

Question number	Answer	Marks	Guidance
1 a i	1 5.6 tonnes ha ⁻¹ 2 Line of best fit/credit suitable annotation of script	2	+/- 0.05
1 a ii	1 Correlation does not prove cause 2 Data from different plots/different conditions 3 Named variable not controlled	3	
1 b i	86 OR 86.4 OR 86.36%	2	Allow one mark for 8.2 – 4.4
1 b ii	Any two from: 1 Different crops need different amount of nitrogen/fertiliser 2 May stimulate growth of leaves more than grain in some crops 3 Other nutrients not taken into consideration	2 max	
		9	
2 a i	Any two from: 1 Gases/correct named gas not released 2 Conditions (in digester) can be controlled 3 Products/named product can be collected 4 Open ponds associated with health risk/environmental damage/eutrophication	2 max	1. Correct named gases include: methane, carbon dioxide, hydrogen sulphide, nitrogen oxides 3. Allow substance = product 4. Accept 'pond' in any context
2 a ii	1 Respiration causes temperature increase/release of heat 2 Enzymes would be denatured/microorganisms killed	2	
2 b i	Any three from: 1 Increase in algae/algal bloom 2 Light blocked out 3 Plants can't photosynthesise/plants and/or algae die 4 Bacteria/saprobionts feed off/break down dead organisms 5 Bacteria/saprobionts use up oxygen/bacteria respire/BOD rises	3 max	On its own the word eutrophication does not gain a mark, the stages need to be described.
2 b ii	Any one from: 1 Acts as soil conditioner/improves drainage/aerates soil/increases organic content of soil 2 Contains other elements/named element/wider range of elements 3 Production of artificial fertiliser energy-consuming 4 Less leaching/slow(er) release of nutrients	1 max	
		8	

Question number	Answer	Marks	Guidance
3 a i	Net primary production = gross primary production – respiratory losses	1	Accept NPP = GPP – R
3 a ii	In tropical rainforest leaves on trees all year round so photosynthesis high all year/in temperate deciduous forest trees lose leaves in winter so less photosynthesis Temperature/light intensity higher in tropical rainforest so more photosynthesis	2	
3 b i	Respiration	1	
3 b ii	Decomposers/fungi and bacteria	1	
3 b iii	$220 \div 1510 \times 100$ 14.6%	2	
3 b iv	More digestible material (in primary consumers) Primary producers contain a lot of cellulose which cannot be digested/primary consumers contain more protein and fat which is more digestible	2	
		9	
4 a	1 Complementary to/fits/binds to active site 2 Competitive/competes/'prevents' enzyme-substrate complexes/'prevents' urea attaching	2	Max one mark if student suggests that active site/enzyme is damaged, destroyed or useless. Allow inhibitor 'prevents' or 'stops' urea/substrate attaching unless student clearly indicates this is permanent. Ignore reference to inhibitor forming an enzyme/substrate complex.
4 b i	Reduces loss of ammonia up to day 8/9 .	1	
4 b ii	Any two from: 1 Increase in urease/temperature 2 More enzyme-substrate complexes 3 More bacteria	2 max	
4 c	1 Less urea/ammonia lost (from soil)/less urea broken down 2 Urea/ammonia converted to nitrite/nitrate 3 Used to produce protein/amino acids/DNA/bases/nucleotides	3	Reference to incorrect bacteria (e.g. denitrifying) producing nitrite/nitrate negates second marking point.
		8	