

Mark schemes

1	(a) $6\text{H}_2\text{O}$	<i>in the correct order</i>	1
	$\text{C}_6\text{H}_{12}\text{O}_6$		1
2	(b) (i) control	do not accept 'control variable' <i>allow:</i> <i>to show the effect of the organisms</i> or <i>to allow comparison</i> or <i>to show the indicator doesn't change on its own</i>	1
	(ii) snail respire		1
		releases CO_2	1
	(iii) turns yellow		1
		plant can't photosynthesise so CO_2 not used up	1
		but the snail (and plant) still respire so CO_2 produced	1
		[8]	
2	(a) chlorophyll is needed for photosynthesis		1
		light is needed for photosynthesis	1
	(b) increases		1
		levels off / reaches a maximum / remains constant / stays the same / plateaus <i>do not allow stops / stationary / peaks</i> <i>allow stops increasing</i>	1
	goes up to / reaches a maximum / levels off at (a rate of) 200 (arbitrary units) or levels off at 225 – 240 (light units) <i>ignore references to other numerical values</i>	1	

- (c) (i) higher light intensity does not increase rate of photosynthesis
accept the graph stays level (above this value)
allow stops increasing
allow the rate of photosynthesis stays the same (above this value)

1

- (ii) any **two** from:

- carbon dioxide (concentration)
 - temperature / heat
 - (amount of) chlorophyll / chloroplasts
- allow water*
allow ions / nutrients
ignore ref to surface area of the leaf

2

[8]

3

- (a) (i) in the direction of the force of gravity

1

- (ii) against the force of gravity

1

- (b) (i) diagram completed to show stem bending / leaning towards the window
the bend / lean can be at / from any point above pot level
ignore any leaves

1

- (ii) more light (for leaves)
ignore heat

1

more photosynthesis / biomass / glucose

ref to 'more' needed once only, eg 'more light for photosynthesis' = 2 marks

if no other marks given allow 1 mark for 'to get light for photosynthesis'

1

[5]

4

- (a) LHS = water

1

RHS = glucose

1

(b) any **three** from:

- (measure) temperature
ignore reference to fair test
- to check that the temperature isn't changing
- rate of reaction changes with temperature
- temperature is a variable that needs to be controlled
allow lamp gives out heat

3

(c) (i) 10

correct answer = 2 marks

allow 1 mark for: $\frac{(10+9+11)}{3}$

allow 1 mark for correct calculation without removal of anomalous result ie 15

2

(ii) graph:

allow ecf from (c)(i)

label on y-axis as 'number of bubbles per minute'

1

three points correct = 1 mark

allow ± 1 mm

four points correct = 2 marks

2

line of best fit = smooth curve

1

(iii) as distance increases, rate decreases – pro

allow yes between 20 – 40

1

but should be a straight line / but line curves – con / not quite pro

allow not between 10 – 20

if line of best fit is straight line, allow idea of poor fit

1

(d) any **four** from:

- make more profit / cost effective
- raising temp. to 25 °C makes very little difference at 0.03% CO₂
- (at 20 °C) with CO₂ at 0.1%, raises rate
- (at 20 °C with CO₂ at 0.1%) → >3x rate / rises from 5 to 17
- although 25 °C → higher rate, cost of heating not economical
- extra light does not increase rate / already max. rate with daylight

accept ref to profits c.f. costs must be favourable

4

[17]

5

(a) light is trapped / absorbed / used

extra answers cancel mark

ignore solar / sunshine

1

by chlorophyll / chloroplasts

if no other marks awarded, allow 1 mark for photosynthesis / equation for photosynthesis

1

(b) (to make) starch (for storage)

ignore 'for growth' unqualified

ignore respiration

1

(to make) fat / oil (for storage)

1

(to make) amino acids / proteins / enzymes

1

(to make) cellulose / cell walls

allow for active transport

allow any other correct, named organic substances (eg DNA / ATP / chlorophyll / hormone)

*if no named examples, allow 'to make **named** cell structures' for max. 1 mark*

1

[6]

6

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

Level 3 (5–6 marks):

A description of how the apparatus is used to measure the **rate** of photosynthesis at different light **intensities** is given.

For full marks reference must be made to a control variable

or

repeats

Level 2 (3–4 marks):

A description of how the apparatus is set up

and

a description of how photosynthesis can be measured.

or

a description of how light intensity is varied

or

a control variable **or** any other relevant point

Level 1 (1–2 marks):

A partial description of how the apparatus is set up

or

a description of how light is supplied

or

a simple description of how photosynthesis can be measured.

or

a control variable

0 marks:

No relevant content.

examples of the points made in the response:

- apparatus set up:
 - weed in water in beaker
 - light shining on beaker
- method of varying the light intensity—eg changing distance of lamp from plant
- method of controlling other variables
 - use same pond weed **or** same length of pond weed
 - temperature: water bath or heat screen
 - CO₂
- leave sufficient time at each new light intensity before measurements taken
- method of measuring photosynthesis – eg counting bubbles of gas released or collecting gas and measuring volume in a syringe
- measuring **rate of photosynthesis** by counting bubbles for set period of time
- repetitions

extra information:

allow information in the form of a diagram

[6]

7

(a) (i) LHS = water
accept H₂O
do not accept H²O / H2O 1

RHS = oxygen
accept O₂
do not accept O / O² / O2 1

(ii) light / sunlight
ignore solar / sun / sunshine
do not allow thermal / heat 1

(iii) chloroplasts
allow chlorophyll 1

(b) (i) 20 1

(ii) any **one** from:
• light (intensity)
• temperature. 1

(c) (i) To increase the rate of growth of the tomato plants 1

(ii) Because it would cost more money than using 0.08% 1

Because it would not increase the rate of photosynthesis of the tomato plants any further 1

[9]