

Mark schemes

**Q1.**

(a) carbon dioxide 1

water 1

(b) light 1

(c)  1

(d) 2.3 **and** 0.5 1  
*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*

$\frac{(2.3 - 0.5) \times 100}{2.3}$  **or**  $\frac{1.8 \times 100}{2.3}$  1  
*allow correct substitution of student's*  
*incorrect graph readings*

78.2(6087....) 1  
*allow correct answer from student's*  
*substitution of incorrect graph readings*  
*ignore incorrect rounding*

78 1  
*allow correct rounding of calculated*  
*value*

(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% 1  
*allow a tolerance of  $\pm \frac{1}{2}$  small square*  
*for graph readings*

- (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*
  - respiration **or** respiring (in mackerel)  
*do **not** accept respiration produces / makes / creates energy*
  - excretion (by mackerel)  
*allow loss of a named waste product such as CO<sub>2</sub> / 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

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

**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

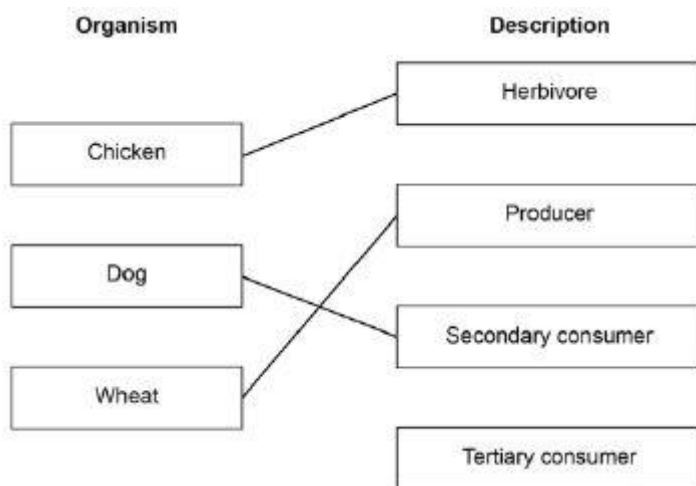
[17]

**Q3.**

(a) 3

1

(b)



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

3

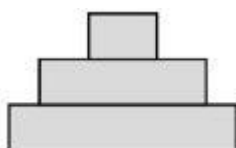
(c) photosynthesis

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:**

*3<sup>rd</sup>-order or tertiary consumer or apex / top predator or (trophic level) 4*

*2<sup>nd</sup>-order or secondary consumer or (trophic level) 3*

*1<sup>st</sup>-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 / CO<sub>2</sub>

*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  $\times 1000$*

*allow  $1.4 \times 10^4$*

1

(e)

*an answer of  $2.625 \times 10^4$  or  $2.63 \times 10^4$*

*or  $2.6 \times 10^4$  scores 4 marks*

*an answer of 26250 scores 3 marks*

*allow ecf from part (d)*

(volume of pond = ) 1.875 **or**  $2.5 \times 1.5 \times 0.5$

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

1

14 000  $\times$  1.875

*allow ecf from part (d)*

1

26250

1

$2.625 \times 10^4$

*allow  $2.63 \times 10^4$  or  $2.6 \times 10^4$*

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*

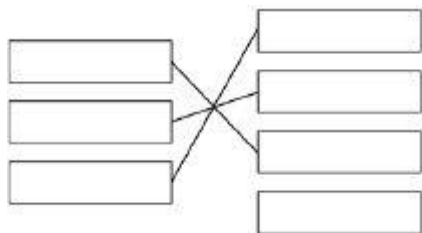
*(so lack of oxygen for Hydra) (1)*

1

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**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) 1
- allow there are fewer (small) fish eating them*
- do **not** accept none are eaten*
- [9]**

**Q7.**

- (a) x-axis: scale + labelled, including units 1
- scale  $\geq \frac{1}{2}$  width of graph paper label:  
biomass in  $g/m^2$*
- bar widths correct 2
- $\pm \frac{1}{2}$ -square each side  
allow 1 mark if 3 correct*
- all 4 bars correctly labelled 1
- 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*
- (b)  $\frac{840 - 10}{840} \times 100$  1
- allow equivalent calculation*
- 98.809523... / 98.810 / 98.81 / 98.8 1
- 99 1
- allow answer given to two significant  
figures from an incorrect calculation in  
step 2*



*an answer of 99 scores 3 marks*

- (c) inedible parts / example  
*allow eaten by other animals or not all organisms eaten*
- or**
- ejected / faeces  
*allow not digested*  
*allow excretion / urine*  
*ignore waste*
- or**
- respiration / as CO<sub>2</sub>  
*ignore energy losses*  
*ignore movement* 1
- (d) bacteria decay organic matter / sewage / algae / dead plants 1
- (by) digestion 1  
*allow example such as starch broken down to sugar*  
**or**  
*protein broken down to amino acids*
- (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)  $0.03 = \frac{\text{output}}{5950 + 50} \times 10$   
*an answer of 1.8 scores 3 marks*

	1
output = $\frac{0.03 \times (590 + 50)}{100}$	
	1
1.8	
	1
(b) indoor % efficiency = $\frac{40}{10000 + 6000} \times 100$	
	1
<b>or</b>	
$\frac{40}{16000} \times 100$	
0.25(%)	
<i>an answer of 8.33 scores 3 marks</i>	
<i>allow 8 / 8.3 / 8.333...</i>	
	1
$\left(\frac{0.25}{0.03} = \right) 8.33$ (times)	
	1
(c) any <b>two</b> from:	
• in faeces / egestion	
<b>or</b>	
not all food is absorbed	
• not all food is ingested	
• in urine / excretion	
• in respiration	
• keeping warm	
• movement	
<i>do <b>not</b> accept 'for respiration'</i>	
<i>allow as 'heat'</i>	
	2
(d) warmer indoors so less energy wasted in keeping warm	
<i>allow less energy lost as 'heat'</i>	
	1
less movement indoors so less energy wasted	
<i>if no other mark awarded, allow it is warmer and there is less movement indoors for 1 mark</i>	
	1
	<b>[10]</b>

**Q9.**

- (a) snail  
**or**  
shrew

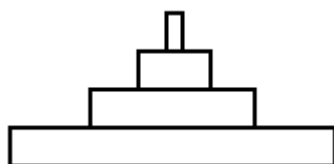
*additional incorrect answer negates correct answer*

- 1
- (b) shrew  
*additional incorrect answer negates correct answer*
- 1
- (c) fewer shrews to eat them
- 1
- (d) population
- 1
- (e) **C**
- 1
- (f)  $(11\ 000 \times 0.1 =)$   
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  $\frac{3 \times 100}{20}$  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 CO<sub>2</sub> / 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]