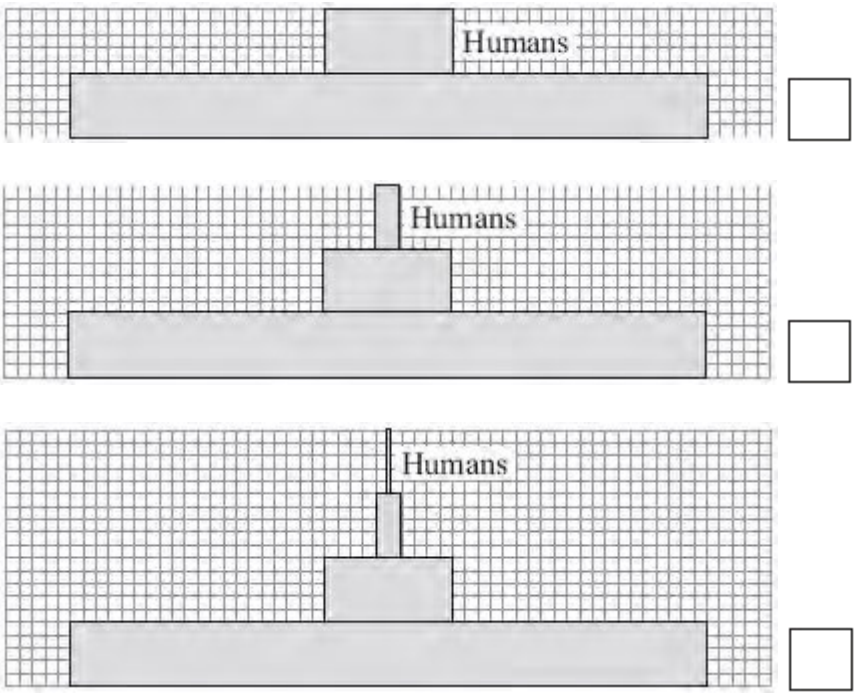
Q1. (a) The diagrams show three pyramids of biomass.

(i) Which pyramid would be the most efficient in providing food for humans?

Tick (✓) **one** box.



(1)

(ii) Give **one** reason for your choice.

.....

.....

(1)

(b) Pigs may be kept indoors or outdoors.

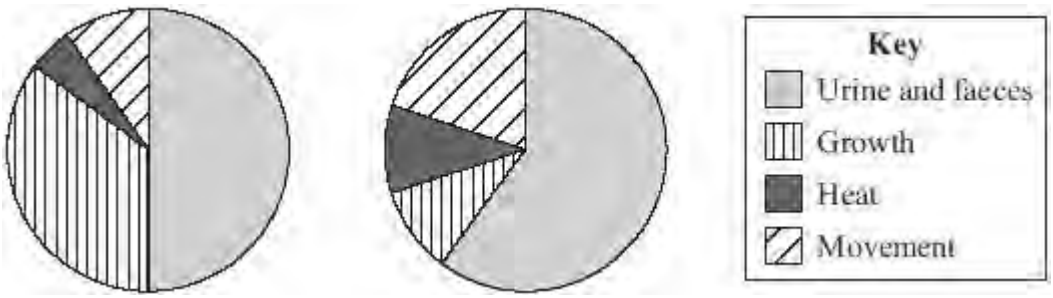
Pigs kept indoors **Pigs kept outdoors**





The pie charts show what happens to the energy in the food eaten by pigs kept indoors and pigs kept outdoors.

Pigs kept indoors **Pigs kept outdoors**



(i) Farmers make more profit from keeping pigs indoors than from keeping pigs outdoors.

Use information from the pie charts to explain why.

.....

.....

.....

.....

(2)

(ii) Meat from pigs kept outdoors may cost more than meat from pigs kept indoors.

Some people prefer to buy meat from animals that have been kept outdoors.

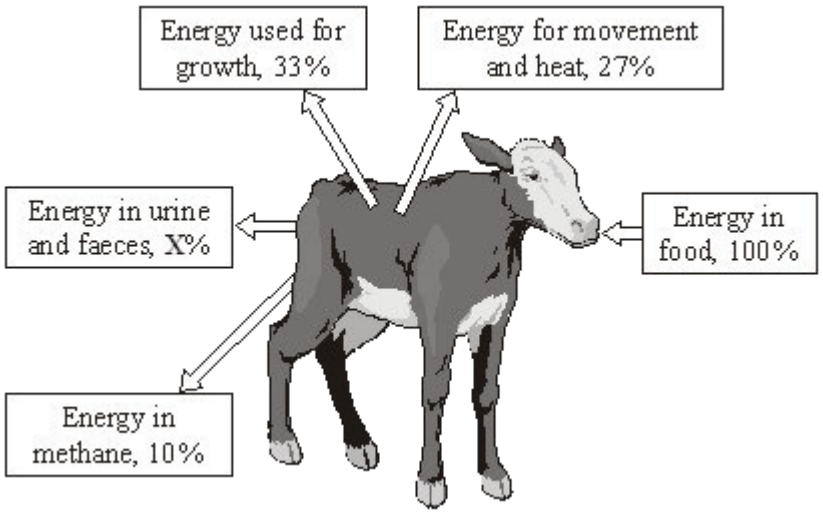
Suggest **one** reason why.

.....

.....

(1)
(Total 5 marks)

Q2. The diagram shows what happens to the energy in the food that a calf eats.



(a) Calculate the % energy lost as urine and faeces (**X**).
Show clearly how you work out your answer.

.....

.....

Energy lost as urine and faeces ..... %

(2)

(b) The energy in the food eaten by the calf in one day is 6 megajoules.

Calculate the amount of this energy that would be used for growth.
Show clearly how you work out your answer.

.....

.....

Energy used for growth ..... megajoules.

(2)

(c) Which process in the body transforms energy in food into heat?

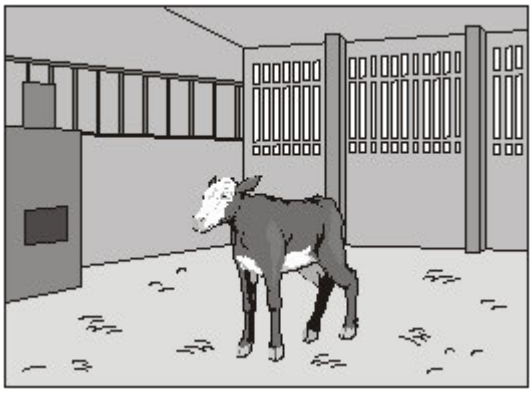
.....

(1)

(d) The pictures show two methods of raising calves indoors.

Method 2 is now banned.

Method 1



Method 2



(i) Calves raised indoors grow faster than calves raised outdoors.

Suggest **one** reason why.

.....

.....

(1)

(ii) **Method 2** was banned after public campaigns.

Suggest **one** reason why people campaigned against this method of rearing calves.

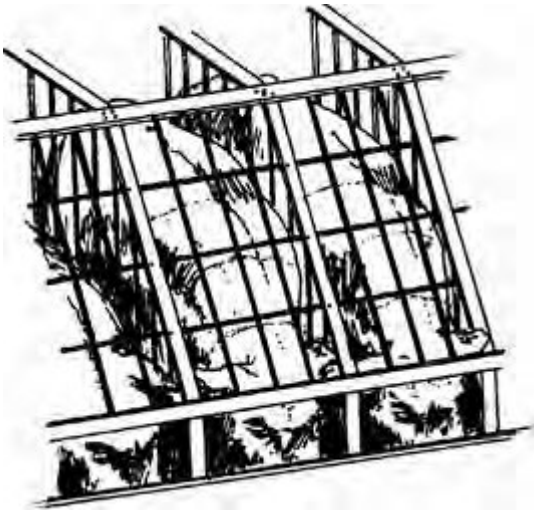
.....

.....

(1)

(Total 7 marks)

Q3. To produce cheap meat, animals must be grown (reared) efficiently. When pigs are reared intensively they are kept indoors. Their surroundings are closely monitored to make sure they have even ventilation and the correct temperature. The risk of infection is high but is reduced by feeding them antibiotics and removing their faeces. The pigs live in cages and cannot move around much.



(a) Explain why farmers control the temperature.

.....

.....

.....

(2)

(b) Explain why farmers want to stop the pigs moving about.

.....

.....

.....

(2)

(c) Give two arguments **against** rearing pigs indoors instead of rearing them outdoors.

1 .....

2 .....

(2)

(Total 6 marks)

Q4. The table gives information about the growth of different types of organism.
The figures were obtained during the period of fastest growth for each organism.

Organism	**Time taken to double in mass**
Bacteria	40 minutes
Yeasts	2 hours
Fusarium	4 hours
Algae	5 hours
Soybeans	1 week
Cattle	8 weeks

(a) (i) Which type of organism grows the fastest? .....

(1)

(ii) How many times faster than cattle do soybeans double in mass?

.....

(1)

(iii) *Fusarium* grows at its fastest rate in a fermenter.
Some scientists put **one tonne** of *Fusarium* into a fermenter.

Use data from the table to calculate how much *Fusarium* there would be in the fermenter after 8 hours.

Draw a ring around **one** answer.

2 tonnes **4 tonnes** **8 tonnes**

(1)

(b) *Fusarium* is used to make mycoprotein.

Read the information about substances found in mycoprotein.

- Protein – can be used for making cells, enzymes and antibodies.

- Fats – are rich in energy but large amounts in the diet can cause circulatory problems.
- Dietary fibre – helps to reduce the risk of colon cancer.

The table compares the composition of mycoprotein and beef.

Substance	Percentage of dry mass	
	Mycoprotein	**Beef**
Protein	47.2	68.3
Fat	13.5	30.1
Dietary fibre	19.2	0.0

Use the information above to answer the questions.

(i) Give **two** reasons why it would be better to eat mycoprotein instead of beef.

1 .....

.....

2 .....

.....

(2)

(ii) Give **one** reason why it would be better to eat beef instead of mycoprotein.

.....

.....

(1)

(Total 6 marks)

Q5. 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.

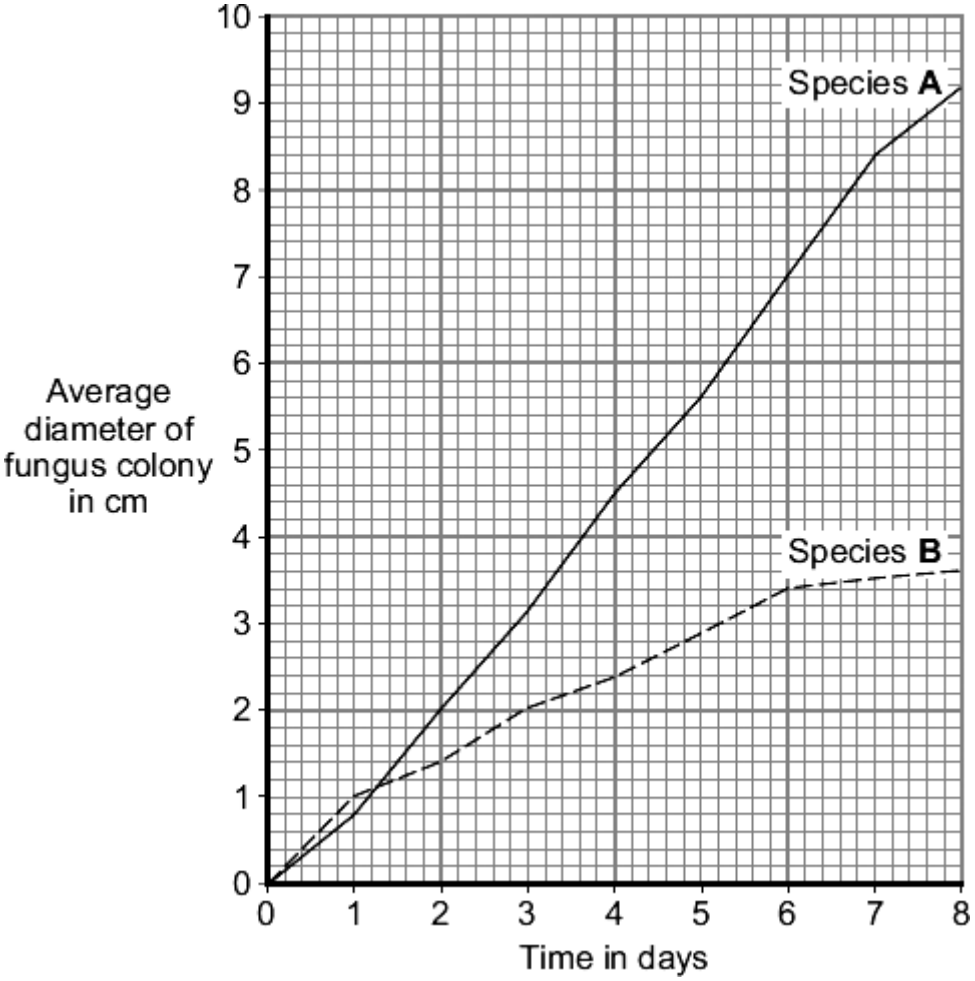
.....

.....

(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.

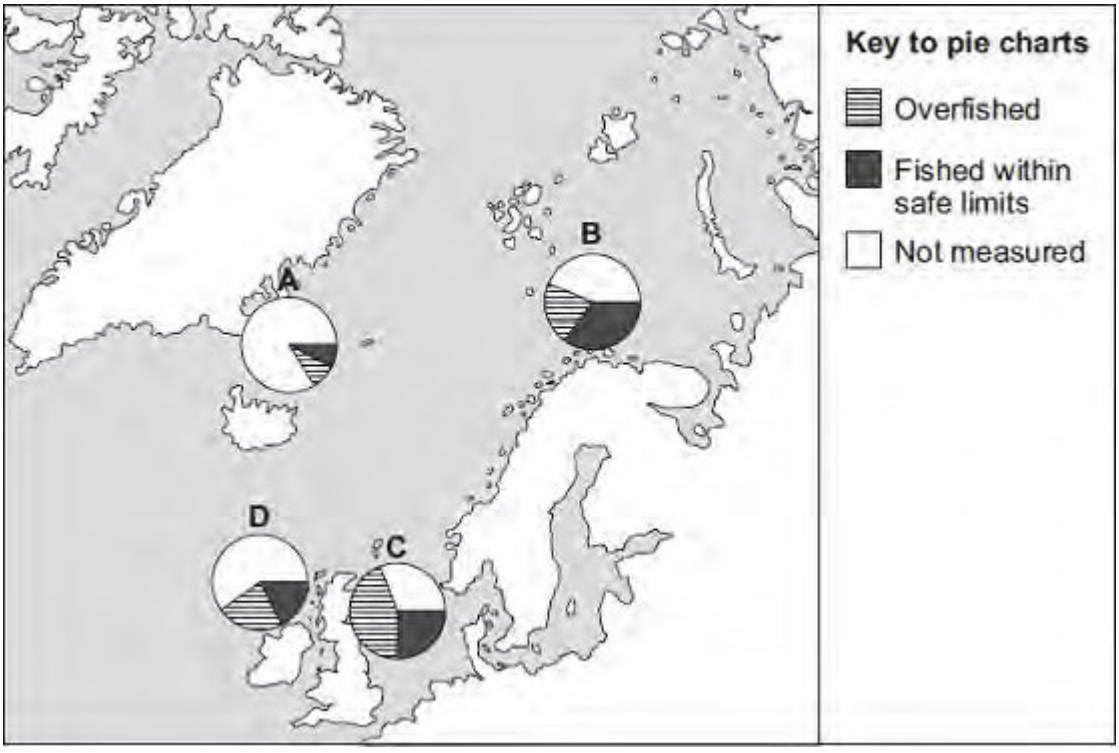
Give **two** of these other factors.

1 .....

2 .....

(2)
(Total 8 marks)

Q6. The map shows pie charts, **A**, **B**, **C** and **D**, that give information about fisheries in some of the seas around Europe.



© European Environment Agency

(a) Which pie chart, **A**, **B**, **C** or **D**, shows the fishery with the largest amount of overfishing? ☐

(1)

(b) It is important to maintain fish stocks high enough for breeding to continue.

Give the reason why.

.....

.....

(1)

(c) Give **two** ways fish stocks can be conserved.

.....

.....

.....

.....

(2)
(Total 4 marks)

Q7. The photographs show four ways of farming.

Growing wheat



Keeping sheep outside



Keeping pigs outside

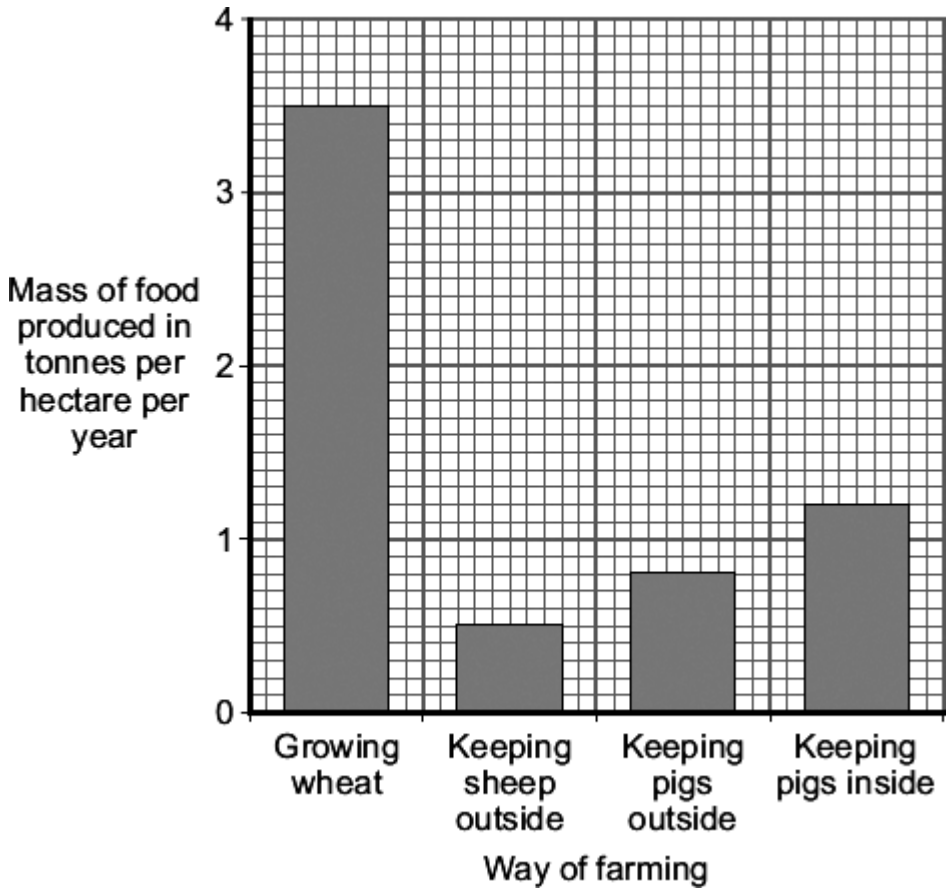


Keeping pigs inside



Growing wheat by Eileen Henderson [CC-BY-SA-2.0], via Wikimedia Commons. Keeping Sheep outside by Andrew Smith [CC-BY-SA-2.0], via W kimedia Commons. Keeping Pigs outside by David Williams [CC-BY-SA-2.0], via Wikimedia Commons. Keeping Pigs inside supplied by iStockphoto/ Thinkstock.

The bar chart shows the amount of food produced from these four ways of farming.



(a) How much extra food can be produced when farmers grow wheat, compared with keeping sheep outside?

Show clearly how you work out your answer.

.....

.....

Answer ..... tonnes per hectare per year

(2)

(b) Sheep eat grass.
For every 1000 g of grass eaten, a sheep increases in mass by only 50 g.
The other 950 g is lost.

How is the other 950 g lost?

Tick (✓) **two** boxes.

As oxygen from photosynthesis ☐

As faeces ☐

As meat ☐

As carbon dioxide from respiration ☐

(2)

(c) (i) Pigs kept inside lose less energy than pigs kept outside.

Why?

Tick (✓) **two** boxes.

Pigs kept inside are fed more. ☐

Pigs kept inside are kept in small pens. ☐

Pigs kept inside are kept warm in the winter. ☐

Pigs kept inside are healthier. ☐

(2)

(ii) Meat from pigs kept inside is usually cheaper than meat from pigs kept outside.

Give **one** reason why.

.....

.....

(1)
(Total 7 marks)

Q8. 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 W kimedia 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 .....

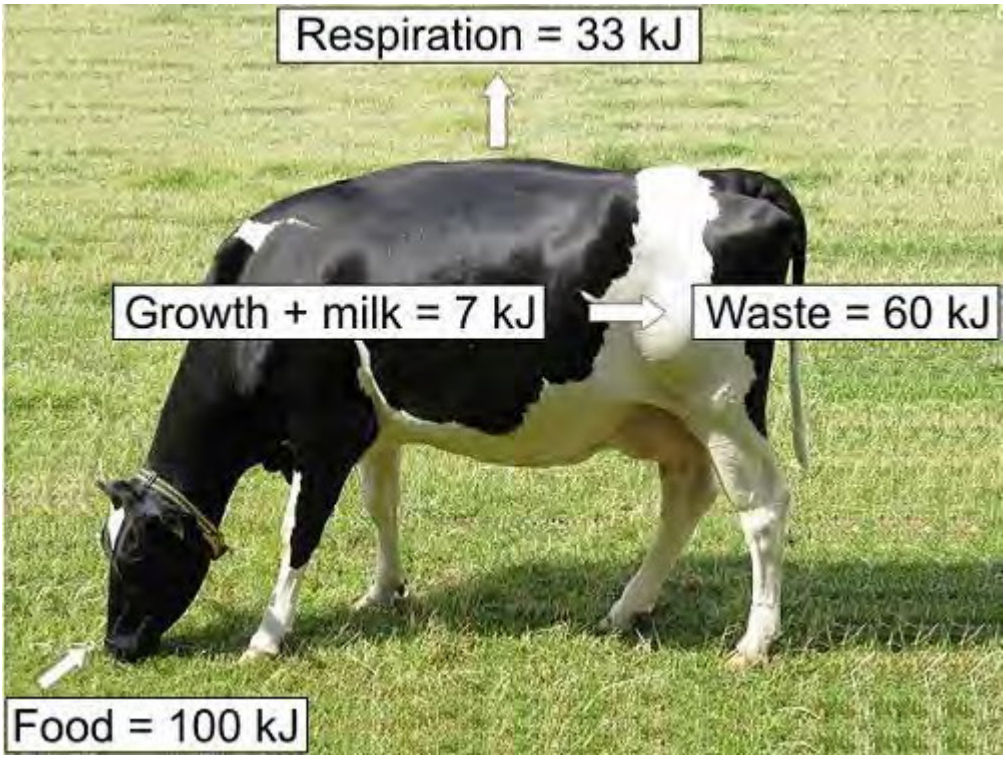
.....

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 W kimedia 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)