

# MARK SCHEME

# GCSE

## BIOLOGY

## AQA - COMBINED SCIENCE

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B 4 - TEST 2

BIOENERGETICS

Beginner

## Mark schemes

1.

(a) respire

1

oxygen / glucose  
glucose / oxygen

} each once only

2

blood

1

carbon dioxide / heat  
heat / carbon dioxide

} each once only

2

**[6]**

2.

(a) (i) glycogen

1

(ii) respiration

1

(b) (i) 483 kJ

1

(ii) oxygen

1

(iii) dilate

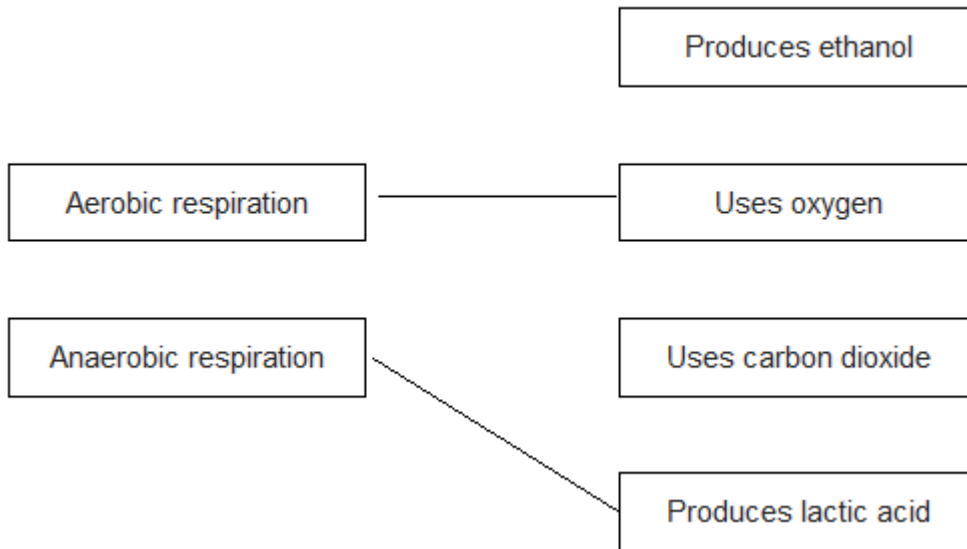
1

(c) supplies more / a lot of oxygen **or** removes more carbon dioxide  
**or** release more energy / faster respiration

1

**[6]**

3. (a)



*an extra line from a LH box negates that mark*

2

(b) any **one** from:

- not enough oxygen present (for aerobic respiration)
- more energy required for exercise (than can be transferred by aerobic respiration)

1

*allow named example for exercise*

(c) produces carbon dioxide

1

produces ethanol

1

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

2

[7]

4. (a) add mineral ions to the soil  
*extra box ticked cancels the mark*

1

(b) increasing the temperature  
*each extra box ticked cancels 1 mark*

1

turning lights on at night

1

[3]

|           |   |   |            |
|-----------|---|---|------------|
| <b>5.</b> | (a) any <b>one</b> from:  |   |            |
|           | <ul style="list-style-type: none"> <li>• (type of / amount of) soil / minerals / nutrients / pH</li> <li>• amount of water / time of watering</li> <li>• space between plants / plants and wall</li> <li>• time for growth</li> </ul> |   |            |
|           | <i>list principle</i>   |   |            |
|           | <i>ignore carbon dioxide / same number of plants / food</i>   |   |            |
|           | <i>do <b>not</b> allow temperature / light / exposure to wind</i>   | 1 |            |
|           | (b) (i) North wall  |   | 1          |
|           | (ii) nugget   |   |            |
|           | <i>list principle</i>   |   | 1          |
|           | (c) has not tested all varieties / nugget / champion against all walls  |   |            |
|           | <i>do <b>not</b> allow repeat experiment</i>  | 1 | <b>[4]</b> |
| <b>6.</b> | (a) photosynthesis  |   | 1          |
|           | (b) oxygen  |   | 1          |
|           | (c) chlorophyll   |   | 1          |
|           | (d) starch  |   | 1          |
|           |   |   | <b>[4]</b> |
| <b>7.</b> | (a) water   |   | 1          |
|           | oxygen  |   |            |
|           | <i>in this order only</i>   |   |            |
|           | <i>accept correct chemical symbols</i>  |   |            |
|           | <i>allow H<sub>2</sub>O / OH<sub>2</sub></i>  | 1 |            |

(b) allow light (in / through) / need light  
*do not accept attracts light*  
*ignore heat / moisture / carbon dioxide*  
*ignore so the plants can be seen*  
*accept the converse, ie the black plastic bag would not let light in*  
(1) 1

for photosynthesis / make sugar / glucose  
*so there would be no photosynthesis (1)*  
*do not allow make food unqualified* 1

(c) Increase (in leaves / new leaves)  
*ignore growth unqualified* 1

(then) level off **or** number of (new) leaves (then) stays the same 1

numerical statement eg max at 3 tablets / 5 (new) leaves  
*should refer to one of the first two marking points*  
*for every extra tablet get 1 extra leaf = 2 marks*  
*for every extra tablet get 1 extra leaf then it levels off = 3 marks* 1

[7]

8.

(a) oxygen  
*allow O<sub>2</sub> / O2*  
*do not accept O<sup>2</sup> or O* 1

(b) (i) light 1

(ii) chlorophyll 1

(iii) decrease 1

(c) any **three** from:

- for respiration / energy  
*do not accept use energy for photosynthesis*
- to make cellulose / starch  
*accept named carbohydrate other than glucose*
- to make lipid / fat / oil  
*accept fatty acid / glycerol*
- to make protein  
*accept named protein / amino acid / named amino acid*
- to build big molecules from small molecules / metabolism  
*if no other marks awarded for making molecules allow 1 mark for growth / repair / new cells*

3

[7]

9.

(a) chlorophyll is needed for photosynthesis

1

light is needed for photosynthesis

1

(b) increases

1

levels off / reaches a maximum / remains constant / stays the same / plateaus

*do not allow stops / stationary / peaks*

*allow stops increasing*

1

goes up to / reaches a maximum / levels off at (a rate of) 200 (arbitrary units)

**or**

levels off at 225 – 240 (light units)

*ignore references to other numerical values*

1

(c) (i) higher light intensity does not increase rate of photosynthesis

*accept the graph stays level (above this value)*

*allow stops increasing*

*allow the rate of photosynthesis stays the same (above this value)*

1

(ii) any **two** from:

- carbon dioxide (concentration)
- temperature / heat
- (amount of) chlorophyll / chloroplasts

*allow water*

*allow ions / nutrients*

*ignore ref to surface area of the leaf*

2

[8]

10.

- (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

[9]

11.

- (a) carbon  
water  
oxygen  
  
light  
  
chlorophyll  
  
starch

*1 mark each*

6

(b) leaf (**or** named part of leaf)  
**or**  
chloroplasts  
*accept anywhere green*  
*do not credit chlorophyll unless qualified*

1

(c) water through the roots  
**or**  
root hairs  
**or**  
by osmosis  
*do not credit where the candidate is unclear about which is which*

1

CO<sub>2</sub> through the leaf  
**or**  
stomata  
**or**  
by diffusion

1

(d) any **one** point:  
increased CO<sub>2</sub> concentration  
increased water supply  
increased temperature (up to a point)  
increased light (intensity)  
*accept altered light quality by less green **or** increasing other colours*  
*accept increased duration of exposure to light*  
*do not credit sun **or** sunshine*  
*accept CO<sub>2</sub> from respiration*

1

[10]