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Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE BIOLOGY

Topic Paper: 7 The environment (Ecology)
Part 2

Time allowed: 40 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

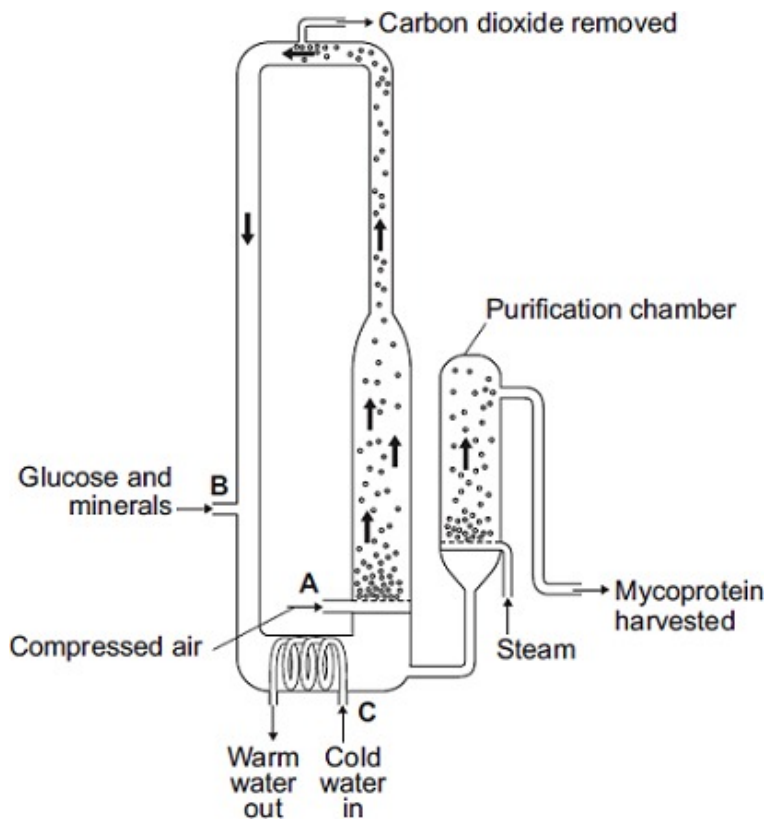
- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



36 Marks

Q8. The diagram shows a fermenter. This fermenter is used for growing the fungus *Fusarium*.

Fusarium is used to make mycoprotein.



(a) Bubbles of air enter the fermenter at **A**.

Give **two** functions of the air bubbles.

- 1.....
-
- 2.....
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(2)

(b) Why is glucose added to the fermenter?

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(1)

(c) The fermenter is prevented from overheating by the cold water flowing through the heat exchanger coils at **C**.

Name the process that causes the fermenter to heat up.

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(1)



(d) It is important to prevent microorganisms other than *Fusarium* growing in the fermenter.

(i) Why is this important?

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(1)

(ii) Suggest **one** way in which contamination of the fermenter by microorganisms could be prevented.

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(1)

(e) Human cells cannot make some of the amino acids which we need. We must obtain these amino acids from our diet.

The table shows the amounts of four of these amino acids present in mycoprotein, in beef and in wheat.

Name of amino acid	Amount of amino acid per 100 g in mg			Daily amount needed by a 70 kg human in mg
	Mycoprotein	Beef	Wheat	
Lysine	910	1600	300	840
Methionine	230	500	220	910
Phenylalanine	540	760	680	980
Threonine	610	840	370	490



A diet book states that mycoprotein is the best source of amino acids for the human diet.

Evaluate this statement.

Remember to include a conclusion in your evaluation.

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(4)
(Total 10 marks)



Q9. The design of biogas generators depends upon the climate.

Photograph 1 shows a biogas generator on a farm in India.



Indian biogas generator, © englNdia, <http://home2.btconnect.com/engindia>, 2005

(a) Describe the processes that occur in the biogas generator.

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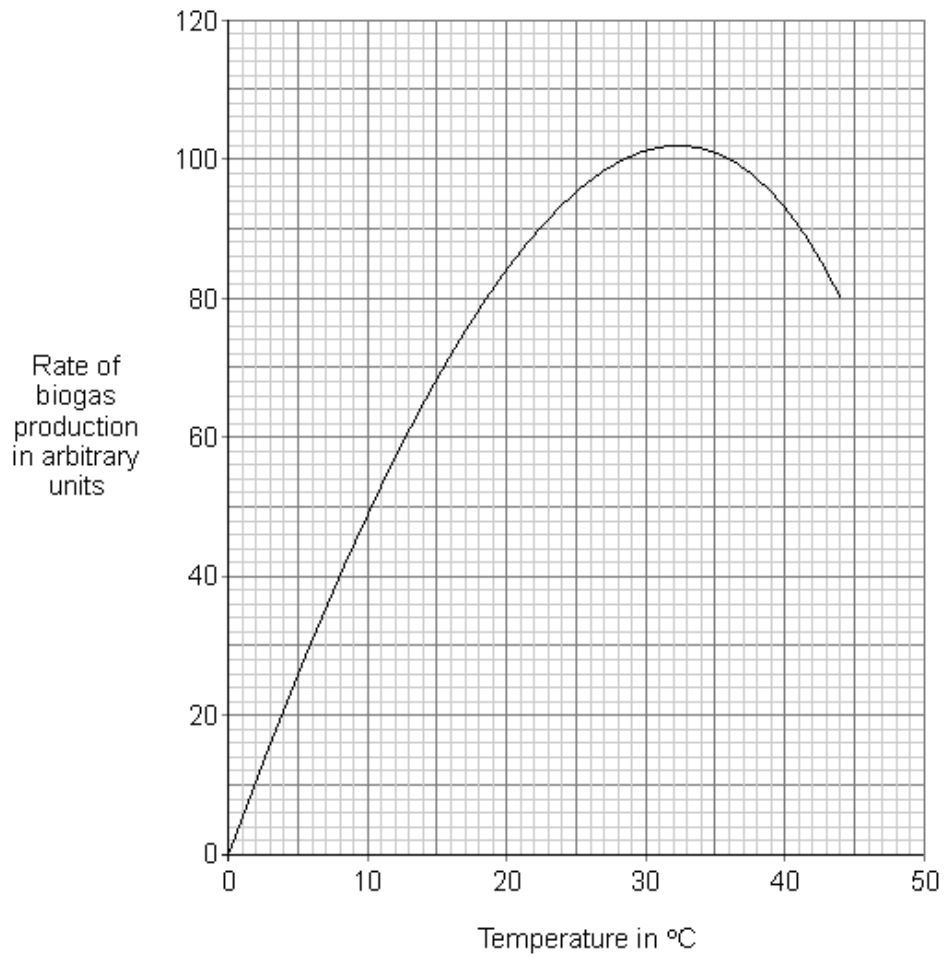
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(3)



(b) The graph shows the effect of temperature on the rate of biogas production.



Temperatures in India frequently rise to 40°C and above.

The biogas generator shown in **Photograph 1** is built mainly underground.

Use information from the graph to suggest why.

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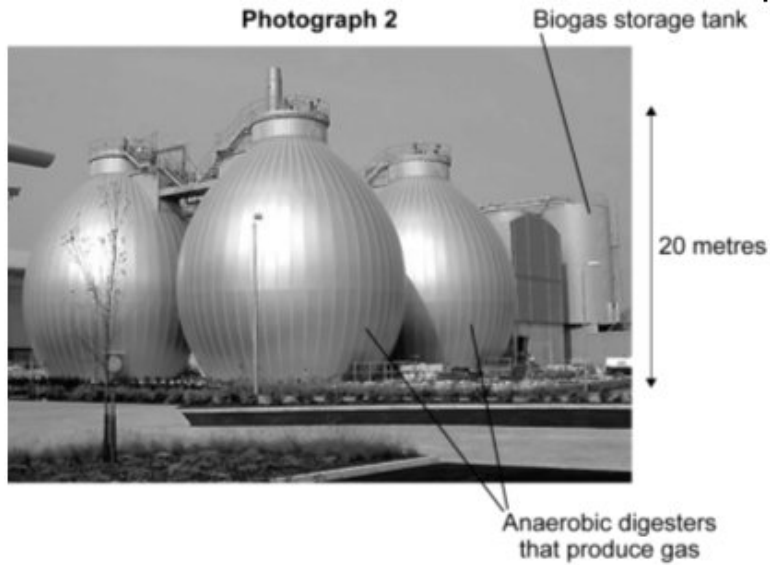
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(2)



- (c) **Photograph 2** shows a set of three biogas generators built at a sewage works in the UK in 2004.



Reading biogas generators, image courtesy of Black and Veatch Ltd

The UK biogas generator has been built with concrete walls, 60 cm thick.

Use information from the graph above to suggest why.

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(2)
(Total 7 marks)

Q10. Scientists have discovered that curry spices affect sheep and cattle. Curry spices can reduce the amount of methane that grazing animals give off.

'Bad' bacteria in the animal's stomach produce methane. About 12% of the animal's food is changed into methane.

The curry spice coriander works like an antibiotic. Adding coriander to animal food reduces methane production by about 40%.

- (a) (i) Why does adding coriander to an animal's food reduce methane production?

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(1)



(ii) Explain **one** advantage to a farmer of adding coriander to the animal's food.

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(2)

(b) Farm animals give off large amounts of methane.

Explain the effects of adding large amounts of methane to the atmosphere.

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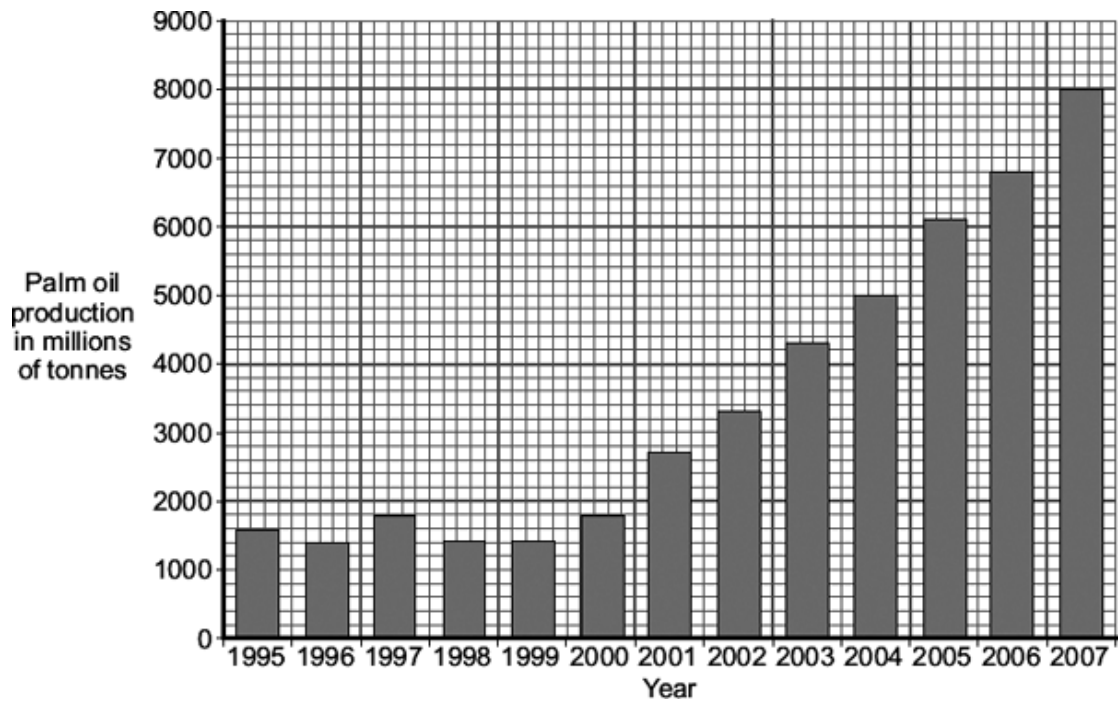
(3)

(Total 6 marks)



Q11. In South Asia, forests are being cleared to grow palm oil trees. The palm oil is mainly used to produce fuel for motor vehicles.

The graph shows the production of palm oil in one South Asian country.



(a) Calculate the mean increase in palm oil production per year for the five year period 2000 to 2005.

Show clearly how you work out your answer.

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Mean increase = millions of tonnes per year

(2)



- (b) Clearing forests and replacing the forests with palm oil trees to produce fuel for motor vehicles will affect the composition of the atmosphere.

Explain how.

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(5)
(Total 7 marks)



Q12. Some scientists set up a biogas generator.

The table shows how the rate of biogas production and the composition of the biogas changed over the first 30 days.

Time in days	Rate of biogas production in cm ³ per hour	Composition of the biogas	
		Percentage of methane	Percentage of carbon dioxide
1	110	27	56
5	90	20	78
10	50	30	68
15	170	68	30
20	115	72	26
25	110	71	27
30	105	70	28

(a) (i) Name the process that produces the methane in biogas.

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(1)

(ii) For the first 10 days, the gas released from the generator contained a high concentration of carbon dioxide. This was because there was air in the generator when it was first set up.

Explain why the presence of air results in a high concentration of carbon dioxide in the biogas.

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(3)



- (b) The scientists concluded that it would not be profitable to collect biogas from the generator until after about 20 days.

Use the data to explain why.

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(1)

- (c) The rate of biogas production slowed down towards the end of the investigation.

Suggest **one** reason why.

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(1)

(Total 6 marks)