



General Certificate of Education

Environmental Science 5441

ESC3 The Biosphere

Report on the Examination

2007 examination - January series

Further copies of this Report are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2007 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

General

Most candidates seemed to be adequately prepared for this examination, although the extended prose in question 6(c) caused problems for some. The vast majority attempted all questions with many full and well-explained answers and most completed the paper within the time allowed. There seemed to be a general improvement in examination technique and there were relatively few very weak scripts seen, although the standard of written English and lack of precision in answering the questions prevented some candidates from gaining marks. A few candidates did not have calculators available and, despite the relatively simple arithmetic involved, did not attempt these questions, thus forfeiting valuable marks.

Question 1

Candidates found this question, testing the principles of energy flow through a food web, surprisingly difficult with very few gaining maximum marks although many candidates gained 3 or 4 marks. Few candidates were aware that the producers are less efficient than consumers at converting the energy they receive into biomass with the fixing of solar energy during photosynthesis being only in the range of 1 – 5% efficient (see Question 4(a)). The answers to this showed evidence of considerable guesswork with an assortment of letters being offered as the answer. Many candidates also had a problem identifying an organism at the fourth trophic level with B being the most common incorrect answer.

Question 2

- (a) The term 'zonation' was well known. 'Succession' was the most common incorrect answer.
- (b) Many weaker candidates failed to score a single mark on this section. As usual with questions on ecological methods, there is evidence of lack of firsthand experience from candidates entered by some centres. Others, however, gave explicit accounts of the direction of the belt transect and suggested how quadrat sampling would take place along the line of the transect. Even some of the more able candidates, however, were unable to give precise information as to what would be measured in the quadrats with frequent comments such as 'note results' that did not gain credit.
- (c) This question was a good discriminator with only the most able candidates gaining both marks. Some failed to read the question adequately and did not answer in the context of seaweeds on a rocky shore with suggestions related to soil or sand conditions. It was common for the weaker candidates to make statements like "some seaweeds prefer different conditions" without any explanation.
- (d) Given the frequency with which calculations involving the Simpson's Diversity Index are tested on this unit, it is surprising that many candidates could not make a satisfactory attempt at this question. Answers to part (ii) revealed that most candidates had very little understanding of the application of diversity indices.

Question 3

- (a) Most candidates gained at least one of the two available marks for this section. It was pleasing to note that many candidates fully understand the concept of the gene pool and the potential consequences of inbreeding from a small population of birds. Common errors, however, included the use of the term 'inter-breeding' when inbreeding was intended. Many candidates also erroneously stated that inbreeding would increase the

mutation rate – rather than the frequency with which mutations would be expressed in the offspring. Some candidates appeared to be under the impression that the Welsh population would be captive bred and would therefore lose important survival behaviours.

- (b) (i) This was well answered with many candidates suggesting that the increase in Red Kite population could be because of abundant food, lack of predators, a bigger choice of mates increasing breeding success or the protected status of the birds freeing them from human persecution.
 - (ii) The term ‘carrying capacity’ refers to the maximum population of a species in an area that can be sustained in the long term without depleting resources. Many answers failed to gain credit either because they referred vaguely to the number of organisms or species present, or did not include the concept of long term sustainability.
- (c) Methods used in the conservation of endangered animal species were well known and many candidates scored maximum marks on this section. Some candidates, however, failed to read the question carefully enough and included reference to seed banks and botanic gardens in their answers.

Question 4

- (a) The calculation of the percentage of solar energy fixed in photosynthesis proved no problem to the majority of candidates.
 - (b) Many candidates scored well on this section and showed good appreciation of the energy losses involved in the fixation of solar energy by plants. The majority of mistakes seemed to be from candidates who had not read the stem sufficiently carefully and had not appreciated that the radiation was “reaching the leaves”.
- (c) (i) Most could shade the correct portion of the graph and understood the concept that whenever photosynthesis exceeds respiration, there is a net increase in tree biomass. Many candidates left this blank which might indicate that they had simply missed the instruction.
- (ii) Most linked the decrease in the rate of photosynthesis at higher temperatures to the denaturation of enzymes and gained full marks.
- (iii) The answers to this question were very disappointing indeed. Very few candidates gained the two available marks for explaining the concept of respiration. Many confused respiration with photosynthesis, or thought that plants only respired at night. Other candidates thought that it was concerned only with exchange of gases, or thought that respiration created energy, rather than releasing it from food.

Question 5

- (a) This proved to be a good discriminator as, whereas many candidates could define the term ‘abiotic factor’ and suggest a suitable example, few could explain how their chosen factor could exert a density-independent effect on a population. Vague references to ‘climate change’ or ‘weather’ did not receive credit unless well-explained.

- (b) This was well-answered by the majority of candidates, although some were obviously unfamiliar with the mark-release-recapture technique for estimating population size and gave very vague accounts, merely repeating the terms given in the name of the method in the hope of gaining some marks. Common errors were to state that 'some species were caught' or that 'all the animals were caught'.
- (c) Most candidates could suggest three biotic factors affecting the frog population, however, many did not answer in the context of the question and state how factors such as food supply, competition or predation could account for the population decrease shown on the graph. It was disappointing to note that a few candidates gave an abiotic factor to this, even when they had answered part (a) correctly.
- (d) A surprising number of candidates failed to gain the mark for completing the equation illustrating stable population size. These candidates did not understand the principle that the number entering the population through births or immigration must balance those leaving through death or emigration.

Question 6

- (a) Many candidates were unable to differentiate between the various designations, giving very similar answers to all three parts, often involving considerable guesswork.
- (b) This was well answered with the majority of candidates suggesting both an advantage and a disadvantage to a landowner of designating a site for wildlife conservation.
- (c) Although there were a few excellent accounts of conservation of UK habitats including sand dunes, woodlands, heathlands, wetlands and hedgerows, these were few and far-between. Candidates gaining good marks for this section had first hand knowledge of the problems of conservation of their chosen habitat, and suggested sensible methods to overcome these problems.
- The title for the extended prose was taken directly from the final part of the Module 3 specification which states that students should be aware of the problems of conserving a given range of UK habitats and that one should be studied in detail. It was evident, however, that this part of the specification is overlooked by many centres. Many candidates could not successfully identify a habitat (despite a list given in the specification) and often confused conservation of a habitat with conservation of large areas of land including National Parks, such as the Lake District or Exmoor. Others interpreted the question as being the habitat of a particular species (often Red Kites) and devoted much space to ways of conserving the species, thus repeating much of the information already given in their answer to Question 3(c). Most responses showed poor use of appropriate technical terminology, which limited the awarding of full marks for Quality of Written Communication.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.