GCSE

BIOLOGY

AQA - COMBINED SCIENCE

MARK SCHEME

B4

PHOTOSYNTHESIS & RESPIRATION

TEST 2

1

(a) 66 (beats per minute)

1

(b) heart rate increased

1

(c) 4

1

(d) any **two** from:

- resting heart rate was lower
- heart rate did not increase as much
- heart rate did not increase as fast
- heart rate returned to normal sooner

2

(e) **Level 2 (3–4 marks):**
A detailed and coherent explanation is given, which logically links changes in the body during exercise to reasons for these changes.

Level 1 (1–2 marks):
Discrete relevant points made. Links may not be made.

0 marks:
No relevant content

Indicative content

Changes:
- breathing rate increases
- deeper breathing
- (body) temperature increases
- sweating occurs
- muscle fatigue
- vasodilation

Explanations linked to correct change:
- to provide more oxygen
- to remove carbon dioxide faster
- (as) more energy required
- (so) increased respiration
- (so) more energy transferred
- for movement or contraction of muscles
- some energy warms the body
- (sweating) cools the body down
- (by) evaporation of sweat

4

[9]

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2 (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

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3 (a) $6H_2O$

in the correct order

1

$C_6H_{12}O_6$

1

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(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

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4 (a) $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$

correct reactants

1

correct products

1

(b) correct scale and label on x axis

1

all 5 plots correct

tolerance ±½ small square

*allow 2 or 3 plots correct for **1** mark*

2

(c) no

no mark

although as distance increases, rate decreases

1

the line curves **or** line should be straight

1

suitable data quoted

examples:

- *supports conclusion between 20–40 (cm)*
- *does not support conclusion between 10–20 (cm)*

1

(d) volume of 1 bubble = $4 / 3 \times 3.14 \times (0.1)^3$

1

$= 0.00419$

1

at 40 cm there are 7 bubbles

1

vol at 40 cm = 0.02933

allow ecf from incorrect value taken from table

1

Rate per minute = × 2

$= 5.86 \times 10^{-2}$ (cm^3 per min)

*allow 5.86×10^{-2} with no working shown for **5** marks*

1

*answer not given in standard form or to incorrect number of sig. figs max **4** marks*

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5 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
  – CO_2
- 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

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6 (a) (i) without <u>oxygen</u>

allow not enough oxygen

ignore air

ignore production of CO_2

ignore energy

1

(ii) more / high / increased lactic acid (at end)

allow approximate figures (to show increase)

ignore reference to glucose

1

(b) (i) 1.5

allow only 1.5 / 1½ / one and a half

1

(ii) increases at first **and** levels off

ignore subsequent decrease

1

suitable use of numbers eg

rises to 10 / by 9 (dm^3 per min)

or

increases up to 1.5 (min) / levels off after 1.5 (min) (of x axis timescale)

allow answer in range 1.4 to 1.5

or

after the first minute (of the run)

1

(iii) supplies (more) oxygen

1

supplies (more) glucose

1

need 'more/faster' once only for full marks

*allow removes (more) CO_2 / lactic acid / heat as an alternative for either marking point one **or** two, **once** only*

for (more) respiration

1

releases (more) energy (for muscle contraction)

*do **not** allow energy production or for respiration*

1

[9]

7 (a) (to) stop them falling in the solution

or

to stop them drowning (in the solution)

1

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(b) **Level 2 (3–4 marks):**
A detailed and coherent explanation is given of how the droplet moves, clearly and logically linked to the process of respiration.

Level 1 (1–2 marks):
Simple statements are made about movement of the water droplet, but any attempts at explaining the reason or linking the movement to the process of respiration are unclear and poorly structured.

0 marks:
No relevant content

Indicative content

- water droplet moves towards the maggots / boiling tube

Explanation:

- the oxygen in the boiling tube is used up in respiration
- (and) the carbon dioxide released from respiration is absorbed by solution **A**
- which causes a pressure difference
- so air is drawn into the tube
- bringing the water droplet with it.

4

(c) *x* axis: Temperature in °C

both needed for the mark

y axis: Rate of respiration in units

1

(d) repeat the experiment at 30 °C

1

(e) 10.5

allow range 10.4–10.8

1

[8]

8 (a) control

1

to check that the indicator colour does not change on its own
or
to check any changes in colour are due to the organisms

1

(b) (tube) **E**

1

<u>most</u> carbon dioxide

1

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(due to) only respiration occurring

allow no carbon dioxide used for photosynthesis

*allow **1** mark **max** if chose tube **D** and give a correct reason*

1

(c) the amount of carbon dioxide produced by respiration equalled amount absorbed for photosynthesis

1

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