Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1		i	**Level 3 (5–6 marks)** Makes detailed comparisons between plant **AND** animal species in climax community **AND** pioneer community. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* Level 3 responses must address some of the emboldened indicative points (or address ideas of equivalent value). **Level 2 (3–4 marks)** Makes comparisons between plant **AND** animal species in climax community **AND** pioneer community. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Mentions some features of species in climax community and/or pioneer community. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 mark** *No response or no response worthy of credit.*	6 (AO 1.2 x 4) (AO 2.5 x 2)	**Indicative points may include** *Pioneer community* Plants - small species with example **shorter life-cycle / fast growing** **seeds or spores** **large quantities produced** **can be dispersed long distances** **germinate rapidly** **self-pollinating / asexual reproduction** **able to tolerate extreme environments, e.g. xerophytic / able to fix nitrogen** Animals - few species (if any) - mostly small species with example *Climax community* Plants - more species than pioneer community - larger species with example **unable to tolerate extreme environments** **require soil with ample water and minerals** **dominant species** **slow growing** Animals - larger species with example - more **herbivore** species **carnivore species present**

- **longer food chains**

QWC

Award the communication mark to answers that include relevant material and make clear comparisons between climax and pioneer communities.

Examiner's Comments

The question asked candidates to compare plants and animals living in two communities. Lower-level answers tended to focus on very general statements about biodiversity and the size of individual organisms. High-scoring answers made direct comparisons along the lines of those suggested in the indicative points in the mark scheme - for example, "In a pioneer community, plants are able to withstand extreme environments, having, for example, xerophytic adaptations, whereas, in a climax community, plants lack such adaptations and require access to an ample supply of water." - and were able to keep their answers concise and within the writing space provided. Reference to all of the indicative points on the mark scheme were seen, along with other creditworthy ideas. Many answers focused entirely on the relative size of the organisms and the species richness of the two communities and so did not achieve higher than Level 2.

Many answers, appropriately, offered examples of pioneer and climax species. On this occasion candidates were not penalised for thinking that lichens (or indeed, algae) are plants, but not fungi and suggesting that bacteria were animals.

Answers that ignored the command word 'compare' and described the process of succession without making direct comparisons between pioneer and climax communities often wasted a lot of space and time discussing

					intermediate series and could not be given the upper 'communication' mark within a level.
					(i) **OCR support**
					The Guide to Level of Response (LoR) questions supports students by providing guidance on how to answer the LoR questions with confidence. Exemplar 2
					This is a concise response that achieved full marks. It mentions few animals in pioneer community (implying species), pioneer plants being adapted to harsh conditions, and pioneer plants being small. (The candidate has been forgiven for thinking that lichens are plants.) With regard to the climax community, tall named plants that dominate and a larger variety of animals has been given. Some of the emboldened indicative points have been addressed so there is just enough here for Level 3. The way the candidate has presented their answer makes comparisons easy.
		ii	(change in) soil / substrate ✓	1 (AO 1.2)	*Mark first answer* **ALLOW** increased humus **ALLOW** any feature of soil **Examiner's Comments** Many candidates did not appreciate the significance of being asked for a change other than in the species that live there. Hence, frequently seen answers such as 'evolution' or 'speciation' were not given. Around a third of responses were given the mark.

		iii	bare ground / rock / water / mud / sand / glacier / lava ✓	1 (AO 2.5)	**IGNORE** empty land **DO NOT CREDIT** incorrect answers, e.g., soil **Examiner's Comments** Most candidates got this correct; those that did not, tended not to have scored highly on part (i).
			Total	**8**	
2			D✓	1 (AO 1.1)	**Examiner's Comments** The vast majority of candidates achieved this mark.
			Total	**1**	
3			B✓	1 (AO 2.2)	**Examiner's Comments** Only around a quarter of responses achieved this mark. The most common incorrect response was A, but it would not be appropriate to compare different depths by measuring area.
			Total	**1**	
4			B✓	1 (AO 1.1)	**Examiner's Comments** Fewer than half of candidates appeared to know that growth contributed to biomass.
			Total	**1**	
5	a		ammonification ✓ nitrifying ✓ *Nitrosomonas* ✓ *Nitrobacter* ✓ amino acids ✓ nitrogen-fixing ✓	6 (AO1.1) (AO1.2)	**ALLOW** lower case letters for all generic names **ACCEPT** phonetic equivalent spelling **ACCEPT** phonetic equivalent spelling **ALLOW** protein **ALLOW** nucleic acids **Examiner's Comments** This question differentiated extremely well between candidates of differing abilities with less than 1 in 10 achieving full marks and slightly more scoring 0 marks. A large minority of candidates couldn't recall the correct bacterial genus and, often, incorrect

				names such as *Azotobacter,* were seen in place of the others. Candidates were given some leeway with spelling but answers that were clearly not phonetic equivalents of the correct answer were not credited; this included 'nitrogen-fixating'. A number of candidates wrote that a plant might convert absorbed nitrates to 'ammonia' and 'nitrogen', instead of 'proteins'.
	b		2 (AO2.5)	**ALLOW** descriptions of either **IGNORE** refs to nitrifying bacteria **ALLOW** reduces availability (to plants) of NO_3^- **Examiner's Comments** Almost half of candidates achieved 1 mark here, usually for describing reduced nitrification or nitrate availability. Only around 1 in 10 candidates realised that denitrification was the key to this question but those that did usually got both marks. Many candidates did not appreciate the significance of the reference to the nitrogen cycle and answered in terms of respiration. A significant number of responses stated that oxygen was needed for photosynthesis.

Content for row b, first column:
increased denitrification / decreased nitrification ✓

conditions favour (named) denitrifying bacteria ✓

(more) nitrate / NO_3^-, converted to nitrogen / N_2 , gas ✓

		Total	**8**	
6	a	i (description of) systematic sampling / transect ✓	1(AO1.2)	**IGNORE** stratified **Examiner's Comments** Around half of candidates immediately spotted the need to reference distribution and promptly cited transects and/or systematic sampling. Many responses discussed doing more quadrats, using point quadrats, or measuring percentage cover within each quadrat, none of which were given marks.
		ii (placement could be) not accurate / biased ✓ position of coordinates difficult to	2 max(AO3.4)	**Examiner's Comments**

			judge ✓ method does not specify top (left) or bottom (left) ✓		Few responses achieved both marks in this question but it did differentiate well. Many spotted the ambiguity about which left hand corner was needed. Fewer seemed aware of the routine limitation with this kind of investigation which is the difficulty in judging the position of the coordinate when you are standing some distance from a tape measure. There were a large number of regular incorrect responses. Many did not seem to appreciate that if a quadrat lay outside the 20 × 20 grid, this would not invalidate the results. Many seemed to think that there would be some difficulty in deciding in which direction north lay while others thought the centre of the quadrat should be placed over the coordinate. This all suggests that many students may have, understandably, had restricted access to fieldwork opportunities during their course. Some struggled to understand the method and were concerned that only those plants associated with 'the north' (either in terms of where they were growing or facing) were being included in the investigation. A few candidates thought north would move.
	b	i	**FIRST CHECK ON ANSWER LIN** **If answer = 0.6816 award 3 marks** $\sum(n/N)^2$= 0.3184 ✓ ✓ 1 - calculated $\sum(n/N)^2$ ✓	3(AO2.4)	**ALLOW** 0.68 / 0.682 **ALLOW** any correct rounding **ALLOW ecf** from calculated value of $\sum(n/N)^2$ **Examiner's Comments** This skill has evidently been well practised, with most candidates getting the correct answer, supported by a clear and well-organised calculation.
		ii	*If treating grass as a single species*… D / calculated diversity / index , is lower ✓ **ora**	2 max(AO2.4)	**ALLOW** 'value' as AW for calculated diversity **ALLOW** 'a bigger number is subtracted from 1'

		$\sum(n/N)^2$ is higher ✓ **ora** *idea that* $(26/N)^2$ will be bigger than the sum of $(n/N)^2$ for individual grass species ✓			**ALLOW** e.g. '0.270 is bigger than the equivalent number for individual grasses' **Examiner's Comments** Most responses gained 1 mark for recognising that the students' approach would have lowered the value for D. However, only a minority went on the support this with reference to which of the earlier stages in the calculation would have been affected. Responses that did not reference the calculated figure for D, merely discussing the idea of biodiversity, were not given marks. ◯ **Assessment for learning** This question could be used, or modified, to consolidate or extend a class's understanding of Simpson's Index and the impact of species richness and evenness.
	c	i	quick(er) ✓ wide(r) area can be surveyed ✓	1 max(AO3.4)	**IGNORE** easier **ALLOW** description of why it might be quicker **Examiner's Comments** Around half of candidates appreciated that ACFOR would be quicker than using quadrats. Few mentioned its advantages for surveying a wide area. Some answers suggested that many candidates were unfamiliar a sampling technique that did not involve quadrats.
		ii	subjective / uses judgement ✓ misses , small(er) / non-flowering , plants ✓	1 max(AO3.4)	**ALLOW** opinion **IGNORE** qualitative / (not) quantitative / inaccurate / imprecise / not random / biased **ALLOW** overestimates abundance of large plants **Examiner's Comments**

				Around half of candidates realised that a major issue with ACFOR was subjectivity. A minority of responses thought that not being able to calculate Simpson's Index was a disadvantage while others thought it would not be possible to perform any kind of statistical test on the resulting data. The fact that the second marking point was very rarely given suggests that very few responses had the opportunity to undertake fieldwork that did not involve quadrat sampling.
		Total	**10**	
7		A ✓	1(AO1.2)	
		Total	**1**	