



## Mark schemes

|          |  |  |            |
|----------|--|--|------------|
| <b>1</b> | (a) <u>In sequence:</u>  |  |            |
|          | heron  |  |            |
|          | frog   |  |            |
|          | slug   |  |            |
|          | lettuce  |  | 1          |
|          | (b) (i) light / sun  |  |            |
|          | <i>ignore photosynthesis / respiration</i>                       |  |            |
|          | <i>cancel mark if water / ions etc given</i>                     |  |            |
|          | <i>do <b>not</b> accept heat</i>                                 |  | 1          |
|          | (ii) traps / absorbs light                                       |  |            |
|          | <i>accept energy for light</i>                                   |  |            |
|          | <i>do <b>not</b> accept collects / attracts</i>                  |  |            |
|          | <i>do <b>not</b> accept 'traps sun'</i>                          |  | 1          |
|          | (iii) 162  |  |            |
|          | <i>if correct answer, ignore working / lack of working</i>       |  |            |
|          | $\frac{10 \times 1620}{100}$ for 1 mark                          |  | 2          |
|          |  |  | <b>[5]</b> |
| <b>2</b> | (a) <b>X</b> (no mark)   |  |            |
|          | <b>X</b> is more visible <b>or</b> <b>Y</b> is more camouflaged  |  | 1          |
|          | (b) (i) so camouflage not changed <b>or</b> so not easier to see |  | 1          |
|          | (ii) 25  |  | 1          |
|          | 7  |  | 1          |
|          | (iii) any <b>one</b> from:                                       |  |            |
|          | • eaten (by birds) / died  |  |            |
|          | • mixed in with large number of unmarked moths                   |  |            |
|          | • moved away   |  | 1          |

(c) (i) DNA

1

(ii) the gene / allele for being dark / dominant

1

[7]

3

(a) **Quality of written communication:**

ideas given in a sensible order

*broken down*

*giving products (could be CO<sub>2</sub>, minerals or gas)*

*(used by trees)*

*Q ✓ or Q ✗*

1

any **three** from:

- microorganisms / bacteria / fungi / saprotrophs
- accept saprophytes / saprobionts / detritivores (named)
- digest / break down organic matter / leaves / decompose / reference decomposers / decay / rot
- use of enzymes / correct named example
- absorption by diffusion / active transport
- must be of breakdown products
- respiration / combustion
- release of carbon dioxide

CO<sub>2</sub> can be used (by trees) in photosynthesis

*do **not** accept CO<sub>2</sub> taken in by roots*

3

(b) any **two** from:

- warmth / suitable temperature  
*do not accept heat / hot weather*
- damp / water / rain / humid / moisture
- oxygen
- suitable pH

2

**[6]****4**

(a) (i) (predator) lion

1

(prey) antelope

1

(ii) light

*accept other positive indications*

1

(iii) in sequence (top to bottom):

lion

antelope

grass

1

(b) (i) bacteria / fungi / saprotrophs

*accept moulds / decomposers / microorganisms / microbes /  
saprophytes / saprobionts*

1

- (ii) aerobic 1
- moist 1
- warm  
*accept other positive indications* 1
- (iii) carbon dioxide 1
- mineral salts 1
- [10]**

**5**

- (a)  $1.67 / 1\frac{2}{3}$   
*accept 1.6 to 1.7*  
  
*ignore working or lack of working  $\frac{400 \times 100}{24000}$  for 1 mark* 2
- (b) any **three** from:  
*deduct only 1 mark for any mention of in carnivore*
- lost as heat **or** keeping body warm  
*lost in metabolic functions is not enough*
- lost in respiration  
*do **not** accept 'used for respiration*
- movement
- not eaten parts or individuals / non-edible parts / dead leaves / wood / bones / faeces / urine  
*ignore 'waste'*  
*ignore references to growth / reproduction* 3

**[5]**

6

(a) 1 mark for each

respiration

eaten

decay

burning

4

(b) (i) digests **or** breaks down **or** decays  
dead (organic) material*accept rots for digests**accept plants for dead organic material**do **not** accept 'live on' **or** 'decompose'*

1

(ii) bacteria **or** worms **or** maggots*accept microbes but **not** germs **or** viruses*

1

**[6]**

7

(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]

8

- (a) (i) vole/small bird/beetle  
*gains 1 mark*

1

- (ii) oak trees are large organisms;  
therefore their biomass is large; but their numbers are small  
*each for 1 mark*

3

- (b) 8 of:  
energy stored in chemicals in cells/tissues/growth;  
passed up food chain;  
less energy stored at each stage in food chain/pyramid level;  
because only part of energy taken in used for growth;  
some lost in waste;  
some used for repair;  
used to main body systems;  
some lost in respiration;  
some converted into other forms of energy;  
e.g. movement;  
much lost as heat;  
by time detritus feeders have used remains;  
all returned to environment  
*each for 1 mark*

8

c1 → animals

c2 → decomposers

*2 marks for sequencing and organising the information*

2

[14]

9

- (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]****10**

- (a) water  
*gains 1 mark*

oxygen  
*gains 1 mark*

2

- (b) e.g.:  
some materials/energy lost in animals' waste materials  
respiration releases energy  
some materials/energy used in maintenance/repair  
some energy used for movement  
much lost as heat to surroundings  
some organisms die (rather than eaten)  
reference to detritivores  
reference to microbes  
*each for 1 mark*

8

**[10]****11**

- (a) (i) e.g. mussels/caddis loach  
*for 1 mark*

1

- (ii) 3 of:  
carbon dioxide  
water  
chlorophyll/chloroplasts  
light  
*any 3 for 1 mark each*

3



- (b) 6 of e.g.  
 some plant/animal material not digested by consumers passes out with faeces  
 respiration releases energy used in movement lost as heat  
 some 'lower' organisms die energy transferred to decomposers/detritivores  
 thence to environment

*any 6 for 1 mark each*

6

[10]

12

- (a) glucose/sugar water

*for 1 mark each*

2

- (b) (i) 204

*for 1 mark*

1

- (ii) 49 **gains 2 marks**

*(incorrect answer, but correct method gains 1)*

2

- (iii) 3 **gains 2 marks**

*(incorrect answer, but correct method gains 1)*

2

[7]

13

- (a) pyramid correct shape labelled

2

- (b) warm  
 moist  
 oxygen

3

[5]

14

- (a) soil contains the microbes which will decay the dead material

*for 1 mark each*

2

- (b) lets in air/oxygen oxygen speeds up decay process  
for 1 mark each

2

**[4]****15**

- (a) levels in correct order  
sizes correct

*for 1 mark each*

2

- (b) (i) working  
0.96% (correct answer = 2)  
for 1 mark each

2

- (ii) 2 of e.g.  
heat up leaves  
absorbed by non-photosynthetic parts  
transmitted through leaves  
*any 2 for 1 mark each*

2

- (iii) 3 of e.g.  
respiration of primary consumers  
movement of p.c.  
waste from p.c.  
repair/growth of p.c.; heat losses to  
surroundings  
*any 3 for 1 mark each*

3

**[9]****16**

- (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]****17**

(a) (i) D

(ii) A

(iii) B

*for 1 mark each*

3

(b) W

*for one mark*

1

**[4]****18**

pros e.g.:

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]**

- 19** (i)  $0.25 \times 100 / 25$   
*gains 1 mark*
- but**  
 1%  
*gains 2 marks*
- (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*

2

3

**[5]**

- 20** decay
- warm (\*)
- moist (\*)
- grow
- (\*) *these words can be either order*

1

1

1

1

**[4]**

- 21** (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]

22

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]

**23**any **five** from:

- the amount of energy (in the biomass of organisms) is reduced at each successive stage in a food chain
- all of prey organism is not consumed
- energy is 'lost' as the organisms' waste materials
- energy is transferred / lost during respiration
- energy is transferred / lost as movement (kinetic energy)
- energy is transferred / lost as heat (thermal energy)
- energy is transferred / lost to the surroundings
- the only energy transferred to a higher level is that which the organisms have used in growing

*statements about energy flow the wrong way are neutral*

**[5]****24**

- (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]****25**

- (a) 115

1

(b) any **four** from

less energy lost / used

as heat lost to the atmosphere

since warm indoors

*accept temperature controlled*

(less energy lost) in movement

since movement restricted

more growth / eggs

*accept prevents loss of body mass **or** gets fatter / weight gain*

4

[5]

26

(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]

27

(a) (i) photosynthesis

1

(ii) respiration

*do not credit combustion*

*do not credit decay*

1

(iii) dry

*accept hot **or** windy **or** drought*

1

(b) any **three** from

\* evaporation (of water)

***or** loss of water vapour*

\* (mostly) from the leaf / leaves

*do not credit incorrect reference to leaves*

\* through the stomata

*accept through each stoma*

*accept through the stomas(sic)*



\* causing a pull

*or causing an increase in osmotic potential (at the top of the plant)*

*or causing an increase in water potential (at the top of the plant) or*

*causing a decrease in osmotic pressure (at the top of the plant)*

\* (so that) water moves up (through the plant)

*do not credit water vapour moves up through the plant*

\* as the transpiration stream

\* water enters through roots (and goes up plants)

3

**[6]****28**

(a) evaporates

1

sea

1

sun

*accept sun*

1

wind

1

condenses

1

rain

1

(b) (i) carbon dioxide

*accept CO<sub>2</sub> provided it is*

*correct in every detail*

1

(ii) (process) D

1

millions of years

*a million years upwards*

1

**[9]**

29

- (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]

**30**

(a) more oxygen/microbes more active

1

(b) plenty of microbes  
moisture/not too wet  
warmth food for microbes

*any 2 for 1 mark each*

2

**[3]****31**

(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]**

- 32** (a) warmth/heat  
oxygen/air  
moisture  
microbes/micro-organisms/fungi/moulds/bacteria  
*any three for 1 mark each* 3
- (b) do not rot  
*for 1 mark* 1
- [4]**
- 
- 33** (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]**
- 
- 34** (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]

35

- (a) microbes/worms/bacteria/fungi/moulds/  
 micro-organisms/decomposers  
 (not germs/bugs/slugs/organisms - ignore these)  
*any one for 1 mark*

1

- (b) idea warm/hot/heat (not sun)  
 oxygen/air  
 moist/water/wet/rain (not 'turn the compost' unless qualified)  
 If no answer given in (a), one e.g. could be credited in (b)  
*any two in any order for 1 mark each*

2

[3]

36

- (a) (i) methane/biogas/natural gas  
*(accept formula) for 1 mark*

1

- (ii) cooking/heating/burning/fuel/vehicle fuel/lighting  
*for 1 mark*

1

- (b) *idea that it is a soil improver/fertiliser/provides nutrients or makes soil richer or improves plant growth/makes plants grow better*  
 (not “plants” alone/gardens/spreading on land)  
*for 1 mark*

1

**[3]****37**

- (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]****38**

- (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 control/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]

39

*idea that*

microbes/bacteria/fungi/moulds/micro-organisms/decomposers.  
 NOT germs/worms/bugs/organisms

*gains 1 mark*

**but** microbes etc. need/grow/cause decay/decompose in

*gains 2 marks*

**but** microbes etc. need/grow/caused decay/decompose  
faster in warm/moist conditions

*gains 3 marks*

(Allow reverse arguments)

[3]

40

(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]



**41**

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]****42**

(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*

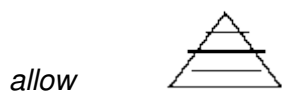
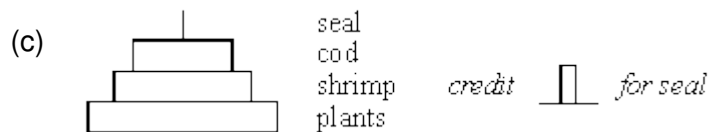
1

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*

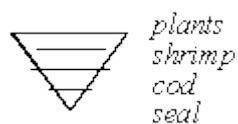
2



- 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]

43

(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]

44

- (a) Decrease: seals will eat more squid and penguins  
for 1 mark

1

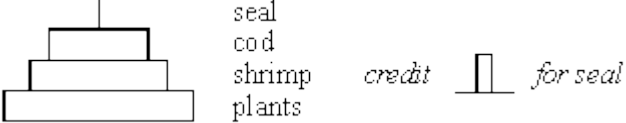
Stay the same:

- more shrimp/food for squid and penguins

*ideas that*

- increase in squid and penguins balances the extra eaten by seals
- seals find other prey (allow start to eat shrimps)  
any two for one mark each

2

- (b) 

*allow*



- correct shape (doesn't need to be to scale)
- correctly with organisms

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

2

- (c)
- seals are mammals
  - *idea that* seals have (to maintain) a constant body temperature  
*[allow warm blooded]*
  - heat losses to cold seas
  - more of food eaten used to replace heat loss

*(credit use of figures i.e. 95% loss compared to 90%  
or 5% efficient compared to 10%  
or 20 : 1 conversion ratio compared to 10 : 1  
with 1 mark)*

*any three for 1 mark each*

3

(d) (i) *ideas that*

- reduce number of fishing boats allowed
- breed in captivity and then release
- agree quotas [not an unqualified 'ban']
- avoid breeding areas
- avoid breeding seasons
- increase size of net mesh/don't catch small fish
- limit catches of shrimps
- cull seals

*any two for 1 mark each*

*[allow any other reasonable answer]*

2

(ii)

- breeding areas closer to some countries than others
- difficult to police/easy to cheat/'poach'
- difficult to agree quotas
- some countries eat more fish than others
- best weather for fishing maybe in breeding seasons
- fisherman/trawlers need employment
- big demand for cod

*any one for 1 mark*

*[allow any other sensible response]*

1

[11]

45

(a) (i) (too) cold / all moisture / water frozen / no moisture / no warmth / conditions for decay are absent.

*for 1 mark*

*(No oxygen is neutral)*

*(Do not accept frozen or ice has preserved them)*

1

(ii)

- (bacteria have) no oxygen / air (because dead fish covered in mud)  
(No moisture x)  
(No moisture and no oxygen or warmth x)
- bones / hard parts do not decay easily

*idea that*

- material of fish replaced by minerals  
*any two for 1 mark each*

2

(b) *ideas that*

- mammoths lived at the same time as humans / there was man in these times
- mammoths lived in the same place as humans
- humans hunted mammoths / ate mammoths / were carnivorous / for fur etc
- reference to later use of more advanced weapons
- humans needed to protect themselves from mammoths
- humans used flints / weapons / tools  
*any two for 1 mark each*

2

(c) *idea that*

- environment changed / became too cold / became too warm /  
vegetation changed / humans destroyed environment
- (new) predator / humans killed them
- new disease
- new competitor / type of elephant
- shortage of food / no food / ran out of prey
- mammoths reproduced too slowly
- mammoths didn't adapt to changes  
*any two for 1 mark each*

2

**[7]**

- 46** (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]**

- 47** (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  
*for 1 mark each*
- independent marking points  
2
- [4]**

- 48** (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]

49

(a) microorganisms / bacteria / fungi / microbes

allow named example **or** mould

ignore decomposers unqualified / germs / maggots / worms

1

(b) it is warm(er) / hot / increased heat / increased temperature

ignore 'sun is hot' unqualified

1

(c) oxygen

1

[3]

50

(a) 30

award **both** marks for correct answer, irrespective of working

$100 - (33 + 27 + 10)$  or equivalent for **1** mark

2

(b) 2 **or** 1.98

award **both** marks for correct answer, irrespective of working

$(33 / 100) \times 6$  or equivalent for **1** mark

2

(c) respiration

1

(d) (i) less / no heat loss / movement

do **not** accept 'energy' / warmth unqualified

1

- (ii) any reference to cruelty eg stress to calf / cramped conditions  
*ignore references to disease / hygiene*

1

**[7]****51**

- (a) methane

1

- (b) (insulation maintains) higher temperature / warm(er) /  
 keeps heat in / prevents heat loss / optimum temperature /  
 heat increases rate of reaction

*do **not** allow hot(ter) / high temperature*

*ignore same / constant temperature*

1

- (c) (i) (\$)25 000

*ignore units*

*ignore working or lack of working*

*add 3 figures and subtract 10 000*

**or**

*use of 35 000 and 10 000 but wrong answer for 1 mark*

2

- (c) (ii) 8 years = **2** marks

*ignore working or lack of working*

**or**

correct answer from (c)(i) = **2** marks

$\frac{200000}{(c)(i)}$  *but wrong answer = 1 mark*

2

**[6]****52**

- (a) (i) 20

1

- (ii) 12000

1



(b) area of strips

**or**

length / width / size of transect

**or**

number of transects

1

(c) (i) since squirrels mobile

**or**

squirrels could be counted twice

**or**

squirrels hide

1

(ii) any **two** from:

- numbers of larders observed likely to be lower than actual  
*do **not** accept squirrels share larders  
or squirrels have more than one larder*
- since unlikely that all could be spotted if 5 m away
- old larder
- squirrels moved on / died
- young squirrels
- haven't made a larder

2

(d) (i) 0 to 6.8

1

(ii) any **one** from:

*do **not** accept squirrels prefer blue spruce*

- squirrels prefer blue spruce cones / seeds / nuts as food
- more cones / food
- more nesting sites
- fewer predators / competitors

1

[8]

53

(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]**

54

- (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]**

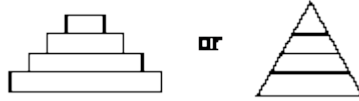
**55**

(a) 0.1

*ignore working or lack of working*

$$\frac{88 \times 100}{88000} \text{ for 1 mark}$$

2

(b) shape: pyramid with 4 tiers

1

labels:

Plants + Herbivores + Carnivores + Top carnivores

(in sequence – largest to smallest)

*allow suitable named examples**inverted pyramid correctly labelled = 1 mark*

1

(c) more energy / biomass / materials / matter available or less energy lost or energy used up (by herbivores)

*not just plants*

1

**[5]****56**(a) any **three** from:

$$1960: \frac{132}{186} \times 100$$

71(%)

$$1970: \frac{161}{247} \times 100$$

65(%)

*if both correct – 3 marks**if one correct – 2 marks**if neither correct – check working – 1 mark each*

3

(b) **advantages (maximum 3 marks)**

reduced use of coal / oil / non renewable / fossil fuels

less smoke / sulphur dioxide

*ignore pollution*

cheaper in long term / over 8+ years / few years

(energy) self-sufficiency idea

fertiliser to help crop growth

*accept less fertiliser bought*

means of waste disposal

*accept any other appropriate responses*

**disadvantages (maximum 3 marks)**

high initial cost

explosion risk

technical **or** training required

*accept any other appropriate responses*

**max 4**

(c) (i) suitable scales;

*S*

**1**

all plots accurate;

*P*

**1**

suitable curve **or** ruled dot-to-dot **or** straight line of best fit

*L*

*do **not** accept lines through origin line must not be thicker than half square*

**1**

(ii) insulation / less temperature variation / maintain temperature

*do **not** accept 'kept cool' **or** 'warm'*

**1**

less chance of microbes being killed /  
enzymes denatured **or** keep at optimum  
temperature **or** maintain high gas production

**1**

**[12]**

57

- (a) methane  
*accept CH<sub>4</sub> / CH4 / CH<sup>4</sup> extras cancel*  
1
- (b) **anaerobic** respiration **or** fermentation  
*ignore decay / decomposition / digestion*  
*do **not** allow aerobic*  
1
- (c) (i) in range 32 – 33  
1
- (ii) keep cool(er)  
**or** keep below 40 (°C)  
**or** insulate from heat  
*allow keep at optimum temperature if (c)(i) < 40*  
1
- high(er) / optimum rate of biogas production  
**or** rate decreases at higher temperatures  
**or** works more efficiently  
*allow correct reference to rate of enzyme action eg high temperature would denature enzyme owtte*  
1
- (d) increases rate / high rate  
*allow 'works better'*  
1
- insulates / keeps warm  
*allow maintains optimum temperature*  
1

[7]

58

- (a) (i) **D**  
1
- (ii) **A**  
1
- (b) (i) air / oxygen (can enter)  
*ignore other factors entering or leaving*  
1
- for (aerobic) respiration  
*do **not** accept anaerobic respiration*  
1

(ii) (more) minerals / nutrients / salt(s) / ions

**or**

named mineral / element available

*ignore fertility / fertiliser*

*allow symbols*

*allow eg mulching / reducing weeds **or** retain water*

1

[5]

59

(a) (i) methane

*apply list principle*

*allow symbols*

1

(ii) anaerobic respiration / (anaerobic) fermentation

*ignore decay / decomposition etc*

1

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

- manure disposed of
- gains fertiliser (for crops)
- gets (free) fuel **or** cheap supply of energy  
**or** (free) cooking / heating / lighting  
*allow converse*  
*allow not using wood / trees*
- can sell crops at higher price

2

(ii) in the UK

*allow converse arguments for Sri Lanka*

lower temperature

**or**

not enough heat

*ignore other factor(s)*

1

process is slower

**or**

enzymes action slower

*ignore references to efficiency / 'bacteria working'*

1

**[6]**