1 Sometimes people need to have their organs replaced by donor organs.

Many of these donor organs are taken from dead people.

There are different systems of deciding whether the organs of a dead person can be used.

- **Opt in** – the organs can only be used if the person carries a donor card or is on the donor register.
- **Opt out** – the organs can be used unless the person has said no while they were alive.

Two doctors are talking about organ donation.

I think **opt out** is best.

It would give us more organs to use for transplants.

This means we would have fewer difficult ethical decisions to make.

Dr Grace



Opt out may provide more organs but I think there could be problems.

Relatives might think that the donor has forgotten to opt out.

We could then have difficult ethical decisions to make.

Dr Henshaw



(a) Both doctors are talking about ethical decisions.

Write about the ethical decisions that each doctor is talking about.

Dr Grace .....

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Dr Henshaw .....

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

(b) Dr Grace thinks that in an **opt out** system more people will donate their organs.

(i) Suggest why this might happen.

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

(ii) The table shows the number of people in different countries who donated organs in 2008.

Country	Number of people donating organs per million people in the country	System used
Spain	34.2	opt out
Portugal	26.7	opt out
Poland	11.2	opt out
UK	14.7	opt in
Germany	14.6	opt in
Netherlands	12.8	opt in

How well does the data in the table support Dr Grace's prediction?

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

2 There are many different types of microorganisms that live in soil.

The table gives the average number of each type of microorganism in one gram of soil.

Type of microorganism	Average number of microorganisms in one gram of soil
viruses	150 000 000
bacteria	3 000 000
fungi	1 000 000

Lucy knows that bacteria are important in soil.

She wants to find out if the soil in her garden contains the average number of bacteria.

She reads about a way of estimating the number.

It involves taking one gram of soil, mixing it with water and spreading the mixture on an agar plate.

Each single bacterium reproduces many times and makes a colony.

(a) When Lucy incubates this **first** agar plate the whole surface of the agar is covered and it is impossible to see individual colonies.

Explain why.

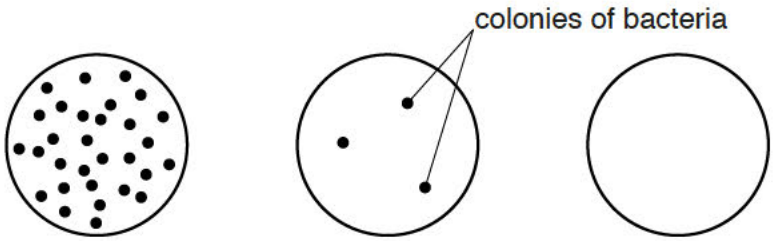
..... **[1]**

(b) Lucy then makes a series of agar plates by diluting the mixture.

The second plate receives 10 times fewer bacteria than in the soil sample.

The third plate receives 100 times fewer bacteria and so on.

The diagram shows some of her results.



Do the results show that Lucy's soil contains the average number of bacteria?

Use her results and the data in the table to work out your answer.

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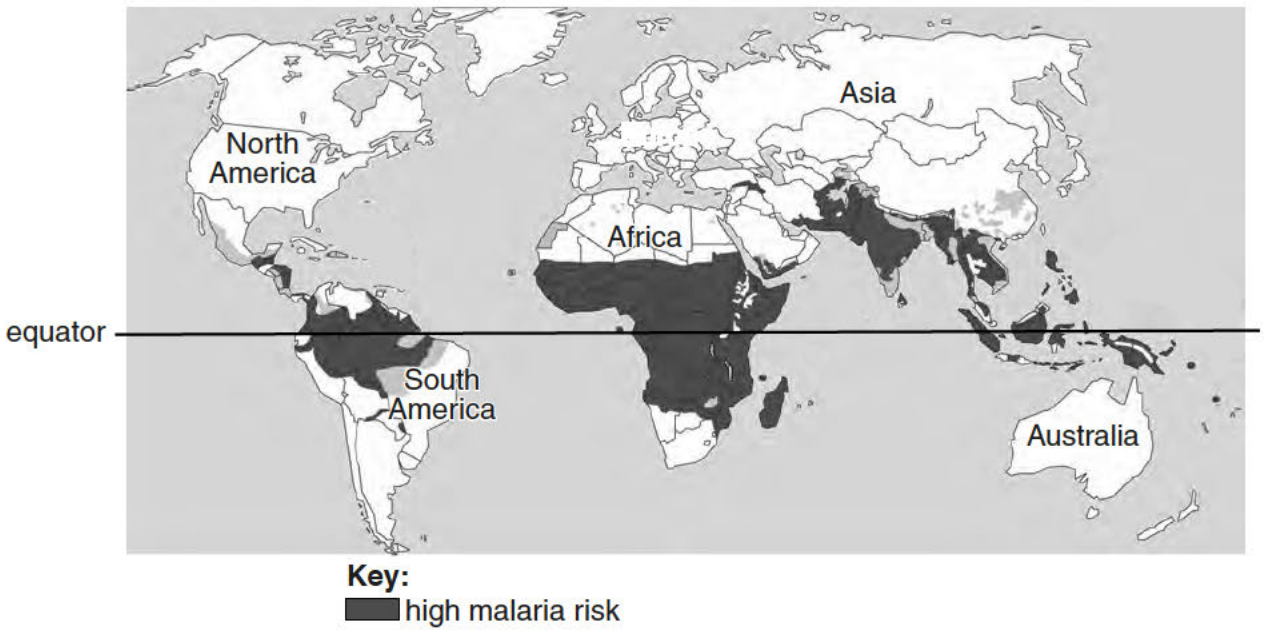
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3 This question is about malaria.

The map shows areas of the world where humans are at high risk from malaria.



(a) (i) Malaria is spread by mosquitoes.

Describe how.

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

(ii) In countries around the equator, pools of water are sprayed with insecticides to reduce the spread of malaria.

Explain how this reduces the spread of malaria.

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(b) Malaria causes a fever.

The body temperature is very high during a fever and this may cause death.

Describe how high body temperatures can cause death.

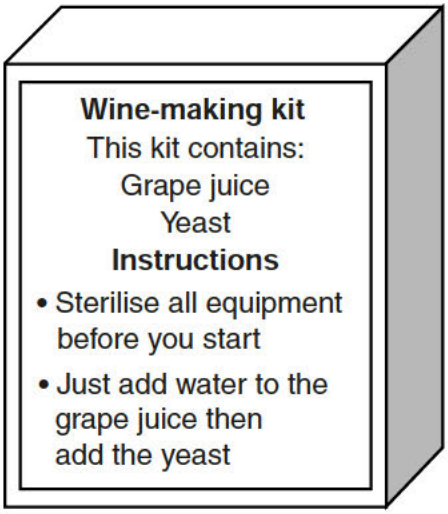
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..... **[2]**

[Total: 6]

4 Jimmy wants to make some wine.

He sees a kit in a shop.



(a) Explain why it is important to sterilise all equipment.

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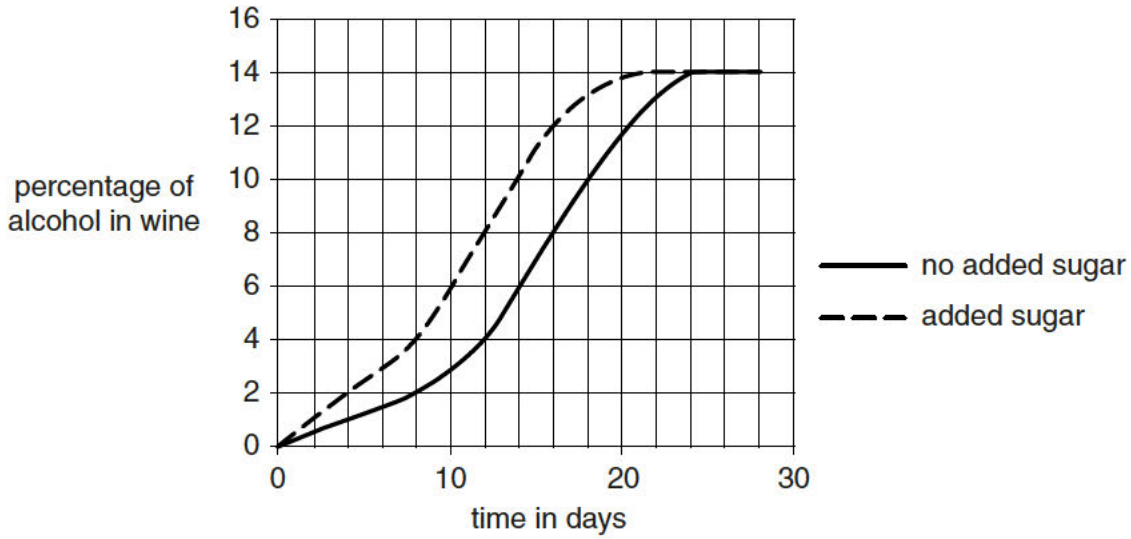
..... **[2]**

(b) Jimmy buys two wine kits to make two batches of wine.

He makes the first batch of wine by following the instructions.

He makes the second batch in the same way except he also adds sugar.

The graph shows the percentage of alcohol in the two batches of wine as they are being made.



Compare the production of alcohol in each batch and suggest explanations for any differences.

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

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

[Total: 8]

5 Linda has a mass of 60 kg.
She wants to find out if she is eating the correct amount of protein.
She starts to work out the protein content of all the food she eats in one day.

Food	Mass eaten in g	Protein content per 100 g of food	Protein content in Linda's food in g
bread	100	7.8	7.8
butter	50	0.6	0.3
egg	50	12.0	6.0
baked potato	200	2.0	.....
cheese	50	26.0	13.0
chocolate	50	8.0	4.0
chicken	50	21.0	10.5
vegetables	50	0.8	.....
cake	100	5.0	5.0
			total .....

(a) Is Linda eating the correct amount of protein?

Complete the table and calculate Linda's estimated average daily requirement of protein (EAR) to help explain your answer.

EAR in g = 0.6 × body mass in kg

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

(b) Linda and Sue are both 30 years old and are the same mass.

Suggest and explain a possible reason why Sue might need more protein than Linda.

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

(c) Three of Linda's friends do **not** eat meat.

Suggest how these friends can still achieve a balanced diet.

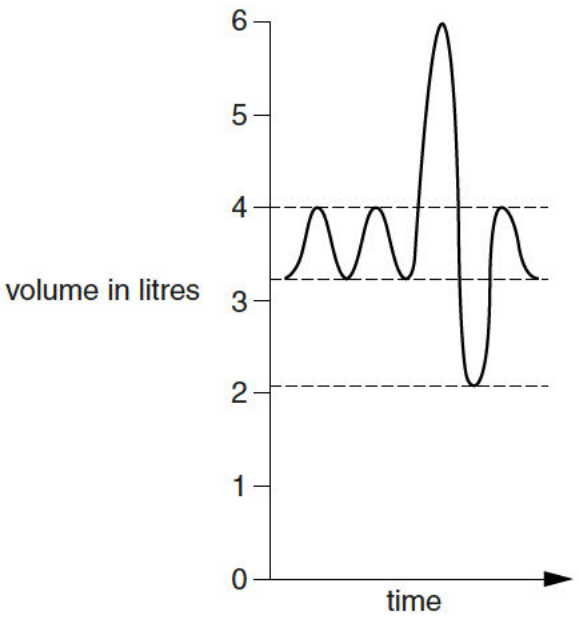
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[Total: 7]

6 **(a** Look at the graph.

It shows the lung capacity of a healthy male.



Calculate the vital capacity of this male.

vital capacity ..... litres **[2]**

(b) Some people have asthma.

Describe how an asthma attack would affect the lungs.

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

[Total: 4]

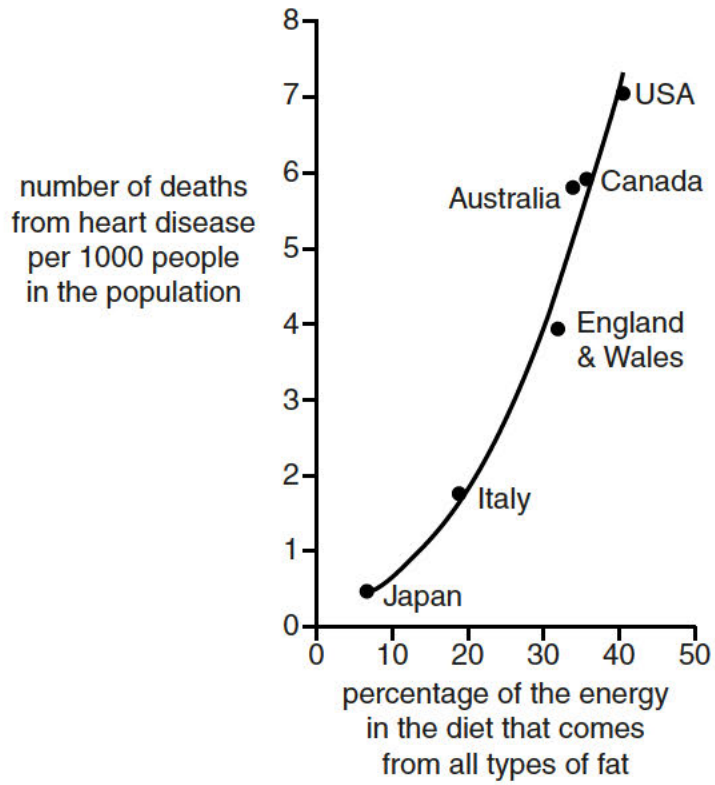
7 In 1953, a famous scientist called Ancel Keys investigated the cause of heart disease.



He noticed that the number of deaths from heart disease varied in different countries.

He wondered if it was to do with diet.

So he gathered some data from different countries and plotted this graph.



Keys concluded that eating large amounts of saturated fat causes heart disease.

Keys' investigation has caused debate between scientists.

Some scientists have criticised his investigation.

Other scientists have provided an explanation to back up his conclusion.

Discuss the arguments that each group of scientists could use.



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

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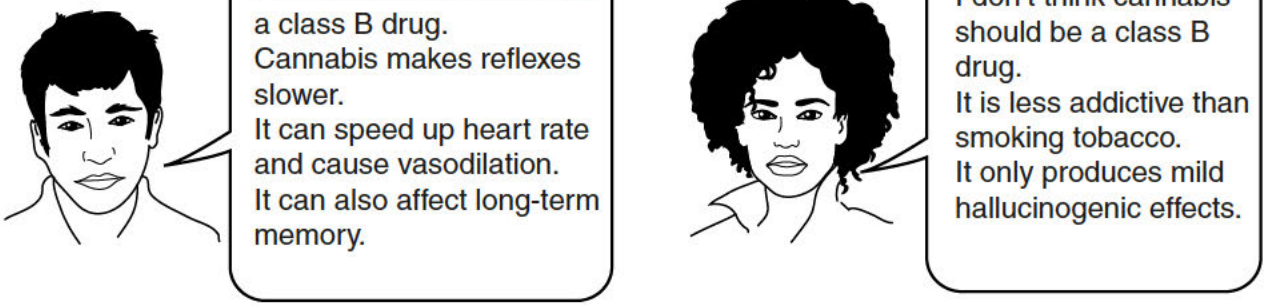
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[Total: 6]

8 **(a** Tim and Daisy are discussing the illegal drug cannabis.



(i) Tim thinks cannabis should be a class B drug.

Explain why illegal drugs are put into different classes.

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

(ii) Daisy says that cannabis has hallucinogenic effects.

Write down the name of one **other** drug that has hallucinogenic effects.

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

(iii) Tim says cannabis causes **vasodilation**.

What is vasodilation?

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

(b) Cannabis prevents the release of a neurotransmitter chemical in the brain.

Explain how this could prevent the proper functioning of the brain.

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

(c) Scientists compare the danger of drugs by working out their therapeutic ratio.

This is worked out by

$$\text{therapeutic ratio} = \frac{\text{lethal dose}}{\text{smallest dose needed to have an effect}}$$

The data in the table is for a 100 kg man.

drug	lethal dose for a 100 kg man in mg	smallest dose needed to have an effect in mg	therapeutic ratio
alcohol	300 000	30 000	10
cannabis		15	
heroin	48	8	6

(i) Giving cannabis to rats kills them when the dose is about 750 mg per kg of rat.

Work out the therapeutic ratio for cannabis for a 100 kg man.

(Assume that cannabis has the same effect on humans as rats.)

Write your answer in the table. [2]

(ii) Which drug do the scientists think is most dangerous?

Use the data to explain your answer.

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..... [2]

[Total: 10]