Mark schemes

Q1.

(a) carbon dioxide

1

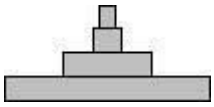
water

1

(b) light

1

(c)



1

(d) 2.3 and 0.5

allow figures in millions
allow in range 2.25 to 2.3 for 2.3
allow in range 0.5 to 0.55 for 0.5

1

$\frac{(2.3 - 0.5)}{2.3} \times 100$ **or** $\frac{1.8}{2.3} \times 100$

allow correct substitution of student's incorrect graph readings

1

78.2(6087....)

allow correct answer from student's substitution of incorrect graph readings
ignore incorrect rounding

1

78

allow correct rounding of calculated value

1

(e) increase (in biomass of herring)

1

from 0.1 to 1.8 (million tonnes)
or
change of 1.7 (million tonnes)
or
change of 1700%

allow a tolerance of ± ½ small square for graph readings

1

(f) smaller / 4-yr-old fish not caught

allow younger fish not caught

allow (only) older fish caught

1

(so) escaping fish can reproduce

allow so younger fish can survive to reproduce

1

[12]

Q2.

(a) from light / sunlight

ignore sun unqualified

1

absorbed by chlorophyll / chloroplasts

if no other mark awarded allow by photosynthesis for 1 mark

1

(b) krill / herring / copepod

1

(c) algae

1

(d) 1 algae
2 krill or copepod
3 squid
4 mackerel
(5 Human)

all correct for 1 mark

1

(e) any two from: (losses due to)

- non-eaten parts (of squid / krill)

  allow bones / shells

  allow eaten by other animals

- <u>respiration</u> or <u>respiring</u> (in mackerel)

  do not accept respiration produces / makes / creates energy

- excretion (by mackerel)

  allow loss of a named waste product such as CO2 / urea

  ignore loss of waste unqualified

  ignore faeces

2

(f) 2.3 and 0.1 (million)

allow in the range 2.25 to 2.3 for 2.3 (million)

1

$\frac{2.3 - 0.1}{2.3} \times 100$ **or** $\frac{220}{2.3}$

1

95.65217.....

allow answer from correct substitution of incorrect values from Figure 3

1

96

allow student's calculated answer correctly rounded to the nearest whole number

1

(g) Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5–6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3–4

Level 1: Relevant points are made. They are not logically linked. 1–2

1–2

No relevant content

0

Indicative content
figures may be given without units (million tonnes) throughout

points for:

- small fish are not caught so can live long enough to reproduce
- biomass / stocks have generally increased after these laws introduced
- '77-'81 law (total ban) resulted in increase in biomass, eg 0.1 to 0.48 or to 0.9 by '84
- '84 law (mesh size) resulted in increase in biomass, eg 0.9 to 1.8 (by '90)
- '97 law (quotas) resulted in increase, eg 1.15 to 1.25
- '98 law (ban in breeding season) resulted in increase, eg 1.25 to 2.5

points against:

- could be a cause other than the law or correlation does not necessarily indicate causal relationship or other factors
- laws superimposed so can't necessarily tell the effect of each
- each law results in an increase followed by a decrease
- quotas lead to dead fish being thrown back into sea

For Level 3 points both for and against must be considered together with appropriate use of data

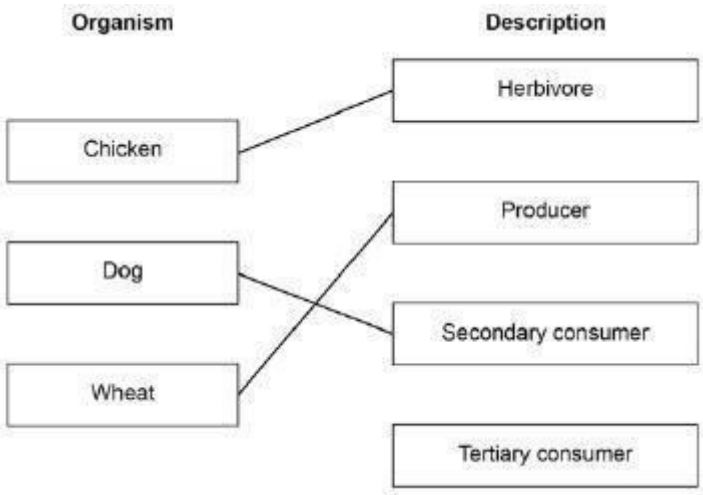
[17]

Q3.

(a) 3

1

(b)



additional line from a box on the left negates the mark for that box

3

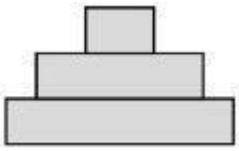
(c) photosynthesis

1

(d) the dog produces waste in faeces

1

(e)



1

(f) farming cows needs more land than farming insects

1

fewer cows being farmed will slow down global warming

1

[9]

Q4.

(a) triangular pyramid with 3 levels

1

correct labels: (waste) vegetables / plants; insect(s); dog(s)

do not accept additional incorrect labels

1

(b) any two from:

- carbon dioxide from respiration (from dog)
  allow carbon dioxide breathed out (by dog)
- urea from excretion (from dog)
  allow urea in urine (from dog)
- not all parts (of insects) are absorbed / digested (by dog)
  allow faeces from egestion (from dog)
  ignore references to loss of energy
  if no other mark awarded allow two factors without descriptions for 1 mark

2

(c) less land required

1

(so) more space for crops (for humans)
allow more meat (from cows etc) for humans

1

less methane (from animals) therefore less global warming
allow less methane from rotting vegetables in landfill

1

(therefore) less harmful effects of global warming on (human) food production
allow example such as less flooding of farmland
allow may lead to the development of more foods for humans made from insects

1

[8]

Q5.

(a) primary consumer

1

(b) correct shape: 4 tiers with largest at bottom and smallest at top

1

correctly labelled:

dragonfly / nymph

+ hydra

+ daphnia

+ algae

in this order
or allow:
3rd-order or tertiary consumer or apex / top predator or (trophic level) 4
2nd-order or secondary consumer or (trophic level) 3
1st-order or primary consumer or herbivore or (trophic level) 2 producer or (trophic level) 1
allow for 2 marks inverted pyramid if correctly labelled

1

(c) any one from:
(Daphnia biomass smaller because)

- non-digestible parts (of algae) or lost in faeces
  ignore waste
- not all absorbed
- lost in urine / urea
- used in respiration or lost as carbon dioxide / CO2
  allow excretion
  allow (to supply energy) for movement / warmth
  allow used to supply energy
- algae not all eaten or eaten by other organisms
- some algae decompose

1

(d)

an answer of 14 000 scores 2 marks

14

1

14 000

allow evidence of an incorrectly calculated mean × 1000
allow 1.4 × 104

1

(e)

an answer of 2.625 × 104 or 2.63 × 104 or 2.6 × 104 scores 4 marks
an answer of 26250 scores 3 marks
allow ecf from part (d)

(volume of pond =) 1.875 or 2.5 × 1.5 × 0.5

an incorrect answer for one step does not prevent allocation of marks for subsequent steps

1

14 000 × 1.875

allow ecf from part (d)

1

26250

1

2.625 × 104

allow 2.63 × 104 or 2.6 × 104

1

(f) increased (growth / reproduction of) algae

1

(more algae so) more food for Daphnia

allow fertiliser toxic to Hydra (1) (so) fewer Daphnia eaten (1)

1

(g) (Hydra have) less food

1

because (graph shows) fewer Daphnia (with more fertiliser)

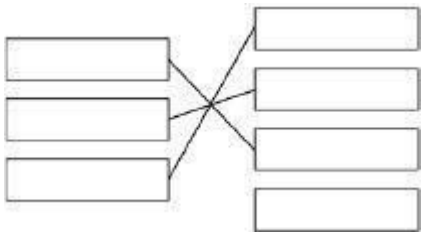
allow other valid suggestions, eg
fertiliser toxic to Hydra (1)
or
fertiliser causes growth of algae (on surface) which block light and so die and decay
or
eutrophication (1)
(decay / eutrophication) uses up oxygen (so lack of oxygen for Hydra) (1)

1

[14]

Q6.

(a)



extra line from a scientific term cancels the mark

1
1
1

(b) $\frac{10}{200} \times 100$

1

5/5.0

1

an answer of 5 / 5.0 scores 2 marks

(c) digestion

1

respiration

1

excretion

1

in this order only

(d) fewer are eaten (by small fish)

allow there are fewer (small) fish eating them

do not accept none are eaten

1

[9]

Q7.

(a) *x*-axis: scale + labelled, including units

scale ≥ ½ width of graph paper label: biomass in g/m2

1

bar widths correct

± ½-square each side
allow 1 mark if 3 correct

2

all 4 bars correctly labelled

large fish + small fish + invertebrate (animals) + algae
or
(trophic level) 4 + 3 + 2 + 1
or
tertiary consumer + secondary consumer + primary consumer + producer

ignore bar heights

1

(b) $\frac{840-10}{840} \times 100$

allow equivalent calculation

1

98.809523... / 98.810 / 98.81 / 98.8

1

99

allow answer given to two significant figures from an incorrect calculation in step 2

1

an answer of 99 scores 3 marks

(c) inedible parts / example

allow eaten by other animals or not all organisms eaten

or

egested / faeces

allow not digested
allow excretion / urine
ignore waste

or

respiration / as CO2

ignore energy losses
ignore movement

1

(d) bacteria decay organic matter / sewage / algae / dead plants

1

(by) digestion

allow example such as starch broken down to sugar
or
protein broken down to amino acids

1

(and) bacteria respire aerobically
or
respire using oxygen

1

(which) lowers oxygen concentration (in water)
or
fish have less oxygen

allow reduced respiration of fish

1

(so) reduced energy supply causes death of fish

allow toxins in the sewage kill fish
ignore pathogens or (pathogenic) bacteria cause disease in fish and kills them

1

[13]

Q8.

(a) $0.03 = \frac{\text{output}}{5950 \div 50} \times 10$

an answer of 1.8 scores 3 marks

1

$$\text{output} = \frac{0.03 \times (590 \div 50)}{100}$$

1

1.8

1

(b) indoor % efficiency = $\frac{40}{10000 \div 6000} \times 100$

1

or

$\frac{40}{16000} \times 100$

0.25(%)

an answer of 8.33 scores 3 marks
allow 8 / 8.3 / 8.333...

1

$\left(\frac{0.25}{0.03} =\right) 8.33$ (times)

1

(c) any two from:

- in faeces / egestion
  or
  not all food is absorbed
- not all food is ingested
- in urine / excretion
- in respiration
- keeping warm
- movement

do not accept 'for respiration'
allow as 'heat'

2

(d) warmer indoors so less energy wasted in keeping warm

allow less energy lost as 'heat'

1

less movement indoors so less energy wasted

if no other mark awarded, allow it is warmer and there is less movement indoors for 1 mark

1

[10]

Q9.

(a) snail
or
shrew

additional incorrect answer negates correct answer

1

(b) shrew

additional incorrect answer negates correct answer

1

(c) fewer shrews to eat them

1

(d) population

1

(e) C

1

(f) (11 000 × 0.1 =)
1 100 (kJ)

1

(g) the snails do not eat the roots of the lettuces

1

(h) any one from:
- light (intensity)
- temperature
- moisture (levels)
- soil pH
- mineral / ion content (of soil)
- wind intensity / speed

  ignore wind direction
- carbon dioxide (levels)
- oxygen (levels)

1

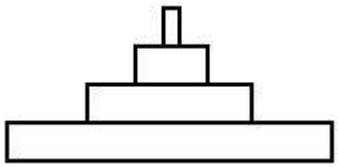
[8]

Q10.

(a) any two from:
- *idea of* absorption of light / energy
- transfer to chemical energy

  allow produce sugars / glucose / starch / carbohydrate / food / biomass
- provides food / energy for animals / caterpillar
- releases oxygen

2

(b) 

1

(c) 15(%)

$\frac{3 \times 100}{20}$ *allow 1 mark for* *with no answer or incorrect answer*

or

allow 1 mark for 0.15

2

(d) (i) any two from:

- markings look like eyes / face / mouth of much larger animal
- looks fierce / scary / dangerous
  allow it looks like a snake
- to frighten blue tit / bird

max 1 if reference to camouflage

2

(ii) any two from:

- sharp / long / big claws
  ignore strong
- sharp / hooked beak
  ignore strong / big
- large wings or flies quickly *allow streamlined / aerodynamic ignore powerful wings*
- good eyesight

2

[9]

Q11.

(a) (i)any two from:

- not all eaten
  allow eaten by other animals
- used for respiration
  ignore used / lost in heat / movement
- lost as CO2 / water / urea
- lost as faeces or not all digested
  if neither mark awarded allow 1 mark for lost as waste

ignore references to energy losses

do not allow for growth / repair / reproduction

2

(ii) any one from:

- thrushes eat other things
- thrush numbers likely to vary (considerably) *allow it is only an estimate (of population size) or only counted thrushes for 5 hours*
- thrushes were not present all the time
- thrushes feed on a much bigger area

1

(b) (i)any one from:

- there are two dependent variables
- there is no independent variable
- to show the association / correlation / pattern (between the two variables)

1

(ii) (snails in woodlands)
more have dark(er) colour(ed shells) or fewer have light-coloured shells
allow converse for grassland, if clear

1

(shells have) no / fewer stripes or have no stripes
allow converse for grassland, if clear

1

(iii) less likely to be seen (by predators / birds / thrushes)
allow camouflaged (from predators / birds / thrushes)
allow light coloured shells with stripes would be more visible (to predators / birds / thrushes in woodland (than grassland)).

1

[7]