1 In the Second World War, atomic bombs were dropped on Japan.

Many of the survivors developed illnesses such as cancer because of the nuclear radiation.

Cancer is caused by changes to DNA in body cells.

(a) Suggest why changes to DNA may cause illnesses such as cancer.

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

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

(b) Collecting data from the survivors of the atomic bombs has provided information linking nuclear radiation and cancer.

Bobby says that it is not right to collect data from the survivors.

Jilly says we should collect this data from the survivors.

Justify **Jilly's** case.

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

[Total: 8]

2 **(a)** Bronchi are airways leading to the lungs.

(i) Smoking cigarettes damages cells lining the bronchi.

What is the name of these cells?

Choose your answer from the list.

ciliated epithelial cells

gamete cells

red blood cells

white blood cells

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

(ii) Smoking can cause cancer in cells lining the bronchi.

Describe and explain **one other** way the smoke affects cells lining the bronchi.

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

(iii) There are two main types of tumour.

People who smoke are more likely to get malignant tumours.

Name the **other** type of tumour and describe how it differs from a malignant tumour.

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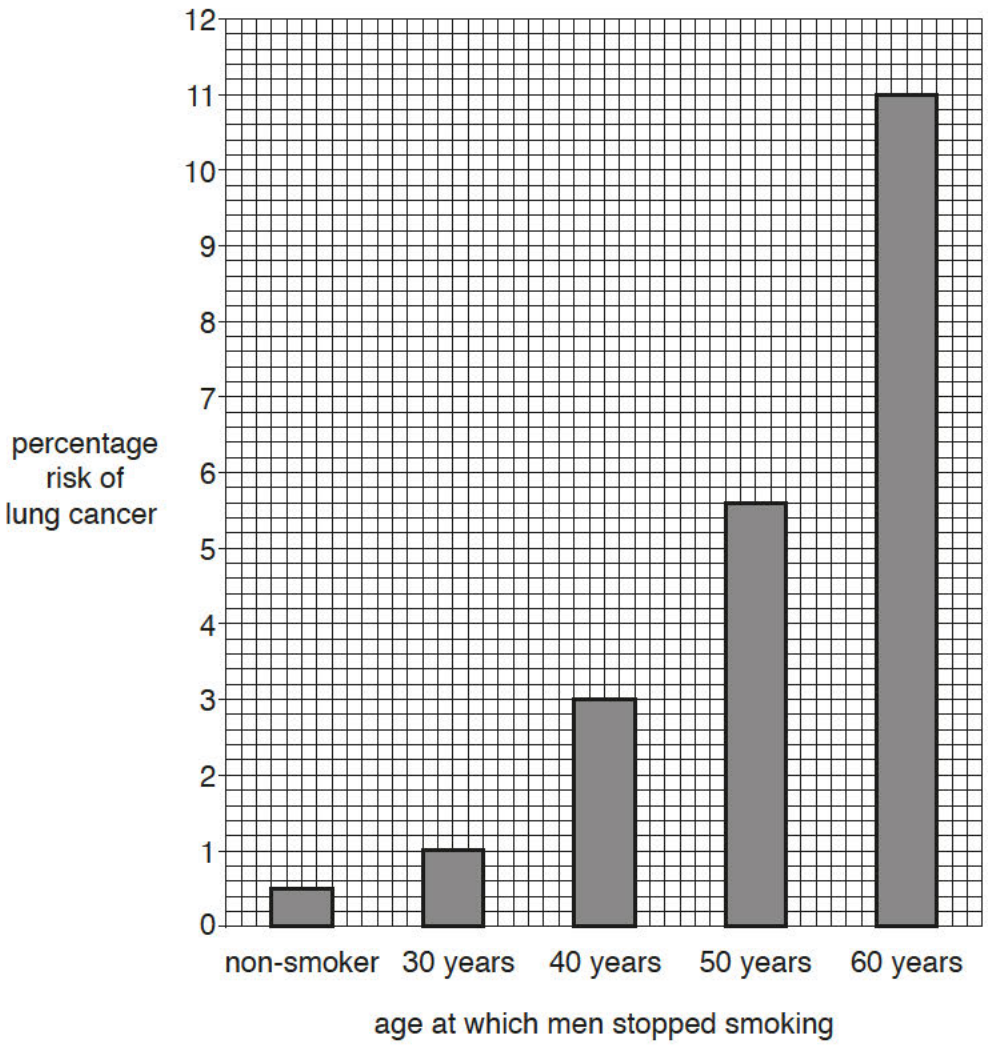
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..... **[2]**

(b) Smoking cigarettes increases the risk of lung cancer.

Look at the graph.

It shows the risk of lung cancer in men who have stopped smoking.



(i) Estimate the risk of getting lung cancer for men who stop smoking at the age of 55 years.

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

(ii) Stopping smoking reduces the risk of getting lung cancer.

Anti-smoking campaigns aimed at people under 30 will have the biggest effect on reducing lung cancer. Explain why.

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3 Doctors are developing a new way of predicting the chance of a person developing heart disease.

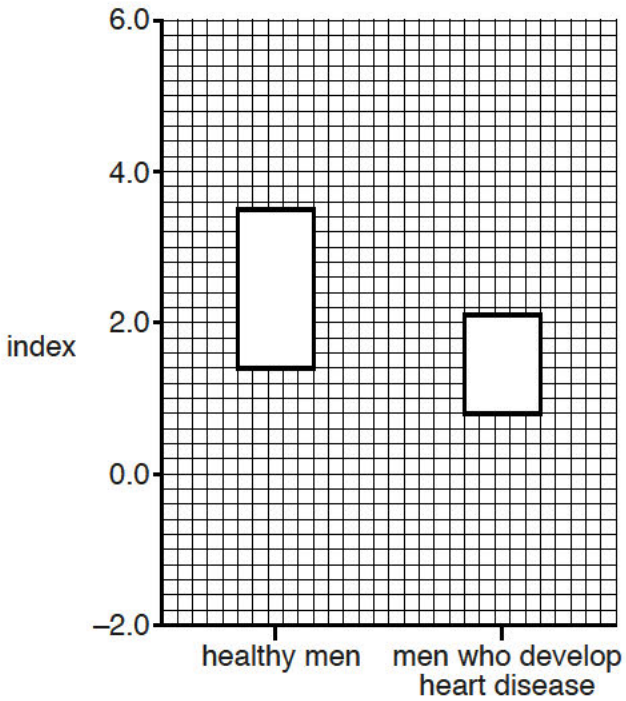
They use a machine to take images of the coronary artery.

They do this when the ventricles are contracting and when they are relaxing.

They can then work out an **index** using this formula.

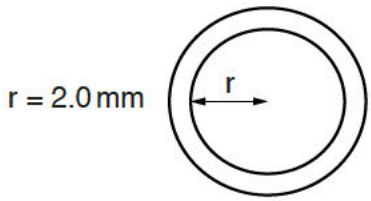
$$\textbf{index} = \frac{\text{cross-sectional area of artery when ventricles are contracting} - \text{cross-sectional area of artery when ventricles are relaxing}}{0.7}$$

The graph shows the range of results for healthy men and for men who develop heart disease.



Eric's coronary artery has a cross-sectional area of **11.5** mm^2 when his ventricles are **relaxed**.

The diagram shows the cross-section of Eric's coronary artery when his ventricles are **contracting**.



Write about the link between the coronary artery and heart disease.

Calculate Eric's index and use the graph to discuss how likely it is that he will develop heart disease.
(use area = πr^2 and $\pi = 3.14$)

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

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4 Malaria is a disease caused by a protozoan called

Plasmodium. *Plasmodium* is transmitted by mosquitoes.



mosquito

(a) Describe how mosquitoes transmit *Plasmodium* between humans.

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

(b) One way of preventing the spread of malaria is by draining swamps.

Explain why draining swamps can help.

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

(c) In the past, some people thought that malaria was caused by harmful gas from swamps.

To protect themselves from malaria, these people put nets around their beds to try to keep out the harmful gas.

Using nets around beds reinforced the **incorrect** idea that malaria is caused by harmful gas.

Explain why.

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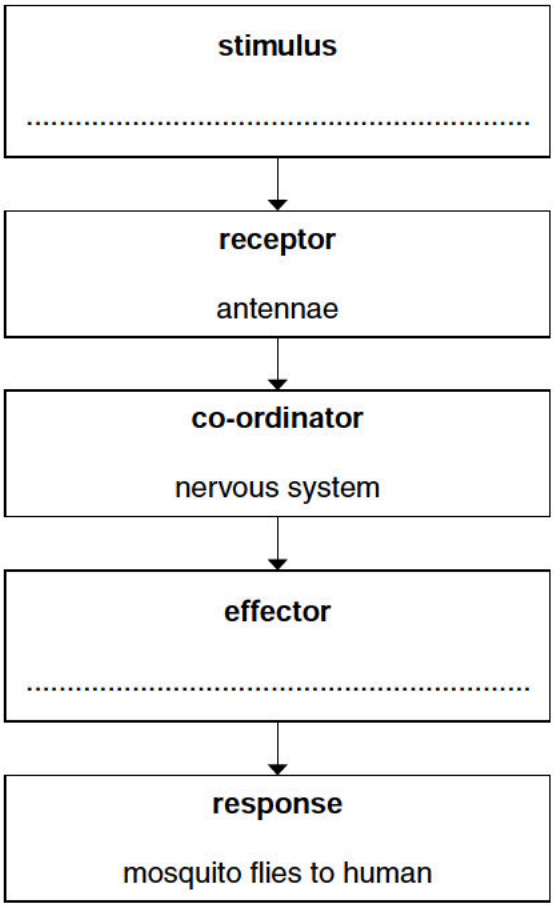
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..... **[2]**

(d) Mosquitoes use their sense of smell to detect humans.

Mosquitoes detect the smell with receptors on their antennae.

Complete the flow chart to show how a mosquito detects, and responds to, the smell of a human.



[2]

(e) One of the symptoms of malaria is a fever.

In a fever, the body temperature may rise to over 40 °C.

(i) How does the body monitor the rise in body temperature?

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

(ii) One way to cool down is by vasodilation.

Explain how vasodilation cools a body.

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

[Total: 11]

5 Anya's dad, Bob, has a lot of salt and saturated fat in his diet and is very overweight (obese).

(a) Look at the BMI chart.

Category	BMI
underweight	< 18.5
normal	18.5–24.9
overweight	25.0–30.0
obese	> 30.0

BMI is calculated using the formula:

$$\text{BMI} = \frac{\text{mass in kg}}{(\text{height in m})^2}$$

This can be rearranged to give the formula:

$$\text{mass in kg} = \text{BMI} \times (\text{height in m})^2$$

Bob's height is 1.8 m, his mass is 120.0 kg and his BMI is 37.0.

Calculate the **least** mass he needs to **lose** to fall into the 'normal' category.

Show your working.

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answer .....kg **[4]**

(b) Anya is worried about her dad's health.

She knows that his diet will increase his blood pressure and cause cholesterol to build up.

She wants to explain to her dad why high blood pressure and a build up of cholesterol are dangerous.

What should she say?



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

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[Total: 10]

6 Rafik plays rugby.



Rafik thinks he needs a special diet.

He finds out about diets for rugby players.

Read the information Rafik finds.

> The training diet of a rugby player should
>
> - **be high in carbohydrate-rich foods** eg cereal, bread, rice, pasta, potato, fruit
> - **be moderate in protein-rich foods** eg meat, chicken, fish, milk and cheese
> - **be low in fat** eg avoid too much butter, fatty meats, high fat snacks and fried food
> - **include fruit & vegetables** to help prevent illness.

(a) Rugby players need a diet low in fat.

Fats are made up of fatty acids and one other chemical.

Write down the name of this chemical.

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

(b) The proteins mentioned in the diet are all **first class proteins**.

What is meant by first class proteins?

.....

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

(c) Rafik is concerned that he might be too overweight to play rugby.

Read the information in the box.

Body Mass Index (BMI)

$$\text{BMI} = \frac{\text{mass in kg}}{(\text{height in m})^2}$$

- underweight < 18.5
- normal weight = 18.5–24.9
- overweight = 25–29.9
- obese = 30 or more.

(i) Rafik is 180 cm tall and has a mass of 85 kg.

Calculate Rafik's BMI.

Show your working.

BMI = ... **[2]**

(ii) Is Rafik overweight? .....

Use the information in the box to explain your answer.

.....

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

(iii) Rafik finds out about the BMI of other rugby players.

He finds out that most of the England rugby team have a BMI greater than 30.

Rafik's friend tells him that a high BMI does not mean you are unfit **and** unhealthy.

Is Rafik's friend correct? .....

Suggest reasons for your answer.

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

[Total: 7]

7 This question is about microorganisms that cause disease.

Flu (influenza) is caused by a virus.

Salmonella food poisoning is caused by bacteria.

(a) Describe the structure of a virus.

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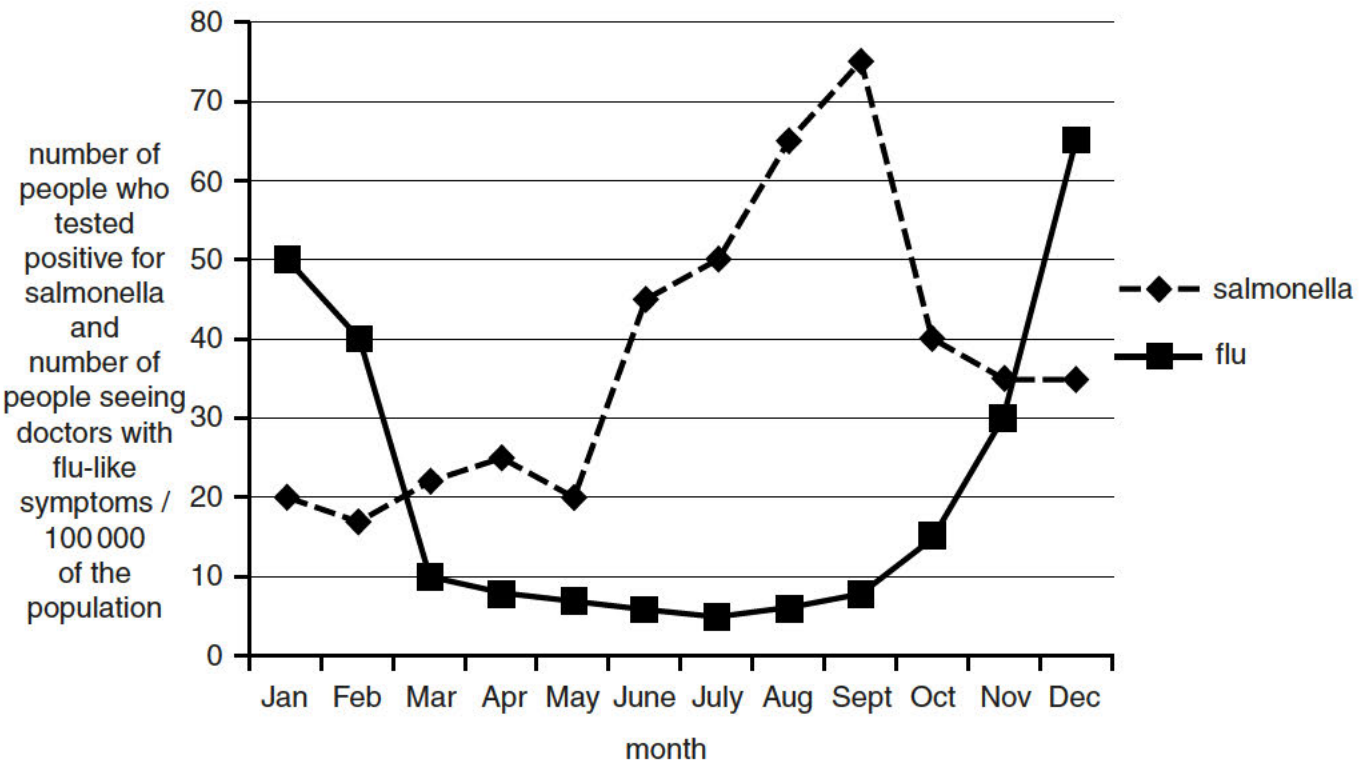
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(b) Look at the graph.

It shows the number of people who tested positive each month for salmonella bacteria.

It also shows the number of people with flu-like symptoms visiting their doctor each month.



(i) Discuss whether the graph gives the true numbers of people actually having salmonella or flu.

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(ii) It is thought that the way the diseases are spread will affect when people are more likely to get the disease.

Flu is spread by airborne droplets, usually indoors or on crowded buses or trains.

Salmonella is spread through food that is not cooked thoroughly or stored at incorrect temperatures.

Write about how the way the microorganisms are spread can explain the patterns in the graph.

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[Total: 7]