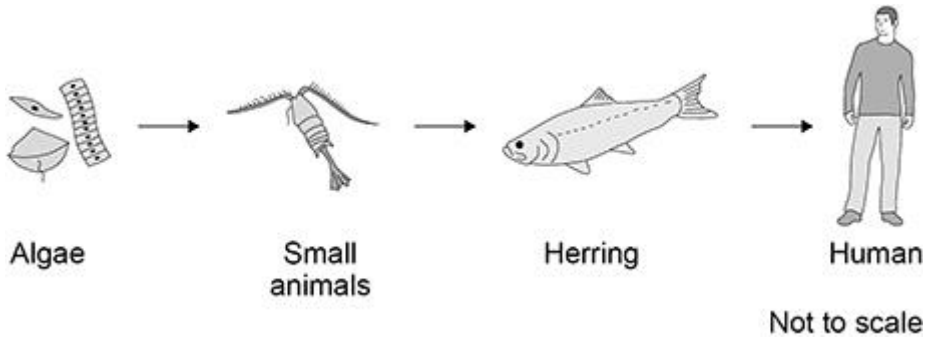
B17- Organising an Ecosystem- Exam Practice 1

Q1.

People eat fish caught in the North Sea.

Figure 1 shows a food chain.

Figure 1



(a) The algae make glucose by photosynthesis.

Which **two** substances do the algae need for photosynthesis?

Tick (✓) **two** boxes.

Carbon dioxide	☐
Nitrogen	☐
Oxygen	☐
Starch	☐
Water	☐

(2)

(b) What is the source of energy for photosynthesis?

Tick (✓) **one** box.

Light	☐
Mineral ions	☐

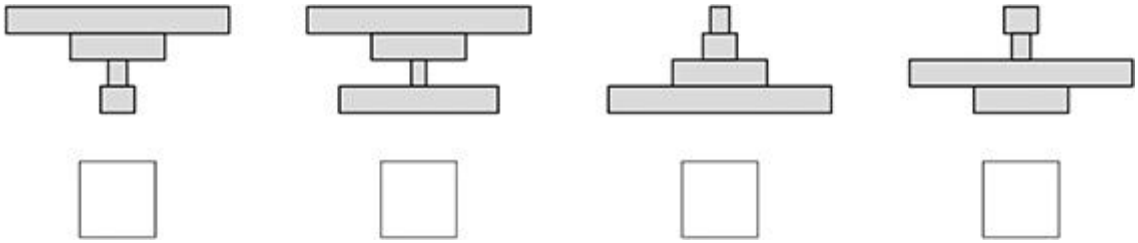
Protein ☐

Water ☐

(1)

(c) Which pyramid of biomass is correct for the food chain shown in **Figure 2**?

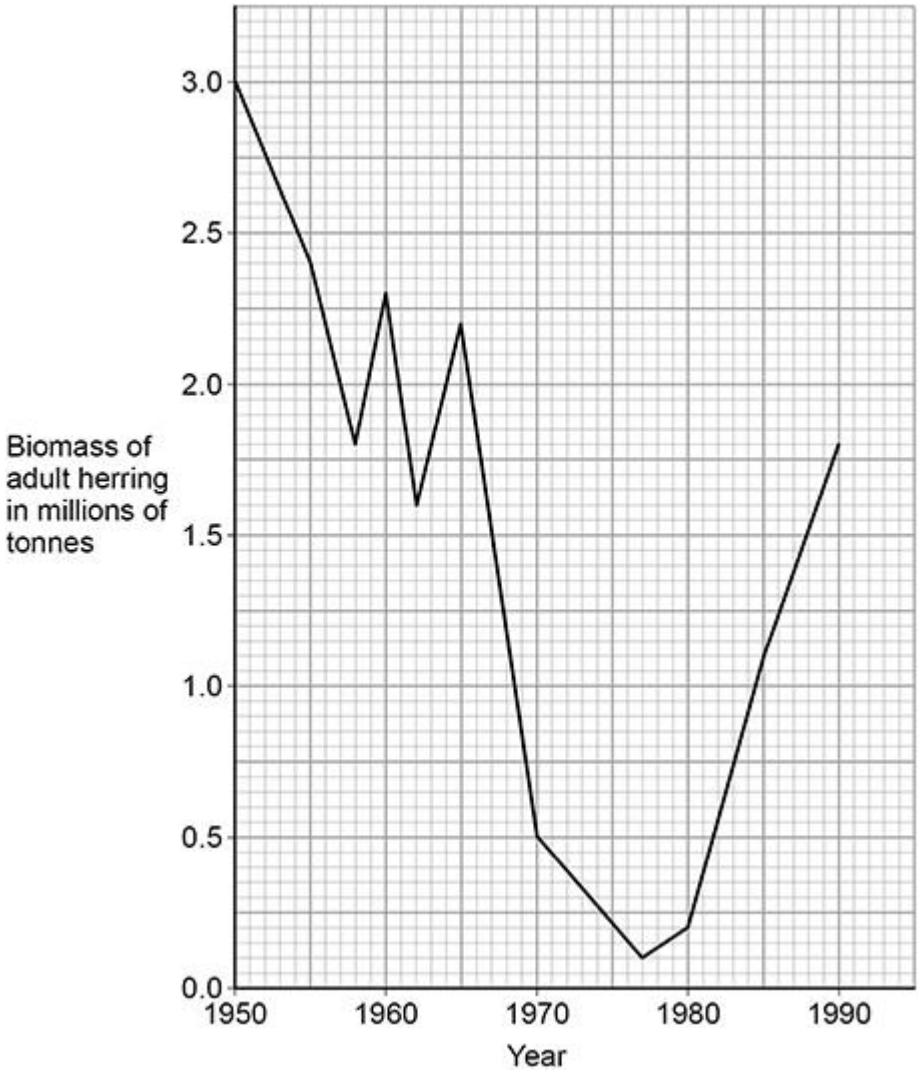
Tick (✓) **one** box.



(1)

Figure 2 shows the biomass of adult herring in the North Sea between 1950 and 1990.

Figure 2



(d) Too many herring were caught in the 1960s.

Calculate the percentage decrease in the biomass of adult herring between 1960 and 1970.

Use the equation:

$$\text{percentage decrease} = \frac{(\text{biomass in 1960} - \text{biomass in 1970})}{\text{biomass in 1960}} \times 100$$

Give your answer to the nearest whole number.

Percentage decrease = _____ %

(4)

From 1977, laws were introduced to help conserve herring.

(e) Describe the change in biomass of adult herring from 1977 to 1990.

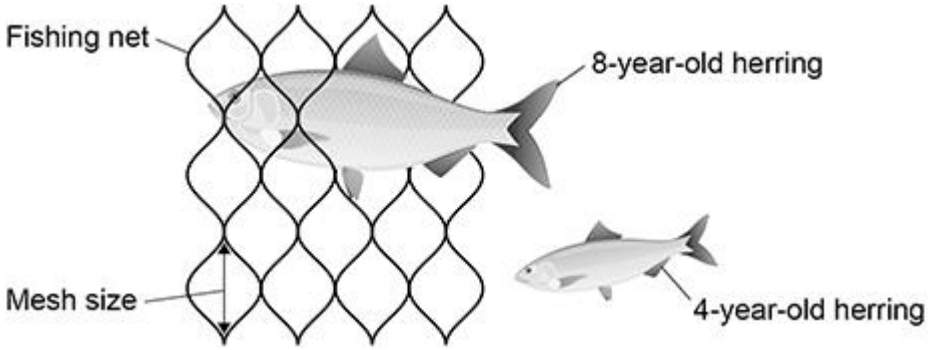
Use data from **Figure 2** in your answer.

(2)

(f) One of the laws was to control mesh size of fishing nets.

Figure 3 shows a fishing net with a legal mesh size.

Figure 3



Herring can live for up to 12 years.

Herring start to reproduce when they are 3 to 4 years old.

Explain how the control of mesh size of fishing nets has helped to conserve stocks of herring.

_____

_____

_____

_____

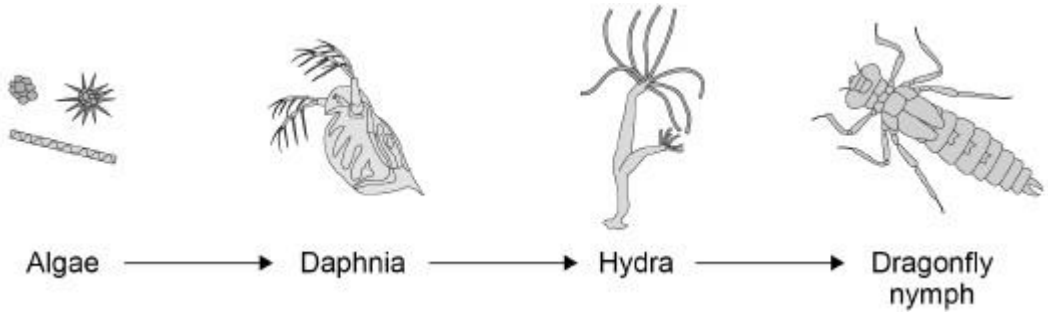
(2)

(Total 12 marks)

Q2.

Figure 1 shows a food chain in a pond.

Figure 1



(a) Which term describes the Daphnia in this food chain?

Tick (✓) **one** box.

Apex predator ☐

Primary consumer ☐

Producer ☐

Secondary consumer ☐

(1)

(b) Draw a pyramid of biomass for the food chain.

Label each trophic level.

(2)

(c) Give **one** reason why the total biomass of the Daphnia in the pond is different from the total biomass of the algae.

_____

_____

(1)

Students investigated the size of the population of Daphnia in the pond.

This is the method used.

1. Collect 1 dm^3 of pond water from near the edge of the pond.
2. Pour the water through a fine net.
3. Count the number of Daphnia caught in the net.
4. Repeat steps 1–3 four more times.

The table below shows the results.

Sample number	Number of Daphnia in 1 dm^3 water
1	5
2	21
3	0
4	16
5	28

(d) Calculate the mean number of Daphnia in 1 m^3 of pond water.

1 m^3 = 1000 dm^3

Mean number of Daphnia in 1 m^3 of pond water = _____

(2)

(e) The pond was a rectangular shape, measuring:

- length = 2.5 metres
- width = 1.5 metres
- depth = 0.5 metres.

Calculate the estimated number of Daphnia in the pond.

Use your answer from part **(d)**.

Give your answer in standard form.

Number of Daphnia in the pond = _____

(4)

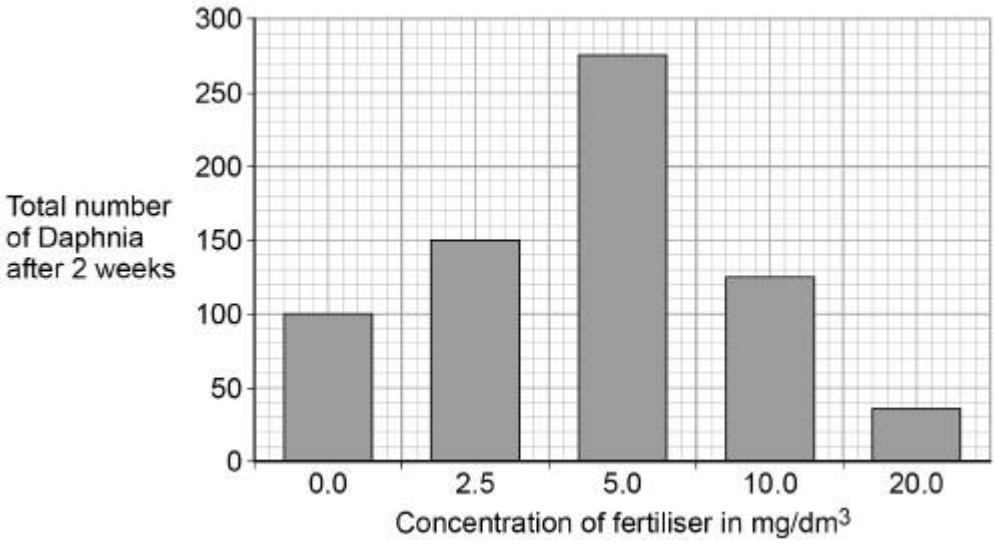
Rainfall can cause fertiliser to be washed from farmland into a pond.

The students investigated the effect of fertiliser on the population of Daphnia in water from the pond.

- The students put 20 Daphnia in each of five different concentrations of fertiliser.
- The students counted the total number of Daphnia in each concentration of fertiliser after 2 weeks.

Figure 2 shows the results.

Figure 2



(f) A concentration of 5.0 mg/dm^3 of fertiliser caused a large increase in the population of Daphnia.

Explain why.

_____

_____

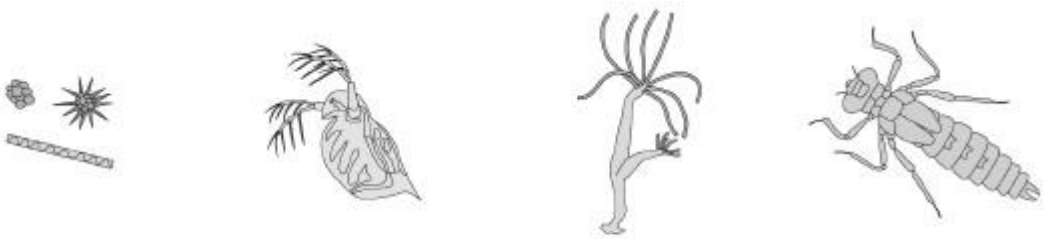
_____

_____

(2)

(g) **Figure 1** is repeated below.

Figure 1



The population of **Hydra** will decrease when 20 mg/dm^3 of fertiliser is added to the pond.

Explain why.

_____

_____

_____

_____

(2)

(Total 14 marks)

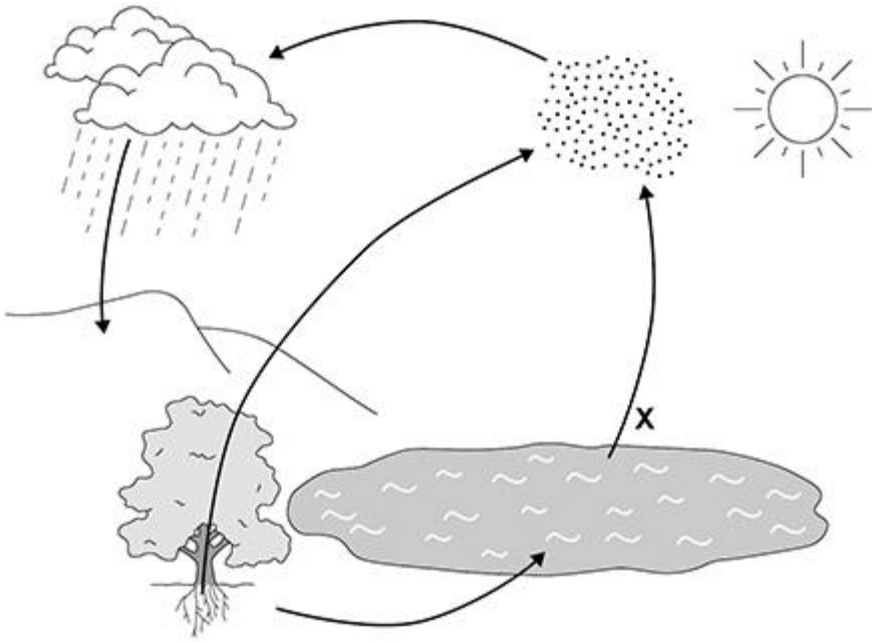
Combined Higher Questions

Q3.

Energy flows through an ecosystem and materials are recycled.

Figure 1 shows the water cycle.

Figure 1



(a) Name process **X**.

_____

(1)

(b) Name the process by which water is absorbed into plant roots.

_____

(1)

(c) Give **two** uses of water in plants.

1 _____

_____

2 _____

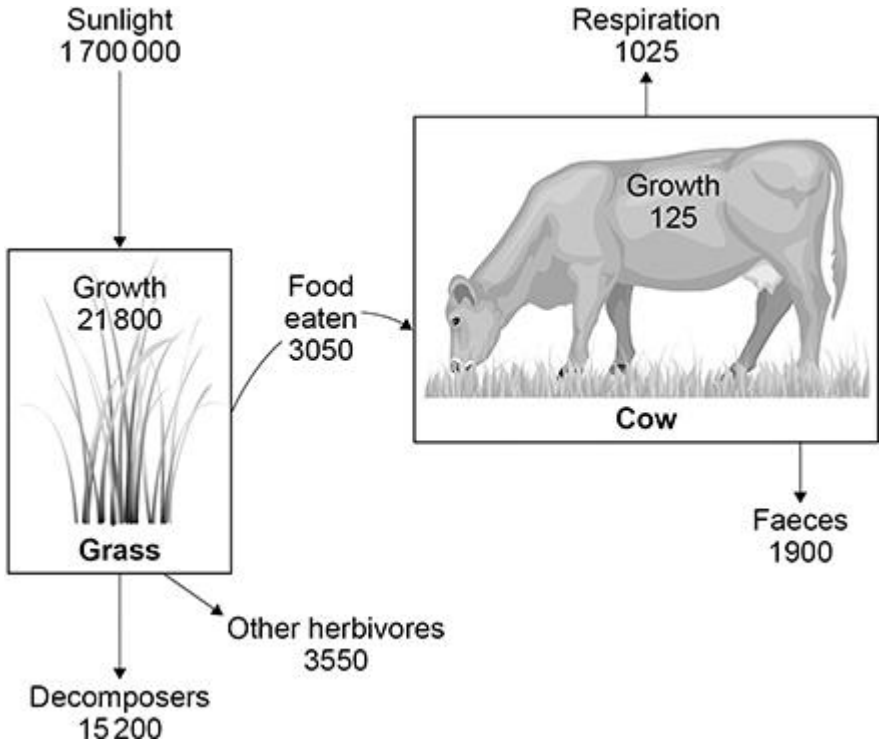
_____

(2)

Figure 2 shows the flow of energy through a food chain.

The numbers are in kilojoules/m^2/year.

Figure 2



(d) The cow is more efficient than the grass at converting energy.

The energy conversion efficiency of the cow is 4.098%.

Calculate how many times more efficient the cow is at converting energy than the grass.

The equation for energy conversion efficiency is:

$$\text{energy conversion efficiency} = \frac{\text{energy used for growth}}{\text{energy input}} \times 100$$

Give your answer to 3 significant figures.

Number of times (3 significant figures) = _____

(5)

(e) It is more energy-efficient to rear cows indoors than to rear cows outdoors.

Give **two** reasons why.

1 _____

2 _____

(2)

(f) Suggest **two** possible disadvantages of rearing cows indoors.

1 _____

2 _____

(2)

(Total 13 marks)

Q4.

Students investigated a food chain in a garden.

lettuce → **snail** → **thrush (bird)**

The students:

- estimated the number of lettuce plants in the garden
- estimated the number of snails feeding on the lettuces
- counted two thrushes in the garden in 5 hours.

The table below shows the students' results and calculations.

Organism	Population size	Mean mass of each organism in g	Biomass of population in g	Biomass from previous organism that is lost in g	Percentage of biomass lost
Lettuce	50	120.0	6000		
Snail	200	2.5	500	5500	91
Thrush	2	85.0	170	330	66

(a) (i) Give **two** ways that biomass is lost along a food chain.

_____

_____

_____

_____

(2)

(ii) Scientists estimate that about 90% of the biomass in food is lost at each step in a food chain.

Suggest **one** reason why the students' value for the percentage of biomass lost between the snails and the thrushes is only 66%.

_____

_____

(1)

(b) European banded snails have shells with different colours (light or dark) and with stripes or with no stripes.

Figure 1 shows two examples of European banded snails.

Figure 1

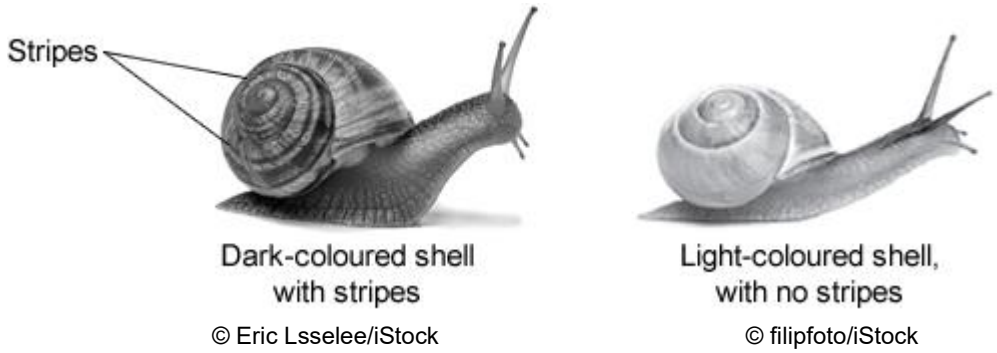
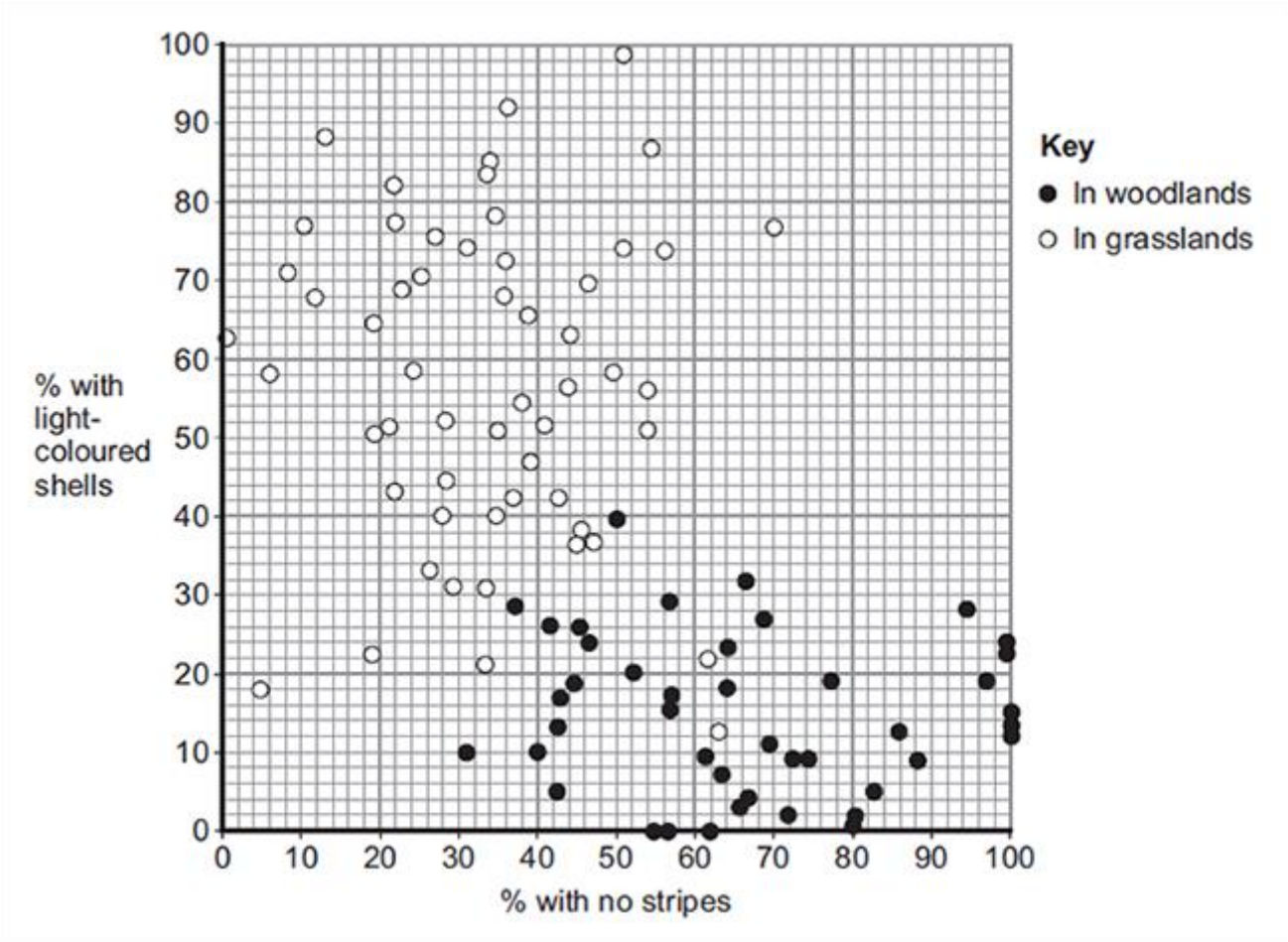


Figure 2 shows results from surveys in woodlands and in grasslands of the percentage of snails with light-coloured shells and the percentage of snails with no stripes.

Each point on the graph represents the results of one survey in one habitat.

Figure 2



(i) **Figure 2** is a scatter graph.

Why is a scatter graph used for this data?

_____

_____

(1)

(ii) Compare the general appearance of snails that live in woodlands with the general appearance of snails that live in grasslands.

_____

_____

_____

_____

(2)

(iii) Suggest a reason for the general appearance of snails that live in woodlands.

_____

_____

(1)

(Total 7 marks)

Q1.

(a) carbon dioxide

1

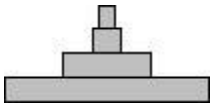
water

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) 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 / CO_2
  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 × 10^4

1

(e)

an answer of 2.625 × 10^4 ***or*** *2.63 × 10^4* ***or*** *2.6 × 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 × 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 × 10^4

allow 2.63 × 10^4 ***or*** *2.6 × 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

[14]

Q3.

(a) evaporation

allow vaporisation

1

(b) osmosis

allow diffusion

ignore absorption

1

(c) any **two** from:

- photosynthesis
- support

allow turgor

allow to fill vacuole

allow opening of stomata

allow to prevent wilting

- (solvent for) transport

allow (as a) solvent

or
translocation
or
for the transpiration stream

allow (as a) medium for chemical reactions

allow hydrolysis / digestion / breakdown of stored food

allow cooling

allow making cytoplasm

2

(d) *substitution*

$$\frac{21\,800}{1\,700\,000} \times 100$$

1

1.282(3529)

allow 1.28 ***or*** *1.3*

1

comparative efficiency

$$\frac{4.098}{1.282}$$

1

3.196.....

allow an incorrectly calculated value for efficiency correctly substituted

1

significant figures
3.20

do ***not*** *accept 3.2*

do ***not*** *accept if a unit is given*

1

(e) less energy lost as heat

allow less heat lost

allow less energy lost keeping warm

or *less energy for maintaining body temperature*

1

less energy lost in movement

ignore less movement

ignore less energy lost unqualified
ignore controlling diet

*do **not** accept energy used for respiration*
*do **not** accept energy produced / made / created*

1

(f) any **two** from:

- increased spread of disease

or

increased use of drugs / antibiotics (to reduce disease))
allow diseases spread (more) easily

- more antibiotics in meat / milk
- (extra) cost of heating / lighting / food / drugs
  allow (extra) energy used for heating / lighting
  ignore (extra) cost unqualified

- aggressive behaviour (causing harm)

or

'emotional' stress reduces productivity
ignore cruelty / unethical
ignore need to clean out barns / sheds
ignore need to maintain / build barns

2

[13]

Q4.

(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_2 / 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]