

- M1.** (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]

M2. (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]

M3. (a) to kill virus
or
to prevent virus spreading 1

(b) take (stem) cells from meristem
or
tissue culture
allow take cuttings 1

(c) use Benedict's solution 1

glucoses turns solution blue to orange 1

(d) **Level 2 (3–4 marks):**
A detailed and coherent explanation is provided. The student makes logical links between clearly identified, relevant points that explain why plants with TMV have stunted growth.

Level 1 (1–2 marks):
Simple statements are made, but not precisely. The logic is unclear.

0 marks:
No relevant content.

Indicative content

- less photosynthesis because of lack of chlorophyll
- therefore less glucose made
so
- less energy released for growth
- because glucose is needed for respiration
and / or
- therefore less amino acids / proteins / cellulose for growth
- because glucose is needed for making amino acids / proteins / cellulose

4
[8]

M4. (a) $6\text{H}_2\text{O}$

in the correct order

1

$\text{C}_6\text{H}_{12}\text{O}_6$

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 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]

- M5.** (a) methane is produced
ignore bad smell 1
- which is a greenhouse gas / causes global warming 1
- (b) $(9.80 / 0.20 = 49 \text{ therefore})$ 49:1 1
- (c) horse (manure)
allow ecf from 11.2
- closest to 25:1 (ratio) 1
- (d) **Level 3 (5–6 marks):**
A detailed and coherent explanation is given, which logically links how carbon is released from dead leaves and how carbon is taken up by a plant then used in growth.
- Level 2 (3–4 marks):**
A description of how carbon is released from dead leaves and how carbon is taken up by a plant, with attempts at relevant explanation, but linking is not clear.
- Level 1 (1–2 marks):**
Simple statements are made, but no attempt to link to explanations.
- 0 marks:**
No relevant content.
- Indicative content**
- statements:**
- (carbon compounds in) dead leaves are broken down by microorganisms / decomposers / bacteria / fungi
 - photosynthesis uses carbon dioxide
- explanations:**
- (microorganisms) respire
 - (and) release the carbon from the leaves as carbon dioxide
 - plants take in the carbon dioxide released to use in photosynthesis to produce glucose

use of carbon in growth:

- glucose produced in photosynthesis is used to make amino acids / proteins / cellulose
- (which are) required for the growth of new leaves

6

(e) any **three** from:

(storage conditions)

- (at) higher temperature / hotter
- (had) more oxygen
- (had) more water / moisture
- (contained) more microorganisms (that cause decay)

allow reference to bacteria / fungi / mould

3

[13]