MARK SCHEME

GCSE

BIOLOGY

AQA - COMBINED SCIENCE

B 4 - TEST 4

BIOENERGETICS

Intermediate

1. (a) glucose ⟶ ethanol + carbon dioxide

allow sugar for glucose

allow correct formulae

ignore attempts at balancing

1

(b) (i) filtration

1

(ii) (fractional) distillation

allow evaporation then condensation

1

[3]

2. (a) (i) 19 800

for correct answer ignore working or lack of working

*165 × 120 but no answer / wrong answer = **1** mark (ignore extras)*

2

(ii) any **two** from:

- for respiration

  ignore oxygen debt

- energy released

  allow energy produced

- prevents anaerobic respiration

- prevents build-up of lactic acid

2

(b) any **two** from:

- increased breathing rate(*)
- increased depth of breathing **or** deep breathing(*)

  *(*)more breathing is max **1** mark*

  ignore increase in heart rate

  allow heavier breathing

  *do **not** allow harder breathing*
- dilation of arteries / vasodilation

  allow blood vessels dilate

  *do **not** allow veins / capillaries dilate*
- blood diverted from elsewhere

  ignore name of organ

2

[6]

3. (a) anaerobic respiration

allow phonetic spelling

1

(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*

2

(ii) more energy is needed / used / released

*do **not** allow energy production*

(at 14 km per hour)

ignore work

1

not enough oxygen (can be taken in / can be supplied to muscles)

allow reference to oxygen debt

*do **not** allow less / no oxygen*

1

so more anaerobic respiration (to supply the extra energy) **or** more glucose changed to lactic acid

allow not enough aerobic respiration

1

[6]

4. (a) person with muscle disease:

allow reverse argument for healthy person

any **three** from:

NB all points are comparative except peak (point 3)

*allow use of **two** approximate figures as a comparison*

- higher resting rate **or** higher at start
- when exercise starts / then increases more / more rapidly

  accept description eg rise …. fall
- peaks (then falls)
- levels off later than healthy person
- higher rate during exercise

  *if no other marks awarded allow **1** mark for 'it's higher'*
- greater range

3

(b) (i) oxygen

accept adrenaline

accept O_2

*do **not** accept O, O2 or O^2*

1

(ii) cannot release sugar / glucose (from glycogen)

or

cannot store glucose / sugar (as glycogen)

1

need to receive glucose / sugar (from elsewhere)

ignore oxygen

1

for energy / respiration / cannot store energy

ignore aerobic / anaerobic

1

[7]

5. (a) (i) 50

1

(ii) 4

accept 3.9 − 4.0

1

(b) (i) glucose

1

oxygen

1

(ii) to release more energy

1

(c) correct readings from graph:

a = 120

b = 60

allow 60 - 61

1

calculation correct for candidate's figures:

e.g. a − b = 60

1

level of fitness correct for candidate's figures:

e.g. very fit

1

(d) any **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.

'more' must be given at least once for full marks

do not allow more energy produced

allow higher blood flow to remove lactic acid / remove (additional) CO_2

4

[12]

6. (a) glucose/sugar water

for 1 mark each

2

(b) (i) 204

for 1 mark

1

(ii) 49 **gains 2 marks**

(incorrect answer, but correct method gains 1)

2

(iii) 3 **gains 2 marks**
(incorrect answer, but correct method gains 1)

2

[7]

7. (a) any **two** from:
- amino acids
- glycerol
- fatty acids

*do **not** accept fat*

allow salt / minerals
allow vitamins

2

(b) 11.79 (g)

*allow 11.8 (g) **or** 12 (g)*

1

(c) **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

- carbon dioxide enters the leaf through stomata
- glucose / sugars produced by photosynthesis (in leaves)
- some detail of photosynthesis
- transport / translocation (of glucose / sugars)
- in phloem
- glucose is converted to starch
- (starch is a) long chain of glucose / sugar molecules
- starch as storage (of glucose / sugars)

[9]

8. (a) $6H_2O$

in the correct order

1

$C_6H_{12}O_6$

1

(b) (i) control

do not accept *'control variable'*

allow:

to show the effect of the organisms

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

[8]

9. (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% CO_2
- (at 20 °C) with CO_2 at 0.1%, raises rate
- (at 20 °C with CO_2 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]