

Centre No.							Paper Reference					Surname	Initial(s)		
Candidate No.							6	1	0	3	/	0	3	Signature	

Paper Reference(s)

6103/03

Edexcel GCE

Biology

Biology (Human)

Advanced Subsidiary

Unit 3 Paper 03

Thursday 8 January 2009 – Morning

Time: 1 hour

Examiner's use only

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Team Leader's use only

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Question Number	Leave Blank
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Materials required for examination

Ruler

Items included with question papers

Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.

The paper reference is shown above. Check that you have the correct question paper.

Answer ALL questions. Write your answers in the spaces provided in this question paper.

Show all the steps in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for individual questions and parts of questions are shown in round brackets: e.g. (2).

There are 3 questions in this question paper. The total mark for this question paper is 38.

Advice to Candidates

You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking account of your use of grammar, punctuation and spelling.

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Answer ALL questions in the spaces provided.

1. Nitrogen fixation, nitrification and denitrification are three processes that occur in the nitrogen cycle.

(a) The table below shows the names of some of the bacteria that carry out some of the processes in the nitrogen cycle.

Complete the table by writing in the boxes the name of the process and the change that occurs in each process.

Bacterium	Process	Change occurring
<i>Rhizobium</i>		
<i>Pseudomonas</i>		
<i>Nitrobacter</i>		

(4)

(b) With reference to the bacteria named in the table, give reasons for each of the following agricultural practices.

(i) The roots of Papilionaceae, such as peas and beans, are ploughed into the soil before planting a different crop.

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(2)

(ii) Soil needs to be well-drained to avoid waterlogging.

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(2)

(Total 8 marks)

Q1



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2. In a study, the productivity of different crops was recorded. For each crop, the net primary production (NPP) for the whole year was recorded. The mean NPP per day throughout the whole year and during spring and summer were also recorded. Data for an intensive algal culture were also recorded. The algae were grown in optimum conditions of temperature, light and nutrient supply throughout the year.

Data for the algal culture and for the crops are recorded in the table below.

Crop	Net primary production / g m ⁻²		
	Per year	Mean per day throughout the year	Mean per day during spring and summer
Wheat	1 241.0	3.4	8.3
Oats	912.5	2.5	6.2
Maize	803.0	2.2	4.4
Hay	949.0	2.6	5.2
Potatoes	839.5	2.3	5.6
Rice	1 460.0	4.0	8.0
Sugar beet	1 496.5	4.1	8.2
Algal culture		12.4	12.4

- (a) Explain what is meant by the term **net primary production (NPP)**.

.....

(2)

- (b) Calculate the NPP per year of the algal culture. Show your working.

Answer g m⁻² year⁻¹
 (2)



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(c) (i) Suggest why the mean NPP per day for the crops during the spring and summer is higher than that throughout the whole year.

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(2)

(ii) Suggest why this difference is not shown by the algal culture.

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(1)

(d) Crops are sometimes used to feed animals farmed to produce milk or meat. Suggest why it might be better to use animal feeds produced from algal cultures for this purpose.

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(3)

(Total 10 marks)

Q2

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3. Fossil deposits of oil are an important source of many fuels. Oil-based fuels consist mainly of hydrocarbons, which release carbon dioxide and water vapour when burnt. Other by-products of combustion include sulphur dioxide. The products of combustion of oil may be a source of pollution in the atmosphere.

The conversion of oil into usable fuels is carried out in refineries. The transport of fossil oil and fuels may involve pipelines, ships and lorries.

During the extraction, refining and transport of oil, a certain proportion of the oil will be lost to the environment. Oil that is lost can be a source of pollution to aquatic ecosystems (hydrosphere) where it can form a thick, sticky layer on the surface of water. This reduces light penetration and gaseous exchange.

Water movements and wave action may cause small globules of oil to form which may stick to the surface of animals or be ingested by them.

In addition to these losses, some oil enters ecosystems from natural sources.

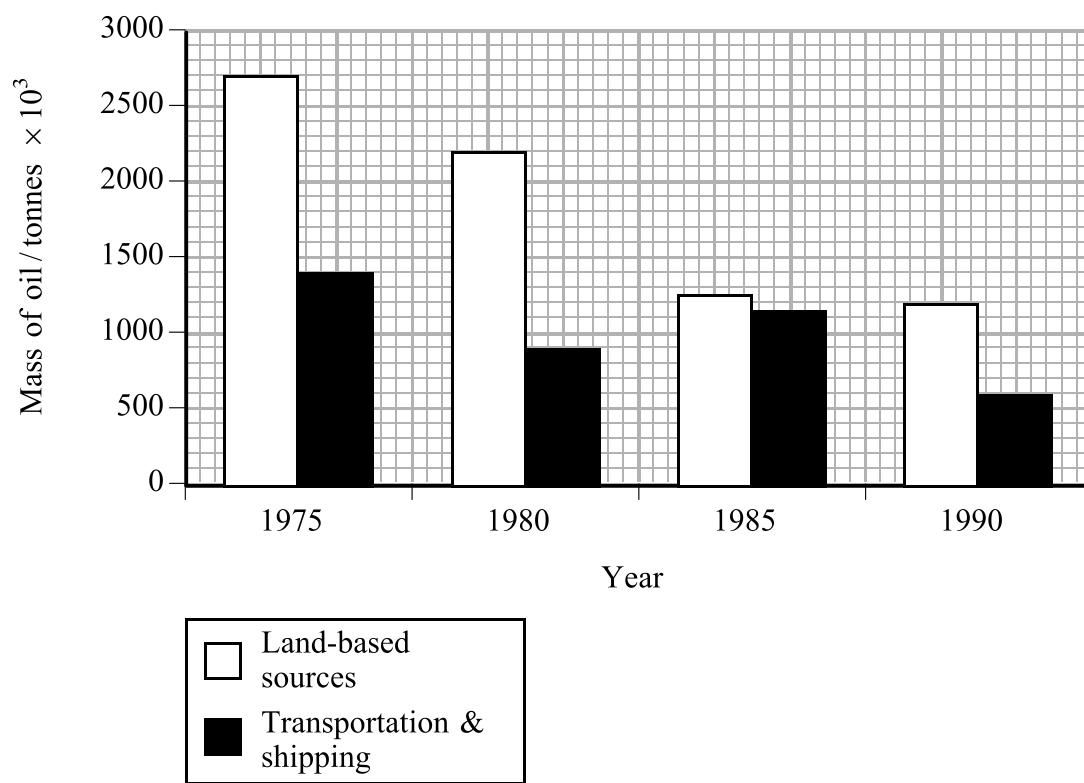
Figure 1 – Some sources of oil pollution and their impact

✓ = likely to have impact ✗ = unlikely to have impact

Source of oil entering ecosystem	Environment		Scale of impact		
	Hydrosphere	Atmosphere	Local	Regional	Global
Natural seepage and erosion of sea floor	✓	✗	✓	✓	✗
Biosynthesis by marine organisms	✓	✗	✓	✓	✓
Marine oil transportation (accidents, operational discharges from ships, etc.)	✓	✗	✓	✓	✓
Offshore oil production (drilling discharges, accidents, etc.)	✓	✓	✓	✓	✗
Oil terminals	✓	✗	✓	✗	✗
Fuel combustion	✗	✓	✓	✓	✓



Figure 2 – Estimates of oil lost to the marine environment from 1975 to 1990



(a) Explain why deposits of fossil fuels, such as oil, can be described as **carbon sinks**.

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(2)

(b) One source of pollution, shown in Figure 1, affects the environment in a different way from the others. State this source and suggest reasons why it is different.

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(3)



(c) State which of the sources, shown in Figure 1, has the least impact. Suggest why this source has less impact than the other sources.

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(3)

(d) Using the data from Figure 2, compare the changes in oil pollution from land-based sources with those from transportation and shipping from 1975 to 1990.

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(3)

(e) Suggest ways in which oil pollution may affect each of the following groups of organisms.

(i) Fish

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(2)



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(ii) Marine plants

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(2)

(iii) Coniferous trees

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(2)

(f) Explain why gasohol is considered to be less polluting than traditional petrol produced from fossil oil sources.

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(3)

(Total 20 marks)

Q3

TOTAL FOR PAPER: 38 MARKS

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