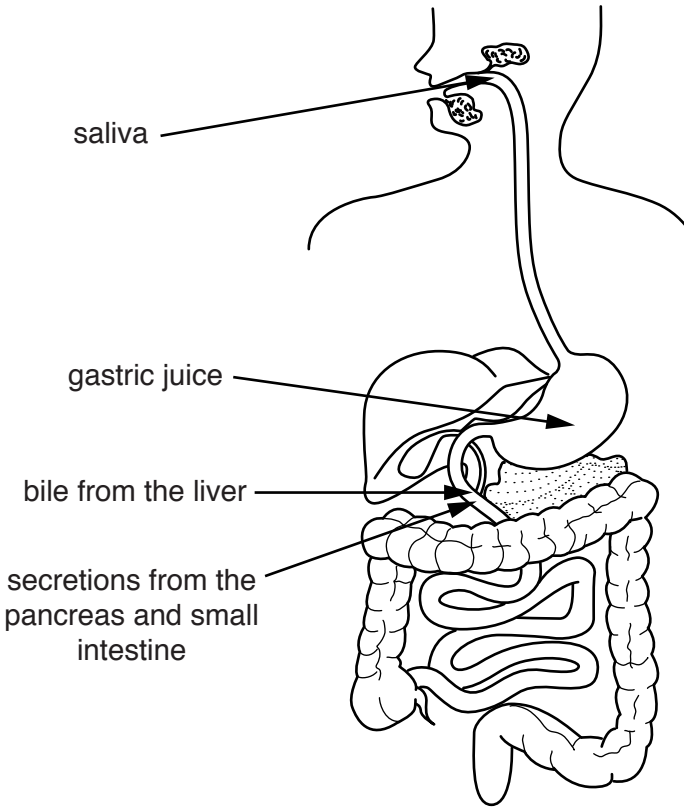
1 Different liquids are added to food as it passes through the digestive system.



(a) One of the liquids released into the digestive system contains no enzymes.

Put a tick (✓) in the box next to this liquid.

saliva	
gastric juice	
bile from the liver	
secretions from the pancreas and small intestine	

[1]

(b) Saliva and gastric juice have different pH values.

Explain why this is important.

.....

.....

.....

..... **[2]**

2 Enzymes have many industrial uses.

(a) Draw straight lines to join each **enzyme** with the correct **use of the enzyme**.

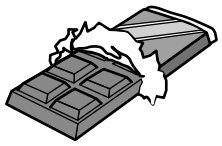
Draw only **three** lines.

Enzyme	**Use of the enzyme**
	used in the production of milk for people with intolerance to dairy products
sucrase	
	used on reagent strips to detect lactose
lactase	
	used to join strands of DNA together
ligase	
	used to produce sweeter sugars for food

[2]

(b) Read the article about using enzymes to make chocolate.

Using enzymes to make better chocolate



Chocolate is made from cocoa seeds.
The fresh seeds have to be treated to produce the chocolate flavour.

Scientists think that they can use protease enzymes to treat the seeds.
They claim that the chocolate tastes 50% better.
The enzymes can be made by genetic engineering.
This might also help the chocolate manufacturers.

(i) Which substance in the cocoa seeds is digested by protease enzymes?

..... **[1]**

(ii) The scientists say that this chocolate tastes 50% better.

Suggest why they may **not** be allowed to use this statement in advertising.

.....

.....

..... **[2]**

(iii) The protease enzyme can be made by genetically engineered bacteria.

The gene for the protease enzyme can be inserted into bacteria using a vector.

Write down **one** type of vector that can be used.

..... **[1]**

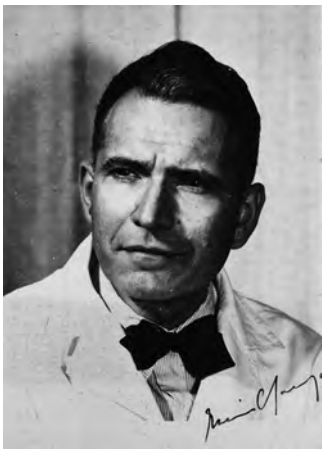
3 This question is about DNA.

Erwin Chargaff was an Austrian scientist.

His work was important in helping James Watson and Francis Crick work out the structure of DNA.

Chargaff discovered that, in any piece of DNA, the number of **A** bases is always the same as the number of **T** bases.

Also the number of **C** bases is always the same as the number of **G** bases.



(a) In one piece of DNA, 27% of the bases are **A**.

Use Chargaff's discovery to work out the percentages of each of the other bases.

.....

..... **[2]**

(b) Suggest how Chargaff's discovery helped Watson and Crick work out the structure of DNA.

.....

.....

..... **[2]**

(c) In 1962, Watson, Crick and another scientist, Maurice Wilkins, received a Nobel prize for their discovery of the structure of DNA.

Controversially, other scientists whose work had helped Watson and Crick did **not** receive the prize. These included Chargaff.

Some people think that Chargaff should have been included in the group receiving the Nobel prize.

(i) Suggest **one** reason why he should have been included in the group.

.....

..... **[1]**

(ii) Suggest **one** reason why he should **not** have been included in the group.

.....

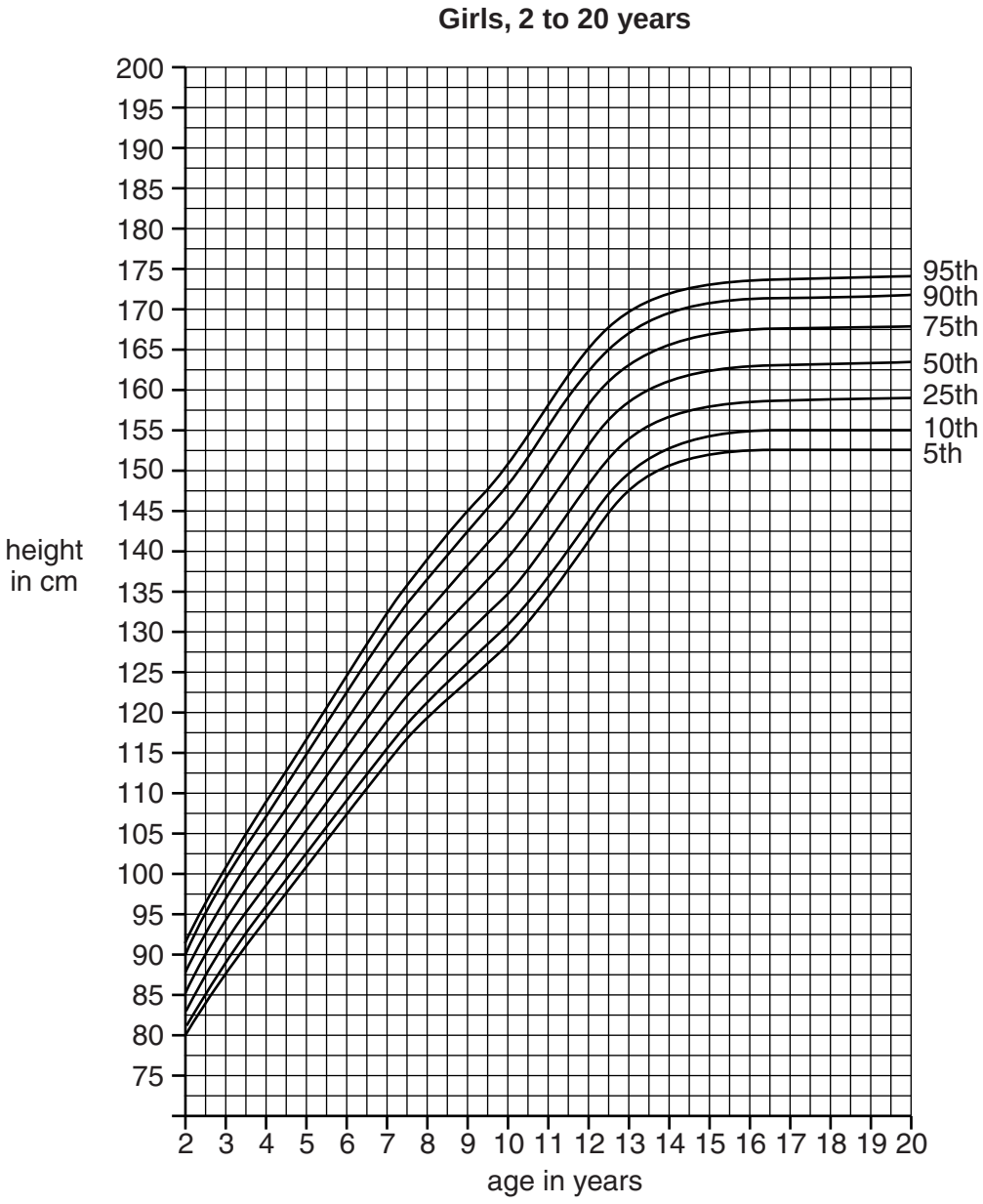
..... **[1]**

[Total: 6]

4 The graphs, on this page and the next page, show height growth curves for girls and boys in the USA. The lines show percentiles.

For example, the top line shows the 95th percentile.

This means that 95% of girls or boys are at or below that height.



(a) At what age is there most variation in the heights of girls?

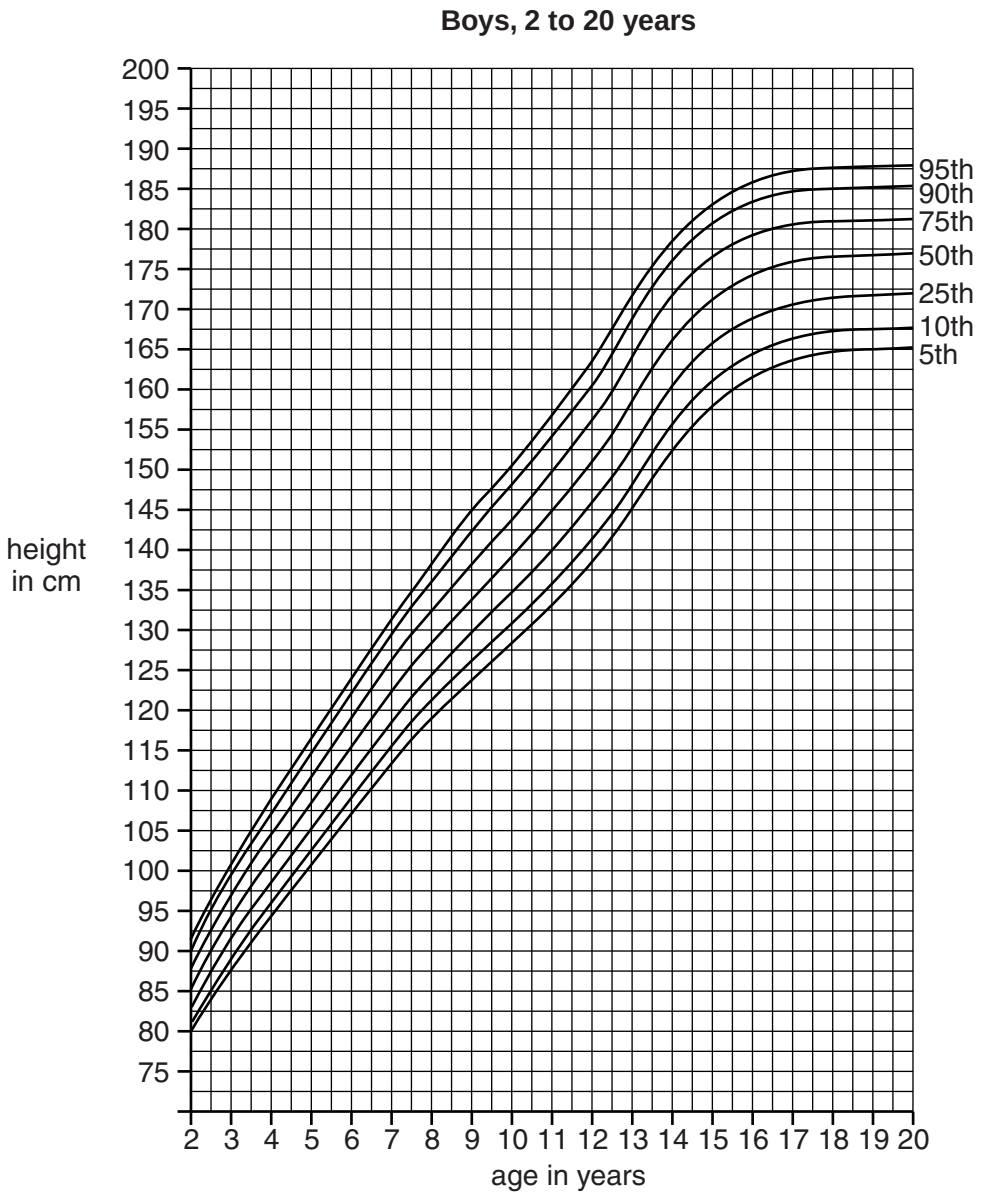
Explain your answer.

.....

.....

.....

..... **[2]**



(b) Kash says that the graphs show that boys are taller than girls at age 20.

Discuss whether or not he is correct.

Use the graphs to help you answer.

.....

.....

.....

..... **[2]**

(c) During growth, different types of protein are made and used.

(i) Write down **two** types of protein that do different jobs and describe the job of each protein during growth.

1 .....

.....

.....

2 .....

.....

.....

[4]

(ii) Proteins are coded for by DNA.

Describe how the DNA base sequence codes for a protein.

.....

..... **[2]**

[Total: 10]

5 This question is about food preservation.

(a) Food preservation is important in hot countries.

This is because food decays faster in warm conditions.

Explain why.

.....

.....

..... **[2]**

(b) Humans treat food in different ways to stop decay.

Some examples of traditional methods from hot countries are shown in the table.

Name of food	Country	Treatment
bummalo	India	fish are hung up in the open air for five days
blatjang	South Africa	apricots are put into pots with other fruit, water and sugar
adobo	Philippines	meat is mixed with vinegar, garlic and bay leaves

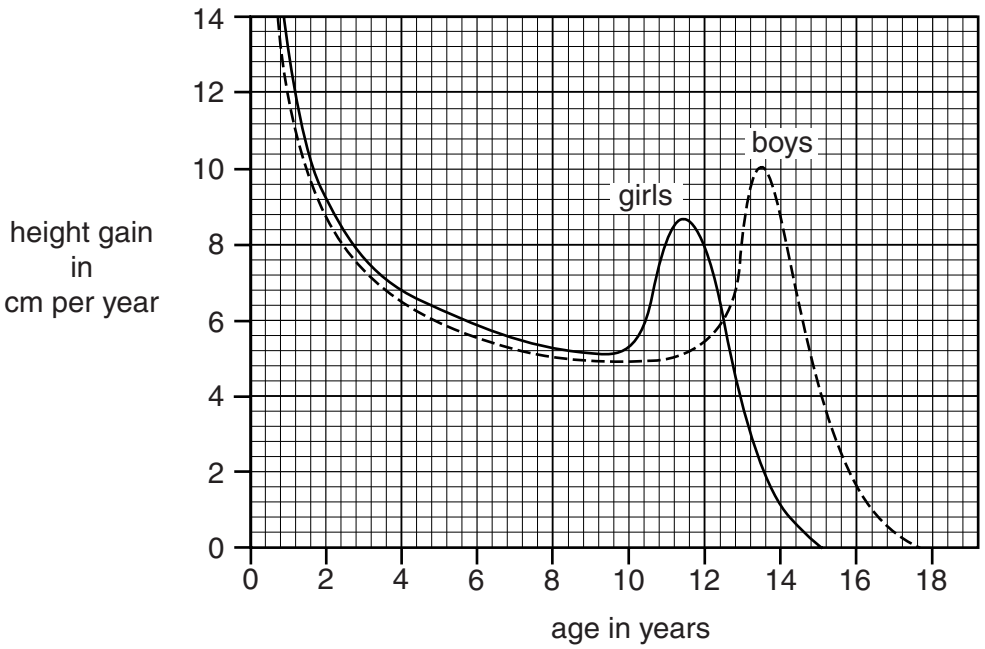
Draw lines to join each **food** with the **method** that is used to stop decay.

Food	Method
adobo	drying the food stops enzymes working
bummalo	acid provides the wrong pH for enzymes to work
blatjang	a concentrated solution draws water out of the microbes

[1]

[Total: 3]

6 **(a** The graph shows the average height gained per year by girls and boys at different ages.



Use the graph to answer these questions.

(i) At what age do girls start adolescence?

..... years **[1]**

(ii) At what age do boys grow at their fastest rate?

..... years **[1]**

(iii) At which age is there the greatest difference in the rate of growth between girls and boys?

..... years

How can you tell this from the graph?

.....

..... **[2]**

(b) Girls and boys grow by their cells dividing.

(i) What is the name of this type of cell division?

..... **[1]**

(ii) Just before cells divide, DNA replication occurs.

Describe how DNA replication occurs.

You may use labelled diagrams to help you answer.

.....

.....

.....

.....

..... **[3]**

[Total: 8]

7 (a) (i) Cell division occurs during growth.

Write down the name of the type of cell division used for growth.

..... **[1]**

(ii) Explain why DNA replicates **before** cells divide.

.....

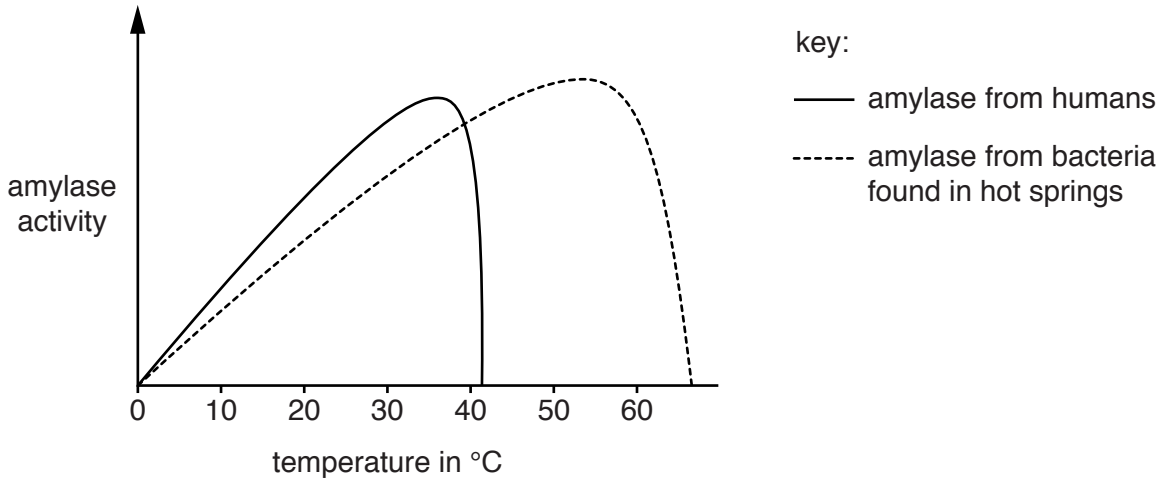
..... **[1]**

(b) Amylase is an enzyme.

Look at the graph.

One line shows the effect of temperature on amylase from humans.

The other line shows a different amylase from bacteria found in hot water springs.



Compare and explain the shape of the graphs for both types of amylase.

The quality of written communication will be assessed in your answer to this question.

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.....

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..... **[6]**

[Total: 8]