1.23 Ecosystems, Adaptation and Feeding Relationships: Test Pack

AQA 8464 · Calculator allowed · about 35 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question checks three key terms used throughout ecology.

(a) Define the term 'niche'. **(1)**

(b) Define the term 'interspecific competition'. **(1)**

(c) Define the term 'intraspecific competition'. **(1)**

(Total for Question 1 is 3 marks)

2 The simplified marine food web below shows some feeding relationships off the UK coast.
phytoplankton -> zooplankton -> herring -> seal -> orca
herring is also eaten by cod

(a) Predict what would happen to the herring population if the seal population increased greatly. **(1)**

(b) Explain the likely effect on the cod population of the same increase in the seal population. **(2)**

(c) State one reason why a real food web is likely to be more complex, and predictions like this less certain, than this simplified diagram suggests. **(1)**

(Total for Question 2 is 4 marks)

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3 Required practical: Erin is investigating the population size of daisy plants growing across a school playing field, using 0.5 m by 0.5 m quadrats.

(a) State one way Erin could make sure the position of each quadrat is chosen randomly. **(1)**

(b) Erin instead places every quadrat in the parts of the field where daisies look most abundant, because this is quicker. Explain the effect this would have on her estimate of the total daisy population. **(2)**

(c) Suggest one way Erin could improve the reliability of her population estimate, other than sampling randomly. **(1)**

(Total for Question 3 is 4 marks)

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4 The diagram below shows the energy stored in the biomass at each stage of a pond food chain, in kJ per m^2 per year.
algae: 12000 kJ -> water fleas: 900 kJ -> minnows: 95 kJ -> pike: 9 kJ



(a) Calculate the percentage efficiency of energy transfer from algae to water fleas. **(2)**
Give your answer to 2 significant figures.

.....

(b) Calculate the percentage efficiency of energy transfer from minnows to pike. **(2)**
Give your answer to 2 significant figures.

.....

(Total for Question 4 is 4 marks)

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5 The table shows the relative abundance (arbitrary index units) of aphids and ladybirds recorded in the same rose garden over six consecutive years.

Year 1: aphids 20, ladybirds 4
Year 2: aphids 55, ladybirds 6
Year 3: aphids 30, ladybirds 14
Year 4: aphids 10, ladybirds 9
Year 5: aphids 25, ladybirds 3
Year 6: aphids 48, ladybirds 5

(a) Describe the relationship shown by the data between aphid numbers and ladybird numbers over the six years. **(2)**

(b) Suggest, in terms of predation, why aphid numbers fell between year 2 and year 3. **(2)**

(Total for Question 5 is 4 marks)

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6 The red squirrel population in a UK forest was 640 in 2015. By 2025, following the introduction of grey squirrels to the area, the red squirrel population had fallen to 224.

(a) Calculate the percentage decrease in the red squirrel population between 2015 and 2025. **(3)**

(b) Higher tier only. Explain, in terms of interspecific competition, how the presence of grey squirrels could cause the red squirrel population to decline. **(2)**

(Total for Question 6 is 5 marks)

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Mark scheme · 1.23 Ecosystems, Adaptation and Feeding Relationships: Test Pack

Question 1

(a) the role or way of life of an organism within its habitat, including what it eats, where it lives and how it interacts with other organisms, oe **B1**

(a) Answer: The role or way of life of an organism within its habitat.

(b) competition between organisms of different species for the same resource, e.g. food, water, light, space or mates, oe **B1**

(b) Answer: Competition between organisms of different species for the same resource.

(c) competition between organisms of the same species for the same resource, oe **B1**

(c) Answer: Competition between organisms of the same species for the same resource.

Question 2

(a) herring population would decrease, because more seals means more herring are predated (eaten), oe **B1**

(a) Answer: The herring population would decrease.

(b) cod population would be likely to decrease, oe **M1**

(b) because cod also feeds on herring, so cod is now competing with a larger seal population for a smaller (falling) herring population, meaning less food is available per cod, oe **A1**

(b) Answer: The cod population would be likely to decrease, because cod compete with seals for herring, and with more seals eating more herring, there is less food available for cod.

(c) one valid reason: cod (and other predators) may have alternative food sources to switch to; other factors such as disease, fishing or temperature also affect population sizes; there may be many more species and feeding links in a real food web, oe **B1**

(c) Answer: Example: cod may be able to switch to eating other prey species if herring become scarce, so the effect may be smaller than predicted.

Question 3

(a) lay two tape measures at right angles along two sides of the field and use a random number generator (or random number table) to generate a pair of coordinates for each quadrat, oe **B1**

(a) Answer: Use two tape measures as axes across the field and a random number generator to pick coordinates for each quadrat.

(b) identifies that the sample is no longer representative of the whole field, because it is biased towards areas with more daisies, oe **M1**

(b) explains this would make the mean density calculated too high, so the estimate of the total population would be an overestimate, oe **A1**

(b) Answer: The sample would be biased towards daisy-rich areas and so not representative of the whole field; the calculated mean density, and therefore the estimated total population, would be too high (an overestimate).

(c) increase the number of quadrats sampled (a larger sample size gives a more reliable mean), oe; accept using a larger quadrat, or repeating on different days **B1**

(c) Answer: Increase the number of quadrats sampled, so the mean density is based on a larger, more reliable sample.

Question 4

(a) substitutes: (900 / 12000) x 100 **M1**

(a) 7.5% cao **A1**

(a) Answer: 7.5%

(b) substitutes: (9 / 95) x 100 **M1**

(b) 9.5% cao (accept 9.47% to 9.5%) **A1**

(b) Answer: 9.5%

Question 5

(a) as aphid (prey) numbers rise, ladybird (predator) numbers rise shortly afterwards, e.g. aphids peak in year 2 (55) and ladybirds peak in year 3 (14), oe **B1**

(a) as ladybird numbers rise, aphid numbers then fall, e.g. after ladybirds peak in year 3, aphids fall to their lowest in year 4 (10), oe **B1**

(a) Answer: Ladybird numbers rise shortly after aphid numbers rise (e.g. aphids peak at 55 in year 2, ladybirds peak at 14 in year 3), and aphid numbers then fall once ladybird numbers are high (aphids fall to 10 in year 4).

(b) ladybird numbers were rising over this period (from 6 to 14), oe **M1**

(b) so more aphids were being eaten (predated) by the larger number of ladybirds, reducing the aphid population, oe **A1**

(b) Answer: Ladybird numbers were increasing over this period, so more aphids were being eaten by the growing number of predators, reducing the aphid population.

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Question 6

(a) calculates the decrease: 640 - 224 = 416 **M1**

(a) substitutes: (416 / 640) x 100 **M1**

(a) 65% cao **A1**

(a) Answer: 65% decrease

(b) grey squirrels compete with red squirrels for the same resources, such as food (e.g. acorns, seeds) and nesting/breeding sites, oe **M1**

(b) grey squirrels are more successful competitors (e.g. larger body size, can digest acorns more efficiently, tolerate higher population densities), so red squirrels obtain fewer resources, reducing their survival and/or reproduction and so their population size, oe **A1**

(b) Answer: Grey squirrels compete with red squirrels for the same food and nesting sites, but are more successful competitors, so red squirrels obtain fewer resources, reducing their survival and reproduction and causing the population to fall.

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