1.24 Biodiversity, Cycles and Human Impact: Test Pack

AQA 8464 · Calculator allowed · about 45 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question checks three key terms used in this topic.

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

(b) Define the term 'greenhouse gas'. **(1)**

(c) Define the term 'biodegradable'. **(1)**

(Total for Question 1 is 3 marks)

2 A car emits 132 g of carbon dioxide for every km it is driven.

(a) Calculate the mass of carbon dioxide, in kg, produced during a 250 km journey. **(3)**

(b) Suggest one way the driver could reduce the total carbon dioxide emissions of this journey, other than driving a shorter distance. **(1)**

(Total for Question 2 is 4 marks)

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3 Carbon is constantly cycled between the atmosphere, living organisms and fossil fuels. Two processes that return carbon to the atmosphere, as carbon dioxide, are combustion and decomposition.

(a) Explain how combustion returns carbon to the atmosphere as carbon dioxide. **(2)**

(b) Explain how decomposition returns carbon to the atmosphere as carbon dioxide. **(2)**

(Total for Question 3 is 4 marks)

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4 An area of mangrove forest covered 1800 hectares in 2010. By 2025, clearance for shrimp farming had reduced the area of mangrove forest to 1260 hectares. (1 hectare = 0.01 km^2, i.e. 100 hectares = 1 km^2.)

(a) Calculate the percentage decrease in the area of mangrove forest between 2010 and 2025. **(3)**

(b) Convert the remaining mangrove forest area in 2025 (1260 hectares) into km^2. **(2)**

(Total for Question 4 is 5 marks)

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5 Kwame surveys the number of individual invertebrates of each species living in two ponds, Pond A and Pond B. Each pond has 4 species present and 110 individuals in total.
Pond A: species counts of 30, 28, 26 and 26
Pond B: species counts of 92, 6, 5 and 7

(a) Calculate the percentage of individuals in Pond B that belong to the most common species. **(2)**

(b) State the species richness (the number of different species present) in Pond A and in Pond B. **(1)**

(c) Using your answers to (a) and (b), explain why Pond A has greater biodiversity than Pond B, even though both ponds have the same species richness and the same total number of individuals. **(2)**

(Total for Question 5 is 5 marks)

6 A wildlife charity asks volunteers across the country to count the number of different butterfly species they see in their own garden over one hour, once a year, and submit the results online. The charity uses the average number of species reported each year as a measure of change in butterfly biodiversity over time.

(a) Suggest one reason why this method might not give a reliable measure of the change in butterfly biodiversity from year to year. **(2)**

(b) Suggest one change to the method that would improve the reliability of year-to-year comparisons. **(1)**

(Total for Question 6 is 3 marks)

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7 A conservation charity estimated the UK hedgehog population at 1 600 000 in 2005. Because of habitat loss and fragmentation, the estimated population had fallen to 560 000 by 2025.

(a) Calculate the percentage decrease in the estimated hedgehog population between 2005 and 2025. **(3)**

(b) Higher tier only. New roads and housing estates have divided much of the hedgehogs' remaining habitat into small, isolated patches. Explain how this fragmentation can reduce the hedgehog population, beyond simply reducing the total area of habitat available. **(2)**

(Total for Question 7 is 5 marks)

8 The table shows the mean atmospheric carbon dioxide concentration, in parts per million (ppm), recorded at a monitoring station in four different years.

1990: 354 ppm
2000: 369 ppm
2010: 389 ppm
2020: 414 ppm

(a) Calculate the mean rate of increase in carbon dioxide concentration, in ppm per year, between 1990 and 2020. **(3)**

(b) Assuming the concentration continues to increase at this same mean rate, predict the carbon dioxide concentration in 2030. **(1)**

(Total for Question 8 is 4 marks)

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Mark scheme · 1.24 Biodiversity, Cycles and Human Impact: Test Pack

Question 1

(a) the variety of different species (of organisms) that live in an area (or on Earth), oe **B1**

(a) Answer: The variety of different species living in an area (or on Earth).

(b) a gas in the atmosphere that absorbs and re-radiates heat energy from the Sun/Earth, keeping the atmosphere warmer than it would otherwise be, oe **B1**

(b) Answer: A gas in the atmosphere that absorbs and re-radiates heat energy, warming the atmosphere.

(c) able to be broken down by microorganisms (decomposers), oe **B1**

(c) Answer: Able to be broken down by microorganisms.

Question 2

(a) substitutes: 132 x 250 **M1**

(a) calculates: 132 x 250 = 33 000 g **M1**

(a) converts and states: 33 kg cao **A1**

(a) Answer: 33 kg

(b) one valid suggestion: drive at a steady, fuel-efficient speed; use a more fuel-efficient or electric vehicle; remove unnecessary weight or roof racks, oe **B1**

(b) Answer: Example: drive at a steady, fuel-efficient speed, so less fuel is burned over the 250 km.

Question 3

(a) combustion is the burning of a fuel that contains carbon, e.g. a fossil fuel or wood, oe **M1**

(a) the carbon in the fuel reacts with oxygen during burning, releasing carbon dioxide gas into the atmosphere, oe **A1**

(a) Answer: Burning a carbon-containing fuel makes the carbon react with oxygen, releasing carbon dioxide into the atmosphere.

(b) decomposers (microorganisms such as bacteria and fungi) break down (feed on) dead organisms and waste material, oe **M1**

(b) the decomposers respire aerobically, releasing carbon dioxide as a waste product into the atmosphere, oe **A1**

(b) Answer: Decomposers break down dead organisms and waste, and respire, releasing carbon dioxide into the atmosphere.

Question 4

(a) calculates the decrease: 1800 - 1260 = 540 hectares **M1**

(a) substitutes: (540 / 1800) x 100 **M1**

(a) 30% cao **A1**

(a) Answer: 30% decrease

(b) uses the conversion 100 hectares = 1 km^2 **M1**

(b) 12.6 km^2 cao **A1**

(b) Answer: 12.6 km^2

Question 5

(a) substitutes: (92 / 110) x 100 **M1**

(a) 83.6% (accept 84% or answers rounding to this) cao **A1**

(a) Answer: 83.6%

(b) both ponds have a species richness of 4 **B1**

(b) Answer: Both ponds have a species richness of 4.

(c) in Pond A the individuals are spread much more evenly across the 4 species (30, 28, 26, 26), whereas in Pond B most individuals (83.6%) belong to a single dominant species, oe **M1**

(c) biodiversity depends on the evenness of numbers across species as well as the number of species (richness), so Pond A, with more even numbers, is more biodiverse despite having the same richness as Pond B, oe **A1**

(c) Answer: Pond A's individuals are spread evenly across its 4 species, while Pond B is dominated by one species (83.6% of individuals); biodiversity depends on evenness as well as richness, so Pond A is more biodiverse.

Question 6

(a) identifies a source of uncontrolled variation, e.g. weather conditions on the count day differ from year to year, or volunteers' skill at identifying species varies, or the gardens taking part change from year to year, oe **M1**

(a) explains the effect: this affects how many butterflies are recorded independently of any real change in biodiversity, so year-to-year comparisons of the average are not reliable, oe **A1**

(a) Answer: Weather on the count day varies from year to year and affects how active butterflies are, so the number recorded reflects the weather as well as real changes in biodiversity, making year-to-year comparisons unreliable.

(b) one valid change: always count at the same time of year and time of day, in similar weather conditions; provide standard identification guides/training for volunteers; use the same set of gardens each year, oe **B1**

(b) Answer: Ask volunteers to count at the same time of year, at a similar time of day and in similar weather conditions each year.

Question 7

(a) calculates the decrease: 1 600 000 - 560 000 = 1 040 000 **M1**

(a) substitutes: (1 040 000 / 1 600 000) x 100 **M1**

(a) 65% cao **A1**

(a) Answer: 65% decrease

(b) fragmentation makes it harder for hedgehogs to move between habitat patches, e.g. because roads and solid garden fences act as barriers, oe **M1**

(b) this isolates small populations, reducing access to mates and food and reducing genetic diversity (more inbreeding), which increases the risk of local extinction in each isolated patch, oe **A1**

(b) Answer: Roads and fences prevent hedgehogs moving between habitat patches, isolating small populations. This reduces access to mates and food and reduces genetic diversity, increasing the risk of local extinction in each patch.

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Question 8

(a) calculates the total increase: 414 - 354 = 60 ppm **M1**

(a) divides by the number of years: 60 / 30 **M1**

(a) 2.0 ppm per year cao **A1**

(a) Answer: 2.0 ppm per year

(b) 434 ppm (414 + (2.0 x 10)) ecf from (a) **B1**

(b) Answer: 434 ppm

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