

GENERAL CERTIFICATE OF SECONDARY EDUCATION

ENVIRONMENTAL AND LAND-BASED SCIENCE

B681/02

Unit B681: Management of the Natural Environment (Higher Tier)

Candidates answer on the question paper
 A calculator may be used for this paper

OCR Supplied Materials:

None

Duration: 1 hour

Other Materials Required:

- Calculator

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **50**.
- This document consists of **24** pages. Any blank pages are indicated.

For Examiner's Use		
	Max	Mark
1	2	
2	1	
3	3	
4	1	
5	3	
6	3	
7	1	
8	2	
9	2	
10	3	
11	4	
12	2	
13	2	
14	3	
15	6	
16	6	
17	6	
TOTAL	50	

Answer **all** the questions.

1 Growing the same crop on the same piece of land year after year is called monoculture.

Give **two** reasons why monoculture may be bad for the soil.

1

.....

2

..... [2]

2 A gardener digs over a vegetable plot in the autumn.

Lime is then put on the surface of the soil.

This helps improve the growing conditions.

Complete the following statement using words from the list.

Lime acts to soil acidity and provide for plant growth.

decrease

dissolve

calcium

increase

potassium

water

[1]

3 Many organisms live in the soil.

Explain the importance of soil organisms in making nutrients available to plants.

.....

.....

.....

..... [3]

4 What type of weed control is **mulching**?

- A chemical
- B clamping
- C composting
- D cultural

Answer **A, B, C** or **D** [1]

5 This table is to compare the features and plants in two woodland ecosystems in the UK.

	features and plants of deciduous woodland	features and plants of coniferous woodland
features		
trees		
shrubs		

Write the **features**, **trees** and **shrubs** from the lists below into the correct woodland.

features

moss and lichens grow on clay or loam soil rich ground flora
 grow on poor sandy soils canopy lets in 20% of light acidic leaf litter

trees

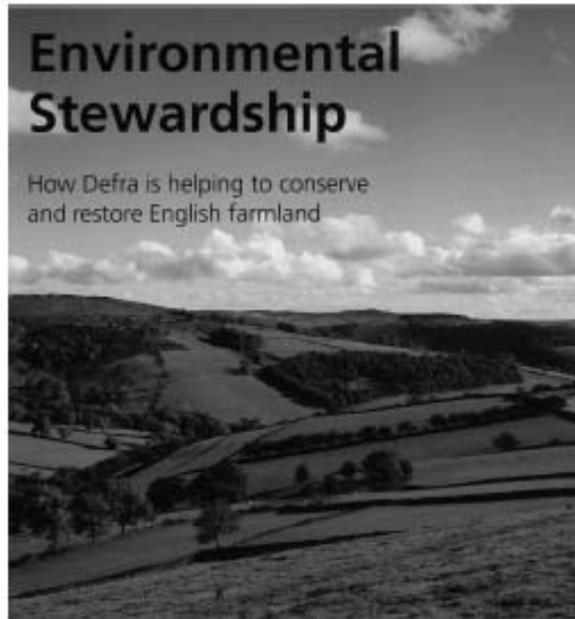
hazel oak pine spruce

shrubs

blackberry bilberry

[3]

6 Farmers are now encouraged to manage their land under the Environmental Stewardship Scheme.



Source: DEFRA, www.defra.gov.uk

State **three different** ways that farmers can manage their land to meet the requirements of this scheme.

- 1
-
- 2
-
- 3
- [3]

7 Clover is a legume.

Legumes are used in crop rotation.

Which is the **best** reason for using legumes in crop rotation?

- A They decrease the humus content of the soil.
- B They decrease the number of pests in the soil.
- C They increase the availability of nitrogen in the soil.
- D They kill weeds growing in the soil.

Answer **A, B, C** or **D**.....[1]

8 Look at the table.

It shows how yield is affected when herbicide is not used, for a range of crops.

crop	percentage (%) of yield lost when herbicide is not used
apples	15
carrots	48
green beans	20
potatoes	32
wheat	25

When growing carrots using herbicide, a farmer has an annual yield of 17 metric tons per hectare. He has three hectares.

What would his total yield be if he did not use herbicides?

.....

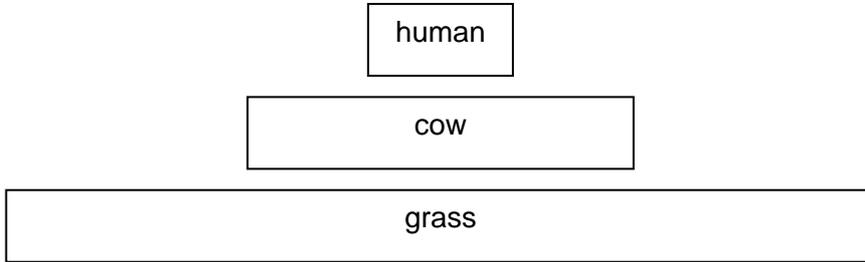
.....

answer metric tons **[2]**

9 Here is a simple food chain.



The food chain can be represented as a pyramid of energy which shows the energy available at each trophic level in a fixed time period.



Explain how intensive agricultural production can change the shape of the pyramid of energy.

.....

.....

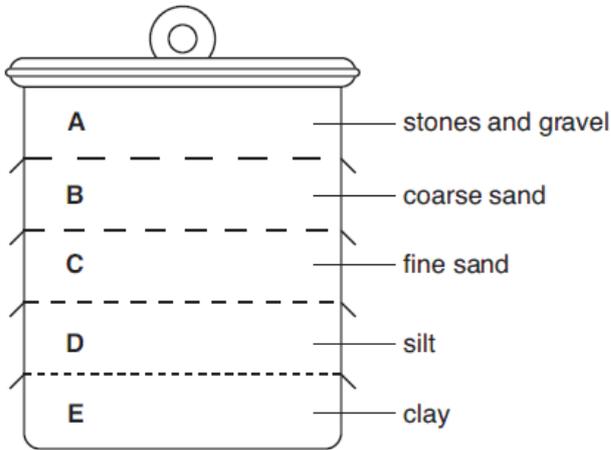
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..... [2]

10 Soil sieves are used to separate the parts of samples of soil taken from two fields.

The drawing shows a section through a set of soil sieves.

The results of sieving 100g of each sample of soil are shown.



	% of each sample	
	field 1	field 2
A	14	5
B	26	46
C	30	39
D	16	8
E	14	2

Suggest how the different soil types in the two fields will affect the way in which the land is used.

.....

.....

.....

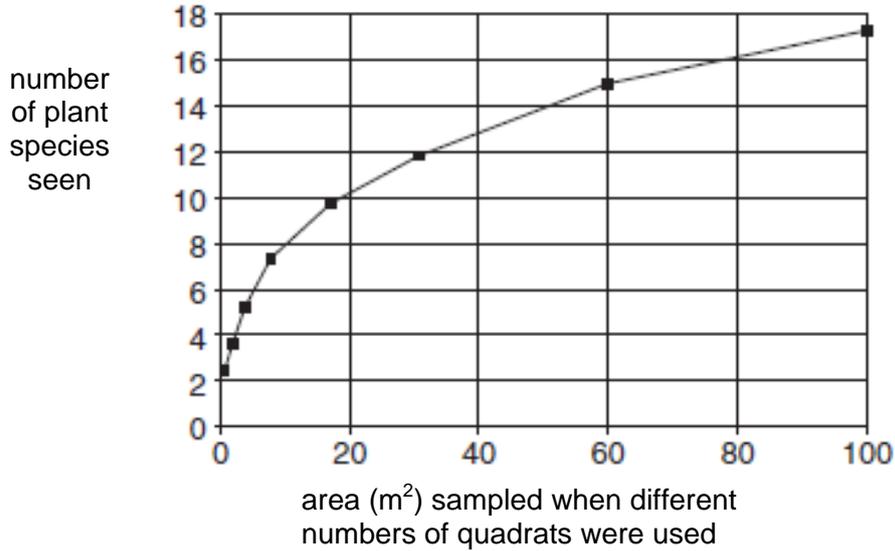
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..... [3]

11 Plant species on a roundabout in a new town were sampled by the random placing of 1m² quadrats. The number of species seen in each quadrat was counted.

(a) The graph shows the number of plant species seen when different numbers of quadrats were used.



If you were repeating this survey, does the graph help in deciding how many quadrats you would use?

Explain your answer.

.....

.....

.....

..... [2]

- (b) A theory in ecology states that biodiversity is greater in many small areas than in one large area of the same total size.

The table compares the number of insect species found in two large nature reserves with the number of species found on the many roundabouts in the new town.

site	total area in m ²	insect species on trees	insect species on grass	total insect species
Millpond Park nature reserve	68 681	32	13	45
Bill Hill nature reserve	43 574	28	10	39
small roundabouts	51 504	67	38	101

Does the data in the table support the theory?

Explain your answer.

.....

.....

.....

..... [2]

12 The photographs show an artificial ecosystem (a garden) and a natural ecosystem (a woodland).



Explain why biodiversity is much greater in the woodland than in the garden.

.....

.....

.....

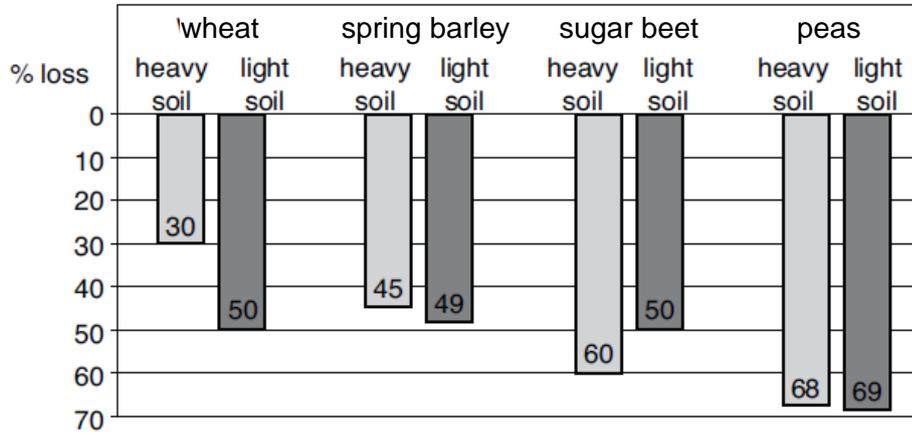
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.....

..... [2]

13 Soil compaction reduces crop yields.

The bar chart compares the percentage loss of yield in four crops when grown in heavy and light soils which have been compacted.



State **two** conclusions the data shows about crop yields in heavy and light soils which have been compacted.

1

.....

2

..... [2]

14 The photograph shows a glasshouse which is used for intensively growing crops all year round.



Explain the advantages of using ICT to control the environment of the glasshouse.

.....

.....

.....

.....

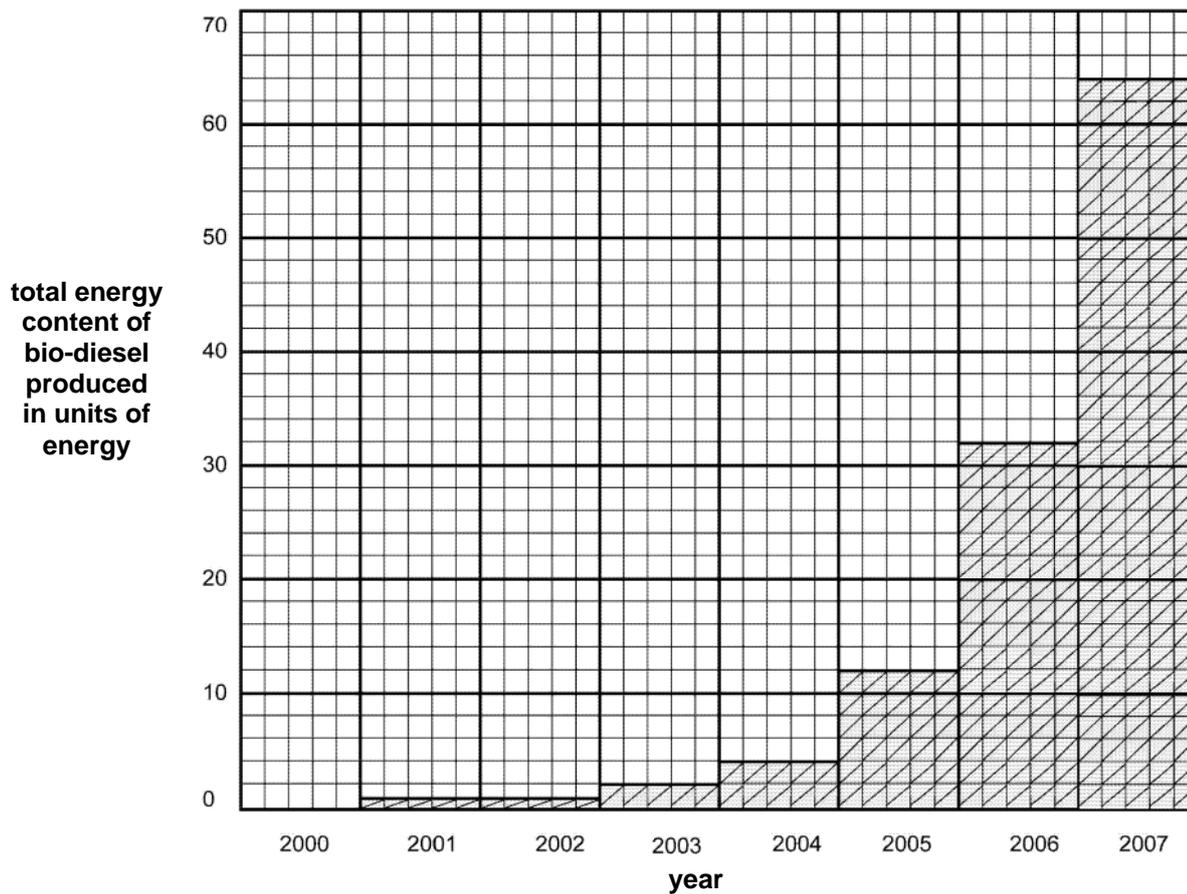
.....

.....

..... [3]

16 Look at the bar chart.

It shows the total energy content of the bio-diesel produced each year since the year 2000.



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ENVIRONMENTAL AND LAND-BASED SCIENCE

Unit B681: Management of the Natural Environment (Higher Tier)

B681/02

MARK SCHEME

Duration: 1 hour

MAXIMUM MARK 50

Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:
 - / = alternative and acceptable answers for the same marking point
 - (1) = separates marking points
 - not/reject** = answers which are not worthy of credit
 - ignore** = statements which are irrelevant - applies to neutral answers
 - allow/accept** = answers that can be accepted
 - (words) = words which are not essential to gain credit
 - words = underlined words must be present in answer to score a mark
 - ecf = error carried forward
 - AW/owtte = alternative wording
 - ORA = or reverse argument

Eg mark scheme shows 'work done in lifting/(change in) gravitational potential energy' (1)

- work done = 0 marks
- work done lifting = 1 mark
- change in potential energy = 0 marks
- gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

Eg

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in
the two correct
boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be
worth 0 marks.

Put ticks (✓) in
the two correct
boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be
worth one mark.

Put ticks (✓) in
the two correct
boxes.

<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be
worth one mark.

7. The list principle:

If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

8. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

Question		Expected answer		Marks	Additional guidance
1		two from: reduces fertility if no improvement done removes particular nutrients (named) for (named crop) removes nutrients from one depth damages soil structure as organic material decreases – leading to faster erosion build up of pests / diseases associated with one crop more likely		[2]	allow requires more fertiliser
2		increase calcium		[1]	both needed for 1 mark
3		three from: dead plants / animal waste unavailable to plants so detritivores increase surface area for decay by decomposers which ingest / break down organic materials into soluble nutrients soluble nutrients within soil water can be absorbed by plants		[3]	answers must be linked in order to gain full credit; they must link action of organisms to increasing solubility of nutrients and should be in the order specified
4		D - cultural		[1]	
5		grow on clay or loam soil canopy lets in 20% of light rich ground flora hazel oak blackberry	grow on poor sandy soils acidic leaf litter moss and lichens common pine spruce bilberry	[3]	6 lines correct = 3 marks 5 or 4 lines correct = 2 marks 3 or 2 lines correct = 1 mark

Question	Expected answer	Marks	Additional guidance
6	three from: 'set-aside' (OWTTE) on land protection of historic features / dry stone walling do not remove hedges / hedge laying / not trimming in the breeding season / do not apply chemicals close to the hedge example of management technique for soil / grassland / pasture (for biodiversity / wildlife) example of management technique for trees / woodland (for biodiversity / wildlife)	[3]	
7	C – increase availability of nitrogen	[1]	
8	$(17 \times 0.52) = 8.84$ $(8.8 \times 3) = 26.5$ (metric tons)	[2]	accept any valid calculation 2 marks for the correct answer
9	idea that intensive production increases efficiency of energy transfer / reduces losses between trophic levels so pyramid is steeper / steps on the pyramid are shallower	[2]	answers must be linked in order to gain full credit; they must link idea of efficiency of energy transfer to the change in shape of the pyramid and should be in the order specified accept appropriate diagram

Question	Expected answer	Marks	Additional guidance
10	field 2 has a sandy soil and field 1 a loam and one of: larger particles in field 2 / sandy soil means it does not retain water / nutrients ora sandy soil / field 2 warms up more quickly ora so loam / field 1 can be used to grow most plants but field 2 / sandy soils are more limiting / good for root vegetables / good for early crops	[3]	answers must be linked in order to gain full credit; they must link identification of soil type with the characteristics and then the uses
11 (a)	because the graph is still rising between 6 and 10 quadrats / more species continue to be found when more quadrats are used so more than 10 / idea that the graph will level out and this is the number which should be used	[2]	no mark for yes / no, explanation must support decision in order to gain full credit
(b)	the total area of all the roundabouts was similar to Millpond / Bill Hill / less than Millpond yet over twice the number / many more insect species were recorded	[2]	no mark for yes answer must link same total area to larger number of species in order to gain full credit
12	because more varied / greater number of habitats (in woodland) ora and so greater variety of organisms / range of species present	[2]	allow examples of habitats answers must be linked in order to gain full credit; they must link numbers / range of habitats to variety of organisms and should be in the order specified
13	two of: compaction has more effect on light soils, except for sugar beet wheat is least affected by compaction in heavy soils spring barley is least affected by compaction in light soils compaction affects peas the most / very badly and equally for both heavy and light soils	[2]	

Question	Expected answer	Marks	Additional guidance
14	<p>ideas of constantly collecting data / monitoring environment and making adjustments to controls so idea of environmental conditions maintained within very close parameters / less variation in conditions so, one of: maximise plant growth / productivity saving on fuel / energy to heat / light glasshouse reduction of labour costs / no need to employ people to manage systems data collected can be used in future planning</p>	[3]	<p>allow examples of conditions monitored allow examples of controls</p> <p>answers must be linked in order to gain full credit; they must link idea of constant monitoring and adjusting conditions to idea of lack of variation in conditions and the advantages of this, and should be in the order specified</p>

Question	Expected answer	Marks	Additional guidance
15 	<p>[level 3] Thorough answer of how crops are genetically modified. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[level 2] Partial answer applying limited knowledge of how crops are genetically modified. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[level 1] Identifies a few aspects of the stages of genetic modification. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the information. (1 – 2 marks)</p> <p>[level 0] Insufficient or irrelevant information. Answer not worthy of credit. (0 marks)</p>	[6]	<p>relevant points include:</p> <ul style="list-style-type: none"> • Identification of a plant with the desired characteristic e.g. disease and pest resistance, hardiness, shape, size and colour. • Isolation of the gene responsible for the characteristic and cutting it out of the plant's DNA. • Attaching of the gene to a carrier (a piece of bacteria DNA) to enable its insertion into the plant cell. • Insertion of this gene package (gene/carrier/switch) back into the bacterium and letting it reproduce so that multiple copies of the gene are produced. • Insertion of the gene package into the plant by attaching it to tiny gold or tungsten particles and firing these into the plant cell or by using a soil bacterium (<i>Agrobacterium tumefaciens modified to make it inactive</i>) to take it into the plant when it infects the plant. • Growing of the plant tissue that has taken up the new gene into full-grown plants. • Testing of the new plants by growing them and letting them go to seed then planting those seeds to make sure the new gene is producing the desired characteristics.

Question	Expected answer	Marks	Additional guidance
16 	<p>[level 3] Describes the trends in detail including rate of increase, giving reasons for the changing rate and explaining a range of implications of changing land use. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[level 2] A partial description of the trends, recognising that growing biodiesel meets energy needs and that this could result in decreased food production. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[level 1] Identifies that production has increased and because biodiesel provides an alternative energy resource. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the information. (1 – 2 marks)</p> <p>[level 0] Insufficient or irrelevant information. Answer not worthy of credit. (0 marks)</p>	[6]	<p>relevant points include:</p> <ul style="list-style-type: none"> • production of biodiesel is increasing • increase is more rapid in later years / not a steady increase • biodiesel can be used as an alternative fuel to provide energy • growth of biodiesel will help meet future energy needs • fossil fuels are a limited resource so the need to provide alternatives leads to an increase • technology improving allowing greater use of / greater demand for biodiesel fuel • land no longer used for growing food crops • less food produced / nationally not producing enough food • as more land used to grow biodiesel decreases dependence on fossil fuels on a national level • a lot of land is required to grow sufficient crops so this is unlikely to meet all national energy needs

Question	Expected answer	Marks	Additional guidance
17 	<p>[level 3] Thorough answer applying knowledge of weathering, deposition and importance of plants and animals to explain the formation of the landscape. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[level 2] Partial answer applying limited knowledge of weathering, deposition and importance of plants and animals to explain the formation of the landscape. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[level 1] Identifies the roles of weathering, deposition and living organisms in the formation of the landscape. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the information. (1 – 2 marks)</p> <p>[level 0] Insufficient or irrelevant information. Answer not worthy of credit. (0 marks)</p>	<p>[6]</p>	<p>relevant points include:</p> <ul style="list-style-type: none"> • limestone is a soft rock / dissolves in water / rainfall • chemical and physical weathering on the sides of the valley due to water / ice / wind • river flows creates a channel / v-shaped valley • deposition / particles deposited from river in base of valley / where water moves more slowly • creates soil when mixed with organic matter / humus • plants and animals die and decay, adding organic matter making soil productive / fertile • trees and other vegetation on valley sides help to stabilise the ground / prevent further erosion
Total		[50]	

Assessment Objectives (AO) Grid

(includes quality of written communication )

Question	AO1	AO2	AO3	Total
1	2			2
2	1			1
3	3			3
4	1			1
5	3			3
6	3			3
7	1			1
8		2		2
9	1	1		2
10		3		3
11(a)			2	2
11(b)			2	2
12		2		2
13		2		2
14	1	2		3
15 	6			6
16 		6		6
17 		6		6
Totals	22	24	4	50

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