



RECOGNISING ACHIEVEMENT

JUNE 2002

ADVANCED GCE UNIT
MARKING SCHEME

MAXIMUM MARK: 90

Syllabus / Component: 2805/03

**Options in Biology:
Environmental Biology**

Paper Set Date: 20/06/02

ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.
You are advised to destroy all draft versions.
2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks ($\frac{1}{2}$) should never be used.
3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.

x = incorrect response (errors may also be underlined)
^ = omission mark
bod = benefit of the doubt (where professional judgement has been used)
ecf = error carried forward (in consequential marking)
con = contradiction (in cases where candidates contradict themselves in the same response)
sf = error in the number of significant figures
4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.
5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.
6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)
7. Strike through all blank spaces and/or pages in order to give a clear indication that the whole of the script has been considered.
8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

| | | | |
|---|-------|---|--|
| Abbreviations, annotations and conventions used in the Mark Scheme | / | = | alternative and acceptable answers for the same marking point |
| | ; | = | separates marking points |
| | NOT | = | answers which are not worthy of credit |
| | R | = | reject |
| | () | = | words which are not essential to gain credit |
| | _____ | = | (underlining) key words which must be used to gain credit |
| | ecf | = | error carried forward |
| | A | = | accept |
| | AW | = | alternative wording |
| | ora | = | or reverse argument |

| Question | Expected Answers | Marks |
|----------|--|--------------|
| 1 | <p>(a) food availability ; level of predation ; mortality rate of young fish ; disease / parasites ; intensity of fishing / overfishing ;</p> | max 3 |
| | <p>(b) removing a controlled number of fish from their populations ; so that there are sufficient left to reproduce and replenish population ; so a similar amount can be fished the following year ; and each year after ; without significantly reducing the population size ;</p> | max 3 |
| | <p>(c) limiting number of fishing vessels operating from each country ; limiting amount of time spent fishing / limiting fishing at certain times of year ; limiting areas where fishing takes place ; setting quotas ; regulating mesh size of nets ; regulating overall size of nets ; regulating types of nets used ;</p> | max 3 |
| | <p>(d) increasing demand for fish (as a source of protein) ; fishermen do not always agree with the figures ; much investment in the fishing industry ; many families / whole towns / villages rely on fishing industry ; measures increase levels of unemployment ;</p> | max 2 |
| | <p>(e) $\frac{800 \times 20,000}{160}$; = 100,000 ;</p> | max 2 |
| | <p>(f) minimal births / deaths between samples ; minimal immigration / emigration between samples ; that marked animals are not harmed in any way / are not more vulnerable to predation ; that marked animals have mixed freely with the rest of the population ; tags have remained in place ; R marks rubbed off</p> | max 2 |

[Total: 15]

| Question | Expected Answers | Marks |
|-----------|--|--------------|
| 2 (a) (i) | $\frac{11.51 - 0.19}{0.19} \times 100$; $= \frac{11.32}{0.19} \times 100$; $= 5957.89 \%$; A 5958 or 5957.9 | max 2 |
| (ii) | when eaten, dieldrin is not broken down or excreted ; accumulates in fatty tissue / fat soluble ; becomes more and more concentrated as more seeds are eaten ; | max 2 |
| (b) | peregrine falcons eat mice ; dieldrin from mice accumulates in fatty tissue of falcons ; becomes even more concentrated than in mice / falcons are at a higher trophic level / bioaccumulation / bioconcentration ; interferes with egg shell production in females / thinner egg shells ; reduces reproductive success ; | max 3 |
| (c) (i) | the place where an organism lives ; | max 1 |
| (ii) | no two species can occupy the same niche ; if they do, competition is intense ; one species will always be at least slightly more successful than the other ; the less successful species will be eliminated ; | max 3 |
| (d) (i) | <i>Scotland</i> Grey squirrel numbers have increased, red have remained steady ; Grey declined initially and then increased, Red increased slightly (till 1985), then decreased ; | max 1 |
| | <i>Wales</i> Grey have remained very steady, red have declined ; Red initially declined very quickly, Grey initially declined slightly ; | max 1 |
| (ii) | Scotland has more available habitat for grey squirrels ; which has allowed it to increase in numbers without competing with the reds ; competition is more intense in Wales ; less suitable habitat / less food available ; AVP ; | max 2 |

[Total: 15]

| Question | Expected Answers | Marks |
|----------|---|-------|
| 3 | (a) not all countries are signatories to the agreement ; still a demand for endangered species and their products ; poachers still prepared to take risks for monetary gain ; very difficult to police over large areas ; corruption ; | max 3 |
| | (b) signatory countries made it illegal to kill / poach elephants ; ban placed on trade in ivory ; co-operation between countries ; | max 2 |
| | (c) 1 rain forests are species rich / have a high biodiversity ; 2 deforestation results in extinction of many species / reduces biodiversity ; 3 loss of habitats ; 4 rain forests can be used to supply sustainable crops ; 5 e.g. nuts / rubber / fruits / plant oils ; 6 also drugs (which await discovery) ; 7 trees act as carbon reservoirs / sinks ; 8 destruction of forests contributes to global warming / greenhouse effect ; 9 less CO ₂ removed from the atmosphere ; 10 more CO ₂ released when wood is burned ; 11 less photosynthesis also means less oxygen production ; 12 transpiration contributes to atmospheric water content ; 13 destruction of forest will disrupt water cycle ; 14 increased soil erosion ; 15 rapid loss of soil fertility ; 16 moral responsibility to later generations to maintain biodiversity ; | max 9 |
| | QWC – legible text with accurate spelling, punctuation and grammar | 1 |

[Total: 15]

| Question | Expected Answers | Marks |
|----------|---|-------|
| 4 (a) | (i) a straight line would be established from low water level to 10m above ; place quadrats along this line ; continuously ; or at specified intervals ; record number of each species in each quadrat ; | max 4 |
| | (ii) line transect records presence or absence ; at specified <u>points</u> along a line ; this cannot be converted to an abundance / kite diagrams show abundance; | max 2 |
| (b) | interspecific is competition <u>between</u> different species ; competition is reduced if different areas are inhabited / competition will lead to different areas being inhabited ; competition will be for food / shelter ; position neritoides occupies means little competition with other species / other species have been outcompeted ; saxatilis, littorea, littoralis / other three species, all overlap / compete successfully / competition is less intense ; no overlap at areas of greatest abundance for each species ; | max 3 |
| (c) | (i) creating a grid over the area under investigation ; use random numbers ; how obtained ; to generate co-ordinates ; place quadrat at these points ; record species in quadrat ; | max 4 |
| | (ii) distribution of periwinkles is determined by height above low water ; pattern of distribution is linear / zonal ; random sampling provides data about general distribution / quantities over an area ; | max 2 |

[Total: 15]

| Question | Expected Answers | Marks |
|----------|---|-------|
| 5 | (a) (i) it is the quantity of oxygen used <u>by the organisms</u> ; in a body of water ; over a specified period of time ; | max 2 |
| | (ii) sample of water of <u>measured volume</u> is taken ; oxygen level is determined ; incubated at 20°C ; in the dark ; to prevent photosynthesis ; for 5 days ; oxygen levels remeasured ; | max 3 |
| | (b) a species whose presence or absence ; or abundance ; such as pollution ; or soil type etc ; | max 3 |
| | (c) (i) high BOD at station 1 / 260 mg dm ⁻³ indicates pollution ; low BOD at station 5 / 3 mg dm ⁻³ indicates clean water ; presence of tubifex worms elsewhere would suggest high levels of pollution ; mayfly nymphs would suggest clean water / they are pollution intolerant ; other species would suggest intermediate levels ; | max 3 |
| | (ii) high BOD at 1 caused by large numbers of aerobic bacteria ; which are decomposing raw sewage / organic matter entering the river ; as bacteria break down organic matter, BOD will decrease ; hence, gradually less organic matter / lower pollution at successive stations ; water at 5 has no organic pollution left / lowest BOD ; | max 4 |

[Total: 15]

| Question | Expected Answers | Marks |
|----------|--|-----------------------|
| 6 | <p>(a) 1 fertiliser dissolves in soil water ; 2 washed / leached from land when it rains ; 3 accumulates in lakes / ponds ; 4 causes algal blooms ; 5 these block out light preventing photosynthesis 6 (rooted) plants die ; 7 increased organic matter ; 8 encourages increase in decomposing bacteria ; 9 which are aerobic ; 10 oxygen levels fall ;</p> <p>QWC – clear, well organised answer, using specialist terms</p> | <p>max 7</p> <p>1</p> |
| | <p>(b) concerns about environmental effects / eutrophication ; effect on soil structure ; cost ;</p> | <p>max 1</p> |
| | <p>(c) <i>advantages</i> less likelihood of eutrophication ; helps maintain soil structure ; minerals released slowly (and as needed) ; less money spent on fertilisers / pesticides ; no chemical residues in food ; less damaging to wildlife ;</p> <p><i>disadvantages</i> organic manure of variable composition ; difficult to control amount applied / to apply evenly ; bulky ; needs heavy machinery to apply on farms ; may contain weed seeds and spores of pathogens ; more problems with pests / diseases ; more labour intensive ; lower yield / shorter shelf life ;</p> | <p>6</p> |

[Total: 15]