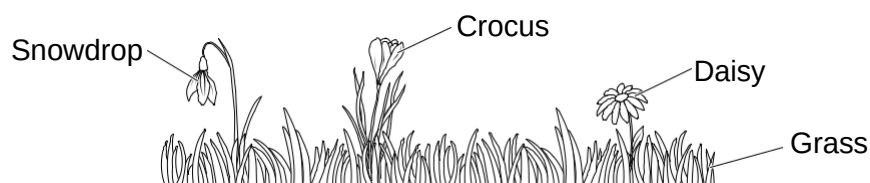


- 2 The diagram shows some different species of flowers that grow in a field.



A student wants to estimate the total number of snowdrops in the field.

They collect data from six small squares of the field.

Small square	1	2	3	4	5	6
Number of snowdrops	5	8	2	9	0	6

- (a)* Describe a method to collect the data in the table.

Include:

- the apparatus needed
- how to use the apparatus on the field
- how to avoid bias in the data.

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[6]

- (b) Use the student's data to calculate the mean number of snowdrops per small square.

Mean number of snowdrops per small square = [2]

- (c) The area of the field is 600 m^2 .

The area of each small square is 0.25 m^2 .

Calculate the number of small squares that fit in the field.

Number of small squares that fit in the field = [2]

- (d) Estimate the total number of snowdrops in the

field. Use the equation:

total number

of snowdrops = mean number of snowdrops $\times$ number of small squares
in the field per small square that fit in the field

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Total number of snowdrops in the field = [1]

- (e) Suggest **one** reason why we can only **estimate** the number of snowdrops in the field from the student's data.

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

- (f) The student thinks their estimate is **not** very close to the true number of snowdrops in the field.

Suggest **one** way to improve the data collection to get a better estimate of the number of snowdrops in the field.

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

- (b) Peas can be used to make meat-free versions of foods such as burgers. However, people don't want these burgers to taste of peas.

Some wild pea plants have a gene that produces flavourless peas.

Put statements **A** to **D** in the correct order to describe how scientists used genetic engineering to add this gene to domesticated pea plants.

- A** Insert the gene into domesticated pea plants.
B Put the flavourless pea gene in a suitable vector.
C Select cells that are modified with the flavourless pea gene. **D**

Isolate the flavourless pea gene.

Write **one** letter in each box.

--	--	--	--

[3]

- (c) Carbon dioxide in the atmosphere is a greenhouse gas.

Explain benefits to the **environment** of growing genetically engineered peas to make meat-free burgers, rather than farming animals and using meat.

Use ideas about carbon dioxide in your answer.

.....

.....

.....

.....

.....

.....

..... [3]

EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.

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Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add a tick to confirm that the work has been seen.
7. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.
8. Award No Response (NR) if:
 - there is nothing written in the answer space

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

9. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

If you have any questions or comments for your Team Leader, use the phone, the RM Assessor messaging system, or email.

10. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

The breakdown of Assessment Objectives for GCSE (9-1) in Biology B:

	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

Question			Answer	Marks	AO element	Guidance
3	(a)		glucose AND digestive ✓ oxygen AND carbon dioxide ✓ urea AND excretory ✓	3	1.1	DO NOT ALLOW reversed order
	(b)	(i)	Any two from: structure A pumps blood to the whole body so needs (more muscle) to pump with higher force/pressure ✓ whereas structure B only pumps blood to the lungs ✓	2	1.1	ALLOW Structure A = 'it' ALLOW around the body IGNORE withstand pressure
		(ii)	blood would flow backwards / the wrong way / into the atrium (when structure A / the ventricle contracts) ✓ less blood would get to the body / blood pressure in the body would be lower ✓	2	2.1	Ensure correct chamber quoted ALLOW other reasonable suggestions of consequences, e.g. body cells/tissues/organs would receive less blood/oxygen/glucose
	(c)		count the number of beats (in the 20 seconds) ✓ multiply by 3 to convert to beats per minute ✓	2	2.2	DO NOT ALLOW "measure pulse rate" (in question stem)
	(d)	(i)	fitness ✓	1	2.2	ALLOW "fit and unfit" DO NOT ALLOW answers that describe the test
		(ii)	age/sex/ethnicity/these variables might affect pulse rate ✓ idea that keeping them the same enables the effect of fitness (alone) to be compared / gives valid conclusion ✓	2	2.2	DO NOT ALLOW "to make it a fair test" without further explanation ALLOW for 2 nd mark "so that fitness is the only variable" oe