

Unit 3 Sustainability & Interdependence

Key Area 1 Marking Scheme

1. D
2. C

Species/type/number /concentration of algal cells OR temperature OR size/volume/surface area of beads OR concentration of bicarbonate indicator OR colour/type of light Any 2 = 2, 1 = 1	2
To protect/shield from heat of lamp	1
Separation of indicator from algae easier	1
Use more tubes/repeat at each light intensity	1
Axes and labels = 1 Plotting and joining = 1	2
As light intensity increases, rate of photosynthesis increases = 1 and at higher light intensities it remains constant = 1	2

4.

(a)	(i)	1. Rises from 2.45 tonnes per hectare to 3.60 tonnes per hectare at 60kg 2. Remains level at 3.60 tonnes between 60kg and 80kg 3. Falls to 3.20 between 80kg and 120kg All 3 = 2, any 2/1 = 1	2
	(ii)	0.025 tonnes	1
(b)	(i)	9:11	1
	(ii)	25%	1
(c)		80kg	1

5. B

6.

<p>1. There is a loss of energy between trophic/food chain/feeding levels OR 2. Livestock produce less energy per area/volume OR 3. Plants produce more energy per area/volume</p> <p>Alternatives to energy = food/biomass</p>	<p>1</p>	
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7. A

9. D

10. D

11.

Question		Acceptable answer(s)	Max Mark	Unacceptable answer
(a)	(i)	1. from 0 – 60 kg per hectare increases from 3 – 8.4 tonnes per hectare 2. remains at 8.4 between 60 and 80 3. between 80 and 100 decreases from 8.4 - 7.9/7.8 All 3 = 2, 2/1 = 1 NOTE - units only needed once; differences acceptable if correct all correct values but no units = 1	2	
(a)	(ii)	208 – 216	1	
(a)	(iii)	840	1	
(b)	(i)	the use of 10/a large number of cattle (in each group/at each feed level)	1	3/multiple groups of cattle sufficient cattle
(b)	(ii)	0.6	1	
(b)	(iii)	1. 20 (1) 2. increasing the phosphate/fertiliser (level applied to crop) increases the mass of/growth (of cattle) (1)	2	
(c)		energy is lost at each level/step/stage/transfer of a food chain	1	

12.

Question	Acceptable answer(s)	Max Mark	Unacceptable answer
(a)	<ul style="list-style-type: none"> • surface area/shape/size/diameter/ mass of beads • temperature • pH/colour of bicarbonate at start/CO₂ concentration at start • distance/wattage/power of lamp/ light intensity • thickness of filter/glass tube • species/strain/type of alga <p style="text-align: right;">1 each, any 2</p>	2	<p>oxygen concentration</p> <p>size/type of filter/glass tube</p> <p>same glass tube</p> <p>time in colorimeter</p>
(b)	<p>keep everything the same/same set-up/experiment</p> <p>AND</p> <p>leave out/without algae/<i>Scenedesmus</i>/beads</p> <p>OR</p> <p>replace algae with glass beads/boiled and cooled algae</p> <p>OR</p> <p>contents of tube listed without algae/cells</p>	1	<p>change gel beads to glass beads</p>
(c)	<p>to allow photosynthesis to occur</p> <p>OR</p> <p>to allow the indicator to be affected by CO₂ / CO₂ to be used/taken up/removed/photosynthesis</p>	1	<p>for indicator to be affected by/detect changes</p> <p>to acclimatise/ settle/adjust to light</p> <p>to allow light absorption to occur</p> <p>to allow reaction/colour change to take place</p>

13. D

14. D

15. D

16.

Question		Expected Answer(s)	Max Mark	Additional Guidance
(a)	(i)	Enzyme X: RuBisCO 1 Substance Y: G3P/glyceraldehyde-3-phosphate 1	2	
	(ii)	Glucose: for respiration/ATP (production)/cellulose formation/starch formation/ other biosynthetic pathways/ processes 1 RuBP: for continuation of the cycle/to allow cycle to occur/ repeat 1 OR to make G3P/intermediate substances	2	Accept examples of biosynthetic pathways eg formation of fats/fatty acids/proteins/amino acids/glycerol/DNA/nucleic acid

b)	(i)	ATP: increases 1 NADPH: increases 1	2	
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17. D

18. D

19.

Question		Expected answer(s)	Max mark	Additional guidance
(a)	(i)	Transmitted/transmission. OR reflection/reflected.	1	
	(ii)	Excites <u>electrons</u> (in the pigment/molecule). OR Promotes <u>electrons</u> to a high(er) energy state. OR Produce high(er) energy <u>electrons</u> .	1	
	(iii)	Broadens absorption/action spectrum. OR Absorbs more/wider range/variety of wavelengths/ colours (of light). OR Allows photosynthesis to happen over more/wider range of wavelength/colours (of light).	1	NOT- absorbs more light NOT- absorbs wider range of light. NOT - absorbs different wavelengths.
(b)		(Photolysis of) water/H ₂ O	1	
(c)		Passes hydrogen to/reduces 3PG/3-phosphoglycerate. OR Passes hydrogen to form G3P/glyceraldehyde-3-phosphate. OR Reduces intermediate/compound to form G3P/glyceraldehyde-3-phosphate.	1	