

Environmental and Land-Based Science

GCSE J650

Report on the Units

June 2007

J650/MS/R/07

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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REPORT ON THE UNITS

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J650 Environmental and Land-based Science

UNIT B493: MANAGEMENT OF THE NATURAL ENVIRONMENT

Introduction

The test for Unit B493 was the first set for the new specification, Environmental and Land-Based Science (ELBS), which is entirely e-assessed. This specification is replacing 1979, Rural and Agricultural Science. Much of the content of 1979 is in the new ELBS specification but it has been expanded to include more environmental topics and applied science. Candidates are required to take three of the five content units of the specification. Unit B493, Management of the Natural Environment, is compulsory. Further details of the ELBS course are to be found on the OCR web site.

The Foundation and Higher tier tests have some questions in common. This year there were some questions in both tests that were also common with the 1979 June papers. These helped awarders carry forward standards from the 1979 specification to the new ELBS specification.

The majority of candidates took these tests on screen and this is the first GCSE qualification offered by OCR which uses computer-based testing. Traditional question papers were available for candidates with special requirements.

Questions asked fell into four categories: objective, short answer, data analysis and extended writing.

It should be noted that questions requiring suggestions and opinions require factual support; superficial answers do not gain credit. Awareness of the mark allocation is also important in such questions. If a question has 3 marks it indicates that more than one idea or comment is needed or that some elaboration is required.

It is important that candidates are taught the significance of 'command' words in the question stem. State, describe, explain and suggest all have specific and different meanings.

On the limited evidence available, it appears the computer-based format concentrates candidates' responses: they often wrote less than those doing the same questions on paper while achieving the same numbers of marks.

In the notes below, the question numbers refer to the on-screen tests.

B493/01: Foundation Tier Test

The first eight questions were objective in nature. Questions 7 & 8 were common with the Higher Tier test.

- 1 This question, targeted at G, provided an 'easy' lead into the paper, with most candidates correctly naming the butterfly as a non-soil organism.
- 2 Here candidates were required to identify a herbivore on the diagram of a food web. This proved to be more difficult than expected. The target grade was F.
- 3 Classification of types of pollution posed few problems, with candidates correctly giving cockerels crowing as noise pollution and diesel fumes as air pollution.
- 4 This question discriminated between standard and low demand. Option C proved to be a strong distractor for the cause of chemical weathering, probably because it referred to 'cracked rocks'.
- 5 The key word in the stem of this question was 'all'. This was in bold text. Those who ignored this opted for 'weeds attracting crops' or 'weeds killing crops'.
- 6 Surprisingly, this straightforward question on the pH scale caused problems to candidates of all abilities. A common error was to reverse acidic and alkaline so losing two marks.
- 7 Candidates had to apply their knowledge to the situation shown in the diagram. It discriminated well at the upper end of low demand.
- 8 Although targeted at C grade, candidates at all levels responded in a similar fashion, about half getting it right. Possibly, this was testing a part of the specification that is not well covered.

The following were short answer questions.

- 9 The reasons for using large farm machinery were well appreciated: they enable work to be done more quickly and their power enables steep land to be worked. General comments and statements such as 'cheaper' did not gain credit.
- 10 The effects large machinery has on a soil also required a precise description that referred to compaction of air spaces leading to poor drainage or to the development of a soil pan. The question specified 'effect on soil', so answers relating to harming plants and animals were not credited.

The photograph of a student moving a heavy box was the stimulus for two low demand questions which failed to discriminate at the standard demand.

- 11 Here the obvious answer was 'she could not see where she was going'. Some worried that her arms would become tired.

Some novel ideas were suggested for carrying the box more safely including 'use a fork lift truck' and 'ask father'. The expected answer was to use a trolley or barrow.

- 12 The photograph of a student picking up a box prompted answers relating to not bending the knees and keeping a straight back as things wrong with her method of lifting. This scored well across the ranges of ability.

- 13 This question discriminated well at all levels. It required candidates to note the relationship between surface area and herbicide uptake: the larger the surface, the more weed killer is absorbed. References to absorption by roots were rejected.
- 14 Many candidates failed to mention a piece of equipment, for instance heaters for temperature, or sprinklers for water application. The way factors help plant growth required specific references e.g. heat affects chemical reactions in photosynthesis or water produces humid conditions that prevent excess water loss and wilting.
- 15 This was a low demand question on risk assessment which was partly in common with the higher paper. A wide range of environmental hazards were accepted as well as 'getting stung by jellyfish' and 'bitten by crabs'!

The following questions were based on data analysis.

- 16 When answering a direct question a specific answer is needed. In this case, +19. (19 alone was not credited).
- 17 Answers needed to refer to the table which showed an increase in length, circumference and mass in the leeks with 'Rootmore'. It did not show that they had greener leaves or better roots.
- 18 Better candidates realised that such an experiment with leeks would be in field conditions so did not try to control light or maintain a constant temperature. Accepted answers included ideas of same growing period, similar depth of planting and spacing, amount of 'Rootmore' added, similar variety of leek used and common treatment for pests etc.
- 19 There were good explanations of why the fungus product, 'Rootmore', was organic that referred to the treatment using a natural product or one that did not involve a synthetic chemical compound.
- 20 Many find the calculation of percentage growth rates difficult. The most popular answer was B -14.6, possibly because by inspection $6.5 + 8.1 = 14.6$.

The following questions required longer responses.

- 21 Here a straightforward statement of what is meant by monoculture was required i.e. the growing of (large) areas of the same crop in the same place year after year. The picture of daffodils proved a distraction for some who defined monoculture as growing crops in rows.
- 22 The question required statements about the advantages and disadvantages of keeping animals in livestock houses. The question did not use the words 'for intensive production'. Some candidates failed to realise this and were side tracked into commenting on the 'evils' and morality of intensive production. Comments such as 'they taste better' were also rejected.
- 23 This was a common question.

Genetically modified crops have 'foreign' DNA (genes) introduced into their genetic make up. This gives them an advantage over normal crops regarding, for instance, long shelf life or increased yield. Credit-worthy responses were few and far between, even from the better candidates.

One might have expected that media coverage of the topic would have provided some understanding that cross pollination could occur with either wild plants to produce unknown effects or with organic crops, so downgrading them. Superficial statements that did not

relate to the environment such as, 'GM crops are not natural' were commonly given and did not gain a mark.

B493/02: Higher Tier Test

The first nine questions were objective questions. Questions 1 & 2 were common with the Foundation Tier test.

- 1 This question required candidates to apply their knowledge to the situation shown in the diagram, which the majority did correctly.
- 2 Although targeted at C grade, many candidates on this paper failed to get the correct answer. Possibly the question was testing a part of the specification that was not well covered.
- 3 Targeted at D grade, most candidates had no difficulty in identifying the non renewable and sustainable source of energy.
- 4 This was another D level question. The photograph was correctly interpreted by most candidates as being a clay soil.
- 5 The diagram of the nitrogen cycle discriminated well between standard and higher demand. The most common distractor was D.
- 6 This was the least well answered objective question. Universal indicator turns blue green in chalk soils which have a pH of around 8. Dark blue indicates pH of around 12 which does not occur naturally.
- 7 The concept of energy flow in the food web is a higher demand topic and this question discriminated well at this level. 'A' was the correct response.
- 8 The table illustrated the availability of nutrients in soils of different pH. Plants can only take up nutrients in solution and many nutrients are insoluble at low pH. This is a topic that has not been taught well in the past.
- 9 This question required an understanding of the difference between preservation and conservation. The former keeps the communities and habitats the same, unchanged, whereas conservation involves management to enable both survival and evolution.

The following were short answer questions.

- 10 This was a common question with the Foundation tier paper. The effects large machinery have on a soil required a precise description that referred to compaction of air spaces leading to poor drainage or to the development of a soil pan. The question specified 'effect on soil', so answers relating to harming plants and animals were not credited.
- 11 The photograph showed a tractor with broad tyres whose large surface area spreads the weight so preventing tyre ruts in the soil. Some candidates also noted the lack of deep treads and if they related this to less ground disturbance, they gained the mark.
- 12 Most candidates were able to relate the large spray boom to fewer passes over the field which lowers the possible damage to soil from the tractor tyres. Weaker candidates lost marks for statements that did not provide an explanation.
- 13 This was a question on risk assessment which was partly in common with the Foundation Tier paper. A wide range of environmental hazards was accepted but for the higher level, detail that related to the shore was needed to achieve the marks. Thus hazard, 'fall over'; control method, 'wear good shoes' is too superficial. Hazard, 'slip on wet rocks'; control method, 'wear shoes with grip' gives the level of detail required.

- 14 Many candidates interpreted this question as asking 'what are the benefits of using ICT in polytunnels', rather than 'how ICT used in polytunnels benefits the environment'. Efficient control of heating and lighting means less energy is needed so less greenhouse gases are produced.
- 15 Again, many candidates misinterpreted the question and gave the advantages of growing crops in polytunnels rather than suggesting the possible effects growing plants in polytunnels might have on the environment. Visual pollution, release of land for other activities and less pollution from aircraft importing exotic crops were correct answers mentioned. The effects on the environment of not having outdoor crops that provide the base for food chains or that need pesticides were credited.

The following questions were based on data analysis.

- 16 There were good explanations of why the fungus product, 'Rootmore', was organic that referred to the treatment using a natural product and one that did not involve a synthetic chemical compound.
- 17 Many find the calculation of percentage growth rates difficult. The most popular answer was B:14.6, possibly because by inspection $6.5 + 8.1 = 14.6$.
- 18 The 1-5 scale was recognised as being inaccurate and a matter of opinion, but on the positive side it is quick and requires no specialised measuring equipment.
- 19 Better candidates appreciated that the experiment with leeks was in field conditions throughout the country so did not try to control light or maintain a constant temperature. Accepted answers included an idea of same growing period, similar depth of planting and spacing, amount of 'Rootmore' added, similar variety of leek used and common treatment for pests etc.

The following questions required longer responses.

- 20 This was a common question.

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One might have expected that media coverage of the topic would have provided some understanding that cross pollination could occur with either wild plants to produce unknown effects or with organic crops so downgrading them. Superficial statements that did not relate to the environment such as, 'GM crops are not natural' were commonly given and did not gain a mark.

- 21 Candidates were asked to comment on the environmental dangers of using excess fertiliser. As is usual, many candidates confused fertilisers with pesticides. The former do not kill crops and as a general rule do not accumulate in the soil and food chain. (There is some evidence that blue baby syndrome is the result of nitrate accumulation in drinking water). The problem with fertilisers is their unexpected effects on the soil pH and nutrient uptake and the effects of run off into water courses and subsequent eutrophication.
- 22 There were 3 marks for this question. Many candidates gave a single, superficial statement that did not achieve the marks. A specific detailed example was required to show how knowledge of science has clearly improved food production. Thus knowledge of biochemistry, e.g. the ripening process in apples, has led to methods of prompting harvest

by ethylene sprays and subsequent storage in high carbon dioxide and low temperatures that limit enzyme activity and respiration to ensure the product gets to the market in an ideal condition. Knowledge of genetics has led to genetic engineering e.g. transfer of genes from to tomatoes to improve colour and shelf life. Similar examples could be quoted from knowledge of animal and plant breeding, soil science, chemistry of pesticides and herbicides. Quoting details from engineering science that has led to more effective and efficient agricultural machines used in food production would have been credited.

**General Certificate of Secondary Education
Environmental and Land-based Science (Specification Code J650)
June 2007 Assessment Series**

Unit Threshold Marks

Unit		Maximum Mark	a*	a	b	c	d	e	f	g	u
B493/ 01	Raw	36				24	20	16	13	10	0
	UMS	50				30	25	20	15	10	0
B493/ 02	Raw	36	27	23	19	15	11	9			0
	UMS	50	45	40	35	30	25	23			0

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/exam_system/understand_ums.html

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