

Write your name here

Surname

Other names

**Pearson Edexcel Certificate**  
**Pearson Edexcel**  
**International GCSE**

Centre Number

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Candidate Number

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# Biology

**Unit: KBI0/4BI0**

**Paper: 2B**

Thursday 8 January 2015 – Afternoon

**Time: 1 hour**

Paper Reference

**KBI0/2B**  
**4BI0/2B**

**You must have:**

Calculator,  
Ruler

Total Marks

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

## Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

## Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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**PEARSON**

**Answer ALL questions.**

- 1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

**COPD: chronic obstructive pulmonary disorder**

Chronic obstructive pulmonary disorder (COPD) is the term used to describe several lung diseases including bronchitis and emphysema. People with COPD have trouble breathing because they have damaged their lungs, usually because of smoking. Eighty per cent of people who develop COPD are, or have  
5 been, smokers.

However, breathing in dust or fumes may also cause COPD. There is also a small genetic risk linked to COPD called alpha-1-antitrypsin deficiency. Alpha-1-antitrypsin is a molecule that protects your lungs from being digested by a protease enzyme released by white blood cells in the lungs. People who  
10 have an alpha-1-antitrypsin deficiency usually develop COPD at a younger age.

There are about 65 million people in the UK and 835 000 are known to have COPD. There are thought to be another 2 million who have COPD but have not been diagnosed because they have not asked for medical help. They seem content to put up with what they call smoker's cough. Sadly, there are about  
15 25 000 deaths a year in the UK because of COPD.

The symptoms of COPD do not usually show until after the age of 35. They include breathlessness when exercising, persistent coughing of mucus and frequent chest infections, particularly in winter. The walls of the airways get thicker in response to inflammation, more mucus is made and the air sacs  
20 are damaged. Although any damage that has already happened to the lungs cannot be reversed, it is possible to prevent COPD from getting worse by making lifestyle changes.

Chest infections are common and can be caused by bacteria or viruses. People with COPD are advised to have two vaccinations. A yearly 'flu jab' each autumn  
25 protects against possible influenza and any chest infection that may develop due to this. Vaccination against *Pneumococcus*, a bacterium that can cause serious chest infections, involves a one-off injection.

Treatment for COPD usually involves relieving the symptoms, such as using an inhaler to make breathing easier. Other treatments such as steroids, antibiotics, breathing oxygen from a cylinder, and inhaling mucolytic (mucus-thinning)  
30 medicines are sometimes prescribed in more severe cases, or during a worsening of symptoms.



(a) COPD includes diseases such as emphysema (line 2).

Give two causes of emphysema.

(2)

1 .....

2 .....

(b) The white blood cells in the lungs release protease (a protein digesting enzyme) (line 9).

Suggest the function of this enzyme in the white blood cells in the lungs.

(2)

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(c) Calculate the number of people who may have COPD that are smokers (lines 4 and 5 and lines 11 and 12).

Show your working.

(2)

Answer .....

(d) (i) Name the air sacs in the lungs responsible for gas exchange (line 19).

(1)

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(ii) Suggest how damage to the air sacs can cause the symptom of breathlessness when exercising (line 17).

(2)

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(e) Explain how the vaccination against *Pneumococcus* provides protection from further infection (lines 24 to 27).

(2)

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(f) (i) Suggest how mucolytic medicines help to treat the symptoms of COPD (lines 30 and 31).

(2)

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(ii) Breathing in oxygen from a cylinder changes the concentration of oxygen in the air sacs.

How does the change in oxygen concentration help to reduce the symptoms of COPD?

(2)

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**(Total for Question 1 = 15 marks)**

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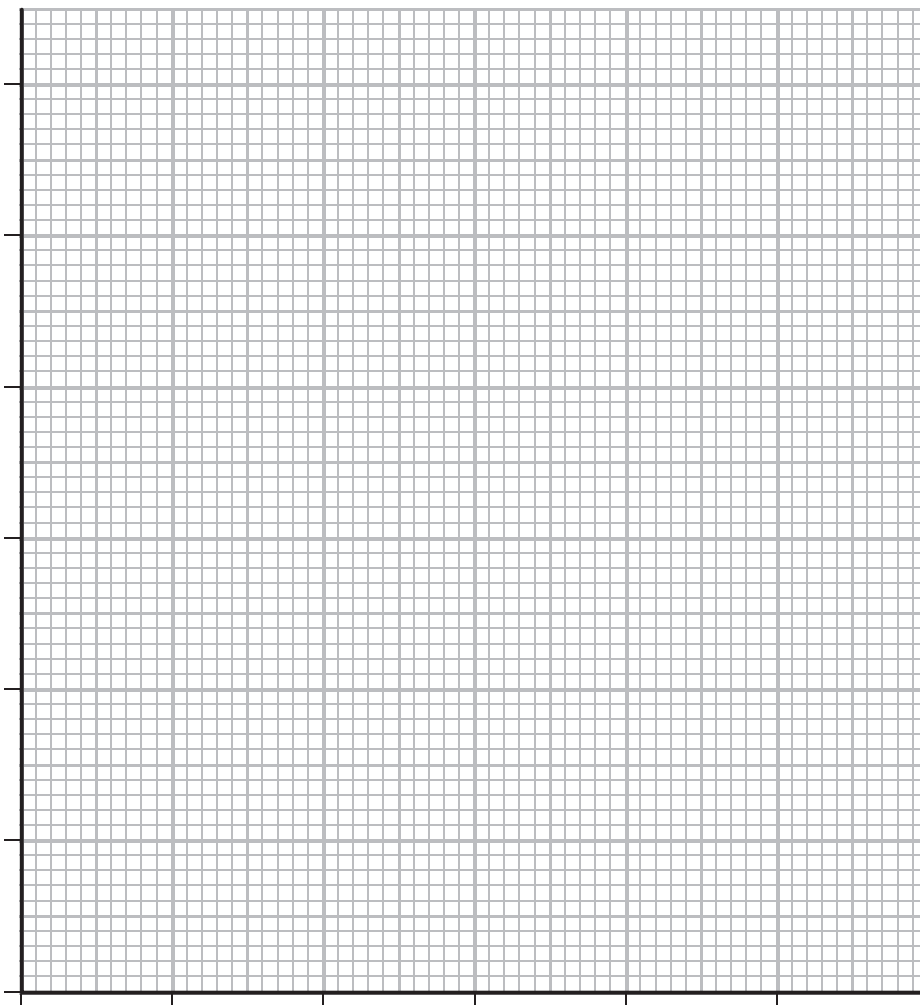
- 2 The table shows the energy requirements (in kilojoules) for females at different ages and different levels of activity.

Age in years	Energy requirement in kilojoules	
	Level of activity	
	Sitting	Active
3	4 200	5 600
6	5 000	7 600
11	6 700	8 400
16	7 600	10 100
25	8 400	10 100
41	7 600	9 200
55	6 700	9 200

- (a) Plot a line graph on the grid below to show how age affects the energy requirements at each level of activity.

Use a ruler to join the points with straight lines.

(5)



(b) Describe how increasing age changes the energy requirements of females.

(2)

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(c) Explain the effect that the level of activity has on the energy requirements of females.

(3)

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**(Total for Question 2 = 10 marks)**

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**3** Nitrogen is an essential element for plant growth. Most plants can only use nitrogen in the form of nitrate ions. Only legumes that have bacteria living in their root nodules can use nitrogen from the air.

(a) (i) Explain how nitrate ions help plants to grow.

(1)

(ii) Name the type of bacteria that live in the root nodules of legumes.

(1)

(b) Many animals excrete urine that contains urea. Some soil microorganisms use the enzyme urease to change urea to ammonium ions and carbon dioxide.

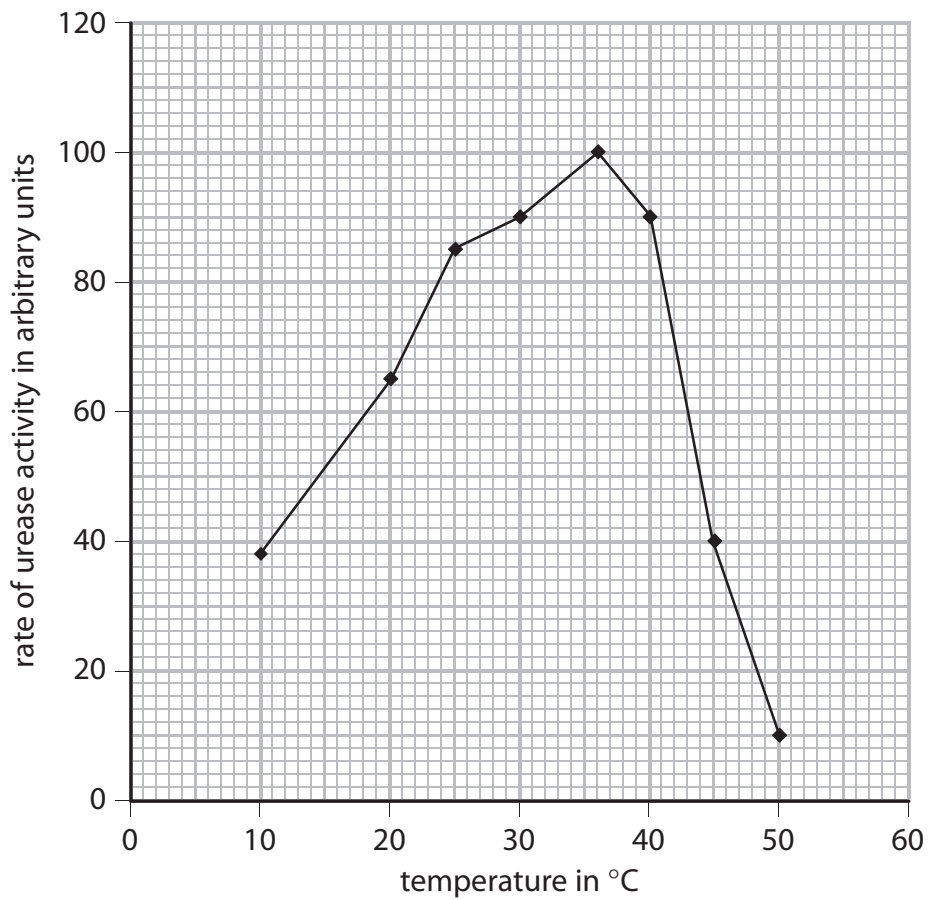
Describe how ammonium ions can be converted to nitrate ions in the soil.

(2)





(c) The graph shows the effect of different temperatures on the rate of urease activity.



(i) Explain the change in rate of urease activity from 10°C to 36°C.

(2)

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(ii) Explain the change in rate of urease activity from 36°C to 50°C.

(3)

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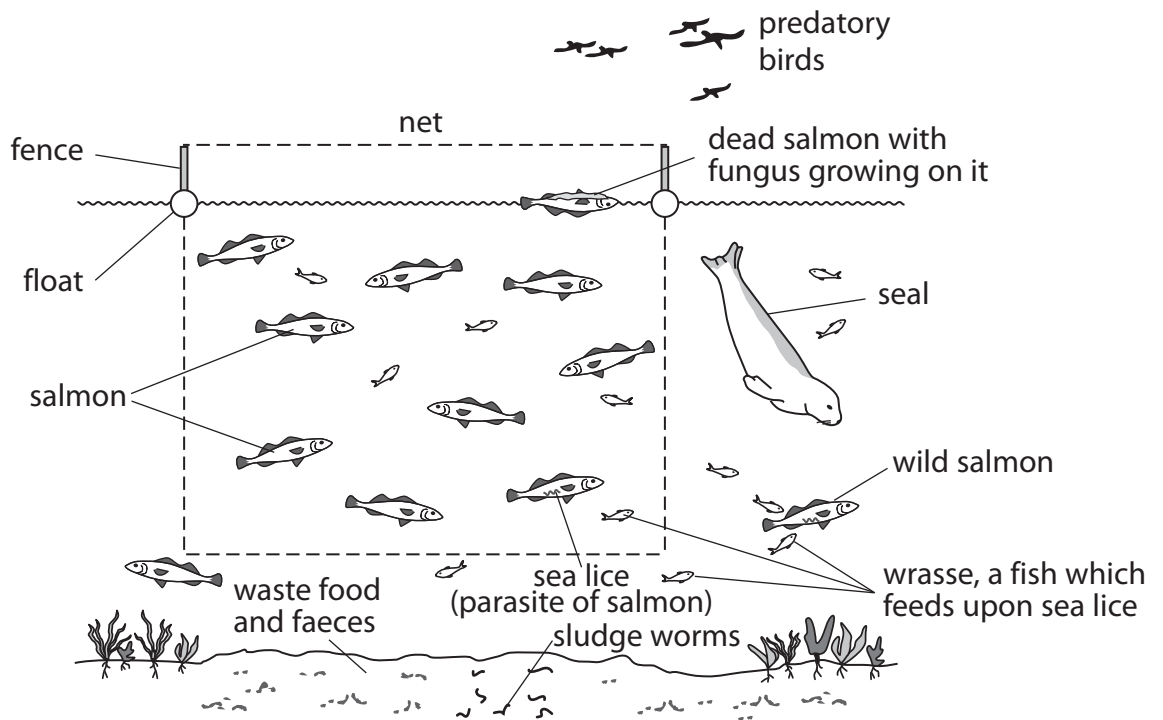
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**(Total for Question 3 = 9 marks)**



4 The diagram shows a salmon fish farm in the sea.



(a) Suggest three ways in which the net protects the salmon.

(3)

- 1 .....
- 2 .....
- 3 .....



(b) Waste food and faeces can collect in the mud beneath the fish farm.

Suggest how this could affect the growth of the salmon.

(3)

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(c) Suggest what should be done with the dead salmon with fungus growing on it.

(2)

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(d) Give the example of biological control shown in the diagram of the fish farm.

(1)

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**(Total for Question 4 = 9 marks)**

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5 A student wanted to investigate the conditions required for the germination of seeds.

He set up 5 boiling tubes each containing 10 cress seeds on cotton wool sealed with rubber bungs.

- Tube A contained dry cotton wool and was placed at room temperature in the light.
- Tube B contained moist cotton wool and was placed at room temperature in the light.
- Tube C contained moist cotton wool and was placed in a fridge in the dark.
- Tube D contained moist cotton wool and was placed at room temperature in the dark.
- Tube E contained moist cotton wool and was placed at room temperature in the light and contained alkaline pyrogallol to absorb oxygen.

The student left the tubes for 3 days and then returned to observe the results.

He measured the height of the seedlings and recorded how many had germinated.

Some of his results are shown below.

Tube A no seeds germinated.

Tube B 9 seeds germinated with the following heights: 2.0 cm, 2.1 cm, 3.1 cm, 2.2 cm, 2.1 cm, 1.8 cm, 2.3 cm, 2.7 cm and 2.5 cm.

Tube C one seed germinated with a height of 0.3 cm.

(a) Complete the summary table to show the conditions and the results for tubes A, B and C only.

(4)

Tube	Location	Water	Light	% seeds germinated	Average height in cm
A	room		yes		
B		yes			
C					0.3



(b) Explain how the student could tell whether the seeds had germinated.

(2)

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(c) The student's teacher commented that there were too many different independent variables in his experiment.

Identify the independent variables in the experiment.

(2)

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(d) Explain what the results would be for tube D.

(2)

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(e) Explain why the seeds in tube E failed to germinate.

(1)

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**(Total for Question 5 = 11 marks)**



- 6 When organic material in sewage, manure, silage effluents and waste milk enters a lake or river it causes pollution.

The organic material is broken down by microorganisms. This process removes oxygen from the water.

The amount of oxygen removed from the water is called the Biological Oxygen Demand (BOD).

The table shows data for different pollutants.

<b>Pollutant</b>	<b>BOD in mg of O<sub>2</sub> per litre of pollutant</b>
treated domestic sewage	20 – 60
raw domestic sewage	300 – 400
cattle manure	10000 – 20000
pig manure	20000 – 30000
silage effluent	30000 – 80000
waste milk	140000

- (a) Explain which pollutant is likely to have the most severe effect on the organisms in a river.

(2)

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- (b) A quantity of pollutant is released into a river. The effect on the organisms will depend on the BOD value and other factors.

Suggest one of these other factors.

(1)

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(c) Waste milk is one of the pollutants.

Name one of the biological molecules found in milk that the microorganisms could feed on.

(1)

(d) Suggest a reason for the difference between the BOD of raw domestic sewage and the BOD of treated domestic sewage.

(2)

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**(Total for Question 6 = 6 marks)**

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**TOTAL FOR PAPER = 60 MARKS**



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