GCSE
BIOLOGY
AQA - COMBINED SCIENCE
MARK SCHEME

B7
ADAPTATIONS & ECOLOGY
TEST 3
Mark schemes

(a) community

(b) any one from:
- fish
- squid

(c) producer

(d) photosynthesis needs light

(nearer the surface there is) more light

allow converse
allow explanations in terms of temperature for 2 marks

(e) any one from:
- mates
- territory

allow space

(f) more predation / eaten

by (toothed) whales

allow 2 marks for squid (population) increases so fish (population) decreases so less food for leopard seals

(a) any two from:
- (same) number of scoops / sweeps each time
  allow any idea of controlling sweeps e.g. for same time
- scoop / sweep (at same) distance from the edge of pond
  allow scoop / sweep at the same place
- scoop (at same) depth
- (same) size of net
- (same) gauge / mesh size of net

(b) 64
(c) 19 to 122
   allow 122 to 19
   or
   103

(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

(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

(f) 35

(g) 37.5 (%)
   allow 38 (%)

(h) there was a high(er) level of pollution (in the pond in 2016)
   because there are no / fewer mayfly nymphs
   or
   because there are fewer freshwater shrimps
   data must be comparative
   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
(a) by helping people relax in outdoor spaces

by reducing the noise pollution

(b) by making new habitats for plants and animals

by providing a resting place for migrating birds

(c) 2,640,000

or

2.64 \times 10^6

(d) \frac{2,640,000}{24} or \frac{2.64 \times 10^6}{24}

110,000

or 1.1 \times 10^5

an answer of 110,000 or 1.1 \times 10^5 scores 2 marks

allow 1 mark for answer to part (c) divided by 24

(e) the variety of different species of organisms in an ecosystem

(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 levels
(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

(b) hand lens

moth guide

(c) any one from:
• can work gently and not disturb moths
• moths might fly away outside

(d) any one from:
• damage to eyes (from UV / bright light)
• burns from hot lamp
• diseases / pathogens from wild organisms

(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

(f) bristles / hairs make it unpleasant to eat

  or

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

- a small SA:V ratio
- means less thermal energy transferred to surroundings
- thick fur
- or hollow hair shafts
  - 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
- or as a food store for respiration when food is in short supply
  - 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
- or so predators do not see them and they can escape
  - large feet
  - to spread weight over snow so they can run faster
  - hibernate in winter
  - to conserve energy stores
- allow ‘heat loss’ for transfer of thermal energy

### 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

(a) wolves

(b) moose and wolves are on different scales
(c) wolf population has increased so more moose are eaten

*do not* accept there are more wolves than moose

(d) any **two** from:

- (other) predators
  *allow correct examples*
  *allow ‘humans hunting moose’*
- (new) pathogens
  *allow diseases*
- competition

(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

reference to mate selection
or fighting
or gaining territory
or competition for mates
or avoiding predation

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<table>
<thead>
<tr>
<th>Factor</th>
<th>Biotic</th>
<th>Abiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diseases</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Herbivores</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Temp</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

*allow 1 mark for 2 or 3 correct*
(b) (leaves block light near tree so) more light (as you move outwards)
   
   allow low light intensity under tree
   ignore Sun

   for photosynthesis
   
   allow less photosynthesis under the tree

   (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

(c) quadrat

   correct spelling only

   light meter
   
   allow lux meter
   allow light intensity meter
   allow light data logger

   in this order

(d) 1.5(0) (m²)

   allow 15 000 cm²

(e) to keep light (intensity) as similar as possible

   allow the light (intensity) might change
   ignore references to temperature
   ignore weather
   ignore Sun
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

(g) daisy

(h) as light (intensity) increased so did the percentage / cover of plants
  ignore directly proportional
  ignore positive correlation unqualified

  up to 100% / maximum at 175 (arbitrary units)
  ignore distance

(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)

  ignore carbon dioxide
  do not accept oxygen
(a) **Level 3**: The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.

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

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

**No relevant content**

**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

kite / bar is longest and deepest / widest / thickest

*do not accept if incorrect organism named*

*allow kite / bar has the greatest area*

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

110 000 in each remaining year

or

2.64 \times 10^6 \text{ in remaining 24 years}

1.1 \times 10^5

an answer of 1.1 \times 10^5 scores 3 marks

(b) (area of woodland =) 21 600

allow 16 800 + 4 800

or 9 000 + 12 600

or 4 800 + 4 200 + 12 600

518 400 (bluebells)

allow their area \times 4 \times 6

an answer 518 400 (bluebells) scores 2 marks
**Level 3:** Relevant points are identified, given in detail and logically linked to form a clear account.

**Level 2:** Relevant points are identified, and there are attempts at logically linking. The resulting account is not fully clear.

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

No relevant content

<table>
<thead>
<tr>
<th>Indicative content</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>reducing pollution</strong></td>
<td></td>
</tr>
<tr>
<td>• trees take in carbon dioxide</td>
<td></td>
</tr>
<tr>
<td>• which will lower atmospheric greenhouse gases and reduce global warming (allow consequences of global warming)</td>
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<tr>
<td>• trees act as noise absorbers</td>
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<tr>
<td>• which will reduce noise pollution in the city</td>
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<tr>
<td>• roots of trees will bind the soil</td>
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<tr>
<td>• which will reduce local flooding and soil erosion</td>
<td></td>
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<tr>
<td>• leaves on trees will trap PM2.5 / tiny particulates</td>
<td></td>
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<tr>
<td>• which will reduce asthma/breathing difficulties of people</td>
<td></td>
</tr>
<tr>
<td><strong>increasing biodiversity</strong></td>
<td></td>
</tr>
<tr>
<td>• new woodlands or new trees in parks / gardens will provide new habitats</td>
<td></td>
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<tr>
<td>• for new species of plants and animals</td>
<td></td>
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<tr>
<td>• linking woodlands</td>
<td></td>
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<tr>
<td>• will allow animals to move into new areas</td>
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<tr>
<td>• planting many new species of trees</td>
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<tr>
<td>• will provide food and shelter for new species of insects/birds</td>
<td></td>
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<tr>
<td>• could extend the scheme</td>
<td></td>
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<tr>
<td>• to reintroduce species of plants or animals which no longer live in that area</td>
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<tr>
<td>• could protect wildlife in the area</td>
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<tr>
<td>• by legislation or community projects</td>
<td></td>
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</table>
(a) availability of food

new diseases

(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

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

(c) line rises and falls

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

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

(d) (voles decrease / drop)

(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

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