4.3 Ecosystems, populations and succession

Name: _____ Class: _____ Date: _____ **Total: 21 marks**

KEY WORDS habitat • population • community • ecosystem • succession • climax community

Objective

Practise statements 5.11-5.15 with Core Practical 11: habitat, population, community and ecosystem; biotic and abiotic control; predator-prey cycles; sampling methods; and succession from pioneer species to climax community.

1 Key knowledge and worked examples

■ Four terms, one hierarchy

Habitat → **population** (one species) → **community** (all populations) → **ecosystem** (community + abiotic environment). **Biotic** factors: competition, predation, disease. **Abiotic** : light, water, temperature, pH, salinity.

■ Sampling

Quadrats: random placement (grid + random numbers) for percentage cover or frequency; transects for gradients. Animals: **capture-mark-recapture** , $Npprox\frac{n_1imesn_2}{m}$ where m is the marked recaptures.

■ Succession

Bare ground → pioneers (tolerant of harsh conditions, change the soil) → grasses → shrubs → trees → **climax community** . Each stage makes the next possible.

■ Worked example: mark-recapture

First catch 60 beetles marked; second catch 45 with 12 marked. $N = 60imes45/12 = 225$. Assumptions: marks persist, no births/deaths/migration between catches, marked mix freely – state one in the exam.

2 Practice

2.1 Define the terms community and ecosystem. [2]

2.2 Give one biotic and one abiotic factor that could limit a woodlouse population. [2]

2.3 Name the first organisms that colonise bare ground in succession. [1]

3 Exam-style questions

3.1 A student samples daisies on a school field with twenty 0.25 m^2 quadrats thrown by hand, finding a mean of 8.4 per quadrat. Describe two weaknesses of this method, how each biases the estimate, and how the student should place quadrats instead. [5]

3.2 The graph of a lynx-hare system shows hare numbers peaking about two years before lynx numbers. Explain the lag between the two peaks, referring to reproduction and starvation. [5]

3.3 A retreating glacier leaves bare rock. Describe the expected succession over 200 years to climax forest, naming the type of organism at each stage and one way each stage changes the conditions for the next. [6]