AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.7.1 ADAPTATIONS, INTERDEPENDENCE AND COMPETITION (PACK 2)

SCORE	PERCENTAGE
/212	%

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Mark schemes

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)

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- 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) <u>Species A :</u>
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]

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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:

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- 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

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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

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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

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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

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(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

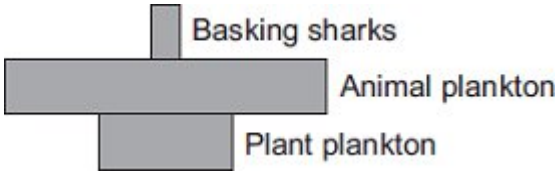
peppered moth larvae do not eat all the leaves from the trees

1

[9]

Q10.

(a)



if more than one box is ticked award no mark

1

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(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 plant (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]

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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]

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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

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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.

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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

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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

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- 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

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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*

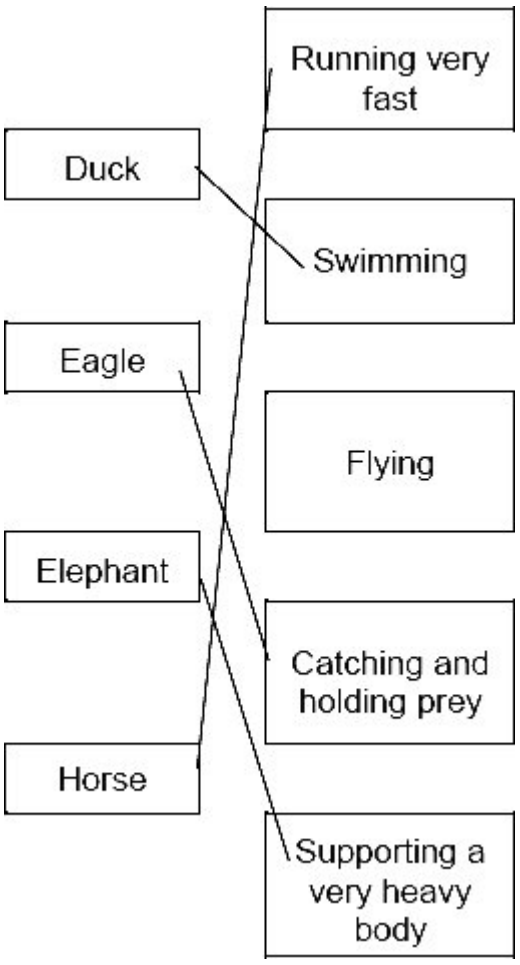
allow prevents burning

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:

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- 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) <u>rises because</u>: -
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

<u>falls because</u>: -
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

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(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

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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

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(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)

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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

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(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

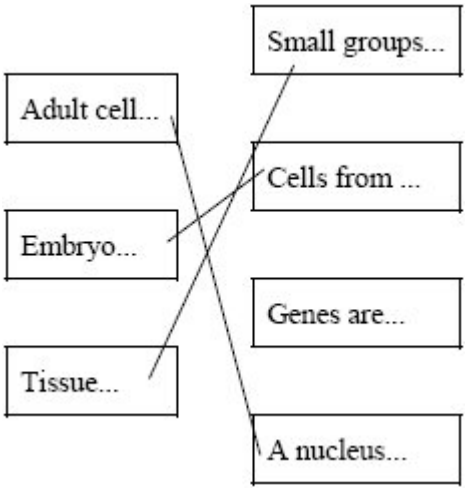
1

land available disappearing

1

(b)

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*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

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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]

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