

MARK SCHEME

GCSE

BIOLOGY

AQA - TRIPLE SCIENCE

B 4 - TEST 6

BIOENERGETICS

Advanced

Mark schemes

- 1.** (a) (i) June
for 1 mark 1
- (ii) April
max. light
photosynthesis makes sugars/substances needed for growth
for 1 mark each 3
- (b) 2 of:
temperature
carbon dioxide availability
water
chlorophyll
any 2 for 1 mark each 2
- [6]**
- 2.** (a) glucose is absorbed by diffusion into the bloodstream 1
then blood delivers glucose to muscles in capillaries 1
- (b) to stop air getting in 1
- (c) yellow 1
- (d) collect the CO₂ / gas with a measuring cylinder / gas syringe 1
(volume collected) in a certain time using a timer / watch 1
- (e) yeast produces ethanol but muscles produce lactic acid
marks can be awarded from correct word or balanced symbol equations 1
yeast produces CO₂ but muscles do not
answers must be comparative 1
both release small amounts of energy 1
ignore both occur without oxygen

[9]

- 3.** (a) light is trapped / absorbed / used
extra answers cancel mark
ignore solar / sunshine 1
- by chlorophyll / chloroplasts
if no other marks awarded, allow 1 mark for photosynthesis / equation for photosynthesis 1
- (b) (to make) starch (for storage)
ignore 'for growth' unqualified
ignore respiration 1
- (to make) fat / oil (for storage) 1
- (to make) amino acids / proteins / enzymes 1
- (to make) cellulose / cell walls
allow for active transport
allow any other correct, named organic substances (eg DNA / ATP / chlorophyll / hormone)
*if no named examples, allow 'to make **named** cell structures' for max. 1 mark* 1
- [6]**
- 4.** (a) (before exercise) – 9 to 11 **and** (after exercise) – 12 **or** 13
both correct 1
- (b) 0.75 to 0.90
ignore working or lack of working
 eg. 2.35 – 1.55 **or** $\frac{(2.35 - 1.0) \times 60}{100}$ **or other suitable figures**
for 1 mark 2

(c) any **four** from:

still need to remove extra carbon dioxide

still need to remove heat / to cool

(some) anaerobic respiration (in exercise)

lactic acid made (in exercise)

oxygen needed to break down lactic acid **or** suitable reference to oxygen debt

lactic acid broken down to CO₂ and water **or** lactic acid changed into glucose

4

[7]

5.

(a) (i) reduced sharply
for 1 mark

1

(ii) converted to glucose which is respired to produce energy
(allow answers in terms of glucagon)
gains 3 marks

3

(b) (i) athlete As was most effective
since resulted in highest muscle glycogen level on day of race
for energy release during race
for 1 mark each

3

(ii) e.g. excess carbohydrate stored as glycogen rather than fat in short term
particularly if glycogen stores depleted
for 1 mark each

2

[9]

6.

(a) + light = + photosynthesis
+ light = + photosynthesis to a limit
limit depends on temp/CO₂ levels
+ CO₂ = + photosynthesis
+ temp = + photosynthesis
each for 1 mark

5

(b) need to raise optimum levels
when one other raised
to get max/economic yield
each for 1 mark

2

[7]

7.

(a) (i) oxygen produced

1

(ii) any **one** from:

- average / mean / median
ignore reliable / precise / accurate
- some may be anomalous
allow some may not float

1

(b) (i) *do **not** allow answers in terms of time only*
if candidate answers in terms of comparing rate of change then the rate of change of photosynthesis must be in the correct direction for 1 mark

any **two** from:

- low intensity / below 12.5 / 2.5 - 12.5 (units of light) flat wrack / it, rate of photosynthesis faster **or** saw wrack rate of photosynthesis slower
allow any value in range
- high intensity / above 12.5 / 12.5 - 15 (units of light) flat wrack / it, rate of photosynthesis slower **or** saw wrack rate of photosynthesis faster
allow any value in range
- same (rate) at 12.5 units

2

(ii) any **two** from:

- saw wrack receives less light
accept converse if clear reference to bladder wrack
- less photosynthesis
if first and second responses, 'less' needed only once

or

less carbohydrate / sugar / starch production

- when tide is in **or** at high tide **or** any tide above low tide
accept saw wrack covered by water / submerged longer / more reference to position on shore is insufficient

2

[6]

8.

(a) low in winter / named months / when the days are short
accept increases in spring / Dec – June

1

high in summer / named month(s) / (when days are long
decreases in autumn / June – December

1

reasonable quantitative statement

accept any reasonable calculated / translated quantitative statement

*higher in summer than in winter for 2 marks
comparative statements may be worth 2 marks*

but

8/11 times higher in summer than in winter for 3 marks

1

(b) no artificial light given in summer / light only given in winter

since natural light greatly exceeds minimum / 600 J (required to produce tomatoes)

accept day length if linked to light energy

OR

light only given in winter

as natural light less than the minimum needed (to grow them) or 600 J

OR

for 2 marks:

percentage increase in growth from artificial] light only significant in winter

2

[5]

9.

(i) with exercise rate rises;

accept between 1 – 2 minutes rate rises

1

(when exercise stops) rate falls slowly;

*accept gentle fall **or** steady fall*

for answers which just describe a rise then a fall allow one mark only as an alternative to the first two points

1

rate does not return to normal **or** to starting **or** to resting rate

*accept rate returns to normal after five minutes **or** three minutes of rest **or** after recording ended*

1

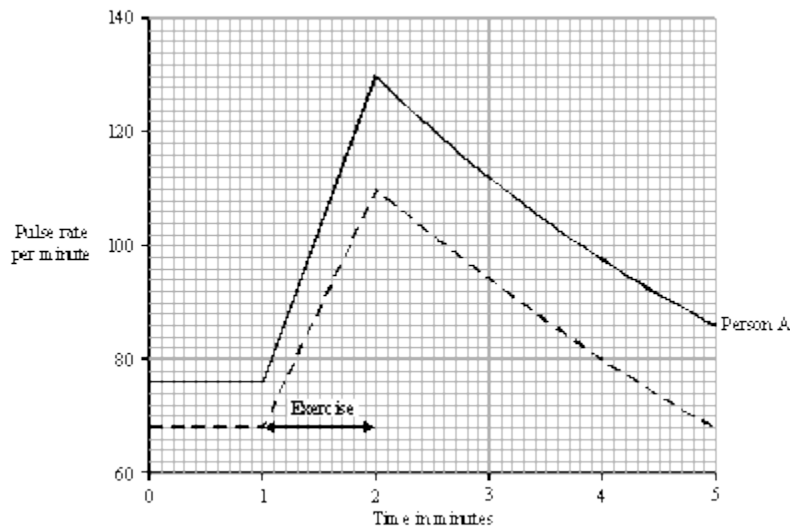
(ii) 86 (per minute);

1

(iii) plotting points;

deduct one mark for each error to max of two

if 68 wrongly plotted count as one error (ignore the quality of the line)



2

[6]

10.

(a) any **three** from:

- rose rapidly (during exercise) / use of approximate figures
- then more slowly (during exercise)
accept rate (of increase) slows down
- to max 126 / at 5 minutes / end of exercise
- rapid fall (during recovery) **or** use of approximate numbers
- then less rapid fall / use of approximate numbers
- returned to resting rate (60 bpm) by 11 minutes

3

(b) arteries dilate / widen

accept muscle in wall relaxes

1

(c)

any **four** from:

- muscles using more energy **or** more energy released
- muscles respire faster
- supply more oxygen
- supply more glucose / sugar
- remove more CO₂
- remove lactic acid
- remove heat / to cool

do **not** accept energy produced

allow for aerobic respiration
or to prevent anaerobic respiration

'more' needed ONCE
only for full marks

4

[8]