

Ecology and the environment practice questions

21 questions · 69 marks · mark scheme at the back

For Edexcel International GCSE Science (Double Award) 4SD0.

Name

Total / 69

The organism in the environment Spec 4.1-4.5

1 All the organisms of different species living together in a wood form which of the following? [1 mark]

- A. ☐ A population
- B. ☐ A community
- C. ☐ A habitat
- D. ☐ An ecosystem

2 A pond contains frogs, fish, water plants and water. State the ecological term for each of the following. (a) All the frogs in the pond. (b) The place where the frogs live. (c) The frogs, fish and plants together with the water, light and temperature of the pond. [3 marks]

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3 A field has an area of 400 m². A student used a 0.25 m² quadrat to count buttercups at six random positions. The results are shown in the table. Estimate the number of buttercups in the field. [3 marks]

Buttercups counted in each quadrat						
Quadrat	1	2	3	4	5	6
Number of buttercups	4	7	5	6	3	5

Answer =

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.....

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- [4 marks]**

Feeding relationships in a meadow	
Organism	Eaten by
Grass	Rabbit, mouse
Rabbit	Fox, buzzard
Mouse	Fox, owl

- [3 marks]**

- [2 marks]

Answer =

- 15** Describe how carbon dioxide is removed from the atmosphere and how it is returned to the atmosphere in the carbon cycle. **[4 marks]**

Human influences on the environment Spec 4.12–4.18B

- 16** Why is carbon monoxide harmful to humans? **[1 mark]**

- A. ☐ It dissolves in blood plasma and makes it acidic
- B. ☐ It combines with haemoglobin so less oxygen is carried
- C. ☐ It destroys white blood cells
- D. ☐ It blocks the alveoli with mucus

- 17** Explain how burning fuels that contain sulfur can kill fish in a lake. **[3 marks]**

- 18** Name two greenhouse gases other than carbon dioxide. For each one, describe a human activity that increases the amount of it in the atmosphere. **[4 marks]**

19 Explain how an increase in carbon dioxide in the atmosphere may lead to global warming. **[4 marks]**

20 Untreated sewage is released into a river. Explain why the number of fish in the river falls. **[3 marks]**

21 Fertiliser is spread on a field next to a lake. After heavy rain, many fish in the lake die. **[6 marks]**
Explain how the fertiliser could have caused the death of the fish.

Mark scheme

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

1. [1]

B B (1)

2. [3]

- population (1)
- habitat (1)
- ecosystem (1)

3. [3]

- mean = $(4 + 7 + 5 + 6 + 3 + 5) \div 6 = 5$ per quadrat (1)
- number of quadrat areas in the field = $400 \div 0.25 = 1600$ (1)
- estimated population = $5 \times 1600 = 8000$ (buttercups) (1)
- award 3 marks for the correct answer with no working; allow error carried forward from an incorrect mean

4. [4]

- place quadrats at random / use random coordinates from a random number generator (1)
- count the number of daisies inside each quadrat (1)
- use the same size of quadrat and the same number of quadrats in each area, with many quadrats (1)
- calculate the mean number of daisies per quadrat for each area and compare (1)

5. [6]

Level 3 5-6	A detailed, well-structured answer that describes and explains the effect of at least two abiotic factors and at least two biotic factors, linking each to population size or distribution, with correct scientific terms.
Level 2 3-4	Describes the effect of both abiotic and biotic factors, with some explanation. The links to population size or distribution may be incomplete.
Level 1 1-2	Names one or more factors, with a limited or no explanation of their effect.

Indicative content

- abiotic: light (less light means fewer plants can photosynthesise, so fewer plants and fewer animals that depend on them; shade-tolerant plants found where light is low)
- abiotic: temperature (affects enzyme-controlled reactions, so growth and survival; species only survive within a range)
- abiotic: water (organisms need water; fewer survive in dry areas, those adapted to dry conditions found there)
- biotic: competition for light, water, mineral ions, food, space (better-adapted species survive and reproduce more, so the other species decrease)
- biotic: predation (predator numbers rise when prey numbers rise; prey numbers then fall; predator peak follows prey peak)

6. [1]

D D (1)

7. [3]

- break down dead plants and animals / waste (1)
- by secreting enzymes (onto the material) (1)
- small soluble molecules diffuse into the decomposer / mineral ions or nutrients are returned to the soil for plants to take up (1)

8. [4]

- (a) a food chain in the correct order, e.g. grass → rabbit → buzzard (1)
- arrows pointing from the food to the organism that eats it (1)
- (b) fox / buzzard / owl (1)
- (c) rabbit numbers fall because the foxes / predators eat more rabbits (1)
- allow for (c): rabbit numbers rise because there is less competition for grass

9. [3]

- a pyramid of number only counts the organisms and ignores their size (1)
- there is one (very large) oak tree supporting many caterpillars, so the bottom bar is the narrowest (1)
- a pyramid of biomass shows the mass of living material, and the oak tree has the greatest mass (1)

10. [2]

- $1200 \div 15\,000 \times 100$ (1)
- 8 (%) (1)
- award 2 marks for the correct answer with no working

11. [4]

- not all of the organism is eaten, for example bones / roots (1)
- some of what is eaten is not digested and is lost as faeces (1)
- energy is released by respiration and lost as heat to the surroundings (1)
- energy is used for movement / keeping warm (1)
- energy is lost in waste such as urine (1)
- Max 4

12. [6]

Level 3 5-6	A detailed, well-structured answer that describes the transfer of both energy and substances along the chain by feeding, and explains at least three ways energy or biomass is lost, linking this to the decrease in biomass at higher levels.
Level 2 3-4	Describes transfer along the chain and gives at least two ways energy or biomass is lost, with a partial link to the decrease in biomass.
Level 1 1-2	States that energy passes along the chain or that energy is lost, with little or no explanation.

Indicative content

- grass absorbs light energy and uses it in photosynthesis to make biomass; this stores energy
- energy and substances (carbon compounds) pass to each organism when it eats the one before
- only about 10% of energy is transferred at each step
- losses: parts not eaten (bones, roots); not digested and lost in faeces
- losses: respiration releases energy as heat; energy used for movement and keeping warm; waste such as urine
- so less energy and biomass is available at each higher trophic level, and the snake level has the least

13. [1]

B B: photosynthesis uses carbon dioxide to make glucose (1)

14. [3]

- decomposers / bacteria and fungi break down the leaves (1)
- decomposers respire (1)
- releasing carbon dioxide (into the air) (1)
- allow CO₂

15. [4]

- plants / algae take in carbon dioxide (1)
- for photosynthesis (1)
- respiration (by plants, animals and decomposers) returns carbon dioxide (1)
- combustion of fuels / burning releases carbon dioxide (1)
- decomposition / decay releases carbon dioxide (1)
- Max 4

16. [1]

B B: carbon monoxide binds to haemoglobin, reducing oxygen transport (1)

17. [3]

- sulfur dioxide is released (1)
- it dissolves in rain water to form acid rain (1)
- acid rain lowers the pH of the lake so fish cannot survive (1)
- allow acidic / acidity for acid

18. [4]

- first gas named: methane / nitrous oxide / CFCs / water vapour (1)
- a human activity that matches the first gas (1)
- second gas named (1)
- a human activity that matches the second gas (1)
- activities: methane – cattle / rice paddy fields / landfill; nitrous oxide – (nitrogen) fertilisers / vehicle exhausts; CFCs – old refrigerators / aerosols / air conditioners; water vapour – burning fuels
- reject carbon dioxide; the activity must match the gas named; ignore 'pollution' or 'factories' alone

19. [4]

- the Earth's surface gives out infrared radiation (1)
- greenhouse gases / carbon dioxide absorb infrared radiation (1)
- and radiate it back towards the Earth (1)
- more carbon dioxide means more heat is trapped, so the average temperature rises (1)
- allow heat for infrared radiation; reject answers based on the ozone layer

20. [3]

- sewage contains organic matter / is food for decomposers, so decomposers / bacteria increase (1)
- they use up oxygen in respiration (1)
- fish die from lack of oxygen (1)
- ignore 'sewage poisons the fish'

21. [6]

Level 3 5-6	A clear, logical and complete sequence from leaching of minerals to the death of fish, including algal bloom, loss of light, death of plants, increase in decomposers and loss of oxygen.
Level 2 3-4	A sequence with most stages, but with one or two missing or unclear links, for example no mention of decomposers or of light being blocked.
Level 1 1-2	One or two correct but isolated points, such as that fertiliser makes algae grow, without explaining how fish are affected.

Indicative content

- heavy rain leaches nitrates / minerals from the fertiliser into the lake
- extra nitrates cause rapid growth of algae (algal bloom) on the surface
- the algae block light from plants lower down
- plants cannot photosynthesise and die
- decomposers / bacteria feed on the dead plants and algae and increase in number
- decomposers use up oxygen in aerobic respiration
- low oxygen concentration so fish die / suffocate
- biodiversity falls