1.23 Ecosystems, Adaptation and Feeding Relationships: 30-minute Pack

AQA 8464 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Six adaptations that help animals survive in cold environments are listed below.

1 a thick layer of blubber under the skin
2 hibernating during the coldest months
3 producing antifreeze proteins in the blood
4 having white fur for camouflage
5 migrating to a warmer climate for winter
6 having a lower resting metabolic rate to conserve energy

Classify each adaptation as structural, behavioural or functional.

(Total for Question 1 is 3 marks)

2 State what is meant by the term 'extremophile', and give one example of an extreme environment in which extremophiles live.

(Total for Question 2 is 2 marks)

3 Explain why a food web gives a more complete picture of the feeding relationships in an ecosystem than a single food chain does.

(Total for Question 3 is 2 marks)

© Revision Library | revisionlibrary.co.uk

4 Lesser celandine is a small woodland plant. It grows most of its leaves and produces its yellow flowers in early spring, then dies back to underground tubers by early summer, once the leaves on the deciduous trees above it have fully grown. Use your knowledge of light intensity and photosynthesis to explain why lesser celandine grows and flowers mainly in early spring.

(Total for Question 4 is 4 marks)

© Revision Library | revisionlibrary.co.uk

5 Priya grows vegetables in her garden. She notices the following feeding relationships: cabbage plants are eaten by caterpillars; caterpillars are eaten by blue tits; blue tits are eaten by sparrowhawks.

(a) Use these four organisms to construct a food chain. Use arrows to show the direction of energy transfer. **(2)**

(b) Identify the producer and the tertiary consumer in this food chain. **(2)**

(c) The caterpillars in the garden have a total of 6200 kJ of energy stored in their biomass. Only 10% of this energy is transferred to the blue tits that eat them. Calculate the energy transferred to the blue tit population. **(2)**

(d) Explain why less than 100% of the energy available in the caterpillars is transferred to the blue tits. **(3)**

(Total for Question 5 is 9 marks)

6 In a farmland food web: cereal seeds are eaten by field voles and by wood mice; field voles and wood mice are both eaten by kestrels and by barn owls. A cold, wet spring causes a sharp decline in the wood mouse population. Predict two effects this could have on the population of kestrels, and explain your answers.

(Total for Question 6 is 4 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 1.23 Ecosystems, Adaptation and Feeding Relationships: 30-minute Pack

Question 1

5 or 6 adaptations correctly classified (structural: thick blubber, white fur; behavioural: hibernating, migrating; functional: antifreeze proteins, lower metabolic rate) **B3**

3 or 4 adaptations correctly classified **B2**

1 or 2 adaptations correctly classified **B1**

Answer: Structural: thick layer of blubber, white fur. Behavioural: hibernating, migrating to a warmer climate. Functional: antifreeze proteins, lower resting metabolic rate.

Question 2

an organism (often a microorganism/bacterium) that is adapted to live in conditions of extreme temperature, pressure, salt concentration or pH, oe **B1**

a suitable example environment, e.g. deep-sea hydrothermal vents, hot springs, or highly salty lakes **B1**

Answer: An extremophile is an organism adapted to live in conditions of extreme temperature, pressure, salt concentration or pH, for example in deep-sea hydrothermal vents or hot springs.

Question 3

a food web shows that most organisms eat, and are eaten by, more than one other species, by combining several interconnected food chains, oe **B1**

this means it also shows what could happen to a population if one of its food sources or predators changes/declines (e.g. alternative food sources are shown), which a single food chain cannot show, oe **B1**

Answer: A food web combines several interconnected food chains, showing that most organisms have more than one food source or predator; this means it can also show what might happen to a population if one food source or predator changes, unlike a single food chain.

Question 4

in early spring, the deciduous trees above have no leaves (bare branches), so light intensity reaching the woodland floor is high **B1**

lesser celandine can absorb more light for photosynthesis at this time, allowing it to produce enough glucose to grow quickly and flower **B1**

by early summer, the tree leaves have fully grown and form a canopy that blocks/absorbs much of the light **B1**

light intensity reaching the woodland floor falls, limiting the rate of photosynthesis, so the plant cannot produce enough glucose to keep growing above ground and instead survives as an underground tuber, oe **B1**

Answer: In early spring there is high light intensity on the woodland floor because the trees have no leaves, allowing lesser celandine to photosynthesise quickly and grow/flower; once the tree canopy is in full leaf by summer, light intensity falls, limiting photosynthesis, so the plant dies back and survives underground as a tuber instead.

Question 5

(a) all four organisms included, in a logical feeding order **B1**

(a) arrows drawn correctly, in the direction of energy transfer (from each organism to what eats it) **B1**

(a) Answer: cabbage plant -> caterpillar -> blue tit -> sparrowhawk

(b) producer correctly identified: cabbage plant, ft from (a) **B1**

(b) tertiary consumer correctly identified: sparrowhawk, ft from (a) **B1**

(b) Answer: Producer = cabbage plant. Tertiary consumer = sparrowhawk.

(c) 6200 x (10/100), oe **M1**

(c) 620 kJ cao **A1**

(c) Answer: 620 kJ

(d) some energy is lost as heat, released during respiration (used for movement and, in the endothermic blue tits, to maintain a constant body temperature) **B1**

(d) not all parts of the caterpillars are eaten, or are not digested, and are egested as faeces/waste material **B1**

(d) some energy is used for the caterpillars' own life processes (e.g. movement, growth of body parts that are not eaten) before they are eaten, oe **B1**

(d) Answer: Energy is lost as heat from respiration (used for movement and, in blue tits, keeping warm), in undigested material egested as faeces, and in the caterpillars' own life processes before being eaten, so only a small proportion of the total energy is passed on.

Question 6

effect 1: the kestrel population may fall (or some kestrels may struggle to find enough food) **B1**

linked explanation: because there is less food available for kestrels overall, as one of their two prey species has declined, oe **B1**

effect 2: the kestrel population might not change very much / may stay fairly stable **B1**

linked explanation: because kestrels can instead eat more field voles (an alternative food source), so they are not solely dependent on wood mice, oe **B1**

Answer: The kestrel population could fall, because there is less food available overall with fewer wood mice; alternatively, it might stay fairly stable, because kestrels can rely more heavily on field voles as an alternative food source instead.

© Revision Library | revisionlibrary.co.uk