

Ecology practice questions

27 questions • 80 marks • mark scheme at the back

For AQA GCSE Biology 8461 and Combined Science: Trilogy 8464. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

Name

Total / 80

Adaptations, interdependence and competition Spec 4.7.1

1 Which list shows the levels of organisation in an ecosystem from smallest to largest? [1 mark]

- A. ☐ Organism, population, community, ecosystem
- B. ☐ Population, organism, community, ecosystem
- C. ☐ Organism, community, population, ecosystem
- D. ☐ Ecosystem, community, population, organism

2 Bluebells grow on the floor of a woodland under tall oak trees. Suggest two factors that the bluebells and the oak trees compete for. [2 marks]

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3 The table shows the number of plants of one species per m² in soils of different pH. (a) [3 marks]
State the soil pH at which the plant is most abundant. (1) (b) Describe how the number of plants changes as the soil pH increases. (2)

Number of plants per m ² at different soil pH					
Soil pH	4	5	6	7	8
Number of plants per m ²	2	14	40	38	9

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- 4** A lake contains small fish that feed on insect larvae. A new predatory fish species arrives [4 marks]
in the lake. It eats only the small fish. (a) Explain how this could affect the population of
small fish. (2) (b) Explain how this could affect the population of insect larvae. (2)

- 5** Polar bears live in the Arctic. (a) A polar bear has a thick layer of fat under its skin. [3 marks]
Suggest how this is an adaptation to its environment. (1) (b) A polar bear has white fur.
Suggest how this is an adaptation. (1) (c) Bacteria that live in deep sea vents are adapted to
very extreme conditions. Name the term for organisms like this. (1)

Organisation of an ecosystem Spec 4.7.2

- 6** A student counted the number of dandelions in 8 quadrats: 3, 8, 5, 8, 6, 4, 8, 6. (a) [5 marks]
Calculate the mean, and give the mode and the median number of dandelions per
quadrat. (3) (b) Each quadrat has an area of 0.25 m². The field has an area of 200 m².
Estimate the number of dandelions in the field. (2)

Answer =

11 Triple only [3 marks]

A student left 60 g of dead leaves to decay. After 20 days, the mass of leaves remaining was 36 g at 25 °C and 52 g at 10 °C. Calculate the mean rate of decay at each temperature, in g per day.

Answer =

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12 Triple only [3 marks]

A gardener wants waste to decay quickly in a compost heap. Explain how the conditions in the heap can be changed to speed up decay.

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13 Triple only Higher tier [2 marks]

Over 30 years, the mean summer temperature in an area has increased. A butterfly species is now found 50 km further north than it was 30 years ago. Suggest why the distribution of the butterfly has moved north.

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Biodiversity and the effect of human interaction on ecosystems

Spec 4.7.3

14 Explain why a great biodiversity helps to keep an ecosystem stable. [2 marks]

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- 15** (a) Give one cause of pollution in water, one in air and one on land. (2) (b) Explain how pollution can reduce biodiversity. (1) **[3 marks]**

- 16** Peat bogs are destroyed to make garden compost. Explain the effects of this on biodiversity and on the atmosphere. **[3 marks]**

- 17** (a) Name two gases in the atmosphere that are increasing and contribute to global warming. (2) (b) Describe one biological consequence of global warming. (1) **[3 marks]**

- 18** Which is a positive human interaction in an ecosystem? **[1 mark]**

- A. ☐ Dumping waste in landfill
- B. ☐ A breeding programme for an endangered species
- C. ☐ Quarrying for stone
- D. ☐ Burning peat

19 A government in a tropical country is deciding whether to allow a large area of rainforest to be cleared for cattle farms and crops for biofuels. Evaluate the environmental implications of deforestation and the conflicting pressures on maintaining biodiversity. **[6 marks]**

[illegible]

Trophic levels in an ecosystem

20 Triple only [1 mark]

A food chain is: grass → grasshopper → frog → snake. Nothing eats the snake. Which statement about the snake is correct?

- A. ☐ It is at trophic level 3 and is a secondary consumer
- B. ☐ It is at trophic level 4 and is a primary consumer
- C. ☐ It is at trophic level 4 and is an apex predator
- D. ☐ It is at trophic level 1 and is a producer

21 Triple only [2 marks]

Explain how decomposers break down dead animals.

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The table shows the biomass at each trophic level in a food chain. (a) A student draws a pyramid of biomass using a scale of 1 mm = 20 g per m². Calculate the length of the bar for the caterpillars. (1) (b) Calculate the efficiency of biomass transfer from the caterpillars to the blue tits. Give your answer as a percentage. (2)

Biomass in a woodland food chain		
Trophic level	Organism	Biomass in g per m ²
1	Oak leaves	2000
2	Caterpillars	240
3	Blue tits	18

Answer =

Only about 10% of the biomass at one trophic level is transferred to the next. Explain why.

Food production

Spec 4.7.5

Triple only

(a) What is meant by food security? (1) (b) Give one biological factor that threatens food security. (1)

25

Triple only

[3 marks]

Some farmers keep food animals in small pens at a controlled temperature. Explain how this increases the efficiency of food production.

26

Triple only

[3 marks]

Explain how control of net size and fishing quotas help to conserve fish stocks.

27

Triple only

[4 marks]

(a) Describe how the protein-rich food mycoprotein is produced. (3) (b) Name the substance made by a genetically modified bacterium that is used to treat diabetes. (1)

[illegible]

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

A A (1)

2. [2]

- any two from:
- light (1)
- water (1)
- mineral ions (1) allow nutrients from the soil
- space (1)
- Max 2

3. [3]

- (a) pH 6 (1)
- (b) number increases from pH 4 to pH 6 (1)
- then decreases from pH 6 to pH 8 (1)
- allow correct data quotes, for example rises from 2 to 40 plants per m², in place of one (b) mark

4. [4]

- (a) small fish are eaten / preyed on (1)
- so their numbers decrease (1)
- (b) fewer small fish to eat the larvae (1)
- so the numbers of larvae increase (1)

5. [3]

- (a) insulation / reduces heat loss in the cold (1)
- (b) camouflage in the snow, so it can get close to its prey without being seen (1) allow to hide from prey
- (c) extremophiles (1)

6. [5]

- (a) mean = $48 \div 8 = 6$ (1)
- mode = 8 (1)
- median = 6 (1) (middle values 6 and 6)
- (b) $6 \div 0.25 = 24$ per m² (1)
- $24 \times 200 = 4800$ dandelions (1) allow 4800 with no working for 2 marks; allow ecf from their mean

7. [6]

Level 3 5-6	A clear, logical method using a transect and quadrats at regular intervals, with measurement of light intensity, repeated or random sampling, and results processed. Control variables and a safety point are included.
Level 2 3-4	A method which uses a transect or quadrats and records the number of plants and light intensity, but with some detail or sequence missing.
Level 1 1-2	Simple statements about counting plants or measuring light, with no clear method.

Indicative content

- lay a tape measure / transect from the edge into the woodland
- place a quadrat at regular intervals, for example every 2 m
- count the number of the plant species in each quadrat
- measure the light intensity at each position with a light meter
- repeat the transect / use more than one transect and calculate means
- same size of quadrat, same time of day, same person counting
- plot a graph of number of plants against distance or light intensity
- safety, for example wear gloves / avoid harmful plants / wash hands afterwards

8. [4]

- (a) lynx (1)
- (b) when there are many hares there is more food for the lynx (1)
- so more lynx survive and breed, and the number of lynx increases (1)
- breeding takes time, so the rise in lynx lags behind the rise in hares (1)
- the lynx then eat more hares, so hare numbers fall, and then lynx numbers fall from lack of food (1)
- Max 3 for (b)

9. [3]

- microorganisms / decomposers break down the leaf / decay (1)
- carbon is released as carbon dioxide by respiration (of the microorganisms) (1)
- carbon dioxide is taken in by a plant / used in photosynthesis to make glucose (1)

10. [2]

- it provides fresh water (1)
- which plants and animals need to survive / for photosynthesis / for cells (1)

11. [3] Triple only

- $(60 - 36) \div 20$ or $24 \div 20$ (1)
- 25 °C: 1.2 g per day (1)
- 10 °C: $(60 - 52) \div 20 = 0.4$ g per day (1)

12. [3] Triple only

- keep it warm (1) because the decomposers' enzymes work faster / respiration is faster (1)
- keep it moist / add water (1) because microorganisms need water to grow and be active
- turn it / mix it to add air / oxygen (1) for aerobic respiration of the decomposers
- ignore 'heat it' unqualified; do not accept boiling / very high temperatures
- Max 3

13. [2] Triple only Higher tier

- the area in the south is now too warm for the butterfly to survive / breed (1)
- the area further north is now warm enough / has suitable conditions (1)

14. [2]

- reduces the dependence of one species on another (1)
- for food, shelter and the maintenance of the physical environment (1)
- so if one species is lost, others still have food and shelter / the community is less affected (1)
- Max 2

15. [3]

- (a) all three correct (2); two correct (1):
- water: sewage / fertiliser / toxic chemicals
- air: smoke / acidic gases
- land: landfill / toxic chemicals
- (b) pollution kills plants and animals, so the number of species falls (1)

16. [3]

- habitat area is reduced (1)
- so fewer species / less variety of plants, animals and microorganisms live there (1)
- decay or burning of peat releases carbon dioxide (into the atmosphere) (1)

17. [3]

- (a) carbon dioxide (1)
- methane (1)
- (b) loss of habitat / change in distribution of species / change in migration patterns (1)

18. [1]

B B (1)

19. [6]

Level 3 5-6	A balanced evaluation with both the benefits and the environmental costs explained, links made to biodiversity and carbon dioxide, and a justified conclusion.
Level 2 3-4	Some benefits and some environmental costs given, with an attempt at explanation, but the evaluation is limited or has no conclusion.
Level 1 1-2	Simple points about benefits or harm, without explanation.

Indicative content

- benefits: land for cattle, rice and biofuel crops, which provides food, fuel and income
- habitat loss, so species lose food and shelter and biodiversity decreases
- fewer trees, so less carbon dioxide is removed by photosynthesis
- burning and decay of trees releases carbon dioxide, which contributes to global warming
- conflicting pressures: need for food, jobs and money versus protecting habitats and slowing global warming
- possible compromises: reducing deforestation, protecting rare habitats, using land already cleared
- a justified conclusion

20. [1] Triple only

C C (1)

21. [2] Triple only

- they secrete enzymes into the environment / onto the dead material (1)
- small soluble food molecules then diffuse into the microorganism (1)
- do not accept decomposers eat / ingest the dead animal

22. [3] Triple only

- (a) $240 \div 20 = 12$ mm (1)
- (b) $18 \div 240 \times 100$ (1)
- = 7.5% (1) allow 7.5 with no working for 2 marks

23. [3] Triple only

- not all the ingested material is absorbed, some is egested as faeces (1)
- large amounts of glucose are used in respiration, and lost as carbon dioxide and water (1)
- water and urea are lost in urine (1)
- ignore energy 'used up' unqualified

24. [2] Triple only

- (a) having enough food to feed a population (1)
- (b) any one from: increasing birth rate / changing diets in developed countries / new pests and pathogens / environmental change such as failure of rains / cost of agricultural inputs / conflict affecting availability of water or food (1)

25. [3] Triple only

- animals move less, so less energy is transferred to the surroundings / less glucose used in respiration for movement (1)
- warm surroundings, so less energy is used to keep warm / less heat lost (1)
- so more of the energy / biomass from food is used for growth (1)

26. [3] Triple only

- larger mesh lets small / young fish escape (1)
- they grow and breed (1)
- quotas limit the amount caught so enough fish are left to breed (1)

27. [4] Triple only

- (a) the fungus *Fusarium* is used (1)
- grown on glucose syrup (1)
- in aerobic conditions (1)
- the biomass is harvested and purified (1)
- Max 3 for (a)
- (b) human insulin (1) allow insulin