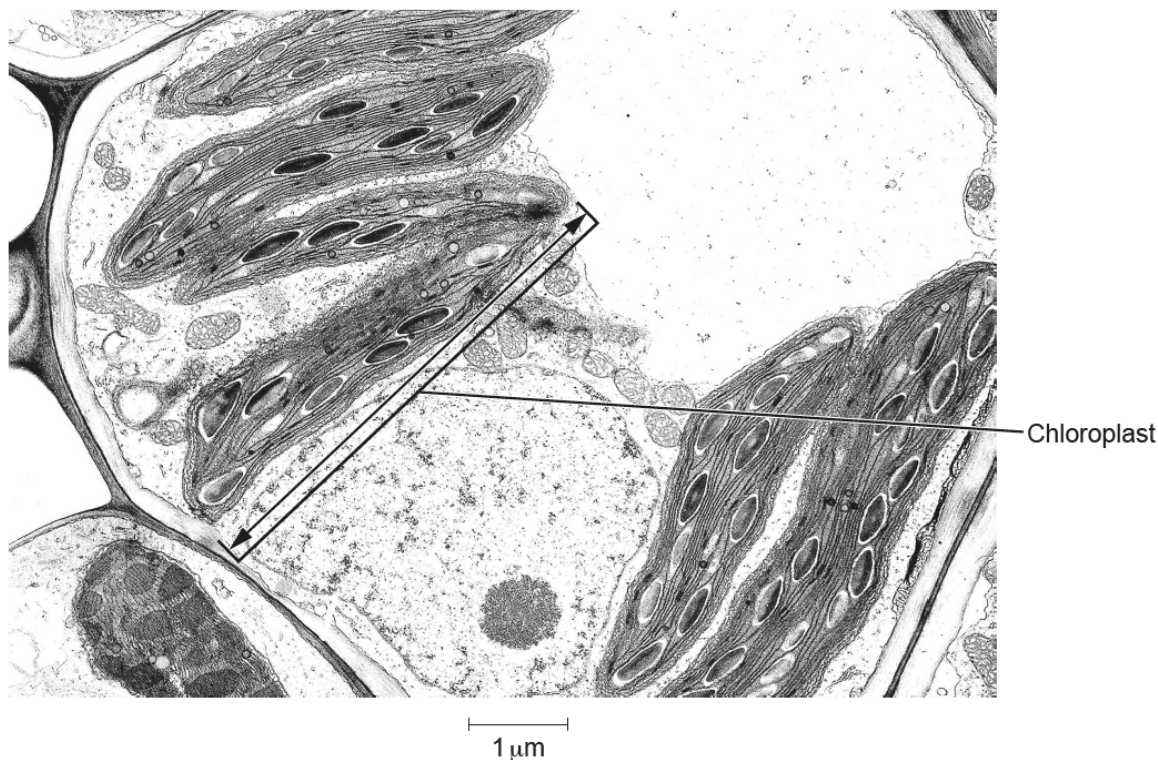
Calculate the magnification of the diagram.

Answer = × [2]

This question assessed their AO1.2 mathematical and AO2.2 practical skills. Some candidates correctly gave 1000 and scored 2 marks. However, the working out of nearly all candidates indicated that there was little understanding of the calculation required, as single marks were very rare. The most common incorrect response was 100.

Question 17(b)(ii)

(ii) Look at the picture of part of a plant cell.



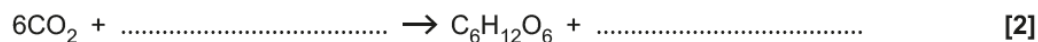
Use the arrow on the picture and the scale to estimate the length of the chloroplast.

Answer = μm [1]

The question assesses AO2.2. A significant number of candidates were able to get the correct answer within tolerance. The most common error was to just measure the length of the chloroplast to 7.5 and fail to use the scale measurement to adjust the estimate.

Question 17(c)(i)

- (c) Photosynthesis takes place inside chloroplasts.
- (i) Complete the chemical equation for photosynthesis.



This question assesses AO1.1 recall of knowledge. However, many candidates seemed to lack any recall and tried to separate out combinations from the formulae given in the question, in many cases these were unrecognisable formulae. Only a few higher ability candidates scored both marks. Common mistakes were to get the correct balanced formula but, unfortunately, put them on the wrong side of the equation. Numbers within molecules were sometimes written as a superscript rather than subscript, or even the same size as the letter.

Question 17(c)(ii)

- (ii) Energy is taken in from the surroundings for photosynthesis to take place.

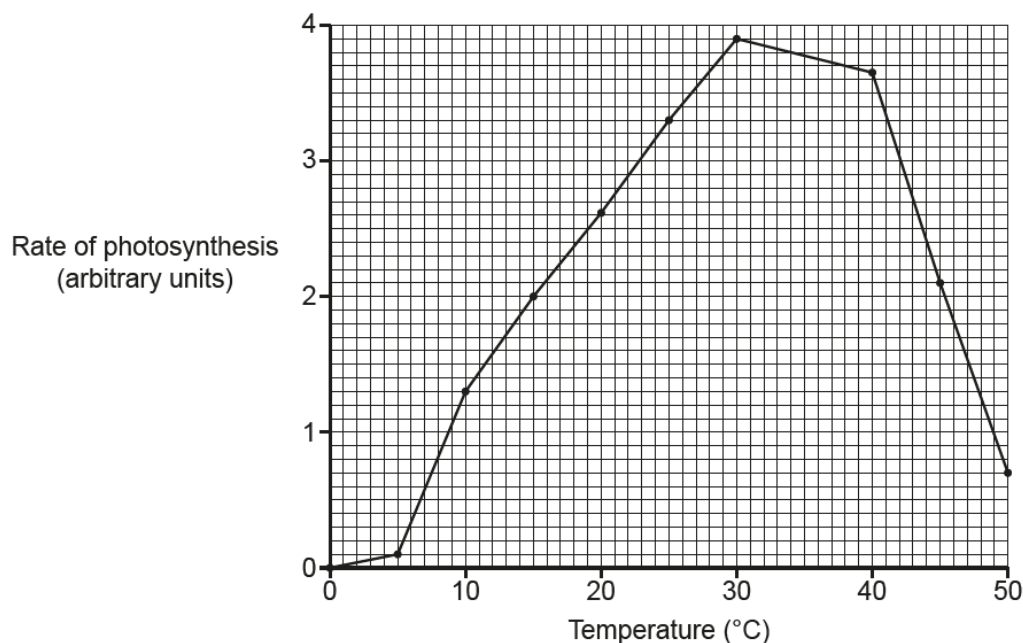
What name is used to describe reactions that take in energy?

..... [1]

Here, many candidates were able to identify this as an endothermic reaction in this AO1.1 question. Only a few incorrectly opted for exothermic but a significant number mistakenly interpreted the question as what would provide the energy and gave respiration as their response.

Question 17(d)(i)

- (d) The graph is from an experiment to show the effect of temperature on the rate of photosynthesis.



- (i) What is the optimum temperature for photosynthesis in this experiment?

..... [1]

Nearly all candidates gained marks here, showing good application of scientific techniques AO2.2. Occasionally candidates put 3.9 as their answer, showing they had misinterpreted the graph.

Question 17(d)(ii)

- (ii) The rate of photosynthesis was recorded in 5 °C intervals.

The experiment could be improved to get a more **precise** value for the optimum temperature.

Explain how.

.....

.....

..... [2]

This question assesses AO3 to analyse information to improve experimental procedures. Many candidates identified the need for narrower temperature intervals, often stating the actual interval they would use, but very few targeted these to around the optimum temperature.

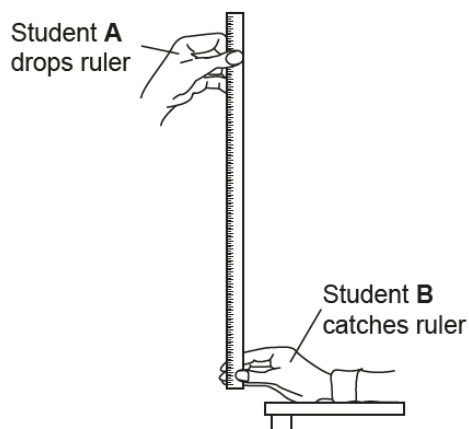
Question 18(a)(i)

18 A class of students investigate reaction time.

Student **A** drops a ruler while student **B** catches it.

They then measure the position of student **B**'s thumb on the ruler, this is the drop distance.

The diagram shows how the measurements were taken.



The drop distance is converted into a reaction time. The reaction time in seconds for each hand is recorded.

The table shows the results for ten **right-handed** students in the class.

Reaction time(s)	
Left non-dominant hand	Right dominant hand
0.22	0.28
0.23	0.25
0.27	0.23
0.24	0.24
0.25	0.24
0.25	0.25
0.25	0.26
0.25	0.26
0.25	0.26
0.27	0.23
Mean = 0.25	Mean = 0.25

(a) (i) Calculate the **mode** for the right dominant hand.

Answer = seconds **[1]**

This question assessed AO2.2. Most had the correct response to this question. Occasionally candidates would forget the decimal point and put 26 or 0.25 as their answer.

Question 18(a)(ii)

- (ii) The mean and mode for the left non-dominant hand are identical.

What **other** conclusions can be made about reaction times in these ten students?

.....

.....

..... [2]

The question assessed AO3 analysing information and drawing conclusions. Some candidates identified that the reaction times were the same, others that the non-dominant (left) hand most often was faster. However, very few candidates were able to give both responses to gain maximum marks.

Question 18(b)

- (b) How could these students improve the recording of their results?

.....

.....

..... [2]

This question set out to assess AO3, analyse information to improve experimental procedures, specifically related to recording data. Few candidates responded to the question in terms of improving the recording of their results. Most included experimental design elements to increase reliability or accuracy but not the actual recording of the data. Some candidates correctly identified that recording raw data of distance would be valuable (for peer review) and higher ability candidates did recognise that rank ordering the data would have improved the recording to help the mode calculation.

Question 18(c)

- (c) The students want to investigate reaction times to see if left-handed people are faster than right-handed people.

How could they develop the experiment to test this?

.....

.....

.....

.....

..... [3]

This question assessed AO3, analysis of information to improve experimental procedures. Very few candidates identified the need to keep the number of left/right (dominant) handed the same as in the experiment. Even fewer suggested testing the non-dominant hand. However, many candidates did gain marks for comparing the means.

Question 18(d)

- (d) The reaction in the experiment involves a **stimulus**.

What is the stimulus in the reaction involving catching the ruler?

..... [1]

The question assessed AO2.2. Very few candidates identified that sight/light was the stimulus, many referring to the distance the ruler dropped. This indicates a lack of understanding of what a stimulus is, linked to the receptors involved.

Question 18 (e)

- (e) Complete the sequence of a reflex arc.

Stimulus→	Sensory neurone→	CNS→	Effector→	Response
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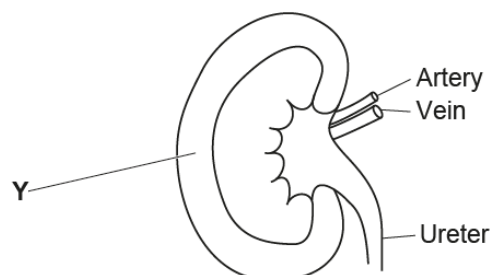
[2]

The question assessed recall AO1.1 for the structure of a reflex arc. Where candidates gained marks, it was usually for the motor nerve. Some also got the receptor but, there were instances where candidates couldn't quite recall the correct name and words like reaction and reactor were seen.

Question 19(a)(i)

19 Look at the diagram.

It shows a vertical section through a kidney.



(a) (i) What is the name of part Y?

..... [1]

The question assessed recall AO1.1 for structure of the kidney. Few candidates could identify the cortex, although some did mix it up with the medulla. Most referred to just the kidney or membrane. Many candidates put no answer.

Question 19(a)(ii)

(ii) Which liquid flows through the ureter?

..... [1]

This tested recall, AO1.1, of the function of the ureter. Some candidates were able to identify urine as the liquid flowing through the ureter. However, common incorrect responses were water, blood and urea.

Question 19(a)(iii)

(iii) Draw an arrow in the ureter showing the direction that this liquid flows.

..... [1]

Candidates could apply their knowledge of direction of flow of urine. The flow in the ureter was well understood by most candidates. There were some candidates however, that had the flow back into, and in some cases, around the kidney.

Question 19(b)(i)

(b) The kidney is important for water balance.

The table shows the measurements of water balance for two patients in hospital.

	Volume of water (ml)	
	Patient A	Patient B
Water taken into body in food and drinks	2500	2500
Water made in the body during respiration	200	200
Total input =	2700	2700
Water lost from kidneys in the form of urine	1900	1700
Water lost through skin, lungs and digestive system	1000	1000
Total output =

(i) Calculate the total output for Patient A and Patient B.

Patient A

Patient B

[1]

Mathematical skills were assessed in this question. Most candidates got the correct calculations. Occasionally the correct calculations were seen in the table but then candidates wrote 900 and 700 on the answer line and did not gain the mark.

Question 19(b)(ii)

(ii) Which patient needs treatment for their kidneys?

Explain the reasons for your choice.

.....

.....

.....

..... [2]

The question required analysis and evaluation to provide a successful response. Most candidates selected Patient A and many then went on to gain at least 1 mark. This was usually for input less than output. Some also then explained that this would lead to water imbalance. Occasionally, candidates would not gain marks even though they had selected the correct patient because they compared the water output to Patient B.

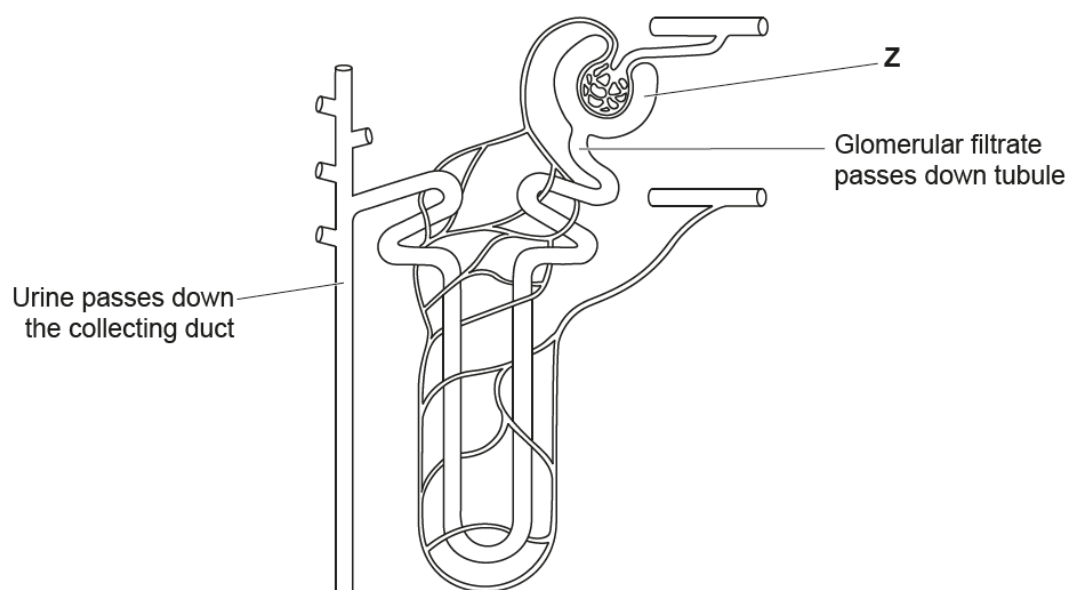
Exemplar 2

They are losing more water in the
form of urine than patient B.
because Patient A total output is 2900
where as Patient B total output is 2700. [2]

In this case the candidate implies that they have decided Patient A needs treatment but haven't said it specifically. This would not prevent the candidate gaining marks but their explanation is comparing water output to Patient B which is incorrect. The correct explanation needs candidates to compare the input and output for each patient separately. This highlights the need for candidates to gain a greater understanding that homeostasis is about maintenance of an individual's internal environment and data should be considered within that same individual and not across others as well.

Question 19(c)(i)

(c) Look at the diagram. It shows a kidney tubule (nephron).



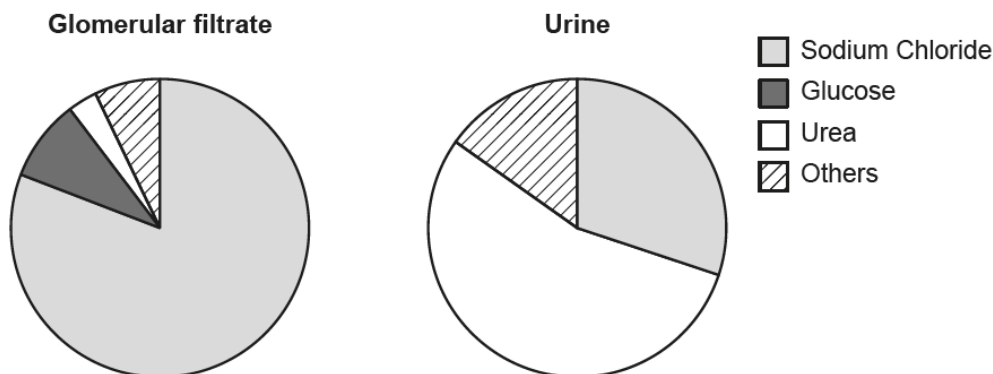
(i) What is the name of part Z?

..... [1]

The majority of candidates found this recall AO1.1 question very challenging.. A small number of candidates correctly identified the Bowman's capsule. Some candidates put glomerulus, presumably using one of the labels as a memory prompt, but many no responses were seen.

Question 19(c)(ii)

(ii) The diagram shows the composition of glomerular filtrate and urine.



What conclusions can be made about what happens between part **Z** and the collecting duct in the kidney tubule?

Use evidence from the diagram to support your answer.

.....

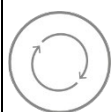
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.....

..... [3]

This question assessed both AO2 and AO3 assessment objectives. This is key to how successful candidates were in their response. Candidates often limited themselves to only one mark due to just stating what happened to the different substances in the filtrate or collecting duct as evidenced in the pie charts. The question required candidates to make conclusions based on the evidence and only a few higher ability candidates linked these changes to reabsorption and excretion.



This highlights a lack of awareness in candidates for what is required from a question asking them to draw conclusions from data. Many just described the data.

Question 20(a)

20 (a) How are hormones transported around the body?

..... [1]

The question assessed AO1.1 recall of hormone transport. Although candidates generally answered this successfully, some did not gain marks because their response was a specific blood cell either red or, in some cases, white. Clear misunderstanding was demonstrated by candidates whose response referred to the nervous system.

Question 20(b)

- (b) Finish these sentences to explain what is happening in the body of a female during the menstrual cycle.

The pituitary gland in the releases the hormone FSH.

FSH causes an to mature in a follicle.

FSH also causes the follicle to release the hormone

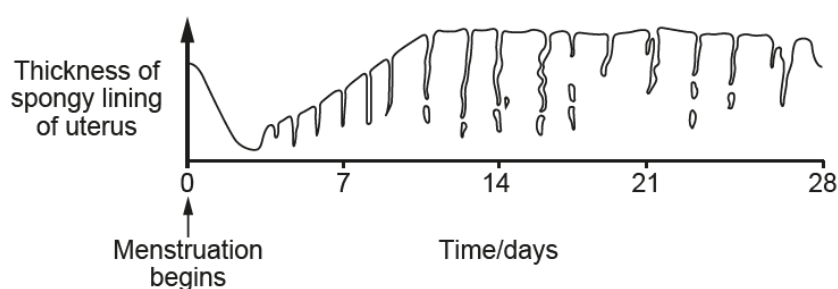
After ovulation, the empty follicle releases another hormone called

[4]

Here AO1.1 recall was assessed for the role of hormones in the menstrual cycle. Most candidates gained one mark for the egg. Some also identified the brain and some got all four marks. However, occasionally candidates unfortunately got the two hormones the wrong way around.

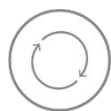
Question 20(c)(i)

- (c) The diagram shows how the lining of the uterus changes during the menstrual cycle.



- (i) Mark on the diagram with the letter **E** the most likely point when ovulation occurs. [1]

Candidates had to apply their knowledge to the diagram. Many candidates gained credit within the tolerance limits. However, there were many no responses, and this is something that candidates should avoid on this type of question.



Examination technique should encourage them to put the letter somewhere on the diagram, even if they are not sure of the correct response.

Question 20(c)(ii)

- (ii) If a fertilised egg is **not** present, a change happens to the uterus lining after 28 days.

How does the uterus lining change?

..... [1]

This AO1.1 question assessed recall of events during the menstrual cycle. Candidates generally answered this question successfully.

Question 20(d)

(d)* The table shows the effectiveness of some different forms of contraception.

Form of contraception	Percentage pregnancies per year (%)
Hormonal	
Injection	<1
Patch	<1
Pill	2
Non-hormonal	
Diaphragm	6
Male condom	2
Male sterilisation	<1

Suggest explanations for the differences in the effectiveness of the methods of contraception and explain why the pill is a popular method.

.....

.....

.....

.....

..... [6]

This Level of Response question assessed application, AO2, and analysing information, interpreting and forming judgements, AO3. To be successful in this question it was important that candidates gave a balanced response that covered all assessment objectives. Candidates were able to demonstrate some understanding of the types of contraception. Many were able to justify the use of the pill as a hormonal method that was relatively easy to use compared to other forms of hormonal contraception. Some candidates understood how hormonal methods worked and others knew the action of non-hormonal barrier methods, but it was very rare to see candidates who described the action of both hormonal and non-hormonal methods.

The most common error in interpreting the data in the table was to assume the one with the highest number was the most reliable. Where candidates were awarded Level 2, this was usually because they had analysed and interpreted the data in the table and used this to form a judgement as to why the pill was a popular method of contraception.

Question 21(a)

21 Students investigate how to extract DNA from peas.

Stage 1:

- Chill 10 cm^3 of ethanol. Keep it on ice throughout the method for use in stage 2.
- Make a thick 'soup' by blending 100 cm^3 of peas with salt and cold water. Blend for 15 seconds in an electric blender.
- Strain the 'soup' through a mesh strainer and collect the liquid part in a beaker.
- Add 30 cm^3 of washing-up liquid and swirl to mix.
- Let the mixture settle for 5–10 minutes in a water bath at 60°C .

- (a) One group of students made a water bath using a beaker of water, thermometer and Bunsen burner. Another group used an electric water bath.

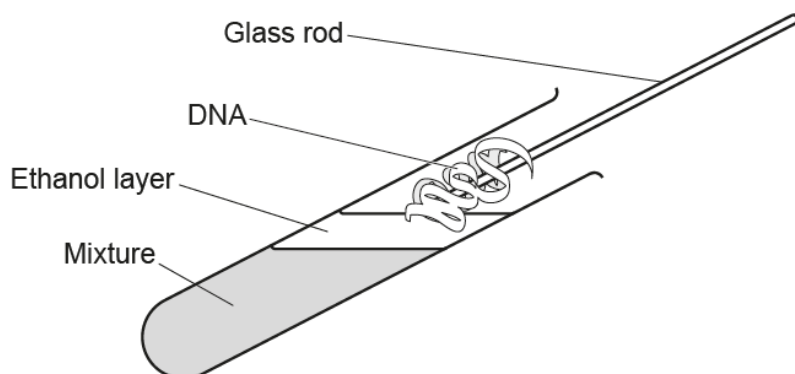
Write down **two** advantages of using an electric water bath.

- 1
-
- 2
- [2]

This question assesses AO2.2. Candidates were able to identify that the electric water bath was much easier to control the temperature, but it was rare to see any link the limited fire risk compared to the Bunsen and beaker.

Question 21(c)

Stage 2 isolates the DNA.



- Pour the mixture collected from stage 1 into a test tube until a third full. Add protease enzymes to the test tube.
- Slowly pour cold ethanol at an angle of 45° into the tube. Ethanol will float on top.
- DNA is soluble in water, but salted DNA does not dissolve in ethanol and will form white clumps where the water and ethanol layers meet.
- Twirl a glass rod and the DNA will collect on the rod.
- Dry the sample on a pre-weighed filter paper and measure the mass of product.

(c) Suggest **two** safety precautions which should be taken at stage 2.

Explain why each safety precaution is needed.

1 Safety precaution:

Explanation:

2 Safety precaution:

Explanation: [2]

This AO2.2 question assessed application of knowledge and understanding to scientific enquiry. Candidates were good at recognising safety precautions. The most common were “gloves to prevent ethanol causing skin irritation” and “goggles to prevent chemicals getting in the eyes”. Where candidates did not gain credit was for generalised explanations such as “goggles, so nothing gets on you”.

Question 21(d)(i)

(d) Look at the table. It shows the results from the two groups of students in the investigation.

Type of water bath used	Mass of DNA collected (mg)			
	Test 1	Test 2	Test 3	Mean
Beaker of water and Bunsen burner				22.9
Electric	33.6	32.3	33.3

(i) Calculate the mean mass collected in the investigation using the electric water bath.

Give your answer to 1 decimal place.

Answer = mg [2]

This question assessed mathematical skills in a scientific enquiry context. Many candidates gained both marks. Occasionally rounding errors meant that they only gained 1 mark for correct working out. This is where showing working out can really benefit candidates, as those that didn't but made a rounding error, scored zero. This can be reinforced when candidates are developing their examination technique.

Question 21 (d)(ii)

(ii) The range of the three test readings for the beaker of water and Bunsen burner was 3.4.

Does the evidence support using an electric water bath instead of a beaker of water and Bunsen burner?

Explain your answer.

.....

.....

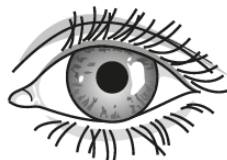
..... [2]

AO3 interpretation and evaluation was assessed in this question. Many candidates identified the increased mass of DNA extracted as indicative that the electric water bath was better to use. Some candidates went on to identify that the range of results was narrower, indicating the variation in results was less and gained 2 marks.

Question 22 (a)

22 A girl walks from a sunny beach into a dark café.

Diagram A shows the girl's left eye on the beach.



A



B

(a) Diagram B shows the girl's left eye after she enters the café.

Explain how you can tell this and how this change happens.

.....

.....

.....

.....

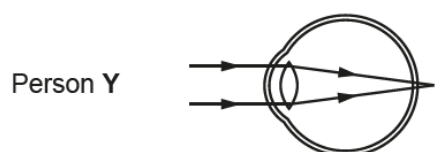
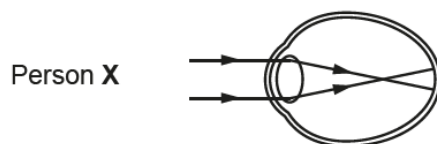
..... [3]

Candidates needed to recall details of how light entering the eye is controlled and apply this to the situation described in the question to be successful. Candidates often got mixed up in describing changes moving from the beach to the café. Although many could describe the change in size of the pupil few could explain how it happens. Radial muscles were not mentioned and where muscles were mentioned this was usually incorrect as they referred to ciliary muscles and suspensory ligaments. The understanding that this was a reflex action was rarely seen.

Question 22(b)(i)

(b) Look at the diagrams.

They show how light is focused in people with different eye defects.



(i) Name the eye defect in each person.

Person X

Person Y

[2]

The question assessed application of knowledge of eye defects. Most candidates referred to short sighted and long sighted with many identifying the correct person. However, some identified the defects but made the incorrect choice of person.

Question 22(b)(ii)

(ii) Identify the type of corrective lens needed by person X and Y and explain how the lenses work.

.....

.....

.....

.....

..... [3]

Candidates needed to recall the appropriate lenses required to correct the eye defects and explain how these lenses work to gain maximum marks. The identification of the corrective lenses was achieved by higher ability candidates, but it was very rare to see anyone demonstrate an understanding of how these corrective lenses work. Both corrective lenses needed to be correctly identified to score the first marking point and some candidates only managed to identify one.

Exemplar 3

a concave lens bends the light outwards.
 before it enters the eye. ✓
 ✓ a convex lens bends the light inwards. ✓

[3]

This exemplar indicates that the candidate clearly understands what is happening to light rays after passing through the corrective lens. Although they have not used the correct terminology of diverging and converging, credit has been given to the descriptions of what is happening to the light rays. The marks awarded for an explanation of how the lenses work could have been gained from a diagram, but this type of response was not seen.



This could be an area for candidates to develop their examination technique to recognise when diagrams could support an answer, if they find difficulty in writing down their ideas.

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