WJEC (Wales) Biology GCSE Topic 1.5 Plants and Photosynthesis Questions by Topic - Mark Scheme

1.

<table>
<tr><th colspan="3">Sub-section</th><th>Mark</th><th>Answer</th><th>Accept</th><th>Neutral answer</th><th>Do not accept</th></tr>
<tr><td>(a)</td><td></td><td></td><td>2</td><td>Water;
Oxygen;</td><td>H_2O
O_2</td><td>Sunlight or
Chlorophyll on arrow</td><td>H2O
O2</td></tr>
<tr><td>(b)</td><td>i</td><td></td><td>2</td><td>All correct = 2 marks
1 error = 1 mark
> 1 error = 0 marks
<table>
<tr><th>Apparatus</th><th>Presence or absence of starch
✓ or ×</th></tr>
<tr><td>A</td><td>×</td></tr>
<tr><td>B</td><td>✓</td></tr>
<tr><td>C</td><td>×</td></tr>
<tr><td>D</td><td>×</td></tr>
</table></td><td></td><td></td><td></td></tr>
<tr><td></td><td>ii</td><td>I</td><td>1</td><td>B and C;</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>II</td><td>1</td><td>A and B;</td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Total Mark</td><td>6</td><td></td><td></td><td></td><td></td></tr>
</table>

2.

Question			Marking details	Marks Available
2	*(a)*	(i)	{Carbon dioxide/CO_2} **and** {oxygen/O_2};	1
		(ii)	Chlorophyll;	1
	(b)	(i)	Increases then {steady/plateau/reference to constant}; (increases) up to 4 a.u.;	2
		(ii)	Two correct readings (13.5 & 16.5); Correct calculation (3 a.u.); Correct answer = 2 marks Allow one mark for two correct readings if answer incorrect	2
		(iii)	{Carbon dioxide/CO_2}; NOT light/ temperature	1
	(c)		Starch; (formation of) cell walls;	2
			Question 2 total	**[9]**

3.	Marking details	Marks Available
	Indicative content:	6

Drop leaf in boiling <u>water</u> to {kill the leaf/ burst the chloroplasts/ {burst/destroy} cell membranes/ to get rid of waxy cuticle}

Boil the leaf in ethanol/alcohol/methanol to remove the <u>chlorophyll</u>

Place the leaf in water to soften it

Spread the leaf on a white tile (or any suitable surface)

Add iodine solution to the leaf surface to test for starch

If <u>leaf</u> turns {blue-black/ black} starch is present

5 – 6 marks
The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.

3 – 4 marks
The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.

1 – 2 marks
The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.

0 marks
The candidate does not make any attempt or give a relevant answer worthy of credit.

4.

Question		Marking details	Marks Available
(a)		carbon dioxide/CO_2 (not CO^2 or Co_2 etc) required for photosynthesis/starch manufacture;	1
(b)	(i)	{Boil/ heat} in {alcohol/methanol/ethanol}; Boiling water = neutral	1
	(ii)	Iodine (solution);	1
	(iii)	no CO_2/ CO_2 absorbed by sodium hydroxide; no photosynthesis; no starch produced;	3
(c)		Control/ to make a comparison;	1
(d)		because you wouldn't know whether it was the lack of light or lack of carbon dioxide which prevented photosynthesis/starch production; Answer must refer to both carbon dioxide and light limiting photosynthesis	1
		Question 4 Total	**[8]**

5.

Question		Marking details	Marks Available
(a)		Carbon dioxide/CO_2	1

6.

Question		Marking details	Marks Available
(a)		To show carbon dioxide/ CO_2 (not CO^2) is needed for photosynthesis/ starch production;	1
(b)	(i)	To prevent soil organisms affecting the experiment (OWTTE);	1
	(ii)	Absorb carbon dioxide / CO_2;	1
	(iii)	Control/ correct ref to using B to compare to A/ to make a comparison;	1
	(iv)	Form an air tight seal/ make the apparatus air tight / prevent {gases/ carbon dioxide/ air} going in or out of the apparatus; NOT oxygen (can be neutral);	1
(c)		Destarch/ remove starch;	1
(d)	(i)	Apparatus **A** Colour – brown/ iodine colour + Reason – no starch present/ no photosynthesis ∴ no starch; (**both** required for one mark)	[1]
	(ii)	Apparatus **B** Colour – black/ blue black + Reason –starch present/ photosynthesis occurred ∴ starch present; (**both** required for one mark);	[1]
		Question Total	**[8]**

7.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			1 1	Light; Water **and** Oxygen;	sunlight		Sun/ solar
(b)	i		2	increase then {plateau/ levels off}; plateau occurs at 4%;	Range of 3-4%	Reference to figures from *y*-axis	
	ii		1 1	34 – 20; 14; (correct answer but no working shown = 2) (incorrect answer but correct readings = 1)			
(c)			2	Iodine (solution); {Yellow/Orange/Brown} to {blue-black / black};	Iodide		
Total Mark			8				

8.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			2	palisade; spongy;			sponge
(b)	i		1	photosynthesis;			
	ii		1	carries sugar(s);	carries sucrose		carries glucose
	iii		1	respiration, starch;			
(c)			1	<u>controls</u> {loss of water /transpiration}/ allows {gases/correctly named gas} to pass in or out/ allows gas exchange;	CO_2		Air CO^2
Total Mark			6				

9.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(a)	(i)		A – Carbon dioxide (1) B – Oxygen (1)	2			2		
		(ii)		{Gas **A**/ carbon dioxide} is the lowest and photosynthesis is highest (at midday) (1) because carbon dioxide is used for photosynthesis (1) {Gas **B**/ oxygen} is the highest and photosynthesis is highest (at midday) (1) because oxygen is produced by photosynthesis (1)		1 1 	 1 1 	4		
		(iii)		Cloudier / less light/ lower temperature/ colder/ less sun			1	1		
		(iv)		49.75/ 49.8/ 50 = 2 marks If incorrect award 1mark for (46+26+76+51)/4 or 199/4 or 49.7		2		2	2	
	(b)			Light		1		1		
				Question total	**2**	**5**	**3**	**10**	**2**	**0**

10.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			2	carbon dioxide + water; → *glucose* + oxygen;	Correct symbols		
(b)			4	1. **X** has photosynthesised; 2. **X** has starch; 3. **Y** no photosynthesis; 4. starch {turned (back) into glucose/used up}/ destarched;			Reference to stored glucose
Total Mark			6				

11.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			1	carbon dioxide + water glucose + oxygen	Correct symbols	Ignore chlorophyll/ light written above/ below arrow.	If these terms are written anywhere else in the equation then do not award the mark
(b)		I	1 1	the sugar concentration/ it/ glucose increases; because light is available for photosynthesis ; (2nd mark only awarded if 1st mark awarded)	sunlight		Sun/ daytime
		II	1 1 1	{No light/ not enough light} for photosynthesis/ it is dark so no photosynthesis takes place; {Sugar/ it/ glucose} decreases; Because sugar used in cell respiration or converted to starch; 3rd mark only awarded if 2nd mark awarded			
Total Mark			6				

12.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)		1	As the (mean dry) mass of the tubers decrease the (mean dry) mass of the leaves and stems increase;			
	(ii)		1	6;			
(b)	(i)		1	Starch;			
	(ii)		2	Starch in the tuber is converted to glucose; {for energy/ as a source of energy/ for respiration/ transported to other parts of plant};			
	(iii)		2	(The leaves and stems are carrying out) photosynthesis; the {products/ named products}of which {increase the mass/ are used for growth};			
Total Mark			7				

13.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
13	(a)	(i)		carbon dioxide + water (1) ⟶ Glucose + oxygen (1)	2			2		
		(ii)		chlorophyll	1			1		
	(b)			14 = 2 marks If incorrect award 1 mark for incorrect rounding e.g. 14.333		2		2	2	
	(c)			greater the distance the lower the number of bubbles (1) there is less {light/ light intensity}(1) less photosynthesis (1) Accept reverse argument for each point		1	2	3		
	(d)			absorbs heat (but lets light through)/ ref. keeping temperature of experiment constant (1)			1	1		1
	(e)			collect volume of gas (1)			1	1		1
				Question 13 total	**3**	**3**	**4**	**10**	**2**	**2**

14.

Question		Marking details	Marks Available
(a)	(i)	Carbon dioxide CO_2; NOT Co Water/H_2O;	2
	(ii)	Chlorophyll;	1
(b)	(i)	I suitable scale;	1
		II all plots correct; (tolerance +/- 0.5 small square) 1 error = 1 mark, 2 errors = 0 mark	2
		III line quality;	1
	(ii)	I rises/increases;	1
		II 22-25	1
	(iii)	Same plant/same time; NOT – ref to repeating/reliability	1
(c)		Respiration/{release/ for}energy/cellulose/cell wall/(storage as) starch/ protein; NOT {create/produce/make} energy NOT food/growth (this could be neutral)	1
		Question 14 Total	**[11]**

15.

Marking details	Marks Available
Indicative content plants use chlorophyll to absorb light energy. convert carbon dioxide and water into glucose and oxygen glucose can be changed to starch and stored used to make cellulose/ proteins light, temperature and carbon dioxide are limiting factors **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit. **Question 11 Total**	6 **[6]**

16.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(b)			3	**Any three (x1) from:** • (Increased light) increases photosynthesis; • (so) there are more plants; • Providing more food for animals; • Providing more oxygen for organisms;	plants grow more		

17.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
17	(a)			• photosynthesis produces {oxygen/ O_2} /{oxygen/ O_2} is a bi-product of photosynthesis (1) Not O^2 or o^2 Reject equation on own • Therefore if the production of O_2 {increases/decreases}/ if there is {more/less} O_2 (1) • (The rate of) photosynthesis is {increasing/decreasing}. (1) The more oxygen the more photosynthesis = 2 marks This question relates to the 'rate of photosynthesis' and not to whether the plant is photosynthesising or not		3		3		3
	(b)			**Any 1 from:** • Increasing light intensity has no effect on O_2 production/photosynthetic rate • Increasing CO_2 concentration has no effect O_2 production/ photosynthetic rate (1) • Increasing temperature increases O_2 production/ photosynthetic rate (1) **Any 1 from:** • Therefore temperature must be the limiting factor • the temperature is too low to increase O_2 production/ photosynthetic rate (1)			2	2		2
	(c)			CO_2 was the limiting factor (1) **Any 1 (x1) from:** • {Increasing/ change in} temperature has no effect on O_2 production/ photosynthetic rate • {Increasing/ change in} light intensity has no effect on O_2 production/photosynthetic rate • Only when carbon dioxide concentration increases does the photosynthetic rate increase			2	2		2
	(d)			To prevent {gases/ air/ oxygen/ carbon dioxide} {entering/leaving}		1		1		1
	(e)			*Factor* – light in the room/ light around the apparatus/ natural light OR temperature outside the container/room temperature (1) *How factor could be controlled* – LIGHT – place in dark/ black out container/make the container light proof/carry out expt in a (light proof) cupboard (1) NOT turning lights off in room/ opening windows to adjust light OR TEMPERATURE – container needs thermostatic control/ OWTTE		1	1	2		2
				Question 17 total	**0**	**5**	**5**	**10**	**0**	**10**

18.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(a)	(i)	A – light / sunlight/ light energy/ solar energy (1) NOT sun B – carbon dioxide/ CO_2 (1) NOT CO^2/ CO2 C – chlorophyll (1) ignore chloroplast		3		3		
		(ii)	B1 should contain {a liquid which doesn't affect the experiment/ water/ sodium bicarbonate solution} (1) So that the volume in each flask is the {same/ equal} (1)			2	2		2
		(iii)	To de-starch the plant/ remove the starch/ plant uses up the starch(1) So that any starch found in the leaves was made during the / to show that photosynthesis took place during the experiment(1)	1	1		2		2
	(b)		1 water ignore temperature 2 alcohol/ ethanol/ methanol/ meths 3 water ignore temperature 4 iodine (solution) All 4 correct (3) 3 correct (2) 2 correct (1) 1 correct (0)	3			3		3
			Question total	**4**	**4**	**2**	**10**	**0**	**7**

19.

Marking details	Marks Available
Indicative content:	6

Drop leaf in boiling <u>water</u> to {kill the leaf/ burst the chloroplasts/ {burst/destroy} cell membranes/ to get rid of waxy cuticle}

Boil the leaf in ethanol/alcohol/methanol to remove the <u>chlorophyll</u>

Place the leaf in water to soften it

Spread the leaf on a white tile (or any suitable surface)

Add iodine solution to the leaf surface to test for starch

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0 marks
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20.

Question		Marking details	Marks Available
(a)	(i)	Phloem; (accept phonetic spelling)	1
	(ii)	phloem clearly identified on the diagram (letter A);	1
(b)		Starch;	1

21.

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
(a)	A – xylem B – phloem C - guard cell 3 correct = 2 marks 2 correct = 1 mark 0/1 correct = 0 marks	2			2		

22.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			1	controls{loss of water /transpiration} **and** allows {gases/correctly named gas} to pass in or out ;			
(b)			1	Guard cells;			
(c)			1	To prevent loss of too much water/ reduces loss of water;			Stops loss of water
(d)	i		1	Decrease/ less time;			
	ii		1	Increase/ more time;			
Total Mark			5				

23.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			1	Active {transport/ uptake};			
(b)			2	Oxygen is needed; For respiration/ release of energy/ to make ATP; 2nd mark is linked to 1st			
(c)			3	Water passes from where it is in high concentration to where it is in low concentration / Water passes from where solute concentration is low to where solute concentration is high ; Via a semi permeable membrane (or other correct description of membrane i.e. semi/ partially) ; Indication of where the higher concentration of water/ solute is;		SPM	
Total Mark			6				

24.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(a)	(i)		Allow range 1.7- 1.8		1		1	1	1
		(ii)		Transpiration Not evaporation	1			1		
		(iii)		**Any two (x1) from:** Surface area of leaves/ number of leaves (1) Fewer stomata (1) Thickness of cuticle/ presence of waxy layer(1)		2		2		
		(iv)		to stop evaporation/ ensures that any water lost was only through the plant (1)			1	1		1
	(b)			Air directed at the leaves by a fan	1			1		1
	(c)			Increase/ faster (1) Larger surface area for absorption of water (1)	1	1		2		2
				Question total	**3**	**4**	**1**	**8**	**1**	**5**

25.

Question	Marking details	Marks Available
(a)	Transpiration;	1
(c)	Any two from: (air) temperature; NOT heat humidity; light intensity; water availability; NOT amount	2

26.

Question		Marking details	Marks Available
(a)		Phloem;	1
	(ii)	any two from;	2
		same • volumes {water/ Topgrow} • light intensity/duration • temperature NOT heat • length of growing time • harvest time • {variety/ type} of tomato • type of soil • pH • height/ mass/age/ stage of growth of plant NOT size NOT 'amount'/ same {place/ environment}/ CO_2/ 'level'	
(c)		any two from; phosphate; NOT phosphorus potassium; magnesium; calcium; iron; named trace element	2