MARK SCHEME

GCSE

BIOLOGY

AQA - TRIPLE SCIENCE

B 4 - TEST 5

BIOENERGETICS

Advanced

1. insufficient / no oxygen available

1

for (just) aerobic <u>respiration</u>

or
<u>respires</u> anaerobically

1

[2]

2. (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 x 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 <u>aerobic</u> <u>respiration</u>

or

decreased <u>anaerobic</u> <u>respiration</u>

allow correct equation for aerobic respiration

accept don't have to respire anaerobically

1

increased <u>energy</u> supply / need

1

less lactic acid formed

or to breakdown lactic acid **or** less O_2-debt

1

can do more work **or** can work harder / faster / longer

accept muscle contraction for work

or less fatigue / cramp / pain

1

[9]

3. (i) 0.25 × 100 / 25

gains 1 mark

but
1%

gains 2 marks

2

(ii) muscle contraction / limb movement / moving around / chewing
heartbeat / breathing / internal muscle activity
maintaining body temperature / keeps body warm
active uptake synthesising substances (*reject* growth)

any three for 1 mark each

3

[5]

4. (a) LHS: carbon dioxide **AND** water

in either order

*accept CO_2 **and** H_2O*
allow CO2 and H2O
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 $C_6H_{12}O_6$
allow C6H12O6
*do **not** accept $C^6H^{12}O^6$*

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]

5. (a) No

no mark
if yes max 1 for correct statement

diffusion is down the concentration gradient

accept by diffusion ions would leave the root

1

to enter must go up / against the concentration gradient
or concentration higher in the root
or concentration lower in the soil

1

(b) (i) 0.9 **or** 3.25

for correct answer with or without working

if answer incorrect 1.3 ***or*** *their rate – 0.4 gains 1 mark*

or *130 – 40* ***or*** *90 gains 1 mark*

2

(ii) (uptake) by active transport

1

requires energy

more energy from aerobic respiration

1

or

more energy when oxygen is present

1

[7]

6. (a) (i) increase (and then level off) **and** max / up to at 0.15 (%) (carbon dioxide)

ignore references to oxygen concentration only

ignore mention of 23

1

(ii) CO_2 is limiting at low CO_2 / at first

ignore specific numbers

1

light is limiting at high CO_2 / at end

1

(b) ***mark both parts together***

effect: (oxygen) falls

1

explanation: (oxygen) used for respiration

if no other marks *awarded allow (effect) no change* ***and*** *(explanation) no photosynthesis for* ***1*** *mark*

1

(c) more chlorophyll / chloroplasts

1

allows more photosynthesis / description

for both marks must refer to more at least once

1

[7]

7. any **four** from:

more energy / respiration required

accept it prevents / reduces anaerobic respiration ***or*** *less / no lactic acid*

reference to increase must be made, but only needed once, provided inference is clear for remainder of points.

accept 'delivered more quickly' for 'increase'

increase oxygen uptake into blood (in lungs)

increase oxygen delivery to muscles

increase glucose delivery to muscles

increase removal of heat from muscles **or** increase delivery of heat to skin

increase removal of carbon dioxide from muscles

increase removal of carbon dioxide from blood (in lungs)

[4]

8. (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 <u>more blood</u> (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]

9. (a) LHS – carbon dioxide / CO_2

allow CO2

ignore CO^2

1

RHS

in either order

glucose / carbohydrate / sugar

allow starch

allow $C_6H_{12}O_6$ / C6H12O6

ignore $C^6H^{12}O^6$

1

oxygen

allow O_2 / O2

ignore O^2 / O

1

(b) any **five** from:

- factor 1: CO^2 (concentration)
- effect - as CO_2 increases so does rate and then it levels off or shown in a graph
- explanation:
  (graph increases) because CO_2 is the raw material or <u>used</u> in photosynthesis / converted to organic substance / named eg
  or
  (graph levels off) when another factor limits the rate.
  accept points made via an annotated / labelled graph
- factor 2: temperature
  allow warmth / heat
- effect – as temperature increases, so does the rate and then it decreases or shown in a graph
  allow 'it peaks' for description of both phases
- explanation:
  (rise in temp) increases rate of chemical reactions / more kinetic energy
  allow molecules move faster / more collisions

  or
  (decreases) because the enzyme is denatured.
  context must be clear = high temperature

  allow other factor plus effect plus explanation:
  eg light wavelength / colour / pigments / chlorophyll / pH / minerals / ions / nutrients / size of leaves
  2nd or 3rd mark can be gained from correct description and explanation

5

[8]

10. (a) 7.15 to 7.45 <u>am</u> **and** 7.15 to 7.45 <u>pm</u>
__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]