InkBiology

ANSWER BOOK

Succession: how bare rock becomes woodland, and why we stop it

Ecology, populations and environmental change · Unit B20

AQA 3.7.4 · OCR A 6.3.2 · Edexcel A Topic 5 · CAIE 18.1

6 questions · 21 marks

NAVY EDITION

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SECTION A · Short, 1 to 2 marks

A1 **B1** the first species to colonise a bare surface, adapted to survive there when almost nothing else can. **B1** they stabilise the surface and hold water, and when they die their remains add the first organic matter, so a thin soil begins to form. [2]

SECTION B · Standard, 3 to 5 marks

B1 **B1** for: the series is long, so a genuine trend can be separated from a run of unusual years, and the fall is measured against a baseline recorded before it began rather than against an impression. **B1** for: a mechanism can be stated. Added nitrogen favours a few vigorous grasses which grow tall and shade the smaller species out, and that is the same competition for light that drives succession, so the claim is more than bare correlation. **B1** against: the two series were measured over the same period, and almost everything else changed over that period as well, so temperature, rainfall, grazing intensity and burning are alternative explanations that have not been excluded. **B1** against: the twelve sites were chosen because somebody could reach them and thought them worth recording, so they are not a random sample of the moor, and there is no untreated plot to compare them against. **B1** judgement: the monitoring cannot establish the cause on its own; what would settle it is a manipulation, with plots assigned in advance to receive added nitrogen and control plots that do not, recorded by the same method. The honest claim from the monitoring alone is that richness fell at this rate over this period, with nitrogen deposition as one candidate cause. [5]

B2 **B1** each community alters the abiotic conditions of the place it occupies, and alters them in ways that suit some other species better than itself. **B1** lichens trap dust, hold water and secrete acids that break the rock down, and their remains add organic matter, so a thin soil forms, which is what a moss needs and a lichen does not. **B1** as the soil deepens it holds more water and more mineral ions, so larger plants with deeper roots can establish and add far more organic matter when they die. **B1** the mechanism at each handover is competition, usually for light: a taller species shades a shorter one, which then photosynthesises below its compensation point, grows less and is lost from the community, which is why the sequence runs small to large. [4]

B3 **B1** a plagioclimax is a community held at a stage short of its climax by a repeated interference, usually grazing, mowing, burning or ploughing. **B1** grazing animals eat the seedlings of hawthorn and other woody plants, so the sere is held at a grassland stage instead of running on to scrub and then woodland. **B1** the many small light-demanding herbs of chalk grassland, and the orchids and butterflies that depend on them, persist only while nothing is shading them. **B1** if the grazing stops, woody seedlings survive and grow and shade the herbs, which then photosynthesise below their compensation point and are lost, so richness falls. Leaving the reserve alone is a management decision with consequences rather than the absence of one. [4]

B4 **B1** the soil already exists, so no part of the sequence has to be spent building it from a bare surface, which is the slowest step of all. **B1** that soil already holds nutrients, water and decomposers, so conditions are tolerable to larger plants from the start. **B1** it also holds a seed bank of seeds, roots and rhizomes that survived the clearance, so the plants of middle seral stages appear within a year or two rather than waiting to arrive as windblown seeds or spores. [3]

B5 **M1** percentage change = (change ÷ original value) × 100, and the original value is the grazed figure of 38. **M1** the decrease is 38 - 12 = 26 species per square metre, so 26 ÷ 38 = 0.684. **A1** a decrease of 68.4 per cent, or 68 per cent to two significant figures. [3]