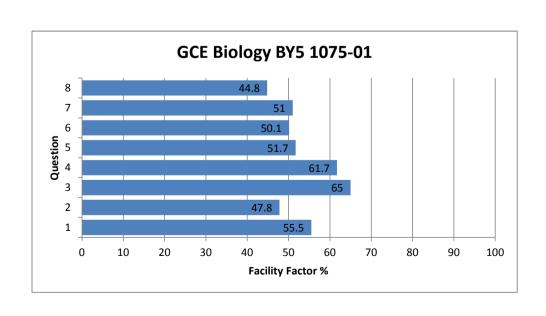


WJEC 2014 Online Exam Review

GCE Biology BY5 1075-01

All Candidates' performance across questions

?	?	?	?	?	?	?	
Question Title	N	Mean	SD	Max Mark	F F	Attempt %	
1	5207	4.4	1.9	8	55.5	99.9	
2	5207	2.9	1.5	6	47.8	99.9	
3	5211	5.2	1.6	8	65	100	
4	5210	6.8	2.5	11	61.7	99.9	1 .
5	5192	6.2	3.1	12	51.7	99.6	\leftarrow
6	5207	6	2	12	50.1	99.9	\leftarrow
7	5202	6.6	2.8	13	51	99.8	<u> </u>
8	5194	4.5	2.1	10	44.8	99.6	`



- 5. The techniques of recombinant DNA technology and micro-propagation are used to produce Genetically Modified Crops. The following summary is adapted from an account given on the Food Standards Agency's web site [www.food.gov.uk]
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 - 7. The plant tissue is put into a selective growth medium so that only modified tissue develops into plants.

(a)	Explain how different types of enzymes are used in stages 2 and 3 to produce the 'g package'.	gene [4]
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•••••		
•••••		

(1075-01)

(b)	Desc from	cribe the steps involved in the culture of a large number of genetically identical plants the plant tissue produced in stage 7. [3]
(c)	(i)	Explain the advantage to farmers of having crops resistant to 'Roundup'. [3]
	(ii)	Explain why environmentalists might have legitimate objections to using GM crops resistant to 'Roundup'. [2]

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 [4]

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prosmid bacoon

(b) Describe the steps involved in the culture of a large number of genetically identical plants from the plant tissue produced in stage 7.	Ť
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(c) (i) Explain the advantage to farmers of having crops resistant to 'Roundup'. [3]	
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ku crops can grow & farmers	
can apply revolved mouring a	
higher yield as accent effect CTOP	
(ii) Explain why environmentalists might have legitimate objections to using GM crops resistant to 'Roundup'. [2]	
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containinating rear by rivers	
laves, washed down. This deaxygoldes)
water therefore containinated Jish	
ound bounds that steed from rivers	
cousing death.	12

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(a)

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LE LA CORRE DISCO CON CONTRA PRIMARIO	
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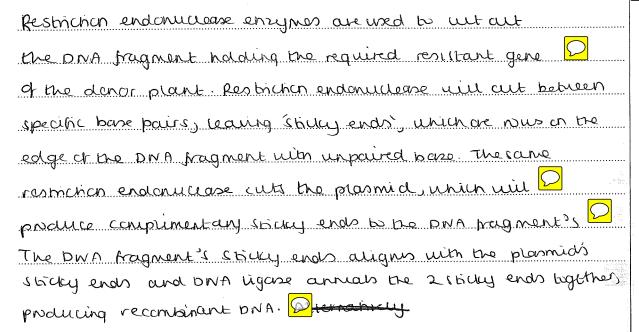
Examiner

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Restriction endonucease enzymes are used to cut out
the DNA fragment holding the required resultant gene
of the donor plant. Restriction endonullegre will cut between
specific base pairs, leaving stilly ends, which are now on the
edge of the DNA fragment with unpowed bero. The came
restriction endonucease cuts the plasmid, which will
produce complimentary source ends to be DNA pagment's
The DWA fragment's Sticky ends aligns with the plannid's sticky ends and DWA ligare annuals the 2 sticky ends bythers
sticky ends and DIVA ligare annuals the 2 sticky ends togethers
producing recombinant DNA. Alternatively

(b) Describe the steps involved in the culture of a large number of genetically identical plants from the plant tissue produced in stage 7.
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of the short / plant tillue is remeted from the plant tillue priduced
with a steple scalpet. The explant is then subdivided into many
pieces and each piece is placed on a stenle, aerated nutrient
medium ruch as agarietty. A callus will grow, which is a mossich
undifferentiated cells. The calles is subdivided and each piece
placed on a growth medium, and will growint a plantlet
(c) (i) Explain the advantage to farmers of having crops resistant to 'Roundup'. [3]
Farmers can spray roundup on their crops, so
killing off any weeds, while the cope will remain alive
This is economically beneficial to the Furners as they will
produce a larger corp yield due to more corps surving
due to the decrared interspecific competition for fixed and space
that would have been present it the weeds were soulpresent.
(ii) Explain why environmentalists might have legitimate objections to using GM crops resistant to 'Roundup'. [2]
The resilitant gene to mundup may pass onto closely
related species of plants or needs. This may mean that
supervisors are produced unith will be respiciale resultant
The GM cops may have an effect on the number of organic form as the cops may be come undifferentiable.

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Examiner only

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'cut out' the derived gent it does this by cutting up	
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enzyme is used to cut open the planned 150 the two DNA	
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by their mandentout clickly ands.	

(a)

(b) Describe the steps involved in the culture of a large number of genetically identical plants from the plant tissue produced in stage 7. [3]
Small cuttings of tohipotentent cells are a placed in a
sterile notablet medium They are called explants. There
explants then divide to join a large man of undifferentiate
celle called a callus. This callus is split up and grown
with some certain apowth factors which cause the cells to
différentiate into plantlets. Once of a sufficient size, there are placed in strike soil and are allowed to opow. Continued
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d interspecific competition wou be minuel. The crops therefore
correcte have to complete len with other species, so can only have more available number, water and light open you healthick and shonger, producing a greater crop yield for the
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cross-pollinate with undestrable were species,
couring them to be revisitore to the herbicial to by specific compellion
Also, it is unknown whether this poreign DNA could be toxic
near organic farms, the organic status of the farm may be compromined by cross-pollination between the two groups I batches of coops.

0.(4)	A selective growth realism is well, which only
	allows those plant cells that here taken up the
	recombinant planned to divide. This medium could
	contain the herbicide Round-up as then only the

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enzyme used in stage 3 cs DNA ligone. Their splices the DNA containing the gene into the planning It anneals the		
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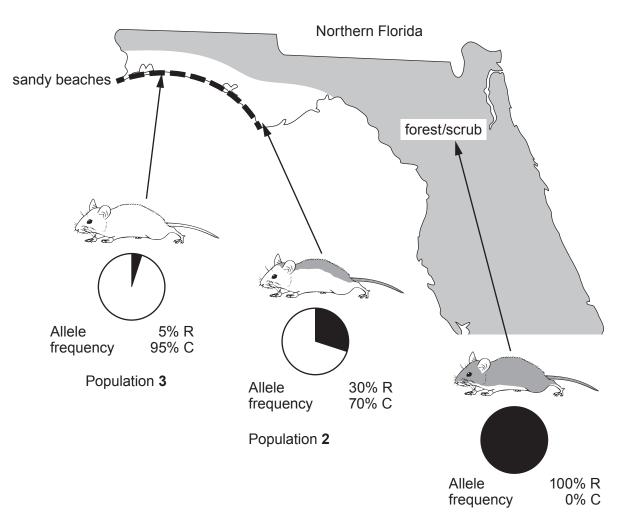
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- A species of mouse Peromyscus polionotus found in Florida, USA, has a number of different coat colours. Coat colour in mice is controlled by several genes. Dark fur is produced when the hair producing cells secrete a pigment called eumelanin. A high level of eumelanin is produced when a transmembrane protein called MC1R is stimulated by a hormone.
 - The diagram below shows part of the amino acid sequence of MC1R, part of the sequence

		ne for MC1R and how it might change to produce light fur:
Original		
Amino acio	d sequence	Ile Thr Lys Asn Arg Asn Leu His Ser
Nucleotide (allele R)	sequence	ATCACCAAAAACCGCAACCTGCACTCG
Changed t	to produce light	fur
Amino acio	d sequence	(Ile Thr Lys Asn Cys Asn Leu His Ser
Nucleotide (allele C)	sequence	ATCACCAAAAACTGCAACCTGCACTCG
	Describe the cha molecule.	ange in the gene and the subsequent change in the MC1R [2]
	Using the informa fur.	tion provided, explain how this change results in mice with light [2]

(b) This change in the MC1R gene means that there are two alleles, R and C. The map below shows the distribution of the different coloured mice and the relative frequencies of the alleles R and C in each population.



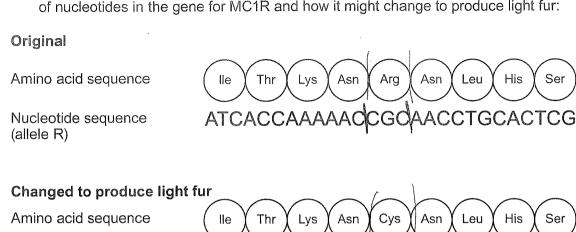
Population 1

	[2]
(ii) Under what circumstance could the difference between the allele frequenci in populations 2 and 3 be explained by genetic drift , despite both living beaches?	

Use the diagram to suggest how fur colour is related to environmental conditions.

		t ion could h	nave cause	d the relativ	e allele fro	equency [4]
Under what species?	circumstances	would the	mouse po	pulation be	come a s	separate
	Shown in pop	Shown in population 3. Under what circumstances	Shown in population 3. Under what circumstances would the	Shown in population 3. Under what circumstances would the mouse po	Shown in population 3. Under what circumstances would the mouse population be	Under what circumstances would the mouse population become a s

- 6. A species of mouse *Peromyscus polionotus* found in Florida, USA, has a number of different coat colours. Coat colour in mice is controlled by several genes. Dark fur is produced when the hair producing cells secrete a pigment called <u>eumelanin</u>. A high level of eumelanin is produced when a transmembrane protein called MC1R is stimulated by a hormone.
 - (a) The diagram below shows part of the amino acid sequence of MC1R, part of the sequence of nucleotides in the gene for MC1R and how it might change to produce light fur:



(i) Describe the change in the gene and the subsequent change in the MC1R molecule. [2]

ATCACCAAAAAQTGCAACCTGCACTCG

Cytosine in original nucleotide squince changes to frymine to There this daanges the code making a different amino acid squere will make a different Potein.

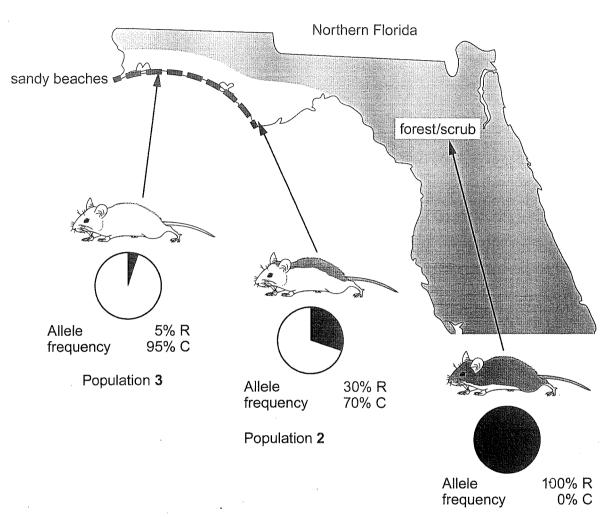
(ii) Using the information provided, explain how this change results in mice with light fur. [2]

with The new/changed protein doesn't secrete the eumelanin prigment due to the transmembrane Protein, MCIR not stimulated by hormore

Nucleotide sequence

(allele C)

This change in the MC1R gene means that there are two alleles, R and C.
The map below shows the distribution of the different coloured mice and the relative frequencies of the alleles R and C in each population.



Population 1

(i) Use the diagram to suggest how fur colour is related to environmental conditions.

[2]

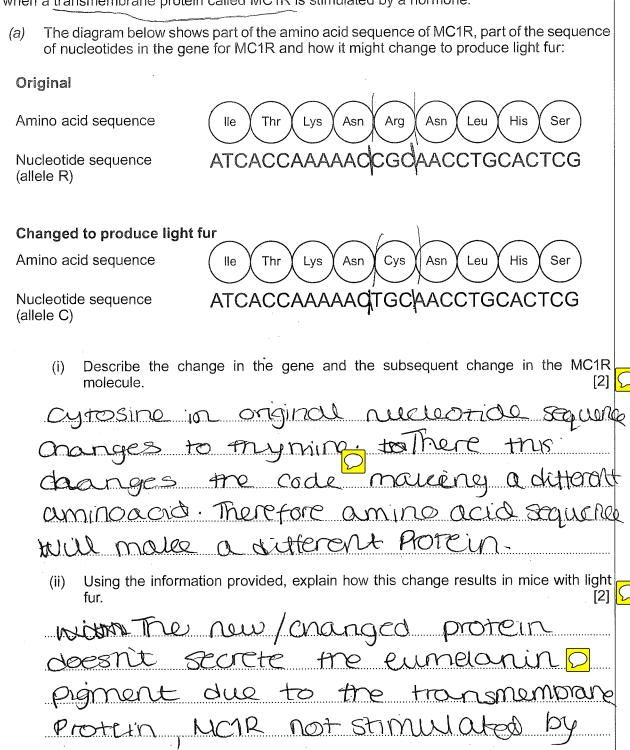
A Lighter Coat Colour is more Likely to SLUVILL ON a Sandy Death than a dark coat as it is less likely to be son. Lighter Coats in Forest is more over as it is less likely to be son. Lighter Coats in Forest is more in populations 2 and 3 be explained by genetic drift, despite both living on beaches?

[1]

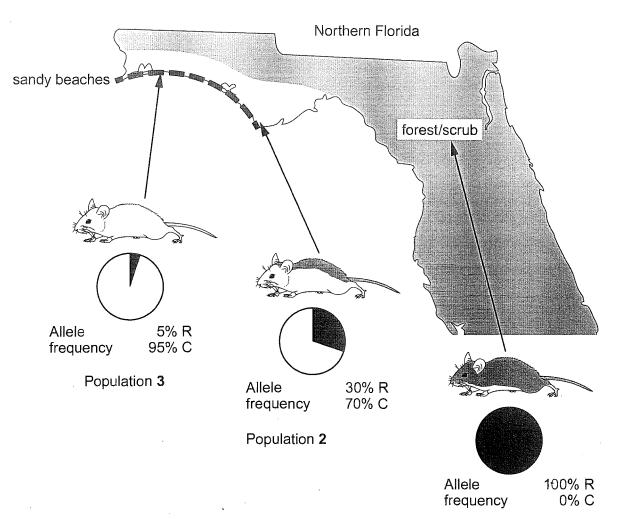
Population 2 and 3 be explained by genetic drift, despite both living on livi

shown in population 3. [4]	
Oark coated môse are more likely	
to sumie in forests as they are	
narder to see by predators.	
Therefore increased dark coat population)
as they reproduce oftspring, passing on	
Ralle any Mice with Callele are	
spotted easily so killed. This is	
oclection pressure.	
(iv) Under what circumstances would the mouse population become a separate species? [1]	
Isolation	

A species of mouse *Peromyscus polionotus* found in Florida, USA, has a number of different coat colours. Coat colour in mice is controlled by several genes. Dark fur is produced when the hair producing cells secrete a pigment called <u>eumelanin</u>. A high level of eumelanin is produced when a transmembrane protein called MC1R is stimulated by a hormone.



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Population 1

(i) Use the diagram to suggest how fur colour is related to environmental conditions.

[2]

A Lighter Gat Glow IS More Lively

to Survive on a Sundy Preun than a

Sark coat as it Is less lively to

be son. Lighter Coats in Forest IS More

(ii) Under what circumstance could the difference between the allele frequencies in populations 2 and 3 be explained by genetic drift, despite both living on beaches?

[1]

(iii) Explain how Natural Selection could have caused the relative allele frequency shown in population 3.
Dank coated mice are more likely
to survive in forests as they are narder to see by predators.
Therefore increased dark coat population
as frey reproduce of spring, passing on Ralle any Mich with Callell are spotted easily so killed. This is
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 - (a) The diagram below shows part of the amino acid sequence of MC1R, part of the sequence of nucleotides in the gene for MC1R and how it might change to produce light fur:

Original

Amino acid sequence (Ile Thr Lys Asn Arg Asn Leu

Nucleotide sequence (allele R)

ATC/ACC/AAA/AAC/CGC/AAQCTG/CACTCG

Changed to produce light fur

Amino acid sequence

lle Thr Lys Asn Cys Asn Leu His Ser

Nucleotide sequence (allele C)

ATC/ACC/AAA/AAC/TGC/AAC/CTG/CAC/TCG

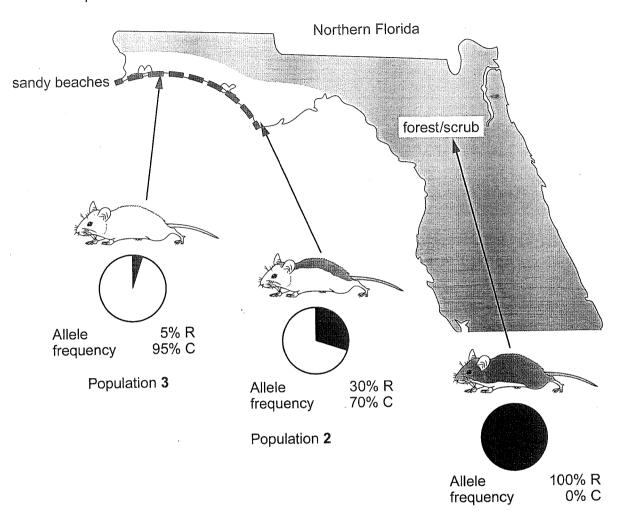
(i) Describe the change in the gene and the subsequent change in the MC1R molecule. [2]

The fifth the piet code in sequence has changed from 'CGC' to 'TGC' and so the amino and in sequence has changed from 'Arg' to 'Cys'. This means the paypepide chair nas changed and so the MC 1 R movement is a new protein.

Movement is not some of a new protein.

(ii) Using the information provided, explain how this change results in mice with light fur. [2]

The change has resulted in the function of MCIR not operating properly. The MCIR notonger is showing by a normane and so a low level of earnelanin is produced, resulting in the rule having light for. (b) This change in the MC1R gene means that there are two alleles, R and C. The map below shows the distribution of the different coloured mice and the relative frequencies of the alleles R and C in each population.



Population 1

(i) Use the diagram to suggest how fur colour is related to environmental conditions.

[2]

Fur cousin is related boths herbitat they occupy.

In population 3, 95% have light fur as they win in

(andy beaches and in population), 100% hours down.

Fur as they wise in forest. This is because they

here an advantage by came of aging in with the ruminalings.

(ii) Under what circumstance could the difference between the allele frequencies in populations 2 and 3 be explained by genetic drift, despite both living on beaches?

[1]

Symphotic realization. Selection pressure.

Examiner only

(iii) Explain how Natural Selection could have caused the relative allele frequency shown in population 3. [4]

in population 3, mice with light four had a decrable characteristic as they blended in with their environment making them less wheley to be eaten by produces. This meant those mice with light four were more wively to survive and reproduce, passing on their acceles by light for be their offspring. Over several generations, the accele to light for increased until the frequency reached 95%. In the current gene pool.

(iv) Under what circumstances would the mouse population become a separate species? [1]

If they could no unger inherbroad and produce feetble offspring.

- 6. A species of mouse *Peromyscus polionotus* found in Florida, USA, has a number of different coat colours. Coat colour in mice is controlled by several genes. Dark fur is produced when the hair producing cells secrete a pigment called eumelanin. A high level of eumelanin is produced when a transmembrane protein called MC1R is stimulated by a hormone.
 - (a) The diagram below shows part of the amino acid sequence of MC1R, part of the sequence of nucleotides in the gene for MC1R and how it might change to produce light fur:

Original

Amino acid sequence

lle Thr Lys Asn Arg Asn Leu His Ser

Nucleotide sequence (allele R)

ATC/ACC/AAA/AAC/CGC/AAQCTG/CAC/TCG

Changed to produce light fur

Amino acid sequence

lle Thr Lys Asn Cys Asn Leu His Ser

Nucleotide sequence (allele C)

ATC|ACC|AAA|AAC|TGC|AAC|CTG|CAQTCG

(i) Describe the change in the gene and the subsequent change in the MC1R molecule. [2]



The fifth topiet code in sequence has changed from 'CGC' to 'TGC' and so the amino and in sequence has changed from 'Arg' to 'CYS' This means the paypeptide chair has changed and so the MC 1 R movement is a new protein.

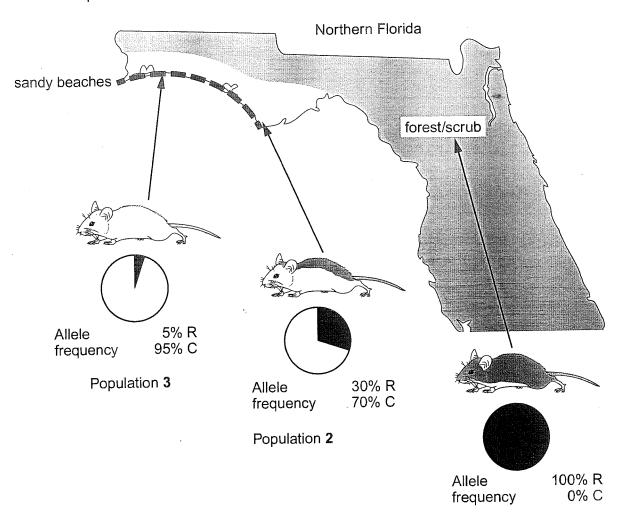
(ii) Using the information provided, explain how this change results in mice with light fur. [2]

The change has resulted in the function of MCIR

not operating properly. The MCIR notonger is showing by a normane and so a low level of eumerania is

produced presulting in the mice having light for.

(b) This change in the MC1R gene means that there are two alleles, R and C. The map below shows the distribution of the different coloured mice and the relative frequencies of the alleles R and C in each population.



Population 1

(i) Use the diagram to suggest how fur colour is related to environmental conditions.

[2]

Fur course is related both herbital they occupy.

In population 3, 95% have light for as they live in

sandy beaches and in population 1, 100% house dank

for as they we in finest. This is because they
here an advantage by consultaging in with the summability.

(ii) Under what circumstance could the difference between the allele frequencies in populations 2 and 3 be explained by genetic drift, despite both living on beaches?

[1]

Sanguara realation. Selection pressure.

Explain how Natural Selection could have caused the relative allele frequency shown in population 3. in population3, mice with light fur had a descrable them less whely to be eaten by produtors. This meant mice with light for were more wirely to surrive and on their queles for light fur to their gnt fur increased until the prequency reached 95%. Under what circumstances would the mouse population become a separate species? [1] If they could no unger interpreted and produce

Examiner only



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Amino acid sequence

AT

Thr Lys Asn Arg Asn Leu His Ser

Nucleotide sequence (allele R)

ATCACCAAAAACCGCAACCTGCACTCG

Changed to produce light fur

Amino acid sequence

lle Thr Lys Asn Cy

Asn Cys Asn Leu His Ser

Nucleotide sequence (allele C)

ATCACCAAAACTGCAACCTGCACTCG

(i) Describe the change in the gene and the subsequent change in the MC1R molecule.

[2]

A Cyristine base in the original base sequence has changed to thyrine This means that the MRNA transcribed is different, so a different trust molecular joins Cystine

instead of Argenine to the polypeptide chain. The MCIR

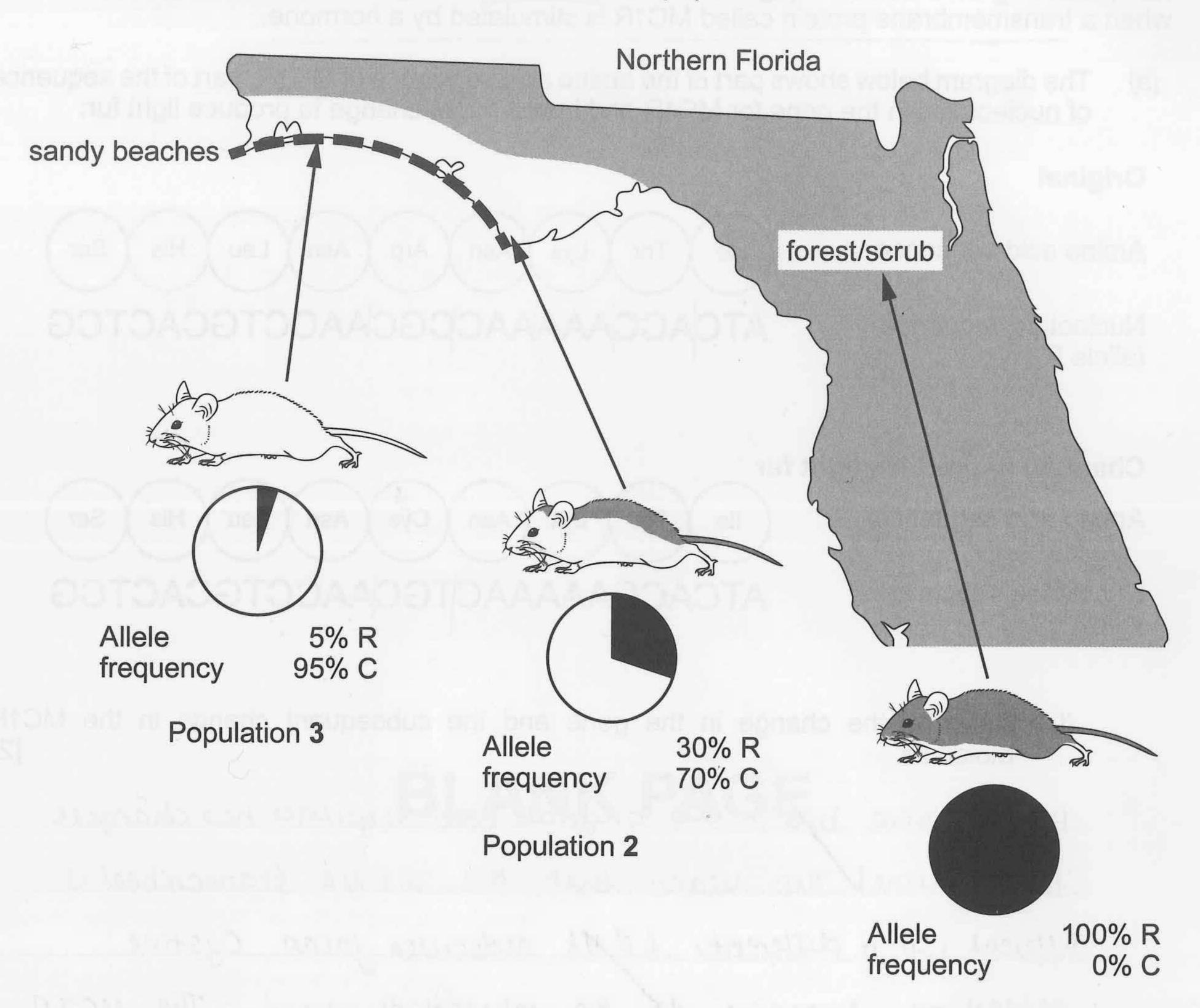
nolecule is therefore as different , as its annino acid sequence

(ii) Using the information provided, explain how this change results in mice with light fur.

Since the amino acid sequence making up the polypephide is different, the resulting polypephide is different, so the complex 3D probein is a different shape, the transmembrane protein therefore cannot secrete high levels of evimelaning and so the dark pignent is not exprensed leaving the mice with lighter unan for-

(b) This change in the MC1R gene means that there are two alleles, R and C.

The map below shows the distribution of the different coloured mice and the relative frequencies of the alleles R and C in each population.



Population 1

(i) Use the diagram to suggest how fur colour is related to environmental conditions.

[2]

In sandy beaches, the lighter mice have a Selective advantage as they are more camouf lageely then their predators upon then darker mice as they blend in with the light Sanol-However in forest I scrub, it is a selective advantage to have the allele for days for as this is (ionlined)

(ii) Under what circumstance could the difference between the allele frequencies in populations 2 and 3 be, explained by genetic drift, despite both living on beaches?

[1]

The population of small so by chance the allele for days for could have been parent on by len mice in population 2 then population 2.

Examiner only

(iii) Explain how Natural Selection could have caused the relative allele frequency shown in population 3.

The nuice show variation, with some howing attended for tight purposed on the nuice. Those with light fur hours a relied is aevantage so are ten timely to be faculable by preclators are they are more cameuflagued. Therefore Survive to maturity, reproduce and para on their favourable alleles for light fur to the next generation.

Over time the attended by preclators agreety prepartion of mice with light for alleles survive, so the author frequency of light for alleles survive, so the author frequency of light for alleles would the mouse population become a separate species?

(iv) Under what circumstances would the mouse population become a separate species?

[1]

When the different deaves because so phenotypically different; then they no longer reproduced with early one deepers.

Thus is reproductive iso lators. They (continued)

(b) (iv)	They one	repowate	Specier	when the	offspring	
					are injertile.	

- 6. A species of mouse *Peromyscus polionotus* found in Florida, USA, has a number of different coat colours. Coat colour in mice is controlled by several genes. Dark fur is produced when the hair producing cells secrete a pigment called <u>eumelanin</u>. A high level of eumelanin is produced when a transmembrane protein called MC1R is stimulated by a hormone.
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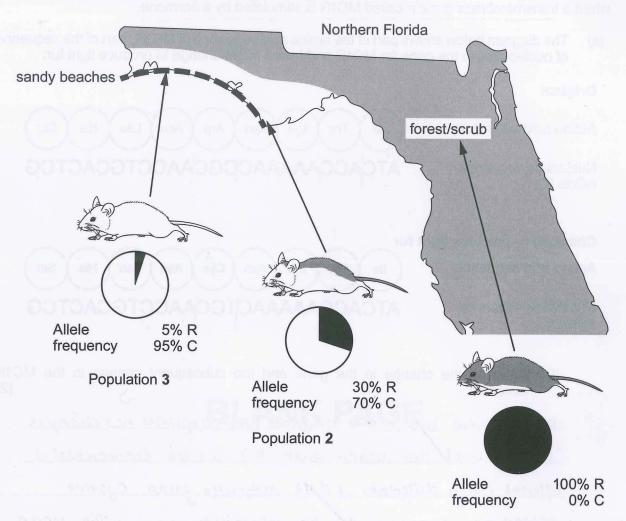
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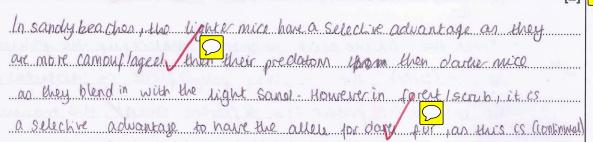
lighter under fur.

(b) This change in the MC1R gene means that there are two alleles, R and C. The map below shows the distribution of the different coloured mice and the relative frequencies of the alleles R and C in each population.



Population 1

(i) Use the diagram to suggest how fur colour is related to environmental conditions.
[2]



(ii) Under what circumstance could the difference between the allele frequencies in populations 2 and 3 be explained by **genetic drift**, despite both living on beaches?

The population ore small, so by chance, the allele for dary

for could have been pomed on by len nice in population 3 then population 2.

Explain how Natural Selection could have caused the relative allele frequency shown in population 3. The ruice show variation, with some howing alleles for light dark for There is a selection premure of preakation on the nice. Those with lighte for have a relective afrantage so are can lively to be titled by predators as they are more comourting There therefore Survive to waterity, reproduce and pan on their favourable alleles jox light for to the next generation. Over time, the alle frequencies change as a great proportion of mice with light for alleles survive, so the allelic frequency of light in creases , and that 100 dark for decreases. Under what circumstances would the mouse population become a separate species? When the different denies became so phenotypically This is reproductive iso cation. The (continued) 12

(b) (iv) Species Examiner only

7.	The following is a quotation from an ecological investigation.
	"Lowland heaths are high-profile ecosystems for conservation action in England, but they are under threat from invasion by <i>Betula spp.</i> , <i>Pinus sylvestris</i> , and <i>Ulex europaeus</i> ."
	[R.J. Mitchel et al. Journal of Applied Ecology, 1997, 37, 1426-1444]
	(a) Distinguish between primary succession and secondary succession. [2]

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(b) The group examined changes in soil chemistry from the original heath stage. Some of their results are summarised in the table below:

soil chemical property	value by succession stage			
	original heath	plus B	plus PS	plus U
рН				
Arne	3.63	4.01	3.60	3.63
Blackhill	3.52	3.66	3.48	3.54
Higher Hyde	3.53	5.06	3.51	3.47
mean	3.56	4.24	3.53	3.55
phosphorus μgPg ⁻¹				
Arne	2.41	3.85	2.69	3.16
Blackhill	4.15	4.91	3.79	4.55
Higher Hyde	5.08	5.35	3.55	4.76
mean	3.88	4.70	3.34	4.16
nitrate/nitrite μgNg ⁻¹				
Arne	0.51	0.65	0.59	1.16
Blackhill	0.84	0.88	0.97	2.31
Higher Hyde	0.69	0.98	1.17	3.64
mean	0.68	0.84	0.91	2.37

(i)	What do the pH values tell us about the soil in all stages in all sites?	[1]
(ii)	Use mean values from the table above to compare three changes to soil chem following invasion by <i>Betula spp</i> . with the changes following invasion by <i>europaeus</i> .	
	pH	
	phosphorus	
	nitrate/nitrite	

Species	% cover of species (by site)		
(by successional stage) Arne		Blackhill	Higher Hyde
original heath			
Calluna vulgaris	62.0	66.1	88.2
Erica cinerea	22.4	25.7	2.6
Erica tetralix	9.9	2.6	9.9
Cladonia portentosa	8.5	0	0.5
plus B			
Betula spp.	18.9	11.7	16.5
Agrostis curtisii	0.0	53.6	0.0
Pteridium aquilinum	25.2	7.5	1.6
Calluna vulgaris	0.0	0.0	0.4
plus PS			
Pinus sylvestris	36.2	38.2	
Pteridium aquilinum	0.3	24.7	
Erica cinerea	0.0	0.0	
Calluna vulgaris	0.0	0.0	
plus U			
Ulex europaeus	87.0	75.3	79.0
Calluna vulgaris	14.7	5.8	7.2
Erica cinerea	1.5	11.3	4.3
Erica tetralix	0.1	0.3	0.3

(i)	Which invading species has least impact on the vegetation on the original heathland?
(ii)	With reference to the data for plus B in both tables suggest a mechanism by which changes to vegetation occur during succession.
•••••	

(d)	Sixte	een years later some of these successions have reached their natural conclusions.	Examir only
	(i)	What name is given to the group of organisms that inhabit the ecosystem at the end of successional change? [1]	
	(ii)	What usually happens to species diversity as succession proceeds? [1]	
	(iii)	Using named species from the table in part (c) explain why conservationists in Dorset are taking steps to prevent plus B and plus PS succession in heathland, but are less worried about type plus U succession. [2]	
	•••••		
			13
			1

ner

	are high-profile ecosys invasion by <i>Betula spp</i>		n action in England, but the d <i>Ulex europaeu</i> s."	эу are
•	[R.J. Mitchel	et al. <i>Journal of Appli</i>	ed Ecology, 1997, 37, 1426	-1444]
(a) Distinguish	between primary succe	ession and secondary	succession.	[2]
primary	Succession	1 13 600	re rocle the	J
has no	o passed	ite. S	econdary	
Success	ion is 1911	roducing	organism	
	ofter a		torcst fire	•••••
_				
			<u>.</u>	
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	© WJEC CBAC Ltd.	(1075-01)	, , , , , , , , , , , , , , , , , , ,	over.

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pH more acidic	
phosphorus Lowered phosphorus	
nitrate/nitrite increased nutrate/nutri	M

(i)

(ii)

Species	% cover of species (by site)		
(by successional stage)	Arne	Blackhill	Higher Hyde
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(i)	Which invading species has least impact on the vegetation on the original heathland?
	pws V
(ii)	With reference to the data for plus B in both tables suggest a mechanism by which changes to vegetation occur during succession. [2]
	depletion of published
	and build up of excretion

13

The following is a quotation from an ecological investigation.
"Lowland heaths are high-profile ecosystems for conservation action in England, but they are under threat from invasion by <i>Betula spp.</i> , <i>Pinus sylvestris</i> , and <i>Ulex europaeus</i> ."
[R.J. Mitchel et al. Journal of Applied Ecology, 1997, 37, 1426-1444]
(a) Distinguish between primary succession and secondary succession. [2] Primary Succession is bore rock that has no passed life. Secondary Succession is Introducing organism ball after a previous forest file or deforestation
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7.

(b) The group examined changes in soil chemistry from the original heath stage. Some of their results are summarised in the table below:

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(i)	What do the pH values tell us about the soil in all stages in all sites? [1]	\bigcirc
(ii)	Use mean values from the table above to compare three changes to soil chemistry following invasion by <i>Betula spp.</i> with the changes following invasion by <i>Ulex europaeus.</i> [3]	
	phosphorus lowered phosphorus	
	nitrate/nitrite increased nutrite	

Species	% cover of species (by site)		
(by successional stage)	Arne	Blackhill	Higher Hyde
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(i)	Which invading species has least impact on the vegetation on the original heathland?	
	pws VD	
(ii)	With reference to the data for plus B in both tables suggest a mechanism by which changes to vegetation occur during succession. [2]	\bigcirc
	depletion of nutrents	
	and build up on excretion	
••••••		

(d)	Sixte	een years later some of these successions have reached their natural conclusions.	Examiner only
	(i)	What name is given to the group of organisms that inhabit the ecosystem at the end of successional change? [1]	\bigcirc
		one trees o	
	(ii)	What usually happens to species diversity as succession proceeds? [1]	\bigcirc
	(iii)	Using named species from the table in part (c) explain why conservationists in Dorset are taking steps to prevent plus B and plus PS succession in heathland, but are less worried about type plus U succession. [2]	\bigcirc
		ercentage of species drop	
	.d.	omatically when pus Band	
	Pu	US PS Successes by Plus U	
	\Box	as less impact o	
			\square

13

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(a) Distinguish between primary succession and secondary succession.

[2]

Primary succession is the colonisation of the previously succession in the colonisation of the secondary succession.

Primary succession and secondary succession.

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(i) What do the pH values tell us about the soil in all stages in all sites? [1]

(ii) Use **mean** values from the table above to compare **three** changes to soil chemistry following invasion by *Betula spp.* with the changes following invasion by *Ulex europaeus*.

pH the invasion of Betvla top made he soil more alkaline from the original health, whereas Ulesc see macinity phosphorus The phosphorus concentration in the toil

increased who see with Behin Spp less and increased with I tower it increased more with Behin Spp.

nitrate/nitrite The nitrate concentration decreased with he

invesion of plus B but increased with M invasion of plus U.

Species	% cov	% cover of species (by site)		
(by successional stage)	Arne	Blackhill	Higher Hyde	
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(i) Which invading species has least impact on the vegetation on the original heathland?

PONS PS

(ii) With reference to the data for **plus B** in both tables suggest a mechanism by which changes to vegetation occur during succession. [2]

First the Betula spp would invade the onea, making
the soil more alkaline, then peteridium aquitinum
would grow, the agreem 3 curtisis his
cultura vulgeris would that to colinic the area.

; (d)	Sixte	een years later some of these successions have reached their natural conclusions.	only
	(i)	What name is given to the group of organisms that inhabit the ecosystem at the end of successional change? [1]	
		climase community	
	(ii)	What usually happens to species diversity as succession proceeds? [1]	
		Species diversity increases	_
	(iii)	Using named species from the table in part (c) explain why conservationists in Dorset are taking steps to prevent plus B and plus PS succession in heathland, but are less worried about type plus U succession. [2]	
		ea & and has had little eyest on he !	
	Co	ver of species so per however plus 1 and	
	Ph	olinisation and if their numbers grow	
	C	then plus is cultura vulgaris would be	13
		in direct competition with he	
		original silv cultura vulgaris.	

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[R.J. Mitchel et al. Journal of Applied Ecology, 1997, 37, 1426-1444]

(a) Distinguish between primary succession and secondary succession.

[2]

Primary succession is the colonisation of land that has never with a Succession inhabited like a bare rock of Scondary succession.

Succession inhabited by a land which has previously been inhabited by a life has been Hopped through.

As example by a life.

(1075-01)

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Turn over.

[1]

The authors studied a number of heathland sites in Dorset including Arne, Blackhill, and Higher Hyde, where succession to one or another of the three species had taken place. The data below are based on the paper but have been simplified and modified for illustrative purposes. The successional stages in the study were named according to the dominant invasive species; plus B, where Betula spp, was the invader, plus PS, where Pinus sylvestris was the invader and plus U, where Ulex europaeus, was the invader.

(b) The group examined changes in soil chemistry from the original heath stage. Some of their results are summarised in the table below:

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mean	3.56	4.24	3.53	3.55
phosphorus μgPg ⁻¹				
Arne	2.41	3.85	2.69	3.16
Blackhill	4.15	4.91	3.79	4.55
Higher Hyde	5.08	5.35	3.55	4.76
mean	3.88	4.70	3.34	4.16
nitrate/nitrite μgNg ⁻¹				
Arne	0.51	0.65	0.59	1.16
Blackhill	0.84	0.88	0.97	2.31
Higher Hyde	0.69	0.98	1.17	3.64
mean	0.68	0.84	0.91	2.37

What do the pH values tell us about the soil in all stages in all sites?

Use mean values from the table above to compare three changes to soil chemistry following invasion by Betula spp. with the changes following invasion by Ulex europaeus.

[3]

pH the invasion of Betula spp made he soil more allowing from he original health whereas Uleach made he soil more staged in some phosphorus The phosphorus concentration in he soil have it increased with Betula spp to and increased with the nitrate/nitrite The nitrate concentration decreased with he investor of plus B but increased with he investor of plus B but investor of plus B bu

pws U.

(ii)

Species	% cov	% cover of species (by site)		
(by successional stage)	Arne	Blackhill	Higher Hyde	
original heath				
Calluna vulgaris	62.0	66.1	88.2	
Erica cinerea	22.4	25.7	2.6	
Erica tetralix	9.9	2.6	9.9	
Cladonia portentosa	8.5	0	0.5	
plus B				
Betula spp.	18.9	11.7	16.5	
Agrostis curtisii	0.0	53.6	0.0	
Pteridium aquilinum	25.2	7.5	1.6	
Calluna vulgaris	0.0	0.0	0.4	
plus PS				
Pinus sylvestris	36.2	38.2		
Pteridium aquilinum	0.3	24.7	/	
Erica cinerea	0.0	0.0		
Calluna vulgaris	0.0	0.0		
plus U				
Ulex europaeus	87.0	75.3	79.0	
Calluna vulgaris	14.7	5.8	7.2	
Erica cinerea	1.5	11.3	4.3	
Erica tetralix	0.1	0.3	0.3	

(i) Which invading species has least impact on the vegetation on the original heathland?

[1] PWS PSD

(ii) With reference to the data for plus B in both tables suggest a mechanism by which changes to vegetation occur during succession.

[2] PWS PSD

(iii) With reference to the data for plus B in both tables suggest a mechanism by which changes to vegetation occur during succession.

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[2] PWS PSD

(iii) With reference to the data for plus B in both tables suggest a mechanism by which changes to vegetation occur during succession.

			Examiner only
; (d)	Sixte	een years later some of these successions have reached their natural conclusions.	
	(i)	What name is given to the group of organisms that inhabit the ecosystem at the end of successional change?	
		climase community.	
	(ii)	What usually happens to species diversity as succession proceeds? [1]	\bigcirc
		Species diversity increases	
	(iii)	Using named species from the table in part (c) explain why conservationists in Dorset are taking steps to prevent plus B and plus PS succession in heathland, but are less worried about type plus U succession. [2]	
	B	ecouse plus U has already colinised he	
		en & and has had little eyest on he ?	
	Co	ver of species so for however plus 13 and	
	Ph	us P3 oure still in he early stages of D	
	C	dinisation and if their numbers grow	
		then plus is cultura vulgaris would be	13
		in direct competition with he	
		original silv cultura vulgaris.	

ı	The following is a quotation from an ecological investigation.
	"Lowland heaths are high-profile ecosystems for conservation action in England, but they are under threat from invasion by Betula spp., Pinus sylvestris, and Ulex europaeus."
	[R.J. Mitchel et al. Journal of Applied Ecology, 1997, 37, 1426-1444]
	(a) Distinguish between primary succession and secondary succession. [2]
	Primary succession occus when a habitat is intially colonised by species, Starting with phones, and where the habitat is considered bare ground in
	Hunt it has Nover previously supported an coasystem. Secondary
	Juccession occurs when species re-inhabit an area after they were
	+ see addithin ouswer booklet
	© WJEC CBAC Ltd. (1075-01)

(b) The group examined changes in soil chemistry from the original heath stage. Some of their results are summarised in the table below:

soil chemical property	value	by succes	sion stage	
	original heath	plus B	plus PS	plus U
рН				
Arne	3.63	4.01	3.60	3.63
Blackhill	3.52	3.66	3.48	3.54
Higher Hyde	3.53	5.06	3.51	3.47
mean	3.56	4.24	3.53	3.55
phosphorus µgPg ⁻¹				
Arne	2.41	3.85	2.69	3.16
Blackhill	4.15	4.91	3.79	4.55
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What do the pH values tell us about the soil in all stages in all sites? [1]
All Soils one Orablic
Use mean values from the table above to compare three changes to soil chemistry following invasion by <i>Betula spp.</i> with the changes following invasion by <i>Ulex europaeus</i> . [3]
pH plus B is able to increase the pH DF the Soil, making the Soil less acidite than before its multiple more acidite
phosphorus plus Bisable to abe to increase the phosphorus
Concontration de line gail more from plus U
nitrate/nitrite plus B increase une sitrate/nitrite concentration
of the 3d Cess so then plus U, which increases this Concentration by a Greater amount than plus B

(ii)

Species	% cover of species (by site)			
(by successional stage)	Arne	Blackhill	Higher Hyde	
original heath	10.34	La Pin deputit O.	Market and the contract of	
Calluna vulgaris	62.0	66.1	88.2	
Erica cinerea	22.4	25.7	2.6	
Erica tetralix	9.9	2.6	9.9	
Cladonia portentosa	8.5	0	0.5	
iòleachada 29 suta bas d	auld mayer	of equite prible	Dorsot are to	
plus B	s U. sulq sin	Laupole bannow	Levi egg tud	
Betula spp.	18.9	11.7	16.5	
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plus PS				
Pinus sylvestris	36.2	38.2		
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(i) Which invading species has least impact on the vegetation on the original heathland?

Ulex europaeus plus U has the Ceest imparet, as most of the

(ii) With reference to the data for **plus B** in both tables suggest a mechanism by which changes to vegetation occur during succession. [2]

Plus B is able to increase both the pt levels and phosphons.

Concontration of the soil to such levels that the plant species

Entra ainerea, Erica tetralist and Clarolonia partentosa are asse to

Strive, coursing the death of these species and the subsequent

of See additional

answer book of

7.(01)	Wiped Out due to natural disater of human impacts. This takes the
onthred	Fin of seeds that serviced Germinating to form new plants and
	Gin of seeds part survived germinating to form new plans and animally migration both into the ecosystem.
), cc)(ii)	introduction at new species which one able to Surine in the less acidic and more concentrated phosphores soils, causing the Ugitablial
	Ohenege dunky succession
orthoused	in the species make-up in the community, prempting Conservationists to prevent plus B and plus B succession more than plus U succession
	due to the see greater change in species in Plus B and Plus PS Diccession then plus U Succession.
	OCCESSION PALA DIOS O OCCESSION.
	E Committee of the comm

7.	The following is a quotation from an ecological investigation.	
	"Lowland heaths are high-profile ecosystems for conservation action in England, but they are under threat from invasion by <i>Betula spp.</i> , <i>Pinus sylvestris</i> , and <i>Ulex europaeus</i> ."	
	[R.J. Mitchel et al. Journal of Applied Ecology, 1997, 37, 1426-1444]	
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	Shorting win planees, and where the head-dut is considered bare ground in	X
	that it has nover previously supported an adolpten. Secondary	,
	Succession occurs when species re-inhabit an area after they were	
	+ see addither cresiver booklet	
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	O ale and second Maril	
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(b) The group examined changes in soil chemistry from the original heath stage. Some of their results are summarised in the table below:

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pH plus B is able to increase the AH DE the Soil,	
making the soil less acidis the soil have been acidis.	
phosphorus plus B is able to abe to increase the chasphorus	
Concentration of the Gal More Flow plus U	
nitrate/nitrite dis B increase the sitrate/nitrite concentration	
Of the Soil Cess so than plus U, which increases this Concentration by a Greater amount then plus B	

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and oftis PS succession	auld Inever	of equite onlike	Dorset are to	
plus B	ype plus U s	Liuoda baanow	Loni equitud c	
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plus PS		Lander Annie	W minor w	
Pinus sylvestris	36.2	38.2		
Pteridium aquilinum	0.3	24.7		
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		A Thomas Service		
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(iii)

			22		
Civita	on veers later	some of these s	successions	s have reached their natural conclusions.	E
Sixte					
(i)	What name is of succession	s given to the gronal change?	oup of organ	nisms that inhabit the ecosystem at the end [1]	2
176		Community		A CONTRACTOR OF THE PROPERTY O	
(ii)				ty as succession proceeds? [1]	2
		~	10.10	Des Siccession proceeds	
(iii)	Dorset are t	ed species from aking steps to po worried about ty	revent plus	n part <i>(c)</i> explain why conservationists in B and plus PS succession in heathland, succession.	2
Plu	6 U Succe	salon only rev	mares Cla	idonle portenbse via plus U	
				Enta seralik along with Calluna	
				Dlus B and plus PS remove	
				the causing a greater change	
yvan	e5gecies	1.000009	Ed. W. Com.		
				* See additional	
				Onswer booklet	

7.(01)	Wiped out due to natural disater of human impacts. This takes the
orthed	Fin of seeds that survived germinating to form her plans and
10.00	animaly migration both into the ecosystem.
	12 February of the book resident
2007(11)	introduction of new species which one able to Surine in the less
	acidic and more concentrated phosphores soils, causing the vegitable
	change during succession
	the same of the same was the same of the s
7 cd (isi)	in the species make-up in the community, prempting Conservationists to
	present plus B and plus B succession more than plus U succession
And the	live to the congresser charge in species in Plus B and Plus PS
	Diccession then plus U Succession.
in Lelie	
	normalisation of the second of