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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Tuesday 7 May 2019

Morning (Time: 1 hour 45 minutes) | Paper Reference **4HB1/01**

Human Biology

Unit: 4HB1

Paper: 01

You must have:
Ruler
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.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 90.
- 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.
- 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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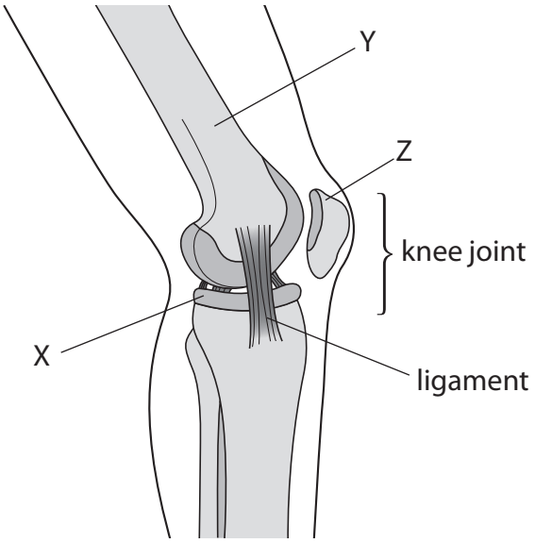
Answer ALL questions.

1 (a) The diagram shows structures in part of a human leg.



(i) The box lists structures in the human leg.

cartilage	femur	kneecap	muscle
fibula	tendon	tibia	

Use words from the box to name structures X, Y, and Z.

(3)

X .....

Y .....

Z .....

(ii) What is the function of ligaments in the knee joint?

(1)

☒ **A** ligaments attach muscles to the leg bones

☒ **B** ligaments hold the leg bones together

☒ **C** ligaments move the leg bones

☒ **D** ligaments stop the leg bones rubbing together

(iii) The type of joint found in the knee and the elbow is the same.

Give the name of this type of joint.

(1)

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(b) Aerobic respiration releases energy for muscles to contract.

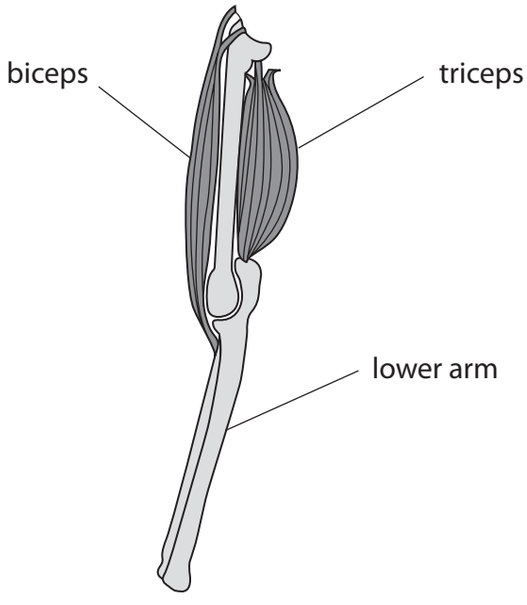
Complete the word equation for aerobic respiration.

(2)

glucose + ... ⟶ ..... + water

(c) Diagram 1 shows a model of the human arm, with the lower arm extended.

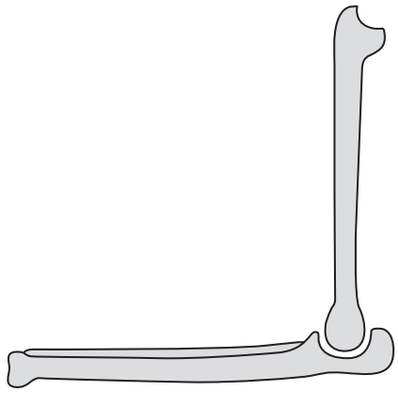
Diagram 1



Complete diagram 2 to show how the muscles change when the lower arm is raised.

(2)

Diagram 2



(Total for Question 1 = 9 marks)

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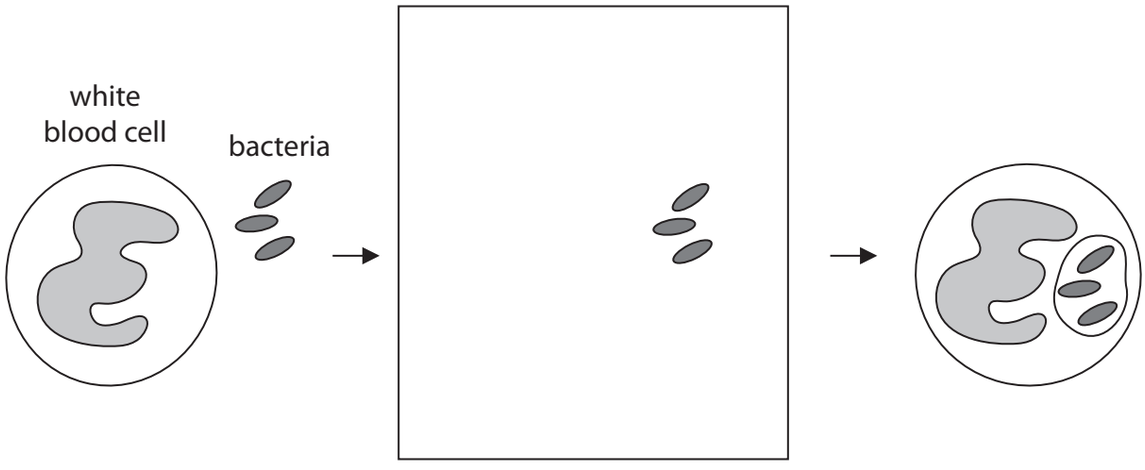
2 (a) Bacteria can cause disease in humans.

The diagram shows how one type of white blood cell helps to defend the body against disease.



(i) Complete the diagram by drawing the shape of the white blood cell at stage 2.

(1)

(ii) The box lists words associated with bacteria and disease.

acids	enzymes	erythrocytes	lymphocytes	phagocytes	toxins

Use words from the box to complete the sentences.

(2)

White blood cells called ..... engulf bacteria.

These white blood cells contain ..... to digest bacteria.

(iii) One way that white blood cells defend the body from disease is shown in the diagram.

State another way in which white blood cells defend the body against disease.

(1)

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(b) The table lists structures found in some cells.

Place ticks in boxes to show which structures are found in bacterial cells and which are found in human skin cells.

One row has been completed for you.

(3)

Structures	Bacterial cell	Human skin cell
nucleus		
DNA		
cytoplasm	✓	✓
cell wall		

(c) Viruses can also cause diseases in humans.

Many viruses contain RNA as their genetic material.

Which statement describes the structure of RNA?

(1)

☒ **A** a double-stranded helix containing the bases ATGC

☒ **B** a double-stranded helix containing the bases AUGC

☒ **C** a single-stranded helix containing the bases ATGC

☒ **D** a single-stranded helix containing the bases AUGC

(Total for Question 2 = 8 marks)

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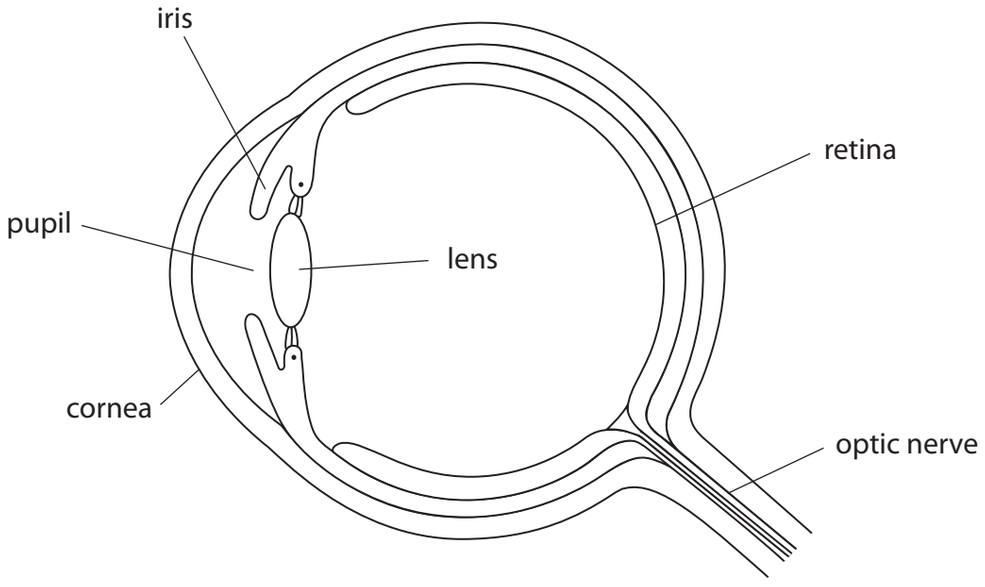
3 The human eye contains structures that help to focus light on the retina.



(a) Which structures help to focus light on the retina?

(1)

☒ **A** cornea and lens

☒ **B** iris and cornea

☒ **C** iris and pupil

☒ **D** pupil and lens

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(b) The intensity of light entering the eye can be measured in a unit called lux.

The table shows the results of an investigation on how light intensity affects the diameter of the pupil in the eye.

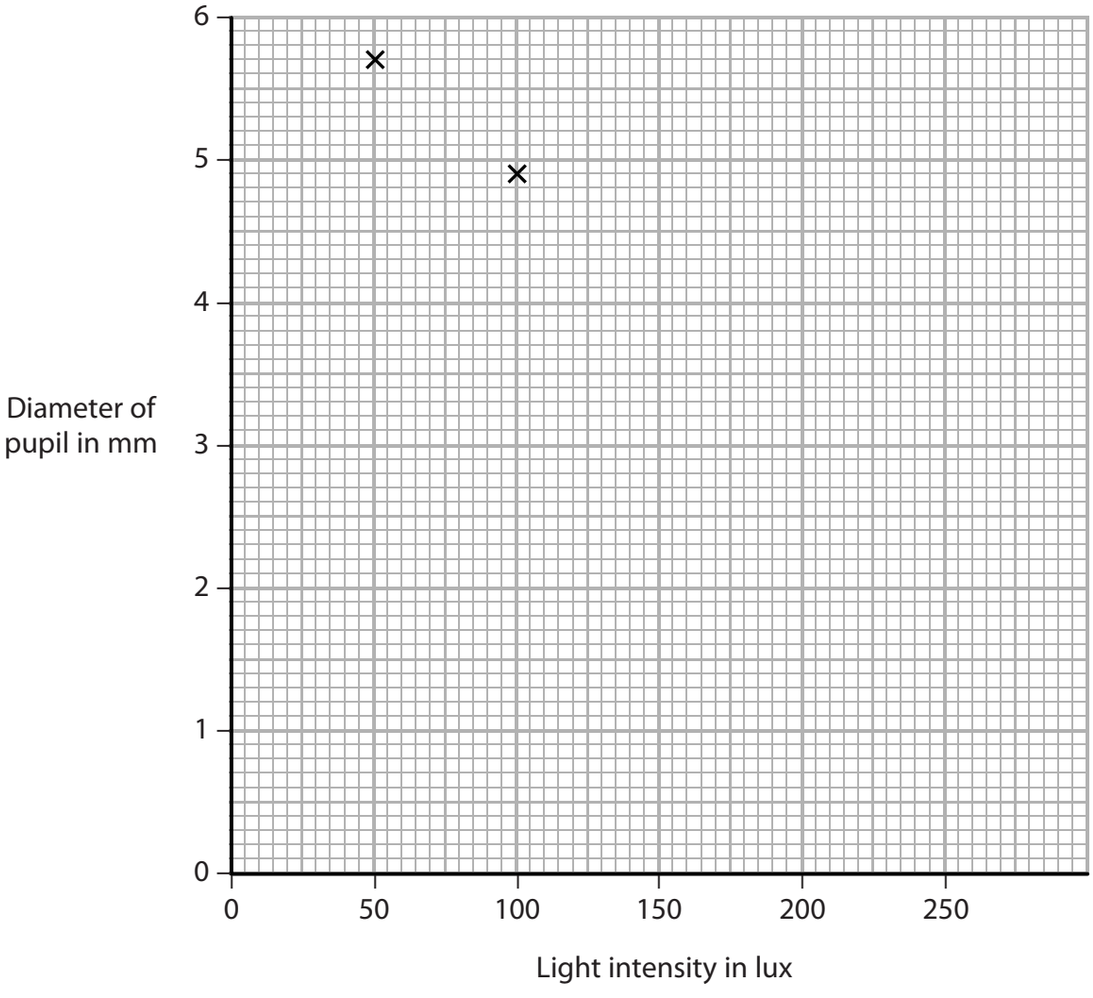
Light intensity in lux	Diameter of pupil in mm
50	5.7
100	4.9
150	2.7
200	3.2
250	2.3

(i) Complete the graph by plotting the results for 150, 200 and 250 lux.

(1)

(ii) Draw a straight line of best fit.

(1)



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(iii) Explain which result is anomalous.

(2)

(iv) State the effect of light intensity on the diameter of the pupil.

(1)

(c) Short-sightedness is a common eye condition.

Explain how short-sightedness affects vision.

(2)

(Total for Question 3 = 8 marks)

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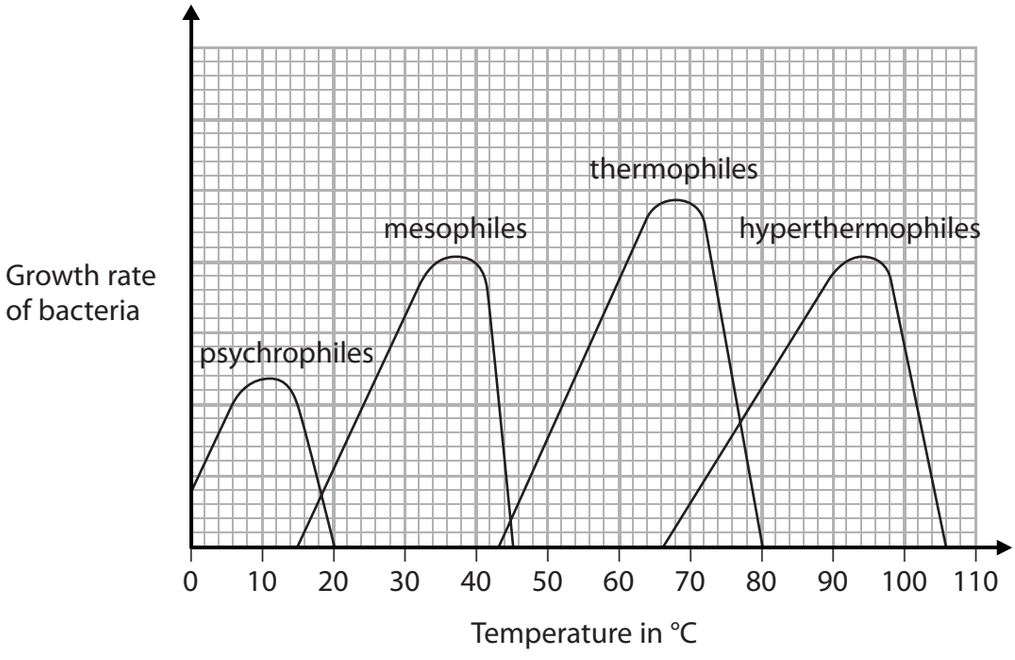
4 (a) Some bacteria in food can affect the digestive system and cause poor health.

Storing food at the correct temperature can reduce the growth of these bacteria.

The graph shows the growth rate of four groups of bacteria at different temperatures.



(i) Food kept in a fridge shows signs of contamination by bacteria.

Which group of bacteria is most likely to have caused this contamination?

(1)

☒ **A** psychrophiles

☒ **B** mesophiles

☒ **C** thermophiles

☒ **D** hyperthermophiles

(ii) Explain how cooking food at 65 °C will affect thermophiles.

(2)

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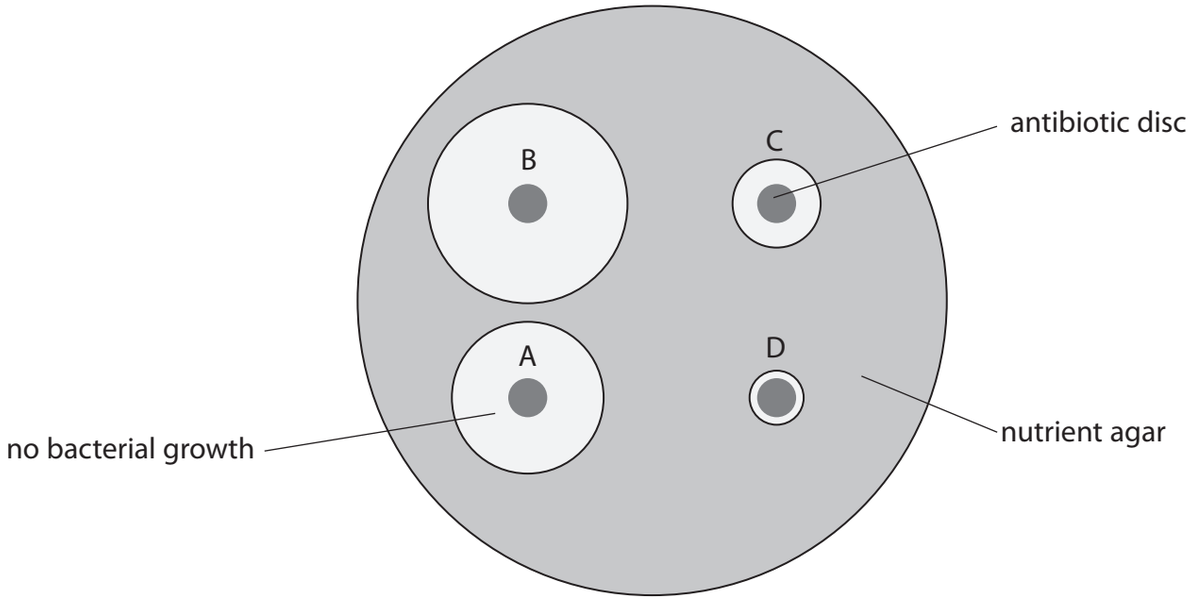
(b) A student investigates the effect of different antibiotics on the growth of bacteria.

She uses this method.

- streak bacteria onto nutrient agar in a Petri dish
- place discs of different antibiotics, A, B, C and D, onto the nutrient agar
- incubate the Petri dish in a warm oven for one week

The diagram shows the results after one week.



(i) Explain how the student could determine the effectiveness of each antibiotic.

(2)

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(ii) Explain safety precautions the student should take in this investigation.

(6)

(Total for Question 4 = 11 marks)

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5 A teacher wants to calculate the body mass index (BMI) of a number of students.

(a) The teacher measures the height of students from four age groups.

There are two male and two female students in each age group.

The table shows the data collected.

Age in years	Height of student in cm				Mean height of students in cm
	Male		Female		
12	146.2	148.9	142.8	144.2	145.5
14	165.7	166.4	161.9	164.0	164.5
16	175.9	178.5	166.3	167.6	
18	180.9	181.3	171.2	174.3	176.9

(i) Calculate the mean height of the students aged 16.

Give your answer to one decimal place.

(2)

mean height = ... cm

(ii) State two conclusions that the teacher could make from the data in the table.

(2)

1 .....

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2 .....

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(iii) Give two ways the teacher could improve his investigation.

(2)

1 .....

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2 .....

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(b) The table shows data for two different students.

Student	Height in m	Mass in kg	BMI
X	1.69	62	21.7
Y	1.46	71	

(i) BMI is calculated using the equation

$$\text{BMI} = \frac{\text{mass}}{\text{height}^2}$$

Calculate the BMI of student Y.
[mass measured in kg, height measured in m]

(2)

BMI of student Y = ...

(ii) BMI can be used to assess whether a person has a healthy mass for their height.

BMI	Classification
below 18.5	underweight
18.5 – 24.9	normal weight
25 – 29.9	overweight
30 – 40	obese
above 40	morbidly obese

Using information from the table, explain how the BMI of student Y could affect her health.

(2)

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(Total for Question 5 = 10 marks)

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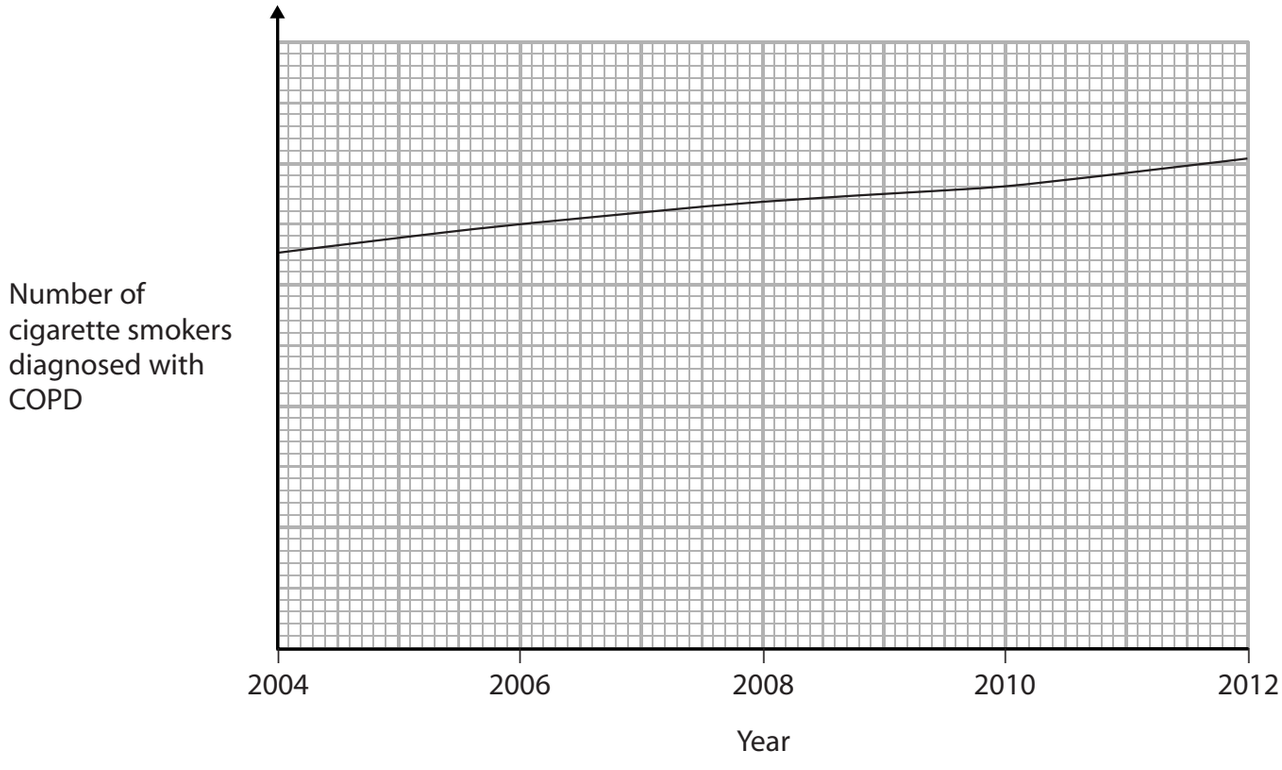
6 (a) Chronic obstructive pulmonary disease (COPD) is the name given to a group of diseases that affect the breathing system.

These diseases include chronic bronchitis and emphysema.

Cigarette smoking is the main cause of COPD.

The graph shows the number of cigarette smokers diagnosed with COPD in the UK over a period of eight years.



(i) Describe the overall trend in cigarette smokers diagnosed with COPD.

(1)

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(ii) Describe what further information is required to help form the conclusion that cigarette smoking is the only cause of COPD.

(2)

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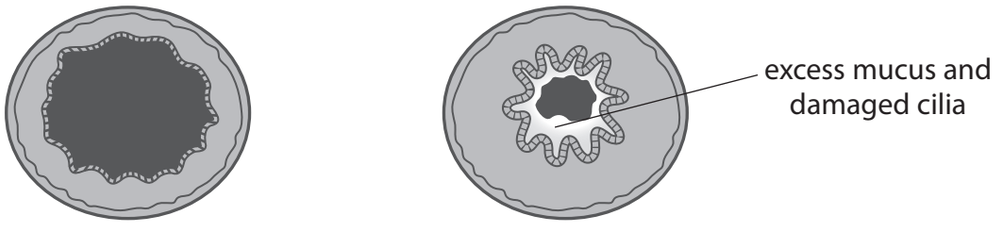
(b) The diagram shows how chronic bronchitis affects the airways in the breathing system.



healthy airway

chronic bronchitis

Explain how excess mucus and damaged cilia affect the breathing system of a person with chronic bronchitis.

(2)

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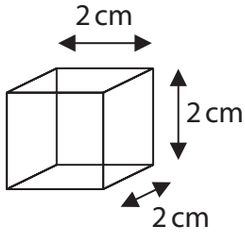
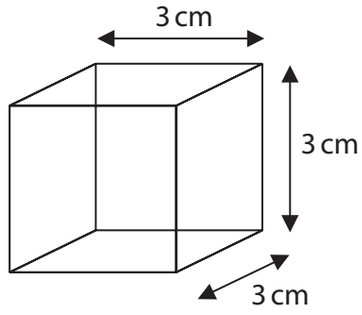
(c) The diagram shows models of two alveoli.

One model represents an alveolus from a person with healthy lungs.

The other model represents an alveolus from a person with emphysema.



Healthy



Emphysema

The table shows the surface area to volume ratio for a healthy alveolus.

	Surface area in cm^2	Volume in cm^3	Surface area to volume ratio
Healthy	24	8	3 : 1
Emphysema			

(i) Complete the table by giving the missing information.

(3)

(ii) Explain how the surface area to volume ratio of alveoli in the lungs of a person with emphysema will affect the normal function of body cells.

(3)

(Total for Question 6 = 11 marks)

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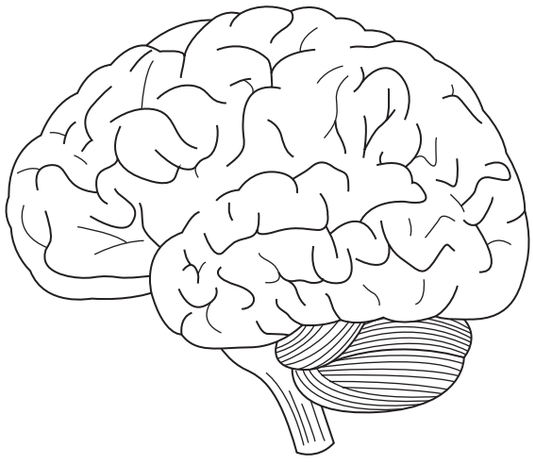
7 (a) The diagram shows a human brain.



Add lines labelled X, Y and Z to the diagram to show the areas of the brain that control these functions.

(3)

X voluntary actions

Y balance

Z breathing rate

(b) Parkinson's disease affects the cells in the brain that help to control body movement.

The affected cells are unable to communicate effectively with neurones that cause muscles to contract.

(i) Name the type of neurone that causes muscles to contract.

(1)

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(ii) Give one difference between neurones that cause muscles to contract and neurones that transmit nerve impulses from receptor organs.

(1)

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(iii) Explain how one neurone communicates with another neurone.

(3)

(c) Recent scientific research into the treatment of Parkinson's disease has involved the use of stem cells.

Explain how stem cells could be used to reduce the symptoms of Parkinson's disease.

(3)

(Total for Question 7 = 11 marks)

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8 *P. vivax* is one of several parasites that can cause malaria.

(a) Explain how *P. vivax* is transmitted from one person to another.

(3)

(b) The table shows the total number of deaths from malaria and the number of deaths caused by *P. vivax*.

It shows the data for five different regions of the world in 2015.

Region of the world	Q	R	S	T	U
Total number of deaths from malaria	191 000	800	3800	14 400	1200
Number of deaths caused by *P. vivax*	1000	500	1400	4900	700

(i) Compare the number of deaths caused by *P. vivax* with the total number of deaths from malaria in regions Q and R.

Include calculations to support your answer.

(3)

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(ii) Suggest one reason why the number of deaths from malaria varies across the different regions.

(1)

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(c) Scientists are developing a vaccine to protect against malaria.

Explain how vaccinating individual people will help to protect a whole population from malaria.

(3)

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(d) *P. vivax* reproduces by asexual reproduction and sexual reproduction.

Explain why it is an advantage for a species to reproduce by both methods.

(3)

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(Total for Question 8 = 13 marks)

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9 Inheritance of blood group involves codominant inheritance.

(a) (i) Which statement describes codominant inheritance in ABO blood groups?

(1)

- ☒ **A** the inheritance of two different alleles, both of which are expressed
- ☒ **B** the inheritance of two different alleles, only one of which is expressed
- ☒ **C** the inheritance of multiple alleles, only two of which are expressed
- ☒ **D** the inheritance of multiple alleles, only one of which is expressed

(ii) State the possible genotypes of a person with blood group A.

(1)

(b) (i) A person's blood group is determined by antigens.

These antigens are carbohydrate and protein molecules on the surface of red blood cells.

In 2007, a team of scientists used enzymes to convert blood groups A, B and AB into blood group O for transfusions.

Suggest how enzymes can convert blood groups A, B and AB into blood group O.

(3)

(ii) Suggest an advantage of producing blood group O using enzymes, compared with other methods of obtaining blood group O.

(1)

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(c) Haemophilia is a sex-linked blood disorder that reduces the ability of the blood to clot.

These are the genotypes of four offspring, P, Q, R and S.

P	Q	R	S
X^HX^h	X^hY	X^HX^H	X^HY

(i) Draw a genetic diagram to show how these offspring are produced from one set of parents.

(2)

(ii) These parents are expecting another baby.

Determine the probability that this baby will have haemophilia.

(1)

probability = ...

(Total for Question 9 = 9 marks)

TOTAL FOR PAPER = 90 MARKS

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