Mark schemes

**Q1.**

(a)     any **three** from:

•        place 30-m tape measure across field / from one wood to the other

•        place quadrat(s) next to the tape

•        count / record the number / amount of dandelions / plants in the quadrat

*ignore ‘record the results’*

*ignore measures / estimates dandelions*

•        repeat every 2 metres

*allow every metre / at regular intervals*

**3**

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

*allow no light*

*ignore sun / rays*

**or**not enough water / ions / nutrients

*accept correct named ion*

*ignore no water / ions / nutrients*

**or**wrong pH of soil

*accept competition with trees for light / water / ions*

*ignore competition for space and competition unqualified*

*accept soil too acidic / too alkaline*

*ignore temperature*

**1**

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

**1**

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

*allow ‘do it in two different locations’ for 2 marks*

**1**

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

*do* ***not*** *allow ‘in other fields’*

**1**

**[7]**

**Q2.**

(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]**

**Q3.**

(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]**

**Q4.**

(a)     looks like a leaf

**1**

so predator less likely to / won’t see it

*allow ‘camouflage’ as alternative to either point*

**1**

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

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

**1**

(ii)     (giraffe) avoids being bitten by ants

*allow ants are poisonous / have unpleasant taste*

**1**

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

**1**

so predators think it has a sting

**1**

**[6]**

**Q5.**

(a)     brown (colour)

**1**

(b)     (long) ears

**1**

(c)     (long) horns

**1**

(d)     (white) ring

**1**

**[4]**

**Q6.**

(a)     C

**1**

(b)     B

**1**

(c)     E

**1**

(d)     D

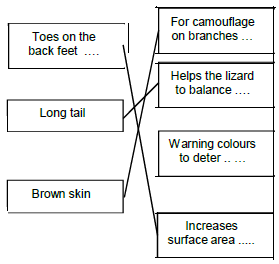
**1**

(e)     F

**1**

**[5]**

**Q7.**

(a)  


*one mark for each line*

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

**3**

(b)     escape (predators)

*accept faster than swimming*

*allow chase prey*

*allow it stops them from drowning*

**1**

(c)     food

**1**

territory

**1**

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

**[6]**

**Q8.**

(a)     an extremophile species

**1**

(b)     (i)      smaller ice area

*allow smaller amount of ice*

*allow less ice*

**1**

(so) less habitat

*allow fewer places to live / nest*

**1**

(ii)     **either** increase

as more sea to live in  
**or**as less competition for food

**or** decrease

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

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

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

**1**

(c)     Living organisms show long-term changes.

**1**

**[5]**

**Q9.**

(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]**

**Q10.**

adaptation and linked advantage eg

*max* ***2*** *for 3 adaptations*

**2**

•        roots widespread / long (1)

to collect water from large area (1)

*ignore large roots*

*accept to collect more water*

•        some roots deep / long (1)

to collect water from deep down (1)

*ignore large roots*

*accept to collect more water*

•        absence of leaves(1)

reduces water loss (1)

•        swollen stem (1)

to store water (1)

•        roots near surface (1)

to absorb rainwater (1)

•        roots widespread (1)

support in sandy soil (1)

**2**

**[4]**

**Q11.**

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

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

*allow keeps warm*

•        small ears (1)  
for reduced heat loss (1)

•        small feet (1)  
for reduced heat loss (1)

*ignore wide feet  
ignore prevent sinking*

•        white fur / coat (1)  
for camouflage / poor emitter (1)

•        small SA/V ratio (1)  
reduces heat loss (1)

•        thick layer of fat (1)  
insulates / keeps warm (1)

**max 4**

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

•        horns (1)  
for defence (1)

•        long legs (1)  
for speed / escape / vision (1)

•        light colour (1)  
for camouflage (1)

*allow pattern*

•        eyes on side of head (1)  
for wider field of vision (1)

•        hooves (1)  
for speed / escape (1)

•        large ears (1)  
to hear predators better (1)

**max 4**

**[8]**

**Q12.**

(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]**

**Q13.**

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

**0 marks**

No relevant content.

**Level 1 (1 – 2 marks)**

At least **one** way in which animals **and / or** plants are adapted to survive.

**Level 2 (3 – 4 marks)**

A description of ways in which animals **and / or** plants are adapted **and** an attempt to link at least **one** adaptation to how it increases the chance of survival.

**Level 3 (5 – 6 marks)**

A description of ways in which animals **and** plants are adapted **and** a description of how at least **one** adaptation increases the chance of survival.

**examples of biology points made in the response:**

**(animals)**

(A) change / decrease in surface area / example

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

(A) hump with fat / fat stores

(fat in hump) to convert to water (via respiration)

(A) long eyelashes

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

(A) nocturnal / ‘keep out of the sun’

reduce sweat loss (in heat of the day)

***extra information***

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

*(A) change / increase in surface area / example*

*(increase in surface area which) increases area heat may be lost from (by radiation)*

*(A) changes to thickness of insulating coat*

*(thicker coat on upper surface) increases insulation from sun’s heat*

*(A) thin (layer) / reduced amount of body fat*

*(reduced amount of body fat which) reduces insulating layer*

*(A) wide feet*

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

**(plants)**

(A) decrease in surface area

(A) leaves are spikes

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

(A) long / wide spread / extensive roots

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

(A) fleshy / thick stem

(fleshy / thick stem) to store water

***extra information***

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

*(A) thick wax*

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

*(A) few(er) stomata*

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

**[6]**

**Q14.**

(a)     gets more light (near surface)

*allow warmer (near surface)*

*allow bladders contain (more) carbon dioxide*

**1**

(so) photosynthesises more

**1**

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

**or**

(so) more biomass / glucose / starch produced

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

*if ‘more’ not given do not award mark on the first occasion*

**1**

(b)     lets angler fish see / attract its prey / mates **or** see predators as it is dark (at 1000m)

**or**

lets angler fish see / attract prey to get food

**or**

lets angler fish see / attract mates to reproduce

**or**

lets angler fish see predators to avoid being eaten

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

**2**

**[5]**

**Q15.**

(a)    (reduced) competition

*ignore fighting*

**1**

for any **one** from:

•       light

*ignore Sun*

•       water

•       nutrients / ions / salts / minerals

*ignore food*

•       space

*allow less overcrowding*

•       colonise new areas

**1**

(b)     hooks

*allow spines*

**1**

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

*ignore wind dispersal*

**1**

**[4]**

**Q16.**

(a)     estimate / count number of squares covered

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

**1**

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

**1**

(b)     (i)      any **two** from:

•        more / most in North east facing

•        followed by the North facing

•        the South facing had no green alga / least

**2**

(ii)     40 (%)

**1**

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

*accept this is the most common percentage / value*

*2nd mark only if 40(%)*

**1**

(iii)    any **three** from:

•        light / sunlight

*ignore Sun / carbon dioxide*

•        temperature

*do* ***not*** *accept oxygen*

•        availability of water / humidity

•        availability of nutrients

•        wind

•        pollution qualified eg SO2, acid rain, soot

•        grazing by animals eg slugs

•        competition with other species

•        pH

**3**

(iv)    eg (*for light*)

*allow overlap between factors*

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

**1**

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

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

**1**

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

*allow green algae unable to withstand desiccation*

**1**

**or** (*for temperature*)

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

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

green algae unable to withstand desiccation

**or** (*for moisture / rainfall*)

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

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

green algae less likely to desiccate (1)

**or** (*for wind*)

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

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

*allow wind carries pollutants*

*allow pollutants toxic to algae*

green algae unable to withstand desiccation (1)

**or** (*from pollution*)

from south / south west (1)

wind carries pollutants (1)

pollutants toxic to / kill algae (1)

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

*allow positive correlation / proportional*

*allow directly proportional*

**1**

scattered results / wide spread

*allow use of approximate numbers to demonstrate scattering*

**or**

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

*allow not a strong relationship / correlation*

**1**

(ii)     not very useful / unreliable

*accept only gives a rough idea / only a general indication*

**1**

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

*allow correlation rather than direct relationship*

**or**

scattered results

**1**

**[16]**

**Q17.**

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

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

*allow keeps warm*

•        small ears (1) for reduced heat loss (1)

•        small feet (1) for reduced heat loss (1)

*ignore wide feet*

*ignore prevent sinking*

•        white fur / coat (1) for camouflage / poor emitter (1)

•        small SA/V ratio (1) reduces heat loss (1)

•        thick layer of fat (1) insulates / keeps warm (1)

**Max 4**

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

•        horns (1) for defence (1)

•        long legs (1) for speed / escape / vision (1)

•        light colour (1) for camouflage (1)

*allow pattern*

•        eyes on side of head (1) for wider field of vision (1)

•        hooves (1) for speed / escape (1)

•        large ears (1) to hear predators better (1)

**Max 2**

**[6]**

**Q18.**

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

**0 marks**No relevant content.

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

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

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

**Examples of points made in the response:**

•        use of tape measure to produce transect

•        transect placed coming out of shady area (e.g. woodland) into lighter area

•        repeat transects

•        samples at same height above ground

•        samples at same aspect (N / E / S / W) on trees

•        measurement of length, or width, of leaves using ruler

•        measure several leaves at each location

•        use of light meter to measure light intensity

•        repeat measurements of light intensity on several days

•        measure light intensities at same time of day

•        calculate mean for each location

•        plot graph of mean leaf length, or width, vs. light intensity.

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

**[6]**

**Q19.**

(a)      (i)     increased water uptake

*ignore nutrients / food*

*allow quicker water uptake*

*allow collects water over larger area*

**1**

(after) rain

*accept ideas in terms of more successful competitor*

**1**

(ii)     water storage **or** stability **or** safety from predators

*ignore absorption of water from soil*

**1**

(b)     reduces water loss / evaporation

*accept reduces transpiration*

*allow stops water loss*

**1**

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

*ignore reflects light*

**1**

folding reduces surface area **or** folding reduces warming

*accept enclosed stomata* ***or*** *less exposure of stomata* ***or*** *increased humidity* ***or*** *less water concentration gradient*

*allow prevents burning*

*ignore less likely to be damaged*

**1**

**[6]**

**Q20.**

(a)     any **three** from:

•        streamlined shape enables it to swim quickly (to catch fish)

•        wings (provide power) to move quickly (to catch fish)

*allow ‘flippers’*

•        wings used for steering

•        white underside / dark top acts as camouflage (so prey less likely to see it)

•        long / sharp beak to catch fish

**3**

(b)     any **three** from:

•        reduces (total) surface area of penguins exposed to wind / cold atmosphere

•        reduced number of penguins exposed (to wind / cold)

*accept reference to movement in or out of the huddle*

*accept outer ones insulate / act as barrier*

•        reducing heat loss

*allow reduced cooling*

•        ‘share’ body warmth / heat

**3**

(c)     (i)      any **two** from:

•        size of tubes

•        volume of (hot) water

*accept amount of (hot) water*

•        left for same length of time

*allow measured at same time intervals*

•        starting temperature

**2**

(ii)     any **two** from:

•        tube alone (**C**) lost heat most (rapidly)

•        tube **B** intermediate

•        tube **A** least (rapidly)

*allow correct use of figures for all 3 tubes*

*ignore just quoting final temperature*

**2**

(iii)    confirms suggestion

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

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

*comparison needed*

**1**

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

*accept ‘it is the same for penguins’*

**1**

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

blood vessels supplying the skin (capillaries) dilate / widen

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

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

*ignore enlarge / expand*

*reference to skin / surface required only once*

**1**

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

*reference to ‘more’ needed at least once to gain* ***2*** *marks*

**1**

and more heat is lost

*reference to ‘more’ needed at least once to gain* ***2*** *marks*

**1**

**if the core body temperature is too low**

blood vessels supplying the skin (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]**

**Q21.**

(a)     (i)      counts / 12

**1**

× 120 × 80 / × 9600  
**or**

× area of field

**1**

(ii)     (more) quadrats / repeats

**1**

placed randomly

*ignore method of achieving randomness*

**1**

(b)     (i)      any **three** from:

•        temperature / warmth / heat

•        water / rain

•        minerals / ions / salts (in soil)

*allow nutrients / fertiliser / soil fertility*

*ignore food*

•        pH (of soil)

•        trampling

•        herbivores

*ignore predators*

•        competition (with other species)

•        pollution qualified e.g. SO2 / herbicide

•        wind (related to seed dispersal).

*ignore space / oxygen / CO2 / soil unqualified*

**3**

(ii)     light needed for photosynthesis

**1**

for making food / sugar / etc.

**1**

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

**1**

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

**1**

(algae / plants) block light

**1**

(low light) causes algae / plants to die

**1**

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

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

**1**

(aerobic) respiration (by microbes) uses O2

*do* ***not*** *allow anaerobic*

**1**

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

*allow suitable named examples eg metals such as Pb / Zn / Cr / oil / SO2 / acid rain / pesticides / litter*

*ignore chemicals unqualified*

*ignore waste unqualified*

*ignore human waste / domestic waste / industrial waste unqualified*

**1**

(d)     (i)      2

**1**

(ii)     more food

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

**1**

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

*allow fewer species in more polluted water*

*ignore none are found at site C*

**1**

**[19]**

**Q22.**

(a)    extremophile(s)

**1**

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

*either order,* ***both*** *required*

**1**

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

*allow habitats overlap the most*

**1**

(iii)    any **two** from:

•         would have wrong food

•         would otherwise be exposed to (specific) predators

•         cannot tolerate extended exposure to air **or** reduced submersion in seawater

*allow cannot tolerate temperature / dehydration*

•         cannot tolerate high salt concentration (in rock pools)

*allow low salt concentration (in rock pools)*

•         cannot compete with small periwinkle

**2**

**[5]**

**Q23.**

(a)    guard cell

*ignore stoma / stomata*

**1**

(b)     Species A :

*allow converse points for species B*

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

**1**

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

**1**

heat (energy) /warmth increases evaporation / transpiration

*must give explicit link between heat and transpiration*

**1**

reduces water loss / evaporation / transpiration

*ignore photosynthesis*

**1**