1.

(a) rate of photosynthesis increases
or
number of bubbles produced (in one minute) increases
or
volume of gas / oxygen produced (in one minute) increases
allow decreases / stays the same throughout

1

(b) light intensity

1

(c) reduces the effect of heat from the lamp
or
prevents temperature affecting photosynthesis

1

(d) 52

1

(e) should be 62
or
is to 3 s.f. / not rounded
allow inconsistent number of significant figures / decimal places

1

(f) the numbers of bubbles at each distance are similar

1

(g) x-axis correctly labelled (colour of light) **and** bars identified as correct colour
bars can be identified by labels beneath the x-axis or with a key

1

bars plotted correctly
*all 4 correct = **2** marks 3 correct = **1** mark*
*if wrong type of graph drawn, max **2** marks*

2

(h) blue light gives highest (rate of) photosynthesis
allow ecf from candidate's graph allow blue light is best

1

green light gives the lowest (rate of) photosynthesis
allow green light is worst

1

(i) energy

in this order only **1**

cell wall(s)

allow cell

*do **not** accept (cell) membrane*

1

starch / fat / oil / lipid

1

[14]

2. (a) $6H_2O$

in the correct order

1

$C_6H_{12}O_6$

1

(b) (i) control

***do not accept** 'control variable'*

allow:

to show the effect of the organisms

or

to allow comparison

or

to show the indicator doesn't change on its own

1

(ii) snail respires

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 respires so CO_2 produced

1

[8]

3.

(a) (i) LHS = water

accept H_2O

*do **not** accept H^2O / H2O*

1

RHS = oxygen

accept O_2

*do **not** accept O / O^2 / 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]

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% CO_2
- (at 20 °C) with CO_2 at 0.1%, raises rate
- (at 20 °C with CO_2 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) (i) chloroplast

1

(ii) cell wall

1

(b) (i) osmosis

accept diffusion **1**

(ii) cell wall (prevents bursting)

1

(c) (i) carbon dioxide

allow correct formula

1

glucose

allow sugar / starch

1

(ii) any **two** from:

- light sensitive spot detects light
- tells flagellum to move towards light
- more light = more photosynthesis

2

(d) (cell has) larger SA:volume ratio

1

short (diffusion) distance

allow correct description

1

(diffusion) via cell membrane is sufficient / good enough

or

flow of water maintains concentration gradient

1

[11]