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Examiners' Report
June 2023

GCSE Combined Science 1SC0 1BF

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June 2023

Publications Code 1SC0_1BF_2306_ER

Introduction

Paper 1SC0_1BF is taken by candidates who have followed the GCSE combined science specification.

The paper consists of 60 marks assessed by a mixture of different question styles, including multiple-choice questions, short answer questions, calculations and one extended open-response question. All questions should be answered in the allowed time of 1 hour 10 minutes. The extended open-response question is identified by an asterisk (*) in the question paper to indicate that marks are also awarded for the ability to demonstrate biological understanding as well as to give a response that shows structure and coherence.

The Combined Science Biology papers assess aspects of working scientifically and mathematical skills, the requirements of which are given in the specification. There are six core practicals which must be completed prior to sitting the examination. Paper 1SC0_1BF assesses content from Topic 1 and Topics 2 – 5. The 2023 paper covered areas of the specification including cell structure and microscopy, stone tools / evolution, domestication of animals, BMI, obesity and CVD, trends in smoking, genetic crosses, diploid / haploid, genetic variation, enzymes, bacterial growth, pathogens and antibiotics.

The extended open-response question required a comparison of a bacterial cell and a plant cell. Questions assessing practical skills included devising a method to investigate the effect of pH on enzymes. Mathematical skills tested included interpretation of graphs and tables, magnitude of units, ratio, bacterial growth and magnification. There were several questions that tested candidates' ability to apply their knowledge to different situations but in these cases, all the information needed to lead candidates to the required responses was supplied in the stems of the questions.

A few examples where candidates had underlined the command words and key words as well as writing key words by the question for extended prose responses were seen, however there was a definite reduction of this practice compared to previous years.

The more straightforward questions where marks could be gained by interpreting given information were answered well and it was pleasing to see some excellent, coherent answers accurately applying relevant scientific terminology to all items that required extended prose. However, overall, it is thought that there is a general reduction in the understanding and use of key words and biological terminology. Centres need to address this as many marks are linked to understanding the rubric in the stem of the question and many marking points require a demonstration of understanding as well as the ability to incorporate terms and nomenclature in responses.

It was noted that some candidates used the scaffolding provided to help them answer questions. Even when candidates scored low or no marks there was a clear use by a small number of candidates of using the diagrams, graphs and information in the stem of the question to guide their responses. It was disappointing, however, to see items based on practical aspects of the subject poorly answered, with little understanding of how to design a method or how equipment can be used / reagents do with the exception of microscopy. A few candidates stated that they had not done practicals / specific practicals in their lessons.

There was still confusion from a minority of candidates who confused the requirements for describe/explain as well as give/state. Explain items were too frequently partly answered as the candidate had only included a description in their response and it was also not uncommon to see the response to a question with the command word describe being extended to include an explanation. There seemed to be a reduction in the number of blank responses seen on items marked which could reflect more diligence on the part of the candidates as well as suggesting that the items could have been more accessible.

Question 1 (a)(iii)

This item was based on topic 1, point 1.1a/b (cell structures and functions) relating mitochondria to respiration. Over half of the candidates scored the available mark here with most of these stating 'mitochondria', with a few scoring with 'cytoplasm'. Incorrect responses included ribosome and vacuole.

'Cytoplasm' is a less common, but creditable response.

(iii) Name the part of an animal cell where respiration occurs.

(1)

Cytoplasm

ResultsPlus
Examiner Comments

Although clearly 'cytoplasm', candidates should be encouraged to write as legibly as possible to ensure that marks can be awarded. Each session some marks are lost by a significant number of candidates due to illegible handwriting.

Question 1 (b)(i)

Q01(b)(i), based on core practical 1.6 and specification point 1.3 required candidates to give an advantage of using a microscope to look at cells. Candidates found this accessible with very few if any blank responses. However, just under half the candidates scored the available mark with common uncreditable answers including see clearer, and 'zooming in'. The former being associated with focusing and the latter not technical enough for credit. Most candidates scored through stating "the microscope makes the cell larger" or "you can see more detail / structures in the cell" often with the aforementioned "see clearer". "Better resolution" was seen rarely but showed that some candidates had been taught this more technical aspect of microscopy. Let's you see structures was deemed insufficient for credit.

(b) A microscope can be used to observe the structure of a cell.

Figure 2 shows a microscope.

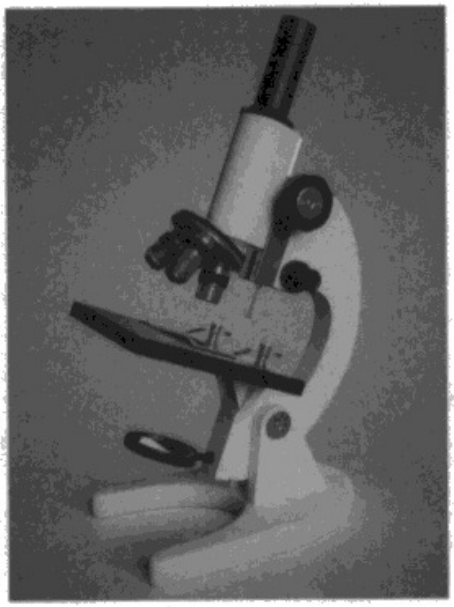

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Figure 2

(i) Give **one** advantage of using a microscope to look at cells.

(1)

Can easily see the ~~cell because of the magnification~~. details on all parts of the cell because of the ~~mag~~ magnification and the focus lenses.

ResultsPlus
Examiner Comments

A good comprehensive response stating the creditable more detail of (all) parts of the cell which is then linked to magnification. The 'focus larger' can be ignored but would not have been credited by itself.

ResultsPlus
Examiner Tip

Encourage candidates to give full responses . Here the explanation is not required but would have gained the mark if the first part was less specific, eg "see cells clearer".

A simple, creditable response.

(b) A microscope can be used to observe the structure of a cell.

Figure 2 shows a microscope.

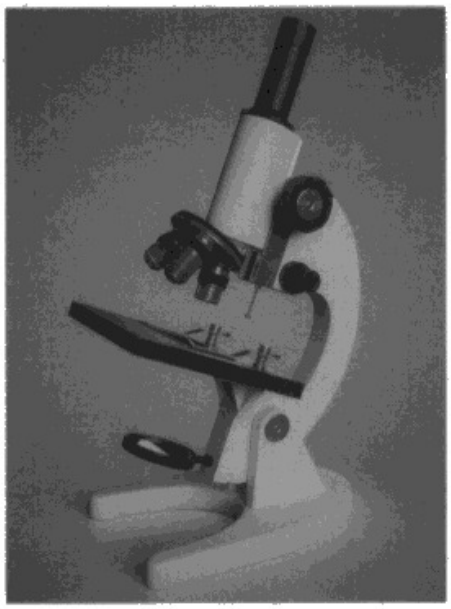

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Figure 2

(i) Give **one** advantage of using a microscope to look at cells.

(1)

High Magnification

ResultsPlus
Examiner Comments

This gained the mark although 'gives / allows **higher** magnification' would have a been better way of phrasing the idea.

ResultsPlus
Examiner Tip

A lot of marks in the science papers are awarded for comparative ideas and so we encourage candidates to use, for example, 'higher', instead of just 'high' where appropriate.

Question 1 (b)(ii)

Q01(b)(ii) required the candidates to draw lines from 2 parts of a microscope (the eyepiece and the stage) to their functions. This was completed correctly by almost all candidates with some scoring just 1 mark. These candidates tended to drop a mark by linking the stage to 'carrying the microscope', rather than 'to place a slide on'. A significant few candidates lost marks by joining the part of the microscope to more than one function. This question format is common in foundation science papers and candidates need to be made aware of the instruction given: draw **one** straight line from something.

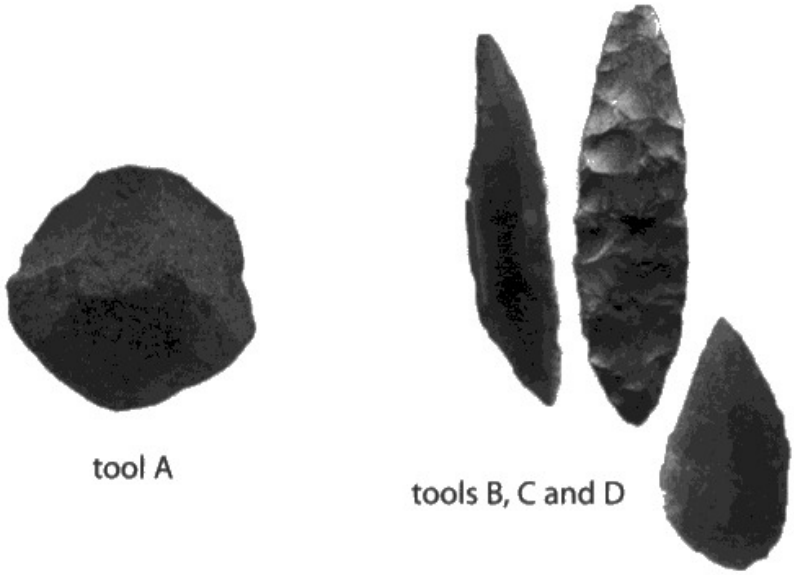
Question 1 (c)

Q01(c) tested candidates knowledge of different prefixes for units. In this case that picometres are smaller than millimetres, micrometres, and nanometres. Candidates were also given the power of 10 for each unit eg millimetre = 10^{-3}mm. It was pleasing to see that over three quarters of candidates scored here, with the commonest error of micrometres being chosen which may have been the unit candidates were most familiar with from their studies.

Question 2 (a)(ii)

This item tested specification reference 4.5a: the development of stone tools over time. Candidates were presented with a diagram showing an oldowan tool and 3 comparable palaeolithic tools, with a statement that these were tools from different periods of time. As this is an 'explain a difference shown in the diagram' question, candidates had to state a difference for one mark and then give a reason to explain the stated difference. Most candidates gained the first mark for stating a difference, with a comment about tool A being round / a rock and tool B being pointed / sharp / longer. The second mark was awarded for a reason for the difference, eg Tools B, C and D were worked more, or that they were younger / made by more recent / more evolved 'humans'. It was possible to gain the two marks by stating that tools B, C and D are worked more as they are made by more recent humans, but this was very rarely seen.

Figure 5 shows some stone tools from two different periods of time.



tool A

tools B, C and D

Figure 5

(ii) Explain **one** difference between tool A and tools B, C and D.

(2)

Tool A looks the more old tool out of them all. The size doesn't matter in this situation, it's the type of condition and how old each stone tool is.

ResultsPlus
Examiner Comments

This response gains one mark for stating that Tool A is older than tools B, C and D. Unfortunately the candidate does not go on to link this with the relative sophistication of the tools in question.

ResultsPlus
Examiner Tip

Don't just write "because of **'the difference'**" – look at the differences and state one of the more obvious ones clearly eg tools B, C and D are longer / more pointed than tool A.

Figure 5 shows some stone tools from two different periods of time.

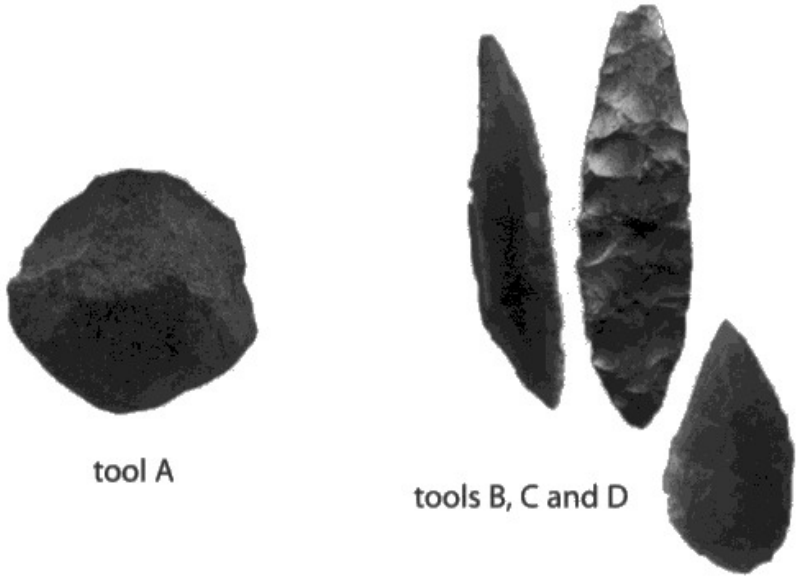


Figure 5

(ii) Explain **one** difference between tool A and tools B, C and D.

(2)

~~tools~~ tool A has been hardly shaped before used as a tool whereas tools B, C and D ~~are~~ have been chiseled and shaped to points which indicate tool A is older.

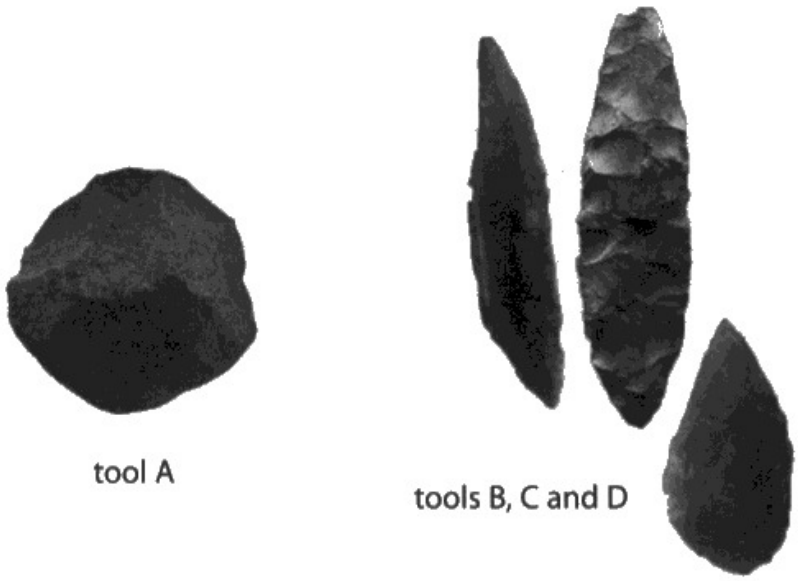
ResultsPlus
Examiner Comments

A good response that clearly states a difference and relates it to the age of the tools.

ResultsPlus
Examiner Tip

If the command word is 'explain', then make sure that you not only state something, but use a word such as because, so, as, which means that etc to link the observation / fact to the reason that states why or how it has happened.

Figure 5 shows some stone tools from two different periods of time.



tool A

tools B, C and D

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Figure 5

(ii) Explain **one** difference between tool A and tools B, C and D.

(2)

Tools B, C and D are chipped and have a pointy edge which can mean humans have discovered them, they are most recent.

A simple 2 mark answer.

In a question like this, you don't need to be too technical. Keeping it simple can gain marks. However, when you check your work at the end of the examination, think – what can I add to this answer to make it better, like using more scientific words, or being more specific.

Question 2 (b)(i)

This item was accessible to candidates with the vast majority choosing 'characteristics' and 'selective' from the list of alternatives to score both marks available. A small percentage scored just 1 mark, usually selecting asexual or inherited for selective.

Question 2 (b)(iii)

This item asked candidates to give an advantage of domesticating animals. This gave candidates more problems with over half not scoring, many of these giving vague answers that often restated the stem of the question, for example 'makes animals suitable for pets'. Candidates that scored referred to the ideas that domestication allowed selective breeding, often described eg it allows good characteristics to be chosen or referred to the commercial value of designer breeds such as cockapoos. The idea of working animals, with horses pulling loads / ploughing as well as guard dogs, police dogs and sheep dogs, was commonly seen. A less common but creditable response was the idea that domestication allowed access to more food / more regular food.

(iii) Give **one** advantage of domesticating animals.

(1)

using them for work or protection for example sheep dogs herd the sheep on farms and police dogs help to find dangerous drugs and capture criminals.

ResultsPlus
Examiner Comments

A commonly seen response referring to working animals with good examples gains this mark.

ResultsPlus
Examiner Tip

If you state a point to answer a question, then to secure available points, clarify it with examples as shown here.

'Pets' was given in the stem of the question. Here the candidate has not just rephrased this but taken it further to explain how pets are useful gaining the available mark.

(iii) Give **one** advantage of domesticating animals.

(1)

Having animals such as dogs for pets means that people are encouraged to by going on walks etc. excercise more ~~for their~~ advantaging their health

ResultsPlus
Examiner Comments

Highlighting / underlining key words in the question is good practice as it focuses the mind on what is required and the scaffolding supplied to help candidates write creditable responses. Centres should encourage candidates to do this when going over exam questions and practice examinations.

Question 3 (b)(i)

Q03(b)(i) required candidates to use information in a table showing BMI ranges with their concomitant weight descriptions. They then had to use the extra information regarding a person with a BMI of 39.0 to explain their risk of developing heart disease. Most candidates scored here with roughly equal numbers gaining the one or two marks available. Those that only scored one mark tended to relate the BMI of 39.0 to being obese but then lost the consequential mark of saying this increases the risk of cardiovascular disease / the risk of CVD is high, often just stating that they have a risk of CVD.

(b) Several factors affect the risk of developing cardiovascular disease.

Figure 6 shows different BMI ranges and their weight descriptions.

BMI range	weight description
18.5 to 24.9	healthy weight
25.0 to 29.9	overweight
30.0 to 39.9	obese
40 or more	severely obese

Figure 6

(i) A person has a BMI of 39.0

Explain the risk of this person developing cardiovascular disease.

(2)

The risk of this person developing cardiovascular disease is higher than an average person with normal weight because this person is classed as obese which means they may experience heart issues as well as ~~rapidly~~ breathing and is more prone to more diseases.

ResultsPlus
Examiner Comments

A good comprehensive responses that addresses both marking points gaining both available marks.

If you are presented with information, eg in table form as here, then make sure you use the information in your answer.

Underlining the key parts of the table helps to focus on what parts are important to use in your response.

Here just one mark is awarded as the candidate refers to being at risk of CVD without reference to the amount of risk, ie being increased, or is at high risk.

(b) Several factors affect the risk of developing cardiovascular disease.

Figure 6 shows different BMI ranges and their weight descriptions.

BMI range	weight description
18.5 to 24.9	healthy weight
25.0 to 29.9	overweight
30.0 to 39.9	obese
40 or more	severely obese

Figure 6

(i) A person has a BMI of 39.0

Explain the risk of this person developing cardiovascular disease.

(2)

with a BMI of 39.0 your weight description is classed as obese this person is at risk of cardiovascular disease because they are not eating healthy, probably has a bad diet and is doing no excersise.

ResultsPlus
Examiner Comments

Many items refer to concepts that vary in degree eg risk, temperature, amount of oxygen etc. Candidates need to be trained to clarify what is required of these comparative parameters to gain credit in examination items.

(b) Several factors affect the risk of developing cardiovascular disease.

Figure 6 shows different BMI ranges and their weight descriptions.

BMI range	weight description
18.5 to 24.9	healthy weight
25.0 to 29.9	overweight
30.0 to 39.9	obese
40 or more	severely obese

Figure 6

(i) A person has a BMI of 39.0

Explain the risk of this person developing cardiovascular disease.

(2)

They are obese which means that they have a lot of fat ~~in~~ near their heart. That fat is blocking their heart from beating properly.

ResultsPlus
Examiner Comments

This response explains why being obese increases the risk of CVD, but only gets one mark as they have not answered the question: how does a BMI of 39.0 affect the risk of heart disease.

ResultsPlus
Examiner Tip

When you have completed your answer, check back and ask yourself 'have I answered the question?' If not, modify your response.

Question 3 (b)(ii)

Over a quarter of candidates scored here with the majority of these getting just one of the two marks available. One problem was that candidates were given that changes in lifestyle can reduce the risk of cardiovascular disease and although they were then asked to give two other treatments for CVD, they still gave two examples of changes in lifestyle, commonly improved diet and increased exercise.

It is useful to note that even if these areas were required, improved, or more healthy diet is not likely to be credited unless it is specific, eg reduce the fat in the diet.

Those that scored here, often gained just one mark for stating eg surgery, which was just sufficient to gain the mark, but then gave an example of surgery eg have a stent fitted, for their second treatment which was deemed to be the same marking point.

(ii) Changes in lifestyle can reduce the risk of cardiovascular disease.

State **two** other treatments for cardiovascular disease.

(2)

1 anticoagulants

2 Stents

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Examiner Comments

Although anticoagulants do not actually make the blood 'thinner' they are often referred to as blood thinners so it gains the mark here.

Stents are an acceptable example of a treatment for CVD so it is also creditable.

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Examiner Tip

The command word here is 'state' and so these concise answers are all that are required for credit. Describe, and explain are examples of command words that usually need more detail to gain marks.

(ii) Changes in lifestyle can reduce the risk of cardiovascular disease.

State **two** other treatments for cardiovascular disease.

(2)

1 eat healthy foods - balanced diet

2 do lots of exercise to have good cardiovascular endurance

ResultsPlus
Examiner Comments

An example of a common error giving two lifestyle changes where the question states 'two other' treatments.

ResultsPlus
Examiner Tip

Look out for words like 'other' in questions. This is not the same as being asked for two 'examples'.

Question 3 (c)(i)

This relatively straightforward item was correctly answered by the large majority of candidates stating that the percentage of people who smoked decreased from 2011 to 2019.

(c) Figure 7 shows the percentage of people who smoked cigarettes in England from 2011 to 2019.

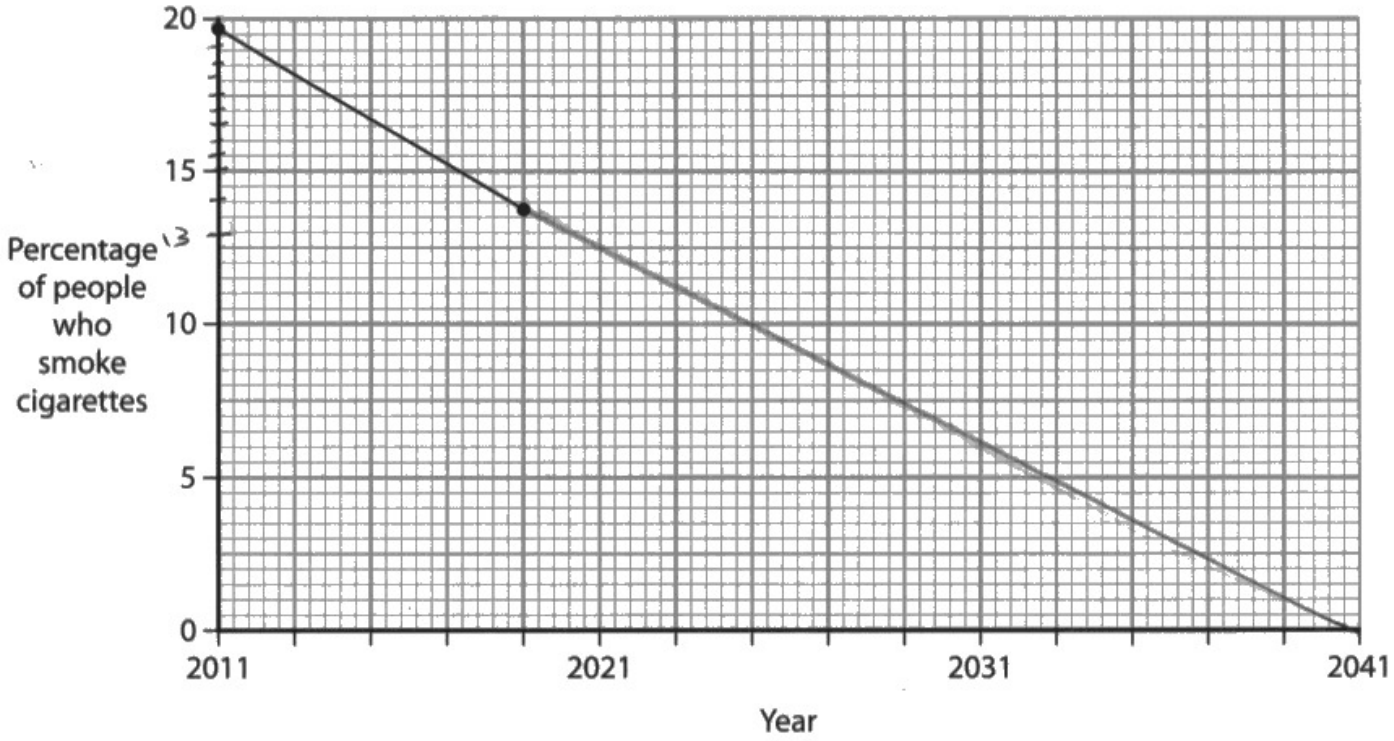

Figure 7

(i) State the trend shown in the graph from 2011 to 2019.

(1)

the percentage of people who smoke has decreased 7% from 2011 to 2019.

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Examiner Comments

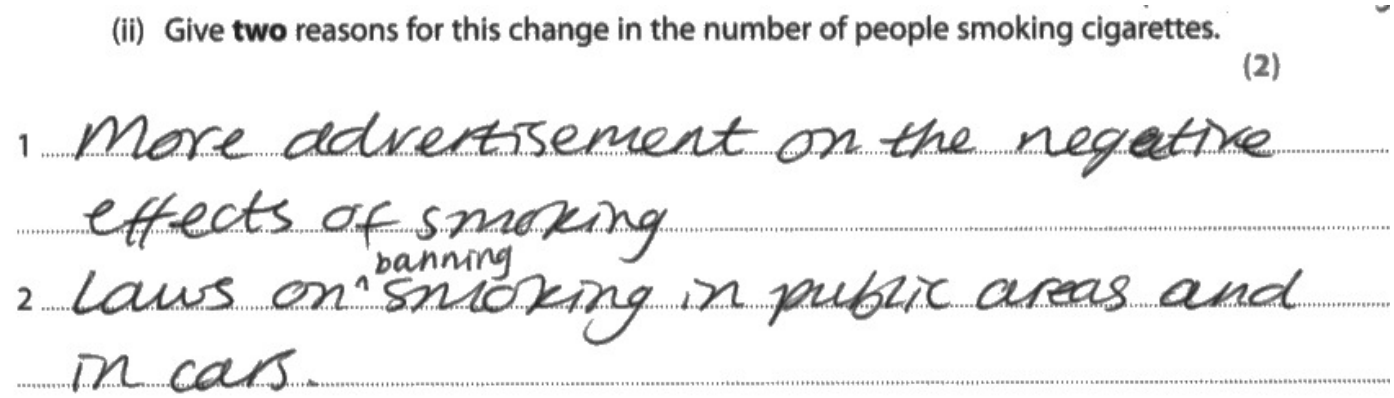
This candidate was credited for stating that the percentage of people who smoked decreased. They have tried to improve their answer by stating the change in the percentage of people who decreased. They have got the amount decreased approximately correct within the tolerance of +/ – one small square we usually allow, but even a larger decrease would not make the mark 0 as it does not contradict the fact that the percentage has decreased.

ResultsPlus
Examiner Tip

It is good practice to quantify data taken from a table or graph but take care that you get the amount decreased correct.

Question 3 (c)(ii)

Q03(c)(ii), which worked well showing good discrimination between candidates asked them to give two reasons for the change in the number of people smoking from 2011 to 2019. Candidates who did not score here often stated that it is because smoking is bad for you which was the case in 2011 as well as in subsequent years so did not explain the change. However, a little more, for example, because there was more awareness of health issues, to stop the damage smoking causes to your lungs, or just so you don't get eg cancer, or 'for health reasons' was sufficient for credit. Most responses seen centred around to reduce health issues. Other creditable answers seen included: using (safer alternatives) such as vaping or using nicotine patches to help you give up as well as a small but significant number stating harder to buy cigarettes and it is now not as sociable / you can't smoke in eg restaurants any more.


(ii) Give **two** reasons for this change in the number of people smoking cigarettes.

(2)

1 More advertisement on the negative effects of smoking

2 Laws on banning smoking in public areas and in cars.

ResultsPlus
Examiner Comments

A good answer gaining both available marks with the first being the common reason to explain the decrease in smoking and the second being a less common, but still valid response to gain credit.

ResultsPlus
Examiner Tip

This candidate has clearly reread their response and realised that they needed to add 'banning' to make credit more likely.

This is good practice and candidates should be trained to reread their responses, eg when they have written the response, or at the end of the examination if time allows and alter their response / add words that make the meaning more salient to the question.

Question 3 (c)(iii)

To gain the available mark here, candidates had to continue the line that showed a decrease in the number of smokers from 2011 to 2019 up to 2041. Just over half continued the line to show further reductions in the number of people who smoked up to 2041 gaining the mark. If their line reached the x axis before 2041, they had to clearly show that it stayed at 0 up to the end of the graph. Failure to do this was not uncommon and accounted for a significant number of candidates who did not gain this mark. Credit was given for curves and decreased and then levelling out lines as long as a) there were no increase and b) the line reached the year 2041. A significant number of candidates did not gain credit here as their line increased / decreased randomly.

(c) Figure 7 shows the percentage of people who smoked cigarettes in England from 2011 to 2019.

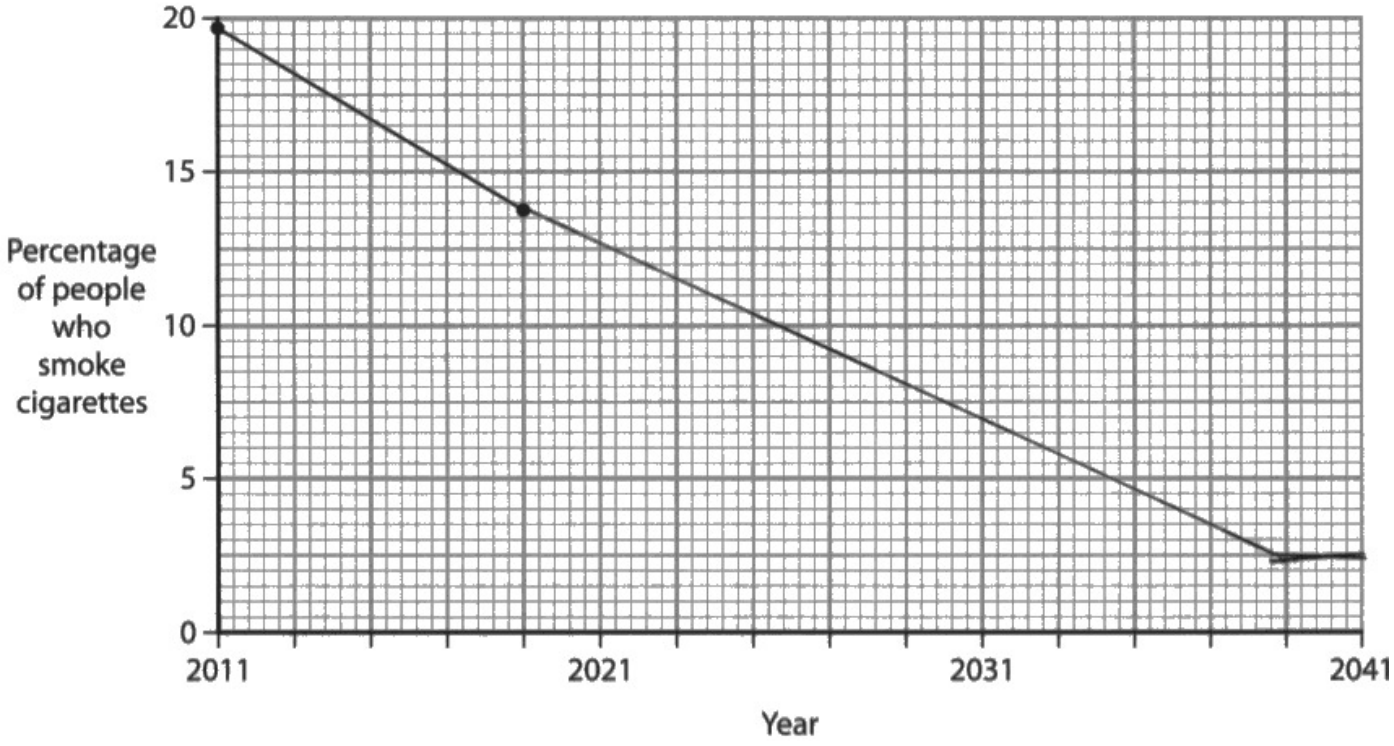


Figure 7

(i) State the trend shown in the graph from 2011 to 2019.

(1)

as each year progresses the less percentage of people smoke

(ii) Give **two** reasons for this change in the number of people smoking cigarettes.

(2)

1 People now have solutions to stop smoking like using vapes instead

2 The consequences are being adverteised on boxes which can steer people awar

(iii) Draw a line on Figure 7 to show the likely trend in the percentage of people smoking cigarettes from 2019 to 2041.

ResultsPlus
Examiner Comments

This line gets the available mark as it shows the percentage of smokers decreasing, but then levels off which is not an unreasonable suggestion. We would not expect foundation candidates to judge where the levelling off occurs.

ResultsPlus
Examiner Tip

Read the instructions carefully and make sure you answer it fully, here it says continue the likely trend and also to do so up to the year 2041. Both of these must be shown to gain credit.

(c) Figure 7 shows the percentage of people who smoked cigarettes in England from 2011 to 2019.

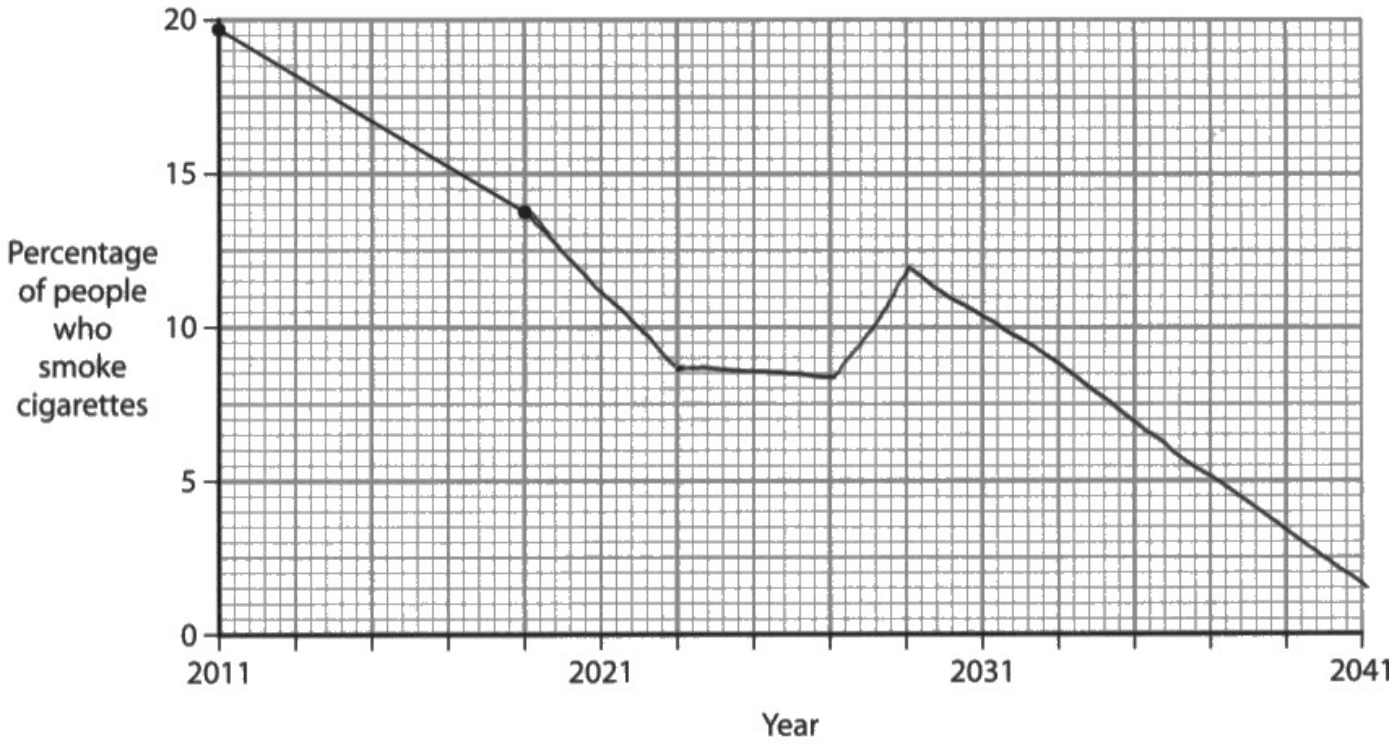


Figure 7

(i) State the trend shown in the graph from 2011 to 2019.

(1)

.....

.....

(ii) Give **two** reasons for this change in the number of people smoking cigarettes.

(2)

1 the age to smoke was constantly bumped up and somwhere the lines

So all the people who still smoked died

2 Other habits were chosen instead

.....

(iii) Draw a line on Figure 7 to show the likely trend in the percentage of people smoking cigarettes from 2019 to 2041.

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Examiner Comments

There is no reason to suggest that the number of smokers will go up at any time, so this candidate loses the available mark for suggesting that the number of smokers will increase in the late 2020s.

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Examiner Tip

The question asks for the likely trend, unless there is evidence to suggest a change in the trend, just continue in the same way as shown.

(c) Figure 7 shows the percentage of people who smoked cigarettes in England from 2011 to 2019.

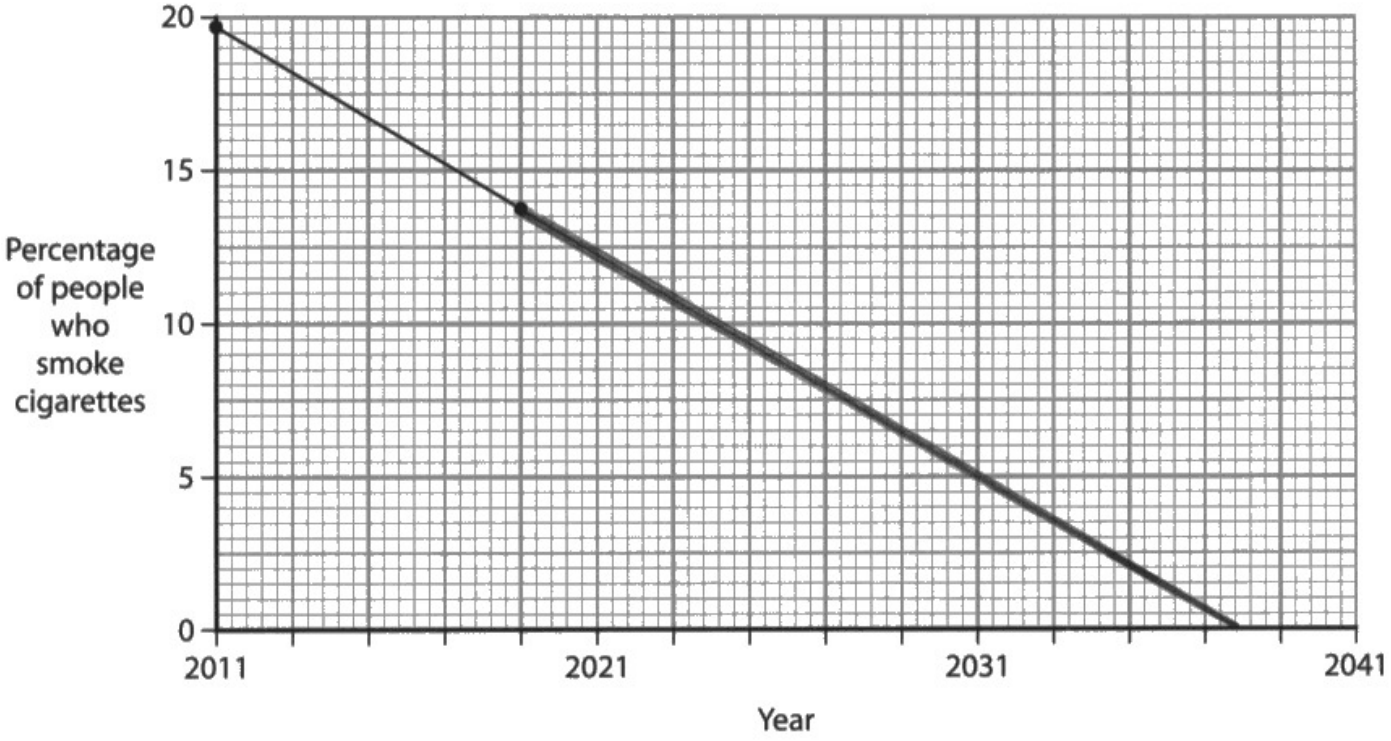

Figure 7

(i) State the trend shown in the graph from 2011 to 2019.

(1)

The percentage of people who smoke cigarettes has decreased from 2011 to 2019.

(ii) Give **two** reasons for this change in the number of people smoking cigarettes.

(2)

1 People now know the side effects of smoking so they decide to quit smoking.

2 The majority of smokers may have died due to smoking related cancers.

(iii) Draw a line on Figure 7 to show the likely trend in the percentage of people smoking cigarettes from 2019 to 2041.

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Examiner Comments

This line does not continue to 2041 as required so gains no credit.

ResultsPlus
Examiner Tip

Make sure you read and comply with the instructions fully. Here the instruction is to continue the trend to 2041. This will usually result in you not being credited.

Question 4 (b)(i)-(ii)

Q04(b)(i)-(ii) was accessed well by the majority of candidates and again showed good discrimination between candidates with roughly half gaining all 3 marks available and significant numbers gaining 2, and 1 marks. For Q04(b)(i), a common error was getting the genotypes of the gametes incorrect, eg R and r or using different letters eg W and w. This was disappointing as the rubric stated that the wrinkled seeds had a genotype of (rr). However, the second available mark, the genotypes of the offspring could still be gained if the incorrect gamete genotypes were correctly inherited. Q04(b)(ii) required the candidates to use their Punnett square offspring genotypes to predict the expected percentage of round seeds produced. There tended to be more correct percentages with correctly completed Punnett squares although it was not uncommon for a correct percentage from an incorrect Punnett square to be creditable. It was pleasing to see over half of the candidates gaining all three marks available, with significant numbers scoring 2 marks. Some of these dropped the gamete genotype but followed this showing that they knew how to use and interpret a Punnett square.

(b) A scientist crossed a pea plant that produced round seeds (Rr) with a pea plant that produced wrinkled seeds (rr).

(i) Complete the Punnett square.

(2)

		wrinkled seeds: R	wrinkled seeds: r
round seeds	R	RR	Rr
round seeds	r	Rr	rr

(ii) State the percentage of the offspring that will produce round seeds.

(1)

percentage = 20 %

ResultsPlus
Examiner Comments

This candidate gains one mark for correctly generating the genotypes of the offspring from incorrect genotypes of the gametes.

ResultsPlus
Examiner Tip

Look carefully at the information given. Here it states that the wrinkled seeds are (rr) so use r and r for the gamete genotypes instead of R and r as shown here.

(b) A scientist crossed a pea plant that produced round seeds (Rr) with a pea plant that produced wrinkled seeds (rr).

(i) Complete the Punnett square.

(2)

		wrinkled seeds	
		r	r
round seeds	R	Rr	Rr
	r	rr	rr

(ii) State the percentage of the offspring that will produce round seeds.

(1)

percentage = 50 %

ResultsPlus
Examiner Comments

A good clearly completed Punnett square with correct interpretation of 50% for all three marks available.

Question 4 (c)(i)

The majority of candidates either scored both available marks here or no marks. A very few lost the rounding mark giving an answer of 2.89 or 2.9 only or in a few cases, incorrectly rounding 2.89 down.

(c) The scientist crossed **two** purple flowering pea plants.

The offspring were:

- 133 plants with purple flowers
- 46 plants with white flowers

(i) Calculate the ratio of offspring with purple flowers to offspring with white flowers.

Give your answer to the nearest whole number.

(2)

OP : OW
133 : 46
÷46 2.89 : 1 ÷46

ratio 2.9 : 1

ResultsPlus Examiner Comments

A correctly calculated ratio gained the first available mark, but then failing to round it to the nearest whole number meant that the second mark available was not awarded.

ResultsPlus Examiner Tip

Numerical tasks often require the answer to be presented to, for example a set number of decimal places / significant figures or, as in this case, to the nearest whole number. Highlight / underline that instruction as you read the question and then make sure that you have followed it to give your final answer.

Question 4 (c)(ii)

Candidates found this item very hard with very few accessing the ideas to gain any marks. The question asked them to explain how purple flowered plants could produce white flowered plants. Whilst some candidates answered the question as though they were mixing paints, others just repeated the stem of the question stating how many purple and white flowered plants were produced. Some candidates came close to scoring but referred to white and purple genes rather than white and purple alleles. A few stated that there were white or purple flowers in previous generations but failed to link this to creditable points. Where letters were used to explain the reason why some white flowered plants were produced, they tended to use R and r, or P and W rather than P and p.

A rare response gaining both available marks as the candidate used correct terminology as well as correct alleles.

(ii) Explain why it was possible for this cross to produce some offspring with white flowers.

(2)

The purple flowers may have had a recessive white allele and these may have mixed therefore having two recessive white alleles and creating white flowers

ResultsPlus
Examiner Comments

In genetic questions ensure that the difference between gene and allele is clear and that the two terms are not mixed up.

When constructing crosses, remember that the same letter is used for both alleles, the capital for the dominant feature and the lower case for the recessive feature.

ResultsPlus
Examiner Tip

If alleles are given, then make sure these letters are used. If letters are not given, then use the capital letter of the dominant characteristic, here P for purple and then use the lower case letter, here p for the recessive characteristic.

(ii) Explain why it was possible for this cross to produce some offspring with white flowers.

(2)

Bec They have a genotype heterozygous homozygous
dominant recessive, therefore, there is a 50% chance
of producing offspring with white flower.

ResultsPlus
Examiner Comments

Here one mark is awarded for saying that the white flowered offspring are homozygous recessive.

ResultsPlus
Examiner Tip

Make sure that you use correct terminology, including homozygous, heterozygous, dominant and recessive as well as allele and gene, when answering genetic questions.

Question 4 (d)(i)

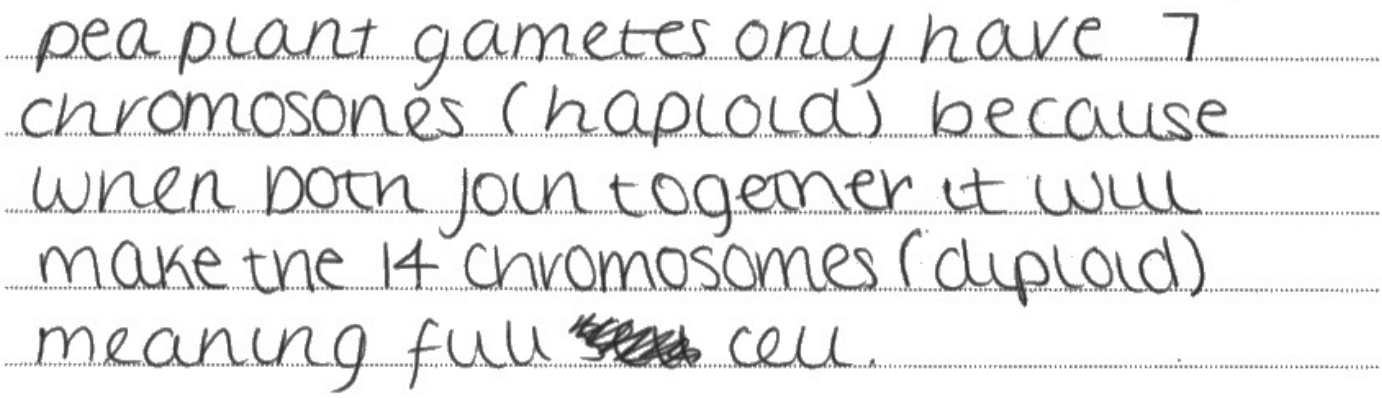
Diploid and haploid seem to be poorly understood by candidates. Meiosis was very rarely seen, suggesting that most candidates do not link it with the production of gametes with particular alleles. About 40% of candidates gained marks here, mainly one, for stating that when the gametes met the full number of 14 was achieved, or much more rarely that the gametes had half the number of chromosomes of the adults. A significant number of candidate responses included the false idea that plants were less complicated than animals so needed less chromosomes missing the point of the question.

(d) The cells in pea plants are diploid.

These cells have 14 chromosomes.

(i) Explain why pea plant gametes have only seven chromosomes.

(2)



ResultsPlus
Examiner Comments

A good clear response gaining both available marks for the correct use of the term haploid and linking that to when two gametes fuse, the diploid number will be generated.

ResultsPlus
Examiner Tip

Ensure that the meaning of genetic terminology is clear including haploid and diploid.

Question 4 (d)(ii)

Some excellent answers were seen, although again, the lack of correct terminology meant that some responses did not gain credit.

Common confusions included the difference between a zygote and an embryo / baby. Many candidates lost a mark for stating that fertilisation is when the sperm and ovum/egg meet rather than fuse / join or when a sperm enters an egg.

There was some confusion by a significant number of candidates with fertilisation and fertilisers with answers stating that the plants use the minerals from the fertilisers to grow faster / better. This is possibly because the earlier part of the question was based on plants.

(ii) Describe what happens at fertilisation.

(2)

The sperm cell meets the egg cell and the sperm cell fertilises the egg cell.

(Total for Question 4 = 12 marks)

*

	P	w
P	PP	Pw
w	Pw	ww

ResultsPlus Examiner Comments

This candidate did not gain credit through lack of correct terminology, for example meet instead of join / fuse. Fertilise was not credited as the item asks the candidate to describe what happens at fertilisation.

ResultsPlus Examiner Tip

When asked to describe something, here, the term fertilisation, don't use versions of the word in question to describe it.

(ii) Describe what happens at fertilisation.

(2)

At fertalisation a male gamete either x or y (which is a haploid) combines with a female gamete which is always x (also a haploid) ~~the~~ produces a diploid zygotte.

ResultsPlus
Examiner Comments

An excellent, full response gaining both marks.

ResultsPlus
Examiner Tip

Make sure that you know the correct meaning of as many key biological terms that you can. There are plenty of lists of key biological words available. Candidates should be supplied with these and regular tests / games / activities used to reinforce them.

Question 5 (a)(i)

This 1 mark item tested the candidates knowledge of the causes of genetic variation: spec statement 3.20. This was surprisingly poorly answered with less than 1 in 10 candidates scoring the available mark, with both mutation and less commonly sexual reproduction. Reproduction on its own was seen, but not credited. Candidates that did not score here often stated 'the environment' or gave examples of variation, eg they can have different colours.

5 (a) Apple trees show genetic variation.

(i) State **one** possible cause of genetic variation in apple trees.

(1)

DNA mutation

ResultsPlus
Examiner Comments

Mutation was the most often seen correct response, here qualified by the addition of 'DNA'.

ResultsPlus
Examiner Tip

This was a one mark question with the command word 'State'. One is emboldened to reinforce the fact that a simple reply, as shown here, is all that is required to gain credit.

Question 5 (b)

Q05(b) was a little higher scoring than Q05(a)(i), although still disappointing that candidates had trouble naming the type of reproduction that produces genetically identical variation. Just 'twins' was seen occasionally with the commonest non-scoring response being 'mitosis' which did not score as it was not considered a type of reproduction that produces organisms. The responses seen, suggest that this is an area of the specification where candidates need more clarification, as well as practice at reading the question carefully.

(b) Name the type of reproduction that produces genetically identical organisms.

(1)

Asexual reproduction

ResultsPlus
Examiner Comments

A correct response gaining the available mark.

ResultsPlus
Examiner Tip

The command word is name, so as shown here, a straightforward response is all that is required. In fact just the word asexual would suffice for the mark as the question asks name the type of reproduction, however, it is advised that making it clear as shown here is best practice.

We can see why mitosis was a very common answer to this question as it produces genetically identical body cells, however, it is not considered to be a type of reproduction that produces genetically identical organisms. This response, therefore, does not receive credit.

(b) Name the type of reproduction that produces genetically identical organisms.

(1)

mitosis

ResultsPlus
Examiner Comments

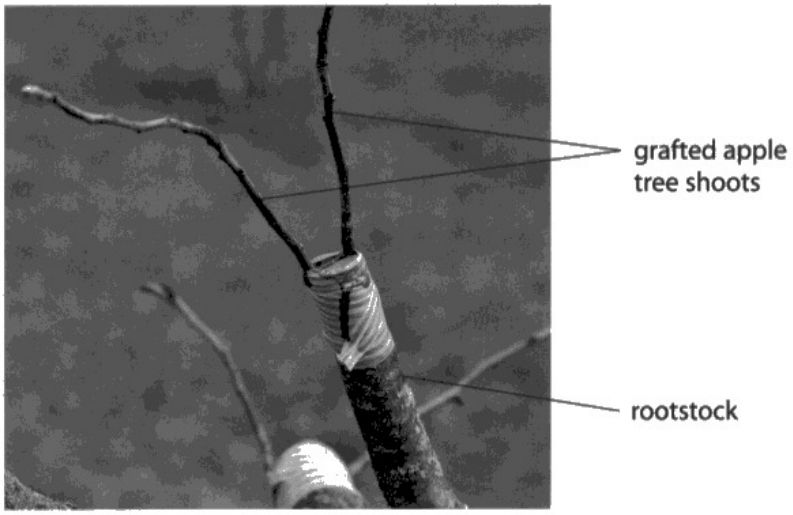
Read each question carefully. In this case 'type of reproduction' meant that the choice was really sexual or asexual. However, the last part of the question: 'to produce genetically identical organisms' was the clue, that it was not just the process for making genetically identical cells that was required.

Question 5 (c)

Although candidates again did not score well on this item, they did find it accessible with few blank responses seen. The problem was candidates applying their knowledge to a new, unfamiliar situation (grafting of apple trees) as well as expressing their ideas clearly and fully. Scoring answers included look / taste the same, with a minority saying you get apples faster (than growing from seed) for an advantage and all the trees being susceptible to the same disease for a disadvantage. It was not uncommon to see ideas that the apples were safe / unsafe to eat / unnatural. Reduction of gene pool was seen rarely.

(c) Grafting is a technique used to grow some varieties of apple tree.

Figure 9 shows apple tree shoots grafted on to a rootstock.



(Source: © ATTILA Barsan/Shutterstock)

Figure 9

Grafting can be used to produce apple trees that are genetically identical.

Give **one** advantage and **one** disadvantage of growing genetically identical apple trees.

(2)

advantage

They will both produce the same amount of apples that look the same and taste the same.

disadvantage

If one isn't immune to a disease then neither will the other therefore if one catches a disease and dies the other most likely will aswell

ResultsPlus
Examiner Comments

A good comprehensive response covering the points that most commonly gained credit. Looking / tasting the same was considered to be a desired characteristic by the vendors as well as the shoppers. We can ignore the inference of only one tree being grafted as this is what is shown in figure 9 as the ideas are applicable to all the grafted trees.

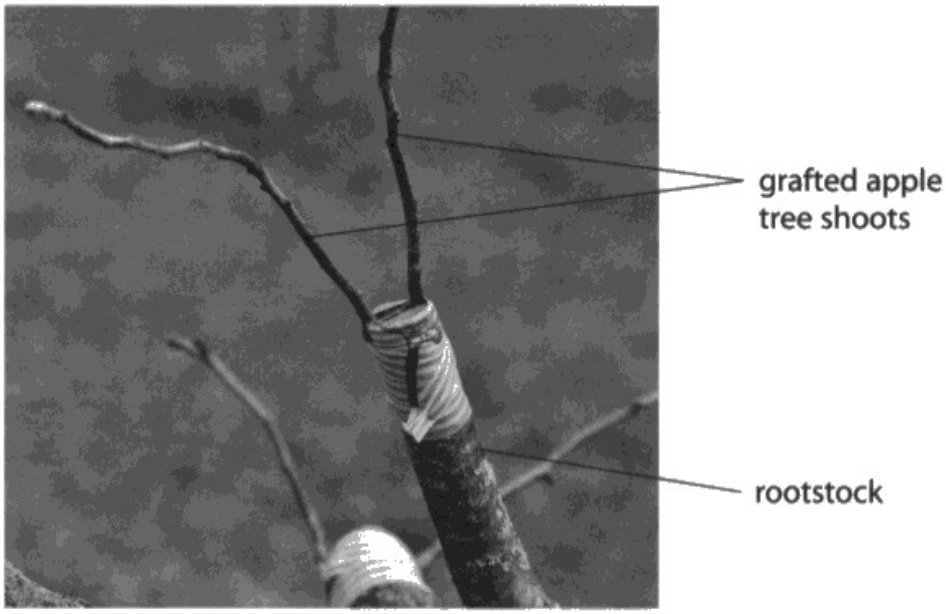
ResultsPlus
Examiner Tip

Writing your responses using biological terms is good, but here writing clearly and logically using simple phrases conveys the required ideas for full credit.

This response gains one mark for the advantage, however, the disadvantage is basically the same point.

(c) Grafting is a technique used to grow some varieties of apple tree.

Figure 9 shows apple tree shoots grafted on to a rootstock.



(Source: © ATTILA Barsan/Shutterstock)

Figure 9

Grafting can be used to produce apple trees that are genetically identical.

Give **one** advantage and **one** disadvantage of growing genetically identical apple trees.

(2)

advantage

by growing identical trees you get a load of the same type and sized apple.

disadvantage

a disadvantage could be that to many grow and there isnt a variety.

It is not uncommon to see the same point given for two options, eg 'A is hotter than B' and 'B is colder than A' for two parts of a question similar to this one. Candidates need to be given practice at advantage / disadvantage type questions so that they do not give the same response, or the reverse response for both options.

Try to make the disadvantage on a different aspect of the question to avoid repeating or contradicting yourself.

Question 5 (d)

Many candidates found all the devise a plan / method items difficult, with some stating that they had not carried out any practicals in lessons. This item was no exception. Candidates were given a list of solutions and told that they could use standard laboratory equipment, but many seemed to lack the experience to be able to convey how to use them as well as put the steps into a logical sequence. Many candidates just stated to put all the solutions together and see what happens. As the task was to 'devise a method to find the optimum pH of an enzyme that breaks down starch', more than just what to do was required, particularly as the solutions were listed. Just stating 'add iodine' was not creditworthy unless it was related to 'testing for starch / see if it goes (blue) black'. Similarly, there had to be an implication at least that the procedure was being repeated for different pHs to gain credit. This could be given for the candidate simply saying add the pH solutions to different test tubes (the implication being a pH in each different test tube). Using apples instead of starch solutions was permitted as it states that the apples contain starch at the start of the item. Common misconceptions included that iodine was used to stain the apple, change the pH and measure the pH. Some candidates included the use of a spotting tile, clearly showing that they had carried out the experiment in school and subsequently the rest of their account tended to be of higher quality. Weaker responses just said 'use', and then listed the solutions and some laboratory equipment, usually gaining no marks.

(d) As apples ripen, enzymes convert starch into sugars.

Devise a method to find the optimum pH of an enzyme that breaks down starch.

You may use standard laboratory equipment and the solutions listed in the box.

starch solution	enzyme solution	iodine solution
a range of pH solutions		

(4)

You would put 5 test tube and in each different one you would add a range of PH solution ~~different~~ to it for each one that is testing add the starch solution, enzyme solution and iodine solution, mix each by every 30 seconds. If the liquid turn black that means the amylase did not break into the starch solution whilst if its a orange colour that means the amylise has break to the starch solution.

ResultsPlus
Examiner Comments

A good clear method, gaining all 4 marks available.

ResultsPlus
Examiner Tip

If you find it easier than writing your answer in full prose as shown here, write your method out as a series of numbered, or bullet points. This often helps you to order your thoughts, and it is easier to check to see if you need to add any detail to your method.

Question 5 (e)

This item required candidates to state why an enzyme with an optimum pH of 6 would not work at pH 10. Candidates scored less well than expected here, with less than half the candidates scoring. Those just scoring one of the two available marks most commonly did so by stating that the enzyme denatures. To gain the second mark you had to say why this stopped the enzyme from working as 'explain' was the command word. Weaker, non-creditable responses simply rephrased the stem of the question saying that the enzyme would not work. Some candidates successfully used the lock and key model to explain why the enzyme would not work. Some candidates did not gain credit for mark point 2, the active site changes shape as they stated that it was the starch that changed shape. Some candidates who said this still gained their second mark by explaining that the enzyme could not join with starch as they would not fit together.

This response gains the two available marks. Although not expressed as clearly as a text book answer, the meaning is clear and meets all three marking points.

(e) The optimum pH of an enzyme is pH 6.

Explain why this enzyme would not work at pH 10.

(2)

~~because~~ ~~the~~ ~~this~~ because the enzyme would have denatured. this means because the pH in this case is above 6 it would affect the way the active sight folds up therfore the substrate wouldnt fit complimentry causing no reaction.

(Total for Question 5 = 11 marks)

ResultsPlus
Examiner Comments

Here the candidate has gained the first mark for enzyme denatured but then gone to meet both 'explain' requirements to gain the second mark.

(e) The optimum pH of an enzyme is pH 6.

Explain why this enzyme would not work at pH 10.

(2)

The enzyme would not work at pH 10 as, it is to much of an Alkaline therefore change the shape of the enzyme.

ResultsPlus
Examiner Comments

1 mark is awarded here for stating that the enzyme changes shape, however the candidate has not explained the consequence of this which stops the enzyme from working.

ResultsPlus
Examiner Tip

The command word here is **Explain** so requires two parts:

1. what happens – here it is that the enzyme changes shape.

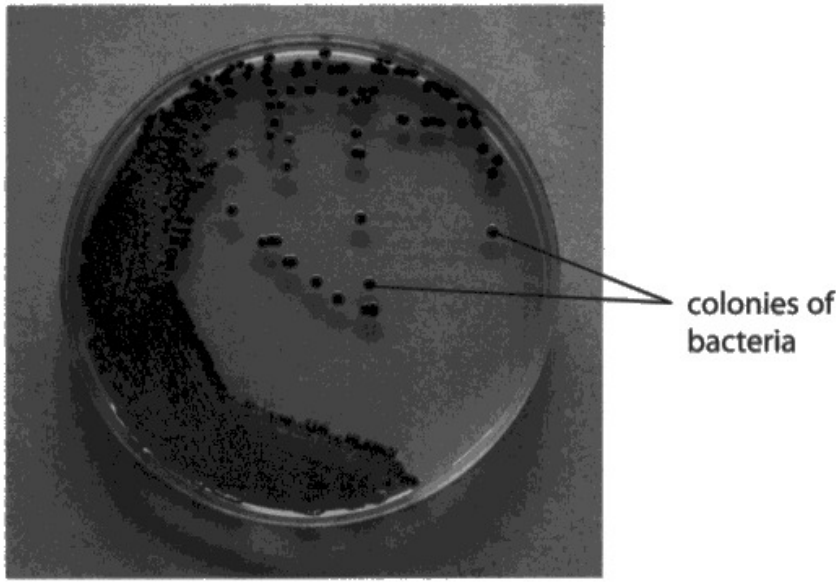
2. how this affects the enzymes function, here either saying the active site shape is changed OR it will not be able to fit / it is not complimentary to the starch molecule.

Candidates can have their responses to this type of item by getting used to adding a second part to their response linked by eg 'because / so / which means that' when they see the command word of 'explain' in the stem of the question.

Question 6 (a)

This item tested the mathematical skills for calculating a population from 1 bacterium that doubles every 30 minutes over a period of five hours. The first mark, which was gained by many candidates, was for showing that there were 10 divisions with the correct answer of a final population of 1024 gaining the second mark. Some candidates counted the starting 1 bacteria as the population after the first 30 minute period and so dropped a mark gaining 1 for stating the final population was 512. Candidates found this item accessible with over 50% doing so sufficiently to gain one or two marks.

6 Figure 10 shows colonies of bacteria growing on an agar plate.



(Source: © Chatchouliya/Shutterstock)

Figure 10

Each colony starts as one bacterium.

Every time bacteria reproduce, the number of bacteria in each colony doubles.

(a) Calculate the number of bacteria in a colony after five hours, if each bacterium reproduces every 30 minutes.

(2)

30, 30 30, 30 30, 30 30, 30 30, 30

1hr 2hr 3hr 4hr 5hr

512 bacteria

ResultsPlus
Examiner Comments

A common error starting the population of one bacterium as the population of the colony after the first 30 minute doubling time. This results in a final population which is half of the theoretical number of 1024. 1 mark awarded.

As so many candidates made this mistake, centres need to practice this aspect of maths with their pupils to help them avoid this basic error.

ResultsPlus
Examiner Tip

Rather than show the time, it is more likely to generate an accurate end population if you begin with the number of starting bacteria and then double this number the prescribed number of times.

Question 6 (b)(i)

Candidates were required to explain the term pathogen here to gain credit. Most knew that it was something to do with disease with less than one fifth of candidates gaining the available mark with many not able to clearly state an organism that causes disease. Some candidates confused the definition with that of a vector saying a pathogen carried something that causes disease, pathogens were the disease or named eg a bacterium whilst others lost marks by confusing pathogens with antibodies often linked to inoculations.

A correct simple definition of a pathogen gaining the available mark.

(b) Some bacteria are pathogens.

(i) State the meaning of the term pathogen.

(1)

A disease causing bacteria/orgnism

ResultsPlus
Examiner Comments

Centres could use the first part of a lesson each week just going over some key words. Use a random key word generator adding new words as you progress through the specification. Time well spent as candidates will then be able to access these words for their responses gaining valuable marks.

ResultsPlus
Examiner Tip

Candidates should ensure that they know the key words and terms for each part of each topic. A significant number of questions ask for / have these key words as integral parts of the mark scheme.

(b) Some bacteria are pathogens.

(i) State the meaning of the term pathogen.

(1)

A pathogen is a term for a disease.

e.g. bacteria, fungi, virus.

ResultsPlus
Examiner Comments

A combination of two commonly seen answers are mixed up here. Pathogen is a term for a disease and the examples given are names of groups of organisms, some of which are pathogenic.

Question 6 (b)(ii)

Q06(b)(ii) required candidates to explain why antibiotics can be used to treat bacterial diseases. Less than one percent of candidates gained 2 marks here with Mark Point 3 (does not affect the host) not seen at all by the majority of markers. Those candidates that did gain the second mark did so by referencing processes that are disrupted by antibiotics, mainly making proteins or cell walls. Roughly 40% of candidates gained 1 mark, mainly for saying that the antibiotics killed the bacteria.

(ii) Explain why antibiotics can be used to treat bacterial infections.

(2)

Antibiotics can be used to treat bacterial infections because antibiotics are made from penecilin which is an antibody that helps fight away infections in the body.

ResultsPlus
Examiner Comments

A common error is shown here: confusing antibiotics with antibodies, coupled with basically repeating the stem of the question.

ResultsPlus
Examiner Tip

Learn the definitions of the key words used in the specification (along with others that are linked to the topics covered).

(ii) Explain why antibiotics can be used to treat bacterial infections.

(2)

Because antibiotics stop the multiplication of the bacteria and controll the bacterian infection.

ResultsPlus
Examiner Comments

Stops the multiplication of bacteria = 1 mark – Mark Point 2.

ResultsPlus
Examiner Tip

Stating controls the bacterial infection is too vague for credit. Be more specific in your answers, saying how this allows the infection to be cured.

Question 6 (b)(iii)

Q06(b)(iii) tested the mathematical skills of enlargement. It was pleasing to see many candidates recalling and using the image size = actual size multiplied by magnification here, with many showing the equation in the 'triangle'.

As a result, candidates tended to gain both marks or none as is often the case with mathematical items. Of those that gained 0 marks, roughly half the candidates, tended to multiply 80 by 0.005 instead of dividing the former by the latter.

(iii) A rod-shaped bacterium is 0.005 mm long.

A student draws the rod-shaped bacterium.

The bacterium in the drawing is 80 mm long.

Calculate the magnification of this drawing.

(2)

I = 0.005

a = 80

m =

magnification = 16,000

$\frac{0.005}{80} = 6.25 \times 10^{-5} = 0.0000625$

80 ÷ 0.005 = 16,000

ResultsPlus
Examiner Comments

A clearly set out correct method and answer, using the magnification = the image size divided by the actual size triangle to gain both marks available.

ResultsPlus
Examiner Tip

When you have completed your calculation, look and see if the answer is reasonable. Here if you, for example, multiplied the actual size 0.05mm by the image size 80mm you would have got a magnification of 0.04.

Think: this is saying that the image length 80mm is 0.04 times smaller than the actual length (0.005 mm). This should ring alarm bells and tell you that you have made a mistake. So check your working and hopefully see where you went wrong and correct it.

Question 6 (c)

The longer, level based, Q06(c) required candidates to compare and state the similarities and differences between a bacterial cell and a plant cell with a maximum mark of 6 available. It was pleasing to see some very comprehensive responses with almost half of the candidates gaining Level 3. A reasonable percentage gained all of the 7 marks (0 to 6) available with 3 marks and 5 marks being more common than the others. Some candidates only gave similarities **or** differences and so were limited to Level 1. A common error for Level 3 candidates was to state that both bacterial cells and plant cells had mitochondria. This may have been because candidates thought that the bacteria cell was a sperm cell as some candidates also said that the bacterial cell has a flagellum to swim to the egg. This meant that they were awarded 5 marks rather than the full 6 marks. The other way that Level 3 candidates gained 5 marks was to state the differences without saying what the structures did, eg stating that the bacterium had a flagellum and the plant does not, rather than adding that the flagellum is used for movement. A few candidates thought that the bacterial cell was an animal cell.

This simple response gives a valid similarity and a difference so gets into Level 2. There is only one of each though and as there is no detail, eg stating the function of the cell wall, this arrives at a mark of 3.

*(c) Figure 11 shows a bacterial cell and a plant cell.

bacterial cell

plant cell

Figure 11

Describe the similarities and differences of a bacterial cell and a plant cell.

(6)

Both have a cell wall, plant cell has a neucles

ResultsPlus
Examiner Comments

It was accepted that a candidate stating that a plant cell has a nucleus, as written here, implies that a bacterial cell doesn't and so it is a creditworthy difference.

ResultsPlus
Examiner Tip

Here there are up to 6 marks available. There is nothing to lose by adding some observations as long as they don’t contradict points you have already made. Here, simple, but obvious differences include the plant cell is larger and bacterial cell has a 'tail' (flagellum).

*(c) Figure 11 shows a bacterial cell and a plant cell.

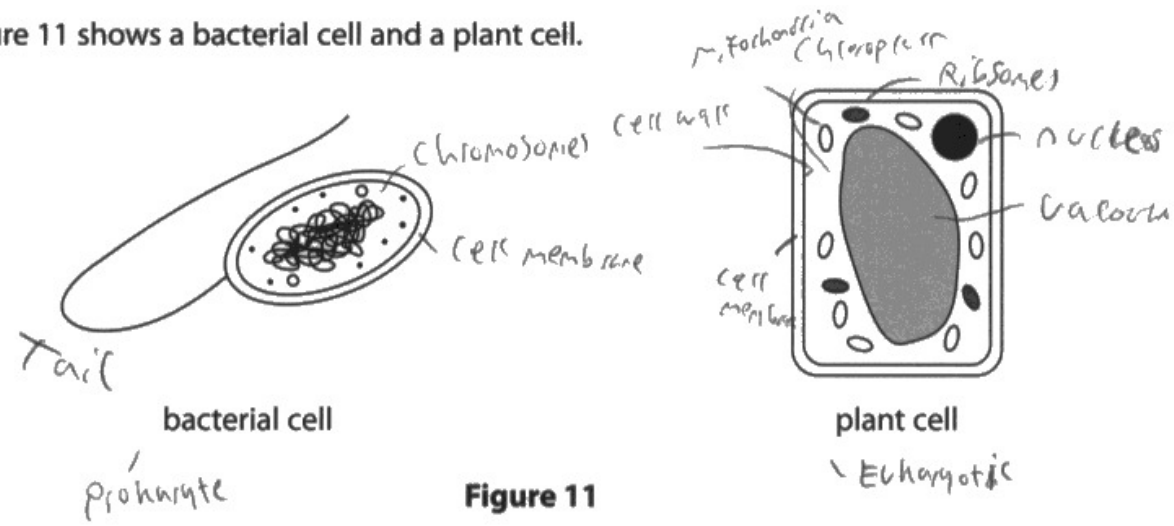


Figure 11

Describe the similarities and differences of a bacterial cell and a plant cell.

(6)

A bacterial cell is prokaryte as it dosent have a nucleus compared to the plant cell which has a nucleus so is therefore a Eukaryotic. A plant cell has a vacoule and a bacteria cell has Chromosones. However they both have a cell membrane; But only a plant cell has a cell wall. (for protection). The plant cell has Ribsomes (produce protien) the bacteria cell does not. The bacterial cell has a tail/flagella to help it move unlike the plant cell that cant move drastically. The plant cell endures photosynthesis the bacteria cell does not.

ResultsPlus
Examiner Comments

There are a lot of points here, most of them are not creditworthy, however, we have one similarity: 'both have a cell membrane' and several differences, eg plant cell being a eukaryote / has a nucleus unlike the bacterial cell. This leads us to Level 2. There are many errors though eg the plant cell has ribosomes which the bacterial does not. There is also some detail eg tail linked to movement, however it is not enough to give the top of Level 2 so 3 marks is the most suitable.

ResultsPlus
Examiner Tip

It is good to see the diagrams being annotated. This was a common strategy used by many candidates. If points were clear – here we have prokaryote and eukaryote clearly written against the bacterial cell and the plant cell, then marks can be awarded. These annotations were part of the candidates responses so we do mark them, although, candidates are advised to make clear as to which cell they refer.

Paper Summary

Based on their performance on this paper, candidates should:

- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer, giving a justification or reason.
- Recognise that 'describe' requires candidates to give an account of something or to say how data in a table or graph changes.
- Use all the information given in the question to help construct an answer, but avoid just repeating the information which has already been given as this is unlikely to gain credit.
- Consider the context of the question to ensure that they apply their scientific knowledge to the question being asked.
- Develop their practical skills knowledge to ensure they can answer questions on the core practicals in detail.
- Check the number of marks given for the question and ensure that they have included enough facts to match the marks available.
- Use scientific terminology accurately, where possible, in responses.
- Always show the working when doing calculations as a mark can be awarded for errors carried forward.
- If a sequence of points need to be made, eg in a plan or method, present them as bullet points or numbered points to make sure that you don't miss out a stage.

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