Questions are for separate science science students only

Q1.

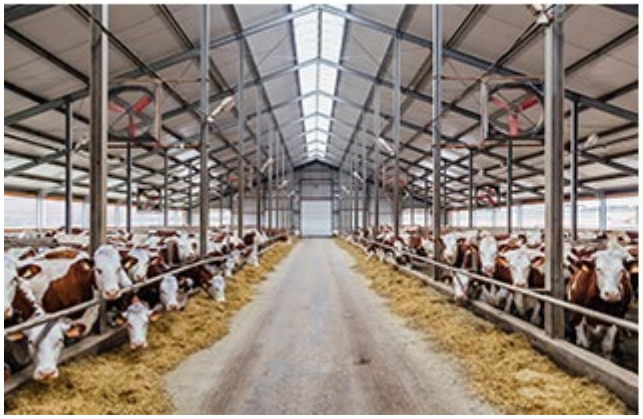
Some farmers keep cows indoors in large sheds.

Other farmers keep cows outdoors in fields of grass.

Figure 1 shows cows being kept indoors and outdoors.

Figure 1

Cows kept indoors



Cows kept outdoors

The table below shows the energy inputs and energy outputs for keeping cows.

	Energy in kJ/m^2/year	
	Indoors	**Outdoors**
Input as food	10 000	5 950
Input as fossil fuel	6 000	50
Output as meat and milk	40	2

(a) Calculate the total energy input for keeping cows **outdoors**.

Use data from the table above. **(biology only)**

_____

_____

Total energy input = _____ kJ/m^2/year

(1)

(b) The total energy input for keeping cows **indoors** is 16 000 kJ/m^2/year.

Calculate the percentage efficiency of keeping cows **indoors**. **(biology only)**

Use the equation:

$$\text{percentage efficiency} = \frac{\text{energy output}}{\text{total energy input}} \times 100$$

_____

_____

_____

Percentage efficiency = _____ %

(2)

(c) The percentage efficiency of keeping cows outdoors is 0.03%.

Why is it more energy efficient to keep cows indoors than to keep cows outdoors? **(biology only)**

Tick (✓) **two** boxes.

Cows are more stressed indoors.	☐
Cows move less indoors.	☐
It is noisier indoors.	☐
It is warmer indoors.	☐
There is less light indoors.	☐

(2)

Diseases in cows can cause problems for farmers.

(d) Suggest why diseases spread more quickly when the cows are kept indoors. **(biology only)**

_____

_____

(1)

One species of bacterium causes a disease in cows.

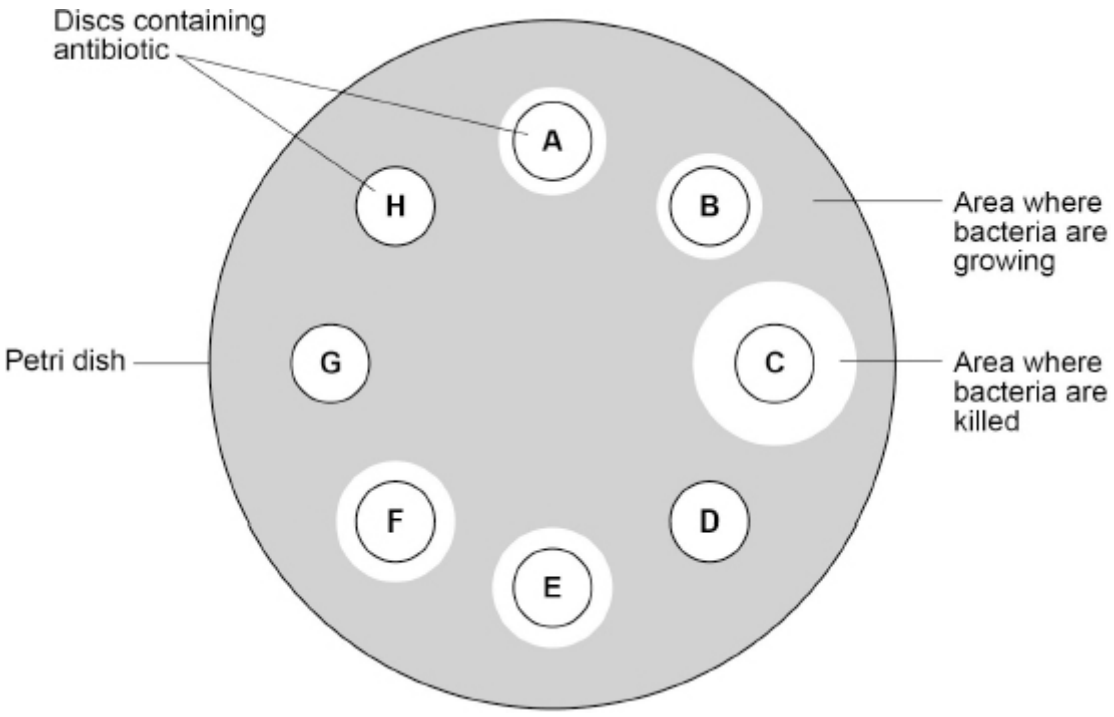
Scientists investigated the effect of eight different antibiotics on the growth of this species of bacterium.

The scientists put discs containing the different antibiotics onto a Petri dish containing the bacteria.

Antibiotics **A** to **H** were used in the investigation.

Figure 2 shows what the Petri dish looked like after 2 days.

Figure 2



(e) This species of bacterium is resistant to some of the antibiotics.

Give the letter of **one** antibiotic the bacterium is resistant to.

_____

(1)

(f) Complete the sentence.

Choose the answer from the box.

carbohydrate	**DNA**	**lipid**

Antibiotic resistance in a single bacterium is caused by a change in the

bacterium's _____.

(1)

(g) Complete the sentence.

Choose the answer from the box.

excretion	feeding	reproduction

A change in one bacterium can cause millions of bacteria to become resistant to the antibiotic.

This is because bacteria have a high rate of _____.

(1)

(h) Suggest why the production of millions of antibiotic-resistant bacteria is a problem for farmers.

_____

_____

_____

_____

(2)

(Total 11 marks)