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General Certificate of Secondary Education 2015

Double Award Science: Biology

Unit B2

Higher Tier



[GSD42]

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FRIDAY 5 JUNE, AFTERNOON

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in blue or black ink only. Do not write with a gel pen.

Answer all eleven questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is **90**.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Questions 2 and 6(e).



1 Blood samples from three patients were analysed. Table 1 gives the results for each patient.

Table 1

Blood samples were	Blood results for				
analysed for	Patient A	Patient B	Patient C		
Blood alcohol level	high	not present	low		
Level of cholesterol	high	normal	low		
Carbon monoxide	normal	high	normal		
Hormones:					
Testosterone	present	absent	absent		
Oestrogen	absent	present	present		
Fertility hormones	absent	absent	present		

Use the information in Table 1 and your knowledge to complete Table 2. The first row has been completed for you.

Table 2

	Patient	Evidence
Most likely to have a heart attack	А	high cholesterol level
Is a male		
Most likely to be a smoker		
Most likely to be receiving IVF Treatment		
Most likely to be a binge drinker		

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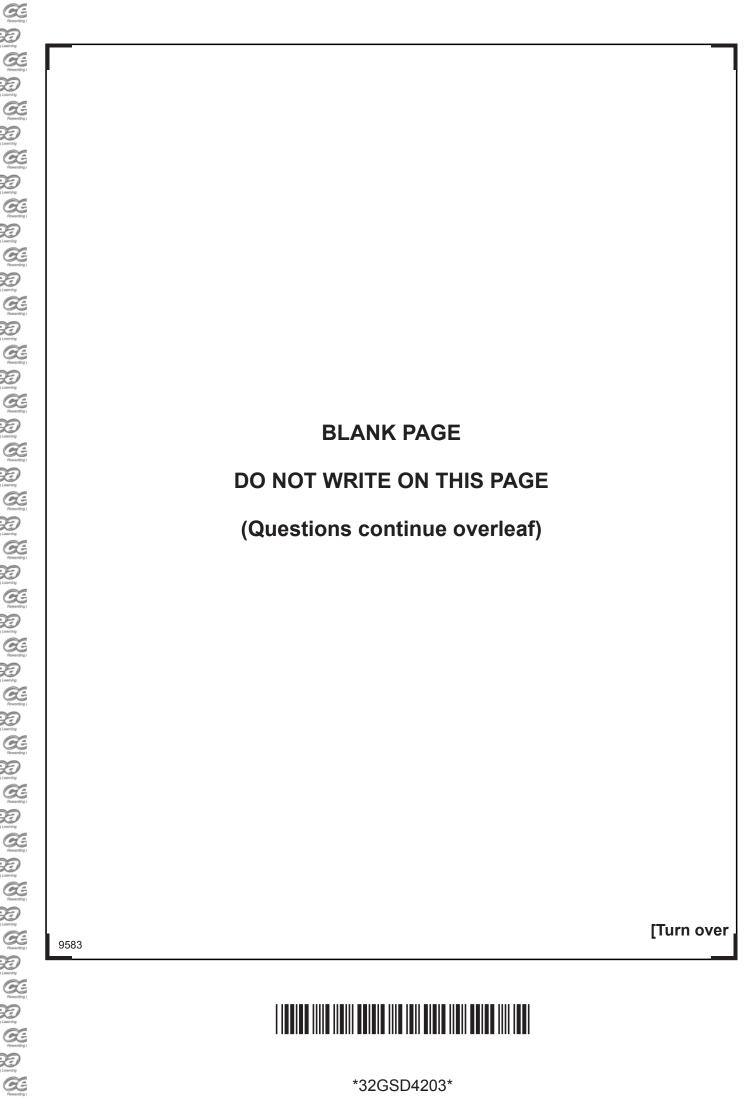
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2 A student wanted to investigate how effective two antibiotics were against a particular type of bacteria.

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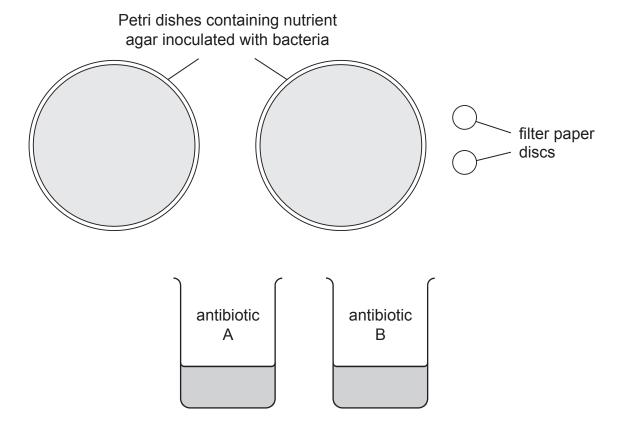
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The student was given the following apparatus:

- two Petri dishes containing nutrient agar inoculated with the bacteria;
- two filter paper discs;
- two different antibiotic solutions.

The diagram shows the apparatus the student was given.





	cribe how the student carried out this investigation.
•	Give two safety precautions. Describe and explain the results the student would obtain if antibiotic A was more effective than antibiotic B.
In th	nis question you will be assessed on your written communication skills uding the use of specialist scientific terms.

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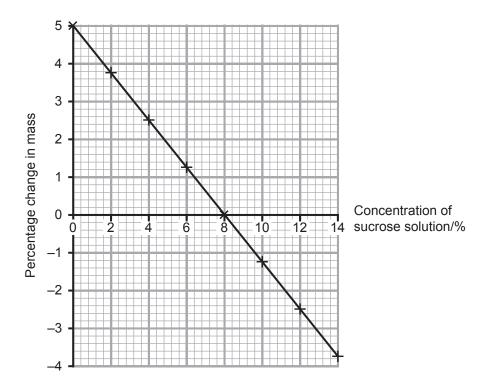


3 A student recorded the mass of eight potato cylinders.

She placed one cylinder in each of eight concentrations of sucrose solution and left them for two hours.

She then reweighed the cylinders and calculated the percentage change in mass.

The graph shows her results.



(a) (i) Use the graph to find the percentage concentration of sucrose solution which gives zero percentage change in the mass of the potato cylinder.

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(ii) Explain your answer.

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(i) water (0% sucrose so(ii) 12% sucrose solutionLabel the cell wall and	-
(i) cell in water	(ii) cell in 12% sucrose solution (Label the cell membrane and cell wall.)
What is the function of the	
What is the function of the	

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4 A high cho	olesterol level	l in the blood	l increases the	risk of a l	heart attack.
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(a) Explain how a high cholesterol level in the blood can lead to a heart attack.

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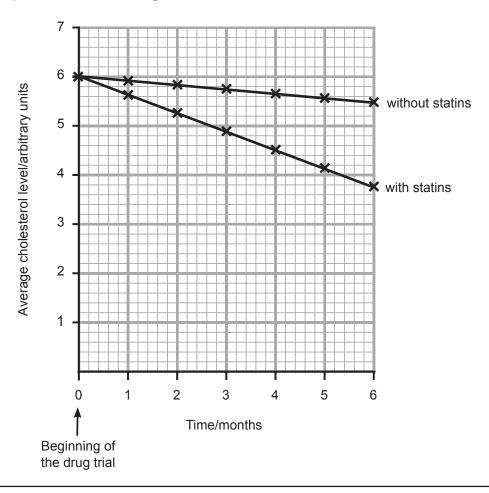
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(b) A six month drug trial involved 14 000 patients with high cholesterol levels.
 It is claimed that drugs called statins reduce cholesterol levels.
 Half of the patients were given statins and half were not.
 All patients were told to eat a balanced diet over the period of the trial.

The graph shows the average cholesterol levels over the six months of the trial.





\[his	he 14 000 patients who took part in the drug trial six out of seven were men. is because men make up a greater proportion of heart disease patients. How many women took part in the drug trial? Show your working
\[his	s is because men make up a greater proportion of heart disease patients. How many women took part in the drug trial?
\[his	he 14 000 patients who took part in the drug trial six out of seven were men. is because men make up a greater proportion of heart disease patients. How many women took part in the drug trial?
\[his	he 14 000 patients who took part in the drug trial six out of seven were men. s is because men make up a greater proportion of heart disease patients.
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•••,	of the trial?
::\	Why was the group of patients who were not given statins included as part
	[3

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(iv) Some of these women found that statins did not reduce their cholesterol level. This meant that they were still at risk of having a heart attack.

Other than a balanced diet suggest **two** lifestyle changes that these women could make which would help to reduce their risk of having a heart attack.

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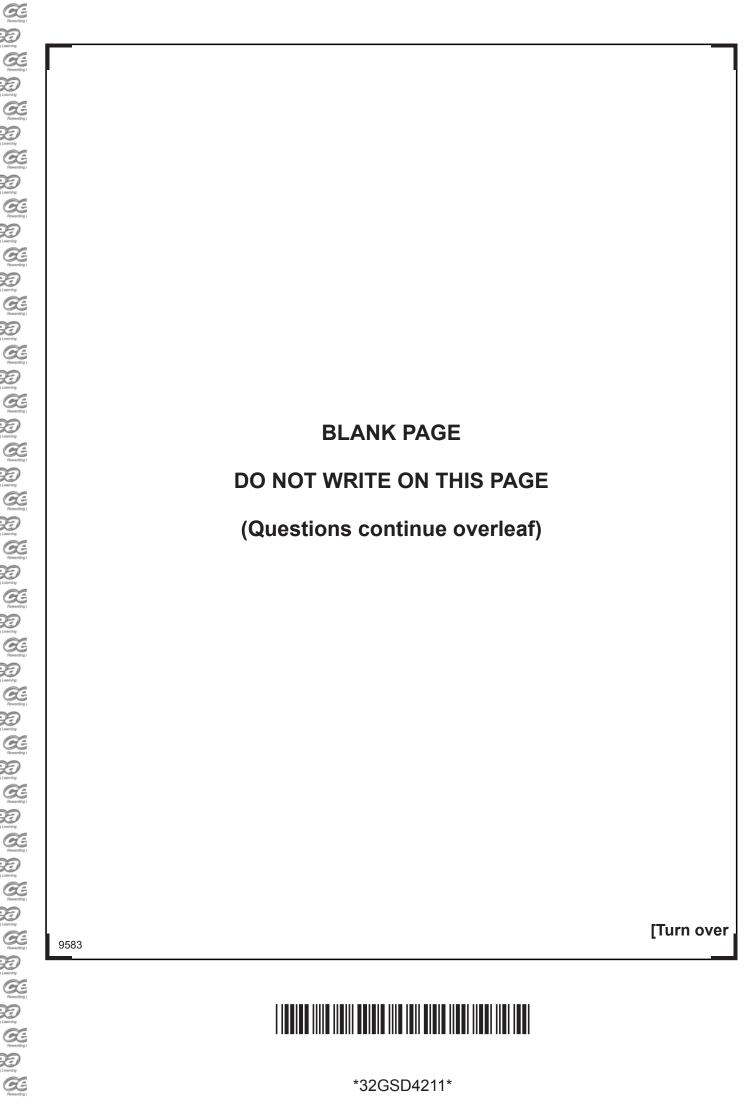
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1. _____

2. ______[2]







;	Bacteri	is a hormone which can be made using genetic engineering. is are used in this process. agram shows a stage in the production of human insulin by genetic ering. insulin gene plasmid
	(a) De	escribe three stages required to produce the plasmid shown in the diagram.
	Ex	e plasmid containing the insulin gene is placed back into a bacterium. plain how this genetically engineered bacterium can be used to produce large antities of insulin in a short period of time.

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(c)	State two other advantages of producing human insulin by this method.	
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(d)	Name the condition that insulin is used to treat.	
		[1]

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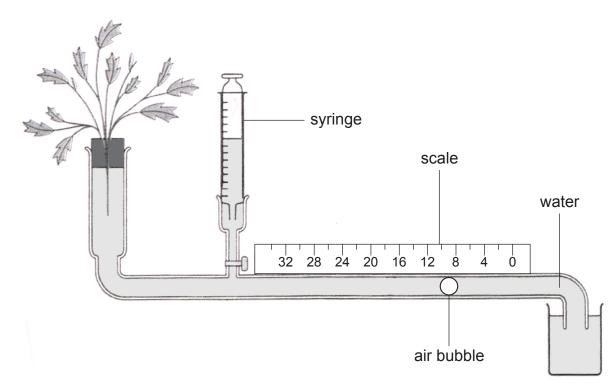
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6 (a) The diagram shows apparatus used to investigate the rate of transpiration in a plant shoot in different environmental conditions.

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© GCSE Biology for CCEA, 2nd Edition by James Napier, Hodder Education (2011). ISBN: 9780340983805. Reproduced by permission of Hodder Education.

Name the apparatus.	
	_ [1]

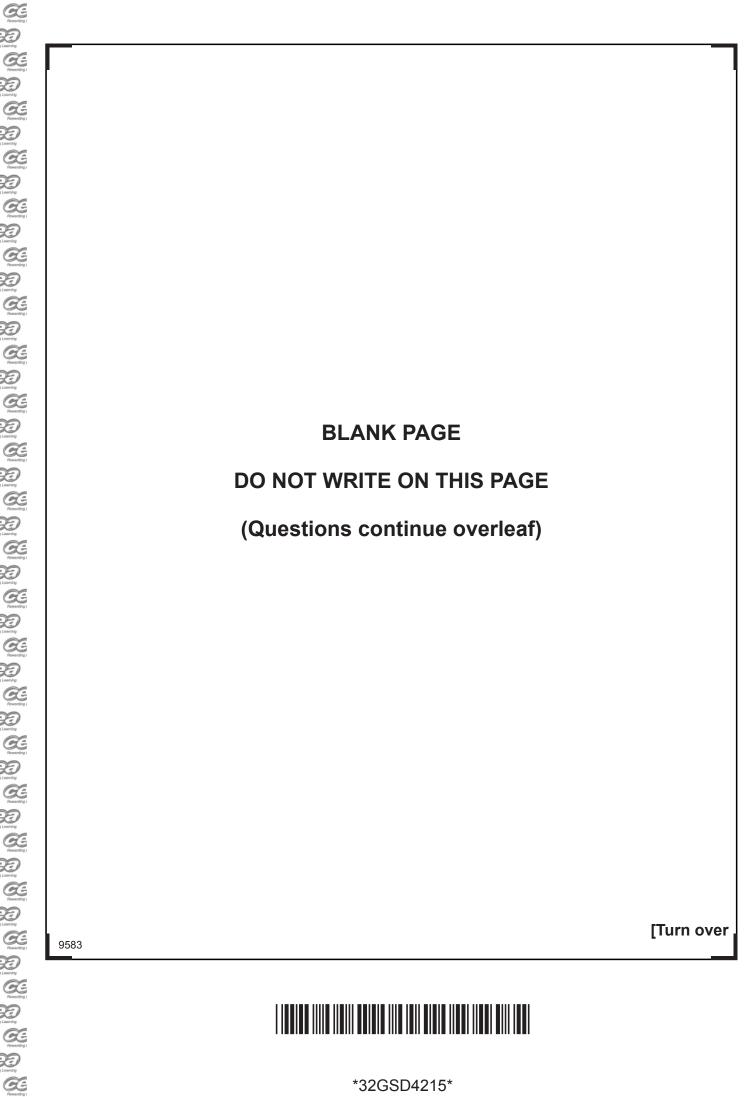
(ii) How is the bubble reset to zero between experiments?

_____ [1]

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(i)







(b) The table shows the distance moved by the air bubble under different environmental conditions over **30 minutes**.

	Env	rironmental cor	ndition			Distance
Experiment	Fan speed on/off	Temperature /°C	Humidity low/high	Position of bubble at the start	Position of bubble at the end	moved by bubble/mm
1	off	20	low	8 4 0	8 4 0	4
2	on	20	low	8 4 0	8 4 0	6
3	off	30	low	8 4 0	8 4 0	
4	on	30	low	8 4 0	8 4 0	9

Complete the table by

i)	drawing in the	position of the	air bubble at the ϵ	end of Experiment 2.	[1]

1	'::\	adjoughting the distance moved by the circleble in Experiment 2	L4.
(11)	calculating the distance moved by the air bubble in Experiment 3.	- 1 1
•	,	carbarating the distance merca by the air babbie in Experiment of	г.

(c)	What is the r	ate of transpir	ation in Expe	riment 1 in mn	per hour?
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(d) (i)	The distance moved by the air bubble in Experiment 1 was 4 mm. The distance moved by the air bubble in Experiment 2 was 6 mm.					
	Give the environmental condition that caused this increase.					

	[1]

(ii)	Experiment 1 was repeated with high humidity. What would you expect to
	happen to the distance moved by the bubble?

<u>آ</u> 1
ь.



(e)	The distances moved by the air bubbles in Experiments 1 and 4 are different. Describe and explain what happened inside and around the leaf to bring about the difference in Experiment 4.
	In this question you will be assessed on your written communication skills including the use of specialist scientific terms.
	[6]
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7 MRSA is a 'superbug'. It is resistant to antibiotics and can spread quickly, particularly in hospitals.

(a) ((i))	What tvp	e of	micro	organis	sm is	MRSA?
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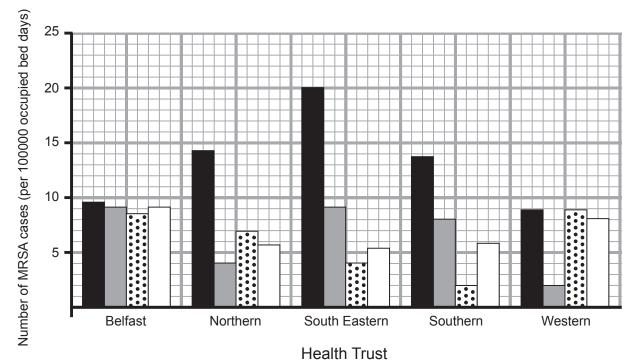
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(ii) Explain what is meant by the term 'resistant to antibiotics'.

______[1]

(b) The graph below compares the number of MRSA cases in hospitals for the first three months of each year from 2009–2012 for each of the five Health Trusts in Northern Ireland.





© Adapted from HSC Public Health Agency '5 areas bacteramia surveillance quarterly report Jan-Mar 2012'.



(i) The table compares the number of MRSA cases in the first three months of 2010 to 2012 compared to the same period the previous year for different Health Trusts.

Use the information in the graph opposite to complete the table for the Western Trust.

	Number of MRSA cases in the first three mont each year compared to the previous year				
Health Trust	2010	2011	2012		
Belfast	decreased	decreased	increased		
Northern	decreased	increased	decreased		
South Eastern	decreased	decreased	increased		
Southern	decreased	decreased	increased		
Western					

(ii) Use the information in the table to give the Health Trust that shows the same trend as the Western Trust.

[1]

(iii) Use the information in the graph opposite to calculate the percentage decrease in MRSA cases between 2009 and 2011 for the South Eastern Trust.

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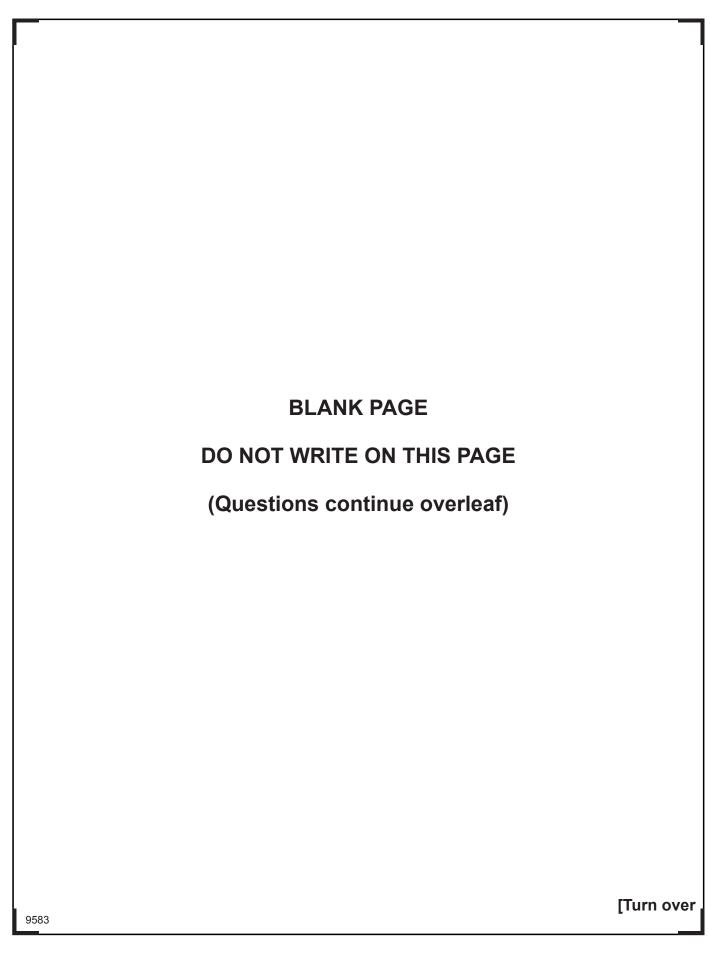
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8 The photographs show strawberry plants and sunflowers.







© Dr Neil Overy / Science Photo Library

(a)	The strawberry	plants	reproduced	asexually to	give clones
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(i)	What is a clone?	
		[1]

The clones were not exactly the same height.

(ii) Suggest why the cloned strawberry plants were not exactly the sar height.	me
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((iii)	What type	of cell	division	occurs	as	plants	grow?

	[1]
 	[י]



(b) (i)	The sunflower plants reproduced by sexual reproduction. The offspring when grown had many different heights.
	Explain the reason for this variation in height.
	[1]
(ii)	What type of variation is shown by the heights of the offspring sunflowers?
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9 (a) The diagram shows the nucleus of a cell that has been produced by meiosis. It contains three chromosomes.

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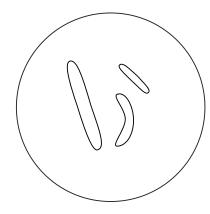
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In the space draw the nucleus of this cell **before** it divided by meiosis.

(ii) Name one part of the human body where meiosis takes place.

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(ii) How many haploid cells are produced from one cell during meiosis?

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(iii) Human eggs and sperm each contain 23 chromosomes.

Explain the significance of this during fertilisation in terms of chromosome numbers.



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V'	Vatson and Crick
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 -	ranklin and Wilkins
	Outline the contribution made by each in the understanding of the structure of ONA as a double helix.
C	n the 1950s, the structure of DNA was discovered as a result of research arried out by different scientists; Rosalind Franklin and Maurice Wilkins, Edwir Chargaff, James Watson and Francis Crick.
th	Scientists often collaborate or use data from each other in order to develop neories and make discoveries.
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(a)	Describe two ways microorganisms are prevented from entering the body.
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(b)	If microorganisms such as bacteria do get into the body, the body responds b producing antibodies.
	Describe how the presence of a specific microorganism results in the product of antibodies.

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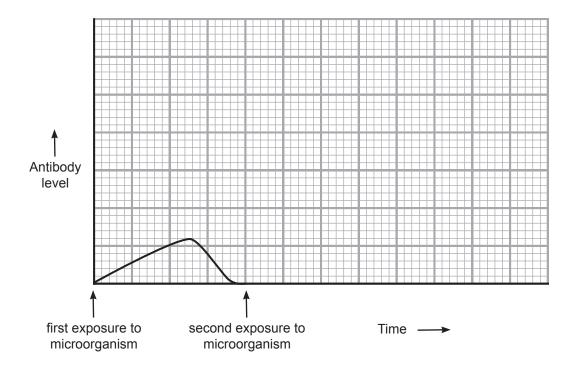
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(c) A person was exposed to the same type of microorganism on a second occasion.

On the graph, draw a line for the time period given to show the antibody level that you would expect.



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11 Sickle cell anaemia is a recessive inherited condition which affects red blood cells. The photograph shows a normal red blood cell and a sickle-shaped red blood cell.





© Mary Martin / Science Photo Library

People who are homozygous recessive for the condition suffer from sickle cell anaemia.

People who are heterozygous for the condition are carriers for sickle cell anaemia.

Let b represent the allele for sickle cell anaemia.

(a) Draw a Punnett square to show how two parents who do **not** suffer from sickle cell anaemia could have a child who does suffer from sickle cell anaemia.

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(b)	pre	National Health Service (NHS) offers screening to some parents during gnancy so they can find out if they are carriers for sickle cell anaemia. This inform them if they are at risk of having a baby with sickle cell anaemia.
	The carr	mother is screened first. The father is only screened if the mother is a rier.
	(i)	Explain why it is only necessary to screen the father if the mother is a carrier for sickle cell anaemia.
		[1]
	(ii)	Suggest the benefit to the NHS of only screening the father if the mother is a carrier for sickle cell anaemia.
(c)		viduals who are carriers for sickle cell anaemia have a natural protection inst malaria.
	Mal yea	aria is carried by mosquitoes. It causes more than one million deaths per r.
	ther	e the theory of natural selection and the information above to explain why be is a higher percentage of the population who are carriers for sickle cell emia in areas where malaria is common.

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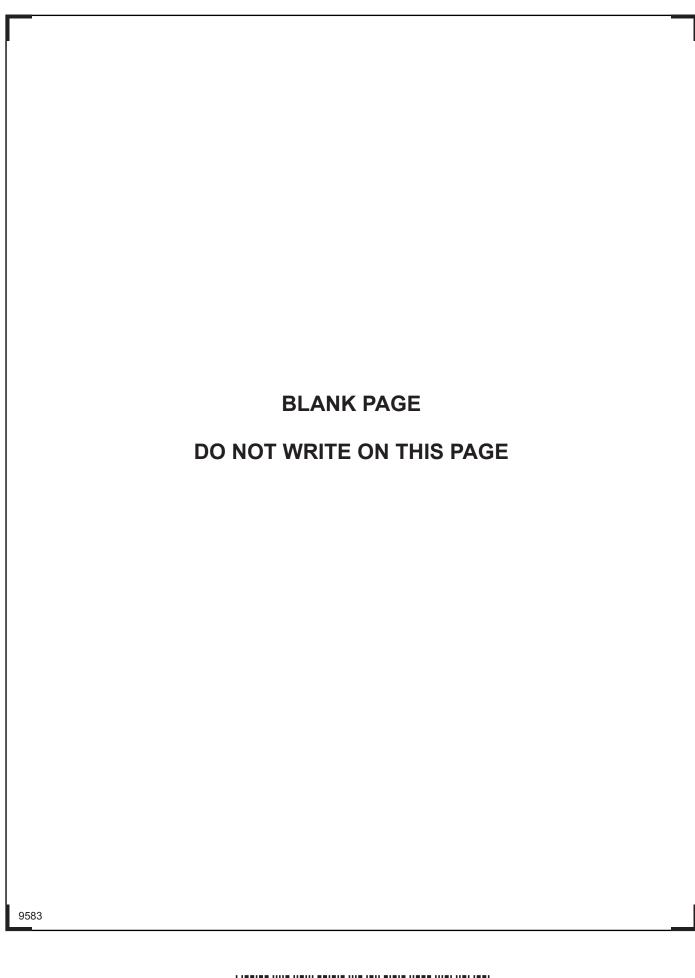
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