



ENVIRONMENTAL MANAGEMENT

0680/41

Paper 4

October/November 2017

MARK SCHEME

Maximum Mark: 60

Published

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This document consists of **7** printed pages.

| Question | Answer | Marks |
|-----------|---|-------|
| 1(a)(i) | 1 677 000; | 1 |
| 1(a)(ii) | 25.8(%);; <i>(if answer incorrect, allow one mark for $1\ 677\ 000 \div 6.5$ [1]);</i> | 2 |
| 1(a)(iii) | Nashville, Memphis, Knoxville, Chattanooga; cities correctly paired with their population (659 000, 656 000, 185 000, 177 000); | 2 |
| 1(b)(i) | <i>any two from:</i> soil type; pH; planting density / number of plants / eq; size of plots; species / variety / type / strain / breed of maize; fertilizer; pesticide; water (schedule) / eq; AVP; | 2 |
| 1(b)(ii) | as a control experiment; to compare (with the other treatments); | 2 |
| 1(b)(iii) | <i>any three from:</i> <i>plot A:</i> plants / crops are shorter / smaller; shorter / smaller cobs; lower yield; <i>differences calculated:</i> 26 cm difference; 0.6 cm difference; 0.3 tonnes difference; | 3 |
| 1(b)(iv) | 6.8(%);; <i>(if answer incorrect, allow one mark for $6.3 - 5.9 = 0.4$ (/ 5.9) [1]);</i> | 2 |

| Question | Answer | Marks |
|-----------|--|----------|
| 1(b)(v) | <p><i>any two from:</i> repeat the trial; use, more plots / more samples; on different farms; use other varieties of maize; measure plants again;</p> | 2 |
| 1(c)(i) | <p><i>any two from:</i> sample too small / should look at more plants; in only one part of the field / eq; yellow spots could be caused by other things;</p> | 2 |
| 1(c)(ii) | <p><i>any four from:</i> <i>ref to</i> a systematic or random method; transect laid out / eq; stated sample points; number of samples; random method, e.g. grid co-ordinates; use of, random tables / random number generator / eq; use of quadrats; size of quadrat; further detail, e.g. sample within the quadrat;</p> | 4 |
| 1(c)(iii) | <p><i>any two from:</i> saves time; saves fuel; less wheelings / eq; AVP;</p> | 2 |

| Question | Answer | Marks |
|-----------|--|----------|
| 2(a)(i) | <i>any two from:</i> switchgrass, is a renewable crop / can be replanted / eq; does not need (added) zinc; idea of carbon neutral / carbon neutral described / little contribution to, global warming / greenhouse gases; | 2 |
| 2(a)(ii) | <i>any three from:</i> transport costs low; labour costs low; more carbon neutral due to shorter distance / less air pollution / eq; (transport is) not time consuming / easier / eq; | 3 |
| 2(a)(iii) | <i>any three from:</i> less food for animals; so less meat production; for humans / humans eat maize / eq; switchgrass grows well in, poor / zn deficient soils / ORA; ethanol can be made from, other crops / wastes / eq; maize can be exported; | 3 |
| 2(b)(i) | 198 AND 91; | 1 |
| 2(b)(ii) | <i>any two from:</i> higher costs of production / profit per dollar invested only slightly more; calculations to show this, e.g. switchgrass is 25 cents on the dollar and hay is 20 cents on the dollar; hay may be more use to them / switchgrass not a fodder crop / eq; AVP; | 2 |

| Question | Answer | Marks |
|-----------|---|----------|
| 2(c)(i) | <p><i>one mark for a valid method and one mark for further detail:</i></p> <p>systematic; e.g. from a list of all farms choose every e.g. tenth;</p> <p>random; e.g. from a list of all farms choose sample using random number generator;</p> <p>stratified / quota; e.g. choose a sample based on the, size / type of farm / choose number of farms of each type according to the number of each needed;</p> <p>self-selection / volunteer; e.g. advertise for farms to volunteer for the survey;</p> | 2 |
| 2(c)(ii) | <p><i>any two from:</i></p> <p>much quicker; reduces, travel costs / cost of carrying out survey; AVP, e.g. a different answer might be given over the phone;</p> | 2 |
| 2(c)(iii) | subsidies / tax break / provide seeds / eq; | 1 |
| 2(c)(iv) | <p><i>any three from:</i></p> <p>biofuel comes from the photosynthesis of plants / plants take in CO₂ / eq; so carbon released is the same as carbon captured / carbon neutral; less fossil fuels are, used / burnt; a reduction in the additional carbon dioxide added to the atmosphere / less greenhouse gases released;</p> | 3 |

| Question | Answer | Marks |
|-----------|---|----------|
| 3(a) | <p><i>any three from:</i> bacteria fix nitrogen; from the air; decomposition (of dead plant material / organic matter); humus added to the soil; nutrient cycling; better soil structure / drainage;</p> | 3 |
| 3(b)(i) | <p>orientation with linear scale;</p> <p><i>axes labelled:</i> average length of maize roots / mm; zinc concentration / ppm;</p> <p>plots correct;</p> | 4 |
| 3(b)(ii) | negative correlation / as Zn concentration increases root length decreases; | 1 |
| 3(b)(iii) | 28(mm); shown on graph; | 2 |
| 3(b)(iv) | <p><i>any three from:</i> long roots absorb, more minerals / nutrients from deeper down; (long roots) so more growth / yield; also (absorb) more water; so less likely to die in hot weather; crops less likely to fall over / more resistant to wind; bind soils better / less soil erosion;</p> | 3 |

| Question | Answer | Marks |
|----------|---|----------|
| 3(c) | <i>any four from:</i> remove, waste tips / chemical waste; fill holes with suitable material, e.g. infill / landfill / mining / seal the mine; waste / overburden / water; add topsoil; add fertiliser; cover with, trees / grass / plant species; grow plants that absorb toxic metals (and remove the plants); landscaping / reprofiling; to reduce drainage of toxic substances into water courses; | 4 |