

Write your name here

Surname

Other names

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

Centre Number

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Candidate Number

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# Human Biology

**Unit: 4HB0**

**Paper: 01**

Tuesday 6 May 2014 – Morning

**Time: 2 hours**

Paper Reference

**4HB0/01**

**You must have:**

Ruler

Candidates may use a calculator.

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 120.
- 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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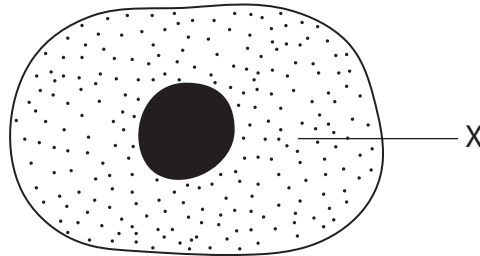


**PEARSON**

**Answer ALL questions.**

- 1 For each of the questions (a) to (j), choose an answer **A, B, C** or **D** and put a cross in the box . Mark only one answer for each question. If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

(a) The diagram shows an animal cell.



Which part of the cell does the letter X show?

(1)

- A** cytoplasm
- B** cell membrane
- C** mitochondrion
- D** nucleus

(b) The correct order in increasing size is

(1)

- A** organelle, organ, cell, tissue
- B** cell, organelle, tissue, organ
- C** organelle, cell, tissue, organ
- D** cell, tissue, organelle, organ

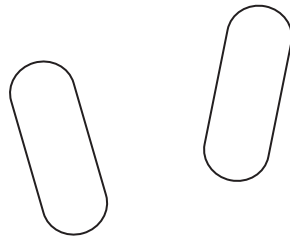
(c) Which two gases are associated with photosynthesis?

(1)

- A** nitrogen and oxygen
- B** oxygen and carbon dioxide
- C** carbon dioxide and nitrogen
- D** argon and oxygen



(d) The diagram shows two living organisms.

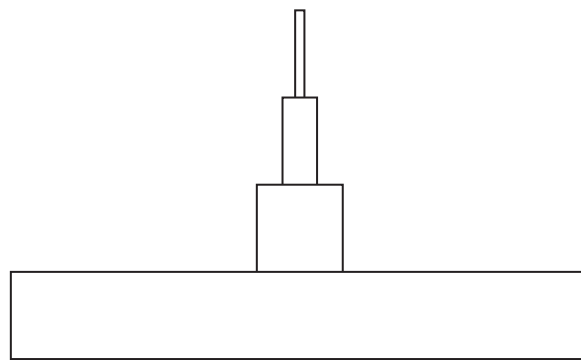


These living organisms are

(1)

- A** animals
- B** bacteria
- C** plants
- D** viruses

(e) This diagram shows the total mass of the living organisms in each trophic level in a wood.



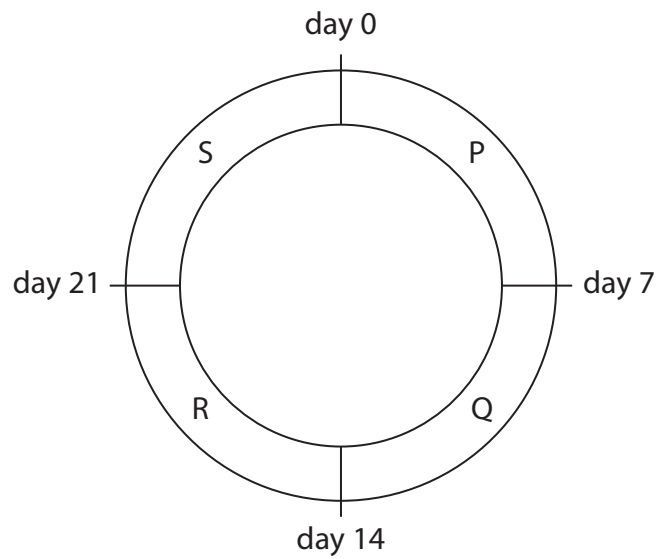
The first trophic level always contains

(1)

- A** consumers
- B** decomposers
- C** herbivores
- D** producers



- (f) The diagram shows a human 28-day menstrual cycle divided into four parts P, Q, R and S. The egg is released on day 14.



In which part of the cycle does menstruation occur?

(1)

- A** P
- B** Q
- C** R
- D** S

- (g) Which blood vessel carries blood from the lungs to the heart?

(1)

- A** hepatic artery
- B** pulmonary artery
- C** hepatic vein
- D** pulmonary vein



(h) The information in the table is from a packet containing pasta.

Contents	Amount per 100g
Energy	1516 kJ
Carbohydrate	72 g
Protein	16 g
Fat	1 g

A person eats 75 g of pasta. How much carbohydrate does the person eat?

(1)

- A** 0.75 g
- B** 4 g
- C** 36 g
- D** 54 g

(i) Cystic fibrosis is carried by a recessive allele.

A man who has one recessive allele for cystic fibrosis has children with a woman who has no recessive alleles for cystic fibrosis.

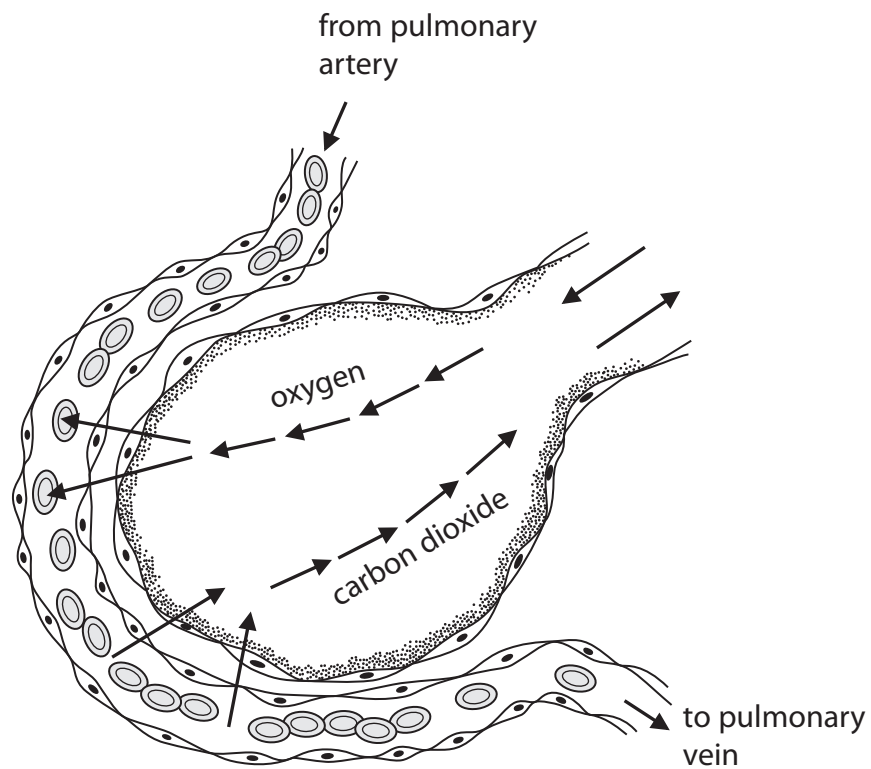
What are the chances of any of their children having cystic fibrosis?

(1)

- A** 0 %
- B** 25 %
- C** 50 %
- D** 100 %



(j) The diagram shows gas exchange between the lungs and the blood.



Gas exchange occurs by

(1)

- A osmosis
- B diffusion
- C respiration
- D active transport

(Total for Question 1 = 10 marks)



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2 A student tests two food samples, P and Q, for protein.

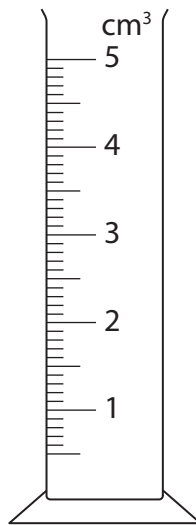
(a) Here is a list of reagents.

**Benedict's      Biuret      ethanol      iodine**

Circle the reagent the student should use.

(1)

(b) The student uses this apparatus to measure 3.0 cm<sup>3</sup> of the reagent.



(i) Name this piece of apparatus.

(1)

(ii) State **one** safety precaution the student should take when measuring out the reagent.

(1)

(iii) On the apparatus, draw where the surface of the reagent should be.

(1)





(c) The results of the food tests for protein on P and Q are shown in the following table.

Food sample	Colour obtained when testing for protein
P	blue
Q	violet

What conclusions may be drawn from these results?

(2)

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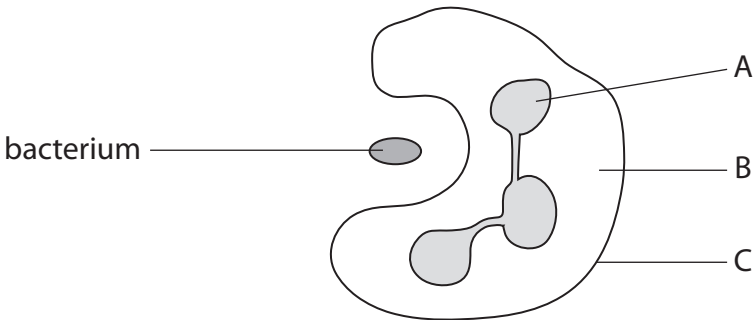
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**(Total for Question 2 = 6 marks)**



3 The diagram shows a white blood cell ingesting a bacterium.



(a) Complete the table to give the functions of the parts of the cell labelled A, B and C.

(3)

Part of the cell	Function
A	
B	
C	

(b) Describe what happens to the bacterium after it has been ingested by the white blood cell.

(2)

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(c) One type of white blood cell produces antibodies.

Describe the role of antibodies.

(2)

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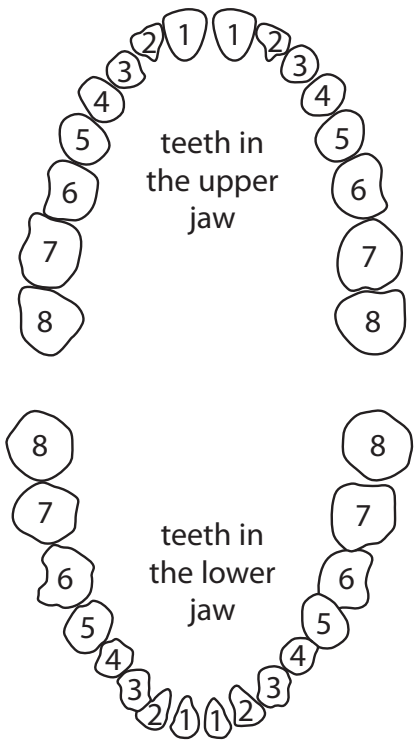
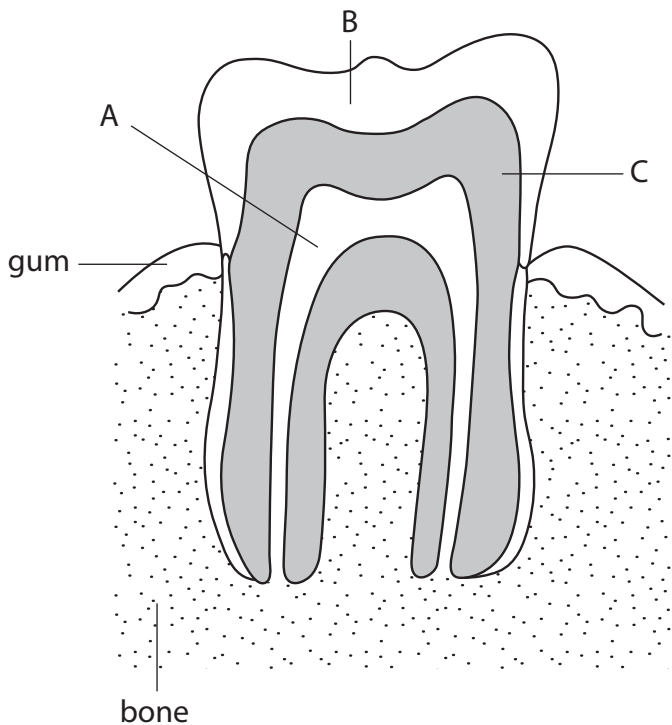
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**(Total for Question 3 = 7 marks)**



4 The diagram shows a tooth and the arrangement of teeth in the upper and lower jaws of a human.



(a) Name the parts of the tooth labelled A, B and C.

(3)

A .....

B .....

C .....

(b) The teeth in the upper and lower jaw in the diagram are numbered from 1 to 8.

Give a number where the labelled tooth might be situated.

(1)

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(c) Name a vitamin and a mineral that are necessary for teeth to grow.

(2)

Vitamin .....

Mineral .....



(d) Explain how brushing teeth regularly can help to prevent tooth decay

(3)

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



5 Most humans are omnivores, eating both plants and animals. Barley is a cereal (plant) that can be fed to cows. Humans can eat barley and also the meat from cows.

(a) Draw a food chain containing cows, humans and barley.

(2)

(b) Energy is lost at each stage in a food chain.

(i) Give **two** ways in which energy is lost.

(2)

1 .....

2 .....

(ii) There is a shortage of food in the world.

Suggest how this food shortage could be reduced if humans ate barley instead of meat from cows.

(2)

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(c) Humans depend on plants for oxygen as well as for food.

(i) Explain why humans depend on plants for oxygen.

(2)

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(ii) From the list, circle **two** raw materials that plants require to make their own food.

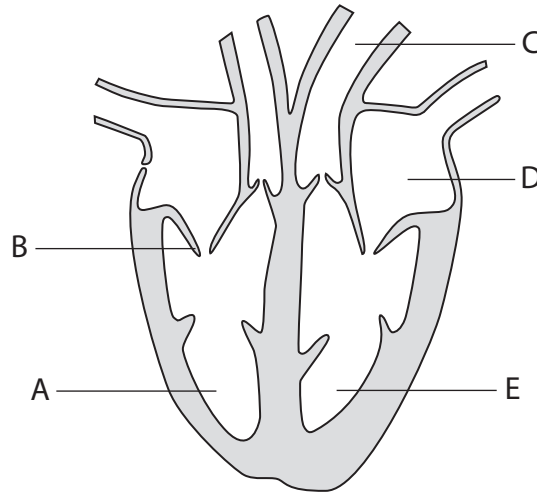
**ammonia      carbon dioxide      glucose      nitrogen      urea      water**

(2)

**(Total for Question 5 = 10 marks)**



6 The diagram shows a section through a human heart, viewed from the front. Parts of the heart are labelled A to E.



(a) (i) Name the parts labelled B and C. (2)

B .....

C .....

(ii) Complete the table by writing the letter of the part of the heart that corresponds to each statement. (4)

Statement	Part of the heart
receives blood from the lungs	
contains deoxygenated blood	
blood flows from here into the pulmonary artery	
blood here is under the highest pressure	





(b) Heart attacks are one of the major causes of death. They can be caused by eating too much fatty food.

Explain how eating too much fatty food may result in a heart attack.

(4)

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**(Total for Question 6 = 10 marks)**



7 Human reproduction involves the fusion of a sperm and an ovum.

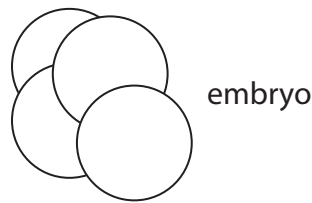
(a) (i) What is the name given to the fusion of a sperm and an ovum? (1)

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(ii) Where does the fusion of a sperm and an ovum take place? (1)

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(b) After the fusion of a sperm and an ovum there is cell division to produce an embryo of four cells as shown in the diagram.



(i) Tick the row in the table that correctly describes the type and the number of cell divisions that produced this embryo of four cells. (1)

Type of cell division	Number of cell divisions	Tick
meiosis	2	
meiosis	4	
mitosis	2	
mitosis	4	

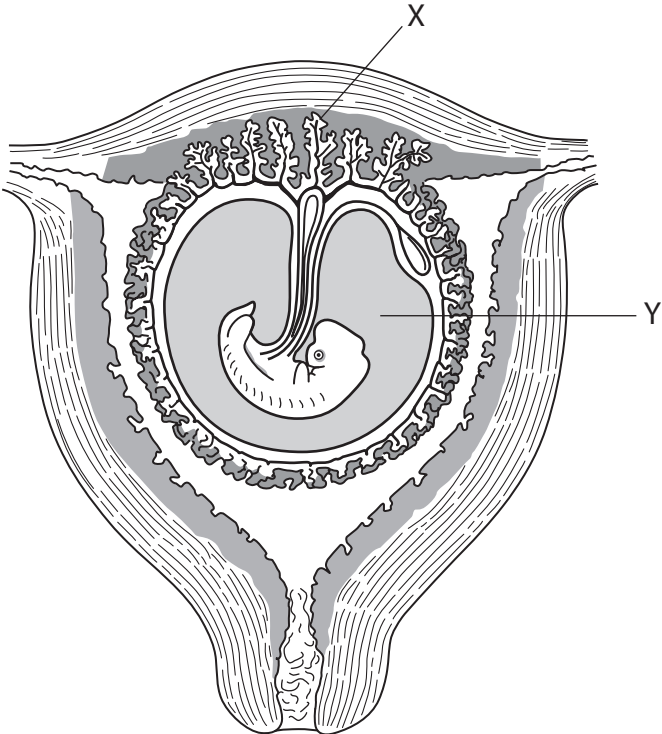
(ii) It is possible to remove one cell from this embryo and test it to see if it has any changes within specific genes in the chromosomes.

What is the name used to describe random change within genetic material? (1)

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(c) The developing embryo is shown in the diagram.



(i) Name the parts labelled X and Y. (2)

X .....

Y .....

(ii) State the function of part Y. (1)

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(iii) Describe the role of part X in the nutrition of the embryo. (3)

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(Total for Question 7 = 10 marks)



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**8** Amylase is an enzyme that breaks down starch into a sugar.

(a) (i) Name the sugar that is formed from the break down of starch by amylase. (1)

(ii) State two places in the human body where amylase is made. (2)

1 .....

2 .....



(b) A student investigated the effect of temperature on the activity of amylase.

She mixed together 10 cm<sup>3</sup> of a starch suspension and an equal volume of amylase solution which had both been kept at 20 °C. She kept the mixture at 20 °C.

The student immediately took a small sample of the mixture and added it to a drop of iodine solution. She did this every 30 seconds for five minutes and recorded the colour of the iodine solution.

The student repeated the experiment at 30 °C, 40 °C, 50 °C, and 60 °C. The results at the different temperatures are shown in Table 1.

**Table 1**

Time in minutes	20 °C	30 °C	40 °C	50 °C	60 °C
0.0	blue-black	blue-black	blue-black	blue-black	blue-black
0.5	blue-black	blue-black	blue-black	blue-black	blue-black
1.0	blue-black	blue-black	yellow	blue-black	blue-black
1.5	blue-black	blue-black	yellow	yellow	blue-black
2.0	blue-black	yellow	yellow	yellow	blue-black
2.5	blue-black	yellow	yellow	yellow	blue-black
3.0	blue-black	yellow	yellow	yellow	blue-black
3.5	yellow	yellow	yellow	yellow	blue-black
4.0	yellow	yellow	yellow	yellow	blue-black
4.5	yellow	yellow	yellow	yellow	blue-black
5.0	yellow	yellow	yellow	yellow	yellow

The rate of reaction is calculated using the following formula.

$$\frac{\text{volume of starch suspension (10 cm}^3\text{)}}{\text{time taken for colour to be yellow}}$$



- (i) Complete Table 2 by adding in the calculated rate of reaction for the enzyme at 30 °C and 50 °C. The other rates have been done for you.

(3)

Table 2

Temperature in °C	Rate of reaction in cm <sup>3</sup> per minute
20	2.9
30	
40	10.0
50	
60	2.0

- (ii) Explain the difference in the rate of reaction at 60 °C compared with the rate of reaction at 40 °C.

(3)

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- (iii) The student concluded that the optimum temperature for amylase activity was 40 °C. Explain why this might not be the correct conclusion.

(3)

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(Total for Question 8 = 12 marks)



9 Carbon monoxide and sulfur dioxide are examples of gases that cause air pollution.

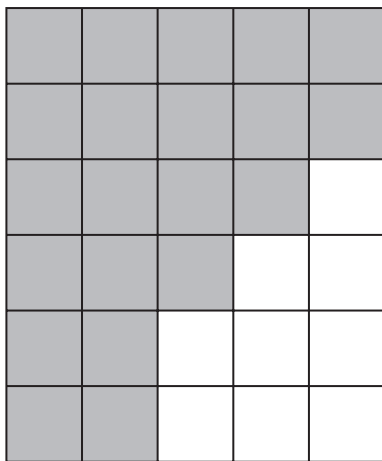
(a) (i) Suggest a possible source of carbon monoxide pollution. (1)

(ii) Suggest a possible source of sulfur dioxide pollution. (1)

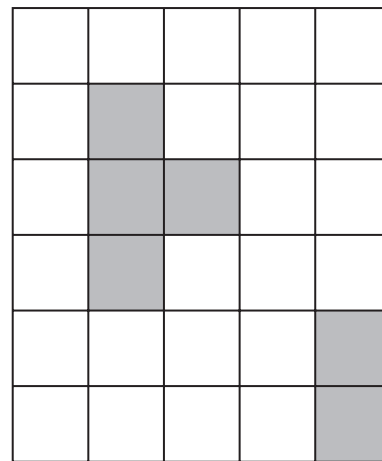
(b) Lichen is an organism that is very sensitive to air pollution. It is sometimes referred to as a biological indicator.

The diagram shows two brick walls. Wall 1 is far away from a source of sulfur dioxide pollution and Wall 2 is near to the source.

The number of bricks covered with lichen is shown.



Wall 1



Wall 2

Key

- Brick covered by lichen
- Brick not covered by lichen





(i) Use information from the diagram and the key to complete the table.

(3)

	Wall far away from the pollution source	Wall near to the pollution source
Number of bricks covered by lichen	21	
Percentage of bricks covered by lichen	70	

(ii) Using information from the table, what conclusions can be made about the use of lichen as a biological indicator of air pollution?

(2)

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(c) If we breathe in carbon monoxide it may combine with our haemoglobin to form a chemical known as carboxyhaemoglobin.

Explain why carboxyhaemoglobin is dangerous to our health.

(2)

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



10 (a) Food poisoning is caused by certain bacteria.

A student has lunch in the canteen at school. She notices that some of the food on the counter is not covered. One of the servers in the canteen coughs a lot.

(i) Explain why the student may be at risk of developing food poisoning. (2)

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(ii) The student eats some of the food and shows symptoms of food poisoning later that day.

Explain why the student did not develop symptoms of food poisoning immediately after eating the infected food. (2)

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(b) The table gives information about the number of food poisoning cases in the United Kingdom between 1997 and 2009. It shows the total number of cases from all bacteria and those only from Salmonella bacteria.

The information shows changes that have occurred from 1997 to 2009. The results are to the nearest thousand.

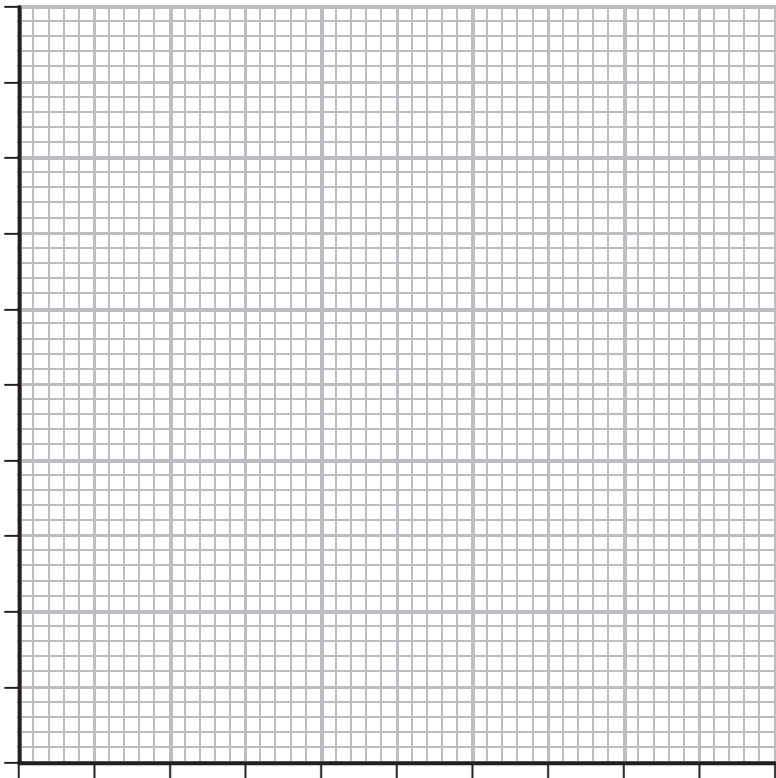
	1997	1999	2001	2003	2005	2007	2009
Number of food poisoning cases from all bacteria	94	86	85	71	70	72	75
Number of food poisoning cases from Salmonella only	31	17	16	15	12	12	9

Source: Chartered Institute of Environmental Health



(i) Plot both sets of data on the grid to show how the number of food poisoning cases from all bacteria has changed over time and also how the number of cases of food poisoning from Salmonella bacteria has changed over time.

(5)



(ii) A student used the information to state that the number of cases of food poisoning is decreasing.  
Do you agree or disagree with the student?

Give reasons for your answer.

(4)

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**(Total for Question 10 = 13 marks)**



11 Scientists sometimes have to work in extreme conditions. The photograph shows some scientists working in the Antarctic.



The outside temperature rarely rises above freezing, but the core temperature of the scientists remains relatively constant.

(a) (i) What is the general name given to the mechanism that keeps conditions inside the body relatively constant? (1)

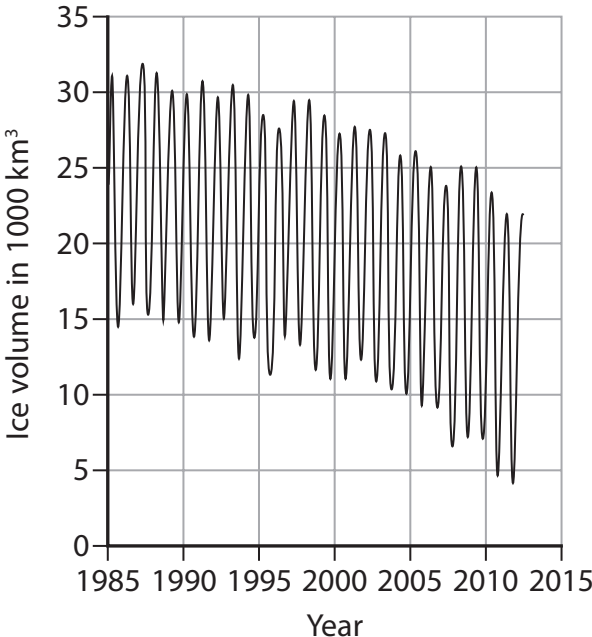
(ii) Complete the passage about temperature regulation by writing a suitable word in each space. (7)

When our core temperature falls, this is detected by the .....  
 in the brain. Nerve impulses are sent to the skin and the blood vessels there  
 ..... This means that less heat is lost from the skin surface.  
 Secretion of ..... is reduced and this means that liquid does  
 not ..... from the skin surface. Heat is generated by  
 ..... In addition, the hair on the skin rises and traps a layer  
 of ..... to provide ..... to help keep  
 the body warm.



(b) Scientists have discovered that there is evidence of global warming, both in the Antarctic and in the Arctic.

Much of the sea at the Arctic is ice. The graph shows how the volume of Arctic sea ice has changed from 1985 to 2012.



(i) Suggest why the graph shows peaks and troughs. (2)

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(ii) Suggest how the graph provides evidence that global warming is occurring in the Arctic. (2)

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(Total for Question 11 = 12 marks)



**12** Haemophilia is a condition in which a person's blood does not clot when their skin is cut.

(a) (i) Describe the process of blood clotting.

(3)

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(ii) Explain the importance of blood clotting.

(2)

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(b) Haemophilia is a sex-linked condition that mainly affects males.

The allele for haemophilia is recessive and is carried on the X chromosome. It is given the letter  $X^h$ . The allele for normal blood clotting is dominant and given the letter  $X^H$ .

(i) Complete the table to show the sex, genotypes and phenotypes of the four people. The first one has been done for you.

(4)

Sex	Genotype	Phenotype
female	$X^H X^H$	normal blood clotting
	$X^H Y$	
male		haemophilia
female		haemophilia

(ii) A man whose blood clots normally marries a woman whose blood also clots normally. They produce a child with haemophilia.

Explain why this child **cannot** be female.

(3)

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**(Total for Question 12 = 12 marks)**

**TOTAL FOR PAPER = 120 MARKS**



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