AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.7.1 ADAPTATIONS, INTERDEPENDENCE AND COMPETITION (PACK 1)

SCORE	PERCENTAGE
/324	%

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Q1.

(a) there is an uneven distribution of dandelions
or
(more) representative / valid
or
avoid bias
or
more accurate / precise mean

ignore accurate / precise unqualified
ignore repeatability / reproducibility / reliability / fair test

1

(b) (correct mean per m^2 =) 6 or 6.0

1

(correct field area =) 55 000 (m^2)

1

mean × area − e.g. 6(.0) × 55 000

allow incorrect calculated values for mean and / or field area

1

330 000

allow correct calculation from previous calculation

1

3.3×10^5

allow calculated value in standard form

1

*an answer of 3.3×10^5 scores **5** marks*
*an answer of 330 000 scores **4** marks*

(c) **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

- placing of quadrat
- large number of quadrats used

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- how randomness achieved − e.g. table of random numbers **or** random number button on calculator **or** along transect
- quadrats placed at coordinates **or** regular intervals along transect
- in each of two areas of different light intensities **or** transect running through areas of different light intensity
- for each quadrat count number of dandelions
- for each quadrat measure light intensity
- compare data from different light intensity

to access **level 3** the key ideas of using a large number of quadrats randomly, or along a transect, and counting the number of dandelions in areas of differing light intensity need to be given to produce a valid outcome

(d) any **two** from:

- temperature

  allow heat

- water

  allow moisture / rain

- (soil) pH

  allow acidity

- minerals / ions

  *allow e.g. magnesium ions **or** nitrate*
  allow salts / nutrients

- winds
- herbivores

  allow trampling
  ignore carbon dioxide
  ignore space
  ignore competition unqualified
  *do **not** accept oxygen*

2

[14]

Q2.

(a)

	statement is true for		
	mitosis only	**meiosis only**	**both mitosis and meiosis**
all cells produced are genetically identical	✓		
in humans, at the end of cell division each cell contains 23 chromosomes		✓	

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involves DNA replication			✓

*3 correct = **2** marks*
*2 correct = **1** mark*
*0 or 1 correct = **0** marks*

2

(b) any **two** from:

ignore references to one parent only

- many offspring produced
- takes less time

allow asexual is faster

- (more) energy efficient
- genetically identical offspring

allow offspring are clones

- successful traits propagated / maintained / passed on (due to offspring being genetically identical)
- no transfer of gametes or seed dispersal

allow no vulnerable embryo stage
allow no need for animals

- not wasteful of flowers / pollen / seeds
- colonisation of local area

must imply local area

2

(c) genetic variation (in offspring)

1

(so) better adapted survive

allow reference to natural selection or survival of the fittest

1

(and) colonise new areas by seed dispersal
or
can escape adverse event in original area (by living in new area)

must imply new area

1

many offspring **so** higher probability some will survive

1

*allow bluebell example described (**max 3** if not bluebell)*

[8]

Q3.

(a)

Classification group	**Name**

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Class	*Mammalia*
Order	*Primates*
Family	*Lemuroidea*
Species	*catta*

*all 4 correct = **2** marks*
*2 or 3 correct = **1** mark*
*0 or 1 correct = **0** marks*

2

(b) Lemur catta

ignore capitalisation / non-capitalisation of initial letters

ignore italics / non-italics
ignore underlining / non-underlining

1

(c) carried by (favourable) currents on masses of vegetation

allow description of currents from Figure 2
ignore swimming

1

(d) isolation of different populations

1

habitat variation between lemur populations

allow examples − biotic (e.g. food / predators) or abiotic (e.g. temperature)

1

genetic variation or mutation (in each population)

1

better adapted survive (reproduce) **and** pass on (favourable) allele(s) to offspring

*allow natural selection **or** survival of the fittest **and** pass on (favourable) allele(s) to offspring*
allow gene(s) / mutation as an alternative to allele(s)

1

(eventually) cannot produce fertile offspring with other populations

allow cannot reproduce 'successfully' with other populations

ignore cannot reproduce unqualified

1

[9]

Q4.

(a) Carl Linnaeus

1

(b) Lithops

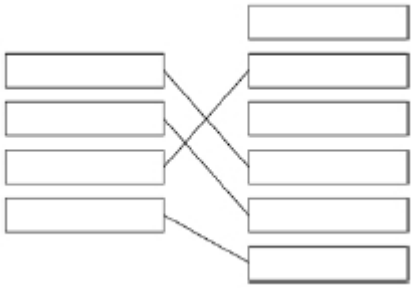
extras cancel

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ignore capitalisation / non-capitalisation

1

(c)



***1** mark per line*

extra line from adaptation negates the mark for that adaptation

1
1
1
1

(d) any **two** from:

- cooler underground / at night
  or
  the jerboa can keep cool
- loses less water
  or
  sweats less
- less likely to be seen (by predators / prey)

2

(e) behavioural

1

[9]

Q5.

(a) correct figures from graph: 5.0 / 5 and 2.60 / 2.6

2.40 / 2.4

*an answer of 2.40 / 2.4 scores **2** marks*

1

*allow correct answer from candidate's figures from graph for **1** mark*

1

(b) $\frac{1}{3}$

1

(c) protein

1

(d) a genetically-modified variety of seed was sown in 2004

1

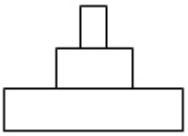
more rain fell in spring and early summer in 2004

1

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the mean summer temperature was lower in 2003

1

(e) 

1

(f) 80

1

(g) chickens use energy for movement and for keeping warm

1

much of the food eaten by chickens is wasted as faeces

1

[11]

Q6.

(a) large number – more representative and so more valid (mean can be calculated)

allow more reliable

1

random – avoid bias

1

(b) correct figures in table:

(3)
(8)
(16)
19
9
4
1

1

(c) all bars plotted correctly

± 1 mm
allow ecf from the table

1

(d) any **three** from:

- much overlap of values between the 2 shores

sheltered shore:

accept converse for exposed shore

- wider range **or** use of figures – e.g. approx 0.26 to 0.70 cf 0.21 to 0.55
- higher mode **or** use of figures – e.g. 0.41 to 0.45 cf 0.36 to 0.40

allow ecf for figures from (b)

- there are no limpets at 0.21 to 0.25

allow there are no limpets on exposed shore at 0.56 to 0.70

3

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(e) sheltered – 0.47 **or** 0.466

1

exposed – 0.35 **or** 0.354

1

(f) radius = 2.48 cm

*an answer of 38.6 / 38.62 / 38.64 scores **3** marks*

1

(area = 3.14 × $(2.48)^2$ =) 19.3 cm^2

allow area calculated from incorrect radius

1

(force = 19.3 × 2 =) 38.6 (newtons)
or
(force = [3.14 × $(2.48)^2$] × 2)
= 38.62 (newtons)
or
(force = [π × $(2.48)^2$] × 2)
= 38.64 (newtons)

allow force calculated from 1 previous error

1

(g) any **two** from:
- foot may not be circular
- foot may be larger / smaller than outside of shell
- scientists' value is approximate
- variation between limpets / described

  *e.g. re muscle development **or** greater 'awareness' of some limpets*
- variation in rock surface texture

2

(h) any **three** from:
- more force of waves to dislodge limpets
- lower height lowers exposure to waves
- wider foot gives greater grip
- those with this / these feature(s) pass on alleles / genes to offspring leading to population of broad squat limpets

  allow converse for sheltered shore throughout, if clearly stated

3

[17]

Q7.

(a) less sweating so less water loss

1

(as) no / little water available in desert

1

(b) (fat store) can be metabolised / respired to water

1

(little urine…) conserve water

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1

(hard mouth) not damaged by spines on plants / on food
or
not damaged by hard / dry food

1

(c) dromedary / *C.dromedarius*
and bactrian / *C. bactrianus*

no mark for the names, but must be identified

because
same genus

ignore 'both are Camelus'

1

(d) any **two** from:

- the fossil record
- oldest fossils in N. America
  or
- newer fossils in S. America / in Asia / in Africa

*allow numbers for ages (45 Mya **and** 3 Mya / 6 Mya)*

- chemical / DNA analysis of living species

allow radioactive dating of fossils

2

(e) isolation of separate camel populations by sea
or
by mountains

1

habitat variation / described between populations

allow examples – biotic (e.g. food / predators) or abiotic

1

genetic variation / mutation in each population

1

45 million years is sufficient time to accumulate enough mutations

1

natural selection
or
better adapted survive to reproduce

1

pass on favourable allele(s)

allow gene(s)

1

[14]

Q8.

(a) snail
or
shrew

additional incorrect answer negates correct answer

1

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(b) shrew

additional incorrect answer negates correct answer

1

(c) fewer shrews to eat them

1

(d) population

1

(e) **C**

1

(f) (11 000 × 0.1 =)
1 100 (kJ)

1

(g) the snails do not eat the roots of the lettuces

1

(h) any **one** from:
- light (intensity)
- temperature
- moisture (levels)
- soil pH
- mineral / ion content (of soil)
- wind intensity / speed

  ignore wind direction
- carbon dioxide (levels)
- oxygen (levels)

1

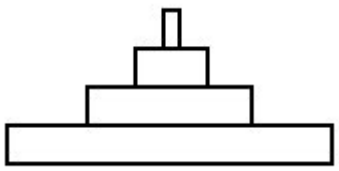
[8]

Q9.

(a) any **two** from:
- *idea of* absorption of light / energy
- transfer to chemical energy

  allow produce sugars / glucose / starch / carbohydrate / food / biomass
- provides food / energy for animals / caterpillar
- releases oxygen

2

(b) 

1

(c) 15(%)

*allow **1** mark for* $\frac{3 \times 100}{20}$ *with no answer or incorrect answer*

or

*allow **1** mark for 0.15*

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2

(d) (i) any **two** from:
- markings look like eyes / face / mouth of much larger animal
- looks fierce / scary / dangerous
  allow it looks like a snake
- to frighten blue tit / bird

max 1 if reference to camouflage

2

(ii) any **two** from:
- sharp / long / big claws
  ignore strong
- sharp / hooked beak
  ignore strong / big
- large wings **or** flies quickly
  allow streamlined / aerodynamic
  ignore powerful wings
- good eyesight

2

[9]

Q10.

(a) 0.67(%)

allow $0.\dot{6}$ or 0.7

*allow **1** mark for evidence of* $(2 \times 10^6) \div (3 \times 10^8)$

or

*allow **1** mark for 0.0067 or 0.6*

2

(b) (i) idea that food chains start with plants / producers

*allow food chains do not start with animals **or** larvae are consumers*

1

idea that these make food (for other organisms in the chain)

*allow idea that plants / producers photosynthesise **or** plants / producers get energy from the sun*

*allow mosquito larvae do not make food / photosynthesise **or** mosquito larvae do not get energy from the sun*

1

(ii) any **four** from:
- reasoned argument for **or** against release
  must refer to at least one advantage and one disadvantage.
  *max **3** marks for either only advantages **or** only disadvantages*

advantages:
- fewer mosquitos biting **or** spreading malaria
- fewer people get / die from malaria
  allow people won't get / die from malaria
- lower medical costs (for those infected **or** for treatment) **or** less healthcare needed

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- better economically for developing / tropical countries.

disadvantages:
- fewer crops reproduce
  allow fewer crops pollinated
- poorer crop yield
- possible starvation (of people)
- high cost of GM production / mosquito release
- less food for bats / birds **or** bats / birds die
  *allow disruption to food chain / ecosystem **or** reduction of biodiversity*
- gene could 'escape' into other wildlife / species
  ignore into plants

4

(iii) any **three** from:
- gene from bacteria cut out
  allow allele for gene
- ref to enzymes (anywhere in process)
  allow at any point in process, ie in cutting or in splicing
- (gene) transferred to chromosome of mosquito
  allow DNA for chromosome
- at an early stage of development
  allow egg / embryo

3

[11]

Q11.

(a) (i) any **two** from:
- not all eaten
  allow eaten by other animals
- used for respiration
  ignore used / lost in heat / movement
- lost as CO_2 / water / urea
- lost as faeces **or** not all digested
  if neither mark awarded allow 1 mark for lost as waste

ignore references to energy losses

do not allow for growth / repair / reproduction

2

(ii) any **one** from:
- thrushes eat other things
- thrush numbers likely to vary (considerably)
  *allow it is only an estimate (of population size) **or** only counted thrushes for 5 hours*
- thrushes were not present all the time
- thrushes feed on a much bigger area

1

(b) (i) any **one** from:
- there are two dependent variables
- there is no independent variable
- to show the association / correlation / pattern (between the two variables)

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1

(ii) (snails in woodlands)
more have dark(er) colour(ed shells) **or** fewer have light-coloured shells
allow converse for grassland, if clear

1

(shells have) no / fewer stripes or have no stripes
allow converse for grassland, if clear

1

(iii) less likely to be seen (by predators / birds / thrushes)
allow camouflaged (from predators / birds / thrushes)
allow light coloured shells with stripes would be more visible (to predators / birds / thrushes in woodland (than grassland)).

1

[7]

Q12.

(a) (i) forest at the edges (of the island) has been removed
allow centrally the forest remains

1

an appropriate area on the island is identified eg south east **or** bottom right

1

(ii) any **two** from:
- (to provide land) for farming / agriculture
- (to provide land) for quarrying
- (to provide land / wood) for building
  allow to provide timber
- to provide fuel
- to produce paper
  allow forest fires

2

(b) any **two** from:
- decreased biodiversity
- loss of habitats
- increased carbon dioxide (concentration)
- global warming
  allow effects of global warming eg flooding / rise in sea level
  allow soil erosion

2

[6]

Q13.

(a) (i) counts / 12

1

× 120 × 80 / × 9600
or
× area of field

1

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(ii) (more) quadrats / repeats

1

placed randomly

ignore method of achieving randomness

1

(b) (i) any **three** from:

- temperature / warmth / heat
- water / rain
- minerals / ions / salts (in soil)

allow nutrients / fertiliser / soil fertility

ignore food

- pH (of soil)
- trampling
- herbivores

ignore predators

- competition (with other species)
- pollution qualified e.g. SO_2 / herbicide
- wind (related to seed dispersal).

ignore space / oxygen / CO_2 / soil unqualified

3

(ii) light needed for photosynthesis

1

for making food / sugar / etc.

1

effect on buttercup distribution eg more plants in sunny areas / fewer plants in shady areas

1

(c) (i) fertiliser / ions / salts cause growth of algae / plants

1

(algae / plants) block light

1

(low light) causes algae / plants to die

1

microorganisms / bacteria feed on / break down / cause decay of organic matter / of dead plants

*do **not** allow germs / viruses*

1

(aerobic) <u>respiration</u> (by microbes) uses O_2

*do **not** allow anaerobic*

1

(ii) sewage / toxic chemicals / correct named example eg metals / bleach / disinfectant / detergent etc

allow suitable named examples eg metals such as Pb / Zn / Cr / oil / SO_2 / acid rain / pesticides / litter

ignore chemicals unqualified

ignore waste unqualified

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ignore human waste / domestic waste / industrial waste unqualified

1

(d) (i) 2

1

(ii) more food

allow other sensible suggestion eg more species colonise from tributary streams after forest

1

(iii) number of stonefly species decreases (from **A** to **B** / **B** to **C** / **A** to **C**) as more pollution enters river / less oxygen

allow fewer species in more polluted water

ignore none are found at site C

1

[19]

Q14.

(a) an extremophile species

1

(b) (i) smaller ice area

allow smaller amount of ice

allow less ice

1

(so) less habitat

allow fewer places to live / nest

1

(ii) **either** increase
as more sea to live in
or
as less competition for food

or decrease
as less space (ice) to lay eggs
or
predators more likely to eat them

there is no mark for increase / decrease alone. The mark is for an appropriate reason linked to increase / decrease

if increase / decrease not ringed the mark may be awarded if it is clear in the explanation which is intended

1

(c) Living organisms show long-term changes.

1

[5]

Q15.

(a) (i) any **one** from:

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ignore references to same lawn / weather / soil, which are not given in the question.

- (same) (type of) weed killer
- (same) volume / 5dm^3 of solution used (on each area)

  allow amount of solution used

  *do **not** allow amount / volume / concentration of weed killer*

  *do **not** allow number of daisy plants*
- effect on daisies (not other weeds / plants)
- (same) area / 10m^2
- (same) time **or** (effect after) two weeks.

1

(ii) more (daisies) growing after use of weed killer **or** after two weeks

allow it does not fit pattern (of other results)

1

(iii) any **one** from:

ignore to see if it / water has an effect

- as a control

  *do **not** allow as a control variable*
- to compare (to the other areas)
- to check other factor(s) are not affecting the results / daisies.

1

(iv) 80 (arbitrary units of weed killer) also killed all the daisies

allow ref to possible experimental design flaws such as 'only tested once' or 'not repeated' or 'different number of daisies in each area at first'

allow idea that other weed species may not respond in the same way as daisies

allow idea that 100 (units) may also kill wanted species / grass

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1−2 marks)
Reference to at least one environmental factor plants respond to
or
at least one response
or
a named hormone

Level 2 (3−4 marks)
Reference to at least one environmental factor plants respond to
and
at least one associated response
or
reference to a named hormone

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and
at least one associated response

Level 3 (5−6 marks)
Reference to at least one environmental factor plants respond to
and
at least one associated response
and
reference to a named hormone

Examples of biology points made in the response:
environmental factors
- light

  allow phototropism
- (direction of the force of) gravity

  allow gravi / geotropism
- moisture / water.

  allow hydrotropism

effects on direction of growth
- shoots grow upwards
- shoots grow towards light
- shoots grow against (the force of) gravity
- roots grow downwards
- roots grow towards moisture
- roots grow towards (the force of) gravity.

  allow reference to 'positive' and 'negative' in terms of tropisms as indicating direction of growth

hormone
- reference to auxin

  allow other named hormone(s)
- unequal distribution of hormone causes unequal growth (rates).

  allow higher concentration of hormone causes faster growth in shoots

  allow higher concentration of hormone causes slower growth in roots

6

[10]

Q16.

(a) gets more light (near surface)

allow warmer (near surface)

allow bladders contain (more) carbon dioxide

1

(so) photosynthesises more

1

(because) bladders aid floating (when tide is in)

or

(so) more biomass / glucose / starch produced

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*ref to 'more' needed only once, eg gets more light for photosynthesis gains **two** marks*

if 'more' not given do not award mark on the first occasion

1

(b) lets angler fish see / attract its prey / mates **or** see predators as it is dark (at 1000m)
or
lets angler fish see / attract prey to get food
or
lets angler fish see / attract mates to reproduce
or
lets angler fish see predators to avoid being eaten

*must be in a correct pair to gain **two** marks*

2

[5]

Q17.

(a) any **three** from:

- blackbirds seen in higher % of / more gardens
- multiplying mean number by percentage of gardens seen in shows blackbird is higher

  *allow **1** additional mark for correct figures showing this, ie 264 sparrows: 305 blackbirds*
- only done on one day / month / hour

  eg only done in January
- only done in gardens (one bird may prefer a different habitat)
- problem of (correct) identification
- may re-count same ones

  if neither point 5 or 6 given allow 1 mark for idea of error / miscounted
- people may quote false numbers / may make it up

3

(b) (i) 60.3

*award **2** marks for correct*

answer, irrespective of working

*award **1** mark for 33.5 + (33.5 × 80 / 100) or equivalent with no answer or incorrect answer **or** award **1** mark for 26.8*

2

(ii) any **two** from:

- change in temperature

  a comparison is required

  eg cooler / warmer / less frost (in 2012)

- fewer predators
- more food **or** less competition for food
- more nesting space **or** less competition for nesting space
- less disease (in 2012)

  allow idea that people may be better / worse at identifying birds / goldfinches

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allow idea of movement to gardens (due to poor food supply elsewhere)

2

[7]

Q18.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1−2 marks)
The apparatus needed to measure the leaf is identified
or
the apparatus needed to measure light intensity is identified
or
an appropriate use of the tape measure is identified.

Level 2 (3−4 marks)
There is a description of a leaf being measured at different locations
or
light being measured at different locations.

Level 3 (5−6 marks)
There is a description of a leaf **and** light being measured at different locations
and
repetitions are included
or
a control variable is described
or
appropriate mathematical treatment of the data is described.

Examples of points made in the response:
- use of tape measure to produce transect
- transect placed coming out of shady area (e.g. woodland) into lighter area
- repeat transects
- samples at same height above ground
- samples at same aspect (N / E / S / W) on trees
- measurement of length, or width, of leaves using ruler
- measure several leaves at each location
- use of light meter to measure light intensity
- repeat measurements of light intensity on several days
- measure light intensities at same time of day
- calculate mean for each location
- plot graph of mean leaf length, or width, vs. light intensity.

allow attempt to overcome other variables − eg soil water / soil pH / temperature

[6]

Q19.

(a) any **three** from:

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- parts of organisms have not decayed
  accept in amber / resin
  allow bones are preserved
- conditions needed for decay are absent
  accept appropriate examples, eg acidic in bogs / lack of oxygen
- parts of the organism are replaced by other materials as they decay
  accept mineralised
- or other preserved traces of organisms, eg footprints, burrows and rootlet traces
  allow imprint or marking of organism

3

(b) (i) teeth for biting (prey)
must give structure + explanation

1

claws to grip (prey)
accept sensible uses

1

wing / tail for flight to find (prey)

1

(ii) any **two** from:

- new predators
- new diseases
- better competitors
- catastrophe eg volcanic eruption, meteor
- changes to environment over geological time
  accept climate change
  allow change in weather
- prey dies out **or** lack of food
  allow hunted to extinction

2

[8]

Q20.

(a) (i) correct bar heights
*three correct **2** marks*
*two correct **1** mark*
*one or none correct **0** marks*
ignore width

2

(ii) (Stream Y)

has many sludge worms / bloodworms

or

has no mayflies / caddis or few shrimp

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*allow **1** mark if invertebrate not named but correct association given*

1

which indicate medium or high pollution

1

(b) (i) suspended solids increase (as a result of sewage overflow)

1

then decrease downstream / return to original levels

1

oxygen levels decrease (after sewage overflow)

1

and then rise again

1

(ii) any **three** from:

- mayflies decrease (to zero) near overflow
  accept 'have died out'
- because oxygen is low **or** mayflies have high oxygen demand
- mayflies repopulate / increase as oxygen increases again
- can't be sure if dissolved oxygen or suspended solids is the cause

3

(c) they respire / respiration

*aerobic respiration gains **2** marks*

1

this requires / uses up the oxygen

1

[13]

Q21.

(a) (i) chloroplast

1

(ii) cell wall

1

(b) (i) osmosis

accept diffusion

1

(ii) cell wall (prevents bursting)

1

(c) (i) carbon dioxide

allow correct formula

1

glucose

allow sugar / starch

1

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(ii) any **two** from:

- light sensitive spot detects light
- tells flagellum to move towards light
- more light = more photosynthesis

2

(d) (cell has) larger SA:volume ratio

1

short (diffusion) distance

allow correct description

1

(diffusion) via cell membrane is sufficient / good enough

or

flow of water maintains concentration gradient

1

[11]

Q22.

(a) (i) 10

1

(ii) any **three** from:

- both increase with distance
- more spp on walls than on trees
- no lichen spp on trees for first 1 km from city
- more steady / less erratic increase on trees than walls (or converse)
- rate of increase increases with distance

3

(b) SO_2 decreases with distance from centre

accept converse

Ignore pollution

1

high SO_2 reduces survival or kills lichen

accept converse

1

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

- (line) transect
- quadrat / reference to specific area
- count number of lichens or coverage on trees
- at regular intervals / set distances

3

(ii) (more) Xanthoria nearest road

allow 'nitrogen-loving' for Xanthoria

1

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(more) Usnea further from the road

allow 'nitrogen-sensitive' for Usnea

1

because most nitrogen oxide from vehicles (near road)

or

because nitrogen oxide levels will be falling / less further away (from road)

accept converse

1

[12]

Q23.

(a) any **one** from:

- get lots of data
  accept more reliable / reproducible
  do not accept more accurate
- cheap / free
- unlikely to be biased
- can cover a wide area at the same time / takes less time
- see seasonal variations

1

(b) (i) correct bar heights

1 *mark for each correct bar*

ignore width of bars

2

(ii) 12 800

(16000 / 100)x80 on its own for ***1*** *mark*

2

(iii) goldfinch

1

(c) any **one** from:

- more food available
  accept fewer predators
- people feed them
  accept less habitat / food in countryside
- more rubbish / waste to eat

1

[7]

Q24.

(a) (i) variation in masses / more representative / more typical / more reliable / average / mean / reference to anomalies

or

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one worm to light to measure change

do not allow more accurate / more precise

ignore fair test / valid / repeatable / reproducible

1

(ii) remove solution / liquid (on outside of worm)

allow 'water'

1

(iii) variable amounts removed from each worm

ignore reference to length of timing

1

(iv) equal sizes of worm / more worms (in each group) / wash off all the sand / repeats / use more accurate balance / use smaller concentration intervals

allow reference to improve blotting technique eg blot before / blot more thoroughly

1

(b) (i) different (starting) masses / sizes / weights (at different concentrations)

1

allows comparisons / shows pattern / shows trend

1

(ii) (+)20

*correct answer = **2** marks, with or without working*

or

$$\frac{7.5}{37.5} \times 100 \quad / \quad \frac{7.5}{37.5} \quad / \quad \left(\frac{45.0}{37.5} - 1\right) \times 100$$

*for **1** mark*

2

(c) (i) graph:

points correct

allow ± 1 mm

*–**1** mark per error*

allow ecf from part b(ii)

2

label on x-axis including units – ie Concentration of salt in arbitrary units

1

line of best fit = smooth curve / ruled straight line

anomaly (4.0, –52) either plotted and ignored re. line

***or** not plotted*

do not allow point to point

allow best fit for ecf from 2bii

1

(ii) on graph:

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ring drawn around point at (4.0, –52)

allow (5.0, –50) if cand. line indicates this

1

(iii) sensible suggestion – eg used wrong solution / used 5.0% instead of 4.0% / different length of time in solutions / ref to error in blotting / balance not zeroed / error in weighing

allow some lugworms died

allow error in calculation

1

(d) (i) 2.9 to 3.0 / correct for candidate's graph ± 0.1

1

value of no change in mass / worms in equilibrium with soln / described

allow small(est) mass change

1

(ii) water loss

1

by osmosis / diffusion

1

from dilute region in the worm to more concentrated solution outside

allow correct description in terms of high to low <u>water</u> concentration / high to low water potential

salt solution is hypertonic

concentration unqualified = salt concentration

1

[19]

Q25.

(a) (i) traps light (energy)

allow uses light / converts light energy to chemical energy

1

for photosynthesis / for making sugar / starch / carbohydrates

ignore food

allow organic molecules

1

(ii) dodder takes sugar / glucose / sucrose from phloem / dodder cannot make its own glucose / carbohydrate

or

phloem has sugar / glucose / sucrose

accept amino acids / fatty acids / other small organic molecule

ignore takes food / minerals / water / nutrients

1

(iii) any **one** from:

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- not enough sugar / nutrients to grow / respire

  accept not enough food to grow / respire
- might strangle / restrict growth by squeezing stem tightly
- may damage stem tissues by growing into it
- may smother leaves / block light **so** less photosynthesis / less growth

1

(b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1 – 2 marks)
Description and explanation of an adaptation which only involves hooks **and / or** suckers.

Level 2 (3 – 4 marks)
Description and explanation of adaptations including hooks **and / or** suckers with any other adaptation **or** explanation.

Level 3 (5 – 6 marks)
Description of most correct adaptations **and** explanations.

Examples of biology points made in the response:

- hooks – for holding on / not being detached
- suckers – for holding on / not being detached
- flattened / large surface area – absorption of (large amounts of) food
- no gut – not needed as host digests food
- thick cuticle – protection from host's enzymes / so not digested
- large number of eggs – increased chance of infecting new host

  allow hermaphrodite and self-fertilising – likely to be just one worm per host

  internal fertilisation – gametes not digested

6

[10]

Q26.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1 – 2 marks)
At least **one** way in which animals **and / or** plants are adapted to survive.

Level 2 (3 – 4 marks)
A description of ways in which animals **and / or** plants are adapted **and** an attempt to link at least **one** adaptation to how it increases the chance of survival.

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Level 3 (5 – 6 marks)
A description of ways in which animals **and** plants are adapted **and** a description of how at least **one** adaptation increases the chance of survival.

examples of biology points made in the response:

(animals)

(A) change / decrease in surface area / example
(decrease in surface area which) reduces area from which sweat / water may be lost

(A) hump with fat / fat stores
(fat in hump) to convert to water (via respiration)

(A) long eyelashes
(long eyelashes) to keep (wind-blown) dust out of eyes

(A) nocturnal / 'keep out of the sun'
reduce sweat loss (in heat of the day)

extra information

allow adaptations of specific animals to living in specified dry conditions, eg a desert

(A) change / increase in surface area / example
(increase in surface area which) increases area heat may be lost from (by radiation)

(A) changes to thickness of insulating coat
(thicker coat on upper surface) increases insulation from sun's heat

(A) thin (layer) / reduced amount of body fat
(reduced amount of body fat which) reduces insulating layer

(A) wide feet
(wide feet) to reduce pressure / spread weight / prevent sinking

(plants)

(A) decrease in surface area

(A) leaves are spikes
(reduced area / leaves are spikes) reduces water loss / transpiration / evaporation

(A) long / wide spread / extensive roots
(long / wide spread /extensive roots) to absorb (more) water

(A) fleshy / thick stem
(fleshy / thick stem) to store water

extra information

allow adaptations of specific plants to living in specified dry conditions, eg a desert

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(A) thick wax

(thick wax) to reduce evaporation / water loss / transpiration

(A) few(er) stomata

(few stomata) to reduce evaporation / water loss / transpiration

[6]

Q27.

(a) microorganisms

allow microbes / bacteria / fungi / decomposers

1

(microorganisms) respire

*do **not** allow dead plants respire*

1

(respiration / decay / microorganisms) releases (thermal) energy / 'heat'

ignore produce 'heat'

*do **not** allow produce energy*

*do **not** allow dead plants release 'heat'*

1

(b) (i) any **three** from:

- (opening) allows oxygen in
- microorganisms / eggs need oxygen

  allow air for oxygen
- oxygen needed for respiration
- (opening) allows release of carbon dioxide (from microorganisms / respiration / eggs)

  allow gaseous exchange (1 mark) of / for microorganisms / eggs (1 mark) if none of first four points given
- (opening) allows energy / 'heat' to escape
- (closing) retains energy / 'heat' if too cool / at night

  *if no mark awarded for either of these points allow 1 mark for vents open in the day to prevent overheating **and** close at night to prevent it getting too cold*
- (closing) retains moisture

  allow (opening) releases moisture

3

(ii) any **one** from:

- maintains sex balance

  e.g. equal / best / correct numbers of male and female
- (survival of species depends on there being) males and females in population

  allow so the offspring are not all the same sex

1

[7]

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Q28.

(a) any **three** from:

- place 30-m tape measure across field / from one wood to the other
- place quadrat(s) next to the tape
- count / record the number / amount of dandelions / plants in the quadrat

  ignore 'record the results'

  ignore measures / estimates dandelions
- repeat every 2 metres

  allow every metre / at regular intervals

3

(b) (i) low light / it is shady

allow no light

ignore sun / rays

or

not enough water / ions / nutrients

accept correct named ion

ignore no water / ions / nutrients

or

wrong pH of soil

accept competition with trees for light / water / ions

ignore competition for space and competition unqualified

accept soil too acidic / too alkaline

ignore temperature

1

(ii) sensible suggestion for a small area, eg chance variation / anomaly / poisoned by animal waste / wrong pH of soil / eaten (by animals) / cut down / footpath

1

(c) repeat (transect) / compare with the results of other groups

allow 'do it in two different locations' for 2 marks

1

at different / random location(s) / elsewhere (across the field)

*do **not** allow 'in other fields'*

1

[7]

Q29.

(a) (i) to get data re position of seaweed / of organism

1

in relation to distance from sea / distance down shore / how long each seaweed was exposed

1

(ii) repeat several times

minimum = 2 repeats

1

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elsewhere along the shore

1

(iii) bladder wrack is further up the shore (than the sea lettuce) / exposed for longer

ignore found in dry areas / on bare rock

1

sea lettuce (only) in rock pools / in the sea / (only) in water

1

(b) gets more light / closer to light

allow better access to CO_2

1

(so) more photosynthesis

allow 1 mark for light for photosynthesis

allow 1 mark for CO_2 for photosynthesis

ignore reference to oxygen for respiration

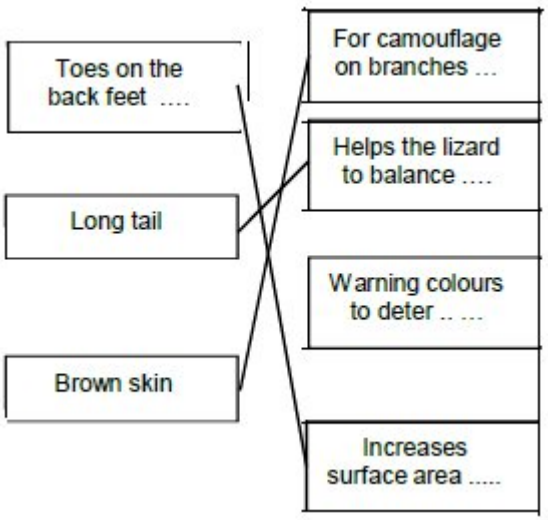
'more' only needed once for 2 marks

1

[8]

Q30.

(a)



one mark for each line

*do **not** award mark for an adaptation if lines are drawn from it to more than one advantage*

3

(b) escape (predators)

accept faster than swimming

allow chase prey

allow it stops them from drowning

1

(c) food

1

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territory

1

*deduct **one** mark for each tick in excess of two*

[6]

Q31.

(a) any correct named physical environmental condition, e.g. light / water / rain / temperature / minerals / nutrients / space (between plants)

ignore carbon dioxide / climate / weather / sun / pollution

1

genes / inheritance

ignore 'variety'

OR

any correct named biotic factor e.g. predation / disease

1

(b) mass of crop also depends on number of pods (per plant) / size / mass of each pea

ignore number of plants

1

(c) microorganisms / bacteria / fungi / decomposers / detritus feeders / named

1

decompose / rot / break down / decay / digest

ignore feed / eat

1

(these organisms) respire

*do **not** allow respiration by pea (plants)*

1

(decay / respiration / microorganisms etc) releases carbon dioxide

*do **not** allow combustion / fossilisation*

1

[7]

Q32.

(a) extremophile(s)

1

(b) (i) common (periwinkle) and flat (periwinkle)

*either order, **both** required*

1

(ii) (common and flat) both live in the same habitat / area / named area

allow habitats overlap the most

1

(iii) any **two** from:

- would have wrong food

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- would otherwise be exposed to (specific) predators
- cannot tolerate extended exposure to air **or** reduced submersion in seawater
  allow cannot tolerate temperature / dehydration
- cannot tolerate high salt concentration (in rock pools)
  allow low salt concentration (in rock pools)
- cannot compete with small periwinkle

2

[5]

Q33.

(a) variation (between organisms within species)
allow described example
*allow mutation – but **not** if caused by change in conditions*

1

those most suited / fittest survive

1

genes / alleles passed on (to offspring / next generation)
allow mutation passed on

1

(b) (i) any **two** from:
allow converse

- increase in latitude reduces number of (living) species
  ignore references to severity of conditions
- increase in latitude reduces time for evolution (of new species)
- the less the time to evolve the fewer the number of (living) species

2

(ii) any **two** from:
*do **not** accept intention or need to evolve*

- (increase in latitude reduces number of (living) species because) less food / habitats / more competition <u>at high latitude</u>
  allow only extremophiles / well-adapted species can survive
- (increase in latitude reduces time for evolution (of new species) because) severe conditions act more quickly / to a greater extent on the weakest
- (the less the time to evolve the fewer the number of (living) species because) species that evolve slowly don't survive

2

[7]

Q34.

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(a) (i) 5.2

*award **2** marks for correct answer, irrespective of working or lack of it*

*award **1** mark for 62.4 ÷ 12 only with incorrect or no answer*

2

(ii) the smaller the (mass of the) bird the more energy is needed (per gram of body mass)

allow converse

ignore figures

1

(iii) smaller bird has larger surface area : volume / mass ratio

allow converse

1

so heat / energy lost more quickly

allow lose more heat / energy

*if (a)(ii) describes a trend of more energy with increasing body mass allow **one** mark for idea of more energy needed for flight*

1

(b) larger birds spend less time feeding

accept converse

allow the less energy they need per day the longer they spend feeding

1

since they need less food per gram of body mass (to satisfy energy needs)

1

[7]

Q35.

(a) use of quadrat / point frame

allow description

1

randomly placed / random sampling

ignore reference to transects

1

(b) (i) 6

1

(ii) more light in A / in field / where sunny

ignore sun

1

more / better / faster photosynthesis in A / with more light

allow converse

1

(iii) use light meter / measure light intensity in both habitats

1

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take many measurements at same time of the day

1

or

laboratory / field investigation with 2 batches high light and low light (1)

count or number of flowers in each (1)

counting point is dependent on investigation point

(c) more glucose / energy available

allow other named product eg protein

allow if more energy produced

1

for growth

dependent on 1st mark

1

[9]

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