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MARK SCHEME

Maximum Mark: 60

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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)	<i>any two from:</i> repeat the trial; use, more plots / more samples; on different farms; use other varieties of maize; measure plants again;	2
1(c)(i)	<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;	2
1(c)(ii)	<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;	4
1(c)(iii)	<i>any two from:</i> saves time; saves fuel; less wheelings / eq; AVP;	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