Example Candidate Responses

Cambridge O Level

Cambridge O Level
Biology
5090

For examination from 2019

Cambridge Secondary 2

CAMBRIDGE
International Examinations

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Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge O Level Biology (5090), and to show how different levels of candidates' performance relate to the subject's curriculum and assessment objectives.

In this booklet a range of candidate responses to questions in Papers 2, 3 and 6 have been chosen to, as far as possible, exemplify grades A, C and E. Each response is accompanied by a brief commentary explaining the strengths and weaknesses of the answers. This booklet does not cover Paper 1 as it contains multiple-choice questions where the mark scheme provides sufficient detail and the candidate answers do not require examiner commentary to expand on how the marks were gained.

Grades are given to each answer in this booklet, however in the examination the whole candidate script is graded on the overall mark awarded. It is therefore possible that, for some questions, candidates attaining a low grade on the whole paper are awarded the same or similar marks to candidates who attained a higher grade on the whole paper.

For each question the mark scheme is followed by examples of marked candidate responses, each with an examiner comment on performance. Comments are given to indicate where and why marks were awarded, and how additional marks could have been obtained. In this way, it is possible to understand what candidates have done to gain their marks and what they still have to do to improve their grades.

Past papers, examiner reports and other teacher support materials are available on Teacher Support at http://teachers.cie.org.uk

Assessment at a glance

Paper 1: Multiple Choice	1 hour
40 compulsory multiple-choice questions. The questions involve four response options. 40 marks	

Paper 2: Theory	1 hour 45 minutes
This paper has three sections. Section A carries 50 marks and consists of a small number of compulsory, structured questions. Section B carries 20 marks and consists of two compulsory questions. Each question is worth 10 marks. Section C carries 10 marks and candidates must choose **one** from a choice of two questions. 80 marks	

Paper 3: Practical Test	1 hour 15 minutes	Paper 6: Alternative to Practical	1 hour
This paper consists of two or three compulsory, practical questions. 40 marks		A written paper of questions designed to test past experience of practical work. 40 marks	

Teachers are reminded that the full syllabus is available at www.cie.org.uk

Paper 2 Theory

Question 1

Mark scheme

	Expected answer	Mark	Guidance
1 (a)	3 named substances, e.g. water salts / ions / named, e.g. Na^+, Cl^-, NH_4^+, Ca^{2+} urea / nitrogenous waste / other named	[3]	**A** any other 3 correct substances, e.g. hormones, pigments, enzymes **R** sugar / glucose **A** any three named ions for 3 marks **A** any three named nitrogenous waste products for 3 marks, e.g. creatinine, uric acid
(b)	more protein / ORA; correct ref. amino acids / ORA; broken down in / converted by liver / deamination; less water / more salts / ions + in diet / ORA; (urine) more concentrated / more urea in (urine) / ORA	[4]	**Ig** ref. to specific foods **A** ref. glucose / sugar only with ref. to diabetes
(c)	drink **A**; increases volume of / more water in + urine / produces most / lot of / more urine; water already being lost in sweat / AW; (sweating) more than usual; ref. temperature regulation / to reduce body temperature / keep cool / AW; danger of dehydration / increases thirst / AW	[1] [4]	Mark independently of drink named **Ig** ref. heat loss in urine
	Total	**[12]**	

Example candidate response – grade A

1 (a) State **three** substances found in the urine of a healthy person.

1 Urea

2 Water

3 Salts and Minerals. [3]

(b) The concentration of a person's urine can vary according to their diet.

Explain how changes in a person's diet can affect the concentration of their urine.

A person consuming more proteins will have a higher concentration of urea in his urine and it will have a yellow colour. Similarly a person consuming more water will have higher concentration of water. This happens because the liver breaks down more proteins and urea is a by-product & kidneys absorb the water hence [4]

(c) An investigation was carried out into the effect of diet on the rate of production of urine. Three students each took 1.5 dm^3 of a different drink **A**, **B** or **C**.

Fig. 1.1 shows the volume of urine released by each student over the next two and a half hours.

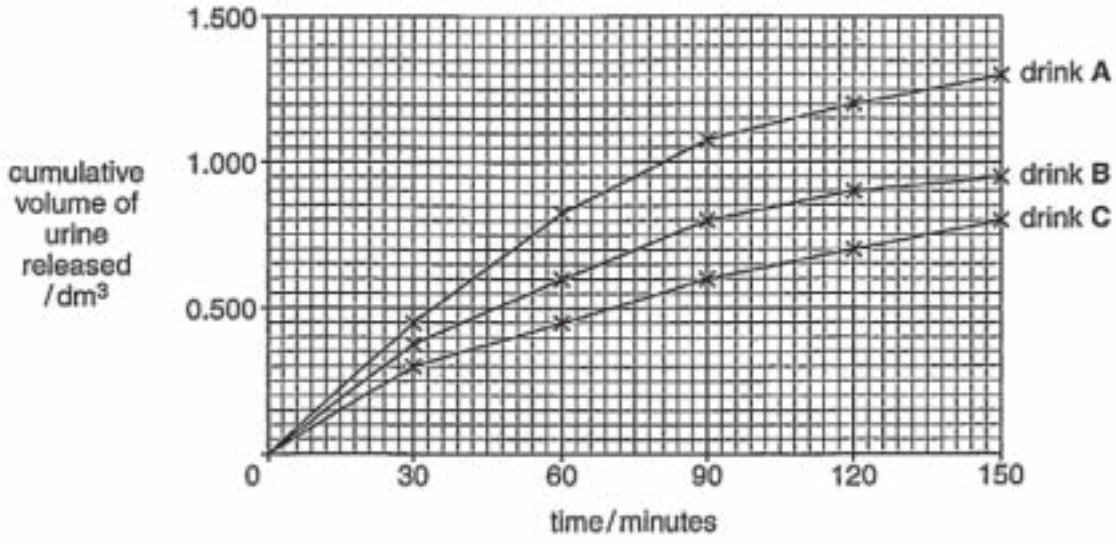


Fig. 1.1

Suggest which of the three drinks it would be better to avoid on a very hot day.

Give an explanation for your answer.

drink ..A.. [1]

explanation It causes increased urination. This will lead to more contents being excreted by the body. This can cause dehydration and thus it should be avoided. This drink excreats almost the same amount of volume as ingested so the water content is low. [4]

[Total : 12]

Examiner comment – grade A

(a) The candidate begins soundly with three correctly named substances. (3/3)

(b) This response also scores full marks, though the candidate only just gains credit for a reference to the liver as it is followed by a mention of proteins, rather than amino acids, being broken down. (4/4)

(c) The candidate appreciates that the drink that leads to the greatest loss of water in the urine should be avoided on a hot day but then fails to explain that water is required to provide for the increased sweating that will occur to maintain body temperature. (3/5)

Total mark awarded = 10 out of 12

Example candidate response – grade C

1 (a) State **three** substances found in the urine of a healthy person.

1 water.

2 nitrogen/nitrogenous waste.

3 glucose [3]

(b) The concentration of a person's urine can vary according to their diet.

Explain how changes in a person's diet can affect the concentration of their urine.

If the person have eaten alot of sweet than more glucose will be fand in the urine. If the person drinks alot of water his urine will be dilute and pale yellow. If he drink less water his urine will be concentrated and dark yellow. If the person eats less sweet or carbohydrates than low amount of glucose will be fand in urine. If the person drinks alot of water more urine produced and if drinks less water, less produ [4]

(c) An investigation was carried out into the effect of diet on the rate of production of urine. Three students each took 1.5 dm^3 of a different drink **A**, **B** or **C**.

Fig. 1.1 shows the volume of urine released by each student over the next two and a half hours.

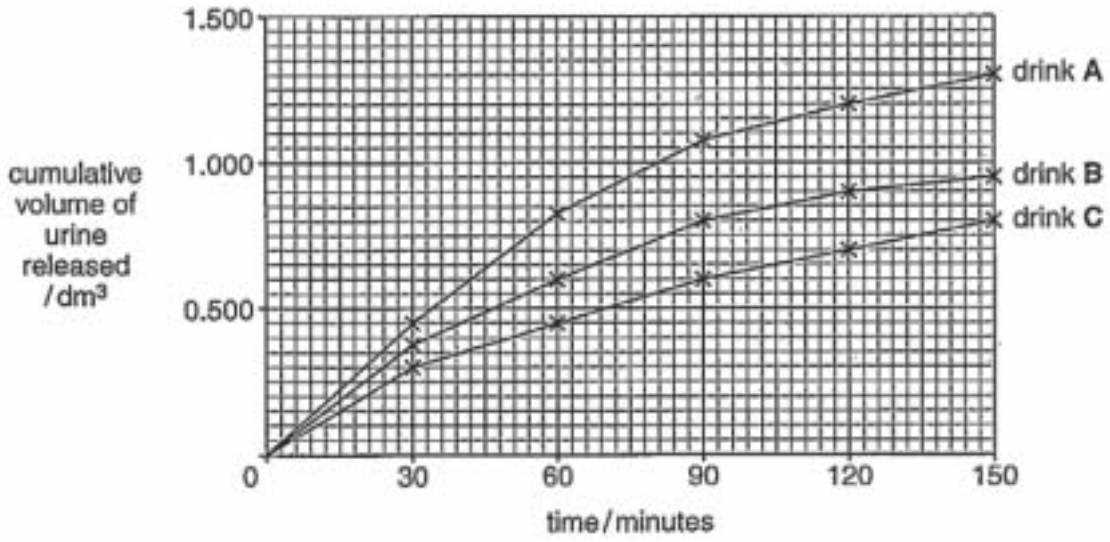


Fig. 1.1

Suggest which of the three drinks it would be better to avoid on a very hot day.

Give an explanation for your answer.

drink ..A..... [1]

explanation ..It produce alot of urine in hot day The body have low water percentage due to loss through sweat glands. The Body should not loss much water through urine in order to maintain constant water in body. If A (drink) is Taken, The body will lack of water and cause weakness etc.....

.....[4]

[Total : 12]

Examiner comment – grade C

(a) The candidate incorrectly names nitrogen, and does not register that the urine is that of a healthy person, and thus incorrectly offers glucose as an answer. (1/3)

(b) The answer correctly refers to the effect on the urine of the intake of a large volume of water, but no other dietary reference is made. The significant omission is that of increased protein and its effect on urea concentration. (2/4)

(c) The correct drink is selected, but there is no mention of the reasons for sweating, nor of the effect of water loss on the body. (3/5)

Total mark awarded = 6 out of 12

Example candidate response – grade E

1 (a) State **three** substances found in the urine of a healthy person.

1 Water

2 Urea

3 Glucose [3]

(b) The concentration of a person's urine can vary according to their diet.

Explain how changes in a person's diet can affect the concentration of their urine.

Changes in a person diet can effect the concentration in such a way that if the person diet is not proper he is not drinking sufficient amount of water than the concentration of urine will be less and there will be more nitrogenous waste etc in the urine but if the person's drinking water the concentration of urine will be high and there will be less nitrogenous waste etc [4]

(c) An investigation was carried out into the effect of diet on the rate of production of urine. Three students each took 1.5 dm^3 of a different drink **A**, **B** or **C**.

Fig. 1.1 shows the volume of urine released by each student over the next two and a half hours.

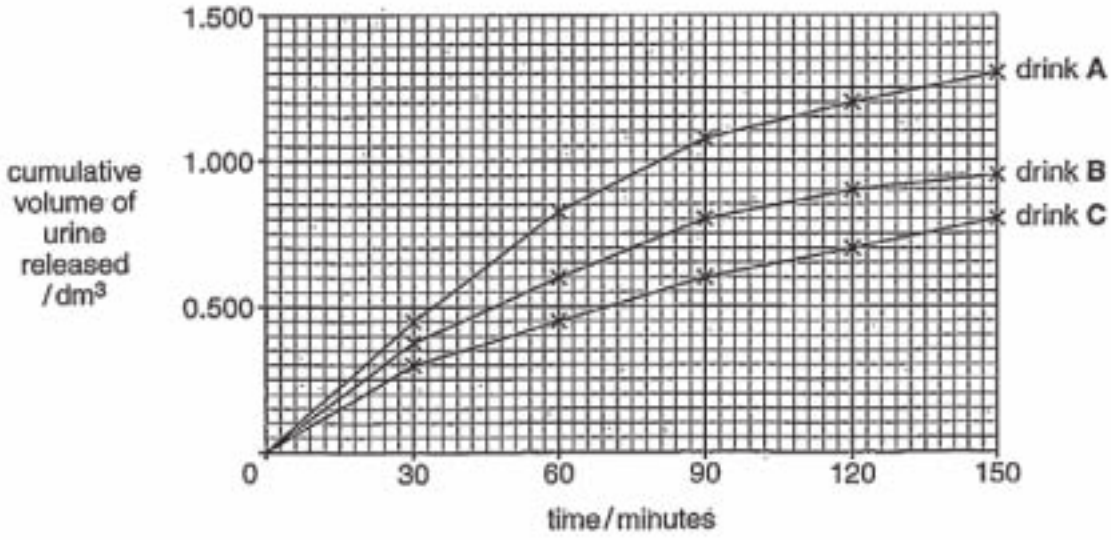


Fig. 1.1

Suggest which of the three drinks it would be better to avoid on a very hot day.

Give an explanation for your answer.

drink C [1]

explanation It should be avoided because less wine is being produced. The drink must not be a good diet for the student It must have less water there must be more nitrogenous waste like urea, creatine etc thus the drink C should be avoided. [4]

[Total : 12]

Examiner comment – grade E

(a) The candidate includes glucose even though the question relates to the urine of a healthy person. (2/3)

(b) The candidate appreciates the effect on the concentration of urine of not consuming sufficient water, but did not think to cover any other dietary constituents. (2/4)

(c) The wrong drink is selected, but marks were still available for an answer that mentioned the increased loss of water in sweat and its possible effect on the body. Unfortunately, nothing of substance was suggested. (0/5)

Total mark awarded = 4 out of 12

Question 2

Mark scheme

<table>
<tr><th colspan="2">Expected answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2 (a)</td><td><table>
<tr><th>combination of letters on each occasion</th><th>number of times each combination of letters is recorded</th></tr>
<tr><td>A and A</td><td>20</td></tr>
<tr><td>A and a</td><td>40</td></tr>
<tr><td>a and a</td><td>20</td></tr>
</table></td><td>[1]</td><td></td></tr>
<tr><td>(b)</td><td>expected are theoretical or statistical / spinning is random or due to chance;
disc poorly made / toothpick doesn't pass through middle / AW;
error in counting</td><td>[2]</td><td>Ig wind / force of spin
A 'it' is random</td></tr>
<tr><td>(c) (i)
(ii)
(iii)</td><td>parents (cells) / genotypes / gonads or both named;

meiosis / reduction division / gamete (formation) / fertilisation;
genes / alleles / chromosomes / gametes</td><td>[3]</td><td>

R genotype</td></tr>
<tr><td>(d)</td><td>Correct alleles, A, B and O (with or without I);
one disc with A and B <u>and</u> one disc with A and O;

each disc with correct numbers of alleles, i.e. 3 for discs given in question;

representing father and mother;

spin several / many times;

results recorded / counted</td><td>[5]</td><td>e.c.f. with letters used in point 1

R if either parent has wrong alleles</td></tr>
<tr><td colspan="2">Total</td><td>[11]</td><td></td></tr>
</table>

Example candidate response – grade A

2 Two students performed an experiment to illustrate inheritance. They each made a 'spinner' similar to the one shown in Fig. 2.1. A result is recorded when a disc is spun and stops with one side nearest the surface.

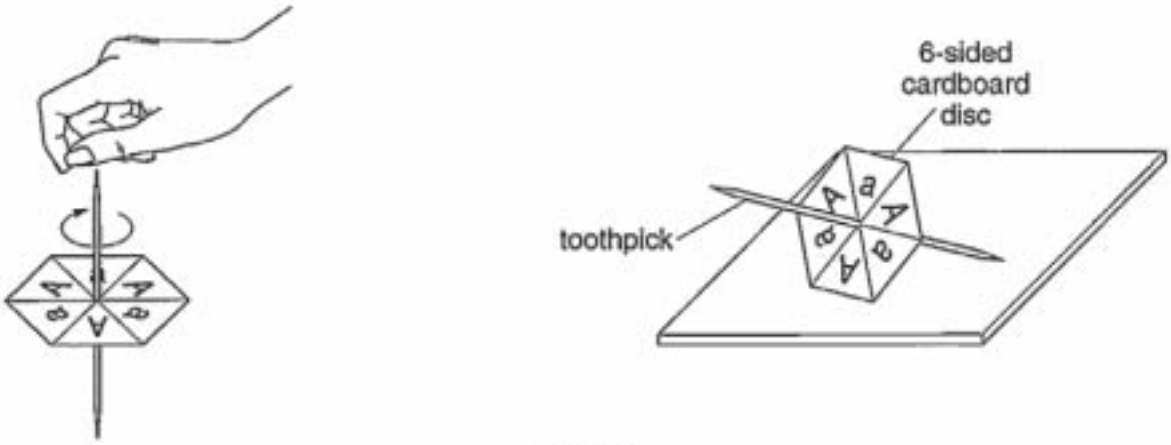


Fig. 2.1

(a) Complete Table 2.1, to show the expected results if the two students spin their discs, at the same time, on 80 separate occasions.

Table 2.1

combination of letters on each occasion	number of times each combination of letters is recorded
A and A	20
A and a	40
a and a	20

[1]

(b) Suggest **two** reasons why the results they obtained may have been different from the expected results.

Because it is a random process and combination of letters is more .....[2]

(c) Suggest the feature or stage in the process of inheritance represented by each of the following:

(i) the students ..... Genes .....

(ii) the spinning of the disc ..... Fertilisation .....

(iii) the letters on the disc ..... Gametes .....

[3]

(d) Describe how the students could modify their spinners and use them to illustrate the possible inheritance of blood groups by children of a father who has codominant blood group alleles and a mother who is heterozygous for blood group A.

By making one spinner with the fathers blood group and one with mothers. The alleles I_A I_B are written for the fathers. The allele I_A and I_O are written for the mother. ~~The number of times the blood group I_AI_A and I_AI_O are written on the spinner should be equal.~~ Then the discs are spinned for 60-80 times and the different combinations recorded. [5]

[Total: 11]

Examiner comment – grade A

(a) The calculation is correct. (1/1)

(b) The candidate failed to realise that one or both of the spinners might have been inaccurately constructed, giving a bias to a particular letter, or that the students may have made an error in counting. (1/2)

(c) The candidate did not think back quite far enough in the process of inheritance to be able to suggest that the students represent the producers of the genes, not the genes themselves; **(i)** and **(iii)** were correct. (2/3)

(d) This was a sound answer allowing full marks to be scored, but there was a failure to mention that both spinners must have the same number of pairs of letters. (5/5)

Total mark awarded = 9 out of 11

Example candidate response – grade C

2 Two students performed an experiment to illustrate inheritance. They each made a 'spinner' similar to the one shown in Fig. 2.1. A result is recorded when a disc is spun and stops with one side nearest the surface.

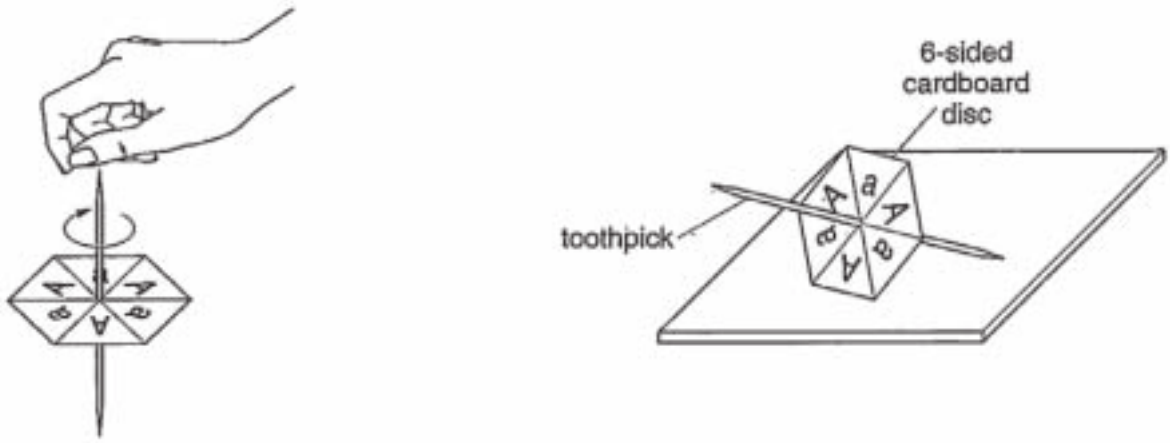


Fig. 2.1

(a) Complete Table 2.1, to show the expected results if the two students spin their discs, at the same time, on 80 separate occasions.

Table 2.1

combination of letters on each occasion	number of times each combination of letters is recorded
A and A	20
A and a	40
a and a	20

[1]

(b) Suggest **two** reasons why the results they obtained may have been different from the expected results.

(1). The size and thickness of the cardboard would affect the result.

(2). The length of the toothpick and the direction in which the cardboard disc rotates can be different. [2]

(c) Suggest the feature or stage in the process of inheritance represented by each of the following:

(i) the students Gametes.

(ii) the spinning of the disc fusion / fertilization.

(iii) the letters on the disc Chromosomes / Genes.

[3]

(d) Describe how the students could modify their spinners and use them to illustrate the possible inheritance of blood groups by children of a father who has codominant blood group alleles and a mother who is heterozygous for blood group A.

for the mother write down the allels as $I^A I^O$ and for father use the allels $I^A I^B$. Use a eight sided cardboard disc. Write I^A on 2 sides, I^O on other two sides and repeat the same for the allels of the father. The possible blood groups of children would be 50% A, 25% AB and the other 25% will be B. [5]

$I^A I^A$ will be ~~40~~ 20 times, $I^A I^O$ will ~~be~~ be 20 times, $I^A I^B$ will be 20 times and $I^B I^O$ will be 20 times. The spiner is robated 80 times. [Total: 11]

Examiner comment – grade C

(a) The calculation was correct. (1/1)

(b) The size and thickness of the cardboard, the length of the toothpick and the direction of rotation would not affect the random nature of the exercise. (0/2)

(c) Gametes, rather than the individuals that produce them, were suggested in **(i)**, otherwise the answers were correct. (2/3)

(d) The correct letters were suggested and there was the appreciation that there should be a large numbers of spins, but one, 8-sided disc with all the relevant alleles written on it would not produce a meaningful result. It was, perhaps, an understandable omission that the candidate failed to refer to recording the results. (2/5)

Total mark awarded = 5 out of 11

Example candidate response – grade E

2 Two students performed an experiment to illustrate inheritance. They each made a 'spinner' similar to the one shown in Fig. 2.1. A result is recorded when a disc is spun and stops with one side nearest the surface.

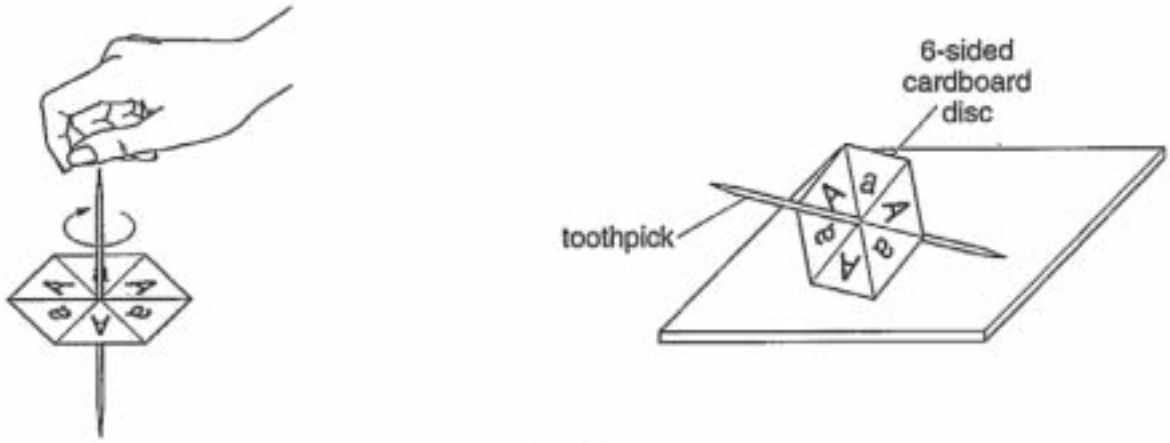


Fig. 2.1

(a) Complete Table 2.1, to show the expected results if the two students spin their discs, at the same time, on 80 separate occasions.

Table 2.1

combination of letters on each occasion	number of times each combination of letters is recorded
A and A	20
A and a	30
a and a	30

[1]

(b) Suggest **two** reasons why the results they obtained may have been different from the expected results.

The results are totally dependent on the fate guies to spin the discs [2]

(c) Suggest the feature or stage in the process of inheritance represented by each of the following:

(i) the students ~~Organisms~~ Parents

(ii) the spinning of the disc ~~Joining~~ Fertilization

(iii) the letters on the disc ~~Genotypes and phenotypes~~ [3]

(d) Describe how the students could modify their spinners and use them to illustrate the possible inheritance of blood groups by children of a father who has codominant blood group alleles and a mother who is heterozygous for blood group A.

Students could modify their spinners by using different possibilities of blood groups e.g. Blood Group A, AB, O. Spinner again then be spinned and the results could be recorded by the students to check and compare them with the conditions applied of parents. [5]

[Total: 11]

Examiner comment – grade E

(a) The requirement for the total to add up to 80 was appreciated, but the 1:2:1 genotypic ratio was not. (0/1)

(b) The force of the spin would not have affected the random nature of the results. (0/2)

(c) The candidate began promisingly, but did not realise that individual letters could not have represented genotypes. (2/3)

(d) The only statement relevant to the question was the listing of three possible blood groups, but there was no understanding of how this (incomplete) knowledge could have been used to modify their spinners. Although nothing of substance was suggested, there was a mention that results need to be recorded. (1/5)

Total mark awarded = 3 out of 11

Question 3

Mark scheme

Expected answer		Mark	Guidance
3 (a)	self (–pollination);	[1]	
(b) (i)	(carried by) <u>wind</u>; pollen to stigma; of another (wheat) plant / flower; correct ref. to cross-pollination (now being possible)	[3]	**Ig** ref. to animals
(ii)	wind can't carry / can't be carried far / reduced dispersal; too much dependence on self-pollination / lack of (genetic) variation AW; wind may not be blowing (over short time period); reduces chances of pollination / fertilisation	[2]	**R** if ref. to seed / fruit
(c) (i)	genetic engineering / genetic modification	[1]	**Ig** gene transfer / biotechnology
(ii)	(bacteria) fix / convert / change / turn; atmospheric / soil nitrogen; (to) ammonium; (to) nitrates; (to make) amino acids / proteins; (nitrates) absorbed / (amino acids or proteins) used by plants	[5]	 **R** ammonia
	Total	[12]	

Example candidate response – grade A

3 Fig. 3.1 shows a flowering head of wheat, and individual flowers before and after opening.

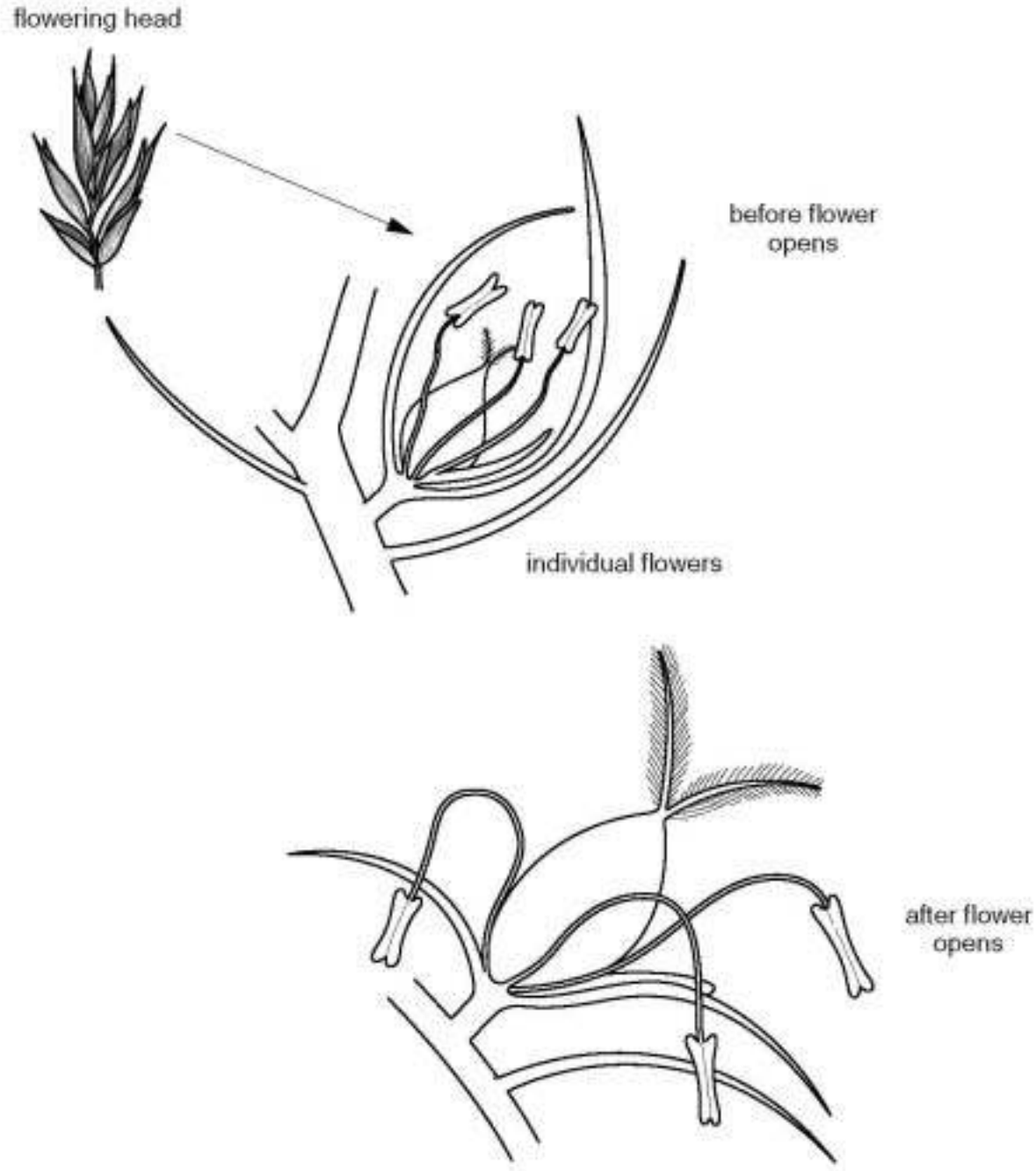


Fig. 3.1

The anthers release most of their pollen before the flower opens. The rest is released after the flower opens.

(a) Name the type of pollination found in the wheat plant before the flower opens.

In Wind [1]

(b) (i) Using the information provided by Fig. 3.1, describe pollination in the wheat plant after the flower opens.

The anthers fall outwards so that their pollen grains can be pollinated by the wind. The pollen grains are small, smath & light. They get carried away by air. The stigma protudes outwards so that the pollengrains could stick. [3]

(ii) Wheat pollen is relatively heavy and is released for only a few hours after the flowers open.

Suggest **two** disadvantages of this.

It gives less time to be pollinated.
It does not get carried far away. [2]

(c) Scientists are working to introduce genes into wheat plants to make them resistant to attack by insect pests (greenfly) and to encourage root nodule bacteria from pea and bean plants to live in their roots.

(i) Name the type of experimental work in which these scientists are involved.

Bio technology [1]

(ii) Suggest how the growth of root nodule bacteria on the roots of wheat plants could reduce the amount of fertiliser required by a growing wheat crop.

The bacterias in the root nodule use the nitrogen gas in the air and hydrogen to make ammonium. These ammonium are then broken into nitrates & nitrites ion which are absorbed by the root hair cell to make aminoacids & prohein. This way the need to use fertilizer to provide nitrates to the plant is decreased

[5]

[Total:12]

Examiner comment – grade A

(a) The long filaments in the diagram appear to have suggested wind pollination to the candidate. However, the full view of part of the flowering head before the flower opens does not show any exposed anthers or stigmas. (0/1)

(b) **(i)** The description of wind pollination omits reference to another flower or plant, but still scores well. (2/3)

(ii) The candidate supplies a full answer. (2/2)

(c) **(i)** Although the area in which the scientists were working might loosely be described as biotechnology (the answer given), this did not accurately describe the specific experimental work in question. (0/1)

(ii) This was a very sound answer, the candidate failing only to mention that the process is nitrogen fixation. (5/5)

Total mark awarded = 9 out of 12

Example candidate response – grade C

3 Fig. 3.1 shows a flowering head of wheat, and individual flowers before and after opening.

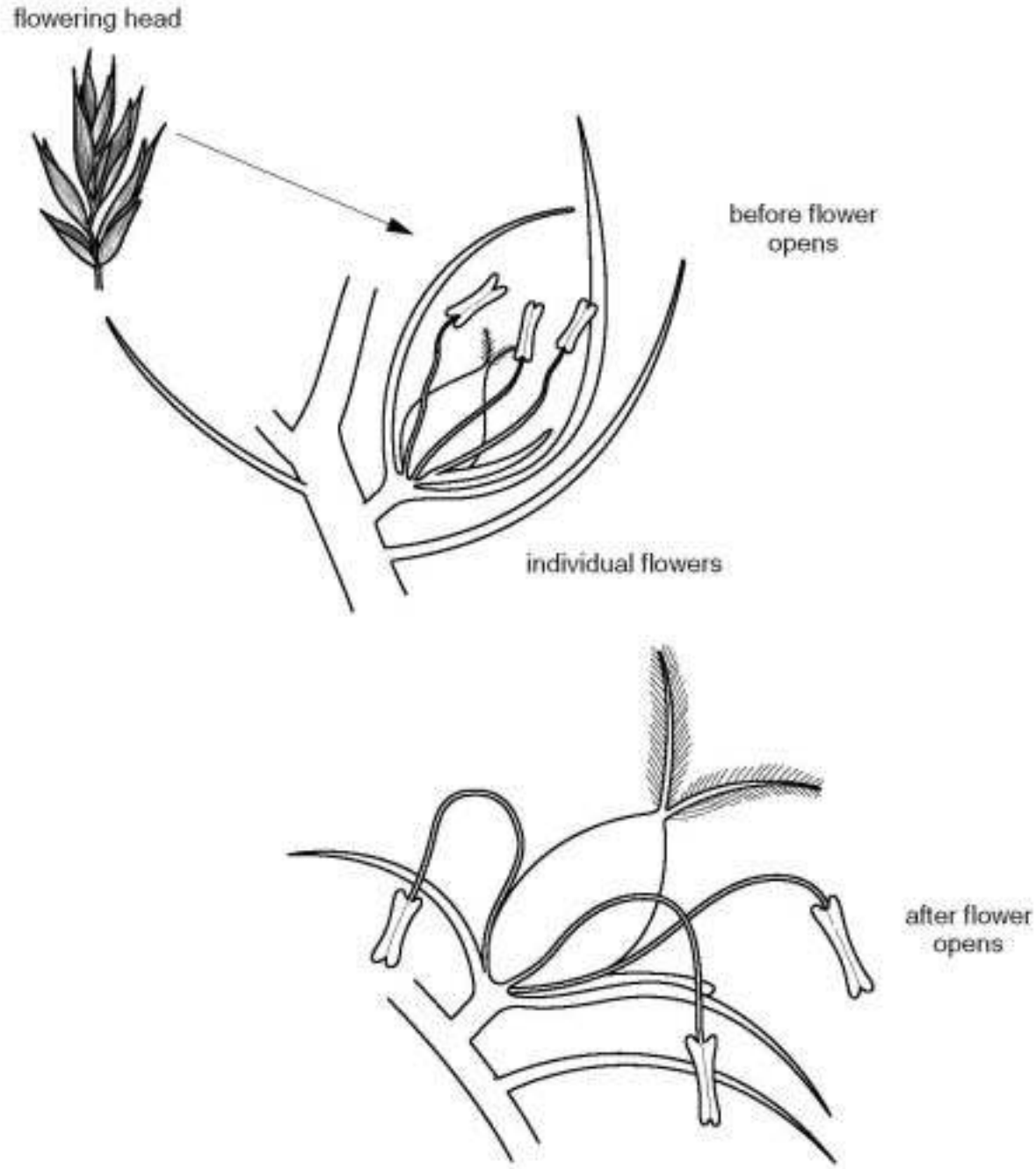


Fig. 3.1

The anthers release most of their pollen before the flower opens. The rest is released after the flower opens.

(a) Name the type of pollination found in the wheat plant before the flower opens.

self pollination [1]

(b) **(i)** Using the information provided by Fig. 3.1, describe pollination in the wheat plant after the flower opens.

after the flower opens wind carry pollen grains which ~~are attached~~ stick onto the the hairy stigma, the mature stigma releases sugary fluid which cause the pollen grain tube nucleus to release enzymes thus pollen tube starts forming. [3]

(ii) Wheat pollen is relatively heavy and is released for only a few hours after the flowers open.

Suggest **two** disadvantages of this.

pollen grain might not travel to far with wind and many get wasted, low probability of fertilization and pollination [2]

(c) Scientists are working to introduce genes into wheat plants to make them resistant to attack by insect pests (greenfly) and to encourage root nodule bacteria from pea and bean plants to live in their roots.

(i) Name the type of experimental work in which these scientists are involved.

artificial selection [1]

(ii) Suggest how the growth of root nodule bacteria on the roots of wheat plants could reduce the amount of fertiliser required by a growing wheat crop.

As bacteria are decomposers, they would act on the dead remained present in the soil and provide nutrition to the wheat plant, less fertilisers would be needed. Bacteria also release nitrogen, which would help the wheat plant in growth and magnesium would be available to, respiration of bacteria would cause availability of carbon dioxide, which would enable the plant to survive harsh and extreme factors. [5]

[Total:12]

Examiner comment – grade C

(a) A correct answer. (1/1)

(b) **(i)** This answer does not give a complete description of wind-pollination in this particular plant as there is no mention of cross-pollination with another flower or plant. (2/3)

(ii) The difficulty of carrying the pollen any great distance and therefore the decreased chances of cross-pollination are clearly described. (2/2)

(c) **(i)** Although artificial selection may take place at a later date, this is not the particular type of experimental work described. (0/1)

(ii) The candidate misses the point that the bacteria are involved in nitrogen fixation, believing that they are decomposers, and describes that process thus failing to score. (0/5)

Total mark awarded = 5 out of 12

Example candidate response – grade E

3 Fig. 3.1 shows a flowering head of wheat, and individual flowers before and after opening.

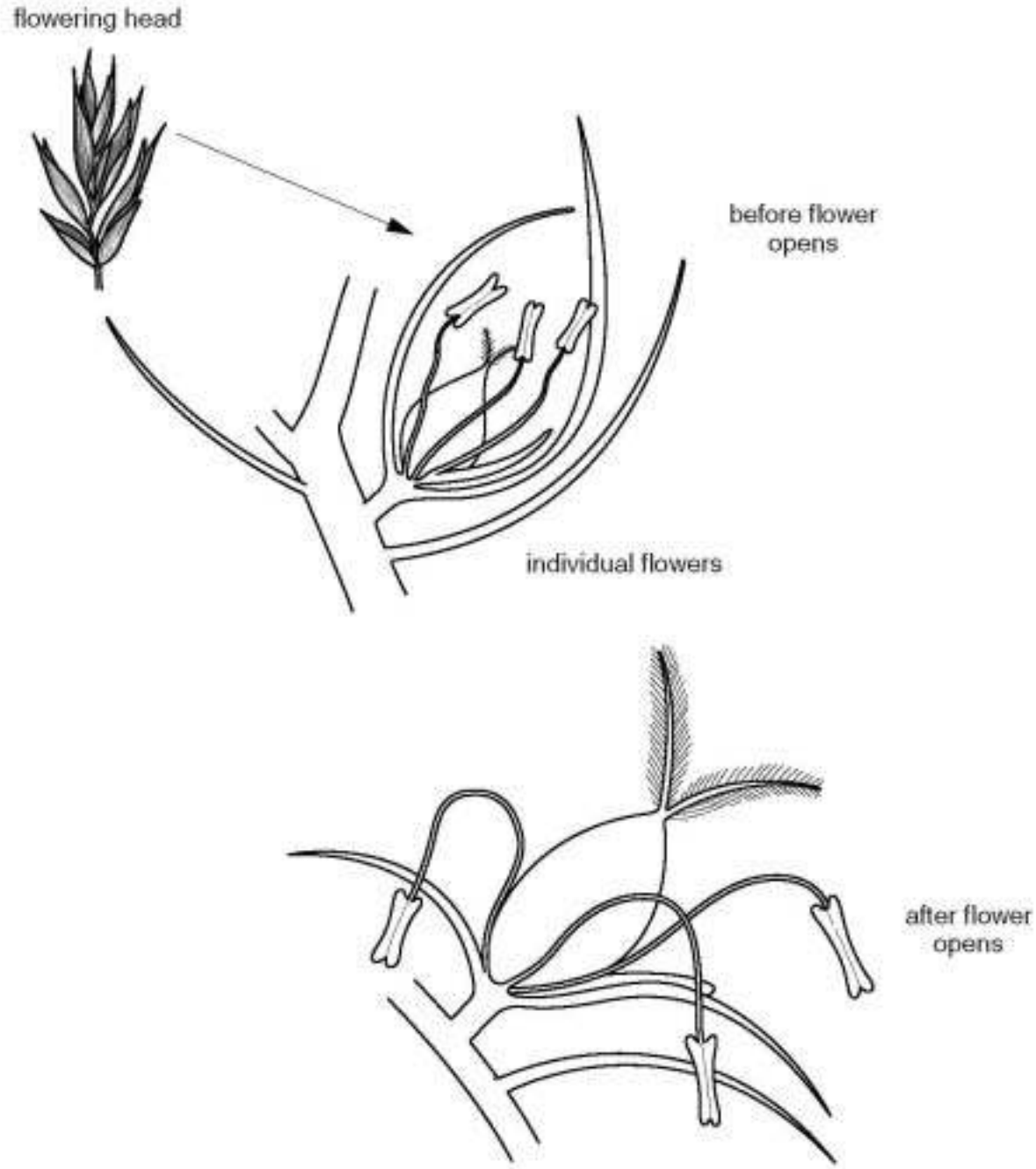


Fig. 3.1

The anthers release most of their pollen before the flower opens. The rest is released after the flower opens.

(a) Name the type of pollination found in the wheat plant before the flower opens.

Self Pollination [1]

(b) (i) Using the information provided by Fig. 3.1, describe pollination in the wheat plant after the flower opens.

The anther of the plant are slightly bend towards the ground so the femal part of the another plant is persent somewhere near the plant then the pollination would be wind pollination. [3]

(ii) Wheat pollen is relatively heavy and is released for only a few hours after the flowers open.

Suggest **two** disadvantages of this.

① they are heavy so wind pollination is difficult

② Since they open only for a few hours so Insect pollination is difficult [2]

(c) Scientists are working to introduce genes into wheat plants to make them resistant to attack by insect pests (greenfly) and to encourage root nodule bacteria from pea and bean plants to live in their roots.

(i) Name the type of experimental work in which these scientists are involved.

Biotecnical [1]

(ii) Suggest how the growth of root nodule bacteria on the roots of wheat plants could reduce the amount of fertiliser required by a growing wheat crop.

As we know that bacteria decompose the death plants and animal to call to fertilizer so fertilizer is used less. And it get more nutrients from the soil than others plant. [5]

[Total:12]

Examiner comment – grade E

(a) The correct answer is given. (1/1)

(b) **(i)** The answer lacks identification of the flower parts involved and scores only for the agent of pollination. (1/3)

(ii) Credit was given for the idea of the wind being unable to carry the pollen any great distance. The second suggestion is well off-beam as it refers to insect pollination. (1/2)

(c) **(i)** The answer given is not sufficiently specific. (0/1)

(ii) The candidate is struggling to make any meaningful response. (0/5)

Total mark awarded = 3 out of 12

Question 4

Mark scheme

<table>
<tr><th colspan="2">Expected answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>4 (a)</td><td>
<table>
<tr><th>structure identified by letter</th><th>name of structure</th><th>carries urine (yes or no)</th><th>carries sperms (yes or no)</th></tr>
<tr><td>F</td><td><u>ureter</u></td><td>yes</td><td>no</td></tr>
<tr><td>G</td><td><u>urethra</u></td><td>yes</td><td>yes</td></tr>
<tr><td>H</td><td><u>rectum</u></td><td>no</td><td>no</td></tr>
<tr><td>J</td><td>vas deferens / sperm duct</td><td>no</td><td>yes</td></tr>
</table>
</td><td>[4]</td><td>1 mark per correct row;

spelling of <u>ureter</u> and <u>urethra</u> must be correct</td></tr>
<tr><td>(b)</td><td>line drawn across sperm duct;

line drawn across oviduct</td><td>[2]</td><td>R if more than one line drawn on each Fig.– unless across same structure

R if more than one structure cut
lg skin cuts</td></tr>
<tr><td>(c)</td><td>closes / restricts AW the urethra;

adverse effect on urination AW</td><td>[2]</td><td>lg ref bladder

lg refs to pain on urination</td></tr>
<tr><td colspan="2">Total</td><td>[8]</td><td></td></tr>
</table>

Example candidate response – grade A

4 Fig. 4.1(a) shows the reproductive organs of a man and Fig. 4.1(b) shows the reproductive organs of a woman.

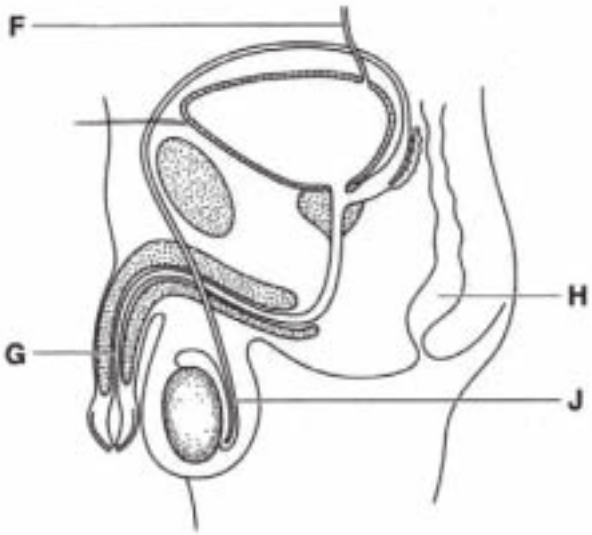


Fig 4.1(a)

Fig. 4.1(b)

(a) Complete Table 4.1, stating the names of the structures in Fig. 4.1(a) and indicating whether they carry urine and/or sperms using yes **or** no as appropriate.

Table 4.1

structure identified by letter	name of structure	carries urine (yes or no)	carries sperms (yes or no)
F	ureter	yes	no
G	urethra	yes	yes
H	anus	no	no
J	sperm duct	no	yes

[4]

(b) Indicate by drawing a line across each of the relevant parts **in both Fig 4.1(a)** and **4.1(b)**, where a cut may be made in order to carry out a form of surgical contraception.

[2]

(c) In older men, the prostate gland tends to increase in size. Suggest an explanation for how this may affect urination.

It causes difficulty as ureter is pressed making the difficult for the urine to flow. It exerts pressure over it due to which here comes the resistance for the urine to flow easily.

.....[2]

[Total : 8]

Examiner comment – grade A

(a) Apart from making the relatively common error of mistaking the rectum for the anus, this was an accurate answer. (3/4)

(b) Sterilisation by cuts across the sperm duct and oviduct are correctly indicated. (2/2)

(c) There is a confusion between the ureter and the urethra, but the deduction that there would be resultant difficulties in the passing of urine is correctly made. (1/2)

Total mark awarded = 6 out of 8

Example candidate response – grade C

4 Fig. 4.1(a) shows the reproductive organs of a man and Fig. 4.1(b) shows the reproductive organs of a woman.

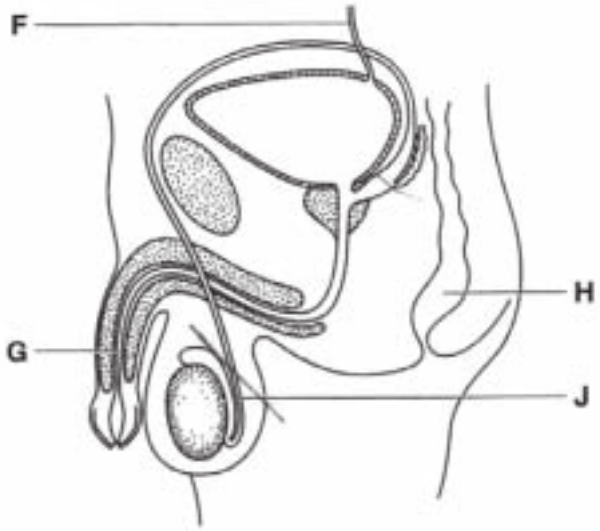


Fig 4.1(a)

Fig. 4.1(b)

(a) Complete Table 4.1, stating the names of the structures in Fig. 4.1(a) and indicating whether they carry urine and/or sperms using yes **or** no as appropriate.

Table 4.1

structure identified by letter	name of structure	carries urine (yes or no)	carries sperms (yes or no)
F	Bile duct	NO	NO
G	Urethra	Yes	Yes
H	Rectum	NO	NO
J		NO	YeS.

[4]

(b) Indicate by drawing a line across each of the relevant parts **in both Fig 4.1(a)** and **4.1(b)**, where a cut may be made in order to carry out a form of surgical contraception.

[2]

(c) In older men, the prostate gland tends to increase in size. Suggest an explanation for how this may affect urination.

In older men, the prostate gland tends to increase in size and it may affect urination because prostrate gland produces more semen, sperm, this causes decrease in the amount of urination. [2]

[Total : 8]

Examiner comment – grade C

(a) The suggestion that the ureter is the bile duct indicates a less-than-sound grasp of the terminology used in relation to the urogenital system, confirmed by a failure to suggest any possible identity for the sperm duct. (2/4)

(b) There were no problems with identifying the structures that need to be cut during sterilisation surgery. (2/2)

(c) The question asked about the possible effect of an enlarged prostate on urination, but the candidate chose to consider possible effects on prostate function. (0/2)

Total mark awarded = 4 out of 8

Example candidate response – grade E

4 Fig. 4.1(a) shows the reproductive organs of a man and Fig. 4.1(b) shows the reproductive organs of a woman.

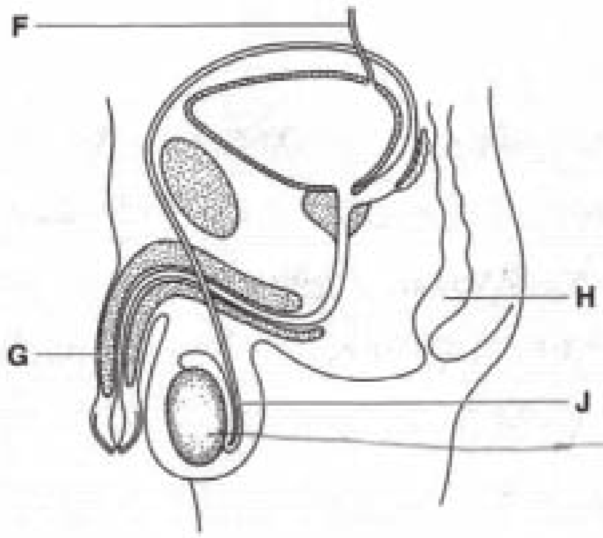


Fig 4.1(a)

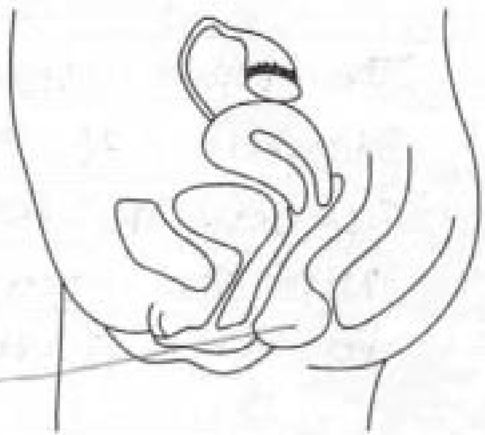


Fig. 4.1(b)

(a) Complete Table 4.1, stating the names of the structures in Fig. 4.1(a) and indicating whether they carry urine and/or sperms using yes **or** no as appropriate.

Table 4.1

structure identified by letter	name of structure	carries urine (yes or no)	carries sperms (yes or no)
F	Ureter	Yes	No
G	Penis	Yes	Yes
H			
J	Ureather	No	Yes

[4]

(b) Indicate by drawing a line across each of the relevant parts **in both Fig 4.1(a)** and **4.1(b)**, where a cut may be made in order to carry out a form of surgical contraception.

[2]

(c) In older men, the prostate gland tends to increase in size. Suggest an explanation for how this may affect urination.

The prostate glands tends to increase in size this will effect the urination. The urination will be released less in amount. [2]

[Total : 8]

Examiner comment – grade E

(a) There was no problem with identifying the ureter and its function but, thereafter, the candidate was unable to link any other correctly named structure with its function. Perhaps a little more care might have identified the urethra, the label line for which was carefully drawn to terminate precisely in that structure. (1/4)

(b) The guesses at where the two cuts should be made were particularly inaccurate. (0/2)

(c) The effect on urination mentioned may have indicted some confusion, but an assumption was made that the candidate was referring to the amount passed at any one time. (1/2)

Total mark awarded = 2 out of 8

Question 5

Mark scheme

Expected answer		Mark	Guidance
5 (a) (i)	photosynthesis / synthesis of carbohydrate / synthesis of protein; transpiration / water loss / evaporation; respiration; translocation; osmosis / diffusion; gas exchange	[2]	
(ii)	lack of (available) water; transpiration / evaporation / water loss + reduced	[2]	
(b) (i)	stoma(ta) / guard cell(s)	[1]	
(ii)	none / fewer on leaves; passage of O_2 / CO_2 / water vapour / gas exchange; for respiration / photosynthesis / transpiration	[2]	i.e. not just a CO_2 / O_2 / water vapour ref.
	Total	**[7]**	

Example candidate response – grade A

5 Cacti are plants that grow in desert conditions. Fig. 5.1 shows a type of cactus.

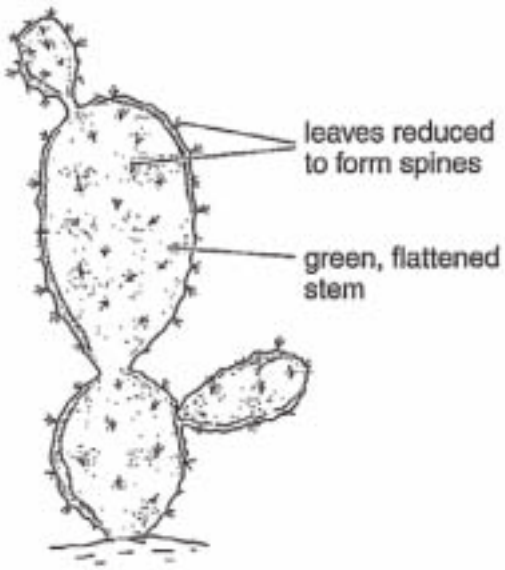


Fig. 5.1

(a) (i) State **two** processes that would normally occur in the leaves of a plant.

1 photosynthesis

2 respiration. [2]

(ii) Suggest why it is an advantage for a cactus to have leaves with a small surface area.

deserts have hot climate ~~if~~ & small surface area means less evaporation or transpiration would take place through leaves and plant can survive for a longer period without wilting. [2]

(b) Fig. 5.2 shows the surface of the stem of the cactus seen using a microscope.

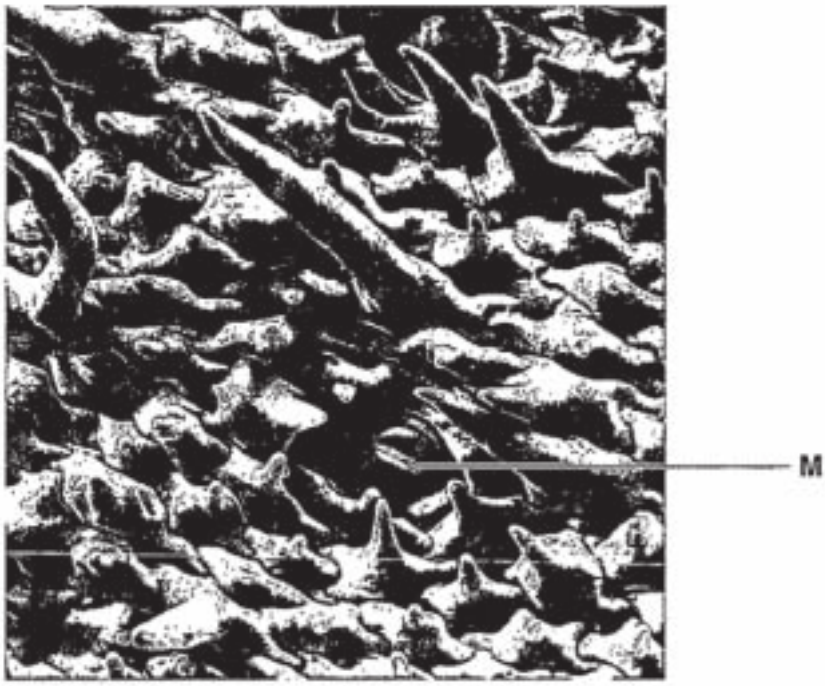


Fig. 5.2

(i) Name the part labelled **M** on Fig. 5.2 ..... Stomata. .....[1]

(ii) Suggest why there are many of these structures on the stems of a cactus.

They are more because stem also carry out photosynthesis and for the diffusion of carbon dioxide in the plant they are necessary. apart from it it provides a pathway for diffusion of oxygen outside. the plant. [2]

[Total: 7]

Examiner comment – grade A

(a) **(i)** Two sound selections were made. (2/2)

(ii) The point is accurately made that water loss is reduced, but there is no link with the importance of this when there is difficulty gaining water from dry desert soil. There is a mention of temperature, but temperature alone is not significant. (1/2)

(b) **(i)** A correct identification. (1/1)

(ii) The candidate understands that carbon dioxide enters through stomata on the stems, and clearly explains that this is because the stem is the site of photosynthesis. (2/2)

Total mark awarded = 6 out of 7

Example candidate response – grade C

5 Cacti are plants that grow in desert conditions. Fig. 5.1 shows a type of cactus.

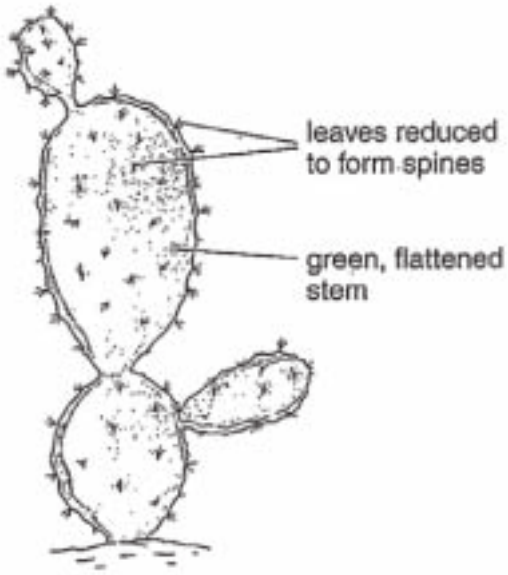


Fig. 5.1

(a) (i) State **two** processes that would normally occur in the leaves of a plant.

1 photosynthesis

2 transpiration [2]

(ii) Suggest why it is an advantage for a cactus to have leaves with a small surface area.

The small surface area would reduce the amount of transpiration as less area would be exposed. [2]

(b) Fig. 5.2 shows the surface of the stem of the cactus seen using a microscope.

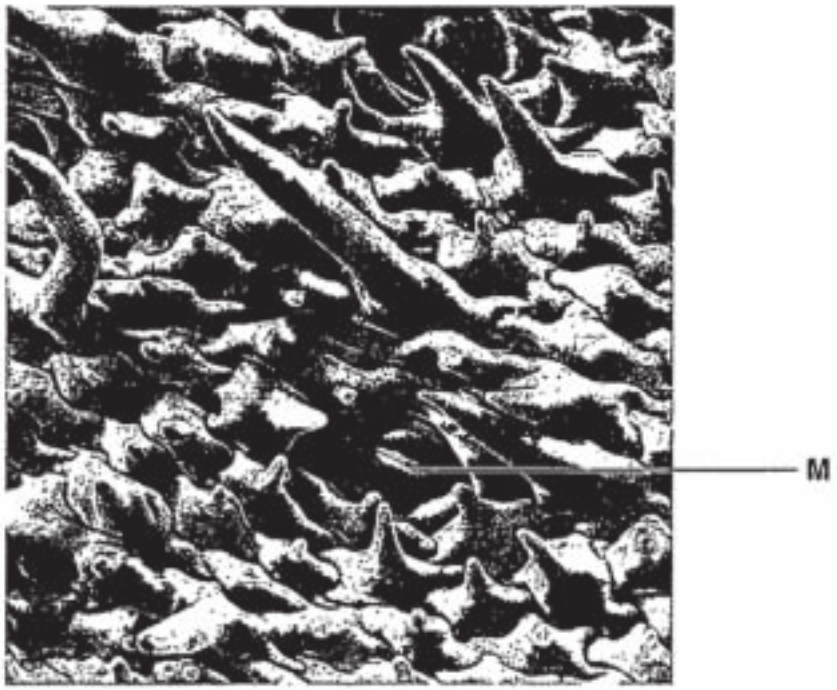


Fig. 5.2

(i) Name the part labelled **M** on Fig. 5.2 ~~guard cell~~ Stomata [1]

(ii) Suggest why there are many of these structures on the stems of a cactus.

Stems of the cactus contain a lot of stomata ~~to~~ survive in desert like conditions. Lots of them enable it to absorb more water and carbondioxide to store it in their stems. [2]

[Total: 7]

Examiner comment – grade C

(a) **(i)** Two sound answers are given. (2/2)

(ii) The candidate does not expand on the value of reduced transpiration. (1/2)

(b) **(i)** Both the deleted first attempt, as well as the second attempt were acceptable answers. (1/1)

(ii) The candidate makes the serious error of stating that stomata absorb water, and thus fails to score. (0/2)

Total mark awarded = 4 out of 7

Example candidate response – grade E

5 Cacti are plants that grow in desert conditions. Fig. 5.1 shows a type of cactus.

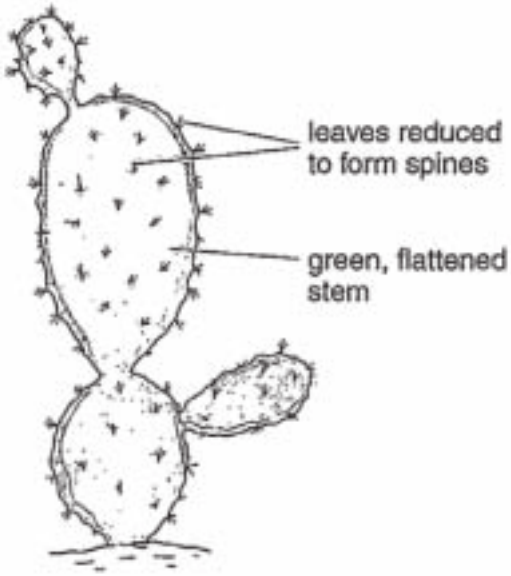


Fig. 5.1

(a) (i) State **two** processes that would normally occur in the leaves of a plant.

1 Photosynthisis

2 transpiration [2]

(ii) Suggest why it is an advantage for a cactus to have leaves with a small surface area.

It is an advantage for a cactus to have leaves with a small surface area so that it can live in deasert. [2]

(b) Fig. 5.2 shows the surface of the stem of the cactus seen using a microscope.

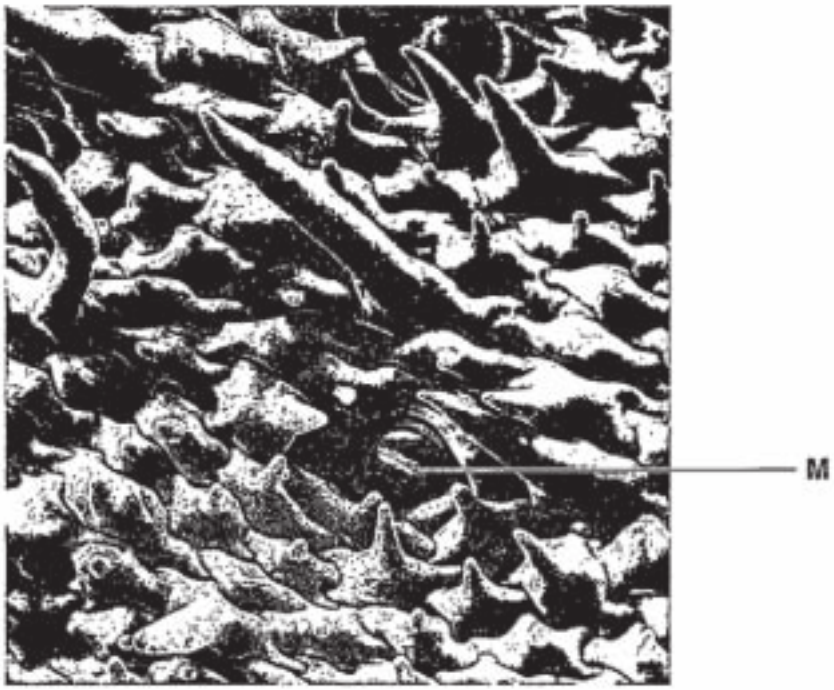


Fig. 5.2

(i) Name the part labelled **M** on Fig. 5.2 Xylem [1]

(ii) Suggest why there are many of these structures on the stems of a cactus.

There are many of these so that water and salt ions are being transfer from one place to another. [2]

[Total: 7]

Examiner comment – grade E

(a) **(i)** The two marks scored for this section are the only answers in this question that are of substance. (2/2)

(ii) The answer fails to provide any scientific reason for why the small surface area enables the plant to live in desert conditions. (0/2)

(b) **(i)** The candidate is unfamiliar with the appearance of a stoma. (0/1)

(ii) A description of xylem function is attempted, but, while it attempts to describe the function of the structure offered as an answer to b)i), it does not describe the function of the structure that appears in Fig. 5.2. (0/2)

Total mark awarded = 2 out of 7

Question 6

Mark scheme

Expected answer		Mark	Guidance
6 (a)	muscles in humans / no muscles in plants; ref. intercostals / diaphragm; humans need to keep (constant) supply of O_2 (to blood) / remove CO_2 (from blood) / ref. higher metabolic rate / rate of respiration in humans; ref. production of (some of their own) oxygen by photosynthesis; lungs / no lungs; ref. stomata/spongy mesophyll in plants / not in humans / ref. alveoli in humans / no alveoli in plants	[3]	(N.B. intercostal ; muscles ; will score 2 marks)
(b)	*(High respiration rate)* humans active / move / muscle + action (or described) / ORA; requires large quantities of / more + energy / ORA; high body temperature in humans / ORA; activity of enzymes / high metabolic rate / ORA; humans complex / named organs, e.g. brain, kidneys, heart; *(Constant respiration rate)* homeostasis; temperature constant in humans / thermoregulation; rate dependent on external temperature in plants; rate dependent on stage of life cycle, e.g. germination / growing season	[7]	**R** humans are larger
	Total	**[10]**	

Example candidate response – grade A

6 (a) Explain the fact that humans breathe while plants do not.

Breathing is a mechanical process · involvi- and more complex
Humans are larger than alot of plants · plants do not
require some such a complex system as they have
in leaves
stomata through which gases diffuse in and out rapidly
and dissolve in the intercellular spaces of spongy mesophyl·
Plants have alot of leaves·
In humans, diffusion alone not fast enough for rapid
metabolic processes · Also, humans have skin and gases [3]
cannot diffuse in and out · Plants do not have ribs or lungs ·

(b) Explain why the respiration rate of humans is relatively high and constant, while that of plants may vary widely.

Humans require more energy due to a much higher
metabolic rate than plants as humans move about
(locomotion)
and muscular contractions, nerve impulses, active
transport, ~~by~~ homeostatis, ~~etc~~ temperature regulation etc
all require alot of energy · In plants, fewer processes
occur · The plants vary in size i·e a small plant may
only carry out ~~re~~ diffusion and osmosis whereas
a large plant may need more energy i·e for
active uptake of mineral ions · Different species of
plant may have different energy requirement · Humans
respiration rate remains constant as they are one
specie and all have similar metabolic processes · In
plants, there are no locomotion of nervous system which may
require so much energy · In humans, respiration 'rate'
depends of exchange of gases through breathing, and [7]
breathing rate is relatively similar for most humans [Total: 10]
hence so respiration rate constant · In plants, diffusion of
gases may slow if stomata are closed, hence less respiration
as less oxygen diffuses in·

Examiner comment – grade A

(a) Although the candidate failed to mention the intercostal muscles and the diaphragm in humans, three other valid marks were found to score a maximum mark for this part of the question. (3/3)

(b) This was a most competent handling of a topic that many candidates found difficult to express accurately. However, it was evident that the candidate was more comfortable with an explanation that related to the human than to a plant. A mention of the use of energy for nerve impulses was considered a sufficient reference to the comparative complexity of the human. (6/7)

Total mark awarded = 9 out of 10

Example candidate response – grade C

6 (a) Explain the fact that humans breathe while plants do not.

humans needed a respiratory system because all the cells are far apart in a human, whereas in a plant diffusion can suffice. Breathing refers to the physical movements of the diaphragm and external and intercostal muscles, since these movements take place in humans they breathe, whereas plants do not 'breathe' but respire (exchange nutrients) [3]

(b) Explain why the respiration rate of humans is relatively high (complex) and constant, while that of plants may vary widely. (depends)

Humans as organisms move about, they also metabolically have complex body processes due to the many different systems within them such as the circulatory or respiratory system. They thus need more energy to carry out the vital processes, and so must take in for synthesis of many more tissues and hormones that plants do not produce, the energy is released through oxidation of food substances by respiration, so their respiration rate is higher. It is also fairly constant because humans also have residual air within their lungs, that is 1500 cm^3, and they normally only take in or exhale 500 cm^3 at one time, so their vital lung capacity remains pretty constant even when supplemental or complemental air is taken in. Also humans use oxygen produce by plants, but plants only use oxygen to respire from the atmosphere. If atmospheric [7]
conditions vary for example at higher altitudes, (oxygen) availability will affect plant growth whereas ___ [Total: 10]

?

Examiner comment – grade C

(a) There are references to the importance of the intercostal muscles and the diaphragm in the breathing process of the human, but no indication of the nature of the respiratory surfaces in either the human or the plant. Indeed, the reference to plants in the answer is very superficial indeed. (2/3)

(b) The candidate tries hard to give a competent answer to the question, but does not expand much beyond the idea that humans have a more complex body than plants. The effect of temperature on humans and plants is overlooked as is the more fundamental facts that, compared with plants, animals are more active with a higher metabolic rate. (3/7)

Total mark awarded = 5 out of 10

Example candidate response – grade E

6 (a) Explain the fact that humans breathe while plants do not.

Humans have special organs for breathing while plant does not. In humans air does not diffuse ~~in~~ or out of the body ~~which~~ while in plants it does diffuse in and out. Breathing is ~~is~~ inhalation and expiration of air which does not happen in plants. [3]

(b) Explain why the respiration rate of humans is relatively high and constant, while that of plants may vary widely.

Humans have to maintain there body temperature while plants ~~don't~~ does not need to maintain it to much. If to much respiration occurs more heat will be released and which increases temperature which can be fatal as enzymes got become denature and reactions ~~might~~ might stop in the body. In plants it varies because of amount of carbohydrates they have produced from photosynthesis and how much energy is needed to ~~for~~ them. In humans energy used is fairly constaint while in plants it is not so thats why ~~there~~ respiration is varies in plants. If ~~temperature~~ temperature is not maintained in humans then cells ~~organ~~ organs are effected and proper functioning of body does not occur. In morning the stomata is open so respiration occurs easily as oxygen can diffuse in while at at stomata is closed ~~and~~ less of oxygen diffuses in. [7]

[Total: 10]

Examiner comment – grade E

(a) The candidate provides a relevant answer, but fails to reach a sufficient level of scientific exactitude to score marks. There is a reference to breathing, but there is no mention of the muscles required for the process. There is an incorrect statement that plants alone employ diffusion in meeting their gaseous exchange requirements. (0/3)

(b) A lot is written, but very little of substance is said apart from a mention that humans maintain a body temperature that prevents the denaturing of enzymes. There is the notion that it is the amount of carbohydrate made during photosynthesis that controls the rate of photosynthesis, but the candidate avoids the common, mistaken belief that photosynthesis is the method by which plants respire. (2/7)

Total mark awarded = 2 out of 10

Question 7

Mark scheme

Expected answer		Mark	Guidance
7 (a)	*Viruses* DNA <u>or</u> RNA **both** must be noted for mark and as possibilities; parasitic / disease causing AW / reproduce only in host <u>cell</u>; *Bacteria* contain DNA; saprotrophic / decomposers AW; ref. binary fission / asexual reproduction / mitosis; *Comparative points* protein coat / no protein coat; not truly living / living; no (cell) wall / (cell) wall; no spores / forms spores; no cytoplasm* / cytoplasm; not affected by / affected by antibiotics; size comparison	[6]	*Accept points on labelled diagrams* **A** harmful / active only in host cell **Ig** loop / strand / RNA **R** protein wall **A** acellular **Ig** composition of the wall ***A** no ribosomes / protoplasm / flagella / plasmid / cell membrane ORA **R** nucleus / mitochondria viruses less than 300 nm – bacteria c. × 50 larger **A** viruses small(er) than bacteria

Question 7 Mark scheme continued

(b)	decomposition / decay / putrefaction; saprotrophic; release enzymes / ref. external digestion; insoluble to soluble; example of macromolecule and breakdown product, e.g. protein to amino acids; respiration; CO_2 released + photosynthesis; water released + later use; nitrification; NH_4^+ / NO_2^- / NO_3^{2-} ; salts for plant uptake	[4]	 **A** saprophytic **A** named enzyme **R** ammonia / NH_3
	Total	**[10]**	

Example candidate response – grade A

7 (a) Describe how a virus differs from a bacterium.

Bacteria are universally accepted to be living things while viruses have not been classified as either living or non-living. Bacteria have a cell wall, a cell membrane, cytoplasm and other organelles insides. Viruses lack all of these features. Bacteria are able to feed on nutrients. Whereas viruses cannot do this. Viruses have a protein coat on the outside, whereas bacteria do not have one. Bacteria can live under variable conditions and reproduce. Viruses remain dormant and exhibit no characteristic of living things, unless they enter a living cell, and start reproducing by manipulating nucleus. Bacteria are larger in size (approximately 1 μm in average). Viruses can be as tiny as 300 nm and can be only seen under electron microscope. [6]

(b) Explain how microorganisms are involved in the recycling of materials in dead organic matter.

Saprotrophic micro-organisms, e.g. bacteria and some fungi feed on dead organic matter. They extract nutrients for their own survival from it and decompose it at the same time. When present on dead matter in favourable conditions, they start multiplying rapidly. They secrete enzymes, which breakdown complex molecules into simple ones which they can utilise for feeding and growth. Thus, by breaking up large molecules into simple ones, they make it easier for molecules to be drained with rainwater, settle into soil, where they can be uptaken by plants easily to form complex molecules for growth again. [4]

[Total: 10]

Examiner comment – grade A

(a) Although there were no references to DNA or RNA, or to the reproduction of bacteria or viruses, the candidate still displayed a sufficient command of the topic to present five valid points of difference. (5/6)

(b) There were really two parts to this section of the question; first the process of decomposition, then the recycling of the products of decomposition. This answer was sound in the first part, but the description of recycling was somewhat superficial. However, the description of decomposition was strong enough to secure a high mark for the section. (3/4)

Total mark awarded = 8 out of 10

Example candidate response – grade C

7 (a) Describe how a virus differs from a bacterium.

One of the difference between virus and bacteria is that virus is ten times smaller than a bacteria. Virus has a protein coat where as bacteria has a cell membrane. Bacteria is a living being where as a virus is not. Bacteria feeds through decomposing dead matter where as virus ~~depends~~ is a pathogen and is dependant on a host cell. Bacteria respires whereas virus does not. Bacteria has a fixed nucleus, a virus contains strands of DNA.

[6]

(b) Explain how microorganisms are involved in the recycling of materials in dead organic matter.

Microorganisms decompose dead organic matter. This matter is converted in to nutriants such as carbohydrates which are taken up by plants (producers) and the eaten by primary consumers, then secondary consumers and are in the end formed into dead organic matter which is again decomposed by the microorganisms. Thus, recycling. [4]

[Total: 10]

Examiner comment – grade C

(a) What might be considered to be the 'lifestyle' of viruses and bacteria provided the candidate with most of the marks that were scored. Structural differences were limited to the possession of a protein coat in viruses. Bacteria were thought to have a nucleus and viruses to contain only DNA. (4/6)

(b) The candidate is aware that bacteria cause decomposition, but has no real grasp of what decomposition involves. The knowledge displayed on recycling was too superficial to collect any of the available marks. (1/4)

Total mark awarded = 5 out of 10

A suitable grade E example candidate response is not available for this question.

Question 8

Mark scheme

Expected answer		Mark	Guidance
8 (a)	muscles; circular; contract; behind food; longitudinal; relax behind food / contract in front of food; pushing / forcing / squeezing (bolus / AW); wave action / rhythmic	[6]	**R** if mention of parts outside of alimentary canal, e.g. trachea **R** if mention of contraction of longitudinal muscles behind food **lg** moving
(b)	its muscles work on their own; muscle not arranged in pairs / ORA; no flexor / ORA; no extensor / ORA; no muscle relaxes when it contracts / ORA; not attached to bones / ORA; does not cause movement at a joint / ORA	[4]	**A** ref. to one muscle
	Total	**[10]**	

Example candidate response – grade A

8 (a) Describe how peristalsis causes food to be moved along the alimentary canal.

Peristalsis occurs throughout the gut. It is a process which involves two sets of muscles working opposite oppositly, also known as antagonistic muscles. The inner wall of the alimentary canal has circular muscles where as the outer wall has longitudenal muscles. As the bolus of food enters the oesophagus the circular muscles behind it will contract while the longitudenal ones will relax, causing the bolus to move forward. This process will happen throughout the gut in a wave like rythmic motion. Constantly moving food particles ahead without any stop hindrance. [6]

(b) Explain why the heart muscle is **not** described as an antagonistic muscle.

The cardiac musles do not work in pairs, such that when one contracts the other relaxes. A human heart is only made up of one set of muscles. These muscles contracts and relax only once, during one heart beat, but no other muscles works simultaneous to the cardiac muscle. muscle. The one set of muscle contracts and relaxes on its own pumping the blood both, to the body and lungs in just one contraction. [4]

[Total: 10]

Examiner comment – grade A

(a) The answer to this section is close to perfection. (6/6)

(b) This is another very good answer to a question. The only mark lost was for a comparative mention of the only antagonistic muscles (of the upper arm) that are specifically mentioned in the syllabus. (3/4)

Total mark awarded = 9 out of 10

Example candidate response – grade C

8 (a) Describe how peristalsis causes food to be moved along the alimentary canal.

In the alimentary canal or the gut is made up of different layers in which there are circular muscles & longitudinal muscles, these are called smooth muscles. Inside the gut is a muscous coat which secreates ~~nats~~ mucus on the walls to help lubricate the food that is moving along the gut. When a food enters the longitudinal muscles contract & circular muscles ~~co~~ relax they form a rhythemic wave which helps the food to move, mucus plays an important role by lubicating the food making it ecsier for it to travel.

[6]

(b) Explain why the heart muscle is **not** described as an antagonistic muscle.

Heart muscle is not antagonistic because it's muscles contract & relax rapidly, it needs to be strong as coptraction & relaxation of the muscles do not stop at any point. Heart is two layed and ~~right~~ left muscles are more broad then the [redacted]right because bood at that area is the highest, also ~~it~~ it is a very different muscle from others by it's specific works.

[4]

[Total: 10]

Examiner comment – grade C

(a) Quite a sound description of peristalsis is given, though there is no indication of which muscles are contracting and which are relaxing in relation to the position of the bolus. (5/6)

(b) The heart muscle action is described sketchily and inaccurately, so no marks were awarded. (0/4)

Total mark awarded = 5 out of 10

Example candidate response – grade E

8 (a) Describe how peristalsis causes food to be moved along the alimentary canal.

The food bolus is moved along the alimentary canal with the help of two muscles lining the wall of the circular muscles and the longitudinal muscles. The circular muscles trap the food in place and relax as the longitudinal muscles contract behind the bolus to move it forward.

[6]

(b) Explain why the heart muscle is **not** described as an antagonistic muscle.

Heart is not an antagonistic muscle because it does not require a specific task to work and does not tire ever. It continously pumps blood around the body throughout the lifetime and does not cause fatigue or lactic acid production.

[4]

[Total: 10]

Examiner comment – grade E

(a) There is no correct description of how the muscles in question cause peristalsis, but there is knowledge of the circular and longitudinal muscles involved. (3/6)

(b) An account of the heart is given, but unfortunately, none of the facts stated relate to the question. It would appear that the candidate has no clear idea of what antagonistic means in relation to muscle arrangement. (0/4)

Total mark awarded = 3 out of 10

Question 9

Mark scheme

Expected answer		Mark	Guidance
9 (a) (i)	obesity; strain on skeleton / effect on joints; strain on heart / pumps harder / pumps faster; breathing difficulties; risk of diabetes; social implications / example, e.g. bullying, clothing; atheroma / AW; high blood pressure; heart disease / heart attack / other cardiovascular condition / AW	[5]	**R** ref. in veins / <u>on</u> arteries **Ig** blood vessels **A** cholesterol
(ii)	poor muscle development ; stunted / poor growth ; heart failure ; lack of / deficiency in one named protein, e.g. haemoglobin / antibodies / enzymes / hormones / thrombin; AVP, e.g. reduced / deficient RBC production / poor wound healing / poor tissue / cell / organ repair / blood clotting / anaemia	[3]	Reference to a **negative** effect required.
(b)	menstruation; loss of blood; haemoglobin	[2]	
	Total	**[10]**	

Example candidate response – grade A

9 **(a)** Explain the health risks of each of the following:

(i) a high-fat diet

A person consuming a high-fat diet would be subjected to heart problems. The fats would increase the amount of cholesterol which gets deposited in the arteries, this may cause heart attacks. Obesity can also be a problem to the person the amount of fatty acids produced increases and gets deposited beneath the skin.

[5]

(ii) a low-protein diet

A person on a low protein diet will not be able to produce enzymes properly. The muscles would not be formed. In severe cases kwashiorkor can occur. The belly protudes outwards and the limbs are weak.

[3]

(b) Explain why women may sometimes require iron supplements to their diet.

Iron is essential for blood, so women require iron to recover blood loss from periods. During pregnancy iron is used for the fetus' development.

[2]

[Total: 10]

Examiner comment – grade A

(a) **(i)** The candidate overlooks references to raised blood pressure, and to stress on the heart and on the joints. Nevertheless, quite a good answer was given. (3/5)

(ii) Although the candidate misses a reference to a lack of dietary protein causing stunted growth, there is still sufficient factual material to score the maximum mark. (3/3)

(b) A reference to 'periods' was allowed for menstruation and thus the candidate scored maximum marks. (2/2)

Total mark awarded = 8 out of 10

Example candidate response – grade C

9 (a) Explain the health risks of each of the following:

(i) a high-fat diet

fats are digested by lipase to fatty acids and absorbed by lacteal and later stored. A high fat diet can cause an increase in the uric acid present in the body, which can also cause clotting in a persons artery which can also result in high blood pressure. Excess fat is stored, having a high fat diet would cause excess fat storage and which would result in increase in weight and also an increase in the temperature to a normal person which caused by dipping heat. [5]

(ii) a low-protein diet

protein are required for growth and for the formation of new protoplasm for cells. Low protein diet would result in weak bones and weak muscles, less cells would be ~~produced~~ formed to much dilute urine, weak or disabled cells would be formed and low concentration of polypeptides in the blood. [3]

(b) Explain why women may sometimes require iron supplements to their diet.

excess blood is lost in a women due to monthly ~~over~~ discharge called menstruation. Iron is required by the body for the formation of red blood cells and in haemoglobin, and for the fast recovery of blood lost. [2]

[Total: 10]

Examiner comment – grade C

(a) **(i)** Although the candidate has an unsound grasp of atheroma formation, there is the realisation that it leads to high blood pressure. Unfortunately, an 'increase in weight' might not be due to obesity, and thus was not credited, and a reference to heart disease was not made. (1/5)

(ii) Unsound suggestions are made about urine concentration and polypeptides in the blood, but accurate knowledge is displayed about the effect of a low-protein diet on muscles and cell production. (2/3)

(b) An accurate account is given of blood loss during menstruation. (2/2)

Total mark awarded = 5 out of 10

A suitable grade E example candidate response is not available for this question.

Paper 3 Practical

Question 1

Mark scheme

Question	Expected answer	Additional guidance	Marks
1 (a) (i)	shape ; outer layer indicated ;		[2]
(ii)	both drawn ; straighter in distilled water + more curved in sugar solution ;		[2]
(iii)	piece in water straightens / curve 'opens' / **AW** ; piece in sugar solution more curved / curve closes / **AW** ;	 **A** rolled / folded	[2]
(iv)	reference to movement of water ; out of (onion) piece in sugar solution + into piece in water ; osmosis ; water potential / concentration greater in onion than sugar solution + water potential / concentration lower in onion than distilled water / **AW** ; semi or partially permeable membrane ; piece in water more turgid + piece in sugar solution less turgid / more flaccid ; outer layers waterproof / less change / unchanged ;	 **A** exosmosis and endosmosis **A** hypotonic / hypertonic **A** def. of turgid / flaccid **A** plasmolysed with reference to cells only	[5]

Question 1 Mark scheme continued

Question	Expected answer	Additional guidance	Marks
(b)	*factor* – same source / type of onion tissue ; *expl* – no variation in cells / comparing similar cells / same water potential of cells ; *factor* – same size / thickness of onion tissue ; *expl* – same distances for water movement ; *factor* – same length of time in solution ; *expl* – same opportunity for movement of water to occur ;	factor and explanation must be linked for two marks	[2]
		Total	**[13]**

Example candidate response – grade A

(a) (i) Draw the shape of these two pieces, at the start, in Table 1.1.
Show the position of the outer layer of onion on the drawing of each piece. [2]

✓ ✓ 2

Table 1.1

	shape of the piece	
	in distilled water	in sugar solution
at start		
after 30 minutes		

Leave the dishes for at least 30 minutes and proceed with Question 2.

✓ ✓ 2

(ii) After 30 minutes or more observe the two pieces of onion.
Draw the shape of these two pieces in Table 1.1 in the lower spaces. [2]

(iii) Describe the change in the shape in the two pieces of onion after 30 minutes compared to the pieces at the start.

2

The pieces of onion in the distilled water (cell wall) outer side bends ✓ backward while the pice pieces of onion in the sugar solution outer side bends inwards ✓ inward.

..... [2]

(iv) Explain what has happened to cause the changes in the pieces of onion.

Onion in distilled water

- The water inside the cell sap was lower then the water surrounding the piece of onion. Thus creating concentration gradient.
- The water moved into the cell by osmosis thus making it turgid and bends backward.

Solution

Onion is sugar Solu

- The water inside the cell Sap was higher then the water Surrounding the piece of onion. Thus creating concentration gradient.
- The water leave the cell by osmosis thus making the vacuole Shink and bends inwards X

3

[5]

(b) State **one** factor that was kept the same in this investigation and explain why it was kept the same.

The Size of the onion piece, so that the differences can be detected observed

1

[2]

[Total:13]

Examiner comment – grade A

(a) The key message for performing well in this section included a clear understanding that, when investigating the effect of sugar solution on slices of onion, the process of osmosis is the passage of water molecules from a region of their higher concentration to a region of their lower concentration through a partially permeable cell membrane and that net movement of water occurs out of the onion cells when placed in sugar solution and into the cells when placed in distilled water.

(i) This part tested the ability of candidates to follow instructions and to record accurate observations using drawing skills. Two marks were awarded to this candidate as both slices were drawn with similarity in shape and size and the outer layers clearly indicated with a double line.

(ii)(iii) Four marks were awarded for the drawings and descriptions of changes showed that the slice had straightened compared with a more pronounced curvature or bending/folding/shrinkage of the slice in sugar solution.

(iv) The candidate made reference to osmosis and the movement of water into and out of the cell in the correct situations. The candidate also reported that the slices became more turgid in water. Candidates generally scored three/four marks for this section as they either omitted reference to a semi or partially permeable membrane or overlooked the process of water movement into cells resulting in turgidity or conversely water moving out of the cells resulting in plasmolysis.

Mark awarded = 9 out of 11

(b) When asked to suggest what factor was kept the same in the investigation undertaken, the candidate indicated that the size should be similar. Reasons for doing so was less well understood so just one mark was awarded.

Mark awarded = 1 out of 2

Total mark awarded = 10 out of 13

A suitable grade C example candidate response is not available for this question.

Example candidate response – grade E

(a) (i) Draw the shape of these two pieces, at the start, in Table 1.1.
Show the position of the outer layer of onion on the drawing of each piece. [2]

Table 1.1

12:09	shape of the piece	
	in distilled water	in sugar solution
at start		
after 30 minutes		

Leave the dishes for at least 30 minutes and proceed with Question 2.

(ii) After 30 minutes or more observe the two pieces of onion.
Draw the shape of these two pieces in Table 1.1 in the lower spaces. [2]

(iii) Describe the change in the shape in the two pieces of onion after 30 minutes compared to the pieces at the start.

The two pieces of onion's ~~inner layer~~ became thicker and ~~stiff~~ stiff after 30 minutes. Before 30 minutes the onion pieces were thinner ~~and~~ not firm. [2]

(iv) Explain what has happened to cause the changes in the pieces of onion.

Osmosis was the reason for the changes in the pieces of onion. Water moved in from higher water potential to lower water potential. Water was pushed against it cell walls and caused the pieces to become turgid. Onion pieces which became from and thicker and

[5]

(b) State **one** factor that was kept the same in this investigation and explain why it was kept the same.

The volume of distilled water and Sugar solution and the time taken 30 minutes for the changes to occur. For acquiring the accurate results. [2]

[Total:13]

Examiner comment – grade E

(a) **(i)** One mark was awarded when slices placed in distilled water for comparison with sugar solution were drawn with similarity in shape and size but the outer layers were not clearly differentiated with a double or darker line.

(ii)(iii) One mark was awarded for clear drawings of the two slices. Further marks were rarely achieved as no differences in shape were described and the majority of comments were confined to differences in texture and turgidity.

(iv) This candidate obtained three marks for confirming that osmosis had occurred with movement of water into slices immersed in distilled water. The candidate omitted to mention that semi/partially permeable membranes were involved or that cells became turgid in distilled water or flaccid/plasmolysed in the sugar solution.

Mark awarded = 5 out of 11

(b) The answer focused on keeping the volume of solutions the same which is not relevant in the context of this part of the question.

Mark awarded = 0 out of 2

Total mark awarded for = 5 out of 13

Question 2

Mark scheme

Question	Expected answer	Additional guidance	Marks
2 (a) (i)	*drawing* clear continuous lines + no shading ; size (should be the same size as the specimen) ; central part clear and in proportion to whole and showing some seeds ; *label* seed + remains of sepals ;	 see measurement given in **(a)(ii)**	[4]
(ii)	line drawn + measurement + units ;	tolerance ± 2 mm **A** measurements in cm	[1]
(iii)	line drawn on Fig. 2.1 in a similar position to **(a)(ii)** + measurement + units ; formula = $\frac{\text{drawn apple measurement}}{\text{Fig. 2.1 apple measurement}}$; allowance for × 3 in Fig. 2.1 ; answer ;		[4]
(b) (i)	colour recorded ; below pH 7 / acidic ;	should be yellow green / yellow / orange but check Supervisor's Report	[2]
(ii)	crush / cut up apple / extract juice / **AW** ; add Benedict's solution ; heat (in a water bath) ; colour change from blue to green / orange / red / red-brown indicates reducing sugar ;	 **R** if non-reducing sugar test carried out initial + final colours needed	[4]
(c) (i)	unwrapped – (0) 20, 45, 65, 80 ;;	4 correct – 2 marks, 1 error – 1 mark	[2]

Question 2 Mark scheme continued

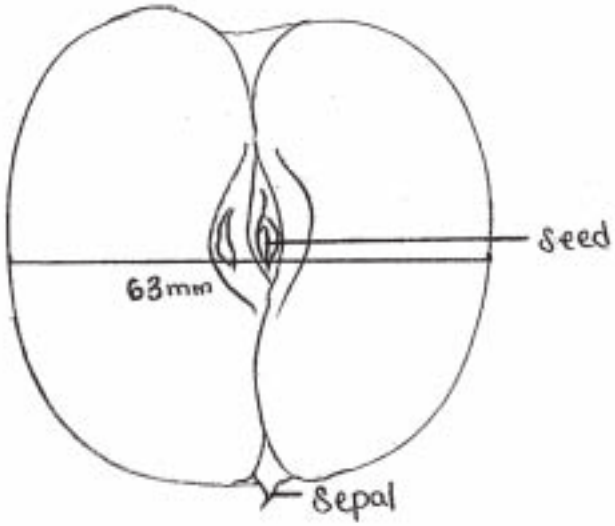
Question	Expected answer	Additional guidance	Marks
(ii)	storage time on x axis + loss in mass on y, both axes fully labelled with units ; scales linear using at least half of grid ; correct plots ; 2 lines drawn – either by straight lines between points or lines of best fit ; lines identified ;	minimum acceptable labels: storage or t / days loss in mass / g tolerance of $\frac{1}{2}$ square **R** fuzzy / thick lines lines may be labelled or a key given	[5]
(iii)	reading at day 8 for unwrapped apples; reading at day 8 for wrapped apples ; subtraction + answer + units ;	read values from candidate's graph	[3]
(iv)	respiration / stored sugars (food) used ; evaporation / water loss ; decomposition / **AW**;	 **A** dehydration **A** decay / microbial action / rotting	[2]
		Total	**[27]**

Example candidate response – grade A

2 You are provided with half of an eating apple.

- Remove the wrapping.

(a) (i) Make a drawing to show the cut surface of this apple. Your drawing should be the same size as the specimen provided. Label the seeds and the remains of sepals.



4

[4]

(ii) Draw a line on your drawing to measure the widest part of the apple.
Record your measurement and units.

.....63...mm.....

[1]

Fig. 2.1 shows a wild apple that is not suitable for eating.

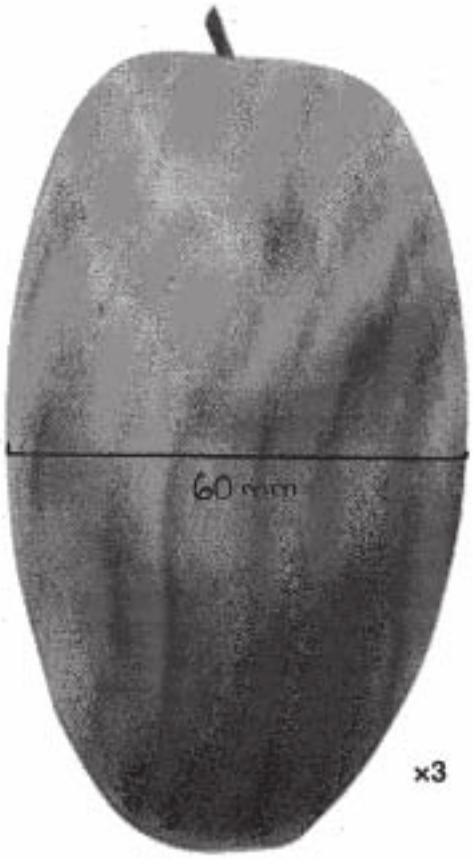


Fig. 2.1

(iii) Draw a line on Fig. 2.1, in a similar position to the one you have marked on your drawing. Measure the length of this line and record below.

.....60 mm.....

Calculate the number of times larger the eating apple you have drawn is compared with the wild apple shown in Fig. 2.1.
Show your working.

magnification = drawing / image = 63 mm / 60/3 mm ✓ ✓ ✓ ✓ 4

= ~~63 mm~~ / ~~60 mm ÷ 3~~

3.15

Number of times larger .....~~1.05~~ times..... [4]

(b) As the apples ripen changes occur in them to make the apple less acidic and sweeter to taste.

- Cut a thin section from the apple and place on the white tile.
- Using the forceps pick up a piece of universal indicator paper and place it on the freshly cut surface of the section of apple.

(i) Record the colour of the indicator paper as the juice of the apple makes contact with the paper.

orange

2

Explain what the colour indicates.

The colour indicates a pH of 4-5 and that apple is weak acidic. [2]

(ii) Describe how you could test a sample of apple to show whether sweetness is due to reducing sugar.

first we will take a small thin slice of the apple and cut it into small pieces to increase surface area. We will then put the sample in a test tube and pour 1 cm^3 of benedicts solution into the test tube. By using test tube holders we will put the test tube in a hot water bath. The colour change from blue to yellow, orange, green, red or brick red will indicate the presence of reducing sugar in apple. The different colours will indicate the amount of reducing sugar thus the amount of sweetness. [4]

4

(c) Eating apples are traditionally stored in cool, dark conditions to preserve them.

Some students compared two samples of eating apples that were stored under the same conditions.

Some apples were wrapped in paper and other apples were left unwrapped.

The students measured the total mass of each sample of apples over 10 days of storage.

Their measurements are recorded in Table 2.1.

Table 2.1

storage time/days	mass of sample of apples/g	
	wrapped in paper	unwrapped
0	505	500
2	495	480
5	475	455
7	460	435
10	455	420

(i) Complete Table 2.2, to show the loss in mass, compared to the starting mass, for the sample of unwrapped apples.

Table 2.2

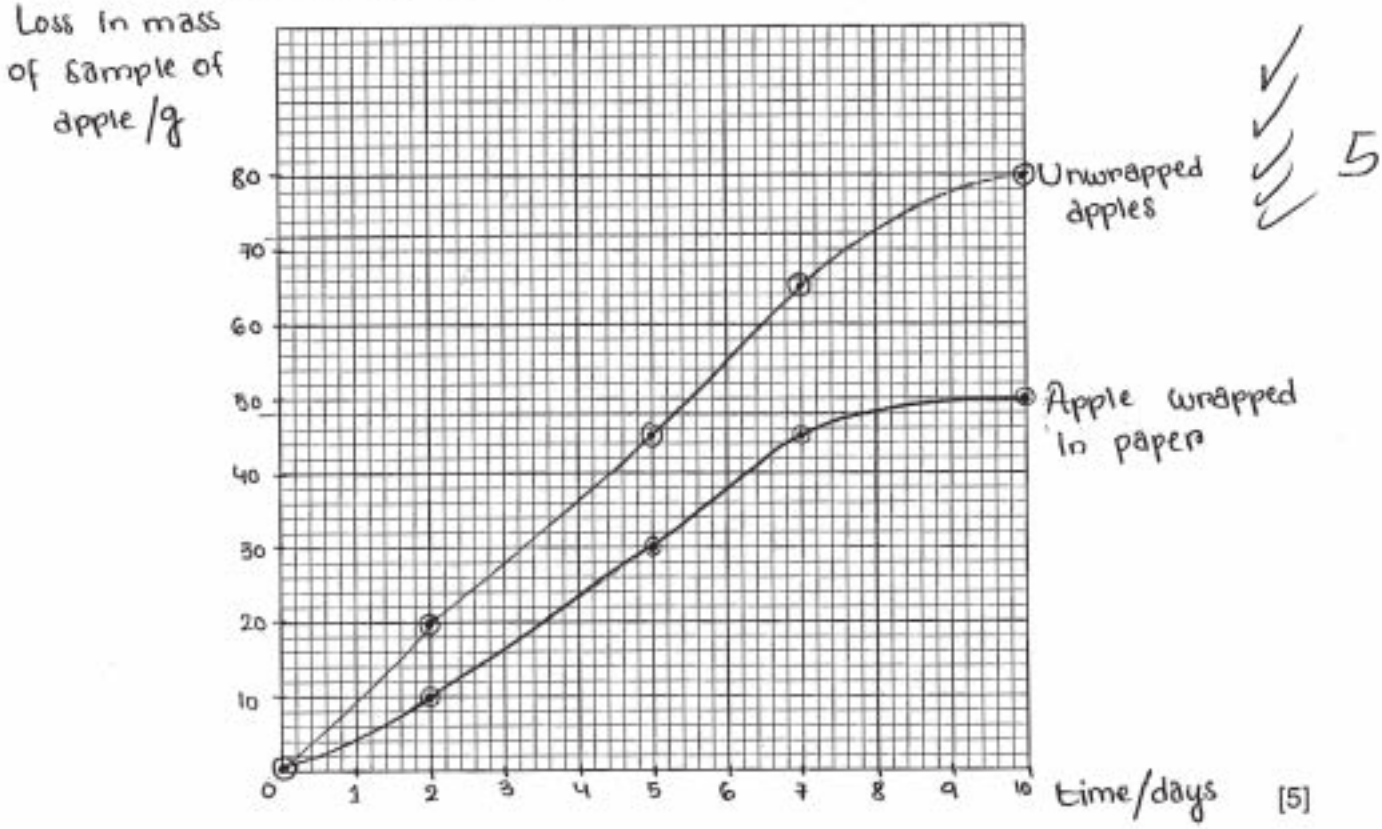
storage time/days	loss in mass of sample of apples/g	
	wrapped in paper	unwrapped
0	0	0
2	10	20
5	30	45
7	45	65
10	50	80

✓ 2

[2]

(ii) Construct a graph of the data in Table 2.2, to show the loss of mass of the wrapped apples and unwrapped apples.

Use the same axes for plotting both sets of data.



[5]

(iii) Using your graph, calculate the difference in loss in mass between the unwrapped and wrapped apples after **8 days** of storage.

8th day, unwrapped apple – 72g
apple wrapped in paper – 48g

Loss in mass = 72g – 48g
= 24g

[3]

(iv) Suggest **two** processes by which the apples lost mass.

It reacted with iron in the air. Transpiration might occur, the acid evaporates [2]

[Total: 27]

Examiner comment – grade A

(a) This section tested the ability of candidates to follow instructions, record accurate observations using drawing skills and perform calculations from individual measurements made.

(i) Four marks were awarded for producing a clear drawing of the cut surface of an eating apple with continuous lines and no shading. The central part was also drawn in proportion to the size of the entire section and seeds and sepals were correctly labelled.

(ii) One mark was awarded for neatly drawing and measuring the line on the widest part of the apple and also including appropriate units such as mm or cm.

(iii) This section tested the ability of candidates to take accurate measurements and perform simple calculations. Four marks were awarded for measuring the length of the line drawn on the photograph of the wild apple and correctly calculating the magnification of the eating apple given in **(ii)** compared with the wild apple by dividing the value given in **(ii)** with that in Fig.2.1.

Mark awarded = 9 out of 9

(b) The key message here included an understanding that during the process of ripening fruits such as apples became less acidic and sweeter to taste due to the presence of reducing sugar. Measurements of pH using universal indicator paper and then Benedict's solution were used to test this.

(i) When asked to record the colour of the indicator on the freshly cut surface of the eating apple, two marks were awarded for correctly recording a range in colour from yellow green to yellow/orange and that the apple juice was acidic or below pH 7.

(ii) A description of the test was required to show that sweetness in ripening apples was due to the presence of reducing sugar. Four marks were given for describing the need to crush/cut up/extract juice from the apple followed by the addition of Benedict's solution and heating in a water bath to show that colour changes from blue to green/orange/red-brown/red were positive for reducing sugar.

Mark awarded = 6 out of 6

(c) The key requirements here involve an understanding of the preservation of edible fruits, which are stored in cool and dark conditions to avoid a reduction in mass, and that processes such as respiration, evaporation and decomposition need to be considered.

(i) Table 2.1 presented five data sets on the mass of apples/g in wrapped compared with unwrapped paper over a storage time of 0, 2, 5, 7 and 10 days. For comparison with Table 2.2, where data were given on the loss in mass/g in apples stored in wrapped paper, candidates were asked to calculate the loss in mass in apples in unwrapped paper relative to storage time/days. This was well calculated resulting in two marks being awarded.

(ii) Using data given in Table 2.2 to construct a graph to show a loss in mass/g against storage time/days, five marks were awarded for correctly labelling the X (storage time/days) and Y (loss in mass/g) axes, together with correct plotting. Two identified data sets drawn by straight lines between points or lines of best fit and using at least half the grid were also required.

(iii) Using the graph drawn in **(ii)**, three marks were obtained for correctly calculating differences in the loss of mass/g between wrapped/wrapped apples after eight days of storage.

(iv) When asked to suggest two processes by which apples lost their mass over time, one mark was awarded for mentioning evaporation.

Mark awarded = 11 out of 12

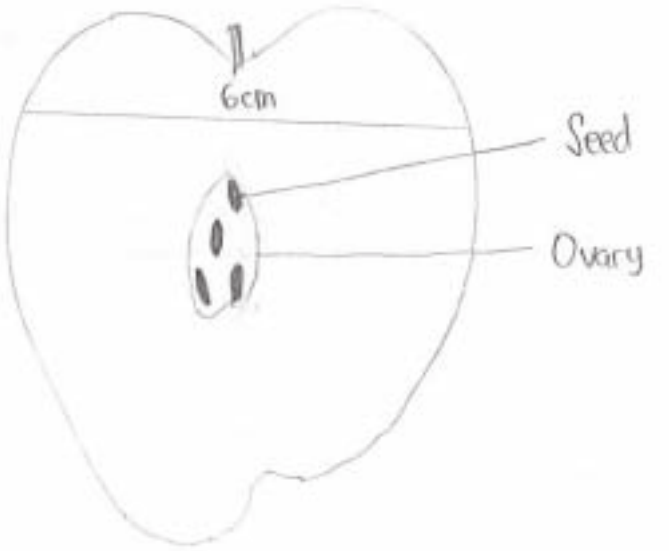
Total mark awarded = 26 out of 27

Example candidate response – grade C

2 You are provided with half of an eating apple.

- Remove the wrapping.

(a) (i) Make a drawing to show the cut surface of this apple. Your drawing should be the same size as the specimen provided. Label the seeds and the remains of sepals.



✓ ✓ ✗ ✗ 2

[4]

(ii) Draw a line on your drawing to measure the widest part of the apple.
Record your measurement and units.

6 cm ✓

[1]

Fig. 2.1 shows a wild apple that is not suitable for eating.

Fig. 2.1

(iii) Draw a line on Fig. 2.1, in a similar position to the one you have marked on your drawing. Measure the length of this line and record below.

5.2 cm

Calculate the number of times larger the eating apple you have drawn is compared with the wild apple shown in Fig. 2.1.
Show your working.

Magnification = $\frac{\text{size of img}}{\text{size object}} = \frac{5.2}{6} = 0.867\times$

✓ 1
✗
✗
✗

Number of times larger 0.867 × [4]

(b) As the apples ripen changes occur in them to make the apple less acidic and sweeter to taste.

- Cut a thin section from the apple and place on the white tile.
- Using the forceps pick up a piece of universal indicator paper and place it on the freshly cut surface of the section of apple.

(i) Record the colour of the indicator paper as the juice of the apple makes contact with the paper.

The colour changes to brown. (pH 4)

Explain what the colour indicates.

It indicates that the apple is acidic and has a pH of 4 [2]

2

(ii) Describe how you could test a sample of apple to show whether sweetness is due to reducing sugar.

Make a solution of the apple and put it into a test tube. Add an equal amount of ~~reducing sug~~ Benedict solution and mix thoroughly. Heat the solution with hot water of about 60° - 80°C. If the solution sample ~~it~~ contain reducing sugar then the colour will change from cloudy green, yellow, orange and finally to brick red. However, if the solution does not contain reducing ~~su~~ sugar then it will stay blue. [4]

3

(c) Eating apples are traditionally stored in cool, dark conditions to preserve them.

Some students compared two samples of eating apples that were stored under the same conditions.

Some apples were wrapped in paper and other apples were left unwrapped.

The students measured the total mass of each sample of apples over 10 days of storage.

Their measurements are recorded in Table 2.1.

Table 2.1

storage time/days	mass of sample of apples/g	
	wrapped in paper	unwrapped
0	505	500
2	495	480
5	475	455
7	460	435
10	455	420

(i) Complete Table 2.2, to show the loss in mass, compared to the starting mass, for the sample of unwrapped apples.

Table 2.2

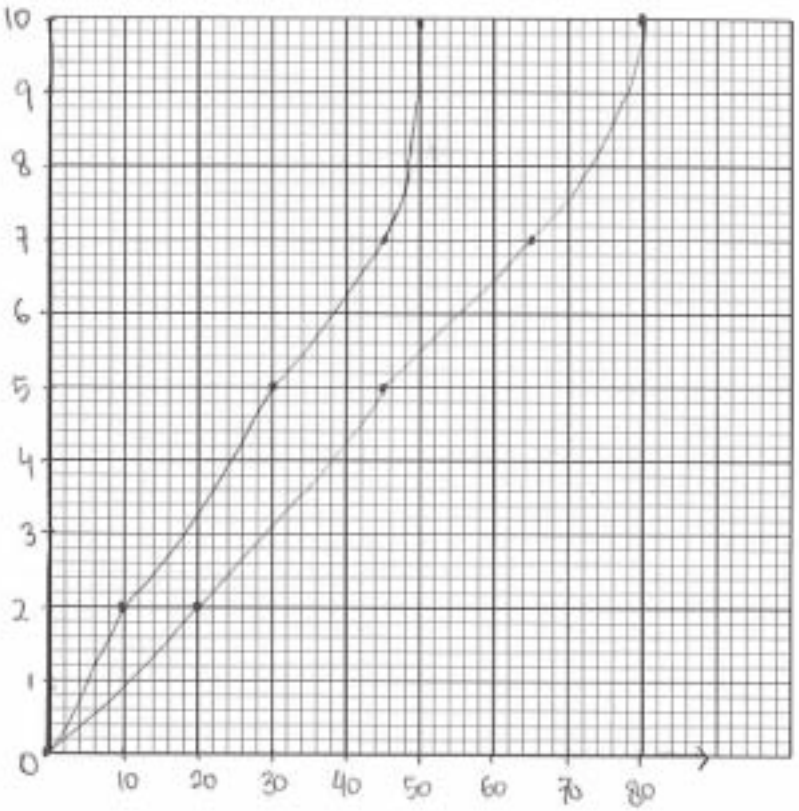
storage time/days	loss in mass of sample of apples/g	
	wrapped in paper	unwrapped
0	0	0
2	10	20
5	30	45
7	45	65
10	50	80

✓✓ 2

[2]

(ii) Construct a graph of the data in Table 2.2, to show the loss of mass of the wrapped apples and unwrapped apples.

Use the same axes for plotting both sets of data.



X ✓✓✓ X 3

[5]

(iii) Using your graph, calculate the difference in loss in mass between the unwrapped and wrapped apples after **8 days** of storage.

Day 8 of unwrapped = 72 g ✓

Day 8 of wrapped = 48 g ✓

Difference loss in mass = 72 - 48 = 24 g ✓

3

[3]

(iv) Suggest **two** processes by which the apples lost mass.

- By the enzyme present inside the fruit

- By The apple is drying and loss some of its water content into the atmosphere ✓ [2]

[Total: 27]

1

Examiner comment – grade C

(a) (i) The candidate was awarded two marks for producing drawings of the cut surface of an eating apple with clear outlines and no shading in the main body of the apple. However the sepals was not labelled.

(ii) One mark was awarded for neatly drawing and measuring the line on the widest part of the apple and also including appropriate units.

(iii) One mark was awarded for measuring the length of the line drawn on the photograph of the wild apple. The final calculation of magnification was incorrect.

Mark awarded = 4 out of 9

(b) (i) Two marks were awarded for correctly recording a change in colour and that the apple juice was acidic or below pH 7.

(ii) A description of the test was required to show that sweetness in ripening apples was due to the presence of reducing sugar. Three marks were given for placing apple slices in Benedict's solution and heating in a water bath to show that colour changes from blue to green/orange/red-brown/red were positive for reducing sugar. Preparation beforehand was lacking as the slices needed to be crushed/cut up or the juice extracted prior to testing with Benedict's solution.

Mark awarded = 5 out of 6

(c) (i) Table 2.1 presented five data sets on the mass of apples/g in wrapped compared with unwrapped paper over a storage time of 0, 2, 5, 7 and 10 days. For comparison with Table 2.2, where data were given on the loss in mass/g in apples stored in wrapped paper, candidates were asked to calculate the loss in mass in apples in unwrapped paper relative to storage time/days. This was well calculated resulting in two marks being awarded.

(ii) Three marks were awarded for correct plotting of the data, which were drawn by straight lines between points or lines of best fit using at least half the grid. Marks were lost by not correctly labelling the X and Y axes and not identifying the two data sets.

(iii) Three marks were obtained for correctly calculating differences in the loss of mass/g between wrapped/wrapped apples after eight days of storage.

(iv) One mark was awarded for stating that water loss uses a process by which apples lost mass. Incorrect reference to enzyme action was made.

Mark awarded = 9 out of 12

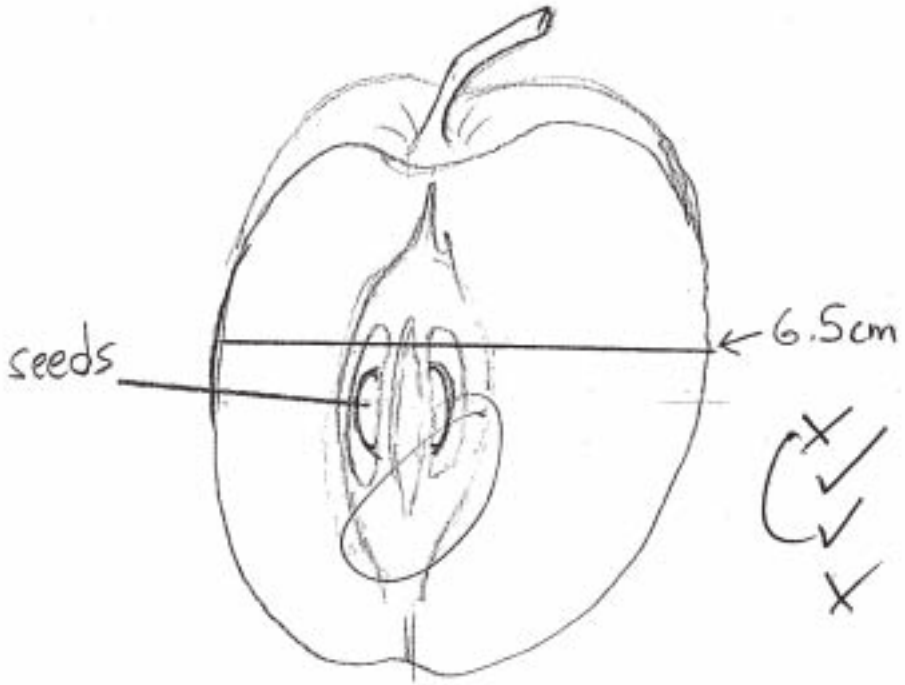
Total mark awarded = 18 out of 27

Example candidate response – grade E

2 You are provided with half of an eating apple.

- Remove the wrapping.

(a) (i) Make a drawing to show the cut surface of this apple. Your drawing should be the same size as the specimen provided. Label the seeds and the remains of sepals.



X ✓ ✓ X 2

[4]

(ii) Draw a line on your drawing to measure the widest part of the apple.
Record your measurement and units.

6.5cm ✓

[1]

Fig. 2.1 shows a wild apple that is not suitable for eating.

Fig. 2.1

(iii) Draw a line on Fig. 2.1, in a similar position to the one you have marked on your drawing. Measure the length of this line and record below.

10.5 cm

Calculate the number of times larger the eating apple you have drawn is compared with the wild apple shown in Fig. 2.1.
Show your working.

$\frac{10.5\text{cm}}{6.5\text{cm}} = \times 1.6$

✓ 1
×
×
×

× 1.6

Number of times larger ..... [4]

(b) As the apples ripen changes occur in them to make the apple less acidic and sweeter to taste.

- Cut a thin section from the apple and place on the white tile.
- Using the forceps pick up a piece of universal indicator paper and place it on the freshly cut surface of the section of apple.

(i) Record the colour of the indicator paper as the juice of the apple makes contact with the paper.

The colour is dark brown ✓ 2

Explain what the colour indicates.

The colour indicates ph 3, we do this test to test its flavour ✓ [2]

(ii) Describe how you could test a sample of apple to show whether sweetness is due to reducing sugar.

By cutting the apple into half and placing a indicator of paper will show the sugar content of the apple and place the ~~oth~~ other half dipped into a sugar solution. This test will help us ~~show~~ whether sweetness is due to reducing sugar in apples 1

[4]

(c) Eating apples are traditionally stored in cool, dark conditions to preserve them.

Some students compared two samples of eating apples that were stored under the same conditions.

Some apples were wrapped in paper and other apples were left unwrapped.

The students measured the total mass of each sample of apples over 10 days of storage.

Their measurements are recorded in Table 2.1.

Table 2.1

storage time/days	mass of sample of apples/g	
	wrapped in paper	unwrapped
0	505	500
2	495	480
5	475	455
7	460	435
10	455	420

(i) Complete Table 2.2, to show the loss in mass, compared to the starting mass, for the sample of unwrapped apples.

Table 2.2

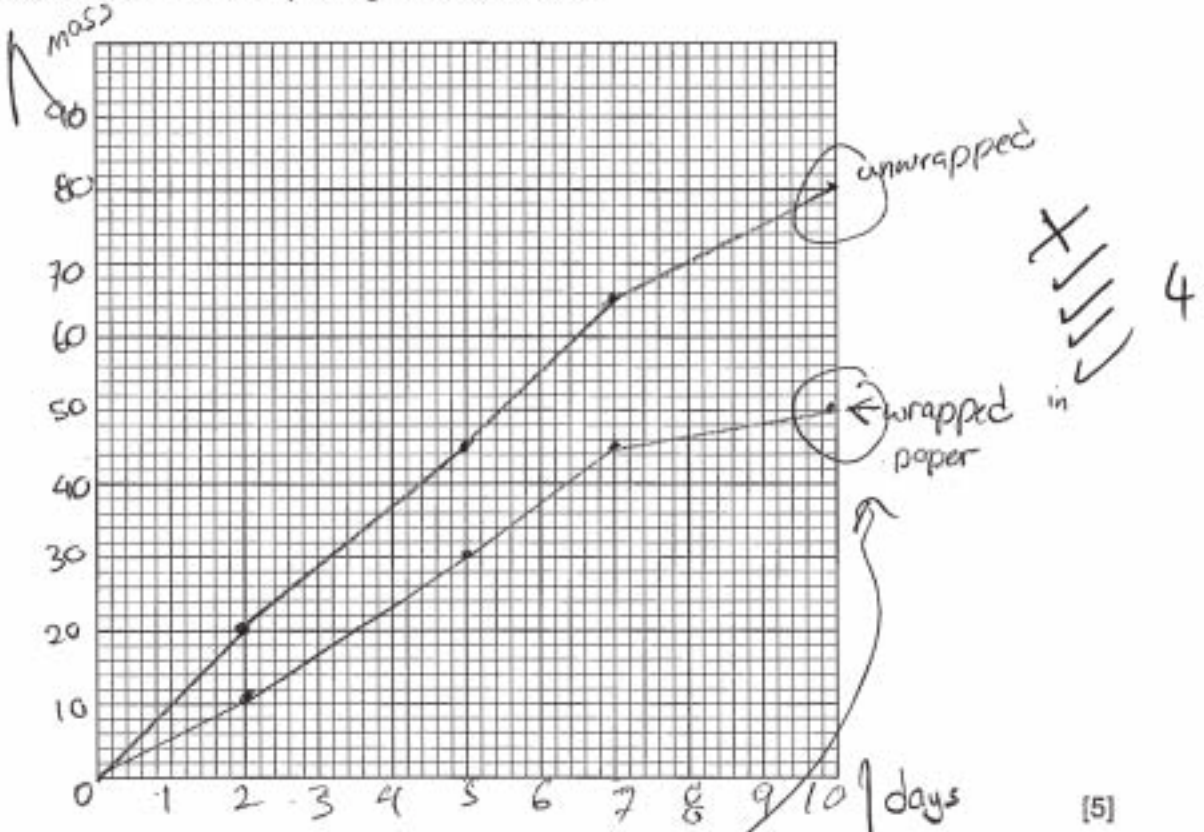
storage time/days	loss in mass of sample of apples/g	
	wrapped in paper	unwrapped
0	0	0
2	10	20
5	30	45
7	45	65
10	50	80

✓ ✓ 2

[2]

(ii) Construct a graph of the data in Table 2.2, to show the loss of mass of the wrapped apples and unwrapped apples.

Use the same axes for plotting both sets of data.



[5]

(iii) Using your graph, calculate the difference in loss in mass between the unwrapped and wrapped apples after **8 days** of storage.

80 ← unwrapped > 8 days

−50 ← wrapped

= 30

30 is the difference in mass loss between unwrapped and wrapped apples after 8 days of storage.

[3]

(iv) Suggest **two** processes by which the apples lost mass.

The two processes which causes apples to lost mass was due to the ~~plastic~~ ~~temperature~~ and the time.

[2]

[Total: 27]

Examiner comment – grade E

(a) (i) Two marks were awarded for producing a full-size drawing of the cut surface of an eating apple plus the central section containing seeds. Labelling of the sepals was omitted.

(ii) One mark was awarded for neatly drawing and measuring the line on the widest part of the apple and also including appropriate units such as mm or cm.

(iii) One mark was awarded for measurement with units. There was little evidence shown of how magnification was calculated and consequently no allowance was made for the ×3 magnification shown in Fig 2.1.

Mark awarded = 4 out of 9

(b) (i) Two marks were awarded for correctly recording an appropriate colour in the range from yellow green to yellow/orange and that the apple juice was acidic or below pH 7.

(ii) One mark was awarded for cutting the apple (prior to adding Benedict's solution). The candidate made no mention of heating the mixture in a water bath to show that a positive reaction would result in the colour of the solution changing from blue to green/orange/red-brown/red. This candidate also lost marks by not adding Benedict's solution to the apple slices.

Mark awarded = 3 out of 6

(c) (i) Two marks were awarded for correctly calculating the loss in mass in apples in unwrapped paper relative to storage time/days.

(ii) Four marks were awarded for correctly plotting of the data given in Table 2.2 which were drawn by straight lines between points. This candidate lost a mark for incorrect labelling of the axes.

(iii) No marks were awarded when candidates frequently misread the question by calculating differences in the loss of mass/g between unwrapped/wrapped apples after eight days of storage from data given in Table 2.1 and not from the graph drawn in **(ii)**. Others calculated the loss of mass on the wrong day or between days 8 and 10.

(iv) Candidates did obtain one mark by identifying evaporation/transpiration or occasionally tissue decomposition as processes involved in the loss of mass in stored apples. This candidate achieved no marks in this section for stating that time and temperature were relevant.

Mark awarded = 6 out of 12

Total mark awarded = 13 out of 27

Paper 6 Alternative to Practical

Question 1

Mark scheme

Question	Expected answer	Additional guidance	Mark
1 (a) (i)	cell membrane ; chloroplast ;	labelling line must end precisely on the cell membrane labelling line may end in middle of chloroplast or end on the outer membrane	2
(ii)	(membranes) destroyed / damaged / broken / no longer only partially permeable / **AW** ; chlorophyll / green contents leak out / **AW** (into water) / chloroplast damaged ;	**Ig** damage to cell wall **A** chlorophyll diffuses out *idea* of chlorophyll leaving cells required	2
(b) (i)	boiling time on x axis + vitamin C content on y + both axes fully labelled ; scales linear using more than half of grid on both axes ; correct plots ; 2 lines drawn – either by straight lines between points or lines of best fit ; both lines identified ;	minimum labels: t / min **R** m vit C / mg per 100 g **R** thick or 'fuzzy' lines lines may be labelled 'cabbage', 'water' or a key given	5
(ii)	correct answer + units ;;	**A** answers written on graph, e.g. 2.8 mins if not in **(b)(ii)** **A** e.g. 3.5 min or 3 min 30 sec award one mark for correct working or method indicated on graph	2

Question 1 Mark scheme continued

Question	Expected answer	Additional guidance	Mark
(iii)	*cabbage* vitamin C decreases ; rapidly then more slowly / **AW** ; *water* vitamin C increases to 4 minutes / 26.0 mg per 100 g ; then decreases ;		4
(c)	temperature – boiling or 100 °C ; mass / weight / volume of cabbage ; feature of cabbage – age / type / variety / healthy / from same plant ; size of leaf pieces / surface area of cabbage ; volume / mass of oil (= volume / mass of water) ; (boiling / cooking) time ; samples taken at same time intervals ; same volume / size of sample taken for testing ; same method for testing for vitamin C used ;	**A** same temperature for water and oil **Ig** amount or quantity unless qualified **A** volume of liquids	4
(d)	take more vitamin C measurements between 4 to 8 minutes / decrease time intervals for taking samples / samples at regular intervals ; use larger sample of / more cabbage ; repeat experiment + mean / average ; use a water bath ;		2
		Total	21

Example candidate response – grade A

1 Fresh food is often cooked before it is eaten.

Fig. 1.1 shows a fresh living green plant cell before cooking, as seen under a microscope.

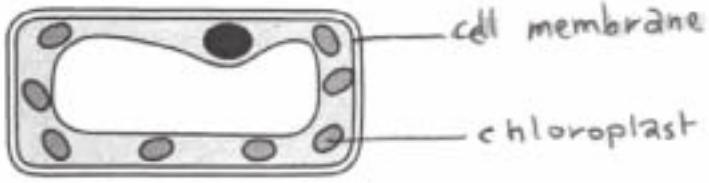


Fig. 1.1

(a) **(i)** On Fig. 1.1, label the cell membrane and a chloroplast. [2]

Some green cabbage leaves were cut into small pieces and placed in **clean** water and then boiled for 10 minutes. After that time the water was green.

(ii) Suggest how the membranes may have been changed by boiling to cause the water to become green.

The membranes had become fully permeable due to the heat by boiling thus they allowed the chlorophyll present in chloroplast to diffuse out of the cell throught the cell membrane and then out of the cell wall which is already fully permeable. The chlorophyll is green thus water turned green. [2]

(b) An investigation was carried out to discover what happens to the vitamin C in cabbage leaves during cooking.

100 g of fresh cabbage leaves were cut up, placed into boiling water and left to continue boiling for 10 minutes.

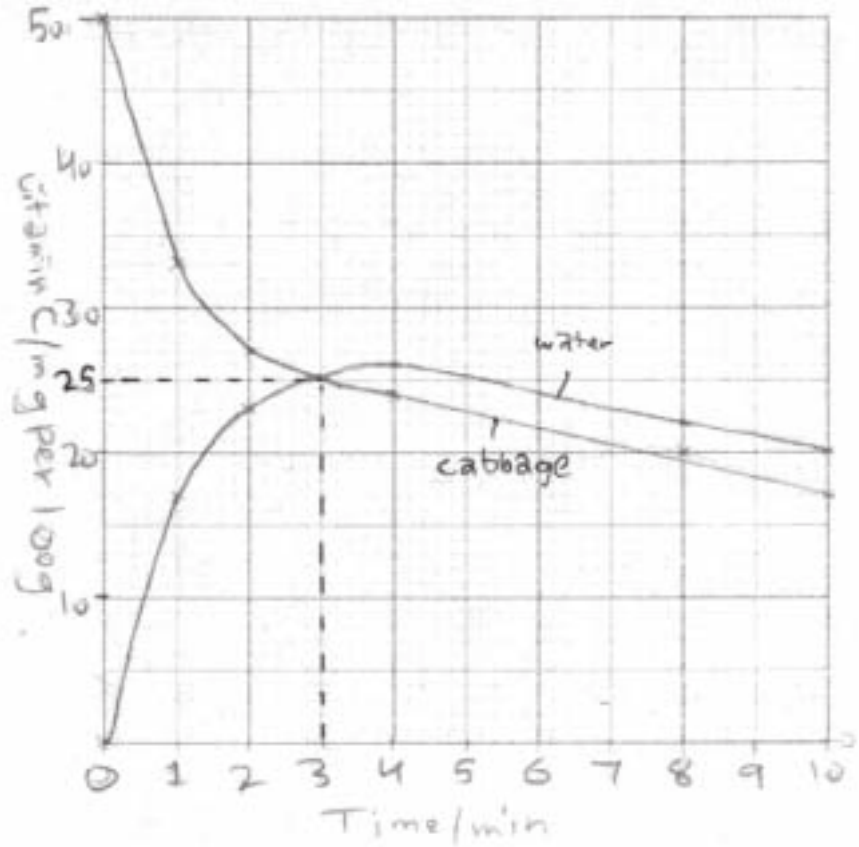
Samples of cabbage leaves and of the water they were boiled in were taken at intervals, cooled, and the vitamin C content was measured.
There is no vitamin C in clean water.

These measurements are shown in Table 1.1.

Table 1.1

boiling time / min	vitamin C / mg per 100 g	
	cabbage	water
0.0	50.0	0.0
1.0	33.0	17.0
2.0	27.0	23.0
4.0	24.0	26.0
8.0	20.0	22.0
10.0	17.0	20.0

(i) Construct a graph of the data in Table 1.1.
Use the same axes for both sets of data.



[5]

(ii) After boiling for 10 minutes only about one third of the vitamin C remained in the cabbage leaves.

Use your graph to find the time at which the vitamin C content in cabbage had fallen to half.
Show your working.

At 25mg draw a straight line and see where it intersects the graph.

answer 3 minutes [2]

(iii) Describe the changes in vitamin C content of the cabbage and the water during the 10 minutes.

in cabbage The vitamin C content of cabbage dropped drastically in the first minute (17mg more lost) to (33mg). Then, the decrease of vitamin C became slower as time passed (1-10 min). First, all vitamin C (50mg) was in the cabbage in water. There was no vitamin C at start. But, in the first minute vitamin C increased rapidly, from (0 mg to 17mg). As time passed, vitamin C continued to increase till 4 mins and then it dropped in the last 6 mins from (26 mg to 20 mg). [4]

(c) To extend this investigation, some students wanted to compare what happens to the vitamin C in a sample of fresh cabbage leaves when they were cooked in oil, safely, instead of water.

Describe **four** factors that would need to be kept the same to make a fair comparison.

Firstly, the mass of ~~the~~ cabbage used should be the same (100g) as in the first experiment. Secondly, the time of cooking/boiling should be the same (10 mins). Thirdly, the cabbage leaves should be of same species and from same plant and they also should be fresh as they were in the experiment before. Fourthly, the volume ~~of~~ of oil used should be equal to the volume of water used before, and also the cabbage leaves should be cut up. [4]

(d) Suggest **two** ways of improving the method used in these investigations.

1. The vitamin C content should be taken at regular intervals: for example after every minute.
2. The experiment should be repeated several times and an average of the result should be taken. [2]

[Total: 21]

Examiner comment – grade A

(a) The candidate's labelling lines in **(a)(i)** indicated an understanding that the cell membrane was represented by the inner of the two single lines and correctly identified a chloroplast. In **(a)(ii)**, the candidate knew that the cell membrane (and chloroplast membrane) is normally partially permeable, preventing the movement of larger molecules from the cell. It was correctly suggested that, because one such molecule, chlorophyll, had been able to move from the cell into the surrounding water, the membrane must have been made fully permeable by boiling.

Mark awarded = 4 out of 4

(b) The line graph drawn in **(b)(i)** had the independent variable, boiling time/min, plotted on the x axis with the dependent variable, vitamin C/mg per 100 g, on the y axis and both axes were fully labelled. Good-sized linear scales had been used making optimum use of the grid, all the points plotted were clearly visible and correct, the lines drawn were clean lines, correctly identified as 'cabbage' or 'water'. The method of working for **(b)(ii)** was shown in writing and on the graph and the reading was correctly taken and expressed. The candidate was able to interpret and use the data given to describe the changes in vitamin C content in **(b)(iii)**, noting that the decrease in the vitamin C content of the cabbage was at a faster rate initially then slower, and that the vitamin C content of the water increased up to a maximum level at a certain time, after which the level began to fall.

Mark awarded = 11 out of 11

(c) The candidate showed a good understanding of the need to the control variables in an investigation e.g. mass, volume, time and the quality of material used, using precise terminology rather than 'amount' or 'quantity' throughout.

Mark awarded = 4 out of 4

(d) Taking samples at regular intervals rather than irregular ones and repeating the investigation to obtain more reliable mean readings were good examples of improving the method used.

Mark awarded = 2 out of 2

Total mark awarded = 21 out of 21

Example candidate response – grade C

1 Fresh food is often cooked before it is eaten.

Fig. 1.1 shows a fresh living green plant cell before cooking, as seen under a microscope.

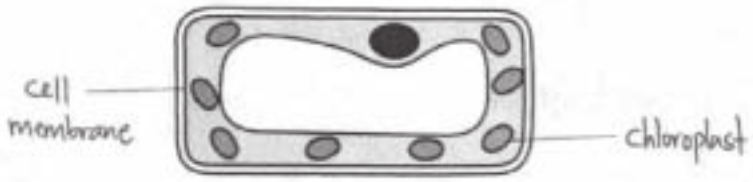


Fig. 1.1

(a) (i) On Fig. 1.1, label the cell membrane and a chloroplast. [2]

Some green cabbage leaves were cut into small pieces and placed in **clean** water and then boiled for 10 minutes. After that time the water was green.

(ii) Suggest how the membranes may have been changed by boiling to cause the water to become green.

The plant cell contains a partially permeable membrane that allows some of the substances to pass through. When the plant cell is placed in a lower water potential solution, the water molecules move ~~from the~~ out from the plant cell ~~to~~ by a process called osmosis. Since the plant cell contains a green pigment called chlorophyll, ~~and it~~ ~~hence causing~~ causes the water to become green.

.....[2]

(b) An investigation was carried out to discover what happens to the vitamin C in cabbage leaves during cooking.

100 g of fresh cabbage leaves were cut up, placed into boiling water and left to continue boiling for 10 minutes.

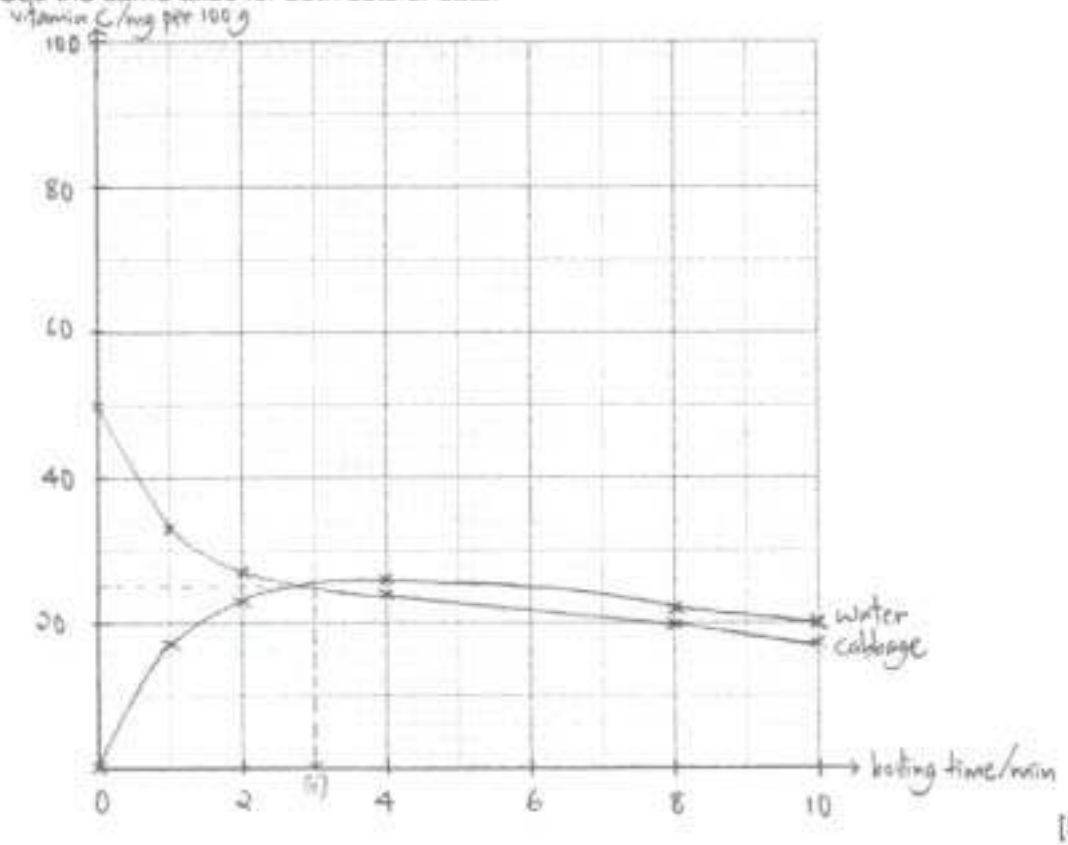
Samples of cabbage leaves and of the water they were boiled in were taken at intervals, cooled, and the vitamin C content was measured.
There is no vitamin C in clean water.

These measurements are shown in Table 1.1.

Table 1.1

boiling time / min	vitamin C / mg per 100 g	
	cabbage	water
0.0	50.0	0.0
1.0	33.0	17.0
2.0	27.0	23.0
4.0	24.0	26.0
8.0	20.0	22.0
10.0	17.0	20.0

(i) Construct a graph of the data in Table 1.1.
Use the same axes for both sets of data.



[5]

(ii) After boiling for 10 minutes only about one third of the vitamin C remained in the cabbage leaves.

Use your graph to find the time at which the vitamin C content in cabbage had fallen to half.
Show your working.

Half of the vitamin C content = 25 mg per 100 g

From graph, 25 mg per 100 g is at 3 minutes.

answer 3 minutes [2]

(iii) Describe the changes in vitamin C content of the cabbage and the water during the 10 minutes.

in cabbage The vitamin C content of the cabbage decreases in an increasing time.

in water The vitamin C content of the water increases initially and slowly decreases in an increasing time.

[4]

(c) To extend this investigation, some students wanted to compare what happens to the vitamin C in a sample of fresh cabbage leaves when they were cooked in oil, safely, instead of water.

Describe **four** factors that would need to be kept the same to make a fair comparison.

Type of cabbage leaves, mass of cabbage leaves, time taken to calculate the ~~content~~ vitamin C content and type of ~~water~~ oil used.

[4]

(d) Suggest **two** ways of improving the method used in these investigations.

Use the same ~~mass of vitamin~~ type cabbage vitamin C and ~~use~~ water, set up the experiment again to calculate the ~~lasting time~~ vitamin C content in a same duration of time.

[2]

[Total: 21]

Examiner comment – grade C

(a) The candidate's labelling lines in **(a)(i)** indicated an understanding that the cell membrane was represented by the inner of the two single lines and correctly identified a chloroplast. The information about osmosis given in **(a)(ii)** does not relate to possible changes in the membrane caused by boiling. That chlorophyll was able to pass through it, out of the cell and into the water indicates that the partially permeable membrane must have become permeable, but this was not suggested.

Mark awarded = 2 out of 4

(b) The line graph drawn in **(b)(i)** had the independent variable, boiling time/min, plotted on the x axis with the dependent variable, vitamin C/mg per 100 g, on the y axis and both axes were fully labelled. The linear scale chosen for the y axis did not make optimum use of the grid provided. All the points plotted were clearly visible and correct, the lines drawn were clean and correctly identified as 'cabbage' or 'water'. The method of working for **(b)(ii)** was shown in writing and on the graph and the reading was correctly taken and expressed. In **(b)(iii)**, the decrease in the vitamin C content of the cabbage was correct but that it happened at a faster rate initially then more slowly was omitted. The vitamin C content of the water did increase, up to a maximum level or for a certain period of time, which was not stated, after which the level then began to fall.

Mark awarded = 8 out of 11

(c) The candidate recognised three of the variables in this investigation that should be controlled.

Mark awarded = 3 out of 4

(d) Repeating what had been done before would not improve the method. Repeating the investigation would only be an improvement if the means of the results from the different investigations were calculated, making the results more reliable.

Mark awarded = 0 out of 2

Total mark awarded = 13 out of 21

Example candidate response – grade E

1 Fresh food is often cooked before it is eaten.

Fig. 1.1 shows a fresh living green plant cell before cooking, as seen under a microscope.

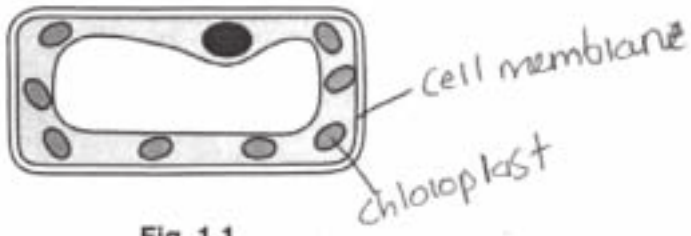


Fig. 1.1

(a) (i) On Fig. 1.1, label the cell membrane and a chloroplast. [2]

Some green cabbage leaves were cut into small pieces and placed in **clean** water and then boiled for 10 minutes. After that time the water was green.

(ii) Suggest how the membranes may have been changed by boiling to cause the water to become green.

The concentration, in water must have been so high, causing the green plant cell, to lose it's turgidity to the water, causing the water, to turn green. Another reason can be the temperature of the boiling water, must have been above optimum temperature, causing the membranes, to ~~lost~~ lose their turgidy, and make the water turn green [2]

(b) An investigation was carried out to discover what happens to the vitamin C in cabbage leaves during cooking.

100 g of fresh cabbage leaves were cut up, placed into boiling water and left to continue boiling for 10 minutes.

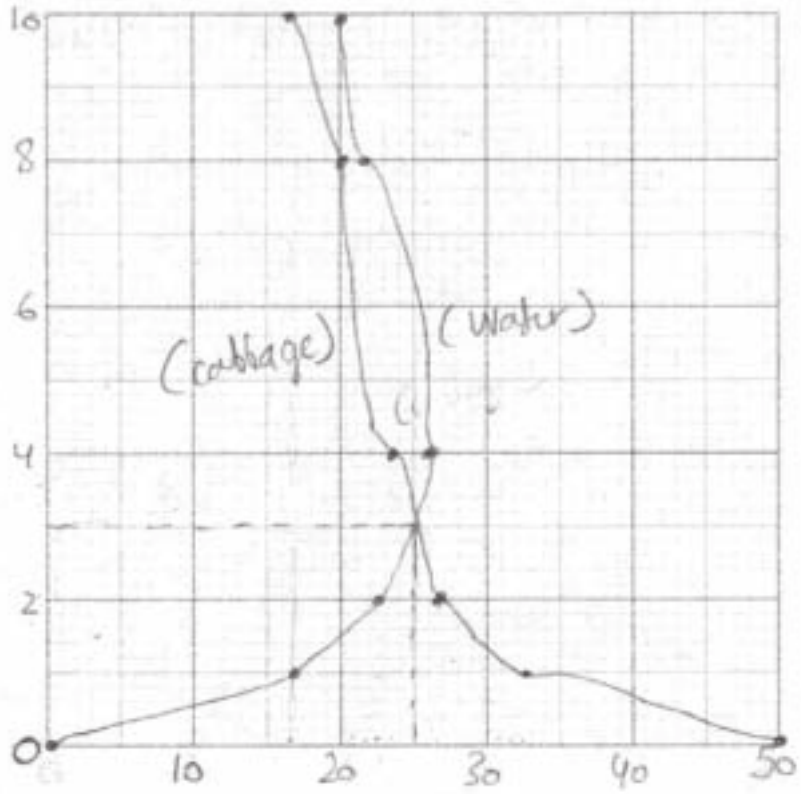
Samples of cabbage leaves and of the water they were boiled in were taken at intervals, cooled, and the vitamin C content was measured.
There is no vitamin C in clean water.

These measurements are shown in Table 1.1.

Table 1.1

boiling time / min (y axis)	vitamin C / mg per 100 g	
	cabbage (x axis)	water (x axis)
0.0	50.0	0.0
1.0	33.0	17.0
2.0	27.0	23.0
4.0	24.0	26.0
8.0	20.0	22.0
10.0	17.0	20.0

(i) Construct a graph of the data in Table 1.1.
Use the same axes for both sets of data.



[5]

(ii) After boiling for 10 minutes only about one third of the vitamin C remained in the cabbage leaves.

Use your graph to find the time at which the vitamin C content in cabbage had fallen to half.
Show your working.

Since, the total vitamin C/mg per 100g is 50, the half is 25, and it touches the graph at 3 minutes, so the answer is 3 minutes

answer 3 minutes [2]

(iii) Describe the changes in vitamin C content of the cabbage and the water during the 10 minutes.

in cabbage The vitamin C, content of the cabbage decreases ~~decreased~~ as the time increased.

in water The vitamin C, content of the water increases, as the time increases.

[4]

(c) To extend this investigation, some students wanted to compare what happens to the vitamin C in a sample of fresh cabbage leaves when they were cooked in oil, safely, instead of water.

Describe **four** factors that would need to be kept the same to make a fair comparison.

The temperature, should be kept constant.
The mg per 100g, should be kept equal, of Vitamin C.
~~Their, should be small differences between~~
The amount of oil, should be in equal, ~~the~~ amount.
The number of cabbage leaves, should be the same.

[4]

(d) Suggest **two** ways of improving the method used in these investigations.

Investigations, can be improved by keeping the temperature constant. Use an extra apparatus or anything, Suitable for such investigations for Control.

[2]

[Total: 21]

Examiner comment – grade E

(a) The candidate's labelling lines in **(a)(i)** indicated an understanding that the cell membrane was represented by the inner single line and correctly identified a chloroplast. The candidate's answer to **(a)(ii)** did not relate to possible changes in membrane structure; osmosis and turgidity are irrelevant here. The water turned green because chlorophyll was able to leave the cell showing that the partially permeable membrane, which normally prevents this, must have been damaged by boiling.

Mark awarded = 2 out of 4

(b) In **(b)(i)** the candidate did not plot the independent variable, boiling time/min, on the x axis with the dependent variable, vitamin C/mg per 100 g, on the y axis, or fully label either axis. Good-sized linear scales were used making optimum use of the grid, all the points plotted were visible and correct, but the lines drawn were not sufficiently smooth. Those lines were correctly identified as 'cabbage' and 'water'. The method of working for **(b)(ii)** was shown and the reading was correctly taken and expressed. In **(b)(iii)** the candidate correctly stated that the vitamin C content of the cabbage decreased with time but did not note that the decrease was faster at first then slower. For the vitamin C content of water the overall statement that it increased could not be credited; it did increase up to a certain point but then it decreased.

Mark awarded = 6 out of 11

(c) The candidate showed some understanding of how the variables should be controlled in this investigation, but used 'amount' instead of 'volume' and 'number' instead of 'mass'. It was assumed, incorrectly, that the word 'constant' means that, e.g. that two samples were heated to the same temperature. However, it could mean that one sample was kept at 100 °C (constantly) throughout the investigation while the other was kept (constantly) at 50 °C.

Mark awarded = 0 out of 4

(d) Ways of improving the investigation's method in **(d)** were not recognised, e.g. taking readings at regular intervals or more frequently within the 10 minutes.

Mark awarded = 0 out of 2

Total mark awarded = 8 out of 21

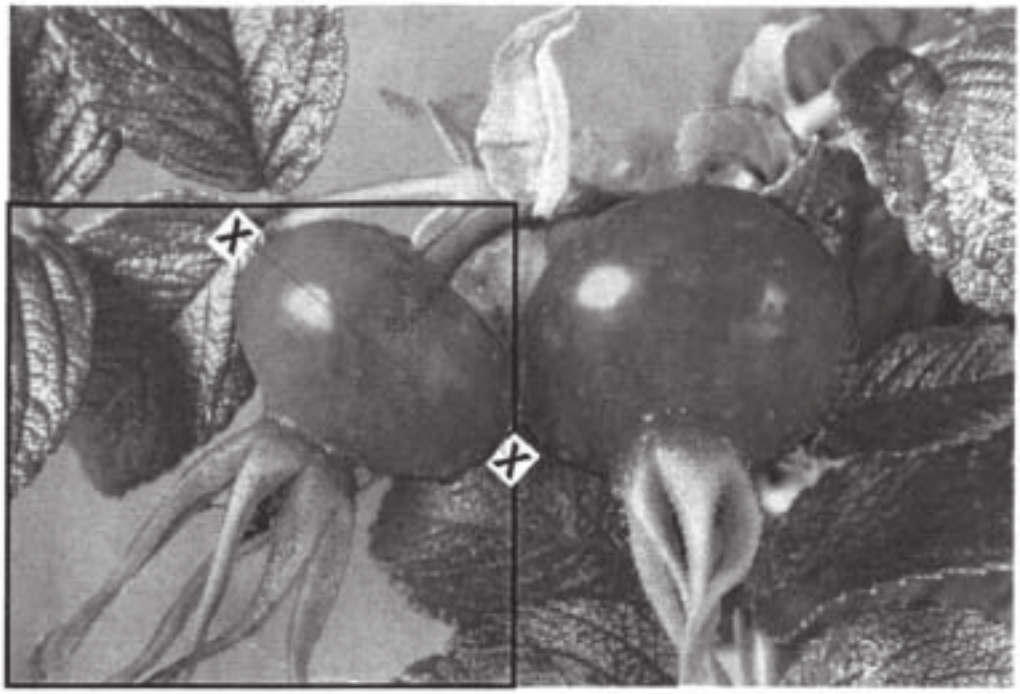
Question 2

Mark scheme

Question	Expected answer	Additional guidance	Mark
2 (a) (i)	only rose hip in 'box' drawn + good size ; body of fruit drawn with clear continuous outline + line delimiting body of fruit and sepals + no shading anywhere ; top of fruit flattened + body of fruit wider than high ; at least 4 sepals realistically shaped, all longer than the depth of the fruit ; a sepal correctly labelled ;	at least 70 mm at widest **R** any leaves etc. drawn / two fruits drawn	5
(ii)	X – X measurement + units ; drawing measurement + units ; formula ; allowance for x2 in Fig. 2.1 ; magnification ;	**A** 41 – 45 mm **A** measurements in cm tolerance ± 1 mm **R** if any units given	5
(iii)	contains seed(s) / **AW**;		1
(b)	thin / aerodynamic / flat / disc-shape ; large surface area (to volume ratio) ;	 **A** large lamina / winged	2
(c) (i)	to avoid competition / overcrowding ; to colonise new areas / increase range ;	**A** idea of competition e.g. if not dispersed new plant will tap nutrients in same soil as parent	 2
(ii)	seeds evenly spread over surface in one + close together in the other dish ; same number of seeds in each dish ; left for same time ; same volume / mass of water (at start) ; same (environmental) conditions given to both ; both dishes covered to prevent loss of water / kept watered ; measurement / comparison of growth ;	**R** different numbers with no reference to spacing **Ig** few / several days **Ig** amount or quantity unless qualified e.g. pH, temperature, light, oxygen	4
		Total	19

Example candidate response – grade A

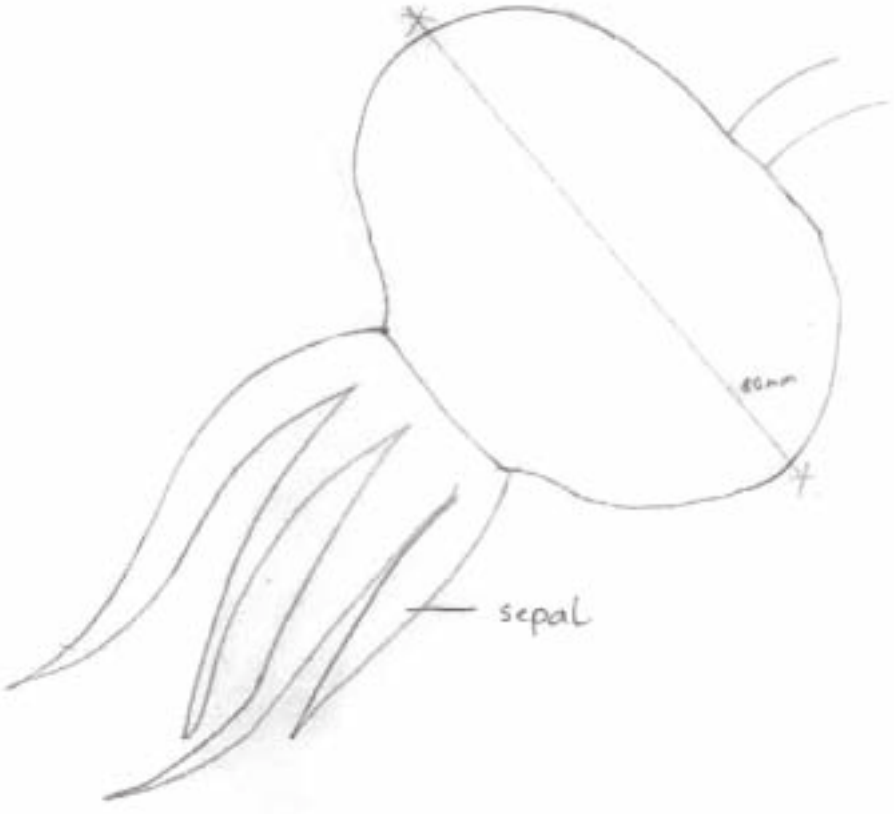
2 Fig. 2.1 shows two rose hips, fruit of the rose.



×2

Fig. 2.1

(a) (i) Make a large drawing of the rose hip shown in the box in Fig. 2.1. Label a sepal on your drawing.



[5]

(ii) Measure the widest part of the rose hip, between **X** and **X** on Fig. 2.1, and record it below.

50mm

Measure the widest part of the rose hip on your drawing and record it below.

80mm

Calculate the magnification of your drawing compared to the actual size of the rose hip.

Show your working.

$\frac{80}{50} \times \frac{2}{1} = 3.2\times$

2 = magnification of picture.

magnification x 3.2 [5]

(iii) Describe how you could practically demonstrate that a rose hip is a fruit.

A fruit is a fertilised ovary. On dissecting the fruit we will see the pericarp (ovary wall and possibly seeds (ovule) inside the fruit as was an ovary. The fact that the rosehip has petals sepals further support this. By observing the internal structures (seed, funicle etc)

[1]

Fig. 2.2 shows fruits from another plant.

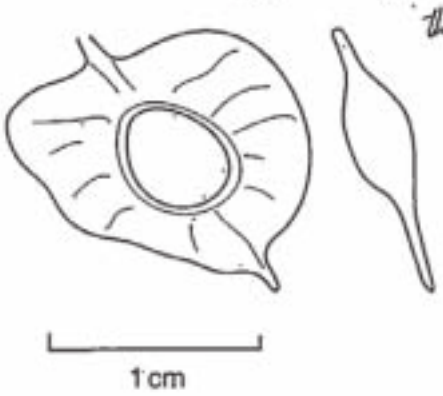


Fig. 2.2

(b) List the physical adaptations that can be seen in Fig. 2.2 that help dispersal of this fruit.

1 Wing like extensions of the seed increase its surface area and buoyancy

2 Is only 1cm long so can easily be carried by wind currents.

[2]

(c) (i) Explain why it is important that fruits are dispersed away from the plant that produced them.

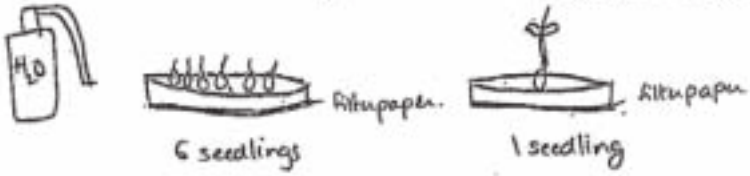
Fruits should be dispersed far away from the parent plant to reduce overcrowding and thus competition for resources. Being dispersed far away helps the plant colonise new areas and breed with different varieties resulting in new plants which are possibly disease resistant and better adapted to surroundings [2]

(ii) You are provided with a packet of seeds, two Petri dishes, two filter papers and water.

Describe how you might use these to investigate the effect of overcrowding on the growth of seedlings.

The petri dishes should be prepared as follows: Both the dishes should be lined with filter paper to create a platform for the seeds and water should be added till the filter paper is damp. (If possible a complete nutrient solution should be used) The same number of drops in each dish. Place 6 seedlings on in the first dish and label it A. Place 1 seeds on the second dish and label it B. Throughout the experiment the temperature should be maintained at 25°C and the dishes should be placed out of direct sunlight to counteract a rise in temperature. The seedling seeds should be observed over [4]

[Total: 19]



a period of 4-6 days from the time they start to germinate. Differences in growth of the seedlings in dish A and B should be observed and recorded. Most probably the seedling in B will grow taller than the seedlings in A.

(Also, the dishes should have been sterilised at the beginning of the experiment to prevent growth of bacteria)

Examiner comment – grade A

(a) The candidate made a good-sized drawing of the rose hip in **(a)(i)** with good proportions and correct label. The lines drawn were clear and clean and no unnecessary shading was used. However, in **(a)(ii)** the distance between X and X had been measured and recorded instead of the measurement of the widest part of the rose hip. The recorded measurements were used correctly to calculate the magnification of the drawing, taking into consideration that the specimen provided had already been magnified ×2. The magnification was expressed correctly. In **(a)(iii)** the candidate recognised that if a structure is a fruit it will contain seeds.

Mark awarded = 10 out of 11

(b) The candidate recognised that the large surface area of the fruit could aid its dispersal. However, its size alone would not, as suggested, aid its dispersal; it would need also to be light - and that cannot be determined from the drawing.

Mark awarded = 1 out of 2

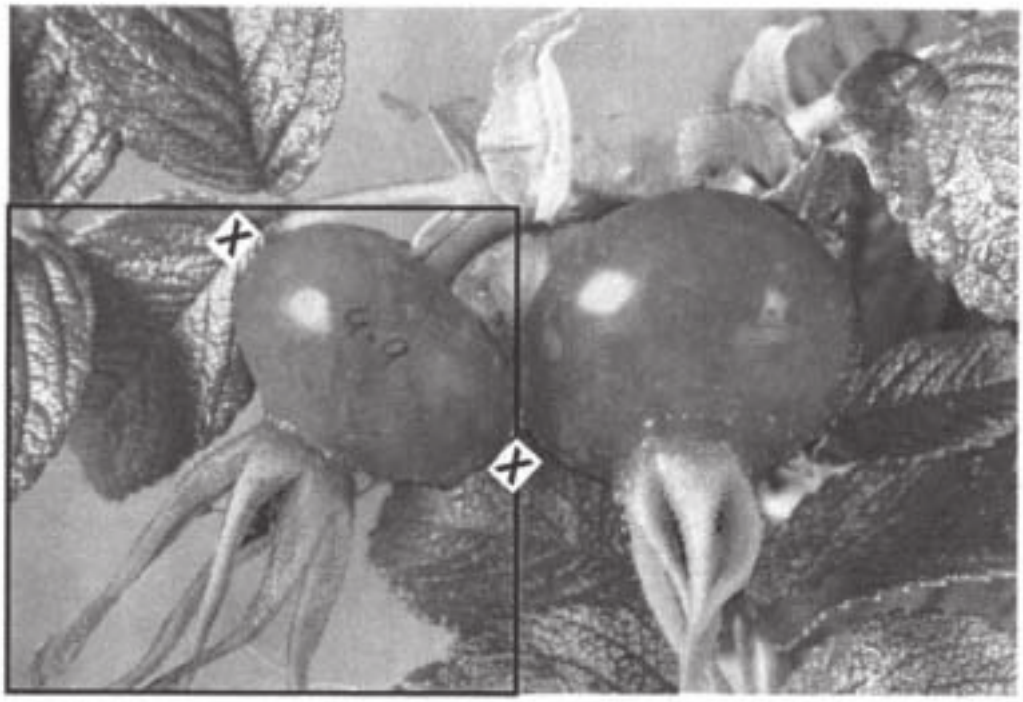
(c) An understanding of the importance of fruit dispersal in preventing overcrowding and making colonisation of new areas possible was shown in **(c)(i)**. A very good grasp of the principles of designing an investigation was shown in **(c)(ii)** with appropriate variables, e.g. temperature and volume of water, being controlled. The results obtained at the end of the given time were compared in order to reach a conclusion.

Mark awarded = 6 out of 6

Total mark awarded = 17 out of 19

Example candidate response – grade C

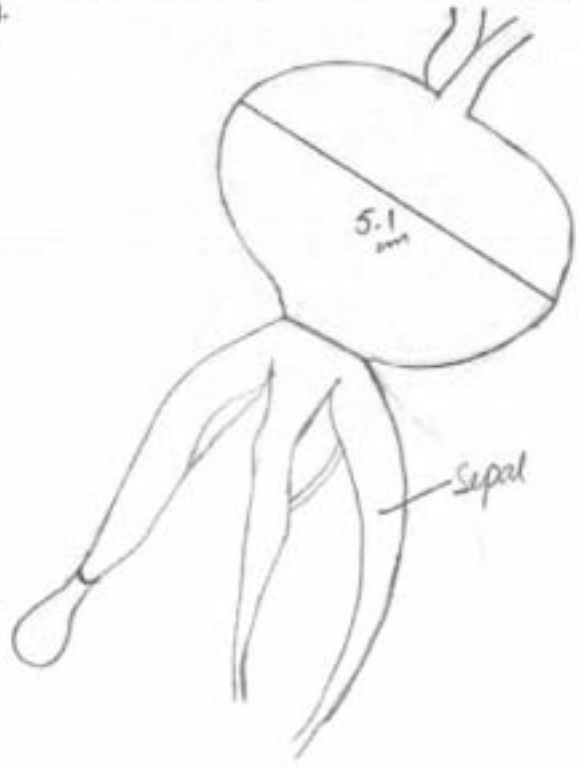
2 Fig. 2.1 shows two rose hips, fruit of the rose.



×2

Fig. 2.1

(a) (i) Make a large drawing of the rose hip shown in the box in Fig. 2.1. Label a sepal on your drawing.



[5]

(ii) Measure the widest part of the rose hip, between **X** and **X** on Fig. 2.1, and record it below.

4.9 cm

Measure the widest part of the rose hip on your drawing and record it below.

5.1 cm

Calculate the magnification of your drawing compared to the actual size of the rose hip.

Show your working.

$\frac{4.9}{2} = 2.45$ Magnification = $\frac{5.1\text{ cm}}{2.45}$

magnification × 2.1 times [5]

(iii) Describe how you could practically demonstrate that a rose hip is a fruit.

To demonstrate rose hip as a fruit the pollens can be showed and along with the sepals [1]

Fig. 2.2 shows fruits from another plant.

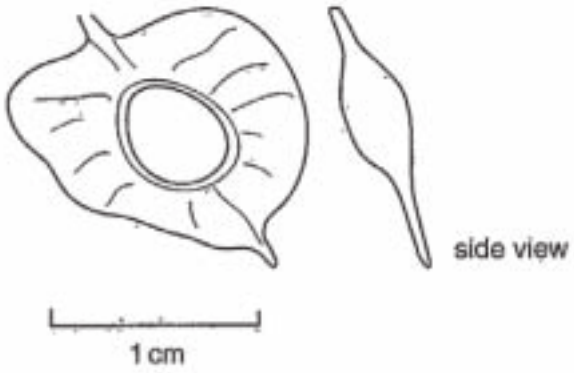


Fig. 2.2

(b) List the physical adaptations that can be seen in Fig. 2.2 that help dispersal of this fruit.

1 It is in the centre of the leave where more insects will come

2 The leaf is thin so that it can be carried with the wind. [2]

(c) (i) Explain why it is important that fruits are dispersed away from the plant that produced them.

It is important for them to be dispersed to avoid any competition for the parent plant as the mineral salts in soil, water and sunlight will have to be shared by both of them the plants. [2]

(ii) You are provided with a packet of seeds, two Petri dishes, two filter papers and water.

Describe how you might use these to investigate the effect of overcrowding on the growth of seedlings.

Equal seeds will be distributed in the petri dishes and less water will be added in one while more water will be added into the other dish. After one day the seeds will be filtered. In the dish with more water all the seeds will be fully grown while in the dish with less water some of the dishes seeds would be grown while the other would be half grown or maybe not even grown. [4]

[Total: 19]

Examiner comment – grade C

(a) The candidate's drawing in **(a)(i)** represented the proportions and shape of the specimen well, delimiting the fruit and the sepals. The lines drawn were clear and clean, no unnecessary shading was used and a sepal was correctly labelled. However, a structure which was not a part of the rose hip was included, too few sepals were drawn and the overall size of the drawing was too small. In **(a)(ii)** the distance between X and X had been measured and recorded instead of the measurement of the widest part of the rose hip. The recorded measurements were used correctly to calculate the magnification of the drawing, taking into consideration that the specimen provided had already been magnified ×2. The magnification was expressed correctly. In **(a)(iii)** the candidate did not recognise that if a structure is a fruit it will contain seeds.

Mark awarded = 7 out of 11

(b) The candidate recognised that the thinness of the specimen might aid its dispersal but does not give a reason for thinking that the structure in the centre might attract insects.

Mark awarded = 1 out of 2

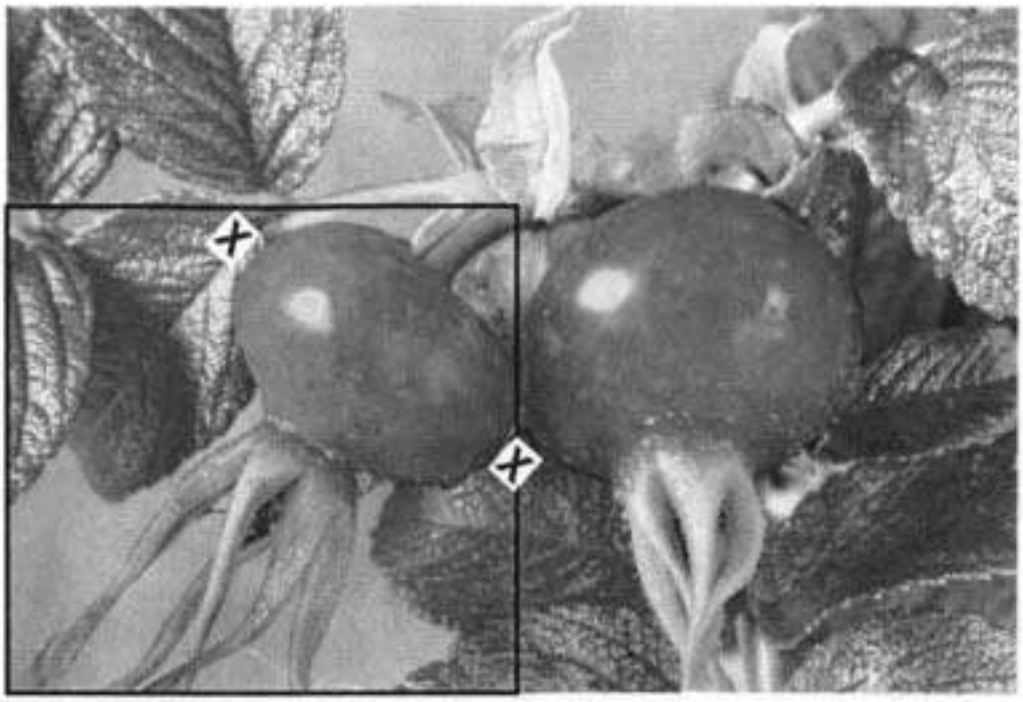
(c) An understanding of the importance of fruit dispersal in preventing competition was shown in **(c)(i)**. That it also makes colonising new areas possible was omitted. In designing an investigation in **(c)(ii)** the need to use similar-sized samples and to compare the samples at the end of the given time was noted. But the method used would not test the effect of overcrowding and the need to control variables, e.g. temperature, volume of water and time, was not recognised.

Mark awarded = 3 out of 6

Total mark awarded = 11 out of 19

Example candidate response – grade E

2 Fig. 2.1 shows two rose hips, fruit of the rose.



×2

Fig. 2.1

(a) (i) Make a large drawing of the rose hip shown in the box in Fig. 2.1. Label a sepal on your drawing.

[5]

(ii) Measure the widest part of the rose hip, between **X** and **X** on Fig. 2.1, and record it below.

6.5 .....

Measure the widest part of the rose hip on your drawing and record it below.

7.1 .....

Calculate the magnification of your drawing compared to the actual size of the rose hip.

Show your working.

$\frac{7.1}{4.5} \times$

magnification × .....[5]

(iii) Describe how you could practically demonstrate that a rose hip is a fruit.

It will contain seeds .....

.....[1]

Fig. 2.2 shows fruits from another plant.

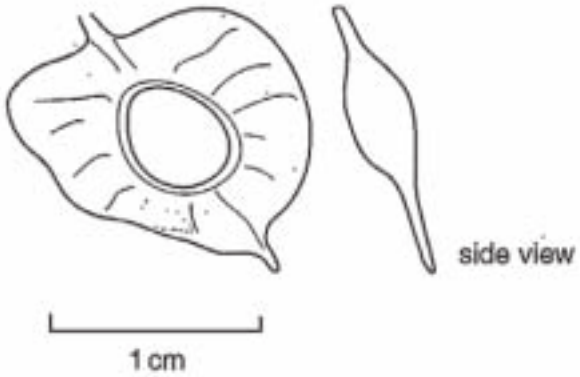


Fig. 2.2

(b) List the physical adaptations that can be seen in Fig. 2.2 that help dispersal of this fruit.

1 Decrease in length .....

2 wind dispersal .....

[2]

(c) (i) Explain why it is important that fruits are dispersed away from the plant that produced them.

It is important that fruits are dispersed away from the plant that produced them because the plants may harm the fruit and cause it to rot, it may decompose. [2]

(ii) You are provided with a packet of seeds, two Petri dishes, two filter papers and water.

Describe how you might use these to investigate the effect of overcrowding on the growth of seedlings.

We will take two Petri dishes, and place equal number of seeds in both the dishes. The amount of water should also be the same. Then filter them. Then we will take different amounts of seeds and water and with the help of filter paper, filter them we will obtain different weights. [4]

[Total: 19]

Examiner comment – grade E

(a) The drawing in **(a)(i)** was large enough but the drawing lines were sketchy instead of clear and clean. The shape of the fruit and the proportions of fruit to sepals were well represented but the label of a sepal was omitted. The measurements taken in **(a)(ii)** were accurate but units were omitted. The measurements were applied correctly to calculate the magnification but the candidate did not take into consideration that the specimen had already been magnified ×2 and did not calculate the magnification itself. The candidate knew, in **(a)(iii)**, that if a structure is a fruit it will contain seeds.

Mark awarded = 5 out of 11

(b) Although the candidate recognised that the fruit might be dispersed by wind, the features that had led to that conclusion were not listed.

Mark awarded = 0 out of 2

(c) The benefits of fruit dispersal in preventing competition and providing opportunities for the colonisation of new areas were not appreciated in **(c)(i)**. In **(c)(ii)**, the need to use the same number of seeds in the two dishes was recognised. 'Amount' of water should be 'volume' of water. There was no reference to keeping other variables, e.g. temperature, the same for both samples or of comparing the growth of the samples after they had both been left for the same period of time.

Mark awarded = 1 out of 6

Total mark awarded = 6 out of 19

Cambridge International Examinations
1 Hills Road, Cambridge, CB1 2EU, United Kingdom
tel: +44 1223 553554 fax: +44 1223 553558
email: info@cie.org.uk www.cie.org.uk