# Mark schemes

**1**

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

*allow pointed / curved wings*
*ignore pointed tail / beak*

OR

large / long wings

*ignore large tail*

**1**

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

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

**1**

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

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

**2**

(ii) nesting sites / territory / habitat

*allow homes / space*
*ignore food unqualified*
*allow well qualified food answers*
*eg insects / food near the ground*
***or***
*insects / food when it's light*
***or***
*insects / food between early May and early August*

**1**

**[5]**

**2**

(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]**

**3**

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

- same volume of solution

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

  *do **not** allow same number of species*
- same age / stage of invertebrates / animals

2

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

1

correct interpolation to X axis

*if no work on graph allow 250*

1

(c) (i) (C)

50% killed at lowest / low copper concentration

*ignore least survivors*

1

(ii) any **two** from:

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

**2**

**[7]**

**4** (a) stays cool
*ignore shade*

**1**

less sweat

**1**

(b) any **two** from:

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

**2**

**[4]**

**5** (a) (i) conserves water owtte

**1**

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

**1**

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

**1**

(b) animal could overheat owtte

**1**

**[4]**

**6** (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]**

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

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

**2**

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

fossil has hind limb / legs / feet

*it = minke*

*accept any valid comparison*

fossil has more ribs / bones

fossil has teeth

fossil has curved spine

**2**

(ii) billion

**1**

give evidence for

**1**

**[6]**

**8** (a) wing pattern similar to *Amauris*

**1**

birds assume it will have foul taste

**1**

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

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

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

**1**

these butterflies survived

**1**

breed / genes passed to next generation

**1**

**[5]**

**9**

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

*list principle*

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

**2**

(ii) less competition for water
*ignore space / light / food*

**or**

more water / nutrients / minerals available

**1**

(b) camouflage / same shape as leaf / looks like a leaf
*allow 'blends in'*
*ignore colour*

**1**

**[4]**

**10**

(a) any **two** from:

*control variables from information given*

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

**2**

(b) any **two** from:

*must be ideas related to a sample*

- some animals not dislodged
  *ignore reliability etc*
- some animals missed / through / escaped net
- invertebrates difficult to identify
- invertebrates from outside area

**2**

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

**1**

(d) any **two** from:

- increased / goes up
  *allow increase implied from all data described*
- 0 at sample 4
- to (more than) 100

**2**

(e) mayfly

**1**

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

**1**

**[9]**

**11** 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]**

**12**

(a) points plotted accurately

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

*deduct 1 mark per error*

*ignore the line*

**2**

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

*accept 30 000 lynx*

*do **not** accept 30 000*

**1**

(c) (i) fall

*mark (i) and (ii) separately*

1

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

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

1

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

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

1

**[6]**

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

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

Polar bear has

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

*accept converse points re sun bear*

1

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

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

1

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

1

energy reserve **or** can release heat

1

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

1

**[5]**

**14** (a) (i) increases

1

(ii) decreases

1

(b) any **two** from:

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

*accept correct named example*
*do **not** accept food*
*do **not** accept <u>all</u>*

- competition for light

**2**

(c) kills / harms other / named organisms

**1**

**[5]**

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

*ignore references to ions throughout ignore animals eating plant*

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

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

<u>deep</u> roots

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

*accept 'moisture' for water*

roots near surface so can obtain water when it does rain

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

swollen stem so can store water

**[3]**

**16** (a) (i) 144

**1**

(ii) 1955 **or** 1979

**1**

(b) (i) 144-12 = 132

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

**1**

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

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

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

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

**1**

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

*do **not** accept statements equating births and deaths or increase or decrease in predators*

**1**

**[5]**

**17** (a) (i) traps air

*note 'keeps warm' is stem*

**1**

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

*accept air is a poor (thermal) conductor*

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

**1**

(ii) **increases** insulation

*do **not** accept keep warm*

**1**

retains body heat or prevents heat loss

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

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

**1**

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

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

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

**1**

**and**

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

*generates more heat*

**1**

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

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

**1**

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

*accept this idea in own words*

**1**

(c)

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

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

any **two** from:

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

*accept no **or** fewer stomata*

*accept no leaves*

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

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

**2**

**[10]**

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

*(allow qualified answers in terms of wings)*

*(allow two adaptations)*

**2**

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

*(allow qualified answers in terms of feet)*

*(allow two adaptations)*

*each for 1 mark*

**2**

**[4]**

**19** (i) 8

*gains 1 mark*

**1**

(ii) winter

*gains 1 mark*

**1**

(iii) e.g. colder/shorter days

*gains 1 mark*

**1**

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

before oak leaves emerge

*each for 1 mark*

**2**

(v) April

*gains 1 mark*

**1**

(vi) e.g. more available food

*gains 1 mark*

**1**

**[7]**

**20** (a) (i) squirrels eat nuts;

*each for 1 mark*

owls eat squirrels

*(2 marks for energy flow)*

**2**

(ii) hazel tree

*gains 1 mark*

**1**

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

*each for 1 mark*

**2**

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

*each for 1 mark*

**2**

(b) (i) digested/broken down;

(ii) by microbes/reference to worm action;

*each for 1 mark*

**2**

(iii) March
warmer/increased activity of worms/microbes;
*each for 1 mark*

2

**[11]**

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

4

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

4

**[8]**

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

4

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

3

**[7]**

**23** Cogently argued based on biological principles, for **and** against introduction of caterpillar

maximum of 4 pros e.g.
fewer chemicals used therefore less expense
less chemical damage to other plants
consequent benefits to food chains
fewer farm animals poisoned therefore more economic
countryside more varied therefore more attractive to tourists
tourists bring economic advantages
greater variety of habitats therefore greater variety of species

*any 4 for 1 mark each* **4**

cons e.g.
danger to livelihoods if crops destroyed by caterpillar
relatively low chance of success since only one third of schemes effective world-wide
unlikely to be natural predators therefore ecological balance affected

*any 2 for 1 mark each* **2**

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

**[8]**

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

(b) e.g.
greys eat greater range of food
greys larger – more effective competitors **2**

**[4]**

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

*for 1 mark each*

**[4]**

**26** (a) from 20.00 to 4.00

*for 1 mark*

1

(b) line correct length

*for 1 mark*

1

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

*for 1 mark each*

2

**[4]**

**27** (a) 1 mark for each correct set of plots

*for 1 mark each*

2

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

*for 1 mark*

1

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

*for 1 mark each*

2

**[5]**

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

*for 1 mark each*

3

(b) they run out of minerals

*for 1 mark*

1

**[4]**

**29**

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

*two for 1 mark each*

**2**

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

*for 1 mark*
*description of whole pattern for one mark*

**1**

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

*for 1 mark*

**1**

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

*for 1 mark*

**1**

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

*any two for 1 mark each*

**2**

**[7]**

**30**

<u>pros e.g.:</u>

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

cons e.g.:

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

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

**[4]**

**31** (i) 0.25 × 100 / 25

*gains 1 mark*

**but**
1%

*gains 2 marks*

**2**

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

*any three for 1 mark each*

**3**

**[5]**

**32** camouflage (when hunting)

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

**1**

insulation (from cold)

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

NEUTRAL RESPONSES –
protection, waterproof

**1**

**[2]**

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

*max 2 if ideas not well expressed*

in summer more greenfly

*accept increase in population*

**1**

in winter less greenfly

*accept decrease in population*

**1**

over the three years greenfly numbers decrease

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

**1**

(b) any **one** from

(number of) greenfly

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

*do not accept food*

**1**

**[4]**

**34** any **two** from

swollen stem stores water (for dry periods)

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

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

**[2]**

**35** (a) any **one** from

big, flat feet

long eyelashes

long hair around openings to its ears

**1**

(b) (the came) does not need insulation

*accept can keep warm without the fat*

**1**

(c) any two from:

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

*any order for the reasons*

**2**

**[4]**

**36** (a) (long) roots

**1**

(b) prevents water from evaporating

*accept to reduce/stop water loss*

**1**

**[2]**

**37** (a) any **three** from:

space

*accept land, room*

water

*accept rain*

nutrients

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

light

carbon dioxide

**3**

(b) herbicides

**1**

**[4]**

**38** (a) 1 for insulation / prevents heat loss

*keeps cold out neutral keeps it warm neutral*

**1**

2 camouflage / other animals cannot see it

**1**

(b) 1 heat loss

*reject shade*

**1**

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

**1**

**[4]**

**39** (a) any **three** from

*different factors are required for each mark*

hares breeding

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

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

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

disease (spreads through the population)

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

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

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

**3**

(b) any **two** from

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

*accept less food, less breeding*

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

*accept less food, less survival*

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

**2**

**[5]**

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

*accept not damaged by grazing animals*

*accept do not get cut or bitten*

*accept reduces competition by other plants*

*do not credit maximum surface of leaves facing Sun*

**1**

(ii) any **one** from

it can force its way through grass roots

*accept in competition with grass roots*

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

*do not credit a good store of water*

to reach down to water

to give good anchorage

*accept it is hard to pull up*

**1**

(iii) any **one** from

to reach more light

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

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

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

*do not credit to help it grow up the hedge*

**1**

(iv) any one from

(they reach out from hedge) to find water

*accept increase surface area*

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

*do not award mark if food mentioned*

to give good anchorage

**1**

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

*do not credit chromosome*

**1**

(ii) any **one** from

they do not crossbreed **or** interbreed

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

do not produce fertile offspring

have different numbers or types of chromosomes

*accept genes are incompatible*

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

*do not credit do not pollinate each other*

**1**

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

have white fur

*for camouflage*

are huge

*for large volume to surfae area*

thick layer of fat

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

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

have thick fur

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

hibernate

*to avoid the coldest part of year*

is a carnivore

*because animals provide high energy food*

has big paws **or** claws

*to be able to walk on snow*

have small ears

*to reduce heat loss*

have furry feet

*for insulation from the snow*

**2**

**[8]**

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

**1**

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

*accept more light means more growth*
***or** they multiply more in more light*
*do not accept they need light*

**1**

(b) (i) eaten by small fish

*do not accept eaten by fish*

1

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

1

(ii) any **two** from

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

*accept more being eaten than being formed*

eaten by small fish

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

1

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

1

any **one** from

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

*do not accept death of large fish*

1

influx of minerals in an ocean current

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

1

**[8]**

**42** (food chain) A gives 7 200 kJ (of useful energy)

***or*** *7.2 MJ*
***or*** *7 200 000 J*
*unit essential in each case*

1

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

***or*** *0.96 MJ*
***or*** *960 000 J*
*unit essential in each case*

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

1

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

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

**1**

(so) (food chain) A is 7.5 times more efficient than (food chain) B

***or*** *for every unit of useful energy given*

*to a person by B, A gives* $7\frac{1}{2}$ *units*

***or*** *food chain B is only 13(.3) % as*
*efficient as food chain A*
***or*** *makes a correct comparison*
*in percentage terms*

**1**

**[4]**

**43**

(a) (i) correct reasons - different

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

*any 2 for 1 mark each*

[mark solely on different environmental condition]

**2**

(ii) grow different dandelions in the same conditions

*for 1 mark each*

**or**

grow the same type of dandelions in different conditions

*for 1 mark each*

**2**

(b) dandelions shorter/smaller/same height

*for 1 mark*

because (named) condition changes

*for 1 mark*

[may refer to answer in a(i)]

**2**

**[6]**

**44**

(a) trees in wood (allow converse)
taller
fewer leaves
thinner trunks
fewer branches
branches/leaves at top only

*any 2 for 1 mark each*

**2**

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

*any 3 for 1 mark each*

3

**[5]**

**45**

(a) (i) predator (allow carnivore)

(ii) prey

*each for 1 mark*

2

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

*each for 1 mark*

2

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

*any two for 1 mark each*

2

**[6]**

**46** idea brown colour/plain shell inconspicuous

*for 1 mark*

less likely to be eaten

*gains 1 mark*

**but**

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

*gains 2 marks*

so alleles (genes) passed on

*for 1 mark*

*(N.B accept inverse of any of the above)*

**[4]**

**47** (a) B plants are:

taller

smaller/thinner leaves

thinner stem or vice versa in referring to A plants

*any two for 1mark each*

**2**

(b) water/rain/moisture

nutrients/any specific mineral (N/P/K)

*each for 1 mark*

**2**

**[4]**

**48** (a) *idea:*

wood goodness recycled/crops goodness removed

*gains 1 mark*

**1**

**but**

wood minerals/nutrients recycled/crops remove nutrients/minerals

*gains 2 marks*

wood and crops compared

*for 1 mark*

**2**

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

*any two for 1 mark each*

*(accept move to new area for 1 mark)*
rotation

*max marks 2*

**2**

**[5]**

**49** (a) predator/carnivore

*(not consumer/hunter)*

*for 1 mark*

**1**

(b) (i) number decrease
not 'no' less food (for large mites)/less prey/fewer small mites to eat
(not 'fewer small mites' etc)
starve/cannot grow/cannot breed/die/die out

*each for 1 mark*

**3**

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

*each for 1 mark*

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

*each for 1 mark*

**2**

**[6]**

**50** (a) idea

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

  *Accept any clear and consistently used notation*
- identify BB, Bb as plain
- identify bb as banded
- ratio 3:1 unbanded/banded (stated or clearly implied
- matches 35:12 results e.g. all the outcomes clearly identified as banded/unbanded)

*for 1 mark each*

**7**

(b) *idea*

- many genes control [accept "continuous variation"]
- many alleles for a gene/large genepool
- snails can inherit lots of different combinations
- mutation (gives rise to many alleles)
  *allow* selection allows alleles to be passed on unless [very]disadvantageous or if advantageous

*any 4 for 1 mark each*

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

**4**

**[11]**

**51** *idea*

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

*for 1 mark each*

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

**[4]**

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

*any 4 for 1 mark each*

**4**

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

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

**or**

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

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

*for 1 mark each*

**3**

**[7]**

**53** (a) predator
prey

*no alternatives*
*for 1 mark each*

**2**

(b) *idea that*
(wasps) increase OR decrease

*gains 1 mark*

**but**
(wasps) increase then decrease/peaks at

*gains 2 marks*
*answers must match*

*idea of change in food supply/whiteflies*
more food/whiteflies OR less food/ whiteflies

*gains 1 mark*

**but**
more food/whiteflies then less food/whiteflies

*gains 2 marks*

**or**
wasps follow trend in whiteflies

*for 2 marks*

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

*for 1 mark each*

**4**

(c) *idea that*
wasps die out/die off/fly away/migrate/leave greenhouse but NOT 'die' alone

*for 1 mark*

**1**

**[7]**

**54** Factor and effect needed.
*idea*

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

*any three for 1 mark each*

**[3]**

**55** (a) too cold in Britain / warmer in Africa

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

*each for 1 mark*

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

**2**

(b) feed at different heights

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

**1**

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

*for 1 mark each*

**2**

**[5]**

**56** *ideas that*

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

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

*for* 'Fibres stop the fruit sinking'

'Wax provides water resistance'

*Award 2 marks*

*any three for 1 mark each*

**[3]**

**57** (a) idea that

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

*gain 1 mark each to maximum of 2*

**but**
so they can photosynthesise

*gains 2 marks*

**2**

(b) herring will be on the bottom
herring follow / will be feeding on the copepods

independent marking points

*for 1 mark each*

**2**

**[4]**

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

*for 1 mark*

**1**

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

*for 1 mark*

**1**

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

*for 1 mark*

**1**

(d) release body heat / keep cool

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

*for 1 mark*

**1**

**[4]**

**59** (a) prey

*for 1 mark*

**1**

(b)

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

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

*any three for 1 mark each*

3

**[4]**