Downloaded from http://www.thepaperbank.co.uk

RECOGNISING ACHIEVEMENT

# 2805/03 Environmental Biology

## January 2005

## Mark Scheme

Downloaded from http://www.thepaperbank.co.uk

## 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 (½) 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.

Downloaded from http://www.thepaperbank.co.uk



| | | | |
|---|---|---|---|
| **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 |
| | AW | = | alternative wording |
| | A | = | accept |
| | ora | = | or reverse argument |

| Question | Expected Answers | Marks |
|---|---|---|
| 1 (a) | increasing availability of phosphate increases growth of all three species ;<br>greatest effect on nettle ;<br>linear effect / increases proportionally / steadily / AW (on nettle) ;<br>slow increase / small increase, in growth of wavy hair grass ;<br>levels off at higher phosphate concentrations ;<br>high levels decrease growth of small scabious / ref to increase and then decrease in growth of small scabious ;<br>small scabious increases steeply / AW (at low phosphate concentrations) ; | **max 4** |
| (b) (i) | fertilisers may help growth of some weed species ;<br>e.g. nettle ;<br>increase in competition with crops ;<br>interspecific ;<br>for light / ref to increased shading / overshadowing ;<br>space ;<br>water ;<br>minerals ; **A** nutrients *2 max for abiotic factors* | **max 4** |
| (ii) | phosphate / nitrate (from fertilisers), is, washed / leached / runs off, from fields ;<br>high levels of, phosphate / nitrate / fertilisers, in ditches ;<br>more water available in ditches ;<br>no competition from crops ; | **max 2** |

Downloaded from http://www.thepaperbank.co.uk



**(c)** *inorganic fertilisers*

run-off / leached from fields (when it rains) ;
cause algal blooms / AW ;
ref to shading / decreased levels of photosynthesis ;
increases decomposition ;
which leads to an increased, Biochemical Oxygen Demand / BOD ;
oxygen levels reduced by aerobic bacteria ;
organisms die due to lack of oxygen for respiration ;
increases growth of some plant species ;
leads to elimination of other species ;

*ref to eutrophication is neutral* **max 4**

*herbicides*

blown by wind away from fields / spray drift ;
kill non-target species ;
e.g. plant species, at field margins / in hedgerows / AW ;
washed into bodies of water ;
general effects on food chains / elimination of food source ;
AVP ; **max 3**

**[Total: 17]**

Downloaded from http://www.thepaperbank.co.uk



| Question | | | Expected Answers | Marks |
|---|---|---|---|---|
| 2 | (a) | (i) | trees are living organisms ;<br>renewable ;<br>ref to, growth / growing ;<br>timber is, of use to human beings / made into products ; | **max 2** |
| | | (ii) | harvested at levels which leave sufficient organisms ;<br>to grow / reproduce, and replenish what has been harvested ;<br>ref to, coppicing / replanting / afforestation ;<br>can be carried on indefinitely ; | **max 2** |
| | (b) | | *award two marks if correct answer (12.43%) is given*<br><br>3180 / 25 592 x 100 ;<br>= 12.43 % ; **A** 12.425 | **2** |
| | (c) | **1** | saves raw materials ; | |
| | | **2** | e.g. fewer trees felled to produce paper / decreases deforestation ; | |
| | | **3** | saves damage, to environment / habitats ; | |
| | | **4** | less need for landfill ; | |
| | | **5** | less pollution ; | |
| | | **6** | example ; e.g. methane, carbon dioxide | |
| | | **7** | reduces need for incineration ; | |
| | | **8** | saves energy / fossil fuels, used in manufacture ; *max 6*<br><br>*pollution marks can be awarded for either ref landfill OR incineration* | |
| | | **9** | charge for waste disposal ; | |
| | | **10** | money back on bottles ; | |
| | | **11** | providing labels to use envelopes more than once ; | |
| | | **12** | (increased) collection / door-to-door service for goods to be recycled ; | |
| | | **13** | provision of <u>separate</u> bins to separate rubbish ; | |
| | | **14** | provision of more recycling, points / centres ; **A** more convenient locations | |
| | | **15** | education and information campaigns / increased public awareness ; *max 6* | |
| | | **16** | AVP ; e.g. ref to figures, ref to greenhouse effect / global warning | |
| | | **17** | AVP ; ref to figures | **max 8** |
| | | | **QWC – legible text with accurate spelling, punctuation and grammar ;** | **1** |
| | | | | **[Total: 15]** |

Downloaded from http://www.thepaperbank.co.uk



| Question | | | Expected Answers | Marks |
|---|---|---|---|---|
| 3 | (a) | | cyclamen mite / prey populations increase ;<br>when conditions are suitable / when predator numbers are low / no or few limiting factors ;<br>provides plenty of food for predator mites ;<br>which begin to increase later / time lag ;<br>cyclamen mites are then eaten by (increasing numbers of) predators ;<br>so both decline in numbers ;<br>cycle repeated ;<br>prey populations reach higher levels than predators ; | **max 4** |
| | **(b)** | **(i)** | *start by looking at end of February*<br><br>increases with appropriate time lag ;<br>decreases at spraying times (end of June / beginning of October) ;<br>final peak for predator numbers is the lowest ; | **max 2** |
| | | **(ii)** | less food available / less strawberry plants ;<br>low temperature / frost ;<br>other predators ;<br>disease / parasites ;<br>ref to parasitoids ;<br>AVP ;<br>**R** spraying idea | **max 2** |
| | **(c)** | **(i)** | biological (pest control) ; | **1** |
| | | **(ii)** | insecticides, are harmful to other organisms / may kill natural predators to the pest ;<br>reduces species diversity / disrupts food chains ;<br>many insecticides are, slow to biodegrade / long lasting ;<br>concentrate along food chains / bioaccumulate / bioconcentrate ;<br>stored in fat deposits of organisms ;<br>ref to effects on top carnivores ; e.g. egg shell thinning<br>poisonous to those applying them ; **A** ref to humans / asthma sufferers<br>pests can build up a resistance ;<br>ref to selection ;<br>run-off from land carries them into water supplies / causes pollution / poisons aquatic organisms ;<br>problems of residues in food ;<br>AVP ; e.g. pesticides need to be used repeatedly | **max 5** |
| | **(d)** | | crop rotation ;<br>intercropping ;<br>release of, irradiated / sterile, males of pest species ;<br>AVP ; e.g. fly paper | **max 2** |
| | | | | **[Total: 16]** |

Downloaded from http://www.thepaperbank.co.uk



| Question | | | Expected Answers | Marks |
|---|---|---|---|---|
| 4 | (a) | | trees felled for wood to, sell / export ;<br>cleared to provide land for agriculture ; **A** cattle ranching<br>to build, housing / villages ;<br>industrial development / mining / quarrying ;<br>building of roads ; | **max 3** |
| | (b) | **1** | high, biodiversity / species diversity ; | |
| | | **2** | deforestation, causes extinction / reduces biodiversity ; | |
| | | **3** | decrease in, size of gene pool / genetic diversity ; | |
| | | **4** | act as carbon, reservoirs / sinks ; **R** carbon fixation | |
| | | **5** | remove carbon dioxide from atmosphere ; | |
| | | **6** | release of carbon dioxide when wood is burnt ; | |
| | | **7** | less photosynthesis also means less oxygen production ; | |
| | | **8** | transpiration contributes to atmospheric water content ; | |
| | | **9** | destruction of rainforests disrupts water cycle ; | |
| | | **10** | rainforests can be used to supply sustainable crops ; | |
| | | **11** | example of crop ; e.g nuts / rubber / fruits / plant oils | |
| | | **12** | drugs / other useful compounds (may await discovery), that only occur in rainforests ; | |
| | | **13** | soils are nutrient deficient and cannot sustain agriculture ; | |
| | | **14** | increased risk of soil erosion ; | |
| | | **15** | moral responsibility to conserve for later generations ; | |
| | | **16** | ref to indigenous populations / tribes ; | |
| | | **17** | AVP ; e.g. provision of habitats<br>ref to Fig. 4.1 | **max 8** |
| | | | **QWC – clear, well organised using specialist terms ;**<br>*award the QWC mark if four of the following are used in correct context*<br>biodiversity — transpiration<br>deforestation — water cycle<br>carbon reservoirs / sinks — sustainable<br>photosynthesis — nutrient deficient | **1** |
| | (c) | | ban on import of wood from, tropical rain forests / unsustainable sources ;<br>introduce labelling system for wood ;<br>trade sanctions on countries that continue to remove rain forests ;<br>schemes / financial support, for setting up of sustainable use of rain forests ;<br>development of ecotourism ;<br>educate local population as to importance of rain forests ;<br>forest reserves established ;<br>AVP ;<br>AVP ; e.g. debt relief<br>fair trade schemes<br>quotas | **max 3** |
| | | | | **[Total: 15]** |

Downloaded from http://www.thepaperbank.co.uk



| Question | | | Expected Answers | Marks |
|---|---|---|---|---|
| 5 | (a) | | *advantages (max 2)*<br><br>can be used with any species (irrespective of size) ;<br>does not require to distinguish one individual from another ;<br>quick to assess ; **R** simple<br><br>*disadvantages*<br><br>subjective / AW ;<br>dominant species may be over-estimated ; | **max 3** |
| | **(b)** | **(i)** | line established, from shore to dune slack / from… to… ;<br>quadrat used ;<br>suitable size / actual size stated (minimum 0.25m$^2$) ; **R** if no units given<br>placed continuously / at specified intervals along line ;<br>key to identify species ;<br>abundance recorded in each quadrat ;<br>bare ground recorded ; | **max 4** |
| | **(ii)** | **1** | ACFOR scale converted to numerical scale ; | |
| | | **2** | reading at each site recorded (on graph paper) ; | |
| | | **3** | width of diagram related to ACFOR (maybe shown on diagram) ; | |
| | | **4** | points from each site joined together ; | |
| | | **5** | repeated for each species found present ; | **max 3** |
| | **(c)** | | use of, thermometer / probe ;<br>probe must be calibrated ;<br>pushed into, sand / soil, to same depth each time ;<br>repetitions at each sampling point ; | **max 2** |

Downloaded from http://www.thepaperbank.co.uk



**(d)** **(i)** a stage during the process of succession ; **1**

**(ii)** sea couch / marram grass, grow in bare sand ;
dune builds up / stabilised by grasses ;
OR
colonisers established on bare, rock / soil ;
example ; (if not sand dunes)

ref to pioneer species ;
organic matter builds up / humus content increases ;
forming soil / depth of soil increases ;
other species take over from grasses ; **A** named example from Fig. 5.1
roots stabilise soil structure ;
diversity of species increases ;
climax eventually reached ;
AVP ;
AVP ; e.g. reference to deflected succession,
growth of shrubs **max 4**

**[Total: 17]**

Downloaded from http://www.thepaperbank.co.uk



| Question | | | Expected Answers | Marks |
|---|---|---|---|---|
| 6 | (a) | | indicator (species) ; | 1 |
| | (b) | (i) | release into, the environment / atmosphere / water / the land ;<br>(of) chemicals / energy / materials ;<br>as a result of human activity ;<br>remain for a long period of time / are persistent ;<br>damage / harm, to the environment / other species / ecosystems ; | max 2 |
| | | (ii) | *air*<br><br>burning of, fossil fuels / named example ;<br>releases, sulphur dioxide / carbon dioxide / nitrous oxides / soot / lead (from exhausts) / AW ;<br>release from, factories / industrial plants / vehicles ;<br><br>*water*<br><br>release of, organic material / slurry / farm waste / sewage ;<br>leaching of inorganic fertilisers ;<br>release of, PCBs / hot water / heavy metals / AW ;<br>ref to named source ; | max 2 |
| | | (iii) | appropriate sampling method ; e.g. kick sampling / quadrats / timed searches<br>how sample sites located ; e.g. above and below source of pollution<br>use of keys to identify species ;<br>repeats ;<br>measure, presence / absence ;<br>or abundance ;<br>how results might indicate pollution levels ;<br>ref to named, index / scale ; | max 5 |
| | | | | [Total: 10] |