

## Biofuels

1. 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
<i>Fusarium</i>	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.

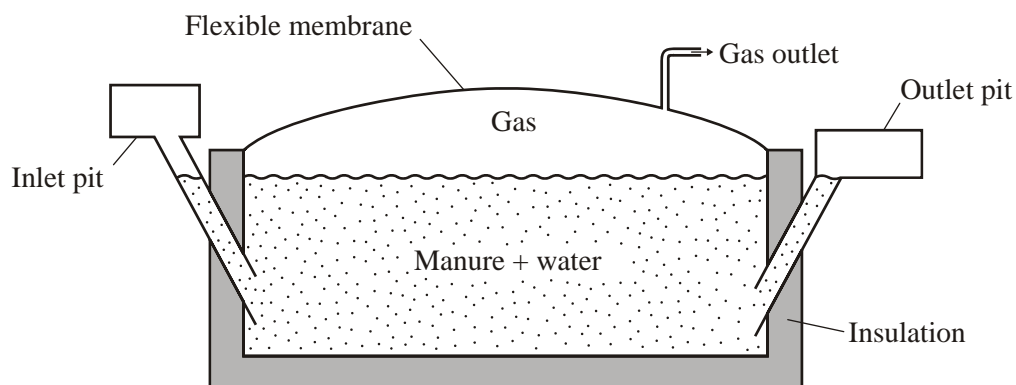
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(1)

(Total 6 marks)

2. The diagram shows one design of biogas generator used on a large dairy farm in the USA.



- (a) What is the main, useful gas in biogas?

Draw a ring around **one** answer.

**carbon dioxide**      **hydrogen**      **methane**

(1)

- (b) The insulation is installed so that biogas is produced at a faster rate.

Why is biogas produced at a faster rate?

.....

.....

(1)

- (c) The table shows costs and income for this generator.

Item	Yearly costs in dollars	Yearly income in dollars
Electricity generated from biogas		22 800
Heating from burning biogas		4 200
Sale of fibre after biogas production		8 000
Operation and maintenance costs	10 000	

- (i) Calculate the yearly profit from the biogas generator.

Show your working.

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(2)

- (ii) It cost 200 000 dollars to build the generator. Use your answer to part (c)(i) to calculate how many years it would take to pay back this cost.

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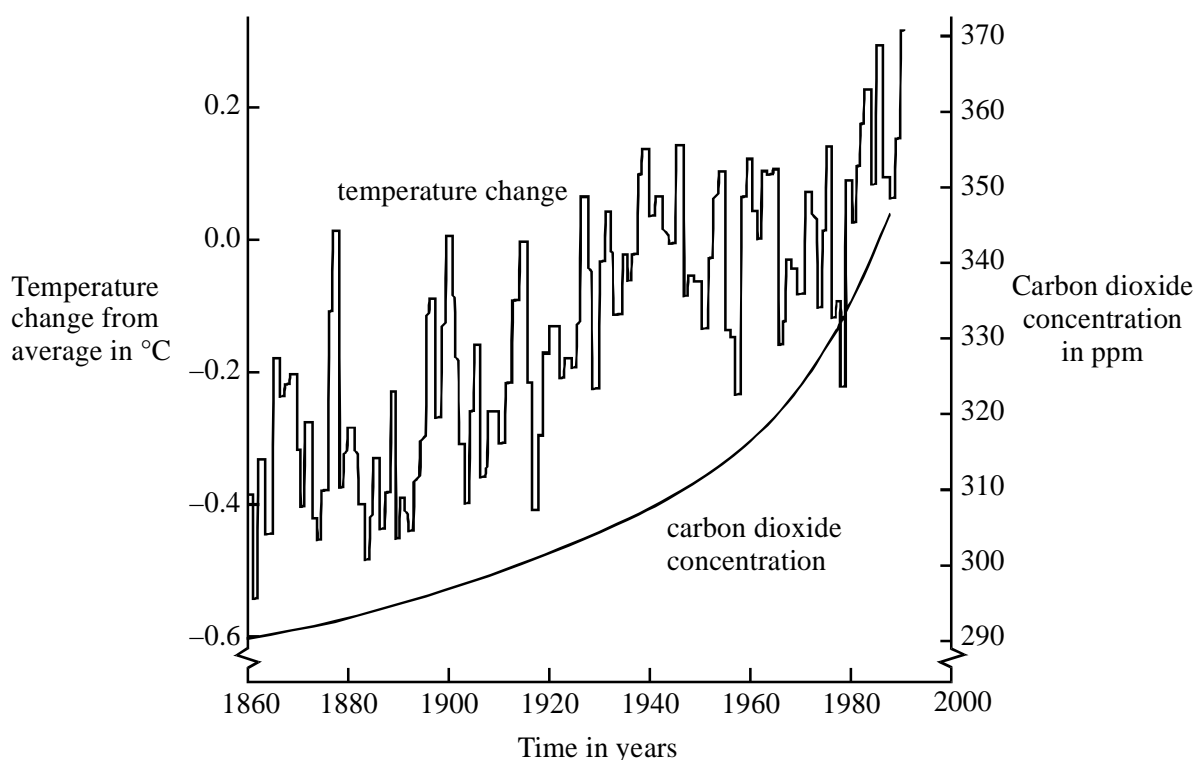
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(2)

(Total 6 marks)

3. 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)