Mark schemes

(a) an extra line from a LH box negates that mark

(b) any one from:
- not enough oxygen present (for aerobic respiration)
- more energy required for exercise (than can be transferred by aerobic respiration)

   allow named example for exercise

(c) produces carbon dioxide
   produces ethanol

   plus any two from:
   - (carbon dioxide) makes bread rise
   - (carbon dioxide) makes beer / cider / (some) wines fizzy
     allow for alcoholic drinks / named drink
   - (ethanol) is the alcohol in beer / cider / wine / spirits

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(b) 66 (beats per minute)

(b) heart rate increased

(c) 4
(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

(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

(a) \[ 6H_2O \]

in the correct order

\[ C_6H_{12}O_6 \]
(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

(ii) snail respires

releases CO$_2$

(iii) turns yellow

plant can't photosynthesise so CO$_2$ not used up

but the snail (and plant) still respires so CO$_2$ produced

(a) (i) 50

(ii) 4

*accept 3.9 − 4.0*

(b) (i) glucose

oxygen

(ii) to release more energy
(c) correct readings from graph:

\[ a = 120 \]

\[ b = 60 \]

\textit{allow 60 - 61}

calculation correct for candidate’s figures:

e.g. \( a - b = 60 \)

level of fitness correct for candidate’s figures:

e.g. very fit

(d) any \textbf{four} from:

- higher heart rate (at 16 km / h) (so takes longer to slow to normal)
- more energy needed
- not enough \( O_2 \) supplied / more \( O_2 \) needed / reference to \( O_2 \)-debt
- (more) anaerobic respiration
- (more) lactic acid made / to be broken down / to remove / to oxidise
- higher blood flow needed to deliver (the required amount of) oxygen.

\textit{‘more’ must be given at least once for full marks}

\textit{do not allow more energy produced}

\textit{allow higher blood flow to remove lactic acid / remove (additional) \( CO_2 \)}

(a) 5624

\textit{allow 2 marks for:}

\begin{itemize}
  \item correct HR = 148 and correct SV = 38 plus wrong answer / no answer
  \textit{or}
  \item only one value correct and ecf for answer
\end{itemize}

\textit{allow 1 mark for:}

\begin{itemize}
  \item incorrect values and ecf for answer
  \textit{or}
  \item only one value correct
\end{itemize}

(b) (i) \textbf{Person 2} has low(er) stroke volume / SV / described

\textit{eg Person 2 pumps out smaller volume each beat}

\textit{do not allow Person 2 has lower heart rate}

(ii) \textbf{Person 1} sends more blood (to muscles / body / lungs)
(which) supplies (more) oxygen

(and) supplies (more) glucose

(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

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

(a) (i) B or D

(ii) A or B
(b) any four from:

more / faster must be implied at least once for full marks

- increased blood (flow)
  ignore reference to breathing

- (more) oxygen supplied or aerobic respiration
  allow less anaerobic (respiration) or and prevents oxygen debt

- (more) glucose / sugar / food supplied
  ignore feeding

- (higher rate of) respiration

- (more) energy needed / released
  allow made

- (more) carbon dioxide removed

- (muscles) doing (more) work or muscles contracting

- remove heat / cooling

- remove lactic acid or less lactic acid formed

(a) more water vapour
accept more water

more carbon dioxide

less oxygen

(b) (i) glucose
accept carbohydrate(s)
accept sugar(s)

(ii) heat
or thermal
or internal kinetic
(iii) lungs

accept alveoli / alveolus

do not credit air sacs

do not credit capillaries

both neutral if included with lungs

(c) oxygen

accept O₂

lactic

(a) LHS – glucose

RHS – water

allow H₂O / H₂O

(b) so the earthworms’ body temperature would change to 20°C

(c) (i) 56 or 55 or 54

if incorrect answer given accept 60 - 5 for 1 mark

or 60 – 6 for 1 mark

or 60 – 4 for 1 mark

(ii) one-tenth of answer to (c)(i) eg 5.5

(at 10°C / lower temperature):

lower rate of respiration

allow chemical reactions slower or enzymes less active

ignore breathing

do not allow anaerobic

worms less active / worms release less energy / worms use less energy

(d) (i) anomalous result / not in line with other data / does not fit the pattern
(ii) more representative / more reliable / can check ‘repeatability’ / see if get similar values / identify anomalies
   ignore valid / more fair
   ignore reproducible
   ignore ‘to remove’ anomalies
   do not accept more accurate or more precise

(a) anaerobic respiration
   allow phonetic spelling

(b) (i) 4.4
   4.2, 4.3, 4.5 or 4.6 with figures in tolerance (6.7 to 6.9 and 2.3 to 2.5) and correct working gains 2 marks
   4.2, 4.3, 4.5 or 4.6 with no working shown or correct working with one reading out of tolerance gains 1 mark
   correct readings from graph in the ranges of 6.7 to 6.9 and 2.3 to 2.5 but no answer / wrong answer gains 1 mark

(ii) more energy is needed / used / released
   do not allow energy production
   (at 14 km per hour)
   ignore work

   not enough oxygen (can be taken in / can be supplied to muscles)
   allow reference to oxygen debt
   do not allow less / no oxygen

   so more anaerobic respiration (to supply the extra energy) or more glucose changed to lactic acid
   allow not enough aerobic respiration