

Respiration

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Biology
Exam Board	AQA
Topic	4.4 Bioenergetics
Sub-Topic	Respiration
Difficulty Level	Gold Level
Booklet	Mark Scheme 1

Time Allowed: 54 minutes

Score: /54

Percentage: /100

Grade Boundaries:

M1.(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

most carbon dioxide

1

(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

[6]

M2.(nitrate) ions are absorbed by active transport

1

(active transport) is the movement of ions against the concentration gradient

allow (active transport) is the movement of ions from a dilute to a more concentrated solution

1

(active transport) requires energy from respiration

1

(respiration) requires oxygen

1

no / little oxygen / air in water-logged soil

1

[5]

M3.(a) reduces biodiversity

1

peat is being used faster than it forms
allow peat is non-renewable

1

(b) decay / decomposition / rotting of peat

1

by microorganisms / bacteria / microbes / fungi / decomposers introduced when peat is mixed with air

1

that respire using substances in peat as reactant

1

and using oxygen that is introduced when peat is mixed with air

1

[6]

M4.(a) 5624

allow 2 marks for:

- correct HR = 148 **and** correct SV = 38 plus wrong answer / no answer

or

- only one value correct **and** ecf for answer

allow 1 mark for:

- incorrect values **and** ecf for answer

or

- only one value correct

3

- (b) (i) **Person 2** has low(er) stroke volume / SV / described
eg **Person 2** pumps out smaller volume each beat
do **not** allow **Person 2** has lower heart rate

1

- (ii) **Person 1** sends more blood (to muscles / body / lungs)

1

(which) supplies (more) oxygen

1

(and) supplies (more) glucose

1

(faster rate of) respiration **or** transfers (more) energy for use

ignore aerobic / anaerobic

allow (more) energy release

allow aerobic respiration transfers / releases more energy
(than anaerobic)

do **not** allow makes (more) energy

1

removes (more) CO₂ / lactic acid / heat

allow less oxygen debt

or less lactic acid made
or (more) muscle contraction / less muscle fatigue
*if no other mark awarded,
allow person 1 is fitter (than person 2) for max 1 mark*

1

[9]

M5. (a) LHS: carbon dioxide **AND** water
*in either order
accept CO_2 **and** H_2O
allow CO_2 and H_2O
if names given ignore symbols
do **not** accept CO^2 / H^2O / Co / CO
ignore balancing*

1

RHS: sugar(s) / glucose / starch / carbohydrate(s)
*accept $\text{C}_6\text{H}_{12}\text{O}_6$
allow $\text{C}_6\text{H}_{12}\text{O}_6$
do **not** accept $\text{C}^6\text{H}^{12}\text{O}^6$*

1

(b) (i) light is needed for photosynthesis

or

no photosynthesis occurred (so no oxygen produced)

1

(ii) oxygen is needed / used for (aerobic) respiration
*full statement
respiration occurs **or** oxygen is needed for anaerobic
respiration gains 1 mark*

2

(c) (i) (with increasing temperature) rise then fall in rate

1

use of figures, ie

max. production at 40 °C

or maximum rate of 37.5 to 38

1

(ii) 25 – 35 °C

either faster movement of particles / molecules / more collisions **or** particles have more energy / enzymes have more energy

1

or temperature is a limiting factor over this range

40 – 50 °C

denaturation of proteins / enzymes

ignore denaturation of cells

ignore stomata

1

(d) above 35 °C (to 40 °C) – little increase in rate

or > 40 °C – causes decrease in rate

1

so waste of money **or** less profit / expensive

1

because respiration rate is higher at > 35 °C

or

respiration reduces the effect of photosynthesis

1

[12]

M6. (a) 7.15 to 7.45 am **and** 7.15 to 7.45 pm

both required, either order

accept in 24 hr clock mode

1

(b) (i) 11

1

(ii) 32.5 to 33

allow answer to (b)(i) + 21.5 to 22

1

(c) any **two** from:

- more photosynthesis than respiration
- more biomass / carbohydrate made than used
allow more food made than used
- so plant able to grow / flower
accept plant able to store food

2

[5]

M7. insufficient / no oxygen available

1

for (just) aerobic respiration

or

respires anaerobically

1

[2]

M8. (a) (i) 120

1

(ii) 11 760 **or**

correct answer from candidate's answer to (a)(i)

correct answer with or without working

if answer incorrect

120 × 98 or

candidate's answer to (a)(i) × corresponding SV gains 1 mark

*if candidate uses dotted line / might have used dotted line(bod) in (a)(i) **and** (a)(ii) no marks for (a)(i) but allow full ecf in (a)(ii) eg $140 \times 88 = 12320$ gains 2 marks*

2

(b) trained athlete has higher stroke volume / more blood per beat

1

same volume blood expelled with fewer beats

or for same heart rate more blood is expelled

1

(c) increased aerobic respiration

or

decreased anaerobic respiration

allow correct equation for aerobic respiration

accept don't have to respire anaerobically

1

increased energy supply / need

1

less lactic acid formed

or to breakdown lactic acid **or** less O₂-debt

1

can do more work **or** can work harder / faster / longer
accept muscle contraction for work

or less fatigue / cramp / pain

1

[9]