AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.7.1 ADAPTATIONS, INTERDEPENDENCE AND COMPETITION (PACK 5)

SCORE	PERCENTAGE
/231	%

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Q1.

(a) food

1

mates

1

(b) any **one** from:

allow converse for late arrivals

(early arrivals)

- get more food
- get the healthiest mates

allow more likely to get a mate

- more space / material for nests
- chicks will hatch earlier and have more time to mature
- less competition
- more resources

1

(c) any **one** from:

allow correct chemical formulae

- carbon dioxide
- methane

allow water vapour, nitrogen oxides, CFCs, ozone
ignore water

1

(d) any **one** from:

- rising sea levels
- examples of climate change

e.g. flooding, drought, desertification, melting ice caps, storms / hurricanes

- extinction of some species
- habitat loss

ignore references to temperature

1

(e) burning fossil fuels

1

farming cows

1

(f) sulfur dioxide

1

[8]

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Q2.

(a)

Factor	Biotic	Abiotic
Diseases	✓	
Herbivores	✓	
Temp		✓
Water		✓

*allow **1** mark for 2 or 3 correct*

2

(b) (leaves block light near tree so) more light (as you move outwards)

allow low light intensity under tree
ignore Sun

1

for photosynthesis

allow less photosynthesis under the tree

1

(which) produces (more) glucose / proteins (for growth)

ignore growth
ignore food

allow molecules, cell components or other correct substances instead of proteins

if no other mark awarded allow less water / ions / minerals / nutrients under the tree

1

(c) quadrat

correct spelling only

1

light meter

allow lux meter
allow light intensity meter
allow light data logger

1

in this order

(d) 1.5(0) (m^2)

allow 15 000 cm^2

1

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

allow the light (intensity) might change

ignore references to temperature
ignore weather
ignore Sun

1

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(f) any **one** from:

- repeat (investigation) around the tree

  allow repeat in different directions

- repeat (investigation) for other trees / areas
- sample every one metre
- count the number of each species present (rather than percentage cover)

  ignore repeats unqualified
  ignore repeat at different times / days / seasons
  ignore different size quadrat
  ignore random sampling

1

(g) daisy

1

(h) as light (intensity) increased so did the percentage / cover of plants

ignore directly proportional
ignore positive correlation unqualified

1

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

ignore distance

1

(i) any pair from:

- (lack of) water / rain (1)

  because the leaves are stopping the rain
  or
  because the roots of the tree are absorbing it (1)

  allow soil moisture

- (lack of) minerals / ions (1)

  allow magnesium / nitrate / nutrients

  because the tree (roots) have absorbed them (1)

- temperature (1)

  allow too cold / cooler

  because less thermal energy from the sun is reaching under the tree canopy (1)

  allow 'heat' for thermal energy

  allow pH / acidity (1)
  because (some) fallen leaves are acidic (1)

2

ignore carbon dioxide
*do **not** accept oxygen*

[15]

Q3.

(a) they survive in high temperatures

1

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they survive where it is acidic

1

(b) C

1

(c) because it has (high / optimum) activity at high temperature or 65 °C **and / or** low pH or pH 3 or high acidity

*allow it is the only enzyme that is active between 55 °C and 75 °C **and / or** below pH4*

1

*mark dependent on C correct for part **(b)***

(d) any **three** from:

- based on DNA / chemical evidence

(the three domains are)

- (Archaea) − primitive / simple bacteria
- Prokaryota / Bacteria − true / modern bacteria
- Eukaryota − includes (protists, fungi,) plants and animals

allow Eukaryota − includes organisms with cells having a nucleus

*if no other mark awarded allow for **1** mark*
mention of Archaea, Prokaryota / Bacteria and Eukaryota
or
three correct descriptions

3

(e) (these microorganisms) live in extreme conditions

allow (most Archaea) are extremophiles

1

[8]

Q4.

(a) one X and one Y chromosome and 9 pairs of other chromosomes

1

(b) any **three** from:

- (called) meiosis

correct spelling only

- DNA / chromosomes replicate
  or
  DNA makes a copy
- two divisions to form 4 cells
- so only 1 set of chromosomes per cell

allow cells are haploid
ignore half the DNA

- (daughter cells / gametes) are all genetically different

*if no other mark awarded allow **1** mark for forms gametes / cells which are all different*
***or** only happens in testes and (embryonic) ovaries*

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3

(c) (meiosis will not work because) number of chromosomes cannot halve

allow chromosomes cannot form pairs
allow chromosomes cannot split up evenly

1

(d) do not use energy in reproduction

1

so more (energy) available to synthesise proteins

allow other correct molecules or cell components

1

allow converse if clearly describing diploid oysters

(e) any **two** from:

- global warming may be raising temperature of water and killing oysters
- pollutants in the water may be toxic and kill the oysters
  or
  increased acidity of the oceans is killing oysters

  allow correctly named pollutant with reason

- new competitors / triploid oysters are using up the normal food source
- new pathogens may be causing diseases
- new predators eating oysters

  ignore over harvesting

2

(f) **Level 3:** A judgement strongly linked and logically supported by a sufficient range of correct reasons is given.

5–6

Level 2: Some logically linked reasons are given. There also may be a simple judgement.

3–4

Level 1: Relevant points are made. They are not logically linked.

1–2

No relevant content

Indicative content

for:

- oysters are available to eat all year **so** eating oysters has become very popular
- cheaper to produce **so** more food for expanding population
- oysters grow faster **so** more oysters for supermarkets / restaurants or more profit for farmers
- stocks are replenished each year **so** more sustainable fishing
- they can harvest / sell all year **so** more stable and profitable for oyster farmers

against:

- carcinogen put into environment / oysters **so** may enter the food chain or cause cancer in humans
- bigger triploid oysters may outcompete the smaller native diploid oysters

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so upset balance of the ecosystem / cause extinction
- people may not buy / eat them because they have used a carcinogenic chemical **so** reduced profit for farmers / suppliers / supermarkets / restaurants
- farmers have to buy new seed oysters every time **so** more expensive

other content:
- shouldn't be eating the oysters until they are thoroughly tested
- should be looking for alternative ways to get triploid oysters
- should stop using triploid oysters until the effect on the (marine) environment is known
- would replace lost oyster beds **but** could change the ecosystem
- oysters available to eat all year **but** probably do not taste the same or have the same flavour

[15]

Q5.

(a) community

1

(b) any **one** from:
- fish
- squid

1

(c) producer

1

(d) photosynthesis needs light

1

(nearer the surface there is) more light

allow converse

*allow explanations in terms of temperature for **2** marks*

1

(e) any **one** from:
- mates
- territory

allow space

1

(f) more predation / eaten

1

by (toothed) whales

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

1

[8]

Q6.

(a) availability of food

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1

new diseases

1

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

1

allow idea of animals (constantly) moving around

(sampling has been used) so some counted more than once

if no other marks awarded allow we don't know the sampling method used

1

(c) line rises and falls

1

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

1

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

1

(d) (voles decrease / drop)

(because) less mice for the owls to eat

1

(therefore) owls eat more voles

*allow for **2** marks (decrease) because they are the only / main source of food for owls*

1

or

(voles increase / rise)

(because) more food is available (1)

(because) mice are not eating it (1)

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

[9]

Q7.

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

- light (intensity)
- more light means more / faster photosynthesis / glucose

1
1

- temperature
- higher temperature more / faster photosynthesis

1
1

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- water
- right amount for transpiration / cell function / photosynthesis

- soil pH / ions
- needed for healthy growth

ignore 'growth' unqualified

ignore carbon dioxide and oxygen

(b) hand lens

1

moth guide

1

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

1

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

1

(e) any **one** from:
- wear sunglasses
  or
  eye protection
- wear gloves or allow lamp to cool.
- wear gloves
  or
  wash hands after handling moths

answer must relate to hazard

1

(f) bristles / hairs make it unpleasant to eat

or

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

1

[10]

Q8.

Level 3: Relevant adaptations are identified, given in detail and logically linked to form a clear account.	5-6
Level 2: Relevant adaptations are identified, and there are attempts at logical linking. The resulting account is not fully clear	3-4
Level 1: Adaptations are identified and stated simply, but their relevance is not clear and	1-2

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there is no attempt at logical linking.	
No relevant content	0
Indicative content • a small SA:V ratio • means less thermal energy transferred to surroundings • thick fur **or** hollow hair shafts • traps a layer of air which acts as an insulating layer stopping transfer of thermal energy • a layer of fat or blubber under the skin • acts as an insulating layer **or** as a food store for respiration when food is in short supply • small ears • reduces surface area for thermal energy transfer • white colour • camouflage in the snow so prey do not see them coming and they get more to eat **or** so predators do not see them and they can escape • large feet • to spread weight over snow so they can run faster • hibernate in winter • to conserve energy stores allow 'heat loss' for transfer of thermal energy	

6

[6]

Q9.

(a)

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	Animalia
Phylum	
Class	
Genus	*Spodoptera*
Species	

1
1

(b) any **one** from:
- no / few natural predators
- no / few pathogens / diseases
- more favourable climate
- plentiful food as corn crops grown over wide areas in Africa

1

(c) any **one** from:
- compare the structural features with those of annelids and arthropods

  allow named structural features eg is it a segmented worm, does it form a pupa, does it turn into an adult with legs.
- carry out DNA analysis and compare with known annelids and arthropods
- carry out electron microscopy of internal parts to see fine structure and compare with known annelids and arthropods

1

(d)

Level 2: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3-4
Level 1: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	1-2
No relevant content	0
Indicative content **advantages** • killing worms will mean more corn / food for African people • so food security or no famine • it will stop the spread of the worms • so stop it reaching other countries and causing food shortages there • it will remove an invasive species • and so restore the natural ecosystem	

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balance in the area **disadvantages** • insecticide will kill other (pollinating) insects • so will stop fertilisation of crops and lead to poor yields • insecticide will kill other insects • and upset the ecological balance in the area or reduce biodiversity in the area • insecticide may be toxic to humans • causing illness if they ingest it • insecticide may build up in the food chain • and poison / kill organisms further up the chain (ignore cost as it could be argued either way)	

4

[8]

Q10.

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

1

110 000 in each remaining year
or
2.64×10^6 in remaining 24 years

1

1.1×10^5

*an answer of 1.1×10^5 scores **3** marks*

1

(b) (area of woodland =) 21 600

allow 16 800 + 4 800
or 9 000 + 12 600
or 4 800 + 4 200 + 12 600

1

518 400 (bluebells)

allow their area × 4 × 6
*an answer 518 400 (bluebells) scores **2** marks*

1

(c)

Level 3: Relevant points are identified, given in detail and logically linked to form a clear account.	5-6
Level 2: Relevant points are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3-4

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Level 1: Relevant points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1-2
No relevant content	0
Indicative content **reducing pollution** • trees take in carbon dioxide • which will lower atmospheric greenhouse gases and reduce global warming (allow consequences of global warming) • trees act as noise absorbers • which will reduce noise pollution in the city • roots of trees will bind the soil • which will reduce local flooding and soil erosion • leaves on trees will trap PM2.5 / tiny particulates • which will reduce asthma/breathing difficulties of people **increasing biodiversity** • new woodlands or new trees in parks / gardens will provide new habitats • for new species of plants and animals • linking woodlands • will allow animals to move into new areas • planting many new species of trees • will provide food and shelter for new species of insects/birds • could extend the scheme • to reintroduce species of plants or animals which no longer live in that area • could protect wildlife in the area • by legislation or community projects	

6

[11]

Q11.

(a) *Oryx*

1

(b) any **two** from:

- white / light colour (to reduce thermal gain)
- short fur (to reduce thermal insulation)
- little body fat

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- large hooves (to walk in sand)
- camouflaged (against sand by light colour)

2

(c) any **three** from:
- variation in population
- animals with longest horns more likely to survive / reproduce
- passing on alleles for long horns
- repeated over many generations

3

(d) breeding programme

1

(e) any **one** from:
- to increase genetic diversity

  *do **not** accept to increase biodiversity*
- species may be unable to cope if environment changes
- all susceptible to same diseases / inbreeding problems

  allow otherwise all offspring would have similar genes or a decreased gene pool
- prevents inbreeding

1

[8]

Q12.

(a) 6

1

(b) only one species present

1

(c) (abiotic)
any **one** from:
- temperature
- exposure to the air / moisture / water / tides
- waves / wind
- rock type / substrate

1

(biotic)
any **one** from:
- competition
- predators
- food

1

(d) select location for transect at random / to be representative

1

transect / tape measure / line from top of shore / beach to sea

1

counting which species touched transect / regular use of quadrat along transect to count species

ignore repeat unqualified

1

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repeat at other locations on same beach/shore

allow repeat at another time of year

or *repeat at low / high tide*

1

[8]

Q13.

(a) producer

1

(b) predators

1

(c) 1200

1

(d) 2 (years)

1

(e) there is more food for wolves

1

(f) humans hunting

1

viruses

1

[7]

Q14.

(a) (placed) randomly

allow description of placement

1

sufficient number (of quadrats) used

1

count (dandelions) in each quadrat

1

use mean number of dandelions, area of quadrat and area of field to estimate population

accept (area of field / area quadrat) × mean number of dandelions per quadrat

1

(b) (40 × 145) / 0.25 = 23 200

1

(0.42 × 23 200 =) 9744

*allow 9744 with no working shown for **2** marks*

*allow ecf from correct attempt at the previous step) × 0.42 for **1** mark*

1

(c) **Level 2 (3–4 marks):**

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A detailed and coherent explanation is given. Logical links between clearly identified relevant points are made to explain why dandelion growth may be limited.

Level 1 (1–2 marks):
Discrete relevant points are made. The logic may be unclear.

0 marks:
No relevant content

Indicative content

factors that may be considered:
competition for resources including:
- light
- water
- space
- mineral ions (allow nutrients / salts / ions from the soil)

reference to why growth may be limited:
- (light) energy for photosynthesis
- water as a raw material for photosynthesis / support
- surface area exposed to light
- sugar / glucose produced in photosynthesis
- (space) to grow bigger
- (space) for growth of root system
- (mineral ions) for growth
- (mineral ions / sugar) for production of larger molecules **or** named example

4

[10]

Q15.

(a) wolves

1

(b) moose and wolves are on different scales

1

(c) wolf population has increased so more moose are eaten

*do **not** accept there are more wolves than moose*

1

(d) any **two** from:

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

2

(e) any **four** from:

- variation (within species) of antler size
  allow description relating to antlers
- (caused by) different genes

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- as a result of sexual reproduction / process of meiosis / mutation
- (phenotype) most suited to environment most likely to survive and breed

  ignore natural selection unqualified
- genes for large antlers (more likely to be) passed on to next generation

4

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

1

[10]

Q16.

(a) Leaf

1

(b) Beetle

1

(c) Community

1

(d) Light intensity

1

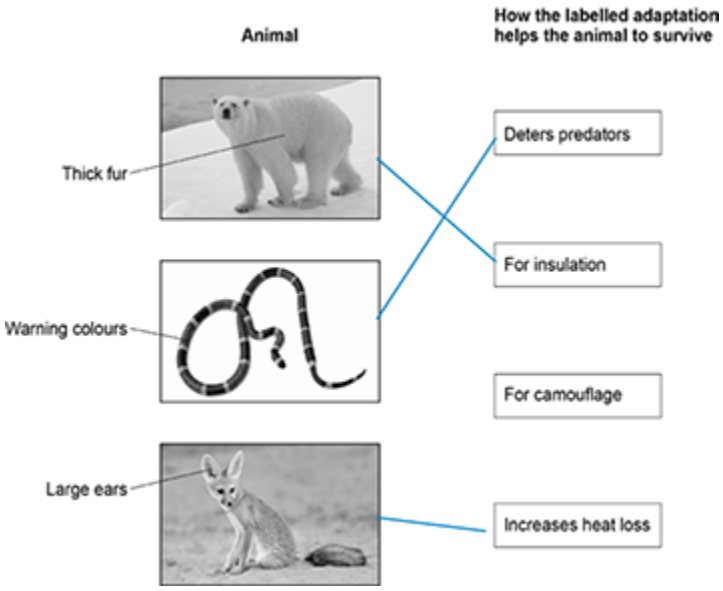
Wind direction

1

[5]

Q118.

(a)



extra lines drawn negates the mark

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3

(b) any **two** from:

- food / prey
  allow water
- mate(s)
  allow females / males
- territory.
  allow space / shelter

2

[5]

Q119.

(a) (i) 3 billion years ago

1

(ii) any **one** from:

- the theory challenged religious beliefs
- there was insufficient evidence at the time
  allow no evidence / proof
- mechanism of inheritance / variation not known
  accept genes not known about
- people believed in different theories.

1

(b) (i) 2 (million years ago)

1

(ii) Snow leopard
*do **not** allow leopard*

1

(c) camouflaged
allow description of camouflage,
eg blends in with background
allow less likely to be seen

1

[5]

Q120.

(a) (i) microorganism / microbe
accept fungus, bacterium, decomposer, allow detritivore eg worms

1

(ii) carbon dioxide

1

nutrients
extra boxes ticked negate mark(s)

1

(b) (crops) grow slower
allow crops won't grow as well

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ignore kill crops

1

Reason:
any **one** from:

- competition
- (crops get) less nutrients / space / water / light

ignore less carbon dioxide

1

[5]

Q121.

(a) Dark

Wet

2

(b) Possible answers:

*must match one of the conditions given in **(a)***

allow ecf

allow for sensor: meter / detector / probe

humidity / moisture sensor
light sensor
thermometer
temperature sensor

1

[3]

Q122.

(small leaves) reduce water loss

*do **not** accept stops water loss*

ignore references to photosynthesis / heat loss / surface area

1

(deep roots) anchor plant into ground

or

absorb more water / nutrients

allow less chance of being blown away / uprooted

allow absorb a lot of water / nutrients

allow can get water / nutrients from deep(er) under ground

ignore stores / processes more water / nutrients

ignore absorbs water / nutrients faster

1

(roots that produce a chemical that stops the growth of seeds of other plants) reduces competition

allow stops competition

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allow a description of competition with reference to preventing growth of other plants

1

[3]

Q123.

(i) damp / wet / moist

ignore rainy

1

dark

allow in the shade

ignore all references to temperature

1

(ii) Possible answers:

*must match one of the conditions given in **(i)***

allow ecf

allow for sensor:
meter / detector / probe

humidity / moisture sensor

light sensor

thermometer

temperature sensor

allow rain gauge only if rain given in (i)

1

(iii) any **one** from:

- not enough data
- sample size too small
- no control(s) in place

ignore not a fair test

ignore references to anomalies

1

[4]

Q124.

(a) (i) at X = 5

*both needed for **1** mark*

at Y = 3

1

(ii) any **one** from:

allow converse answers

answer must be comparative

- more oxygen at X

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- less pollution / sewage at X
  allow cleaner
- better quality (water) at X
  allow less harmful

1

(b) not enough oxygen (at Y)
allow less oxygen at Y than X
*do **not** allow there isn't any oxygen*

1

[3]

Q125.

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

- food
- mates
- territory / space
  ignore habitat, land
  ignore water

2

(ii) any **two** adaptations with explanations from:
***1** mark for adaptation*
***1** mark for correct explanation*
ignore prevents / no heat loss

- <u>long / thick</u> hair or wool
  allow a lot of
  allow <u>long / thick / a lot of</u> fur
  ignore fat although reason can still be credited
  ignore coat

(for) insulation
allow (to) trap energy / heat / air
allow to keep warm

- small surface area : volume ratio
  ignore large body mass although reason can still be credited

(therefore) lose less energy
allow (to) keep warm
allow heat for energy
ignore (to) insulate

- small ears / tail
  allow (to) keep warm
  allow heat for energy

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(therefore) lose less energy

ignore (to) insulate

*only allow big tusks if qualified eg digging through <u>snow / ice</u> for(food) for **2** marks*

ignore references to predators and prey

*only allow big feet if qualified eg for walking on <u>snow / ice</u> for **2** marks*

4

(b) (i) natural selection

1

(ii) if some animals grew a long nose / acquired characteristic (during their lifetime)

ignore answers about Darwin's theory

allow trunk for nose

allow used trunk / nose / it a lot

allow stretched trunk / nose / it

1

their offspring would inherit / also have a long nose

*do **not** accept references to genes / DNA / chromosomes*

1

[9]

Q126.

(good eyesight) to see its prey / judge distance

ignore predators or competition throughout

1

(strong sharp claws) to grasp / carry / kill its prey

allow to catch prey

1

(powerful wings) to swoop to catch its prey / control its flight / fly fast / carry (heavy) prey

allow to fly only if qualified

1

[3]

Q127.

(a) extremophiles

accept named examples eg acidophiles, thermophiles, thermophytes, halophytes

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

0 marks
No relevant content

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Level 1 (1 – 2 marks)
Either a difference **or** a reason is given.

Level 2 (3 – 4 marks)
A difference is given **and** an attempt to suggest reason(s) for the difference.

Level 3 (5 – 6 marks)
A difference is given **and** suitable reasons, which add value, to explain the difference.

Difference

- food chain near hydrothermal vent begins with bacteria
- food chain near surface of the sea begins with seaweed
  allow no seaweed at the bottom of the sea
- use different energy sources
- producers (in the two chains) are different
  allow limpets eat different foods
  accept bacteria / limpets / crabs (in the 2 areas) are different (species)
  or
  have different adaptations
  or
  have evolved differently

examples of scientific points made in the response

- seaweed is an alga
  allow plant
- seaweed absorbs light / energy from sun
- for photosynthesis
- to make glucose / sugar/ carbohydrate / food
  allow chemical energy
- no light at bottom of sea
  allow no sun (light)
- plants can't survive in the dark / conditions at the bottom of sea
  allow descriptions of conditions e.g. harsh
- bacteria are extremophiles
  allow thermal energy or 'heat'
- bacteria need different energy source / use chemical energy
- to make carbohydrate / food

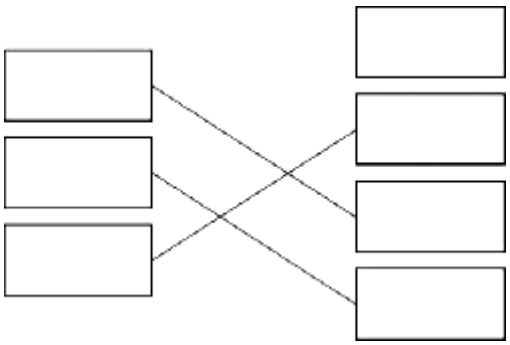
6

[7]

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Q128.

(a)



extra line from statement cancels the mark

3

(b) any **three** from:

- light
  ignore Sun
  ignore territory / soil / habitat
- space
- water / moisture
- mineral salts / ions / nutrients / named
  ignore food
  ignore gases

3

[6]

Q129.

(a) 36 (%)

36 (%) gains two marks

accept answers in range 32 (%)–42 (%)

*if answer incorrect give **1** mark for evidence of estimating number of squares as being 8–10.5*

2

(b) (i) Greater plantain most abundant on path / walked area

*for **2** marks a correct statement must be made for each plant.*

1

Ribwort plantain most abundant away from path / on the field / grass / on area not walked on

accept answers in terms of quadrat number / start and finish

*accept for **1** mark where number of one plant high, number of other plant low*

ignore figures

1

(ii) *if no position given max 1 mark*

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for Greater plantain numbers higher on path

accept converse statements

Greater plantain grows flatter / lower to ground / is shorter

ignore surface area

1

(so) will be damaged less by trampling /will not be pulled out
or
for Ribwort plantain numbers higher in field

Ribwort plantain has tall leaves or is taller

allow tall stems

to obtain more light
or for photosynthesis

ignore Sun

ignore references to nutrients

ignore competition unless qualified

1

(c) *answers must refer to named plantain(s) to gain credit*

Greater plantain would grow better on football pitch / area 1

accept converse argument

1

(since) more trampling on pitch

*if **no** other marks gained, allow **1** mark for more plantains in area 2 <u>because</u> they will not be affected by human activity / example*

1

[8]

Q130.

(a) (i) (small eyes hidden in fur) to stop soil getting in eyes

accept any valid reasons

*do **not** accept does not need to see*

1

(ii) (strong front limbs) to dig / tunnel

accept any valid reasons

allow catch prey

1

(iii) (tentacles that are sensitive to touch) identify / feel organisms

accept any valid reasons

allow detect objects in front of it

ignore feel where they are going

ignore smell

1

(b) the Sun

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accept light
ignore heat

1

[4]

Q131.

(thick fur) insulation / reduces energy loss
allow heat for energy
allow traps warm air / keeps it warm

1

(large feet) does not sink into <u>snow</u>
allow to move on <u>snow / ice</u>
allow for stability / balance
allow for grip
ignore to jump / run quickly

1

(white fur) camouflage / not easily seen (by predators)
allow to blend with surroundings
ignore disguise
ignore to hide
ignore references to prey / hunting

1

[3]

Q132.

(a) Both birds arrive earlier to the UK than they used to
extra ticks negate mark

1

After 1970 the order that the two birds arrive in the UK reversed

1

(b) any **one** from:

- climate change
  accept named climate change eg global warming / dimming
  allow change in temperature qualified
  ignore change in weather
- change in food availability
  ignore availability of plants
- change in genes / mutation
  allow birds evolving / natural selection
  ignore adapted
- change in predation (pressure)

1

[3]

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Q133.

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 on the marking guidance (see Reference Material), and apply a 'best-fit' approach to the marking.

0 marks
No relevant information.

Level 1 (1-2 marks)
There is a basic description of either differences or explanations only.

Level 2 (3-4 marks)
There is a clear description of at least **one** difference with a correctly linked attempt at an explanation.

Level 3 (5-6 marks)
There is a clear and detailed description of at least **two** differences explained and correctly linked. Competition explained

Examples of the points made in the response

allow converse statements for trees in forest

description of tree on its own.

- is wider / bushier

  allow (leaves / branches) spread out

- has more leaves

- is shorter

  ignore trunks

- has leaves all over tree

  ignore size of leaves

explanation linked:

- more space
- more light
- more nutrients

  allow photosynthesise more

  ignore reference to being eaten

  is shorter cannot be linked with more nutrients

  ignore tree roots unless clearly linked to obtaining nutrients

competition mentioned:

- for light

  ignore fight

- for nutrients

  ignore water and carbon dioxide

- for space

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ignore evolution / natural selection / adapting

[6]

Q134.

(a) camouflaged in <u>summer and winter / all year</u>

allow matches background for (camouflage) all year

1

(so) fewer eaten (by predators)

allow to avoid / hide from predators

1

or

light coloured coat emits less energy / heat (than darker coat)(1)

accept converse argument but answer must be comparative

*do **not** accept darker coat absorbs more energy / heat (in summer)*

(so helps) hare stays warmer in winter(1)

(b) small(er) surface area

allow small(er) surface area : volume ratio

*do **not** accept small volume : SA **or** large SA : volume*

ignore references to being less visible

1

(so) lose less energy / heat

allow retains / conserves <u>more</u> energy / heat

ignore prevents / stops heat loss

ignore keeps heat in

ignore absolutes

1

[4]

Q135.

(a) the birds now arrive earlier (in the UK)

must imply both species of birds

1

the Sand martin (now) arrives before the Barn swallow

or

the Barn swallow (now) arrives later than the Sand martin

or

arrival time of the two birds has reversed

1

(b) any **two** from:

- warmer in UK <u>earlier</u> (in year)

  or

  colder abroad <u>earlier</u> (in year)

  allow too hot / cold abroad <u>earlier</u> (in year)

  ignore global warming

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- insects / food appears <u>earlier</u> (in year in UK)
  or
  shortage of insects / food abroad <u>earlier</u> (in year)
  accept feasible reference to competition for food

- new genes / mutation
  allow evolution / natural selection
  ignore adapted
  ignore pollution

2

[4]

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Q1.

(a) This question was generally very well answered. 57% of students achieved both marks and it was rare to encounter a student who did not achieve at least one mark.

Some students only ticked one box, so it is worth reiterating that reading the question stem is of utmost importance. The number of boxes to tick in multiple choice questions is given in bold font.

(b) Students were given a straightforward statement that, 'Birds that arrive early might survive better than birds that arrive late'. They were then asked to give one reason for this. 60% of students identified early arrivals having access to more food, better choice of mates, nesting sites and less competition for resources. There were obvious clues in the list given in part **(a)**, which students may well have picked up on.

Those students who did not gain the mark generally did not 'add value' to their response and simply stated, 'they would get food', which was insufficient. The most common incorrect answers related to temperature or being 'better adapted'.

(c) Students were asked to name one greenhouse gas. 71% of students correctly named 'methane' or 'carbon dioxide', with a few also gaining credit for the use of correct chemical formulae. Some students, however, wrote the 2 as a superscript and so were not awarded the mark. Incorrect answers of carbon monoxide and water were fairly common.

(d) This question was generally well understood with 41% of students achieving a mark for identifying one other effect of global warming. The common answers were sea levels rising, melting ice caps, flooding, extinction and habitat loss. Quite a few students managed to put two or three answers into the one mark e.g. as the ice caps were melting, this caused the sea levels to rise which resulted in flooding and often habitat loss.

There were, many vague answers such as acid rain, weather changes, temperature changes, ice melting and crop growth being affected. These were insufficient to gain credit.

(e) This question asked students to identify two human activities that cause global warming. Burning fossil fuels was usually identified but turning off lights or using too much water was often selected as the second response.

(f) This question asked which gas in the atmosphere causes acid rain. Many students selected carbon monoxide, a small number ozone, but 58% of students did select sulfur dioxide.

Q2.

Foundation

(a) 70% of students achieved at least one mark. The most confusion appeared to be whether diseases / herbivores were biotic or abiotic.

(b) Most students achieved one mark for identifying the importance of more light as one moves further away from the tree, with a significant number gaining the second

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mark for the link to photosynthesis. There were, however, a good number of responses only referring to Sun which was not creditworthy.

Very few (less than 1%) got maximum marks for stating production of proteins/glucose. Many students referred to food being made which was insufficient. It was common for students to make two creditworthy points about 'light' and 'less water / minerals', but only achieving the single mark on offer

(c) This question asked for the name of two pieces of equipment that would have been used.

- Quadrat was the most popular correct answer, although some missed out on the mark for incorrect spelling.
- Light meter was rarely encountered. Answers often referred to ammeters, voltmeters and light sensors, solar panels and arbitrary measurers.

27% of students achieved at least one mark.

(d) This calculation was very difficult for students, with 3% answering correctly. They were asked for the total area sampled. Many attempted to calculate the area of the circle in the diagram. It was also quite common to see answers for area of a quadrat multiplied by 5 rather than by 6.

(e) Students were asked to suggest a reason why the investigation was done as quickly as possible on the same day. 28% of students referred to the idea of light intensity being controlled. However, many gave insufficient answers about the Sun, weather or temperature being the same.

This question was often approached from two perspectives, both of which were creditworthy with a reference to light. Either, why it was done as quickly as possible or why it was done on the same day.

(f) There was a huge variety of suggestions about how the investigation could be improved. 17% of students identified sampling at a smaller distance or repeating under another tree.

Popular misconceptions seen referred to extending the transect, using a bigger quadrat or repeating the investigation at a different time. One particularly popular response seen was to do it more slowly. This had clearly been derived from the stem of the previous question. There were also a number of responses which simply suggested repeating it which were insufficient.

(g) This question asked students to identify which plant species would only grow at high light intensity. 42% of students were able to give 'daisy'. The most popular incorrect answer was clover, possibly because it was the species with the highest percentage coverage at high light intensity.

(h) Students were asked to make a conclusion about the relationship between light intensity and the total percentage cover of plants. 24% students achieved the first mark point but the second one was rarely seen.

The two most popular incorrect responses were those that only referred to number of plants rather than cover or percentage and those who stated the relationship the wrong way around e.g. 'as percentage cover increases so does the light intensity'.

(i) Students were asked to suggest another factor which may have caused the results obtained. Generally many students gave water, minerals and a few gave

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temperature as a correct factor. However, very few responses then linked the factor to how the tree would cause the results and subsequently, the second mark was awarded much less often. Common misconceptions for the factor mark were carbon dioxide and moisture. Trampling was also seen but was not creditworthy. 5% of students achieved full marks.

Higher

(a) 86% of students were able to identify two or three factors that were biotic or abiotic, with about 64% identifying all four correctly.

(b) Most students noted that light increased as you moved away from the tree. However, a much lower number related light to photosynthesis and fewer still could link to glucose for growth, although some answered with 'providing food'. There were students who mixed up photosynthesis and respiration.

(c) Many students identified a quadrat and most of these could spell it correctly. Much fewer identified the light meter, with solar panel and light dependent resistor (LDR) as the most common wrong answers. 'Lightometer' was seen but unless this was qualified as a mobile phone app it did not gain credit. Similarly a 'light sensor' was only correct if linked to a data logger.

(d) Most students attempted a calculation, with 15% answering correctly. Some students were able to correctly calculate the area of one quadrat as 0.25 m^2 but then multiplied by either ten or five instead of the six sites sampled.

(e) A wide variety of answers were seen suggesting that students understood that light intensity could change during the day. Provided the idea was clear credit was awarded.

(f) The many students who just wrote 'repeat the investigation' did not gain credit. However 38% of students knew that this would only improve validity if it was in a different direction or for a different tree. Sampling every metre was also a correct common response.

(g) 74% of students identified 'daisy'. A number of students wrote more than one answer and so lost the mark under the list rule. Clover was a common incorrect answer, possibly because that was the species with the highest percentage cover at high light intensity rather than the species which **only** grew at high light intensity.

(h) The first straightforward mark point for increasing light intensity showing an increased percentage cover of plants was stated by 62% of students although some incorrectly inferred that it was the percentage cover of plants causing the increased light intensity.

Only the most mathematically astute students were able to note that a maximum of 100% cover was seen from 175au of light for the second mark. A number of students did not read the question carefully enough and gave detailed descriptions of what was happening for each species instead.

(i) While 69% of students were able to identify a factor for one mark, often seen and credited within the reason section, very few were able to explain this in terms of the tree. Instead students gave very general reasons for why the factor was needed by plants. Many students wrote about the carbon dioxide level under a tree changing which is not the case.

Q3.

(a) Students were able to relate extremophiles to harsh conditions with 39% of students identifying one of the conditions and 54% identifying both.

(b) 64% of students identified enzyme C as the enzyme from bacteria in the cave.

(c) Those students who selected the incorrect enzyme in part **(b)** were unable to get any credit for their answer to this question. Some who correctly picked enzyme C then incorrectly wrote about microbes living or surviving in the conditions rather than referring to enzymes still being active in these conditions.

Other students appeared to misunderstand the graph itself and presumed that the enzymes themselves had high temperatures or were acidic rather than the activity being greatest in those conditions. The word optimum was rarely used.

Those students who got the correct answer (28%) usually referred to 'enzyme activity at high temperatures'. Whereas the students who wrote about pH did not mention that the conditions were of low pH or high acidity, simply referring to it being acidic.

(d) There were a few excellent answers from students who had a real understanding of this new aspect of the specification. However, in general students struggled with this question, with 12% not attempting it at all. 3% of students achieved three marks.

Many students did not know what the domains were. Students often wrote answers about kingdoms and phyla rather than the three domains. And there were many answers that suggested the domains were a way of classifying organisms in the environment with many references to producers, consumers, habitats, communities and abiotic and biotic factors. Many students confused the three-domain system with the Linnaeus system of classification and described that instead.

Other students described the thee-domain system as referring to the conditions of an organism's environment, referencing the previous questions' use of pH and temperature. Some students also described food chains or predator prey relationships. Students were often able to achieve two out of the three marks for their descriptions of Eukaryotes and Prokaryotes. However, they often did not describe Archaea as 'simple' or 'primitive' bacteria, but simply as extremophiles.

Not many students received credit for marking point one as they usually just referenced classification based on characteristics rather than DNA or chemical evidence. The compensation mark was the marking point most often awarded.

(e) 24% of students answered this question correctly. Some did not recognise that the extreme conditions were the focus of the question and instead commented on the microorganism being found in the caves which had matching conditions to the graphs.

Common incorrect answers included that Archaea are primitive or old or that they survived in hot or dark or humid or acidic conditions without making reference to the fact that these conditions are extreme.

Q4.

As expected with this question being higher demand, students generally achieved lower marks. Some excellent answers were seen where students were able to access knowledge from different parts of the specification as well as use information from the question stem and their own wider reading to express complex concepts.

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(a) This was not a straightforward knowledge question as students needed to use logical thinking as well as knowledge of chromosomes to work out the correct alternative. 50% of students arrived at the correct response. Many realised that there would be one X and one Y chromosome but their maths let them down when they computed that only eight more pairs would be needed.

(b) A large number of students understood meiosis was the type of cell division and many students could not spell it correctly. Being able to understand the differences in mitosis and meiosis is crucial as is being able to correctly spell all keywords. 28% of students achieved two or three marks.

(c) Students seemed to struggle with the idea that meiosis created four daughter cells from the two divisions, although they did tend to identify that the cells would be haploid. Many just stated the cells would be not identical rather than being genetically different.

The majority of students found it difficult to transfer their knowledge of humans and their 23 pairs of chromosomes to oysters with ten pairs and so their answers were confused. 19% of students achieved the mark here.

(d) While students were able to note that triploid oysters didn't spend time reproducing, very few related this to energy. Many went down the route of not needing time to look for a mate. The few that did identify energy and reproduction (6% of students) rarely linked the energy available to synthesising proteins, and instead going with vague references to 'growth' which is insufficient at this level.

(e) Students had the idea that global warming, pollutants, competition or predators could be involved, but rarely gained credit as they did not express this with the necessary high demand biological detail required to explain how it would lead to a reduction in population.

Key points were generally missing such as toxic pollutants and new predators or pathogens. Some students mentioned disease but did not relate it to pathogens. 3% of students achieved full marks.

(f) This 'extended response' question was targeted at grades 6–9. Many students were able to access level 1 (43%) and level 2 (27%). It served its purpose of allowing the higher-attaining students to perform well, while not discouraging lower-attaining students from answering, and very few students made no attempt.

It was felt that students engaged with the opportunity to have an opinion about ideas on whether supermarkets and restaurants should be allowed to stock a product which may have a link to a carcinogen.

Q5.

(a) 45% of students knew that the term community is all the organisms in an ecosystem.

(b) 53% of students could identify a secondary consumer from the food web.

(c) 78% of students could identify that algae are producers.

(d) Few students applied their knowledge of algae to the need for light for photosynthesis. 32% of students achieved any credit for their answer. The question had included a prompt that algae photosynthesise. Many students referred to algae being safe from predators near the surface, or sometimes even, nearer the prey of algae near the surface.

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(e) Most students could recall that animals compete for mates or territory.

(f) 59% of students could interpret the food web. Common mistakes involved reading the arrows on the food web the incorrect way, such as fish eat seals.

Q6.

(a) 75% of students achieved both marks for this question. 'Availability of food' was the most common correct answer.

(b) 62% of students were unable to give a creditworthy answer to this question. The question is about the accuracy of the data for the one woodland, so saying 'do more woodlands' was incorrect. The ideas of animals hiding so not being counted, or being counted twice were the most common acceptable answers.

(c) This question had a mark available at all levels of demand. 87% of students achieved at least one mark, with the easiest mark for 'the line goes up and down' being given by most. The second mark was for a line where all peaks and troughs were below those of the prey line. The final and most difficult mark achieved by 6% of students was for showing that the line drawn was slightly after the prey line.

(d) 53% of all students achieved at least one mark for this question. Of the incorrect responses a significant number of students stated that voles eat mice.

Q118.

(a) Half the students gained full marks for this question. Most recognised thick fur for insulation, but some thought it was for camouflage. Students had to read the label and make a link to thick fur, rather than white fur. Some mistakenly thought the snake's warning colours were for camouflage.

(b) The majority of students scored 1 mark, and almost two thirds gained 2 marks. The most common answer was 'food'. Many went on to give another correct resource. Quite a lot listed food and water, but these could only be awarded 1 mark.

Q119.

(a) (i) Two thirds of the students correctly said that simple life forms first developed on Earth more than 3 billion years ago.

(ii) Most students said that Darwin's theory of evolution was not accepted at first because there was not enough evidence, or they referred to religious beliefs to gain the mark.

(b) (i) The majority of students correctly said that the lion evolved 2 million years ago.

(ii) Almost two thirds of the students gained the mark for saying that the snow leopard is the closest relative to the tiger. Others lost the mark because they just said 'leopard', which was incorrect.

(c) Most students said that the stripes help to camouflage the tiger, or gave a description of this to gain the mark, for example, 'so the tiger could blend in with its surroundings'. References to a disguise were ignored. Some mistakenly thought that the stripes acted as warning colours to deter predators.

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Q120.

(a) (i) Almost half of the students said microorganisms or bacteria to gain the mark. Other acceptable answers that were seen included: fungi, decomposers, flies and worms. Some students had not read the question carefully and did not name an organism; instead they said enzymes, light, oxygen, alkenes or feeding. There were quite a few references to carbon dioxide, carbon or the carbon cycle. A number of students did not attempt this question.

(ii) Almost all students gained at least 1 mark and over half of the students gained both marks.
"Nutrients" was the most common correct response, and the most common distractor was "Oxygen".

(b) Some students thought the crops would grow faster because the manure would contain nutrients.
They had not read the question carefully, which asked for the effect of weeds on the growth of crops. Some thought the weeds would kill the crops, which was not allowed; a reference to slowing the growth rate was required. Quite often students did not gain the mark for describing the effect of weeds on the growth of crops, but they did give a correct reason. Usually students said that the weeds would take up the crops' space or light.

Q121.

(a) Most students gained full marks for this question, with almost all students gaining at least 1 mark. The most common correct response was "Wet"; and "Warm" was the most common distractor.

(b) The most common response was "thermometer", which usually was not creditworthy as students had not selected "Warm" in part (a). The equipment students named had to match an environmental condition that they had ticked. There were some unusually named pieces of equipment, for example light measurers. Other items that were not creditworthy included cameras, quadrats, measuring cylinders and pipettes.

Q122.

Three quarters of the students gained at least 1 mark. Few students said that small leaves reduce water loss. Most students made reference to the spines, rather than the leaves, saying animals would not eat them, or that the leaves would have a small surface area so there was less chance of the plant being blown away. Some thought small leaves would increase photosynthesis or decrease heat loss.

There were several different answers that could be given in relation to deep roots, and this is where most students scored. Some just said "To absorb water". This was insufficient as all roots absorb water; they had to say to absorb more water or nutrients from the soil. Many students gained the mark for deep roots holding the plant in the ground in strong winds. If they just said "To keep the plant strong" they could not gain this mark.

A few students gained the mark for saying competition was reduced. Others gave a description of this, but did not gain the mark if they just said "So they'll have more space". A reference to there being fewer plants around was also needed. Similarly, saying "So there were no plants around" was also insufficient. The advantage of this had to be stated.

Q123.

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(i) A large number of students simply copied the information in the table, saying under dead, dry leaves and under dead, wet leaves. There had to be added value to gain any marks. Wet or moist conditions was the most common correct response. Some said wet and dry conditions, which negated this mark. They had not considered the information to work out that most woodlice were in dark conditions. Some students said in covered conditions, or dead conditions, which were ignored. All references to temperature were ignored; those seen were split between saying warm or cold.

(ii) Students seemed to have had little experience of measuring environmental conditions. Many students gave thermometer as a piece of equipment to measure an environmental condition, but this could only score if they had made some reference to temperature in part (i), and many had not done this. Light sensor was also seen quite a lot. Incorrect responses included quadrat, transect and camera. There were several made up pieces of equipment such as water measurers.

(iii) Most students gained the mark for saying there were no repeats, not enough woodlice or not enough data. Some thought different habitats should have been surveyed, but this would not have made the conclusion more valid. There were the usual responses that were not creditworthy, such as “It wasn’t a fair test” or “It wasn’t accurate”.

Q124.

(a) (i) Many students totalled all the invertebrates sampled, rather than the number of different species.

(ii) Many students said there are more invertebrates at X, and did not answer the question which asked for a comment about the water at points X and Y. The question clearly asked for a comparison of the water at X and Y, but many just said there was a lot of sewage at Y. Some said there were different levels of oxygen in the water, but didn’t say where there was more or less. Some came up with illogical suggestions, such as the water was deeper at Y or there was more water at X. It appeared that most students had not looked at the whole table, so did not relate the invertebrates to the level of oxygen in the water.

(b) The question asked students to use information from the table to suggest why no Dragonfly nymphs were found at Y. The answer had to refer to oxygen levels. Many said Dragonfly nymphs needed medium-high oxygen levels, but did not go on to say that the oxygen level at Y was too low. If students said there was no oxygen at Y they did not gain the mark. Many said the water at Y had sewage in it, or was polluted, but this did not relate to information in the table.

Q125.

(a) (i) Most students gave food and mates as their answers. Females or males were allowed for mates. Students who said habitat did not gain the third marking point as this is not competed for. Many gave water, which was ignored. Quite a lot of students wrote a list of answers, which sometimes led to a loss of a mark if one of the things listed was incorrect. It is better not to write a long list to avoid the negation of marks.

(ii) Two adaptations with correctly linked explanations were needed for full marks. They had to say the woolly mammoth had thick or long hair or wool for the first marking point, not just hair. A thick coat was ignored. The required explanation for this was for insulation, although to trap air or heat was allowed.

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Most students just said to keep warm, which was also allowed. Some students mentioned the small surface area to volume ratio reducing heat loss, but many got the ratio confused. Small ears reducing heat loss were mentioned quite often. If students talked about large feet or tusks they had to relate these to survival in the cold, as this is what the question asked for. Some students did not understand the term adaptation, and talked about the habitat or cold conditions. Some very vague explanations were seen, many repeated the question stating'….so helped it survive in the cold' or said'….. protected it from the cold'.

(b) (i) Some students answered this well. Several said'survival of the fittest', but the question asked for the name of the process, which is natural selection. Others demonstrated some knowledge of the process using terms like adaptation, variation, mutation and reproduction, but these were not enough for the mark.

(ii) Some students gained the marks for saying the elephant used its trunk a lot or stretched it during its lifetime, and this was passed on to the offspring. Many students rewrote the stem of the question and explained Darwin's theory of evolution, talking about those elephants with more useful characteristics surviving and passing on the gene. Along similar lines, others mentioned mutations or breeding. Some explained Lamarck's theory in terms of God. This area of the specification is not well understood.

Q126.

The question was well answered and most students were cued in to the question by the photograph. The majority of students gained 2 marks for describing how good eyesight and strong, sharp claws helps the osprey to survive. They had more difficulty in explaining why powerful wings were useful, with many just saying so it can fly, which was insufficient. They had to qualify flight in some way, eg to control its flight or fly fast. Some students got confused between predators and prey.

Q127.

(a) A few students gained a mark for correctly stating that extremophiles can survive in extreme conditions. The most common incorrect responses were bacteria and microbes. Extremists was another common response.

(b) Most students attained Level 1 or Level 2. The difference given was usually that the food chain at the hydrothermal vent started with bacteria, or the food chain at the surface started with seaweed. Many explained the difference by saying there was no light at the seabed, so plants couldn't grow there. This moved the response into Level 2, but a Level 3 response had to add value – not just quote information given in the question. Some added value by explaining that plants need light to photosynthesise.

Q128.

(a) This question was very well answered, but several students lost marks because they drew more than one line from a plant. The most common error was to link large colourful flowers and a strong scent, for the Azalea, to absorbing lots of light.

(b) It was reassuring to see almost half the students gaining full marks for this open question about factors that plants compete for. The majority of students correctly

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gave space, light and water. Some just wrote ‘Sun’ which was not enough to gain the mark and many wrote food, soil or a named gas. A few students thought plants competed for mates.

Q129.

(a) This type of question had not been set before but almost a quarter of the students gained full marks. The range of acceptable answers for two marks was 32%–42%. Students were awarded one mark if they gave an acceptable number of squares covered by the plant (acceptable range 8–10.5), but failed to calculate the percentage correctly.

(b) (i) This question required a description of the distribution of the two species and quite a lot of students gained both the available marks. Students awarded one mark generally described the distribution of only one of the species, or said ‘where the number of one plant is high the number of the other plant is low’.

(ii) This question asked students to suggest reasons for the distributions they had described in part (b)(i). Consequently, the majority of students failed to make suggestions and merely again described the differences in the distribution. The most common adaptation given was that Ribwort plantain is taller, but these students had difficulty in articulating why this was an advantage. Less than a tenth of students gained both marks.

(c) Almost half of the students gained a mark for stating that there would be more plantains in the football field because of lower human influence, however there were few two mark answers seen.

Q130.

This question addressed a topic new to the specification leading to considerable variation in responses from different centres.

(a) (i) Less than half of the students recognised that the fur around the eyes would protect the eyes from dirt underground. A surprising number of students stated that the eyes would prevent the animal being seen by predators or that the eyes were not needed underground.

(ii) Almost all students made a reasonable reference to tunnelling or to catching prey.

(iii) Students generally found it difficult to put their thoughts into words and many ended up by virtually repeating the question eg ‘They can feel where they are going’.

(b) Less than half of the students gave light as the energy source. ‘Plants’ and ‘the Sun’ were common unacceptable answers.

Q131.

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This question was well answered, with over half the students scoring all three marks. When questions are asked about adaptations the response should relate the adaptation to the habitat. Many students did not link the features to how they would help the hare to survive the conditions in the Arctic. Most students gained a mark for saying the hare's thick fur helped it to keep warm. Having large feet had to be linked to the snowy or icy conditions. 'To run fast' did not gain the mark. A surprising number of students thought that hares are predators and had to be camouflaged from their prey. References to prey were ignored as long as the response made it clear that they were camouflaged or less easy to see.

Q132.

(a) Almost half of students gained two marks, with very few students not scoring anything.

(b) Climate change was a common correct answer, but a change in the weather was ignored. Some students referred to changes in temperature, but these had to be qualified, for example, 'it's warmer earlier in the UK'. Food availability or competition for food was often stated for a mark.

Q133.

In this question students were assessed on their ability to both describe differences between the tree on its own and the trees growing in a forest and to give reasons for the differences. They were also assessed on 'QWC' - their ability to use good English, organise information and use appropriate specialist terms. Most students' QWC was appropriate to the level of their scientific response.

To attain Level 3 (5–6 marks) students needed to include descriptions of at least two differences with correct explanations in terms of competition. Most students attained Level 2 (3–4 marks) by giving at least one difference which they made a reasonable attempt to explain. A basic description of a difference or explanation was all that was needed for Level 1 (1–2 marks). Some students explained the differences, but could not attain Level 2 because they had not described the differences as well.

The question was well attempted with most students organising their answers logically. Over half the students were credited with three or more marks. Some students gave confused descriptions of what the trees in the forest competed for, giving names of gases and water, which were ignored. Many mentioned leaves being eaten by animals, which was also ignored.

Q134.

(a) Most students went down the route of camouflage when answering this question. Unfortunately, some did not explain that the change in coat colour meant that it was camouflaged in both summer and winter, many just mentioned being camouflaged against the snow in winter. A surprising number of students thought that hares are predators.

Where students tried to explain the colour changes in terms of heat loss they tended to get confused, saying the dark coat absorbed heat in summer, but as it would be

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warmer in summer than winter this was not logical. They should have explained the lighter coat emitted less energy than the darker coat, so helped it to stay warmer in winter.

(b) Most students said that smaller ears would have a smaller surface area. Many then went on to say that this would stop heat loss. This did not gain credit as there would still be energy lost, but it would be less; absolutes were not credited. Some thought smaller ears would be better so then the hare wouldn't be seen as easily or that European hares needed bigger ears for better hearing. Compared to question (a) students did not do as well.

Q135.

(a) A large number of students had not read the information given in the question, or the axes on the graph, and did not realise that the graph was showing arrival dates. Many students thought the graph was showing changes in the population sizes of the two birds. Many students gave confusing statements about increasing or decreasing arrival dates and some thought the birds did not stay as long in the UK. Clear statements about changes in migratory patterns were lacking with many just giving arrival dates of the birds in a specific year. Less than half of students were given at least one mark.

(b) Many students just said ‘for food’. This was not enough to gain the mark as they had to say food was available earlier in the year (in the UK). Quite a lot of students gained the mark for a correct reference to competition with the Barn Swallow for food. Changes in temperature also had to be explained fully, for example, warmer earlier in the year (in the UK). References to global warming and climate change on their own were ignored. Very few students mentioned a mutation or change in genes as a reason for the change in migration pattern. Most students did not gain any credit for this question.

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