

Answer **all** the questions.

1 John is a scientist.

He works for a company that makes tyres.

He tests the hardness of two types of rubber.

Rubber A has crosslinks. **Rubber B** does not.

John tests each type of rubber five times.

Here are the results.

type of rubber	hardness in arbitrary units				
rubber A	48	52	47	54	49
rubber B	12	13	14	34	17

(a) (i) Why does John do the test five times?

Put a tick (✓) in the box next to the correct answer.

To make the test fair.

The more tests he does the fewer errors he will make.

To find out if the results are repeatable.

To have practice doing the test.

[1]

(ii) What is the best estimate of the true value of hardness for **rubber A**?

Put a **ring** around the correct answer.

25

34

47

50

54

[1]

(iii) John says that the true value for the hardness of **rubber B** lies in the range 12 to 17.

Explain why.

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..... [2]

(b) Natural rubber is a polymer.

Crosslinks in rubber change its properties.

Put a tick (✓) in the box next to the correct word to complete each sentence.

There are crosslinks between one rubber	atom		and the next.
	fibre		
	molecule		

This stops the chains	breaking.		This makes the rubber harder.
	increasing in length.		
	sliding over each other.		

[2]

[Total: 6]

2 Mike is the manager of a large department store.

He wants to know if it is better to use paper or poly(ethene) bags in his store.

He uses ideas about Life Cycle Assessment (LCA).

(a) Mike knows that paper is made from renewable resources, and that poly(ethene) is made from non-renewable resources.

Which of these statements explain the difference?

Put ticks (✓) in the boxes next to the **two** correct answers.

Paper is biodegradable.

Poly(ethene) can be burned to provide energy.

When older trees are cut down new trees can be planted.

Poly(ethene) is made from crude oil.

Many different products are made from crude oil.

[2]

(b) The table shows energy used at different stages of the life cycle for paper and poly(ethene) bags.

	energy in MJ	
	paper	poly(ethene)
manufacture of materials	0.8	0.7
manufacture of bags from materials	0.1	0.1
delivering bags to store	0.5	0.4
taking bags to landfill	0.3	0.2

Use the information in the table to find out if the statements below are **true** or **false**.

Put ticks (✓) in the correct boxes.

	true	false
1.7 MJ of energy is used in the life cycle of a paper bag.		
2.4 MJ of energy is used in the life cycle of a poly(ethene) bag.		
The life cycle of a paper bag uses 0.3 MJ more energy than a poly(ethene) bag.		

[2]

- (c) Lorries deliver the bags to the store.
One lorry can carry many more poly(ethene) bags than paper bags.

How does this affect the **environmental impact** of using paper bags compared to poly(ethene) bags?

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..... [2]

- (d) There are other questions which Mike has to answer to complete the Life Cycle Assessment.

He needs to know which sort of bag causes **less harm to the environment**.

Which of the following questions will help him decide?

Put ticks (✓) in the boxes next to the **two** correct answers.

- Are the poly(ethene) bags more flexible than the paper ones?
- Is it easier to print on paper bags?
- Are the bags recycled, burned or thrown away?
- How much do the bags cost?
- How much carbon dioxide is released when making the bags?

[2]

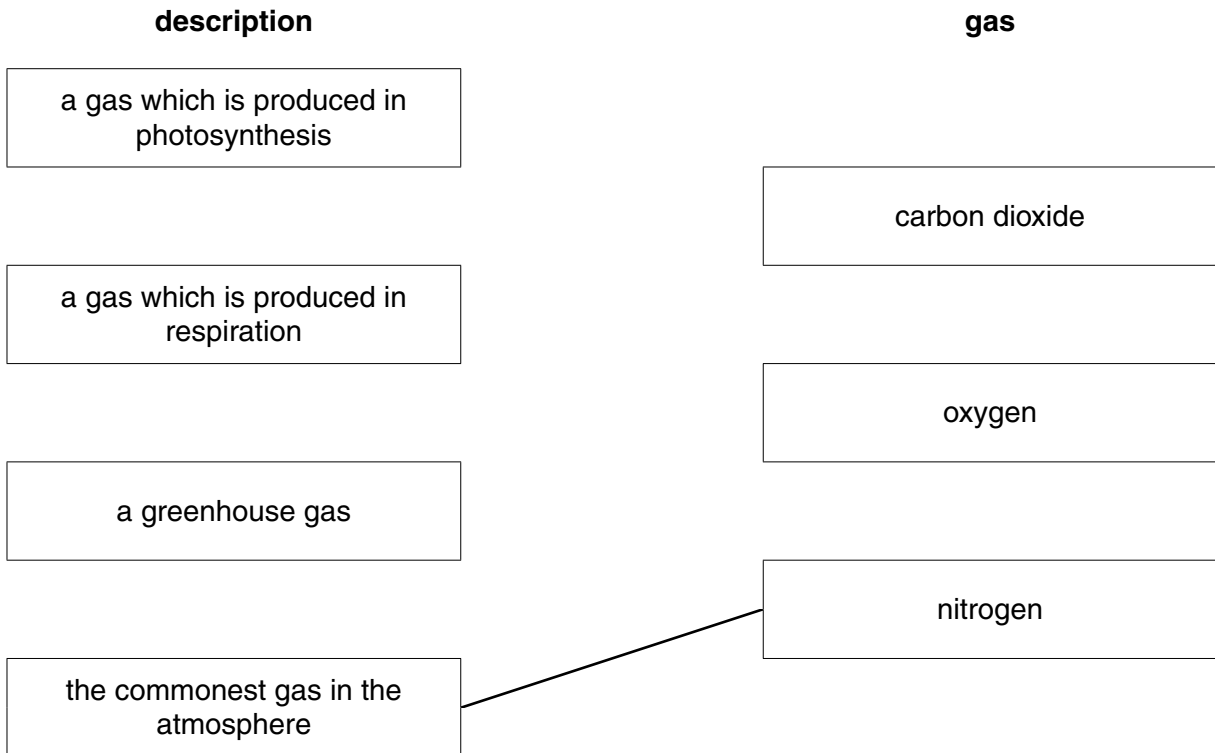
[Total: 8]

3 A number of gases are present in the atmosphere.

Here are some descriptions of three gases.

Draw straight lines to link each **description** to the **gas** that it describes.

One has been done for you.



[2]

[Total: 2]

4 (a) Put a ring around the correct words in **bold** in the following sentences.

Microwaves and infrared radiation are part of a family of radiations called the **electromagnetic / invisible / visible** spectrum.

Radiation from this family delivers energy in 'packets' called **atoms / electrons / ions / photons**.

The energy of a 'packet' of microwaves is **greater than / smaller than / the same as** the energy of a 'packet' of infrared radiation.

[3]

(b) Microwaves can be used for heating food in a microwave oven.

Which of the following statements correctly explain how this happens?

Put ticks (✓) in the boxes next to the **two** correct statements.

Microwaves are absorbed by the food.

Microwaves are reflected by the food.

Microwaves are emitted by the food.

Microwaves make particles of the food vibrate.

Microwaves ionise particles of the food.

[2]

(c) Microwaves and infrared radiation are both used to send information from one place to another.

Choose **one** type of radiation from either microwaves or infrared radiation.

Give an example of information that can be transmitted using this radiation, and describe how this information is sent and received.

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..... [3]

[Total: 8]

5 Read this article about ultraviolet radiation.

A little ultraviolet is good for you

People in northern Europe often have fair skin. This allows the skin to absorb more ultraviolet and produce more vitamin D, which the body needs.

Unfortunately, the sunlight that reaches us these days has much more ultraviolet than it used to have. This can damage the skin, causing skin cancer.

(a) Two people read this article.

Dean

I like to get a sun tan, and this article shows that the more ultraviolet you get, the more vitamin D your body makes.



Kate

I worry about skin cancer, because my auntie had it. There is more chance of this happening now that the ultraviolet is stronger.



(i) Who refers to a correlation in the article?

Put a tick (✓) in the box next to the correct answer.

Dean only

Kate only

both Dean and Kate

neither of them

[1]

(ii) Who mentions both risk **and** benefit?

Put a tick (✓) in the box next to the correct answer.

- | | |
|--------------------|--------------------------|
| Dean only | <input type="checkbox"/> |
| Kate only | <input type="checkbox"/> |
| both Dean and Kate | <input type="checkbox"/> |
| neither of them | <input type="checkbox"/> |

[1]

(b) Here are a number of statements about ultraviolet radiation (UV).

They are not all true.

Put a tick (✓) in the correct box after each statement to show whether it is **true** or **false**.

	true	false
UV can be good for you.	<input type="checkbox"/>	<input type="checkbox"/>
UV can damage living cells.	<input type="checkbox"/>	<input type="checkbox"/>
UV is a non-ionising radiation.	<input type="checkbox"/>	<input type="checkbox"/>
UV is part of the electromagnetic spectrum.	<input type="checkbox"/>	<input type="checkbox"/>
UV has more energetic photons than X-rays.	<input type="checkbox"/>	<input type="checkbox"/>

[2]

[Total: 4]

6 Read the information about measles.

Information about measles

1. Measles is a disease that is caused by a virus.
2. It can cause a high temperature and a rash.
3. About 1 in 15 people with measles have complications such as chest infections, fits and, in very rare cases, brain damage.
4. In 1987, before MMR vaccination started, 86 000 children caught measles and 16 died.
5. Measles is one of the most infectious diseases known.

(a) (i) Measles usually causes a number of symptoms.

Put a **ring** around a sentence number that describes symptoms of measles.

1 2 3 4 5

[1]

(ii) Which sentence explains why antibiotics cannot be used to treat measles?

Put a **ring** around the sentence number that describes why antibiotics **cannot** be used to treat measles.

1 2 3 4 5

[1]

(b) Vaccination can protect a person against measles.

Put a tick (✓) in the box next to the correct description of how vaccination does this.

Vaccination ...

... stops the measles virus getting into the body.

... stops the immune system making antibodies.

... causes the production of antibodies before infection.

... causes the production of antigens before infection.

[1]

- (c) (i) The MMR vaccine protects against measles, mumps and rubella.

A scientist claimed that MMR vaccination could have serious side effects.
He claimed that, in a few cases, it could be linked to a condition called autism.

After this claim, there was a fall in the number of children vaccinated against measles.

Suggest why.

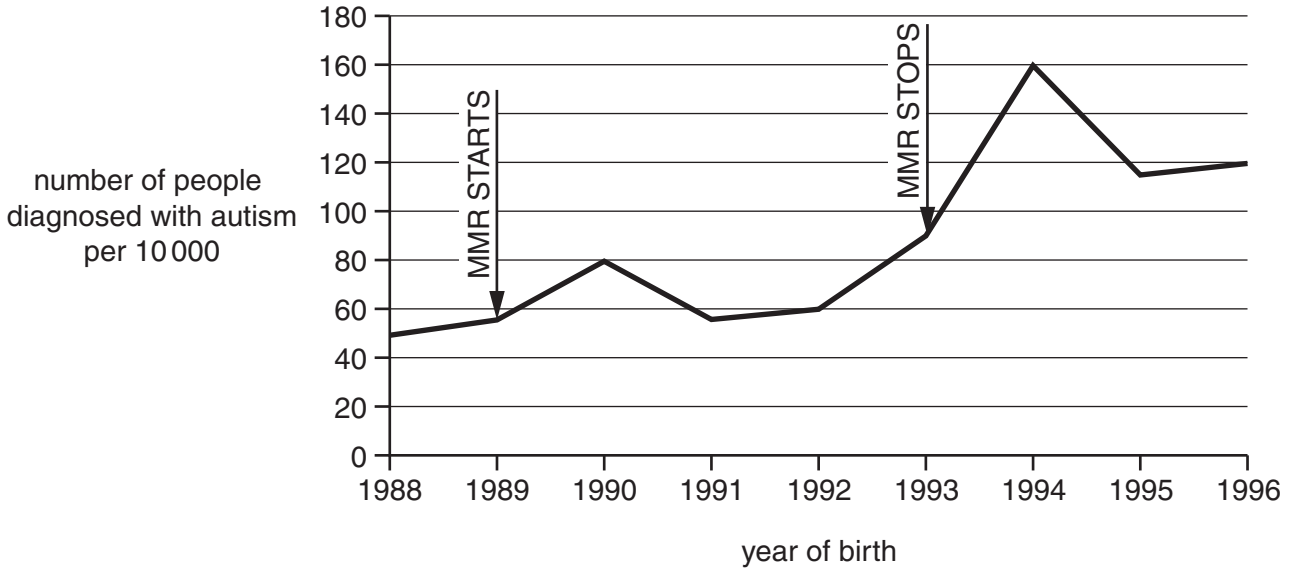
Use ideas about risk and the '**Information about measles**' to help you.

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..... [2]

- (ii) In Yokohama, a city in Japan, MMR vaccination started in 1989 and was stopped in 1993. Data about MMR vaccination and autism were collected. The data are shown in the graph.



Use **one** straight line to link the correct **description** of these data with the correct **conclusion**. Draw only **one** line.

description

conclusion

MMR vaccination did not change the trend in the number of autism cases.

When MMR vaccination stopped, the number of autism cases decreased.

When MMR vaccination started, the number of autism cases remained the same.

Another vaccine causes autism.

MMR could cause autism.

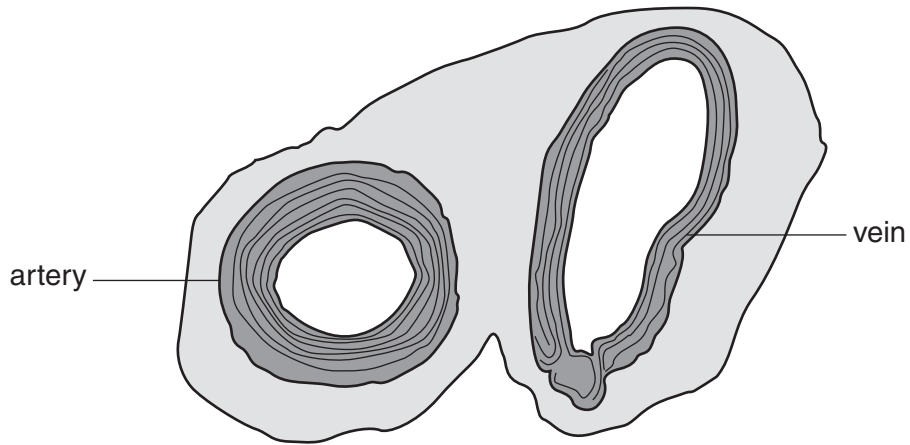
MMR stops autism.

MMR is not linked to autism.

[2]

[Total: 7]

7 Look at the diagram showing a cross section of two blood vessels in a tissue.



(a) Arteries and veins do different jobs.

Write about how arteries are different from veins.

In your answer you should include

- how the job of arteries is different from the job of veins
- how their structures are different
- why their structures are different.

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..... [3]

- (b) (i) Changes to the coronary artery can cause a heart attack. Complete the sentences describing this process.

The heart muscle has its own blood supply to provide food and

The blood supply also removes

A heart attack can occur when the blood vessels that supply the heart muscle become blocked with

[2]

- (ii) Put ticks (✓) in the boxes to indicate which of the lifestyle factors **increase** the risk of heart disease and which **decrease** the risk of heart disease.

lifestyle factor	increases risk	decreases risk
low-fat diet		
cigarette smoking		
moderate aerobic exercise		
eating five portions of fruit and vegetables a day		
working long hours in a difficult job		

[2]

[Total: 7]

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