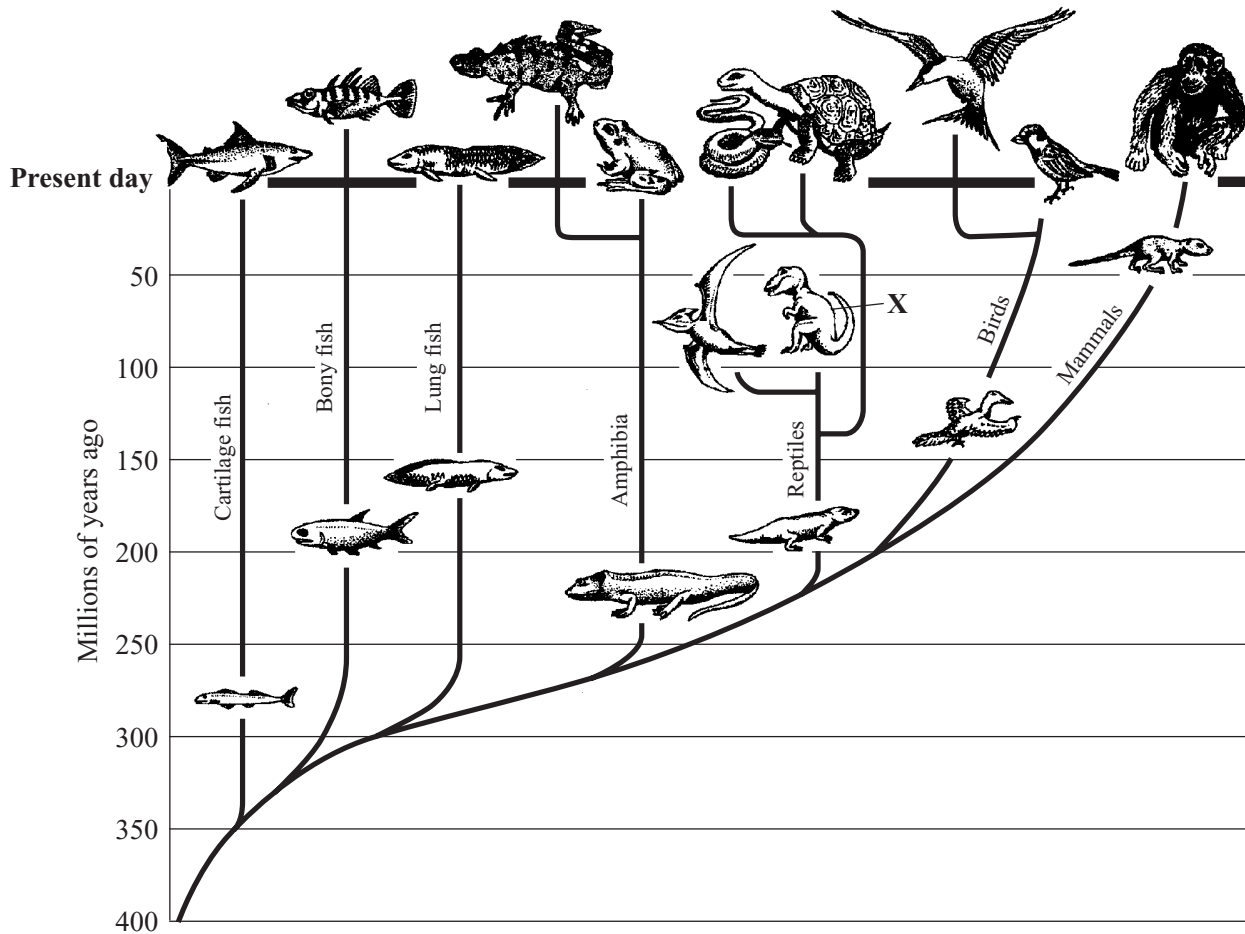


ENVIRONMENT, INHERITANCE AND SELECTION

1 The diagram shows a timeline for the evolution of some groups of animals.

All the groups shown below the line for **Present day** are extinct.



(a) Use information from the diagram to answer these questions.

(i) Name the **four** groups of animals which developed legs.

1 2.....
3 4.....
(1 mark)

(ii) Name the **two** groups of animals which developed wings.

1
2
(1 mark)

(iii) Which group of animals shown on the diagram evolved first?

.....
(1 mark)

(b) (i) The animal labelled **X** has been extinct for over 50 million years.

How do we know that it once lived?

.....
.....
(1 mark)

(ii) Complete the sentence by using the correct words from the box.

diseases	enzymes	hormones	plants	predators	rocks
----------	---------	----------	--------	-----------	-------

Animals may become extinct because of new

and new

(2 marks)

6

- 2 (a) Some disorders in humans are inherited. The sentences below are about some of these disorders.

In the sentences below, cross out the **two** lines which are wrong in each box.

Cystic fibrosis affects the

cell membranes
cytoplasm
nucleus

The allele that causes cystic fibrosis is

a carrier
dominant
recessive

Huntington's disease affects the

digestive system
nervous system
reproductive system

The allele that causes Huntington's disease is

a carrier
dominant
recessive

(4 marks)

- (b) Genetic engineering is being used to help sufferers of cystic fibrosis.

In the sentence below, cross out the **two** lines which are wrong in each box.

In genetic engineering, genes are cut out of

cell membranes
chromosomes
cytoplasm

using

drugs
enzymes
hormones

(2 marks)

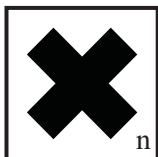
PATTERNS AND REACTIONS

3 List A shows five different hazard symbols.

List B gives descriptions of hazards in a different order.

Draw a straight line from each hazard symbol in List A to its description in List B.

List A



List B

This substance catches fire easily.

This substance provides oxygen which allows other substances to burn fiercely.

This substance is harmful if swallowed, but is not likely to cause death.

This substance causes death if swallowed.

This substance attacks and destroys living tissue.

(5 marks)

5

Turn over ►

4 We use enzymes in industry. These are some of the properties of enzymes:

- they work at low temperatures and this can save energy
- they work at atmospheric pressures and therefore use less expensive equipment
- they are easily broken down by high temperature or the wrong pH
- they are soluble in water, so it is difficult to separate them from water-soluble products
- they are very expensive to buy.

(a) Use the information above to answer this question.

(i) Give **two** advantages of using enzymes in industry.

1.....

 2.....

(ii) Give **two** disadvantages of using enzymes in industry.

1.....

 2.....

(4 marks)

(b) Different enzymes have different jobs:

- protease enzymes break down proteins so that they are easier to digest
- lipase enzymes break down fats
- carbohydrase enzymes break down starch into sugar for energy drinks
- isomerase enzymes break down glucose into fructose which is much sweeter.

Which enzyme is used:

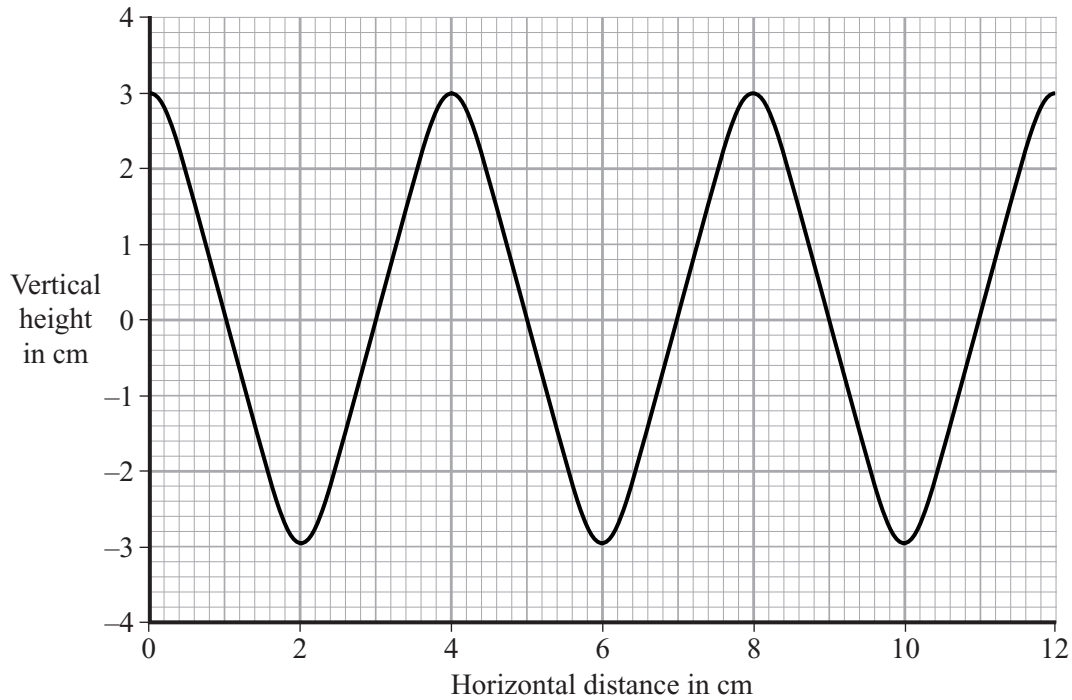
- (i) to help to get greasy stains out of clothes?
- (ii) in making slimming foods?
- (iii) in making baby foods?

(3 marks)



FORCES, WAVES AND RADIATION

- 5 The diagram shows a water wave drawn to scale.



- (a) What is the wavelength of this water wave? cm (1 mark)
- (b) What is the amplitude? cm (1 mark)
- (c) Twelve waves pass an observer in four seconds.

What is the frequency of the waves? Show clearly how you work out your answer and give the unit.

.....

.....

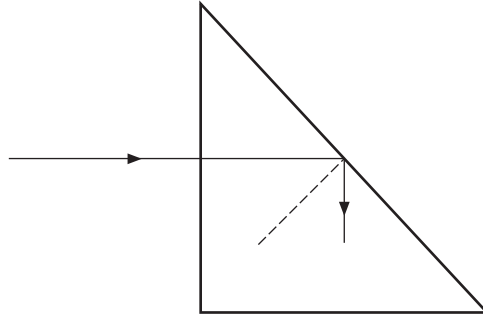
Frequency = (3 marks)

5

Turn over ►

6 Glass prisms are used in many optical devices.

(a) The diagram shows what happens to a ray of light as it travels through a glass prism.



To gain full marks for this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

Use the words in the box to help you to explain why the ray behaves in this way.

angle	critical	normal
-------	----------	--------

.....

.....

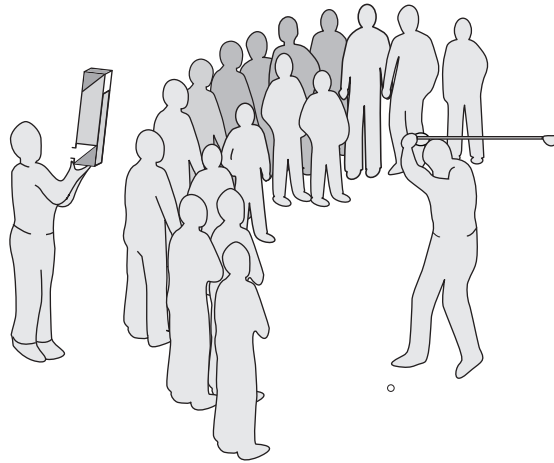
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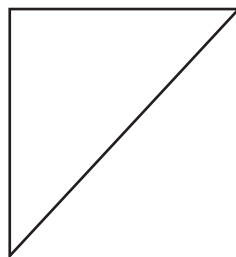
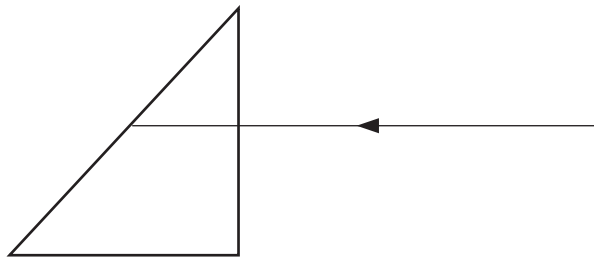
(3 marks)

(b) Periscopes can be used to look over the heads of other people.



A periscope contains two glass prisms.

Complete the diagram to show the ray of light reaching the person's eye.



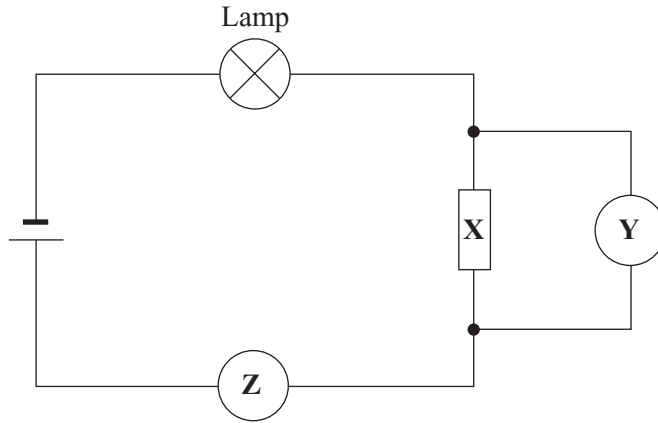
(3 marks)

6

Turn over ►

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

7 The diagram shows a circuit.



- (a) (i) Name component X.
- (ii) What does meter Y measure?
- (iii) What does meter Z measure?

(3 marks)

(b) Which of the equations shows how current, potential difference and resistance are related?

Tick the box against the correct equation.

- current = potential difference × resistance
- potential difference = current × resistance
- resistance = current × potential difference

(1 mark)

(c) Complete the sentences about energy transfers in a television set.

A television set is designed to transfer electrical energy into energy and energy.

Some energy is lost as

(3 marks)

NO QUESTIONS APPEAR ON THIS PAGE

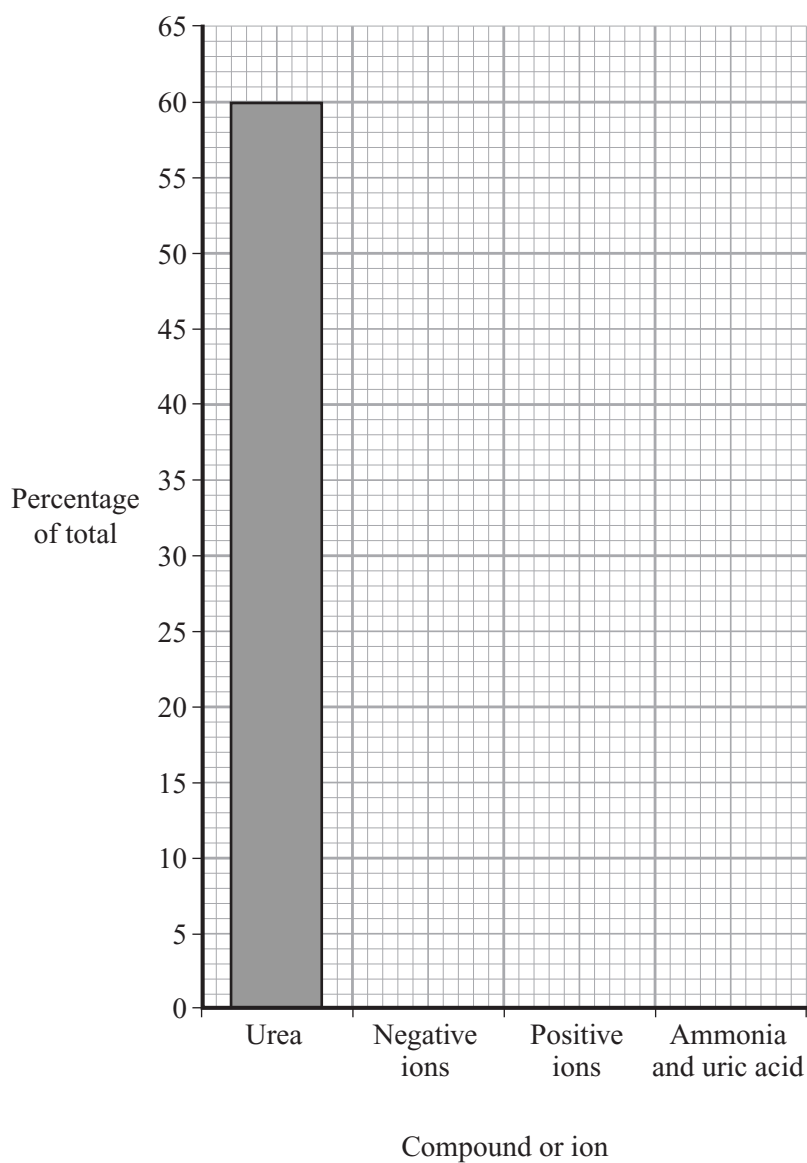
TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 8 (a) The table shows the compounds and ions dissolved in a student's urine.

Compound or ion	Percentage of total
urea	60
negative ions	25
positive ions	10
ammonia and uric acid	5

- (i) Complete the bar chart. One bar has been drawn for you.



(2 marks)

(ii) There is a total of 10 g of compounds and ions dissolved in a sample of this student's urine.

Calculate the mass of urea in the sample. Show clearly how you work out your answer.

.....
.....
.....

Mass of urea g
(2 marks)

(b) Use words from the box to complete the sentences.

anus	bladder	kidneys	liver	lungs
------	---------	---------	-------	-------

Plasma transports carbon dioxide from the body to the

Plasma transports urea from the to the

(3 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

ENVIRONMENT, INHERITANCE AND SELECTION

9 (a) This question is about the hormones that control the monthly cycle in women.

Complete the sentences.

Hormones control the monthly release of an egg from a woman's

They also control the thickness of the lining of her

Hormones that are given to women to stimulate the release of eggs are called
..... drugs.

Hormones that are given to women to prevent the release of eggs are called
oral

(4 marks)

(b) In humans, one of the pairs of chromosomes in each cell carries the genes which determine sex.

What is the difference between the sex chromosomes of a man and a woman?

.....
.....
.....
.....

(2 marks)



10 (a) Cornflowers are weeds that grow in crops such as wheat.

Suggest **two** factors that cornflowers and wheat will compete for.

1

2

(2 marks)

(b) *To gain full marks for this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

Sulphur dioxide is released when some fossil fuels are burned.

Describe, in as much detail as you can, how sulphur dioxide affects the environment.

.....
.....
.....
.....
.....
.....

(3 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

PATTERNS AND REACTIONS

11 Use the Periodic Table of Elements on the Data Sheet to help you to answer this question.

(a) Describe, in as much detail as you can, the structure of a fluorine atom.

.....

.....

.....

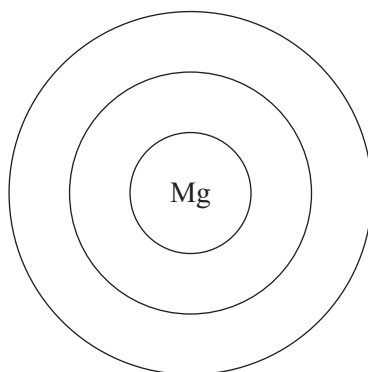
.....

.....

.....

(3 marks)

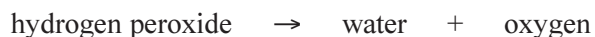
(b) Complete the diagram to show the electronic structure of a magnesium atom.



(1 mark)

4

12 Hydrogen peroxide slowly decomposes into water and oxygen.



The reaction can be speeded up by adding manganese dioxide.

- (a) (i) What do we call a substance that speeds up a chemical reaction without being changed itself?

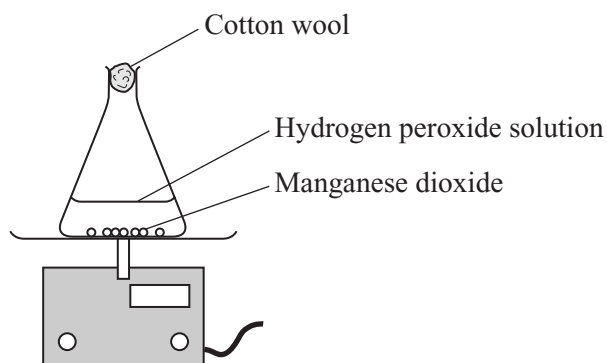
.....
(1 mark)

- (ii) Give **two** other ways of increasing the rate of this reaction.

1.....
2.....
(2 marks)

- (b) The diagram shows how the rate of this reaction can be measured.

As the hydrogen peroxide decomposes, the mass of the flask and its contents decreases.



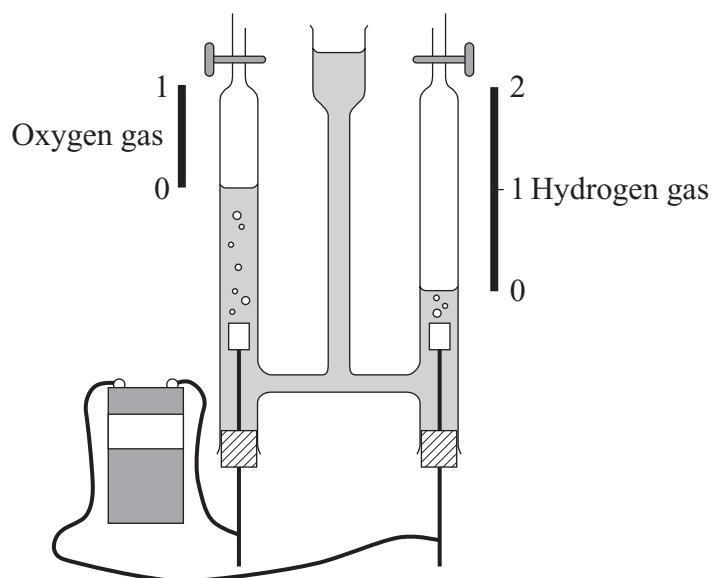
Why does this decrease in mass take place?

.....
.....
(1 mark)

4

Turn over ►

- 13 In the nineteenth century, the scientist Gay-Lussac electrolysed water and got the results shown in the diagram.



He did experiments on other compounds. His results are shown in the table.

Volumes of reacting gases in cm ³				Ratio of reacting gases in compound	
hydrogen	100	oxygen	50	H:O	2:1
hydrogen	90	nitrogen	30	H:N	3:1
nitrogen	50	oxygen	100	N:O	

- (a) Complete the table. (1 mark)
- (b) What does this tell you about the way in which gases combine?

.....

.....

(1 mark)

(c) Gay-Lussac suggested that the formula of water is H₂O.

Dalton thought it was HO.

Look at the results for the electrolysis of water. Which scientist was correct?

.....

Give the reason for your answer.

.....

.....

(1 mark)

(d) Dalton believed that atoms of the same element would repel each other.

A scientist called Avogadro said that gases such as oxygen existed as pairs of atoms linked to form molecules.

What holds the two oxygen atoms together in an oxygen molecule?

.....

.....

(1 mark)

4

TURN OVER FOR THE NEXT QUESTION

Turn over ►

FORCES, WAVES AND RADIATION

- 14 (a) A government decides to launch a spy satellite to see if another country is increasing the size of its air force. They decide **not** to use a geostationary satellite.

What type of orbit should the satellite be placed in? Indicate the position of the orbit and its height.

.....
.....

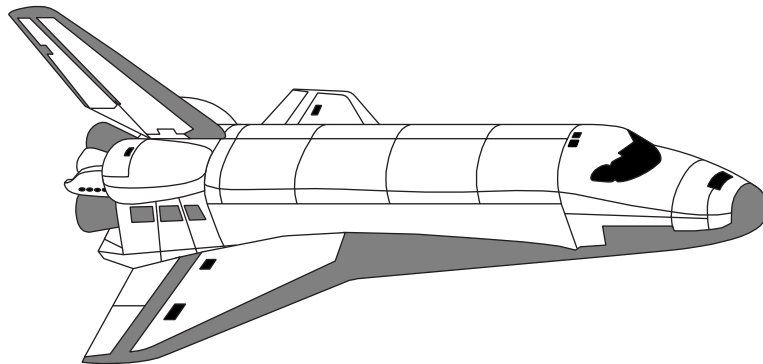
(2 marks)

Explain the reasons for your answer.

.....
.....
.....

(2 marks)

- (b) The drawing shows a space shuttle.

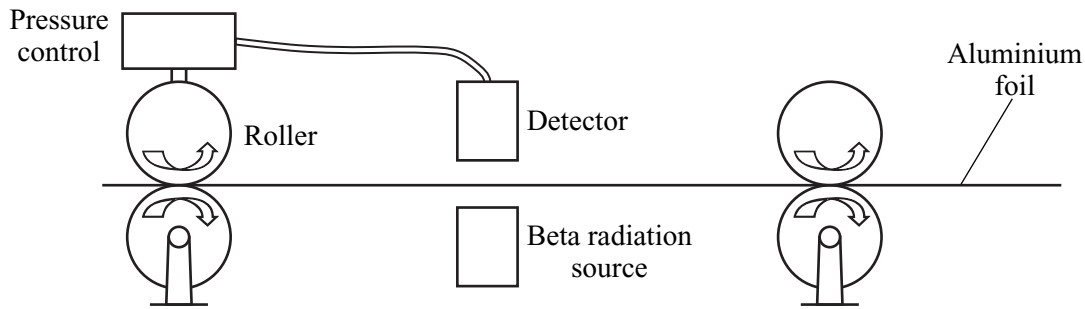


Explain how a space shuttle stays in an orbit around the Earth.

.....
.....
.....
.....

(2 marks)

15 The diagram shows how the thickness of aluminium foil is controlled. The thicker the aluminium foil, the more radiation it absorbs.



(a) The designers used a beta radiation source for this control system.

(i) Why would an alpha radiation source be unsuitable in this control system?

.....

 (1 mark)

(ii) Why would a gamma radiation source be unsuitable in this control system?

.....

 (1 mark)

(b) The substance used in the beta radiation source is radioactive.

(i) Why are some atoms radioactive?

.....

 (1 mark)

(ii) Explain why radiation is dangerous to humans.

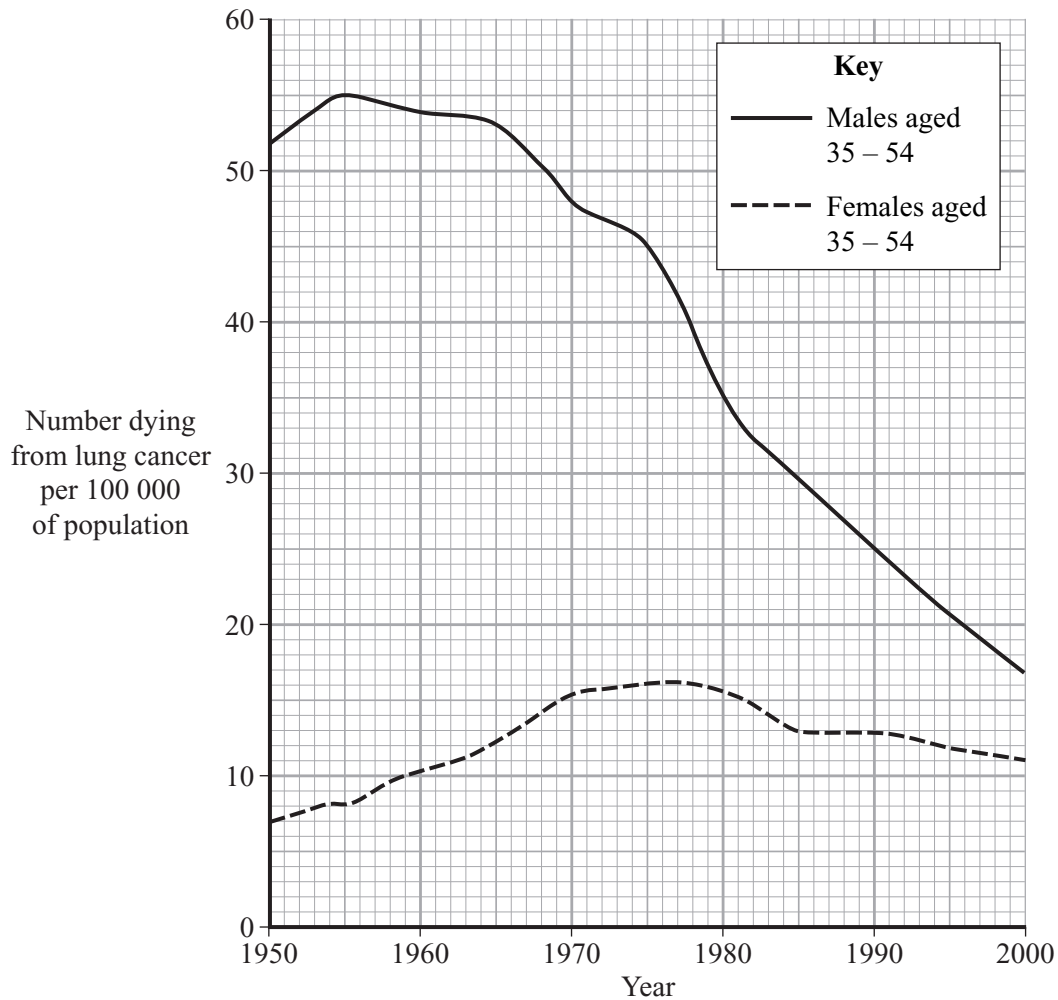
.....

 (2 marks)

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

16 Scientists study the effect of smoking on the number of people dying from lung cancer.

Graph 1 shows the number of people who died from lung cancer in this country between 1950 and 2000.



Graph 1

(a) Describe how the number of men who died from lung cancer changed between 1960 and 2000.

.....

.....

.....

.....

(2 marks)

(b) Describe **two** differences between the numbers of men and women who died from lung cancer between 1960 and 2000.

1

.....

2

.....

(2 marks)

(c) A town in this country had 500 000 inhabitants in 1955.

How many men aged 35–54 from that town are likely to have died from lung cancer in 1955?

.....

.....

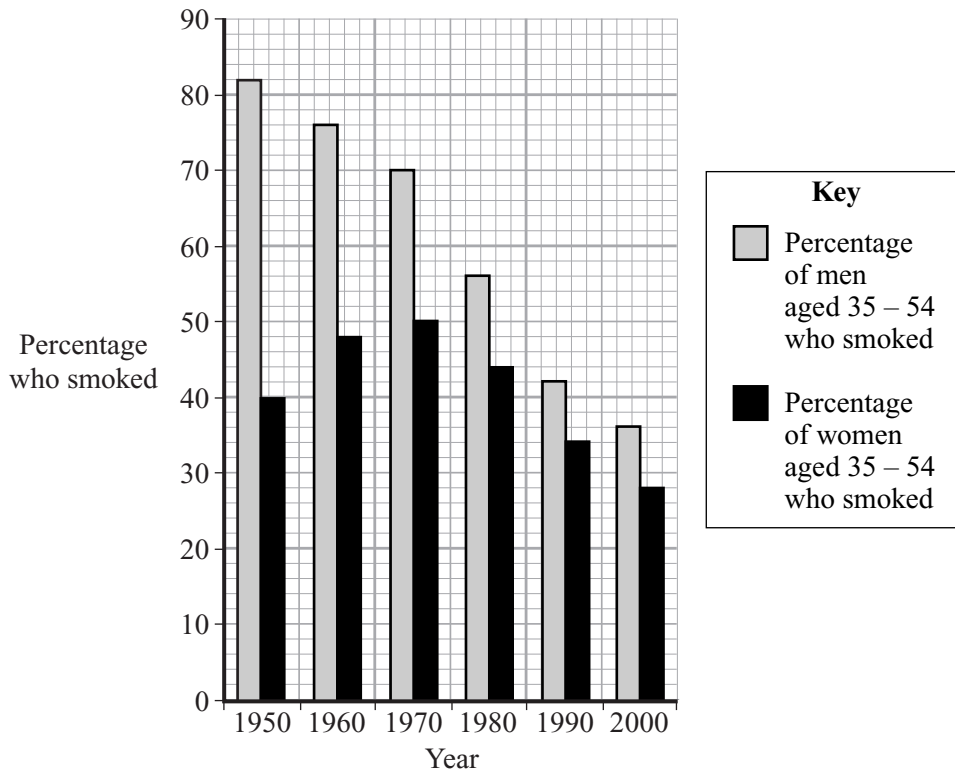
Number of men.....

(1 mark)

QUESTION 16 CONTINUES ON THE NEXT PAGE

Turn over ►

(d) **Graph 2** shows the percentage of the population who smoked between 1950 and 2000.



Graph 2

Explain how the data from **graphs 1** and **2** support the hypothesis that smoking increases the risk of getting lung cancer.

.....

.....

.....

.....

(2 marks)

7

END OF QUESTIONS