

GCSE

BIOLOGY

AQA - COMBINED SCIENCE

MARK SCHEME

B7

ADAPTATIONS & ECOLOGY

TEST 3

Mark schemes

1	(a) community	1
	(b) any one from: <ul style="list-style-type: none">• fish• squid	1
	(c) producer	1
	(d) photosynthesis needs light	1
	(nearer the surface there is) more light <i>allow converse</i> <i>allow explanations in terms of temperature for 2 marks</i>	1
	(e) any one from: <ul style="list-style-type: none">• mates• territory <i>allow space</i>	1
	(f) more predation / eaten	1
	by (toothed) whales <i>allow 2 marks for squid (population) increases so fish (population) decreases so less food for leopard seals</i>	1
		[8]
2	(a) any two from: <ul style="list-style-type: none">• (same) number of scoops / sweeps each time <i>allow any idea of controlling sweeps e.g. for same time</i>• scoop / sweep (at same) distance from the edge of pond <i>allow scoop / sweep at the same place</i>• scoop (at same) depth• (same) size of net• (same) gauge / mesh size of net	2
	(b) 64	1

- (c) 19 to 122
allow 122 to 19
or
 103
 1
- (d) water fleas were not evenly spread (around the edge of the pond)
allow any description of this such as more water fleas near the vegetation
 1
- (e) more water fleas live near the edge of the pond
allow more water fleas live where there is vegetation
allow converse if student's calculated answer to part (b) was less than 12
 1
- (f) 35
 1
- (g) 37.5 (%)
allow 38 (%)
 1
- (h) there was a high(er) level of pollution (in the pond in 2016)
 1
- because there are no / fewer mayfly nymphs
or
 because there are fewer freshwater shrimps
data must be comparative
 1
- allow converse for 2014*
- (i) any **two** from:
 • famine / food insecurity
 • water shortage
 • landfill sites filling up
 • acid rain
 • deforestation / habitat destruction
 • extinction of species
or
 reducing biodiversity
 • natural resources running out
ignore global warming and any water pollution references such as sewage or eutrophication
 2

[12]

3

- (a) by helping people relax in outdoor spaces 1
by reducing the noise pollution 1
- (b) by making new habitats for plants and animals 1
by providing a resting place for migrating birds 1
- (c) 2 640 000
or
 2.64×10^6 1
- (d) $2\,640\,000/24$ or $\frac{2.64 \times 10^6}{24}$ 1

110 000
or 1.1×10^5
an answer of 110 000 or 1.1×10^5 scores 2 marks
allow 1 mark for answer to part (c) divided by 24 1
- (e) the variety of different species of organisms in an ecosystem 1
- (f) any **one** from:
 - plant different types of plants
allow plant wildflowers
 - ask zoo to breed endangered animals for the woodlands
 - reintroduction of plants or animals that no longer live in Manchester
 - protect the woodland habitats
allow sensible way to do this
 - plant hedgerows on the edge of city / in parks
 - not using landfill / recycling waste
 - ban on cutting down trees
 - sensible suggestion to reduce pollution levels1

[9]

4

- (a) any **two** pairs from:
- light (intensity)
• more light means more / faster photosynthesis / glucose
 - temperature
• higher temperature more / faster photosynthesis
 - water
• right amount for transpiration / cell function / photosynthesis
 - soil pH / ions
• needed for healthy growth
- ignore 'growth' unqualified*
ignore carbon dioxide and oxygen

1
1
1
1

(b) hand lens

1

moth guide

1

(c) any **one** from:

- can work gently and not disturb moths
- moths might fly away outside

1

(d) any **one** from:

- damage to eyes (from UV / bright light)
- burns from hot lamp
- diseases / pathogens from wild organisms

1

(e) any **one** from:

- wear sunglasses
or
eye protection
 - wear gloves or allow lamp to cool.
 - wear gloves
or
wash hands after handling moths
- answer must relate to hazard*

1

(f) bristles / hairs make it unpleasant to eat

or

bright colour acts as warning to predators (that it is poisonous)

1

[10]

5

Level 3: Relevant adaptations are identified, given in detail and logically linked to form a clear account.	5-6
Level 2: Relevant adaptations are identified, and there are attempts at logical linking. The resulting account is not fully clear	3-4
Level 1: Adaptations 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
<p>Indicative content</p> <ul style="list-style-type: none"> • a small SA:V ratio • means less thermal energy transferred to surroundings • thick fur <p>or hollow hair shafts</p> <ul style="list-style-type: none"> • traps a layer of air which acts as an insulating layer stopping transfer of thermal energy • a layer of fat or blubber under the skin • acts as an insulating layer <p>or as a food store for respiration when food is in short supply</p> <ul style="list-style-type: none"> • small ears • reduces surface area for thermal energy transfer • white colour • camouflage in the snow so prey do not see them coming and they get more to eat <p>or so predators do not see them and they can escape</p> <ul style="list-style-type: none"> • large feet • to spread weight over snow so they can run faster • hibernate in winter • to conserve energy stores <p>allow 'heat loss' for transfer of thermal energy</p>	

6

[6]

6

(a) wolves

1

(b) moose and wolves are on different scales

1

(c) wolf population has increased so more moose are eaten
do not accept there are more wolves than moose

1

(d) any **two** from:

- (other) predators
allow correct examples
allow 'humans hunting moose'
- (new) pathogens
allow diseases
- competition

2

(e) any **four** from:

- variation (within species) of antler size
allow description relating to antlers
- (caused by) different genes
- as a result of sexual reproduction / process of meiosis / mutation
- (phenotype) most suited to environment most likely to survive and breed
ignore natural selection unqualified
- genes for large antlers (more likely to be) passed on to next generation

4

reference to mate selection

or

fighting

or

gaining territory

or

competition for mates

or

avoiding predation

1

[10]

7

(a)

Factor	Biotic	Abiotic
Diseases	✓	
Herbivores	✓	
Temp		✓
Water		✓

allow 1 mark for 2 or 3 correct

2

- (b) (leaves block light near tree so) more light (as you move outwards)
allow low light intensity under tree
ignore Sun 1
- for photosynthesis
allow less photosynthesis under the tree 1
- (which) produces (more) glucose / proteins (for growth)
ignore growth
ignore food
allow molecules, cell components or other correct substances instead of proteins
if no other mark awarded allow less water / ions / minerals / nutrients under the tree 1
- (c) quadrat
correct spelling only 1
- light meter
allow lux meter
allow light intensity meter
allow light data logger 1
- in this order*
- (d) 1.5(0) (m²)
 allow 15 000 cm² 1
- (e) to keep light (intensity) as similar as possible
allow the light (intensity) might change
ignore references to temperature
ignore weather
ignore Sun 1

- (f) any **one** from:
- repeat (investigation) around the tree
allow repeat in different directions
 - repeat (investigation) for other trees / areas
 - sample every one metre
 - count the number of each species present (rather than percentage cover)
ignore repeats unqualified
ignore repeat at different times / days / seasons
ignore different size quadrat
ignore random sampling
- 1
- (g) daisy
- 1
- (h) as light (intensity) increased so did the percentage / cover of plants
ignore directly proportional
ignore positive correlation unqualified
- 1
- up to 100% / maximum at 175 (arbitrary units)
ignore distance
- 1
- (i) any pair from:
- (lack of) water / rain (1)

because the leaves are stopping the rain
or
because the roots of the tree are absorbing it (1)
allow soil moisture
 - (lack of) minerals / ions (1)
allow magnesium / nitrate / nutrients

because the tree (roots) have absorbed them (1)
 - temperature (1)
allow too cold / cooler

because less thermal energy from the sun is reaching under the tree canopy (1)
allow 'heat' for thermal energy
allow pH / acidity (1)
because (some) fallen leaves are acidic (1)
- 2
- ignore carbon dioxide*
*do **not** accept oxygen*

[15]

8

- (a) **Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.

5–6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3–4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1–2

No relevant content

0

Indicative content

- lay a transect line from the edge of the sea up to the stony beach
- place a quadrat at regular intervals
- on the same side of the transect line each time
- use quadrats that don't float
- count number of each species present (in the quadrat)
or estimate percentage cover of plant / seaweed / algae
- use a key to identify the individual species
- repeat another transect line parallel to the original / 5m further along the shore
- conduct at least three transect lines
- calculate the means for each distance up the shore

to access **level 3** the key ideas of using quadrats with transect lines and counting the number of each species need to be given to produce a valid outcome

- (b) toothed wrack

1

kite / bar is longest **and** deepest / widest / thickest

*do **not** accept if incorrect organism named*

allow kite / bar has the greatest area

1

- (c) any **three** from:

- more stable
- more habitats
- greater range of food sources

ignore more food unqualified

- greater interdependence
- sand / stony beach is (very) dry so plants can't grow there
- fewer temperature fluctuations

3

[11]

9

(a) 2 640 000 (in remaining 24 years)

1

110 000 in each remaining year

or

2.64×10^6 in remaining 24 years

1

1.1×10^5

an answer of 1.1×10^5 scores 3 marks

1

(b) (area of woodland =) 21 600

allow 16 800 + 4 800

or 9 000 + 12 600

or 4 800 + 4 200 + 12 600

1

518 400 (bluebells)

allow their area $\times 4 \times 6$

an answer 518 400 (bluebells) scores 2 marks

1

(c)

Level 3: Relevant points are identified, given in detail and logically linked to form a clear account.	5-6
Level 2: Relevant points are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3-4
Level 1: Relevant 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 reducing pollution <ul style="list-style-type: none">• trees take in carbon dioxide• which will lower atmospheric greenhouse gases and reduce global warming (allow consequences of global warming)• trees act as noise absorbers• which will reduce noise pollution in the city• roots of trees will bind the soil• which will reduce local flooding and soil erosion• leaves on trees will trap PM2.5 / tiny particulates• which will reduce asthma/breathing difficulties of people increasing biodiversity <ul style="list-style-type: none">• new woodlands or new trees in parks / gardens will provide new habitats• for new species of plants and animals• linking woodlands• will allow animals to move into new areas• planting many new species of trees• will provide food and shelter for new species of insects/birds• could extend the scheme• to reintroduce species of plants or animals which no longer live in that area• could protect wildlife in the area• by legislation or community projects	

10

(a) availability of food 1

new diseases 1

(b) (sampling has been used) so not all mice / voles / owls are counted
or
some mice / voles / owls won't have been caught **or** were hidden 1

allow idea of animals (constantly) moving around

(sampling has been used) so some counted more than once
*if no other marks awarded allow we don't know the
sampling method used* 1

(c) line rises and falls 1

rise and fall pattern is below the line for mice and voles (throughout graph) 1

rise and fall pattern is after the corresponding rise and fall for mice and voles (from
first trough onwards) 1

(d) (voles decrease / drop) 1
(because) less mice for the owls to eat

(therefore) owls eat more voles
*allow for 2 marks (decrease) because they are the only /
main source of food for owls* 1

or

(voles increase / rise)

(because) more food is available (1)

(because) mice are not eating it (1)

*no mark for decrease / increase
mark as pairs with correct increase / decrease given*

[9]