

Q1. Food chains show the flow of energy through the organisms in a habitat.

(a) The diagram below shows a food chain.



The biomass in each stage of the food chain changes as food passes along the food chain.

Draw a pyramid of biomass for this food chain.

Label the pyramid.

(2)

(b) The table below shows three food chains, **A**, **B** and **C**.

	Food chain
A	plants → sheep → human
B	plants → grasshoppers → frogs → trout → human
C	plants → human

(i) In which food chain, **A**, **B** or **C**, will the greatest proportion of biomass and energy of the plants be passed to humans?

(1)

(ii) Give reasons why the food chain that you chose in part **(b)(i)** passes on the greatest proportion of biomass and energy to humans.

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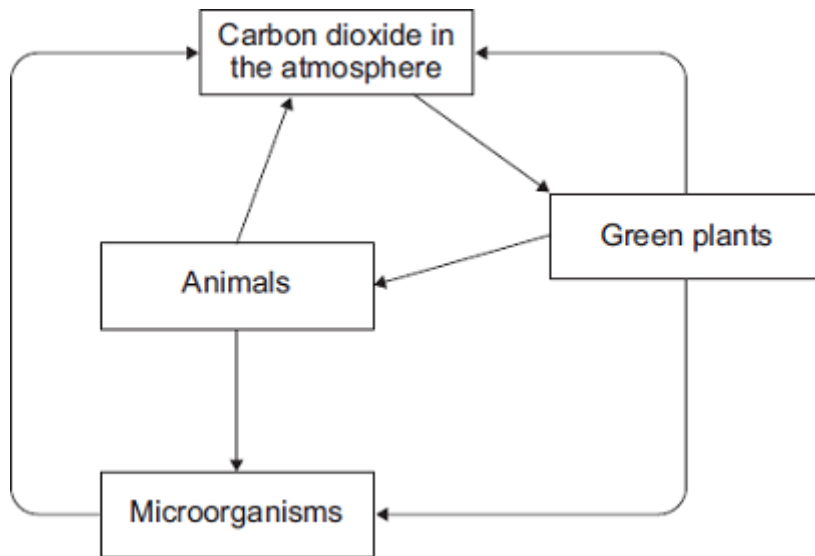
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(3)
(Total 6 marks)

Q2. *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagram shows part of the carbon cycle.



Describe how living things are involved in the constant cycling of carbon.

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(Total 6 marks)

Q3. There are many ways to increase the efficiency of food production.

(a) The table shows the energy available to humans from two different food chains.

Food chain	Energy transferred to humans in kJ per hectare of crop
Wheat → humans	900 000
Wheat → pigs → humans	90 000

(i) Compare the amount of energy the two food chains transfer to humans.

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(1)

(ii) Give **one** reason for the difference in the amount of energy the two food chains transfer to humans.

.....

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(1)

(b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Give methods used in the factory farming of animals.
 Explain the advantages and disadvantages of these methods.

(iii) This year the hazel bushes have produced very few nuts.

Explain, as fully as you can, how this might affect the populations of:

1. squirrels;

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2. owls.

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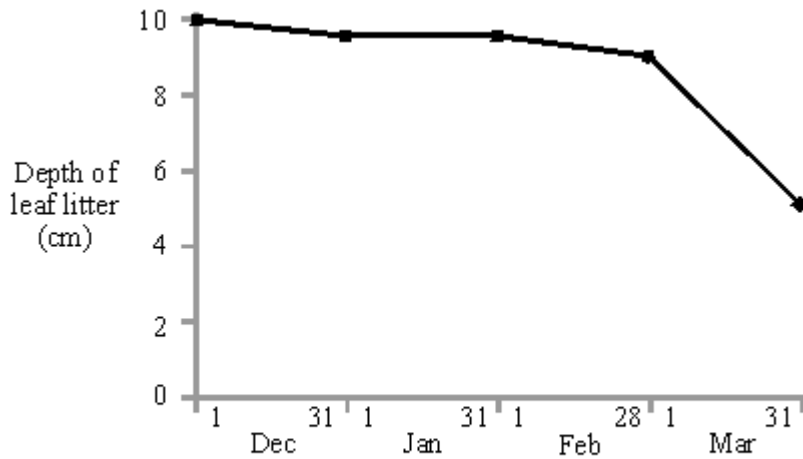
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(4)

(b) An area of the floor of the wood 1 m² was fenced off so that animals could not reach it. The graph below shows the depth of leaf litter (dead leaves) inside the fence over the next few months.



Explain, as fully as you can,

(i) why the depth of the leaf litter decreased;

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(1)

(ii) how this decrease happened.

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(1)

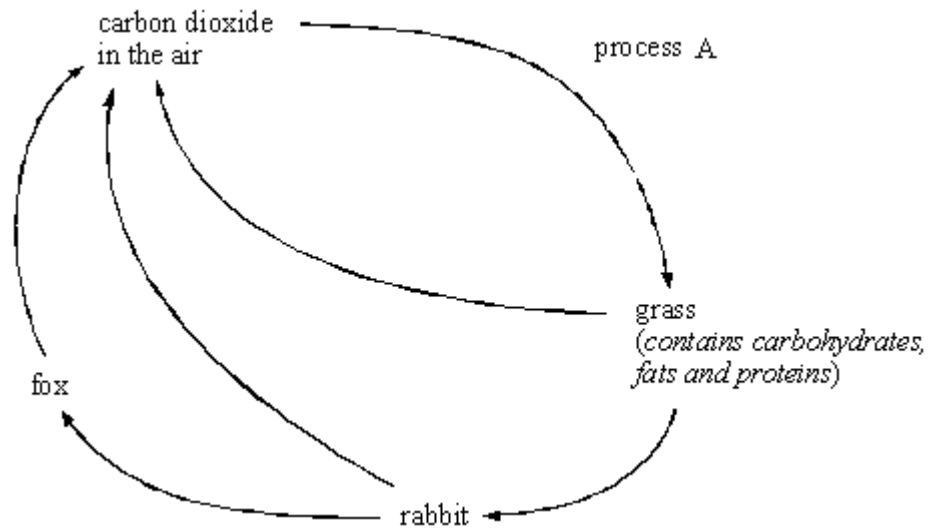
(iii) In which month does leaf litter disappear fastest? Explain why.

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(2)

(Total 11 marks)

Q5. The diagram shows part of the carbon cycle.



(a) Write down the name given to process A.

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(1)

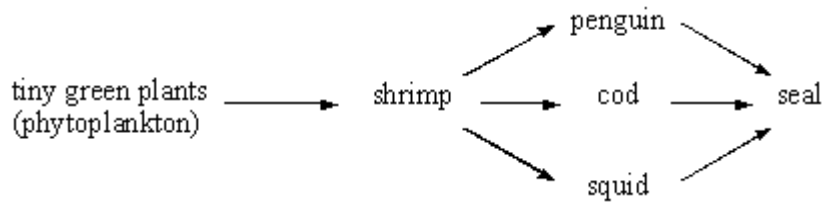
(b) Explain, as fully as you can, how some of the carbon in the grass becomes part of the fox's body.

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(3)

(Total 4 marks)

Q6. Scientists have found the following food web in the Antarctic Ocean.



(a) (i) Write down the name of the producer in this web.

.....

(ii) Write down the names of **two** organisms which are prey in this web.

.....

.....

(3)

(b) Humans are removing large numbers of the cod.
Some scientists argue that this could lead to a decrease in the numbers of squid and penguins.
Others argue that the numbers of squid and penguins will stay the same.

Carefully explain each argument.

Why they might decrease.

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Why they might stay the same.

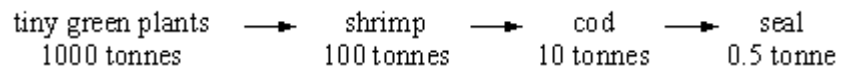
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(2)

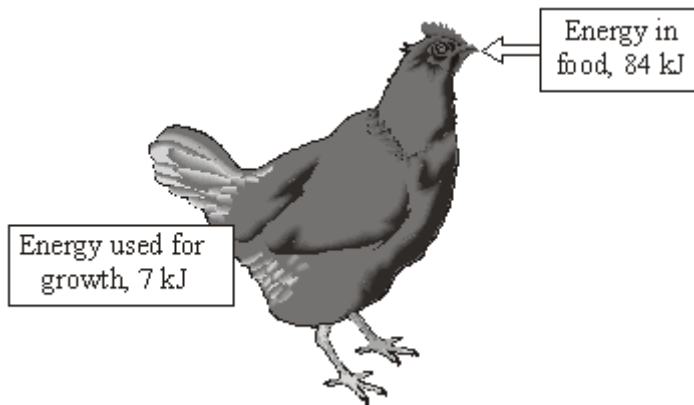
(c) The following information is about the biomass of the organisms in one of the food chains in the web.



Draw and label a pyramid of biomass for this chain.

(2)
(Total 7 marks)

Q7. The diagram shows what happens to some of the energy in the food that a chicken eats.



(a) Calculate the percentage of energy used for growth.

Show clearly how you work out your answer.

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.....

Energy used for growth = %

(b) The energy that is not transferred into growth is lost.

Give **three** ways in which this energy is lost.

1

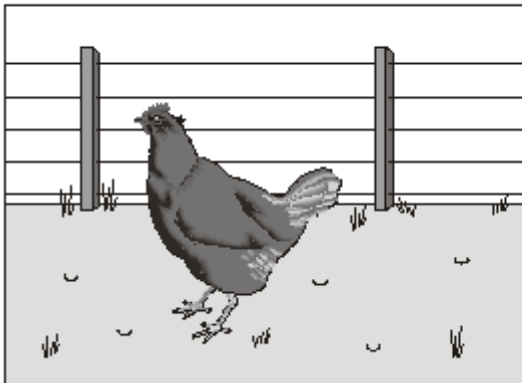
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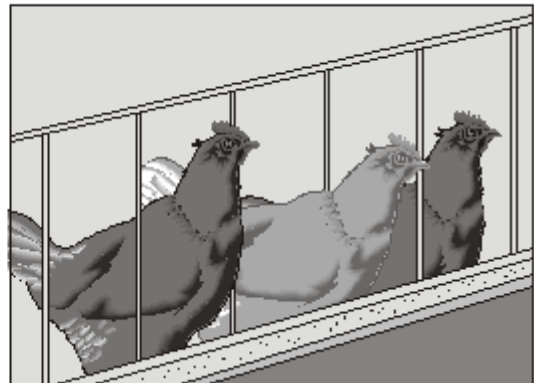
(3)

(c) The pictures show two ways of keeping chickens to produce eggs.

Chickens kept outdoors (free-range)



Chickens kept in cages (battery chickens)



Battery chickens produce more eggs per year than free-range chickens.

Suggest **one** reason why.

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.....

(1)

(d) The animals that we raise for food are usually herbivores (plant eaters) rather than carnivores (flesh eaters).

Explain why.

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(2)
(Total 8 marks)

Q8. (a) One food chain in the wood is:

Hazel tree nuts → squirrels → owls

(i) What does this food chain tell us?

.....
.....

(2)

(ii) Which **one** of the organisms in the food chain is a producer?

.....

(1)

(iii) This year the hazel bushes have produced very few nuts.

Explain, as fully as you can, how this might affect the populations of:

1. squirrels;

.....
.....
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.....

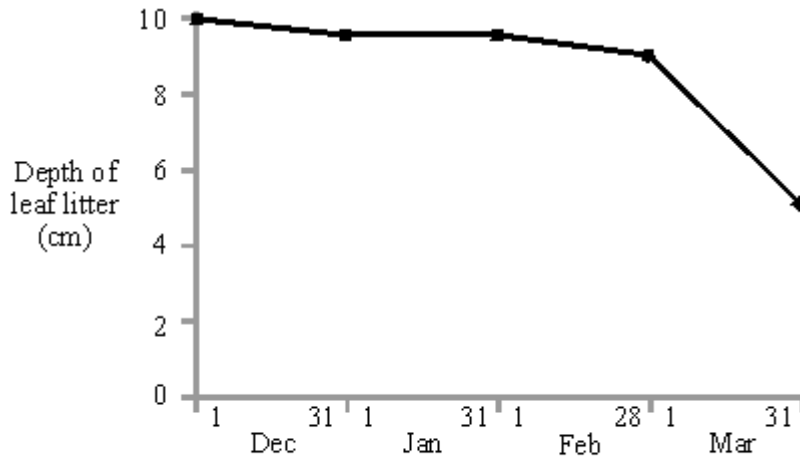
2. owls.

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(4)

- (b) An area of the floor of the wood 1 m² was fenced off so that animals could not reach it. The graph below shows the depth of leaf litter (dead leaves) inside the fence over the next few months.



Explain, as fully as you can,

- (i) why the depth of the leaf litter decreased;

.....

(1)

- (ii) how this decrease happened.

.....

(1)

- (iii) In which month does leaf litter disappear fastest? Explain why.

.....

.....

.....

.....

(2)
(Total 11 marks)

M1.(a) 3-layered triangular pyramid

as blocks or layered triangle, ignore (small) gaps between layers

1

(pyramid) labelled in food chain order

all three labels are required

for 2 marks the pyramid must be fully correct

1

(b) (i) C

1

(ii) shortest **or** fewest stages / transfers / (trophic) levels

allow only if (b)(i) is C or blank

1

less losses in waste / faeces / urine / CO₂ / excretion

allow smaller amount uneaten

1

less loss in respiration / heat / movement

allow less lost keeping warm

*do **not** allow energy for respiration*

*do **not** allow respiration makes energy*

*allow less loss (of biomass / energy) **or** less transfer (of biomass / energy) to surroundings if neither 2nd nor 3rd point given, for 1 mark*

1

[6]

M2. Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the [Marking guidance](#).

0 marksNo relevant content.

Level 1 (1-2 marks)For at least one process **either** the organism that carries it out **or** the carbon compound used **or** the carbon compound produced is described **or** for at least one organism **either** the carbon compound it uses **or** the carbon compound it produces is described **or** at least one process is named

Level 2 (3-4 marks)For some processes (at least one of which is named) **either** the organisms involved **or** the carbon compounds used **or** the carbon compounds produced are described

Level 3 (5-6 marks)For at least one named process an organism **and** either the carbon compound used for the process **or** the carbon compound produced by the process are described **and** for other processes (at least one of which is named) **either** the organism **or** the carbon compounds used **or** the carbon compounds produced are described (as in Level 2)

Examples of Biology points made in the response:

- (green) plants photosynthesise
- photosynthesis takes in carbon dioxide
- (green) plants use carbon to make carbohydrate / protein / fat / organic compounds / named (e.g. enzymes / cellulose)
- animals eat (green) plants (and other animals)
- (green) plants respire
- animals respire
- respiration releases carbon dioxide
- (green) plants and animals die
- microorganisms decay / decompose / rot / break down / feed on dead organisms
- microorganisms respire

[6]

M3.(a) (i) wheat → humans chain transfers 10 times more energy than wheat → pigs → humans chain

allow 10% if given as a comparison e.g. one is 10% of the other

or

wheat → pigs → humans chain transfers 810 000 (kJ per hectare) less
ignore less unqualified

1

(ii) any **one** reason for energy loss from pigs e.g :

ignore respiration, growth

ignore heat unqualified

- movement
- (maintaining) body temperature
- waste materials
allow named examples
- not all parts of pig eaten by human
- because there is an extra stage (pigs) in the food chain and energy is lost at each stage
allow longer food chain so more energy lost

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the [Marking guidance](#), and apply a 'best-fit' approach to the marking.

0 marksNo relevant content.

Level 1 (1-2 marks)There is a basic description of at least one factory farming method

or

identification of an advantage or disadvantage of factory farming.

Level 2 (3-4 marks)There is a description of at least one factory farming method

and

an advantage or disadvantage is explained.

Level 3 (5-6 marks)There is a description of factory farming methods

and

advantage(s) and disadvantage(s) are explained.

Examples of Biology points made in the response:

factory farming methods e.g.:

- Kept in cramped conditions / battery hens / calf crates / pig barns / fish tanks
- Controlled temperature / heating
- Controlled feeding / modified food given / growth hormones
- Controlled lighting
- Treated with prophylactic antibiotics

Advantages e.g.:

- Increased efficiency / profit / greater food production / cheaper food / faster growth
- Farmer can have more livestock
- Less energy is lost through movement
- Less energy is used keeping warm
- (Food is high in calories / protein) so animals will grow faster / lay more eggs
- Easier to vaccinate all the animals
- Easier to protect animals from predators
- Antibiotic treatment stops infections in animals

Disadvantages e.g.:

- Stress / cruelty / inhumane / unethical
- Restricted movement / overcrowding
- Faster spread of diseases
- Antibiotics in the food chain / residual chemicals in the food chain
- Wasting fossil fuels / increasing global warming
- Increased pollution from animal waste and from additional transport

6

[8]

- M4.** (a) (i) squirrels eat nuts;
each for 1 mark

	owls eat squirrels <i>(2 marks for energy flow)</i>	2
(ii)	hazel tree <i>gains 1 mark</i>	1
(iii)	1 squirrel population would decrease; because fewer nuts available as food <i>each for 1 mark</i>	2
	2 owl population would decrease; because fewer squirrels available as food <i>each for 1 mark</i>	2
(b)	(i) digested/broken down;	
	(ii) by microbes/reference to worm action; <i>each for 1 mark</i>	2
(iii)	March warmer/increased activity of worms/microbes; <i>each for 1 mark</i>	2
		[11]
M5.	(a) photosynthesis <i>for 1 mark</i>	1
(b)	<ul style="list-style-type: none"> • 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]

M6. (a) (i) (tiny green) plants / phytoplankton
for 1 mark

1

(ii)

- penguin
 - shrimp
 - cod
 - squid
- any two for 1 mark*

1

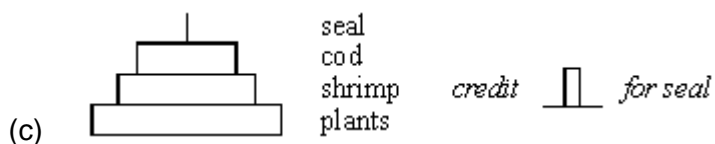
(b) Decrease: seals will eat more squid and penguins
for 1 mark

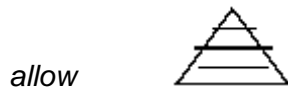
1

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*

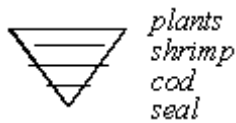
2





- 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]

- M7.** (a) 8.3 **or** 8.3 recurring **or** 8
*award **both** marks for correct answer, irrespective of working*
7 / 84 × 100 or equivalent for 1 mark

2

(b) any **three** from:

- heat
allow keeping warm
- respiration
***not** for respiration*
- movement **or** example of movement eg exercise / kinetic
- faeces / waste / urine / excretion / urea
ignore eggs / sound

3

(c) any **one** from:

- less / no movement

allow examples of movement

- less / no heat loss
- reference to selective breeding
- reference to controlled / better / more feeding

1

(d) any **two** from:

- less steps in food chain
- less losses of biomass / energy / examples of losses
- cheaper to feed herbivores
allow dangerous to keep carnivores
herbivores contain more energy is insufficient

2

[8]

M8. (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]