1.5 Ecosystems and Interdependence: 30-minute Pack

Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question has two parts.

(a) Explain the general mechanism by which invasive species reduce biodiversity in a habitat. **(2)**

(b) Give one specific example and describe the effect. **(2)**

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2 State two reasons why sampling with quadrats might give an inaccurate estimate of plant population size across a whole field.

(a) Give two reasons (one per line). **(2)**

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3 Describe how you would use a belt transect to investigate how plant species change from the edge to the centre of a hedgerow. Include the main steps and one piece of equipment you would use.

(a) Describe the method in clear steps and name one piece of equipment. **(3)**

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4 Extended response (6 marks). A local nature group plans to restore a small pond that has become overgrown with duckweed and has low oxygen levels in summer. They consider removing some duckweed, planting native aquatic plants, and reducing nutrient runoff from a nearby garden. Discuss the advantages and disadvantages of these actions and recommend which single action or combination you would choose. In your answer evaluate likely effects on biodiversity and water quality, and consider practical issues such as effort and time. You will be assessed on the quality of your written communication and the balance of science in your evaluation.

(6)

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5 A simple food chain in a meadow is: grass -> caterpillar -> song thrush.
State the producer, two consumers and name a possible predator of the song thrush.

(a) State the producer in this food chain. **(1)**

(b) State two consumers in the chain, naming them separately. **(1)**

(c) Name a possible predator of the song thrush in this meadow. **(1)**

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6 Explain why removing a top predator from an ecosystem can cause numbers of some species to increase and others to decrease. Use the terms: predation, population, trophic level, and competition in your answer.

(a) Write your explanation. **(4)**

7 Biologists measure the number of dandelions in two grassy fields using quadrats. Field A: counts in five quadrats = 12, 9, 15, 13, 11. Field B: counts in five quadrats = 8, 7, 6, 9, 10. Calculate the mean number of dandelions per quadrat for each field. Which field is likely to have the greater dandelion density overall?

(a) Calculate the mean for Field A. **(2)**

(b) Calculate the mean for Field B. **(1)**

(c) State which field likely has the greater dandelion density and give a brief reason. **(1)**

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Mark scheme · 1.5 Ecosystems and Interdependence: 30-minute Pack

Question 1

(a) invasive species outcompete native species for resources or prey upon them or bring disease — **M1**

(a) leading to reduction or local extinction of native species and lower biodiversity, oe — **A1**

(a) Answer: **Invasive species compete with native species for food, space or light, or they may prey on or infect native species, causing declines or local extinctions and so reducing biodiversity.**

(b) specific invasive example named eg grey squirrel in UK outcompeting red squirrel, Japanese knotweed outcompeting native plants, signal crayfish reducing native crayfish — **M1**

(b) effect described eg red squirrel numbers fall and local extinction risk increases, or native plants shaded out and soil changes reducing other plants, oe — **A1**

(b) Answer: **Example: grey squirrel introduced to the UK outcompetes native red squirrels for food and habitat, causing red squirrel populations to decline.**

Question 2

(a) reason 1 eg quadrats not placed randomly so biased sampling — **B1**

(a) reason 2 eg too few quadrats or quadrat size not representative, or seasonal variation, oe — **B1**

(a) Answer: **Possible reasons: quadrats not placed randomly so results are biased; too few quadrats sampled so estimate is unreliable.**

Question 3

(a) lay a tape measure from edge to centre and place quadrats at regular intervals along it — **M1**

(a) record species and abundance in each quadrat moving along the belt transect — **M1**

(a) equipment stated eg tape measure, quadrat, clipboard and identification key, oe — **A1**

(a) Answer: **Lay a tape measure from the hedgerow edge to the centre, place quadrats at regular intervals along the tape, record which plant species and their abundance in each quadrat, and repeat to get replicates. Equipment example: tape measure and quadrat.**

Question 4

Level 3 A balanced, well-explained evaluation that considers advantages and disadvantages of the actions, makes a justified recommendation, and links effects to biodiversity and water quality. Good structure and clear use of biological terms. — **5-6**

Level 2 Some evaluation with advantages and disadvantages described and a recommendation, but reasoning may be incomplete or partially linked to biodiversity and water quality. Communication is clear but not fully developed. — **3-4**

Level 1 Simple statements or descriptions of actions with little or no evaluation or justification. Limited use of biological ideas and poor organisation. — **0-2**

Indicative content:

- Removing duckweed: advantage - increases light penetration and oxygen levels, immediate effect; disadvantage - must be repeated, may remove habitat for some invertebrates, labour intensive.
- Planting native aquatic plants: advantage - increases oxygen through photosynthesis, provides habitat and increases biodiversity; disadvantage - takes time to establish and may need protection from grazing.
- Reducing nutrient runoff: advantage - addresses root cause by lowering eutrophication, long-term improvement in water quality and biodiversity; disadvantage - may require cooperation from neighbours and changes in garden practices, time lag before benefits.
- Evaluation points: combined approach likely best as removing duckweed gives immediate relief while planting and reducing runoff give medium to long-term improvement; consider effort and resources, prioritise actions that address cause and maintain habitat diversity.

Question 5

(a) grass cao — **B1**

(a) Answer: **Grass**

(b) two consumers named (one mark if two given together is acceptable) eg caterpillar and song thrush cao — **B1**

(b) Answer: **Caterpillar; song thrush.**

(c) predator named eg fox, sparrowhawk, cat, kestrel, owls, oe — **B1**

(c) Answer: **Fox (or sparrowhawk, cat, kestrel, owl).**

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Question 6

(a) idea that top predator normally eats prey species so predation reduces prey numbers **M1**

(a) removal of predator leads to increase in those prey populations (direct effect) **M1**

(a) increased prey leads to more competition for resources among those species or for species at other trophic levels **M1**

(a) linked conclusion that some other species may decrease because of increased competition or because their food source is reduced, oe **A1**

(a) Answer: **Removing a top predator stops predation on its prey so those prey populations increase. This can cause greater competition for food and space among those species and reduce food for species at other trophic levels, so some other populations fall.**

Question 7

(a) correct addition and division shown for Field A: (12+9+15+13+11) / 5 **M1**

(a) 12 (dandelions per quadrat) cao **A1**

(a) Answer: **12 dandelions per quadrat**

(b) 8.0 (dandelions per quadrat) cao **A1**

(b) Answer: **8.0 dandelions per quadrat**

(c) Field A, because its mean number per quadrat (12) is higher than Field B (8), oe **B1**

(c) Answer: **Field A, because the mean per quadrat is higher (12 > 8).**

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