Q1. Human activities affect the environment.

(a) **List A** gives four human activities.

List B gives the effect of the activities on the environment.

Draw **one** line from each human activity in **List A** to its effect on the environment in **List B**.

List A **Human activity**	**List B** **Effect on the environment**
	Adds methane to the atmosphere
Digging a new quarry	
	Pollutes hedges around fields
Spraying pesticides on crops	
	Reduces the land available for wild animals
Growing rice	
	Produces lots of litter
Driving cars that release sulfur dioxide	
	Produces acid rain

(4)

(b) Human activities are increasing *global warming* .

Give **two** effects of *global warming* on the environment.

1.....

.....

2.....

.....

(2)
(Total 6 marks)

Q2. There are plans for a 'cattle factory' to be built in the UK.

Information about the cattle factory and traditional cattle farming in the UK is given below.

Cattle factory

Traditional cattle farming

Cattle factory by Pirhan [CC BY-SA 2.0], via Flickr. Traditional cattle farming by Mat Fascione[CC-BY-SA-2.0], via Wikimedia Commons

Cattle factory

- There will be over 8 000 cows in three large sheds.
- Each cow will be milked three times a day.
- Each cow will produce about 50 litres of milk every day.
- Waste will be collected and used to produce electricity for 2 000 homes.
- Cows are kept near to each other so disease can spread easily.

Traditional cattle farming

- Most farms have between 5 and 500 cows.
- The cows spend most of the time in fields.
- Cows are milked once or twice a day.
- Each cow produces up to 20 litres of milk a day.
- The waste is used as natural fertiliser for crops.

(a) Use the information to answer the questions.

(i) Give **two** reasons why some people think the cattle factory is a good idea.

1 .....

.....

2 .....

.....

(2)

(ii) Give **two** reasons why some people think traditional farming is better than the cattle factory.

1 .....

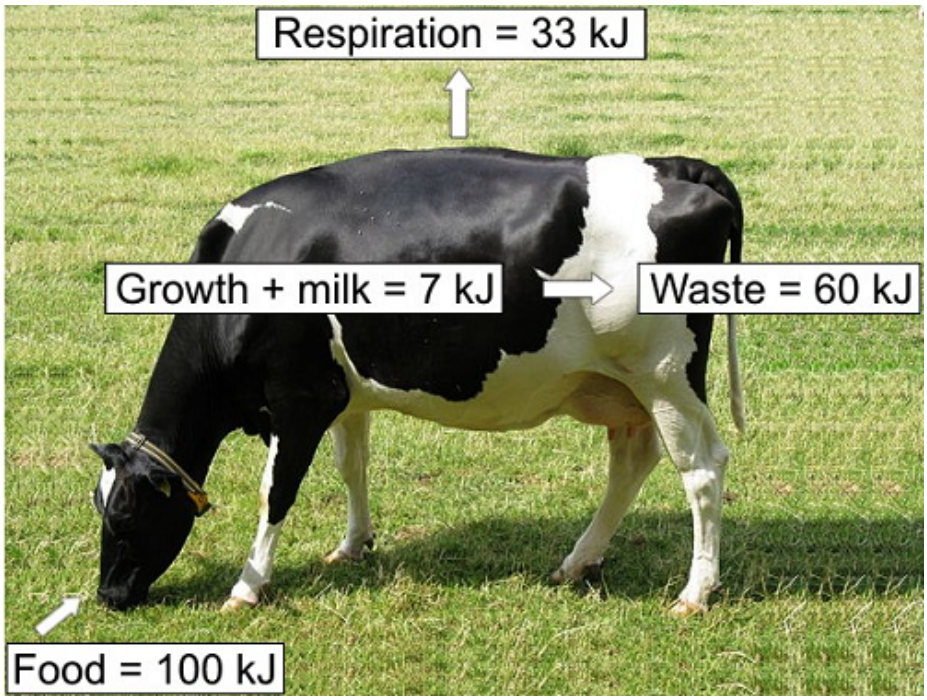
.....

2 .....

.....

(2)

(b) The diagram shows what happens to 100 kJ of energy in the food eaten by a cow on a traditional farm.



By Dohduhdah (Own work) [Public domain], via Wikimedia Commons

Use your knowledge and the information in the diagram to answer this question.

Compare the transfer of energy from the food eaten by cows in the cattle factory with the energy transferred by cows on a traditional farm.

Use words from the box to complete the table.

more	**less**	**the same**

Energy	**Amount of energy transferred by cows in a cattle factory compared with cows on a traditional farm**
transferred for growth and milk	
transferred in respiration	

(2)

(Total 6 marks)

Q3. The photographs show some ways in which humans affect the environment.

(a) Coal-burning power stations give off smoke. The smoke contains many different gases.

By Norbert Kaiser (English: own work.) [CC-BY-SA-3.0], via Wikimedia Commons

Draw a ring around the correct answer to complete each sentence.

(i) The gas which causes global warming is

carbon dioxide.
oxygen.
sulfur dioxide.

(1)

(ii) The gas which causes acid rain is

methane.
oxygen.
sulfur dioxide.

(1)

(b) The photograph shows a quarry.

By Thomas Bjørkan (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

Draw a ring around the correct answer to complete each sentence.

(i) Quarrying

- releases methane into the atmosphere.
- increases biodiversity.
- reduces land available for animals and plants.

(1)

(ii) Quarrying can be reduced by recycling

- metals.
- paper.
- plastic

(1)

(c) The photograph shows a farmer spraying fruit trees.

Photograph supplied by Hemera/Thinkstock

Chemicals in the spray kill insects on the trees.

Draw a ring around the correct answer to complete each sentence.

(i) The spray contains

fertiliser.
herbicide.
pesticide.

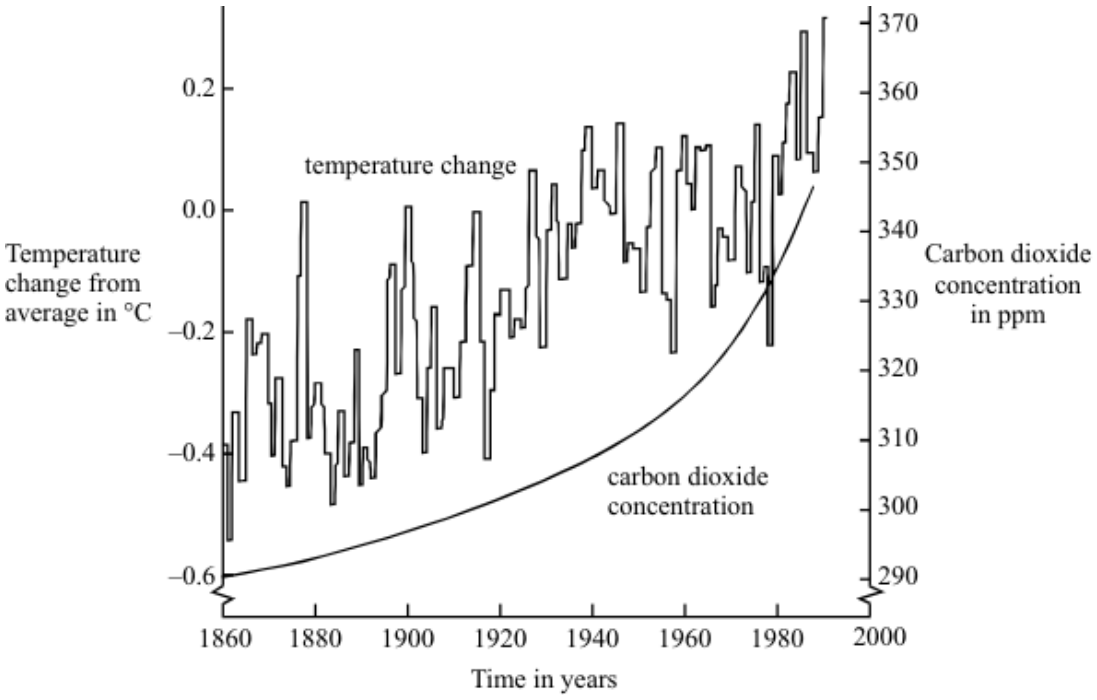
(1)

(ii) The chemical in the spray might also

kill other animals.
kill plants.
increase biodiversity.

(1)
(Total 6 marks)

Q4. The graph shows changes in temperature and in carbon dioxide concentration in the earth's atmosphere between 1860 and 1990.



(a) Give **two** human activities which may have helped to increase the concentration of carbon dioxide in the atmosphere.

1 .....

2 .....

(2)

(b) (i) Describe the changes in temperature shown by the graph between 1860 and 1990.

.....

.....

.....

(2)

(ii) Do the data in the graph prove that increased carbon dioxide concentrations in the atmosphere caused the changes in temperature you described in part (b)(i)? Give a reason for your answer.

.....

.....

(1)

(c) Describe **one** way in which a change in temperature such as that shown in the graph might affect the environment.

.....

.....

(1)

(Total 6 marks)

Q5. 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.

.....

.....

(1)

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

.....

.....

(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.

.....

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.....

.....

(6)
(Total 8 marks)

Q6. Mycoprotein is produced from the fungus *Fusarium*. Mycoprotein is sometimes used instead of meat in foods for vegetarians.

(a) The table shows the amounts of some substances in mycoprotein and in chicken.

Substance	Mass in grams per 100 grams	
	Mycoprotein	**Chicken**
Protein	11.8	22.0
Dietary fibre	4.8	0.0
Fat	3.5	6.2
Carbohydrate	2.0	0.0
Cholesterol	0.0	0.1

(i) Draw a ring around the correct answers to complete the sentence.

Eating mycoprotein instead of chicken helps to lower the risk of heart disease because

mycoprotein contains no | fat / carbohydrate / cholesterol | and

mycoprotein contains less | dietary fibre. / fat. / carbohydrate. |

(2)

(ii) A body-builder ate 4 kilograms of chicken each week to help him build up his muscles.

If he ate mycoprotein instead of chicken, he would need to eat about twice as much to have the same effect.

Use information from the table to give **one** reason why.

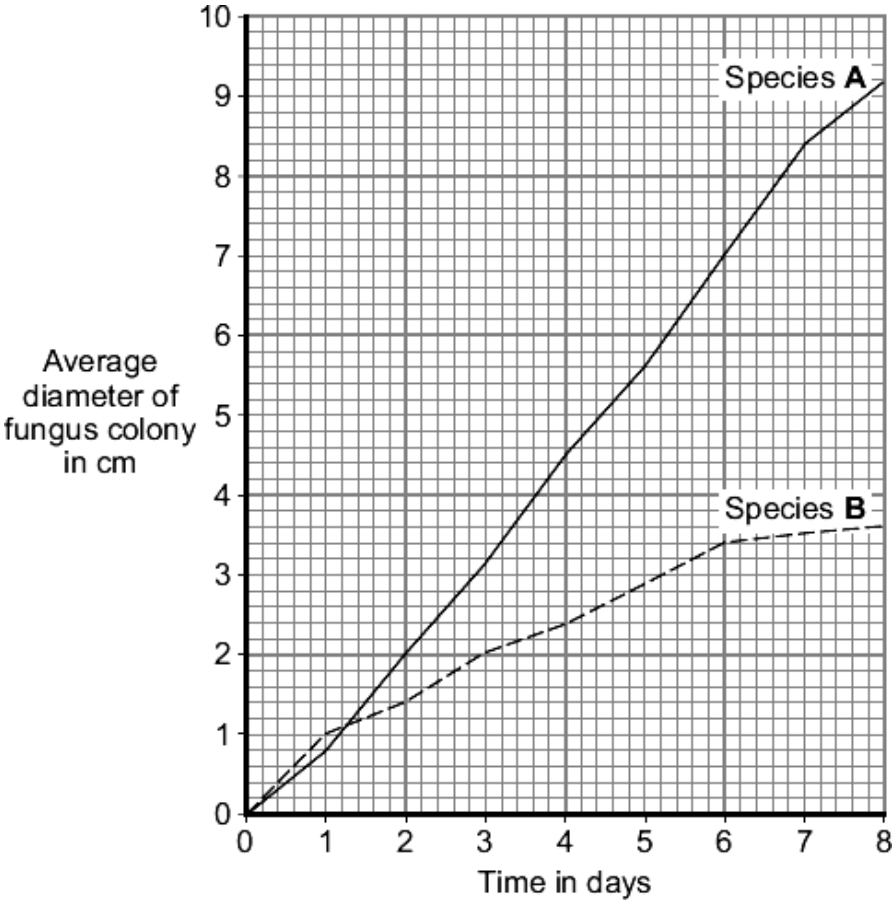
.....

.....

(1)

(b) Scientists investigated the growth of two species, **A** and **B**, of the fungus *Fusarium*.
The scientists grew the fungus on agar jelly in Petri dishes.
They measured the diameter of a colony of each fungus every day for 8 days.

The graph shows the results.



(i) Describe how the diameter of the colony of species **A** changed between day 0 and day 8.

.....

.....

.....

.....

(2)

(ii) Give **one** difference between the results for species **A** and the results for species **B**.

.....

.....

(1)

(c) Both Petri dishes contained the same nutrients.
Both Petri dishes were kept at 25 °C.

When *Fusarium* is grown in an industrial fermenter, other factors also need to be controlled.

Give **two** of these other factors.

1 .....

2 .....

(2)

(Total 8 marks)

Q7. (a) Tuna fish are carnivores. In the wild they feed on smaller fish called herring. Herring feed on plankton. Tuna can be attacked by parasitic worms which feed on their flesh.

(i) In the space below sketch the appearance of a pyramid of biomass for this food chain.

Do not forget to label each section of the pyramid.

(2)

(ii) If a tuna eats 1 kg of herring, it gains about 65 g in mass.

Give **two** reasons why so little of the mass of the herring is converted into mass of the tuna.

1 .....

.....

2 .....

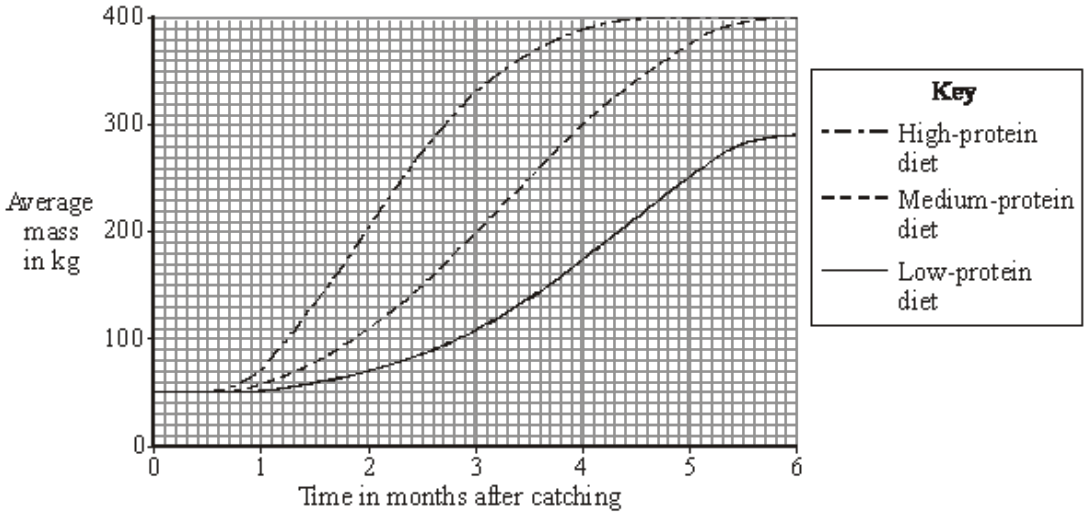
.....

(2)

(b) Young tuna are caught by fish farmers and reared in large pens in the sea.

The fish are fed more food than they would normally catch themselves so they grow quickly. When they reach 400 kg they are sold.

The graph below shows the effect of feeding tuna different amounts of protein in their food.



(i) Calculate the average increase in mass per month of the fish fed on the low-protein diet over the six months.

Show clearly how you work out your answer.

.....

.....

Average increase in mass per month ..... kg

(2)

(ii) There is not enough information in the graph to allow the fish farmer to decide whether to use the high-protein diet or the medium-protein diet.

Suggest **one** other piece of information that he needs in order to make this decision.

.....

.....

(1)

(c) Some consumers will not buy tuna grown in this way.

Suggest **one** reason for their decision.

.....

.....

(1)

(Total 8 marks)

Q8. Deforestation affects the environment in many ways.

(a) Deforestation increases the amount of carbon dioxide in the atmosphere.

Give **two** reasons why.

1 .....

2 .....

.....

(2)

(b) Deforestation also results in a loss of *biodiversity*.

(i) What is meant by *biodiversity*?

.....

.....

(1)

(ii) Give **one** reason why it is important to prevent organisms from becoming extinct.

.....

.....

(1)

(Total 4 marks)

Q9. Read the passage below about biogas production in Sri Lanka, which is a country with a much warmer climate than the UK.

> Mr Ratnayake is a farmer. Using nothing more than cow dung, he has enough power to cook and provide heat and light for his home without using a single piece of wood. He collects the manure from his cows in their cattle shed. He then mixes the manure with water and leaves it to ferment in a large concrete pit. The gas produced is collected in a simple storage tank and is piped into his house for use.
>
> The dried manure left after this biogas is generated is richer than ordinary manure. It makes a good organic fertiliser for Mr Ratnayake's crops. He can then sell his crops at a higher price as they are organic produce.
>
> *http://www. i-sis.org.uk*

(a) (i) What is the fuel gas present in biogas?

.....

(1)

(ii) Name the process which produces biogas.

.....

(1)

(b) (i) Give **two** ways in which Mr Ratnayake benefits from making biogas as described in the passage.

1 .....

.....

2 .....

.....

(2)

(ii) This design of biogas generator works well in Sri Lanka. It would not work so well in the UK.

Explain why.

.....

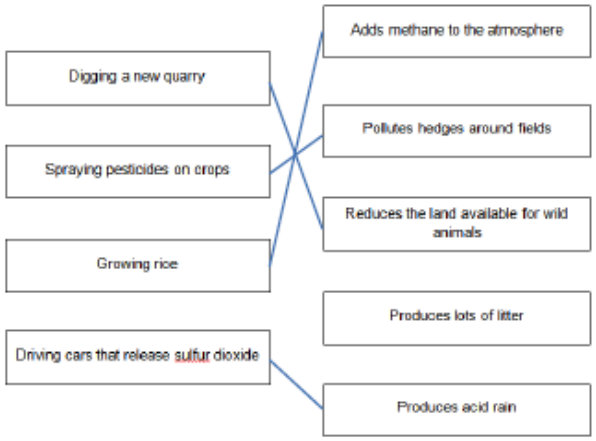
.....

.....

.....

(2)
(Total 6 marks)

M1. (a)



1 mark for each correct line

extra line from box in left hand column cancels mark

4

(b) any **two** from:

- climate change
  ignore 'Earth warmer'
- more extreme weather / changes to weather (patterns) / described
- rise in sea level
- melting of ice caps
- reduced biodiversity
- changes to migration patterns
- changes in distribution of species
  accept faster plant growth / tropical species can be grown in UK
  accept tropical diseases / example spread to temperate regions

2

[6]

M2. (a) (i) any **two** from:

- more milk
  (about) 50 litres milk compared to (up to) 20 litres / 30 litres more
  ignore costs / profit
- electricity produced
- farmers can keep more cows in the space
  answers must refer to number of cows <u>and</u> space

2

(ii) any **two** from:

- less stress for cow **or** not cruel to cow **or** cows have freedom to move around
  ignore references to ethical / unnatural without qualification
- crops fertilised
- less disease **or** disease not as easily spread

2

(b) more

1

less

in this order

1

[6]

M3. (a) (i) carbon dioxide

1

(ii) sulfur dioxide

1

(b) (i) reduces land available for animals and plants

1

(ii) metals

1

(c) (i) pesticide

1

(ii) kill other animals

1

[6]

M4. (a) burning / combustion fossil fuels / burning wood

accept named fossil fuel
accept driving cars / any vehicles
*do **not** accept burning / combustion unqualified*
*do **not** accept factories*
ignore factory chimneys unqualified
ignore respiration

1

deforestation

1

(b) (i) (overall) increase

1

fluctuations

highs are higher <u>and</u>

*lows are not as low = **2** marks*

1

(ii) no – could be due to some other factor **or**
could be coincidence **or** fluctuations ±
same size as the overall rise or large
fluctuations or sometimes when CO_2 rises temperature doesn't

1

(c) any **one** biotic **or** abiotic effect eg:

*do **not** credit just "climate / weather change"*
allow <u>extreme</u> climate / weather change

changes in rainfall

accept drought, desert formation

ice-caps melting / rise in sea level

accept flooding

changed pattern of winds

changed pattern of migration

changed species survival

changed growth

1

[6]

M5. (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 marks
No 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]

M6. (a) (i) cholesterol

1

fat

in this order

1

(ii) mycoprotein has (approx) half amount of protein / has 11.8 (g) protein while chicken has 22.0 (g)

accept has less protein

ignore less fat

1

(b) (i) increased

1

(±) constant rate **or** (from 0) to 9.2 / by 9.2(cm) **or** about 1 cm a day **or** increase slower at the beginning and / or at the end

1

(ii) species **A** grows faster / more than species **B**
or
species **A** has larger diameter **or** is bigger
or
the growth of species **B** slows down after 6 weeks

accept use of approximate figures

1

(c) any **two** from:

- pH / acidity / alkalinity

  ignore references to carbon dioxide / waste products

- (speed of) stirring

  ignore time in the fermenter

- oxygen (concentration) / aeration

  ignore initial amount of Fusarium

- ion concentration / named eg $-NH_4^+$

  allow ammonia

- pressure

2

[8]

M7. (a) (i) a triangular-shaped pyramid, with 4 layers – widest at the bottom

either in blocks or as a triangle

1

labels in food chain order (from widest part)
ie plankton – herring – tuna – parasitic / worms

*upside down labelled pyramid with producer at top gains **2** marks*

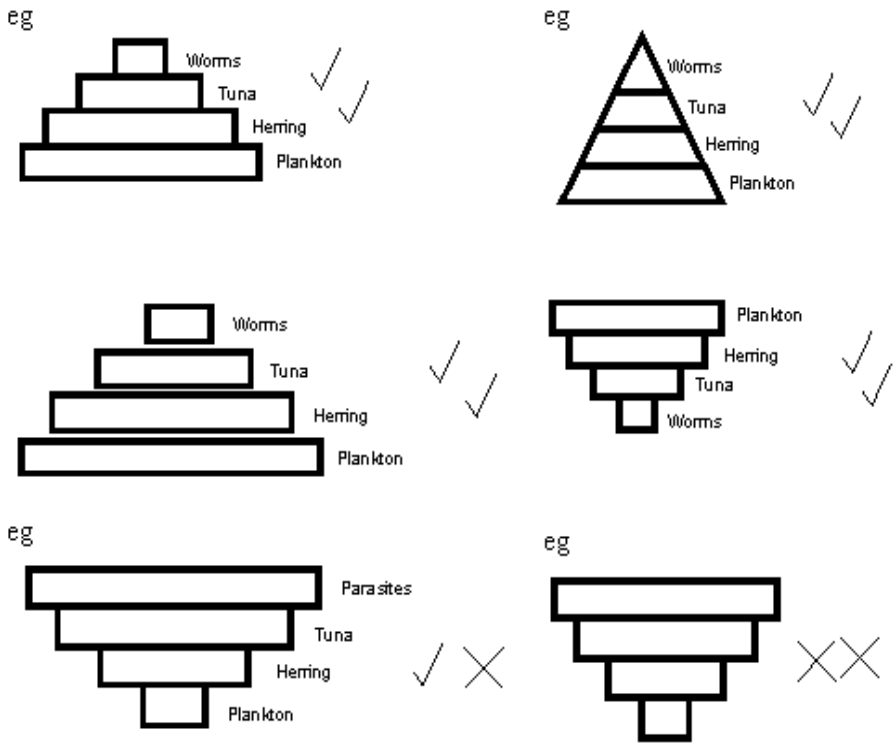
*upside down labelled pyramid with producer at bottom gains **1** mark for labels*

*unlabelled upside down pyramid = **0** marks*

accept separate boxes

*correct food chain with correct arrows if given gains **1** mark*

1



(ii) any **two** from:

- waste / excreted / urine / faeces / CO_2 (from tuna)

  from / of tuna not required but do not accept if of / from other organisms

- respiration (of tuna)

  ignore used in reproduction

- movement (of tuna) / hunting

  *if a mark is not awarded for respiration / movement / heat allow **1** mark for energy (unqualified)*

- used for heat (production) (of tuna)

- not digested / absorbed

2

(b) (i) 40

*award **both** marks for correct answer, irrespective of working*
*allow (290 – 50) /6 **or** 240/6 for **1** mark*

*allow 48.3 **/** 48 $\frac{1}{3}$ **/** 48 for **1** mark*

2

(ii) cost of food / protein

1

(c) any **one** from:

- concern about animal welfare **or** examples **or** cruel to tuna **or** unethical **or** lack of space

  allow immoral

  ignore not natural

- poorer flavour / quality

1

[8]

M8. (a) any **two** from:

ignore CO_2 release unqualified

- burning
- activity of microbes / microbial respiration
- less photosynthesis

  *do **not** accept CO_2 taken in for respiration*

  or

  trees take in CO_2

  or

  less CO_2 locked up in wood

- CO_2 given off by clearing machinery

2

(b) (i) range of different species

accept idea of variety of organisms or plants or animals

1

(ii) any **one** from:

- organisms may produce substances useful to humans

  *do **not** accept if food is only example*

- duty to preserve for future generations
- effect on other organisms e.g. food chain effects

  ignore effect on human food supply

- loss of environmental indicators

1

[4]

M9. (a) (i) methane

apply list principle

allow symbols

1

(ii) <u>anaerobic</u> 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) <u>in the UK</u>

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]