OCR
Oxford Cambridge and RSA

GCE

Biology

Unit **F215:** Control, Genomes and Environment

Advanced GCE

Mark Scheme for June 2014

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning of annotation
BP	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	Tick
	Cross
	Unclear
BOD	Benefit of doubt
EE	Effective evaluation
L1	Level 1
L2	Level 2
L3	Level 3
L4	Level 4
NAQ	Not answered question
OFR	Own figure rule
SEEN	Noted but no credit given
TV	Too vague
^	Omission

Question			Expected Answer	Mark	Additional Guidance
1	(a)	(i)	*discontinuous* gender / male and female / eye colour **;** *continuous* size / length / mass **;**	**2**	**Mark the first answer on each prompt line.** If an additional answer is given that is incorrect or contradicts the correct answer, then **= 0 marks** **Note:** Suggestions must relate to **visible** characteristics of the **frogs**, **ACCEPT** sex **IGNORE** skin colour (as stated in Q) **CREDIT** example of a ***measurable*** characteristic (e.g. leg length, surface area, height, weight)
1	(a)	(ii)	*idea of* **1** no / little **,** environmental effect for **,** (named example of) discontinuous variation / example given for discontinuous variation in **(i)** as ecf **;** **2** some / large **,** environmental effect for **,** (named example of) continuous variation / example given for continuous variation in **(i)** as ecf **;** **3** gender may be affected by **,** temperature / atrazine exposure **;**	**2**	**IGNORE** examples of environmental factors **ACCEPT** discontinuous variation is ***only*** **,** genetic / due to alleles present **Note:** A comparative statement (e.g. ' environment has a greater effect on continuous variation') **= 2 marks** (mps 1 & 2) e.g ‘ no environment effect for discontinuous variation but it does affect continuous variation’ **= 2 marks** (mps1 &2)

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(iii)</td><td>1 idea that offspring visibly different from , A / egg donor ;

2 to show that the offspring produced were clones ;

3 to show / identify , (genetic) parents (of clone) / B and C ;</td><td>2 max</td><td>ACCEPT brown frog for A

2 ‘to show that cloning is successful’ is not enough

Note:
‘To show that the offspring were clones as they are not the same as A.’ = 2 marks (mps 1 & 2)</td></tr>
<tr><td>1</td><td>(b)</td><td>(i)</td><td><table><tr><th>Genetic fingerprint number</th><th>Letter of frog</th></tr><tr><td>1</td><td>D</td></tr><tr><td>2</td><td>A</td></tr><tr><td>3</td><td>B</td></tr></table>;
;
;</td><td>3</td><td>Mark the first answer in each box. If an additional answer is given that is incorrect or contradicts the correct answer, then = 0 marks

If no letters in the table <u>at all</u>, look at the diagram and award marks if the profiles are identified correctly.</td></tr>
<tr><td>1</td><td>(b)</td><td>(ii)</td><td>cytoplasm / mitochondria , came from A

or

mitochondria / (mitochondrial) DNA , in cytoplasm of A ;</td><td>1</td><td>If frog not identified correctly = 0 marks

Must refer specifically to frog A

Must refer specifically to frog A</td></tr>
</table>

Question			Expected Answer	Mark	Additional Guidance
1	(c)	(i)	*advantage* (genetically identical so) all react the same **or** genetic variable controlled **;** *disadvantage* expensive (to produce) **or** don't see varied response to drug like in real populations (of mice) **or** *idea that* clones (of mice) may have unknown health issue (which would affect responses) **;**	**2**	**Note that the question refers to the use of cloned or uncloned mice in testing – and NOT to humans.** **ACCEPT ora** throughout **IGNORE** large numbers of clones produced **IGNORE** ref to animal welfare / religious objections **IGNORE** ref to validity **ACCEPT** 'no genetic diversity to affect results' **ACCEPT** 'rare allergies / adverse reactions **,** won't be seen'

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(c)</td><td>(ii)</td><td>1 idea to produce , elite / best , animals ;
2 idea to save / preserve , endangered animals ;
3 grow / produce (spare) , stem cells / tissues / organs ;
4 AVP ;</td><td>2</td><td>IGNORE ref research into disease (as given in Q)
IGNORE ref to cost
1 ACCEPT example / desirable characteristics
2 ACCEPT recreating extinct animals
3 ACCEPT ref to named example of , tissue / organ
4 e.g. pet cloning / cloning GM animals / animals for xenotransplantation</td></tr>
<tr><td>1</td><td>(d)</td><td></td><td><table><tr><th>Individuals</th><th>% of alleles shared</th></tr><tr><td>David and John</td><td>100</td></tr><tr><td>Anne and Lisa</td><td>50</td></tr><tr><td>Sarah and Lisa</td><td>50</td></tr></table>; ; ;</td><td>3</td><td>Mark the first answer in each box. If an additional answer is given that is incorrect or contradicts the correct answer, then = 0 marks</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>17</td><td></td></tr>
</table>

Question			Expected Answer	Mark	Additional Guidance
2	(a)		(belong to the) same genus ;	1	
2	(b)	(i)	**1** not much / little / some **,** competition / niche overlap **;**		**This mark is for a stand alone statement** **DO NOT CREDIT no** competition **IGNORE** competition unqualified / inter / intra
			reasons for little competition **2** use / feed on **,** different sized flowers / different depth of flowers **;**		**2 CREDIT** correct comparative description or use of data e.g. *B. pratorum feed* on **,** bigger / longer / deeper **,** flowers **or** *B. pratorum* 7.4(mm) **and** *B. terrestris* 6.3(mm)
			3 vary in proportions of pollen **and** nectar they collect **;**		**3 CREDIT** correct description e.g. *B. pratorum* mostly pollen and nectar **and** *B. terrestris* mostly nectar only **or** comparison of 2 species using table data **IGNORE** 'different amounts' of pollen and nectar
			4 fly / live / active / feed / visit flowers **,** at different times **;**		**4 CREDIT** correct description of difference e.g. *B. pratorum* peak in June **and** *B. terrestris* in July **or** *B. pratorum* appear in earlier in the year **or** comparison of 2 species using graph data
			reason for competition **5** *idea that* fly / live / active / feed / visit flowers **,** overlaps there must be competition **;**		**5 CREDIT** correct description from data e.g. both compete for food between May and September / both collect pollen only from same % flowers
			6 AVP **;**	4 max	**6** e.g. use / feed on **,** different species of flowers

Question			Expected Answer	Mark	Additional Guidance
2	(b)	(ii)	**1** *idea of* isolation / isolating mechanism / barrier **;**		
			2 seasonal (difference) / temporal (difference) / males and queens (in different populations) produced in different months / breeding (in different populations) in different months **;**		**2** **CREDIT** example of seasonal / temporal (e.g. *B. pratorum* has its peak number of workers in June and *B. terrestris* in July)
			3 behavioural (difference) / visit different (types of) flowers / feed at different times / feed on different food types **;**		**3** **CREDIT** 'different mating rituals'
			4 different flower locations / different (micro)habitats **;**		
			5 *idea that* gene flow restricted / no gene flow (between populations) **;**		**5** **must refer to gene /allele**
			6 different adaptations / specialisation / niche partitioning **;**	**3 max**	**6** **IGNORE** speciation (as implied in Q) - can be mistaken for specialisation

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>2</td><td>(c)</td><td>(i)</td><td>
<table>
<tr><th>Observation</th><th>Type of behaviour</th></tr>
<tr><td>The time taken for a worker bee to collect food from a flower decreases with practice.</td><td>learned (behaviour) / learning /
operant conditioning / trial and error ;</td></tr>
<tr><td>All bumble bees start at the bottom of a vertical spike of flowers and work upwards.</td><td>innate / instinctive ;</td></tr>
</table>
</td><td>2</td><td>Mark the first answer in each box. If an additional answer is given that is incorrect or contradicts the correct answer, then = 0 marks

ACCEPT taxis / example of taxis eg chemotaxis
IGNORE inherited / genetically determined
DO NOT CREDIT kinesis</td></tr>
<tr><td>2</td><td>(c)</td><td>(ii)</td><td>Idea that better / more efficient , at , finding / getting , food ;

AVP ;</td><td>1 max</td><td>ACCEPT more food can be collected
less , time / energy , spent looking for food
easier to find food
e.g. ref to reduces competition from other colonies</td></tr>
<tr><td>2</td><td>(d)</td><td>(i)</td><td>reverse transcriptase ;</td><td>1</td><td>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks

DO NOT CREDIT DNA (reverse) transcriptase</td></tr>
</table>

Question			Expected Answer	Mark	Additional Guidance
2	(d)	(ii)	1 <u>mRNA</u> binds to **,** (gene) probes / cDNA / ssDNA **,** by complementary base pairing **;** 2 *idea that* the ***more*** active the gene the ***more*** mRNA produced **;** 3 during transcription **;** 4 ***more*** fluorescence indicates ***more*** mRNA (bound) **;**	**3 max**	1 **DO NOT CREDIT** in the context of the gene probe binding to DNA 3 **IGNORE** translation
2	(d)	(iii)	1 dopamine linked to **,** ADHD / addiction / risk-taking / adventurous behaviour / hyperactivity / erratic behaviour (in humans) **;** 2 *idea of* common mechanism in bees and humans (for adventurous behaviour) **;** 3 *idea that* as they are different organisms the mechanisms may not be comparable (even though apparently similar) **;** 4 AVP **;**	**3 max**	1 **IGNORE** ref to schizophrenia / Parkinson's **This mark is for the effect of the *chemical* dopamine, not the dopamine receptors alone.** 2 e.g. ***both*** have **,** DRD4 / dopamine receptors e.g. dopamine has the same effect in ***both*** 4 e.g. other genes also involved in **,** bee / human **,** behaviour **Note:** 'both have dopamine receptors which are linked to adventurous behaviour' **= 1 mark** (mp 2 only) 'both have dopamine receptors and dopamine is linked to adventurous behaviour' **= 2 marks** (mps 2 & 1)
			Total	**18**	

Question			Expected Answer	Mark	Additional Guidance
3	(a)	(i)	*seedlings / coleoptiles have same* **S1** age **;** **S2** height / length **;** **S3** mass **;** **S4** genotype / genome **;** **S5** species **;** *procedure has same* **P1** same volume of solution applied **;** **P2** (named) feature of growth medium **;** **P3** watering regime **;** **P4** light **,** intensity / wavelength / duration **;** **P5** temperature **;**	**3 max**	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **S2 IGNORE** size / surface area / width **S3 IGNORE** size / weight **S4 ACCEPT** same genetic makeup **IGNORE** same genes **For all P points IGNORE** light ***direction*** (as this is an independent variable) **P1 IGNORE** ref to concentration of solution **ACCEPT** *idea of* consistency in application of **J** and **K** **P2** e.g. type / pH / fertiliser (applied) / minerals / ions **IGNORE** nutrients **P3** e.g. volume of water / time of watering **P4** e.g. distance from light source

Question			Expected Answer	Mark	Additional Guidance
3	(a)	(ii)	*idea that* shows the response without treatment **or** *idea that* allows the **,** effect of the treatment / results / groups **,** to be **,** compared **;**	**1**	**IGNORE** improves validity / fair test (as an explanation is required) 'to show the effects of J and K' is not enough **CREDIT** 'observations' for treatments
3	(a)	(iii)	***ONLY CREDIT mark points in context of results, and not in context of general roles of auxin and giberellin*** ***J** is auxin because* **A1** inhibition of development of (lateral) buds (in group 2) **;** **A2** growth of **,** coleoptiles / group 5 **,** towards light **;** ***K** is gibberellin because* **G1** greater increase in **,** height / stem length (in group 3) **;** **G2** causes growth of (lateral) buds (in group 3) **;**	**3 max**	**J must be identified correctly for A marks to be awarded** **K must be identified correctly for G marks to be awarded** **A1 CREDIT** (group2) results show apical dominance **A2 CREDIT** (group 5) results show positive phototropism **IGNORE** plant (as all are plants) **G1 CREDIT** greater elongation **G2 CREDIT** (group 3) results do not show apical dominance
3	(b)	(i)	protein **;**	**1**	**ACCEPT** glycoprotein **IGNORE** polypeptide / channel / carrier / transport
3	(b)	(ii)	(synaptic) cleft **;**	**1**	**IGNORE** gap **IGNORE** neuromuscular
3	(b)	(iii)	acetylcholine esterase / ACh esterase **;**	**1**	**ACCEPT** phonetic spelling and ignore upper/lower case **IGNORE** AChE

Question			Expected Answer	Mark	Additional Guidance
3	(c)				**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
			mitochondria ;		**ACCEPT** mitochondrion **DO NOT CREDIT** mitochondrial matrix
			oxidative phosphorylation ;		**IGNORE** electron transport chain (as not a stage)
			lactate ;		**ACCEPT** lactic acid
			creatine phosphate / phosphocreatine ;		**DO NOT CREDIT** creatinine
			(cross-)bridge / (cross-)link ; myosin (head) ;	6	**DO NOT CREDIT** bond **ACCEPT** phonetic spelling
			Total	**16**	

Question			Expected Answer	Mark	Additional Guidance
4	(a)	(i)	3 ;	1	**IGNORE** triplet
4	(a)	(ii)	4^3 **or** 4 x 4 x 4 **or** 4 x 4^2 ;	1	
4	(a)	(III)	Several, triplet(s) / codon(s) , code for one amino acid ; (some are used as) start / stop / termination ; *idea that* mutation may , not result in change in amino acid / have a neutral effect / result in silent mutation ;	2 max	**Must be clear that base combination is a group of 3 bases** **IGNORE** degenerate **DO NOT CREDIT** makes/ produces/ creates , amino acids **DO NOT CREDIT** deletion / insertion (as would create frame shift)
4	(a)	(iv)	adenine / A **and** cytosine / C **and** guanine / G ;	1	**Mark the first 3 answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** adenosine **DO NOT CREDIT** cysteine **DO NOT CREDIT** glycine

Question			Expected Answer	Mark	Additional Guidance
4	(b)		*transcription* **1** DNA / gene **,** copied / transcribed **,** into mRNA **;** **2** free / activated **,** (RNA) nucleotides / (RNA) nucleoside triphosphates **;** **3** (line up by) complementary base-pairing / described **;** **4** (to) one / template / reference / sense , (DNA) strand ; **5** (catalysed by) RNA polymerase **;** *translation* **6** (mRNA moves to) ribosomes **;** **7** tRNA (molecules) bind to mRNA **;** **8** anticodon(s) **,** match / pair with / bind to **,** codons **;** **9** specific / correct **,** amino acid attached to tRNA **;** **10** formation of peptide bond between amino acids;	**6 max**	**Marks may be awarded from an annotated diagram** **1 IGNORE** 'used to make' **2 DO NOT CREDIT** DNA nucleotides **3 CREDIT '**A-T, C-G **and** A - U**'** **4 ACCEPT** 'non-coding' for 'template' **5 DO NOT CREDIT** in context of breaking H bonds **6 CREDIT** translation occurs at ribosomes **Note:** tRNA anticodons bind to mRNA codons **= 2 marks** (mps 7 & 8) **10 DO NOT CREDIT** dipeptide / polypeptide **,** bond
			QWC **;**	**1**	**Award** QWC if **two** mps from **1** – **5** have been awarded **before** **two** mps from **6** – **10** **Place a tick or a cross alongside the pencil icon to indicate whether or not the QWC mark has been awarded.**
			Total	**12**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td>(i)</td><td>
1 lag phase / slow increase
(in , population / number / percentage) ,
at start / initially / day 0 - 1 / during day 1 ;

2 log phase / exponential increase / rapid increase ,
day 1 - 3 ;

3 <u>rate</u> <u>of</u> <u>increase</u> , slows / less steep ,
days 3 - 4 / during day 3 ;

4 stationary phase / population levels off /
population stays at 100% ,
at end / finally / remaining days / days 4 - 6 ;

5 comparative figures quoted with 2 x-y readings ;
</td><td>4 max</td><td>
IGNORE explanations
ACCEPT ‘the population grows’ or ‘it grows’
(rather than increase)
DO NOT CREDIT ‘yeast grow(s)’

1 ACCEPT days 0 - 0.9
ACCEPT lasts 1 day

2 ACCEPT days 0.9 - 3.5

3 ACCEPT days 3.3 - 3.6

4 ACCEPT after day 3.5 - 4

5 Each unit must be quoted at least once

<table>
<tr><th>Time (days)</th><th>Yeast (% final population)</th></tr>
<tr><td>0</td><td>24</td></tr>
<tr><td>1</td><td>32</td></tr>
<tr><td>3</td><td>90</td></tr>
<tr><td>3.5 - 6</td><td>100</td></tr>
</table>

Take care to distinguish between an increase in percentage (by either quoting the figures for the days or by calculating the difference) and a percentage increase.
</td></tr>
</table>

Question			Expected Answer	Mark	Additional Guidance
5	(a)	(ii)	**1** sugar converted to ethanol **;** **2** in <u>anaerobic</u> <u>respiration</u> **;** **3** sugar **,** undergoes glycolysis / converted to pyruvate **;** **4** pyruvate **,** loses carbon dioxide / decarboxylated / forms ethanal **;** **5** reduced NAD giving hydrogen to <u>ethanal</u> **;** **6** *idea of* NAD being **,** regenerated / recycled , (so) glycolysis continues ; **7** correct ref to **,** pyruvate decarboxylase / ethanol dehydrogenase **;**	**3 max**	**CREDIT** glucose / maltose / maltotriose for 'sugar' **2** **IGNORE** fermentation **5** **CREDIT** $NADH_2$ / NADH ($+H^+$) / red NAD
5	(a)	(iii)	*ethanol is* produced in **, all** yeast growth phases / **all** of the time **or** production of ethanol increases as yeast population increases **or** *idea that* ethanol is a normal (metabolic waste) product (of yeast) **;**	**1**	**IGNORE** ref to ethanol not being a secondary product **CREDIT** 'produced during normal growth' **CREDIT** follows growth curve for yeast **IGNORE** waste unqualified

Question			Expected Answer	Mark	Additional Guidance
5	(a)	(iv)	**1** sugar <u>conc</u>entration falls **too** low **;** **2** pH falls **too** low / conditions become **too** acidic / decrease in pH causes enzymes to denature **;** **3** high ethanol <u>conc</u>entration **,** damages / poisons / inhibits **,** yeast **;**	**2 max**	**1** **ACCEPT** very low sugar concentration / sugar concentration decreases as used up **2** **ACCEPT** very low pH / very acidic **DO NOT CREDIT** 'falls and rises' **3** **ACCEPT** high ethanol <u>concentration</u> kills yeast
5	(b)		**1** glucose can **,** be used / enters glycolysis **,** directly / without being broken down (first) **;** **2** maltose**,** must **,** be <u>hydrolys</u>ed / have <u>glycosidic</u> bonds broken ; **3** enzyme / maltase **,** only made when **,** needed / maltose present / glucose running out **;** **4** enzyme induced **/** gene(s) switched on **;** **5** transcription <u>and</u> translation / protein synthesis **,** takes time **;** **6** maltotriose requires, more (2) <u>hydrolysis</u> (reactions) / breaking of more (2) <u>glycosidic</u> bonds **or** enzyme to break down maltotriose made last **;**	**3 max**	**ACCEPT** 'monosaccharide' for glucose and 'disaccharide' for maltose and 'trisaccharide' for maltotriose throughout **1** **IGNORE** ref to glucose being used first / at start / immediately (as stated in Q)

Question			Expected Answer	Mark	Additional Guidance
5	(c)		*advantages of using yeast* **A1** less energy required ; **A2** does not need , high temperature / 300^{o}C / high pressure ; **A3** can use waste material (as a substrate) ; **A4** substrate is , sustainable / grown each year ; **A5** process does not use up , oil reserves / fossil fuels ; **A6** product is carbon neutral / no carbon footprint ; **A7** AVP ; *disadvantages of using yeast* **D1** time consuming / takes several days ; **D2** needs , downstream processing / purification of product ; **D3** is killed by product ; **D4** can (only) use batch method ; **D5** aseptic / sterile , conditions required ; **D6** AVP ;	**5 max**	**CREDIT** statements relating to yeast method only **IGNORE** statements relating to chemical method **IGNORE** ref to cost **A2** **ACCEPT** works well at low , temperatures / pressures **A3** **CREDIT** example e.g. sugar cane waste **A6** **IGNORE** ref to global warming / greenhouse gases **A7** e.g. yeast is readily available / easily accessible / yeast is in plentiful supply / yeast has simple growth requirements / process is less hazardous **D1** **ACCEPT** slower rate of reaction **D2** **ACCEPT** need to separate ethanol from yeast **D3** **ACCEPT** is inhibited by product **D5** **ACCEPT** more likely to become contaminated **D6** e.g. concentration of ethanol produced is limited
			QWC ;	**1**	**Award** if 2 **A** marks **and** 2 **D** marks have been awarded **Place a tick or a cross alongside the pencil icon to indicate whether or not the QWC mark has been awarded.**
			Total	**19**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td></td><td>
<table>
<tr><th>Explanation</th><th>Letter</th></tr>
<tr><td>One gene with two alleles.
The alleles show codominance.</td><td>A ;</td></tr>
<tr><td>One gene with two alleles, located on an autosome (gene not sex linked).
One allele is dominant and the other is recessive.</td><td>E ;</td></tr>
<tr><td>Two genes for two different characteristics on two different chromosomes.</td><td>D ;</td></tr>
<tr><td>A sex linked gene with a dominant and a recessive allele.</td><td>B ;</td></tr>
<tr><td>Epistasis, where two genes interact to affect one phenotypic character.</td><td>C ;</td></tr>
</table>
</td><td>5</td><td>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</td></tr>
</table>

Question			Expected Answer	Mark	Additional Guidance
6	(b)	(i)	q^2 = 15 ÷ 60 or 0.25 ; q = $\sqrt{0.25}$ or 0.5 ; (p =) 0.5 ;	3	**Correct answer (0.5) = 3 marks** even if no working shown **No mark for incorrect q^2 value but apply ecf afterwards** **ALLOW** ecf from candidates q^2 value (likely to be 0.87 or 0.9 (if candidate's q^2 = 0.75)) **ALLOW** ecf for p from candidate's calculated q value, (if q value between 0 and 1) **IGNORE** % values given for p (e.g. 50 % for 0.5)
6	(b)	(ii)	*in the pet shop* **1** population is , small / not (sufficiently) large ; **2** not all members of the population are breeding ; **3** *idea that* mating is not random ; **4** *idea that* migration / emigration / immigration , is occurring ; **5** *idea that* the non-brown rabbits could be colours other than white ;	2	**IGNORE** ref to (natural) selection / mutation (as these do not apply to the 'artificial' population in the pet shop) **IGNORE** 'albinos are infertile'
			Total	10	

Question			Expected Answer	Mark	Additional Guidance
7	(a)				**Note: All mark points are comparative**
			1 pioneers arrive **,** ***before*** climax / ***earlier*** **;** **ora**		**1** **CREDIT** pioneers arrive first / climax arrive last
			2 pioneer communities subject to **,** ***greater*** / ***more*** **,** change / succession / replacement **;** **ora**		
			3 pioneer community (usually) has **,** ***less*** / ***lower*** **,** biodiversity **;** **ora**		
			4 *idea that* pioneer community is (often) ***less*** **,** stable / self-sustaining **;** **ora**		
			5 pioneer community has ***lower*** biomass **;** **ora**		
			6 AVP **;**		**6** e.g. species in pioneer community better adapted to (named) abiotic factor(s) **<u>and</u>** those in climax community better adapted to (named) biotic factor(s)
				2 max	

Question			Expected Answer	Mark	Additional Guidance
7	(b)		**1** decomposition is break down **,** dead matter / waste **or** decomposition is conversion of organic matter to inorganic **;**		**1 IGNORE** putrefication **1 CREDIT** for **inorganic:** carbon dioxide / CO_2 / water / H_2O / ammonium compounds / ammonium ions / NH_4^+ **IGNORE** ammonia / NH_3
			2 denitrification is conversion of nitrates to nitrogen (gas) **;**		**2 CREDIT** correct formulae (NO_3^- and N_2) **DO NOT CREDIT** nitrogen oxides
			3 decomposition increases **,** mineral / nitrate **,** supply **and** denitrification reduces **,** mineral / nitrate **,** supply **;**	**2 max**	**3 CREDIT** decomposition returns , mineral / nitrate, to soil **and** denitrification removes mineral / nitrate, to soil
7	(c)		**1** conservation maintains **,** ecosystem / biodiversity / species / habitats **or** conservation involves **,** active / sustainable **,** management of **,** ecosystem / resource / habitat **;**		**IGNORE environment for MP1 and 2** **ACCEPT** named resource
			2 preservation leaves **,** ecosystems / habitats **,** undisturbed **;**	**2**	**ACCEPT** unchanged/ not disrupted / no physical intervention **IGNORE** ref to preservation in any context other than that of conservation/preservation

Question			Expected Answer	Mark	Additional Guidance
7	(d)		**1** nitrogen fixation is the conversion of (atmospheric) nitrogen into **,** ammonia / ammonium compounds / ammonium ions **;** **2** nitrification is the conversion of **,** ammonia / ammonium compounds /ammonium ions **,** into nitrite / nitrate **;** **3** correct ref to microorganisms involvement in both processes **;**	**2 max**	**1** **CREDIT** N_2 / NH_3 / NH_4^+ **2** **CREDIT** NH_3 / NH_4^+ **CREDIT** NO_2^- / NO_3^- **DO NOT CREDIT** nitrate to nitrite **3** e.g. nitrogen fixation involves **,** *Rhizobium* / *Azotobacter* / *Nostoc* **and** nitrification involves **,** *Nitrosomonas* / *Nitrobacter*
			Total	**8**	

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