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
- 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		✓	

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	**Name**

group	
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

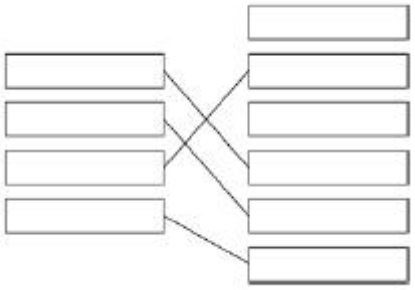
1

(b) Lithops

extras cancel

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

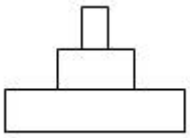
1

more rain fell in spring and early summer in 2004

1

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

(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

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

(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

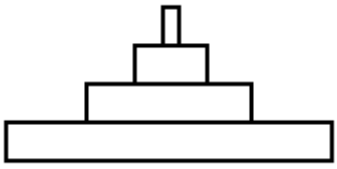
[8]

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*

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
- 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)

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

(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) respiration (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

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:

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
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

*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

  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:

- 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

*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

(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

(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

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

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

*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:

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:

- 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.

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

(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]

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

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

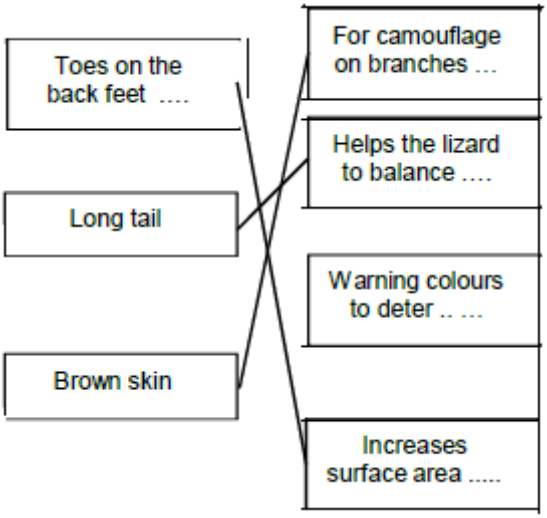
'more' only needed once for 2 marks

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

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
- 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.

(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

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]

Q1.

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

ignore oxygen / food / sun / carbon dioxide

- light
- water
- space
- nutrients / ions / minerals / named

*accept two named minerals / ions for **2** marks*

2

(ii) less competition for water

ignore space / light / food

or

more water / nutrients / minerals available

1

(b) camouflage / same shape as leaf / looks like a leaf

allow 'blends in'

ignore colour

1

[4]

Q2.

(a) **1** mark for each adaptation and **1** mark for its correct linked advantage

- long / thick hair / fur (1) for insulation (1)

  allow keeps warm
- small ears (1) for reduced heat loss (1)
- small feet (1) for reduced heat loss (1)

  ignore wide feet

  ignore prevent sinking
- white fur / coat (1) for camouflage / poor emitter (1)
- small SA/V ratio (1) reduces heat loss (1)
- thick layer of fat (1) insulates / keeps warm (1)

Max 4

(b) **1** mark for an adaptation and **1** mark for its correct linked advantage

- horns (1) for defence (1)
- long legs (1) for speed / escape / vision (1)

- light colour (1) for camouflage (1)
  allow pattern
- eyes on side of head (1) for wider field of vision (1)
- hooves (1) for speed / escape (1)
- large ears (1) to hear predators better (1)

Max 2

[6]

Q3.

(a) wing pattern similar to *Amauris*
allow looks similar to Amauris

1

birds assume it will have an unpleasant taste

1

(b) mutation / variation produced wing pattern similar to *Amauris*
*do **not** accept breeds with Amauris*
*do **not** accept idea of intentional adaptation*

1

these butterflies not eaten (by birds)

1

these butterflies breed **or** their genes are passed to the next generation

1

[5]

Q4.

(a) guard cell
ignore stoma / stomata

1

(b) Species A :
allow converse points for species B

stomata open in dark / at night **or** close in light / in day

1

stomata closed during warm(est) period **or** open when cool(er)

1

heat (energy) /warmth increases evaporation / transpiration
must give explicit link between heat and transpiration

1

reduces water loss / evaporation / transpiration
ignore photosynthesis

1

[5]

Q5.

(a) any **two** from:

- fewer trees to take in carbon dioxide for photosynthesis
- decomposers / microorganisms respire (as they decay debris) releasing carbon dioxide
- burning of wood releases carbon dioxide

allow carbon dioxide released by burning fossil fuels in vehicles / factories

2

(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)
There is a brief description of some steps in the process but the order is not clear with little biological vocabulary used.

Level 2 (3 − 4 marks)
There is a reasonably clear description of the process involving many of the steps and using some biological vocabulary.

Level 3 (5 − 6 marks)
There is a clear, logical and detailed scientific description of the process using appropriate biological vocabulary.

examples of biology points made in the response:

- this contains mineral ions (and organic matter)
- this increases growth of algae / water plants
- the plants / algae (underneath) die
- due to lack of light / photosynthesis / space
- decomposers / microorganisms feed on decaying matter **or** multiply rapidly
- the respiration of decomposers uses up all the oxygen
- so invertebrates die due to lack of oxygen
- this is called eutrophication

6

[8]

Q6.

(a) any **three** from:

- streamlined shape enables it to swim quickly (to catch fish)
- wings (provide power) to move quickly (to catch fish)

allow 'flippers'

- wings used for steering
- white underside / dark top acts as camouflage (so prey less likely to see it)
- long / sharp beak to catch fish

3

(b) any **three** from:

- reduces (total) surface area of penguins exposed to wind / cold atmosphere
- reduced number of penguins exposed (to wind / cold)

  accept reference to movement in or out of the huddle

  accept outer ones insulate / act as barrier
- reducing heat loss

  allow reduced cooling
- 'share' body warmth / heat

3

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

- size of tubes
- volume of (hot) water

  accept amount of (hot) water
- left for same length of time

  allow measured at same time intervals
- starting temperature

2

(ii) any **two** from:

- tube alone (**C**) lost heat most (rapidly)
- tube **B** intermediate
- tube **A** least (rapidly)

allow correct use of figures for all 3 tubes

ignore just quoting final temperature

2

(iii) confirms suggestion

no mark awarded
*accept correct answers referring to other suggestions in **(b)***

since (both outer and inner) tubes in bundle lost heat less rapidly (than 'stand − alone' tube)

comparison needed

1

penguins in a huddle lose less heat (than single ones)

accept 'it is the same for penguins'

1

(d) **if the core body temperature is too high**

blood vessels supplying the skin (capillaries) dilate / widen

*accept reference to arteries / arterioles but **not** veins / capillaries*

*do **not** accept references to movement of blood vessels*

ignore enlarge / expand

reference to skin / surface required only once

1

so that more blood flows through the (capillaries) in skin / near surface

*reference to 'more' needed at least once to gain **2** marks*

1

and more heat is lost

*reference to 'more' needed at least once to gain **2** marks*

1

if the core body temperature is too low

blood vessels <u>supplying the skin</u> (capillaries) constrict / narrow

allow full marks if 'too low' given first

*if no other marks awarded, allow vasodilation when too warm **and** vasoconstriction when too cold for **1** mark*

1

(e) (i) wings move to provide movement for diving

allow muscles contract / work

1

energy (for movement) comes from respiration

*do **not** allow produces / makes / creates energy*
allow energy comes from / is supplied by / is released by respiration

1

respiration / muscle contraction also releases heat

allow produces heat

1

(ii) any **three** from:

- feet not / less used **or** no muscle contraction in feet
  allow little energy / heat released through respiration in feet
  *do **not** allow veins / capillaries*
- vessels supplying feet constrict / less blood to feet
- so temperature in feet cools / decreases
- more heat loss from large surface area or rapid flow of cold water over foot

3

[22]

Q7.

(a) estimate / count number of squares covered

*do **not** allow number of squares containing algae*

1

divide by total number of squares and multiply by 100 / multiply by 4

1

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

- more / most in North east facing

- followed by the North facing
- the South facing had no green alga / least

2

(ii) 40 (%)

1

two directions had this value (rest of directions had only one)

accept this is the most common percentage / value

2nd mark only if 40(%)

1

(iii) any **three** from:

- light / sunlight
  ignore Sun / carbon dioxide
- temperature
  *do **not** accept oxygen*
- availability of water / humidity
- availability of nutrients
- wind
- pollution qualified eg SO_2, acid rain, soot
- grazing by animals eg slugs
- competition with other species
- pH

3

(iv) eg (*for light*)

allow overlap between factors

light intensity *least* on north / north east facing parts of tree (1)

1

green algae adapted for photosynthesis in low light intensities (1)

allow, since less light from Sun, cooler so less evaporation

1

negative effect of high light intensity on green algal chlorophyll / photosynthetic pigments (1)

allow green algae unable to withstand desiccation

1

or (*for temperature*)

temperature highest on south (and west) facing parts of tree

(causing) more water to evaporate from this side of tree

green algae unable to withstand desiccation

or (*for moisture / rainfall*)

rainfall highest on north / north east facing parts of tree (1)

(giving) more moisture on this part of tree (1)

green algae less likely to desiccate (1)

or (*for wind*)

wind speed / duration greatest on south (and west) facing parts of tree (1)

(causing) more water to evaporate from this side of tree (1)

allow wind carries pollutants

allow pollutants toxic to algae

green algae unable to withstand desiccation (1)

or (*from pollution*)

from south / south west (1)

wind carries pollutants (1)

pollutants toxic to / kill algae (1)

(c) (i) as the concentration of ammonia increases so does the % abundance of nitrophyte lichens

allow positive correlation / proportional

allow directly proportional

1

scattered results / wide spread

allow use of approximate numbers to demonstrate scattering

or

for any value of one parameter there is a wide range of the other

allow not a strong relationship / correlation

1

(ii) not very useful / unreliable

accept only gives a rough idea / only a general indication

1

for any value of one parameter there is a wide range of the other

allow correlation rather than direct relationship

or

scattered results

1

[16]

Q8.

(a) looks like a leaf

1

so predator less likely to / won't <u>see it</u>

allow 'camouflage' as alternative to either point

1

(b) (i) thorns (of acacia tree) hurt (predators)

allow idea that fewer animals / predators live in trees ***or*** *ground living animals can't reach them (in the trees)*

1

(ii) (giraffe) avoids being bitten by ants

allow ants are poisonous / have unpleasant taste

1

(c) looks like / mimics a wasp **or** has warning colouration

1

so predators think it has a sting

1

[6]

Q9.

(a) sulfur dioxide

1

(b) (i) mutation

1

(ii) pale form now (more) easily seen (by predators) **or** dark form now less easily seen (by predators)

accept ref to camouflage

1

so pale form (more) likely to be eaten **or** dark form less likely to be eaten

1

so dark form (more likely to) breed / pass on genes

or

pale form less likely to breed / pass on genes

1

(c) (i) pyramid of three layers of diminishing size

either way up

1

three labels in food chain order

award 2 marks only if the pyramid is correctly labelled

accept trees / birch

accept (peppered) moth(s) / larvae

1

(ii) some material is lost in waste from the birds

1

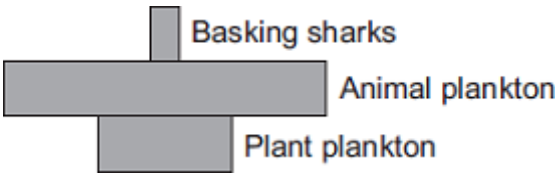
peppered moth larvae do not eat all the leaves from the trees

1

[9]

Q10.

(a)



if more than one box is ticked award no mark

1

(b) increasing / higher light / temperature

ignore references to months other than February – April

*do **not** accept mineral / ions increase*

1

more / increased photosynthesis

*for both marks there must be a reference to 'more' at least once (e.g. 'more light for photosynthesis' gains **2** marks)*

*allow **1** mark for reference to light **and** photosynthesis without an idea of 'more'*

1

(c) increase due to increase in plant plankton / food

ignore references to months other than April – July

1

decrease due to fall in plant plankton / food **or** decrease as eaten by (basking) sharks

allow decrease as eaten by predators / animals / fish

1

(d) fall due to use / intake by <u>plant</u> (plankton)

ignore ref to no change section of graph

for fall allow March / April

ignore May / February

1

increase due to decay / decomposition / breakdown

for increase allow any month in range August to November

ignore December

1

of dead (plant / animal) plankton

allow of dead organisms / waste

1

[8]

Q11.

(a) C

1

(b) B

1

(c) E

1

(d) D

1

(e) F

1

[5]

Q12.

(a) Scotland

1

any **one** from

- Scotland 15 to 20% / about 1/5th to 1/7th but England and Wales / the others are less / lower / reasonable estimated figures
- $\frac{13.4}{79}$ is greater than England / $\frac{11.4}{130}$ and Wales / $\frac{2.8}{21}$

1

(b) (i) broadleaf woodlands have more grey squirrels **or** broadleaf woodlands have less red squirrels

allow converse referring to conifers

1

(ii) Wales has more conifers and / but more grey squirrels
or
Wales has less broadleaf and / but more grey squirrels

allow converse for red squirrels

1

(c) any **three** from:

answers must be comparative they = grey squirrels

grey squirrels

allow converse arguments for red squirrels

- have wider range/ more types of food
- are resistant to parapox (virus) but reds are not

ignore reference to other disease

- have more young each year / litter
- young more likely to survive (in mixed populations)

3

[7]

Q13.

(a) brown (colour)

1

(b) (long) ears

1

(c) (long) horns

1

(d) (white) ring

1

[4]

Q14.

(a) (soft) body parts / other parts / named parts

accept flesh

1

decayed / decomposed / rotted / eaten

or

bones do not decay / decompose / rot / get eaten

ignore disintegrated / dissolved

ignore microorganisms

1

(b) any **one** aquatic feature from: eg

- streamlined body shape
- long tail
- eyes on top of head
- scales
- fins / paddles / flippers / webbed feet

ignore gills

1

any **one** terrestrial feature from:

- (front) legs / limbs / hands
- could lift front end upwards

ignore feet

*accept for **2** marks eg fin / flipper can be used for walking **or** fins like legs*

1

[4]

Q15.

(a) (reduced) competition

ignore fighting

1

for any **one** from:

- light

  ignore Sun

- water
- nutrients / ions / salts / minerals

  ignore food

- space

  allow less overcrowding

- colonise new areas

1

(b) hooks

allow spines

1

attach to animals / human clothing / animals carry fruits long distances

ignore wind dispersal

1

[4]

Q16.

any **three** from:

ignore references to carbon cycle

accept digested / decomposed / broken down / rotted for decay throughout

ignore eating

- dead leaves / flowers / bluebells are decayed
- idea that microorganisms do the decaying

  accept microbes / bacteria / fungi / mould / decomposers for microorganisms

- minerals / ions / nutrients / named released (by decay / microorganisms)

  ***not** mineral ions unqualified*

- (released) into soil **or** minerals / ions / nutrients taken up / in by (bluebell) roots (next year)

  look for idea that minerals / ions / nutrients are in soil (eg released into soil or taken up from soil)

3

[3]

Q17.

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 apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1-2 marks)
There is at least one example of an adaptation of either an animal **or** a plant. However it may not be clear how the adaptation helps the organism to avoid being eaten.

Level 2 (3-4 marks)
There is a description of an adaptation of at least one animal **and** at least one plant. It is clear how at least one of these adaptations helps the organism to avoid being eaten.

Level 3 (5-6 marks)
There are clear and detailed descriptions of a range of adaptations of named animals **and** named plants. It is clear how most of these adaptations help the organisms to avoid being eaten.

examples of clear and detailed biology points made in response:

- **camouflage** – the method of camouflage should be described plus a statement that the predator is less likely to see the prey
- **mimicry / warning colouration** – the method should be described plus a statement that the predator is likely to confuse the prey with e.g. a poisonous organism
- **thorns / prickles / spines / horns** – a statement that these are sharp and are likely to hurt a predator
- **long limbs / streamlining** – a statement that these increase speed and make it more likely that prey will outrun predator
- **bad taste / poison** – a statement that predator will find this unpleasant and 'spit out' prey / not attack same prey again
- **large ears / position of eyes** – a statement that predators will be detected earlier so the prey can escape sooner

[6]

Q18.

(a) *answer to be marked as a whole*

has thorns / prickles / points
accept sharp points

1

(these) hurt animal
allow frighten animal

only *accept prevent animal eating leaves if qualified by 'hurting' or 'frightening'*

1

(b) *answer to be marked as a whole*

camouflaged / looks like twig / disguised

allow blends in

ignore too small to see

1

(animal) cannot **see / detect** / recognise it

allow animal does not eat twigs

only *accept prevents animal eating it if qualified by 'seeing' or 'wrong food'*

1

(c) *answer to be marked as a whole*

red / colour

1

warns that insect might be poisonous / dangerous

allow inedible / tastes bad

1

[6]

Q19.

there are no / few predators of the lionfish
or spines protect lionfish from predation

allow warning colouration / poisonous

or no / fewer disease organisms

1

predators / prey in Atlantic do not recognise lionfish
or not fished by humans

allow high reproduction

1

also there is abundant food in Atlantic
or there is no / less competition in Atlantic

ignore adaptation to new environment

1

[3]

Q20.

(a) large area

allow thin / large / big / flat / light

allow adaptations that cannot be seen eg internal air spaces

1

(b) (shape means that) snow falls off

1

(c) protect / stop it being eaten

1

(d) stores/ absorbs water (from other parts of the plant)

ignore absorbs water from soil / air

ignore nutrients

1

[4]

Q21.

(a) any **two** from:

ignore size of dish

- colour of dish **or** all dishes black
- (same) amount of each seed
- position of dishes **or** all dishes in same place / garden

ignore wood

- time observed / visited / left

2

(b) sunflower

1

(c) (i) (No)

named seed does not fit pattern

or

millet / safflower / corn eaten a lot but have little fat

or

the seed with the highest percentage eaten has least fat

accept converse

1

(ii) *allow separate references to sunflower and niger*

table 1 mark

- highest number of visitors **or** large range of visitors

allow most popular

1

table 2 mark

- high percentage eaten

or

contain high fat for energy / insulation
allow most eaten

1

[6]

Q22.

(a) (i) increased water uptake
ignore nutrients / food
allow quicker water uptake
allow collects water over larger area

1

(after) rain
accept ideas in terms of more successful competitor

1

(ii) water storage **or** stability **or** safety from predators
ignore absorption of water from soil

1

(b) reduces water loss / evaporation
accept reduces transpiration
allow stops water loss

1

wax protects plant **or** reflects heat **or** keeps plant cool **or** unpalatable
ignore reflects light

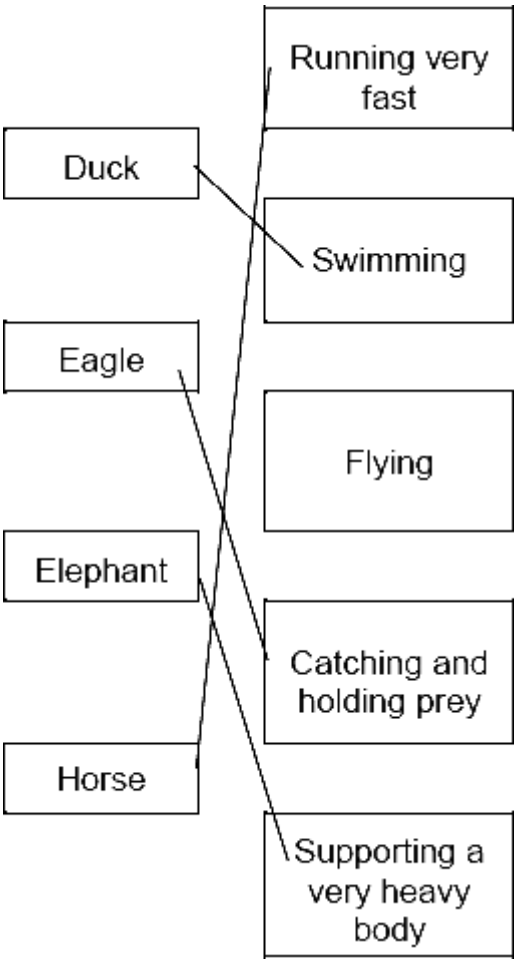
1

folding reduces surface area **or** folding reduces warming
*accept enclosed stomata **or** less exposure of stomata **or** increased humidity **or** less water concentration gradient*
allow prevents burning
ignore less likely to be damaged

1

[6]

Q23.



*all four correct = **4** marks*
*three correct = **3** marks*
*two correct = **2** marks*
*one correct = **1** mark*
extra line from a statement cancels the mark

[4]

Q24.

(a) any **two** from:

- food / feeding
  ignore water
- mates / mating
- territory / space / land / shelter / nesting sites
  ignore homes / place to live / habitat / resources
- status (within group)

2

(b) (i) rises to 1480 to 1500
or rises by 880 to 900
or rises until 1993
ignore incorrect figures if 1993 given

1

falls to 400 to 440 **or** falls by 1040 to 1100

*if neither mark gained then allow **1** mark for rise followed by fall **or** fell by 160 to 200*

1

(ii) rises because: -
less competition from mule deer
or mule deer population falling
or fewer mule deer

ignore reference to food / breeding

ignore reference to predation / disease

1

falls because: -
more competition from mule deer
or mule deer population rising
or more mule deer

ignore more / less suited to environment

*if neither mark gained then correct reference to competition gains **1** mark*

1

[6]

Q25.

(a) camouflage / less visible

ignore insulation

1

(b) insulates / keeps warm

allow keeps out cold

ignore camouflage

1

(c) prey can't hear it / help catch prey /
cannot hear it so isn't scared away

ignore predation on owl

1

(d) catching / eating / killing prey /
perching / defence

1

[4]

Q26.

(a) any **two** from:

- shorter distance between samples

  ignore repeat investigation /measurements

- sample to greater height

- specify the size of each site
  ignore longer transect

1

(b) (i) Parmelia

1

(ii) Evernia

1

(c) any **two** from:

- Lecanora does not extend over whole range of transect / does not grow everywhere /does not grow in town centre / does not grow in countryside
- Lecanora grows in a range of sulfur dioxide concentrations ***or*** Lecanora only grows in limited range of sulfur dioxide concentrations **or** Lecanora lives over large range of sulfur dioxide concentrations
- other factors eg different pollutant might also influence growth of Lecanora
- sulfur dioxide / pollutant concentration was not measured
  ignore Lecanora does not give accurate measure of sulfur dioxide concentration
- amount of Lecanora not measured

2

[5]

Q27.

1 mark for each adaptation and **1** mark for its correct **linked** advantage

fur / long hair / thick coat (1)

for insulation / reduces heat loss (1)
allow keeps warm for insulation point

large body / large mass / small (1) SA:V ratio
ignore layer of fat

retains heat / loses less heat (1)
ignore keeps warm

short legs (1)
reject short (height) / small (height)

reduces surface area / heat loss (1)
ignore keeps warm for this point

small ears (1)

reduces surface area / heat loss (1)
ignore keeps warm for this point

horns (1)

defence (1)

large shoulders (1)

to move through snow (1)

[4]

Q28.

(a) digging /getting to insects

1

(b) catching insects / food / insects
stick to the tongue

1

(c) hear insects / predators

1

(d) stop soil / dust / insects getting in

1

[4]

Q29.

(a) (i) quadrat / grid
allow suitable description in a(i) or a(ii)
allow quadrant

1

(ii) any **two** from:

- use a transect / description
  allow measure distance of the test or sample site from road
- sample every metre
  ignore random placing of quadrat
- count plants (in quadrat)

2

(iii) the nearer to the road, the more (plantain) plants
accept the more dead nettles the less plantains

1

(b) (i) any **two** factors from: eg

- grow better / survive away from road
- sensitive to pollutant / named pollutant / dust / fumes
  ignore carbon dioxide as pollutant
- (roadside) weedkillers

- trampling /damage / turbulence
- grass cutting
- competition
- aspect eg hillier

or

give **one** mark for a factor and **one** mark for its effect eg

dust (from road) (1)

reduces photosynthesis (1)

or

'loses' in competition (1)

for light / water / nutrients / minerals / ions / space / soil (1)

ignore food for plants

2

(ii) any **two** factors eg

ignore distribution

- can withstand pollution

allow grows better in polluted air

ignore 'prefer' pollution

- competition
- aspect eg flat

or

give **one** mark for a factor and

one mark for its effect eg

use carbon dioxide (from traffic) (1)

enhances photosynthesis (1)

or

'wins' in competition (1)

ignore food for plants

for light / water / nutrients / minerals / ions / space (1)

2

[8]

Q30.

(a) any **two** from:

- streamlined / smooth
  allow description eg long and thin ignore slimy / oily skin unless qualified
- flippers
  *allow fins **or** webbed feet*
- flattened / long / large / powerful tail
  tail must be qualified to gain credit

2

(b) **1** mark for each adaptation and **1** mark for its correct linked advantage

correct advantage mark can be awarded if adaptation is attempted but not awarded the mark

eg

fat / blubber (1)
ignore skin / fur

insulates (1)
allow keeps warm

or

large mass to area ratio **or** small area to mass ratio (1)
ignore large body unqualified
allow volume for mass

heat loss reduced (1)
ignore keeps warm

2

[4]

Q31.

(a) protection / defence
*ignore insulation **or** rolls into a ball*
ignore camouflage

1

from predators / from being attacked / from being eaten

1

(b) looks like snake / looks scary

1

deters predators **or** has large eyes to spot predator **or** camouflage **or** warning colouration from predator or prey

*allow **two** separate adaptations for **2** marks*

1

(c) (i) natural selection

1

(ii) Darwin

1

(iii) simple life forms

1

(d) believe that God created all organisms **or** humans there from the beginning

1

[8]

Q32.

(a) variation / mutation

1

individuals with characteristics most suited to environment survive

allow survival of the fittest

1

genes passed to next generation **or** these individuals reproduce

1

(b) any **two** from:

- similar in size to Emperor penguin **or** bigger than all penguins
- large size is adaptation to cold climate
- since less heat loss per unit of body volume **or** smaller surface area / volume ratio

2

[5]

Q33.

(a) killed by poachers / killed for tusks

1

less trees / leaves to eat

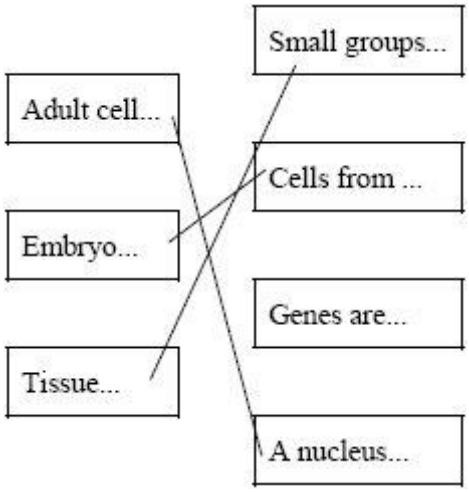
ignore feed on lots of leaves

1

land available disappearing

1

(b)



*all three correct = **3** marks*
*two correct = **2** marks*
*one correct = **1** mark*
extra line from a statement cancels the mark

max 3

[6]

Q34.

(a) streamlined / aerodynamic / swept-back / arrow-shaped / dart-shaped wings / tail

allow pointed / curved wings
ignore pointed tail / beak

OR

large / long wings

ignore large tail

1

(b) no / fewer insects / food (in winter)

*allow **too** cold*
ignore not adapted to cold
ignore day length

1

(c) (i) any **two** from

- feed / hunt at different heights **or** swifts feed higher up
- feed / hunt at different times **or** swifts feed at night
- arrive / depart at different times

2

(ii) nesting sites / territory / habitat

allow homes / space

ignore food unqualified

allow well qualified food answers
eg insects / food near the ground

or

insects / food when it's light

or

insects / food between early May and early August

1

[5]

Q35.

(a) long hind legs / muscular hind legs / bent hind legs

accept powerful hind legs

accept back legs act as spring

1

(b) colour / markings warns predators not to eat it

allow animals learn not to eat them

ignore camouflage

1

[2]

Q1.

(a) any **two** from: eg

- same volume of solution
  *do **not** allow same size of container*
- left for same length of time
- same temperature
- same oxygen
- same pH
- same number of invertebrates / animals
  *do **not** allow same number of species*
- same age / stage of invertebrates / animals

2

(b) line of best fit / curve / point to point drawn going through 240-260 and 25

1

correct interpolation to X axis
if no work on graph allow 250

1

(c) (i) (C)

50% killed at lowest / low copper concentration
ignore least survivors

1

(ii) any **two** from:

- involves counting
  *easy to count gains **2** marks*
- easy to do
- invertebrates more sensitive
- needs less / no apparatus
  ignore more reliable / accurate

2

[7]

Q2.

(a) stays cool
ignore shade

1

less sweat

1

(b) any **two** from:

- breathing rate less
- less water lost via breath
  less can be implied
- less water <u>from</u> respiration

2

[4]

Q3.

(a) (i) conserves water owtte

1

(ii) prevents overheating / keeps cool
allow cooler at night
allow safety from predators

1

(iii) increases heat loss / cooling
allow prevents sinking into sand

1

(b) animal could overheat owtte

1

[4]

Q4.

(a) **1** mark for each adaptation and **1** mark for its correct linked advantage

- long / thick hair / fur (1)
  for insulation (1)
  allow keeps warm
- small ears (1)
  for reduced heat loss (1)
- small feet (1)
  for reduced heat loss (1)
  ignore wide feet
  ignore prevent sinking
- white fur / coat (1)
  for camouflage / poor emitter (1)
- small SA/V ratio (1)
  reduces heat loss (1)
- thick layer of fat (1)
  insulates / keeps warm (1)

max 4

(b) **1** mark for each adaptation and **1** mark for its correct linked advantage

- horns (1)
  for defence (1)
- long legs (1)
  for speed / escape / vision (1)
- light colour (1)
  for camouflage (1)
  allow pattern
- eyes on side of head (1)
  for wider field of vision (1)
- hooves (1)
  for speed / escape (1)
- large ears (1)
  to hear predators better (1)

max 4

[8]

Q5.

(a) any **two** from:

- streamlined / shape reduces friction / long and thin / smooth surface OWTTE
- fins / flippers / tail / paddle
  *do **not** accept 'arms' or 'legs'*
- structures that push against water

2

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

fossil has hind limb / legs / feet
it = minke
accept any valid comparison

fossil has more ribs / bones

fossil has teeth

fossil has curved spine

2

(ii) billion

1

give evidence for

1

[6]

Q6.

(a) wing pattern similar to *Amauris*

1

birds assume it will have foul taste

1

(b) mutation / variation produced wing pattern similar to *Amauris*

*do **not** accept breeds with Amauris*

*do **not** accept idea of intentional adaptation*

1

these butterflies survived

1

breed / genes passed to next generation

1

[5]

Q7.

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

list principle

- light

  ignore oxygen / food / sun
- water
- space
- nutrients / ions / minerals / named
- carbon dioxide / CO_2

2

(ii) less competition for water

ignore space / light / food

or

more water / nutrients / minerals available

1

(b) camouflage / same shape as leaf / looks like a leaf

allow 'blends in'

ignore colour

1

[4]

Q8.

(a) any **two** from:

control variables from information given

- area of bed sampled
- sampling time
- size of net
- kicking action
- net position

2

(b) any **two** from:

must be ideas related to a sample

- some animals not dislodged

ignore reliability etc

- some animals missed / through / escaped net
- invertebrates difficult to identify
- invertebrates from outside area

2

(c) 10 to 99 **or** 10 – 99 **or** 99 to 10 **or** 99 – 10

1

(d) any **two** from:

- increased / goes up

allow increase implied from all data described

- 0 at sample 4
- to (more than) 100

2

(e) mayfly

1

because not found downstream of point where sewage enters stream **or** only in the unpolluted water

1

[9]

Q9.

adaptation and linked advantage eg

*max **2** for 3 adaptations*

2

- roots widespread / long (1)

to collect water from large area (1)

ignore large roots
accept to collect more water

- some roots deep / long (1)

to collect water from deep down (1)

ignore large roots
accept to collect more water

- absence of leaves(1)

reduces water loss (1)

- swollen stem (1)

to store water (1)

- roots near surface (1)

to absorb rainwater (1)

- roots widespread (1)

support in sandy soil (1)

2

[4]

Q10.

(a) points plotted accurately

$+\frac{1}{2}$ *square*

deduct 1 mark per error
ignore the line

2

(b) 30 **or** correct from candidate's graph

accept 30 000 lynx
*do **not** accept 30 000*

1

(c) (i) fall

mark (i) and (ii) separately

1

(ii) fewer hares **or** lack of food

*do **not** accept no hares or food*

1

(d) kills / preys / preys on / hunts / catches
and eats / for food (other) animals

*must have the eat **and** kill for the point*

1

[6]

Q11.

The answer to this question requires good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.

*maximum of **4** marks if ideas not well expressed*

Polar bear has

white fur - camouflage **or** not seen by prey

accept converse points re sun bear

1

thick(er) fur - insulation **or** keeps heat in

number must be comparative
numbers given must be explained
*do **not** accept keeps warm / keeps out the cold*

1

thicker fat - insulation **or** keeps heat in

1

energy reserve **or** can release heat

1

lower S.A - slower / less heat loss
(re body size)

1

[5]

Q12.

(a) (i) increases

1

(ii) decreases

1

(b) any **two** from:

- competition for water
- competition for ions / minerals / salts / nutrients

accept correct named example
*do **not** accept food*
*do **not** accept all*

- competition for light

2

(c) kills / harms other / named organisms

1

[5]

Q13.

any **three** from adaptation **and** effect:

ignore references to ions throughout ignore animals eating plant

few leaves / no leaves / little growth above ground / low surface area above ground so less water loss

*do **not** accept zero water loss*

deep roots

so can reach water **or** because surface soil is likely to dry out

accept 'moisture' for water

roots near surface so can obtain water when it does rain

widespread roots or many roots so can obtain water from a large area

swollen stem so can store water

[3]

Q14.

(a) (i) 144

1

(ii) 1955 **or** 1979

1

(b) (i) 144-12 = 132

allow 130, 134
allow a transfer error from part (a)

1

(ii) disease **or** predators **or** sterility **or** starvation **or** migration **or** climatic **or** weather change

*award **one** mark for an awareness that any of the following factors could reduce the rabbit population*

accept words to the effect of e.g vegetation decreased = starvation
e.g. humans named as predators

*do **not** accept gender bias of offspring **or** 'too crowded' unless qualified*

1

(c) there's only enough food **or** water **or** space for about 140

*do **not** accept statements equating births and deaths or*

increase or decrease in predators

1

[5]

Q15.

(a) (i) traps air

note 'keeps warm' is stem

1

(increases) insulation effect **or** retains body heat or prevents heat loss

accept air is a poor (thermal) conductor

*do **not** credit acts as a barrier unless qualified by a prevention of heat loss*

1

(ii) **increases** insulation

*do **not** accept keep warm*

1

retains body heat or prevents heat loss

accept:
*stored fat can be broken down **or** respired **or** burned (1 mark)*
credit 'used for energy'

to release (thermal) energy (1 mark)
*do **not** credit create energy*

1

(iii) less **or** smaller surface area (per unit mass or volume)

*accept uses more glucose **or** respires more*

*do **not** credit small surface area*

1

and

less heat loss (for its mass) or explanation of this idea

generates more heat

1

(b) (coloured) to match or blend in with environment

*accept this idea in candidate's own words e.g disguised **or** specific example*

1

any **one** from:
prevents predation
aids hunting

accept this idea in own words

1

(c)

*note: marks are awarded for an indication of enhanced qualities **or** adaptations of xerophytes*

*do **not** credit an unqualified **effect***
*e.g. small surface area **or** they can store water **or** spikes **or** prickly leaves related to protection*

any **two** from:

widespread roots
long roots
spiky leaves or needles
hidden **or** sunken stomata
fleshy leaves **or** stems **or** roots for water storage
leaves arranged to **funnel** dew to roots
hairy **or** rolled leaves
light colour

*accept no **or** fewer stomata*

accept no leaves

accept crassulacean acid metabolism
*accept ephemeral (flowering **or** leaf loss **or** production)*

accept reverse diurnal pattern of stomatal opening (stomata open at night)

2

[10]

Q16.

(a) it has a long/thin beak;
which enables it to reach down the long flower tube/OWTTE;

(allow qualified answers in terms of wings)

(allow two adaptations)

2

(b) it has a sharp beak;
which enables it to peck through the base of the flower tube/OWTTE

(allow qualified answers in terms of feet)

(allow two adaptations)

each for 1 mark

2

[4]

Q17.

(i) 8

gains 1 mark

1

(ii) winter

gains 1 mark

1

(iii) e.g. colder/shorter days

gains 1 mark

1

(iv) e.g. obtains light needed for food production;

before oak leaves emerge

each for 1 mark

2

(v) April

gains 1 mark

1

(vi) e.g. more available food

gains 1 mark

1

[7]

Q18.

(a) (i) squirrels eat nuts;

each for 1 mark

owls eat squirrels

(2 marks for energy flow)

2

(ii) hazel tree

gains 1 mark

1

(iii) 1 squirrel population would decrease;
because fewer nuts available as food

each for 1 mark

2

2 owl population would decrease;
because fewer squirrels available as food

each for 1 mark

2

(b) (i) digested/broken down;

(ii) by microbes/reference to worm action;

each for 1 mark

2

(iii) March
warmer/increased activity of worms/microbes;

each for 1 mark

2

[11]

Q19.

(a) 4 of:
intensification due to need to improve efficiency of energy transfer;
has led to developing fast growing crop varieties;
native plants cannot compete with these;
for e.g. light/water/minerals;
effect of herbicides;
pesticides killing pollinating insects
each for 1 mark

4

(b) recommend a variety of measures; (can be implied)
because rotational will allow these species to continue;
permanent will allow others;
leading to conservation of a wide range of species
each for 1 mark

4

[8]

Q20.

(a) e.g.:
competition for light because potamogeton plants taller
competition for nutrients taller plants may have longer roots
each for 1 mark

4

(b) descriptions of:
measuring tape or similar quadrat
method of estimating cover (inside quadrat)
each for 1 mark

3

[7]

Q21.

Cogently argued based on biological principles, for **and**
against introduction of caterpillar
maximum of 4 pros e.g.
fewer chemicals used therefore less expense
less chemical damage to other plants
consequent benefits to food chains
fewer farm animals poisoned therefore more economic
countryside more varied therefore more attractive to tourists
tourists bring economic advantages
greater variety of habitats therefore greater variety of species
any 4 for 1 mark each

4

cons e.g.
danger to livelihoods if crops destroyed by caterpillar
relatively low chance of success since only one third of schemes
effective world-wide

unlikely to be natural predators therefore ecological balance affected

any 2 for 1 mark each

2

cogently argued case **gains up to 2 marks**

2

[8]

Q22.

(a) 2 of e.g.
competition for food competition for space disease

2

(b) e.g.
greys eat greater range of food
greys larger – more effective competitors

2

[4]

Q23.

(1) A
(2) C
(3) B
(4) D

for 1 mark each

[4]

Q24.

(a) from 20.00 to 4.00

for 1 mark

1

(b) line correct length

for 1 mark

1

(c) e.g. it is dark so fewer predators can see it,

for 1 mark each

2

[4]

Q25.

(a) 1 mark for each correct set of plots

for 1 mark each

2

(b) (i) number of voles/amount of food

for 1 mark

1

(ii) e.g. increased number of owls
new disease

for 1 mark each

2

[5]

Q26.

(a) light and/or temperature too low in winter,
increasing light in spring leads to increase in photosynthesis
increasing temperature in spring leads to increasing metabolism/ growth/reproduction

for 1 mark each

3

(b) they run out of minerals

for 1 mark

1

[4]

Q27.

(a) long / pointed horns ***and*** for defence
long legs ***and*** to run away *reject strong / powerful legs*
long legs ***and*** to kick predator
tall ***and*** can see predators a long distance away but accept
eyes on side of head ***and*** to see predator approaching
large ears ***and*** to hear predators approaching
pattern ***and*** for camouflage any

two for 1 mark each

2

(b) (i) fall in morning / day and rise at night or any reasonable

for 1 mark
description of whole pattern for one mark

1

(ii) loss due to evaporation or transpiration <u>in day</u> / absorbed from air
<u>at night / when cool</u>

for 1 mark

1

(c) (i) 19.30 – 20.30 **and** 07.30 – 08:30

for 1 mark

1

(ii) highest moisture content in grass
needs water in desert conditions / response to shortage of drinking water
sensible reference to less chance of predation

any two for 1 mark each

2

[7]

Q28.

pros e.g.:

gum trees survive therefore less soil erosion
therefore food webs not disrupted
if no culling, whole Koala population may die
easier to cull because Koalas are difficult to catch

cons e.g.:

Koala's 'right to life' / ethical issue
better to transfer to reserves on mainland than kill
could use tranquillisers to catch without killing
could allow population to stabilise naturally

max 4 of the above; max 3 pros or cons.

[4]

Q29.

(i) 0.25 × 100 / 25

gains 1 mark

but
1%

gains 2 marks

2

(ii) muscle contraction / limb movement / moving around / chewing
heartbeat / breathing / internal muscle activity
maintaining body temperature / keeps body warm
active uptake synthesising substances (*reject* growth)

any three for 1 mark each

3

[5]

Q30.

camouflage (when hunting)

*accept the idea that the white coat prevents the prey **or** predator 'seeing' the Arctic fox*

1

insulation (from cold)

*accept an idea that the thick coat retains body heat **or** traps air **or** that air in the fur is a poor conductor **or** keeps it warm*

NEUTRAL RESPONSES –
protection, waterproof

1

[2]

Q31.

(a) **Quality of Written Communication**

The answer to this question requires ideas in good English, in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.

max 2 if ideas not well expressed

in summer more greenfly

accept increase in population

1

in winter less greenfly

accept decrease in population

1

over the three years greenfly numbers decrease

*accept fall **or** drop for decrease*

1

(b) any **one** from

(number of) greenfly

severe **or** cold winters
toxic chemicals
destruction of habitats
disease
predators
weather
temperature

do not accept food

1

[4]

Q32.

any **two** from

swollen stem stores water (for dry periods)

reduced leaves / spines lose less water /less transpiration / less evaporation

idea of long roots absorb water from deeper / more spread out in soil

[2]

Q33.

(a) any **one** from

big, flat feet

long eyelashes

long hair around openings to its ears

1

(b) (the came) does not need insulation

accept can keep warm without the fat

1

(c) any two from:

- (the camel) can drink large amounts of water in one go
- loses little water by urine and/or sweating
- (the camel) can use fat from its hump to produce water

any order for the reasons

2

[4]

Q34.

(a) (long) roots

1

(b) prevents water from evaporating

accept to reduce/stop water loss

1

[2]

Q35.

(a) any **three** from:

space

accept land, room

water

accept rain

nutrients

accept fertilisers, nitrates, minerals
*do **not** accept food*
*do **not** accept just sun*

light

carbon dioxide

3

(b) herbicides

1

[4]

Q1.

(a) 1 for insulation / prevents heat loss

keeps cold out neutral keeps it warm neutral

1

2 camouflage / other animals cannot see it

1

(b) 1 heat loss

reject shade

1

2 insulation from hot sand / prevents heat passing from sand / prevents burning

1

[4]

Q2.

(a) any **three** from

different factors are required for each mark

hares breeding

(amount) of food **or** plants available

eaten by lynx **or** predators **or** reference to size of lynx / predator population

hares dying **or** reference to being killed by humans

disease (spreads through the population)

(competition) for space **or** (lack of) space)

*alternative to either of these points but not both change in environment **or** habitat*

temperature **or** weather **or** climate

3

(b) any **two** from

more food **or** hares for lynx encourages more breeding (in lynx)

accept less food, less breeding

more food **or** hares allows greater survival rate of cubs **or** adult lynx

accept less food, less survival

idea of time lag for breeding **or** time lag for dying

2

[5]

Q3.

(a) (i) to go under teeth **or** mower

accept not damaged by grazing animals

accept do not get cut or bitten

accept reduces competition by other plants

do not credit maximum surface of leaves facing Sun

1

(ii) any **one** from

it can force its way through grass roots

accept in competition with grass roots

it is a store of food (to help the plant recover)

do not credit a good store of water

to reach down to water

to give good anchorage

accept it is hard to pull up

1

(iii) any **one** from

to reach more light

*accept to get out of the shadow of the hedge **or** tall grass*

to let seeds be caught on animals' coats (more easily)

*accept improves access **or** visibility **or** ease for pollination*

do not credit to help it grow up the hedge

1

(iv) any one from

(they reach out from hedge) to find water

accept increase surface area

*accept to find nutrients **or** minerals*

do not award mark if food mentioned

to give good anchorage

1

(b) (i) gene **or** allele

do not credit chromosome

1

(ii) any **one** from

they do not crossbreed **or** interbreed

*accept different species do not breed together **or** do not fertilise each other*

do not produce fertile offspring

have different numbers or types of chromosomes

accept genes are incompatible

*do not credit have different genes **or** are genetically different*

do not credit do not pollinate each other

1

(c) one mark is for the adaptation and one is for an appropriate reason

have white fur

for camouflage

are huge

for large volume to surfae area

thick layer of fat

*for insulation or to reduce heat loss **or** retain heat*

*do not credit to stop it losing heat **or** withstand the cold **or** keep it warm*

have thick fur

*for insulation **or** to reduce heat loss **or** retain heat*

hibernate

to avoid the coldest part of year

is a carnivore

because animals provide high energy food

has big paws **or** claws

to be able to walk on snow

have small ears

to reduce heat loss

have furry feet

for insulation from the snow

2

[8]

Q4.

(a) diatoms photosynthesise **or** are producers

1

the amount of growth depends upon the energy **or** light they get

accept more light means more growth

***or** they multiply more in more light*

do not accept they need light

1

(b) (i) eaten by small fish

do not accept eaten by fish

1

minerals **or** nitrate **or** phosphates
or nutrients **or** food supply used up
or reduced

1

(ii) any **two** from

gets colder
light decreases
end of their life span **or** die

accept more being eaten than being formed

eaten by small fish

do not accept a decrease in nitrates ***or*** *phosphates*

1

(c) increased minerals **or** nitrates **or** phosphates

1

any **one** from

due to death **or** decay of diatoms **or** fish

do not accept death of large fish

1

influx of minerals in an ocean current

do not accept extraneous pollution ***or*** *dumping by a ship*

1

[8]

Q5.

(food chain) A gives 7200kJ
(of useful energy)

or *7.2MJ*
or *7200000J*
unit essential in each case

1

(food chain) B gives 960kJ (of useful energy)

or *0.96MJ*
or *960000J*
unit essential in each case

credit 1 mark if ***both*** *are numerically correct but unit omitted*

1

same comparison made in **each** case
e.g. for each kilogram of grain

or *refers to more stages in food chain*
results in less efficiency

1

(so) (food chain) A is 7.5 times more efficient than (food chain) B
or *for every unit of useful energy given to a person by B, A gives* $7\frac{1}{2}$ *units*
or *food chain B is only 13(.3)% as efficient as food chain A*
or *makes a correct comparison in percentage terms*

1

[4]

Q6.

(a) (i) correct reasons - different

light	protection
moisture	pH/acidity/alkalinity
temperature	soil
nutrients	air
genetic differences	

any 2 for 1 mark each

[mark solely on different environmental condition]

2

(ii) grow different dandelions in the same conditions
for 1 mark each

or
grow the same type of dandelions in different conditions
for 1 mark each

2

(b) dandelions shorter/smaller/same height
for 1 mark

because (named) condition changes
for 1 mark

[may refer to answer in a(i)]

2

[6]

Q7.

(a) trees in wood (allow converse)
taller

fewer leaves thinner trunks
fewer branches
branches/leaves at top only

any 2 for 1 mark each

2

(b) light
water
space
nutrients
(*allow up to 2 named substances e.g. CO_2/O_2/NO_3)*

any 3 for 1 mark each

3

[5]

Q8.

(a) (i) predator (allow carnivore)

(ii) prey

each for 1 mark

2

(b) fewer ladybirds; because less food/ladybirds starve
or
no change; because alternative food supply

each for 1 mark

2

(c) any two suitable environmental effects e.g.
food;
diseases;
other predators;
space;
insecticides

any two for 1 mark each

2

[6]

Q9.

idea brown colour/plain shell inconspicuous

for 1 mark

less likely to be eaten

gains 1 mark

but
less likely to be eaten <u>before breeding</u>

gains 2 marks

so alleles (genes) passed on

for 1 mark
(N.B accept inverse of any of the above)

[4]

Q10.

(a) B plants are:
taller
smaller/thinner leaves
thinner stem or vice versa in referring to A plants

any two for 1mark each

2

(b) water/rain/moisture
nutrients/any specific mineral (N/P/K)

each for 1 mark

2

[4]

Q11.

(a) *idea:*
wood goodness recycled/crops goodness removed

gains 1 mark

1

but
wood minerals/nutrients recycled/crops remove nutrients/minerals

gains 2 marks

wood and crops compared

for 1 mark

2

(b) (add) fertiliser/nutrients/minerals
(add) manure/animal waste/compost

any two for 1 mark each

(accept move to new area for 1 mark)
rotation

max marks 2

2

[5]

Q12.

(a) predator/carnivore

(not consumer/hunter)
for 1 mark

1

(b) (i) number decrease
not 'no' <u>less</u> food (for large mites)/less prey/fewer small mites <u>to eat</u>
(not 'fewer small mites' etc)

starve/cannot grow/cannot breed/die/die out

each for 1 mark

3

(ii) increase small mites breeding faster (than they are eaten)

each for 1 mark

(accept different food found)
decrease = O maths but 1 mark for possible reason can be awarded - more (small mites) eaten

each for 1 mark

2

[6]

Q13.

(a) idea

- unbanded dominant/plain **or** banded recessive
- because banded appears in young/
- parents heterozygous/Bb
- offspring BB } Bb } Bb } bb } credit response consistent with parents even if not both heterozygous

Accept any clear and consistently used notation

- identify BB, Bb as plain
- identify bb as banded
- ratio 3:1 unbanded/banded (stated or clearly implied
- matches 35:12 results e.g. <u>all</u> the outcomes clearly identified as banded/unbanded)

for 1 mark each

7

(b) *idea*

- many genes control [accept “continuous variation”]
- many alleles for a gene/large genepool
- snails can inherit lots of different combinations
- mutation (gives rise to many alleles)

allow selection allows alleles to be passed on unless [very]disadvantageous or if advantageous

any 4 for 1 mark each

[Also credit, for 1 mark each, up to 2 causes of mutation,
e.g. mistakes in cell division, radiation]

4

[11]

Q14.

idea

- banded snails camouflaged/less easily seen
- fewer banded eaten [by birds]
- more banded survive to breed
- more genes for banded passed on
  or more banded snails in population

for 1 mark each

N.B.
Accept reverse of all above for plain snails
*All 4 marks may be gained by a relatively short response

[4]

Q15.

(a) *idea:*
soil wetter
soil less aerated
less food for moles/voles/foxes/badgers/birds
soil less fertile (less leaves in soil not enough on its own)
less food grown
earthworms die out/fewer earthworms
(not just "earthworms get eaten")

any 4 for 1 mark each

4

(b) method
advantage
disadvantage
*e.g.**

- chemical
- kills worm/affects reproduction/maintains earthworm population
- persistent/food chain/kill earthworm

or

- import biological central/predator/disease/parasite
- kills worm/affects reproduction/maintains earthworm population
- may attack other animals/cause same sort of problems

as New Zealand worms

(* credit other plausible suggestions for method/advantage/disadvantage)
for 1 mark each

3

[7]

Q16.

(a) predator
prey
no alternatives
for 1 mark each

2

(b) *idea that*
(wasps) increase OR decrease
gains 1 mark

but
(wasps) increase then decrease/peaks at
gains 2 marks
answers must match

idea of change in food supply/whiteflies
more food/whiteflies OR less food/ whiteflies
gains 1 mark

but
more food/whiteflies then less food/whiteflies
gains 2 marks

or
wasps follow trend in whiteflies
for 2 marks

or
linked to increase/decrease other environmental effects
e.g. more/less food for wasps, use of insecticide
e.g. temperature change, other predator
If increase/decrease not given then second part (reason) gains no marks
for 1 mark each

4

(c) *idea that*
wasps die out/die off/fly away/migrate/leave greenhouse but NOT ‘die’ alone
for 1 mark

1

[7]

Q17.

Factor and effect needed.
idea

- killed by poachers (for tusks/ivory)
- not enough food for elephants because humans cut down trees
- not enough space because more used by people/agriculture
- food/space destroyed by humans
- killed for food

any three for 1 mark each

[3]

Q18.

(a) too cold in Britain / warmer in Africa

- no insects / food in Britain / insects / food in Africa / insects are hibernating in Britain

each for 1 mark

[Take answers to refer to Africa unless otherwise stated]
[Do not allow 'because of climate]

2

(b) feed at different heights

for 1 mark
[Comparison is required if answer is quoted from information given]

1

(c) insects they eat are carried up on air currents
this doesn't happen until ground / air has warmed

for 1 mark each

2

[5]

Q19.

ideas that

- trees hang over the sea / grow close to the sea / on the shore – coconuts drop into the sea. or similar *(not just simply 'spread)*
- wax / fibres (trapped air) – stop the fruit sinking / provide water resistance
- water store – supply water until root reaches a supply
- nutrient store – supply nutrients/salts until root reaches supply
- hard shell – to protect from breakage on landing / to protect the embryo from feeding animals.

[Award maximum of 1 mark for 2 survival / spread features or 1 survival + 1 spread feature]

for 'Fibres stop the fruit sinking'

'Wax provides water resistance'

Award 2 marks

any three for 1 mark each

[3]

Q20.

(a) idea that

- light doesn't reach deeper parts
- plants need / absorb light
- to make food

gain 1 mark each to maximum of 2

but

so they can photosynthesise

gains 2 marks

2

(b) herring will be on the bottom

herring follow / will be feeding on the copepods

independent marking points

for 1 mark each

2

[4]

Q21.

(a) idea of camouflage / blend in with / protection against predators

for 1 mark

1

(b) only active when it is cool / stay out of the heat by day / avoid predators / it is cooler

for 1 mark

1

(c) conserve / do not waste water / do not lose water / avoid dehydration / can't obtain water easily / only get water from food

for 1 mark

1

(d) release body heat / keep cool

(*allow* feet / tail stop rat sinking into sand / keep balance / for stability / easier movement in sand / run faster)

for 1 mark

1

[4]

Q22.

(a) prey

for 1 mark

1

(b)
- disease
- eaten (by predators) / predators
- (over)fished / caught by fishermen
- competition for food / not enough food (for all the baby fish) / no food

(*do not allow* they migrate or move elsewhere)

any three for 1 mark each

3

[4]