

**M1.** (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]**

**M2.** (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]**

- M3.** (a)
- warmth / heat / hot / not cold if refer to weather or
  - moisture / water conditions outside the compost heap, *do not allow*
  - air / oxygen (*allow idea that not squashed down*)  
*in any order for 1 mark each*
- 3
- (b) *idea that* nutrients / minerals / nitrates are recycled / fertilise the soil  
(*do not allow* food / goodness)  
*for 1 mark*
- 1

[4]

- M4.** (a) 1  
*for 1 mark*
- 1
- (b) skin  
kidneys  
*for 1 mark each*
- 2
- (c) (i) *idea that*  
there will be less / no sodium (per day) (in her urine)  
*for 1 mark*
- 1
- (ii) *idea that*  
she should take in more sodium (chloride) / salt  
(*allow* stay indoors / in shade **or** be less active)  
*for 1 mark*
- 1

[5]

- M5.** (a) (i) moist (warm and cold are neutral)  
for 1 mark 1
- (ii) *idea that roots / plants (only) grow with moisture (second condition negates answer)*  
*idea that same (amount of growth) whether warm or cool*  
for 1 mark each 2
- (b) *idea that quicker / cheaper / more successful / same as the parent plant*  
for 1 mark 1

[4]

- M6.** (a) breath same + sweat more\* + urine less\* (*All three needed*)  
or  
total same but split differently  
for 1 mark
- \*either change correctly quantified eg*  
**x** cm<sup>3</sup> more/less or **n** times more/less  
for 1 further mark
- sweat 250 more    6 x more  
urine 250 less    ¼/25%less 2

- (b) *ideas that*
- you sweat (more) to keep cool on a hot day
  - urine adjusted (by kidneys) to keep balance / to keep same total loss  
each for 1 mark

*(NB credit these answers if in (a) candidates have answered more fully than expected)*

(c) *ideas that*

- when blood water normal/100% / steady kidney re-absorbs water at low/steady rate
- when blood water percentage falls, the rate at which kidney re-absorbs water rises
- when blood water percentage rises again, is high/normal the rate at which kidney re-absorbs water falls
- 97 / 97.5% / 98% (of normal) blood water is the point at which the kidney's reabsorption rate starts to increase / decrease  
*each for 1 mark*

*[allow idea that there is delay between blood water percentage changing and rate of re-absorption changing]*

4

(d) *any reference to hormone(s) / pituitary (gland)*  
*gains 1 mark*

but  
ADH or hormone(s) from pituitary (gland)  
*gains 2 marks*  
*(do not allow 'brain')*

2

[10]

**M7.** (a) photosynthesis  
*for 1 mark*

1

(b)

- grass eaten by rabbit
- rabbit eaten by fox
- carbon becomes part of fats/proteins in the fox's body

- or passes along the chain as (carbohydrate) / fat / protein  
each for 1 mark  
*[Do not accept 'carbon gets into fox's body', for third mark]*

3

[4]

**M8.** *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]

**M9.** (a) (i) (tiny green) plants / phytoplankton  
*for 1 mark*

1

(ii)

- penguin
- shrimp

- cod
  - squid
- any two for 1 mark*

1

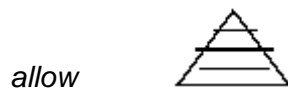
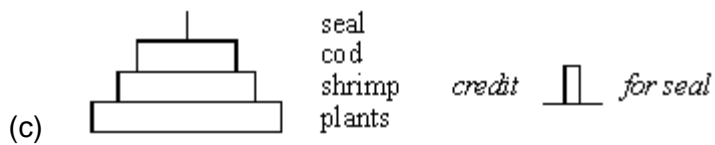
(b) Decrease: seals will eat more squid and penguins  
*for 1 mark*

1

Stay the same:

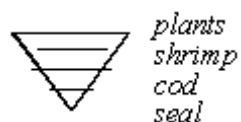
- more shrimp for squid and penguins
  - squid and penguins increase balances the extra eaten by seals
  - seals find other prey [allow shrimps]
- any two for 1 mark each*

2



- correct / shape (designs need to be to scale)
- correctly labelled with organisms

(if wholly correct but inverted then credit 1 mark)  
*each for 1 mark*



2

[7]

- M10.** (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]**

- M11.** (a) sweat – 6 squares high  
urine – 15 squares high  
each to < half a square for 1 mark each

2

- (b) for hot day (assumed unless otherwise stated)
- same in breath
  - same total
  - more in sweat\* / sweats more
  - less in urine\* / urinates less
  - correct quantification of either \* eg  $x\text{cm}^3$  more / less or **n** times more / less  
250  $\text{cm}^3$  more sweat    6 x more sweat

250 cm<sup>3</sup> less urine    ¼ / 25% less urine  
any four • for 1 mark each  
[Do not allow just figures quoted from the table]

4

(c) *ideas that*

- you sweat more **to keep cool** on a hot day
- urine adjusted (by kidneys) to keep balance / to keep same total loss  
*each for 1 mark*

[Accept "more sweat therefore less urine"]  
[Credit ideas from (c) if given in (b)]

2

[8]

**M12.** (a) (i) asexual / non-sexual / cloning    [not artificial]  
*for 1 mark*

1

(ii) gene / allele / chromosome / DNA  
*for 1 mark*

1

(iii) A) same / look alike / similar  
*gains 1 mark*

**but** same sex / all female / all black / identical / clones  
*gains 2 marks*

B) same as the black (female)  
*for 1 mark*

3

(b) (i) ovaries [not reproductive organs]  
*for 1 mark*

1

(ii) hormones / fertility drugs / FSH  
*for 1 mark*

Allow LH



**M13.** 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]

**M14.** (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 = 0 maths but 1 mark for possible reason can be awarded -  
more (small mites) eaten

each for 1 mark

2

[6]

- M15.** (a) (i) carbohydrate\*/fat/protein in cell  
(or example e.g. glucose/starch)

for 1 mark

1

- (ii)  $\frac{21500}{1050000} \times 100$  or 2.(05)%

for 1 mark

1

- (b) *ideas that:*  
little energy used for growth/most wasted/lost  
*gains 1 mark*

**but**

only 4% used for new growth  
*gains 2 marks*

evidence/idea that this is repeated at each stage  
idea of diminishing return/less energy at each stage  
*for 1 mark each*  
*(maximum of 3)*

3

- (c) *idea:*  
plants at the start of all food chains  
shorter food chain  
more efficient/less energy lost/more food  
cheaper/more economic  
(must bear consequence of at least one of earlier marks)  
*any three for 1 mark each*

3

[8]

- M16.** (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]

##

idea of information/characteristics/features/DNA  
 [alternative answer – how they are passed on i.e via reproduction]  
 eggs/ova [**not** ovaries] sperm  
*idea that they have inherited their parents' genes*  
*each for 1 mark*

[4]

<b>M18.</b>	(a)	evaporates	1
		sea	1
		sun	1
		<i>accept sun</i>	1
		wind	1
		condenses	1
		rain	1
	(b)	(i) carbon dioxide	
		<i>accept CO<sub>2</sub> provided it is correct in every detail</i>	1
		(ii) (process) D	1
		millions of years	
		<i>a million years upwards</i>	1

[9]

<b>M19.</b>	top left label sensory	<i>credit afferent</i>	
		<i>do not accept receptor</i>	1
	bottom right label connector <b>or</b> relay	<i>credit intermediate</i>	
			1
	bottom left label motor <b>or</b> effector	<i>credit efferent</i>	
			1

[3]

**M20.** (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 surface 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]

**M21.** (a) brain

1

(b) receptor **or** sensory **or** afferent  
*connector or relay*

3

effector **or** motor **or** efferent

(c) any **one** from  
blink (of eye)

*accept a violent movement of a limb from pain or sharp object*

knee jerk

*do not credit snatch from cold object or any temperature reference e.g. boiling water*

*accept sneezing, coughing, choking, vomiting, pupil closing or reflex*

1

(d) danger **or** a signal detected (by nerve)  
**or** impulse sent

1

goes to **or** through spine

*accept impulse by-passes the brain  
do not award mark if brain mentioned  
do not credit message to spine*

1

a very rapid response occurs **or** then to  
effector **or** muscle **or** motor

*accept no thinking time is needed*

1

[8]

**M22.** an impulse **or** electrical signal  
*accept electrical pulse do not credit message*

1

in receptor **or** neurone of retina  
*accept nerve **or** rod **or** cone*

1

sent along optic nerve  
*do not credit inverts the image*

1

[3]

**M23.** (a) 850

1

(b) (i) more

because exercise makes us sweat **or** work harder  
*accept to cool the body*  
*do not credit body hotter or giving off more heat*

2

(ii) more

because she respire more  
*accept she breathes (in and out) more **or** heavier **or** faster*

2



(iii) less  
because (more) water has been lost by sweating **or** breathing out **or** other methods  
*accept arguments about conservation of water*

2

(c) kidney

1

[8]

**M24.** (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]

**M25.** (a) all bars correct for greenfly, ladybird ( $\pm$  one square) and blackbird (less than one square)

1

bars are centred

*do not accept pyramid shape if **all** to left or right of centre*

1

bars are labelled (in correct sequence)

1

(b)  $\frac{1}{12}$  or 8.3% or 1:12

*if answer is incorrect accept correct*

*working out (eg  $\frac{50}{600}$ ) for 1 mark*

*accept 12 or 12:1 for 1 mark*

*accept 8.3 for 1 mark (without %)*

2

[5]

**M26.** (a) any **two** for one mark each

*answers should relate to the ideas in the list*

birth control pills are 99 % effective in preventing pregnancy

the hormones in the pills give protection against some women's diseases

*condom (neutral)*

the woman's monthly periods become more regular

2

(b) any **two** for one mark each

*answers should relate to the ideas in the list*

the hormones in the pills have some rare but serious side effects

**only** 99% effective

this method of birth control provides no protection against sexually transmitted disease

a woman has to remember to take a pill every day

2

[4]

**M27.** Quality of written communication: One mark for using correct scientific terms microorganisms and respiration 1

(air contains) oxygen 1

(microorganisms break down human waste) by respiration (which releases carbon dioxide) 1

[3]

**M28.** (a) genetically identical / same genetic information / same DNA 2

*accept identical / same chromosomes / alleles / genes*

*allow 1 mark for identical same characteristics*

(b) Quality of written communication: Correct sequence split → transfer 1

any **two** from

- split apart cells (from embryo)
- before specialised  
*allow early stage*
- implant / transplant
- into host / mother / uterus / womb

2

[5]

<b>M29.</b>	ovaries	<i>accept ovary</i>	1
	womb	<i>accept uterus</i>	1
	fertility	<i>accept FSH</i> <i>do <b>not</b> accept fertilisation</i>	1
	contraceptive(s)	<i>allow birth control</i> <i>accept oestrogen <b>or</b> progesterone</i> <i>do <b>not</b> accept pill alone</i>	1
			<b>[4]</b>

<b>M30.</b>	any <b>two</b> 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		<b>[2]</b>

<b>M31.</b>	(a) <b>Quality of written communication</b>		
	<i>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</i>		
	idea of mutation <b>or</b> variation	<i>do <b>not</b> allow 'bacteria get used to antibiotics' <b>or</b> idea that antibiotics change the bacteria <b>or</b> 'bacteria become immune' <b>or</b> references to adaptation or evolution</i>	1

(resistant cells) survive antibiotic 1  
(resistant cells) breed 1

(b) **EITHER** (yes)

keep animals disease free (1) so grow faster (1 mark) **or** live longer

**OR** (no)

resistant bacteria may develop (1)  
risk to human **or** animal health (1)

*allow bacteria become resistant / immune*

2

[5]

**M32.**

(a) asexual

*mitosis is neutral*

1

(b) (body cell)

nucleus *is* from body cell

*no mark for just body cell – mark the explanation*

*allow converse nucleus from egg cell is removed*

1

nucleus contains (genetic) information / instructions / chromosomes / genes / DNA / allele

*do **not** credit 'contains characteristics'*

1

(c) splitting apart (cells from clonal) embryo

*do **not** credit 'repeat process'*

1

[4]

- M33.** (a) pituitary (gland) 1
- ovaries 1
- allow corpus luteum*
- (b) idea of stimulating release of eggs 1
- preventing release of eggs
- allow FSH increases fertility*  
*accept contraception / contraceptive pill*  
*/ morning after pill*  
*allow oestrogen decreases fertility*  
*accept progesterone affects uterus lining*  
*do **not** credit simply 'a hormone to*  
*increase fertility **or** a hormone to*  
*decrease fertility'*  
*do **not** credit 'pill' unqualified*  
***or** injections*  
*do **not** accept just FSH **or** oestrogen*  
***or** IVF with no effect stated*
- 1
- [4]
- M34.** (a) pressure / temperature / hot / cold / touch / pain  
ear / cochlea  
chemicals / taste / named taste e.g. salt  
(reject skin receptors e.g. hot, cold)  
*for 1 mark each*
- 3
- (b) impulses / electrical pulse / electrical signal  
(reject information, message, pulse, signal)  
via sensory neurones (*ignore* relay neurone, synapse)  
(in) optic nerve  
(*allow 1 mark for via nerves or neurone if neither second nor third mark scored,*

*reference to spinal cord disqualified route mark)*  
*for 1 mark each*

3

[6]

**M35.** (a) pressure / temperature / hot / cold / touch / pain  
ear / cochlea  
chemicals / taste / named taste e.g. salt  
(*reject* skin receptors e.g. hot, cold)  
*for 1 mark each*

3

(b) impulses / electrical pulse / electrical signal  
(*reject* information, message, pulse, signal)  
via sensory neurones (*ignore* relay neurone, synapse)  
(in) optic nerve  
(*allow 1 mark for via nerves or neurone if neither second nor third mark scored,*  
*reference to spinal cord disqualified route mark)*  
*for 1 mark each*

3

[6]