| Surname | | Other Names | |
|---|---|---|---|
| Centre Number | | | Candidate Number | | | | |
| Candidate Signature | | | | | | | |

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General Certificate of Secondary Education
June 2004

ASSESSMENT and QUALIFICATIONS ALLIANCE

# SCIENCE DOUBLE AWARD (MODULAR) 3468/1F
# FOUNDATION TIER
# Paper 1

**F**

Monday 7 June 2004 1.30 pm to 3.00 pm

**In addition to this paper you will require:**
- the Data Sheet (enclosed);
- a ruler.

You may use a calculator.

Time allowed: 1 hour 30 minutes

**Instructions**
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

**Information**
- The maximum mark for this paper is 90.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

| For Examiner's Use | | | |
|---|---|---|---|
| Number | Mark | Number | Mark |
| 1 | | 9 | |
| 2 | | 10 | |
| 3 | | 11 | |
| 4 | | 12 | |
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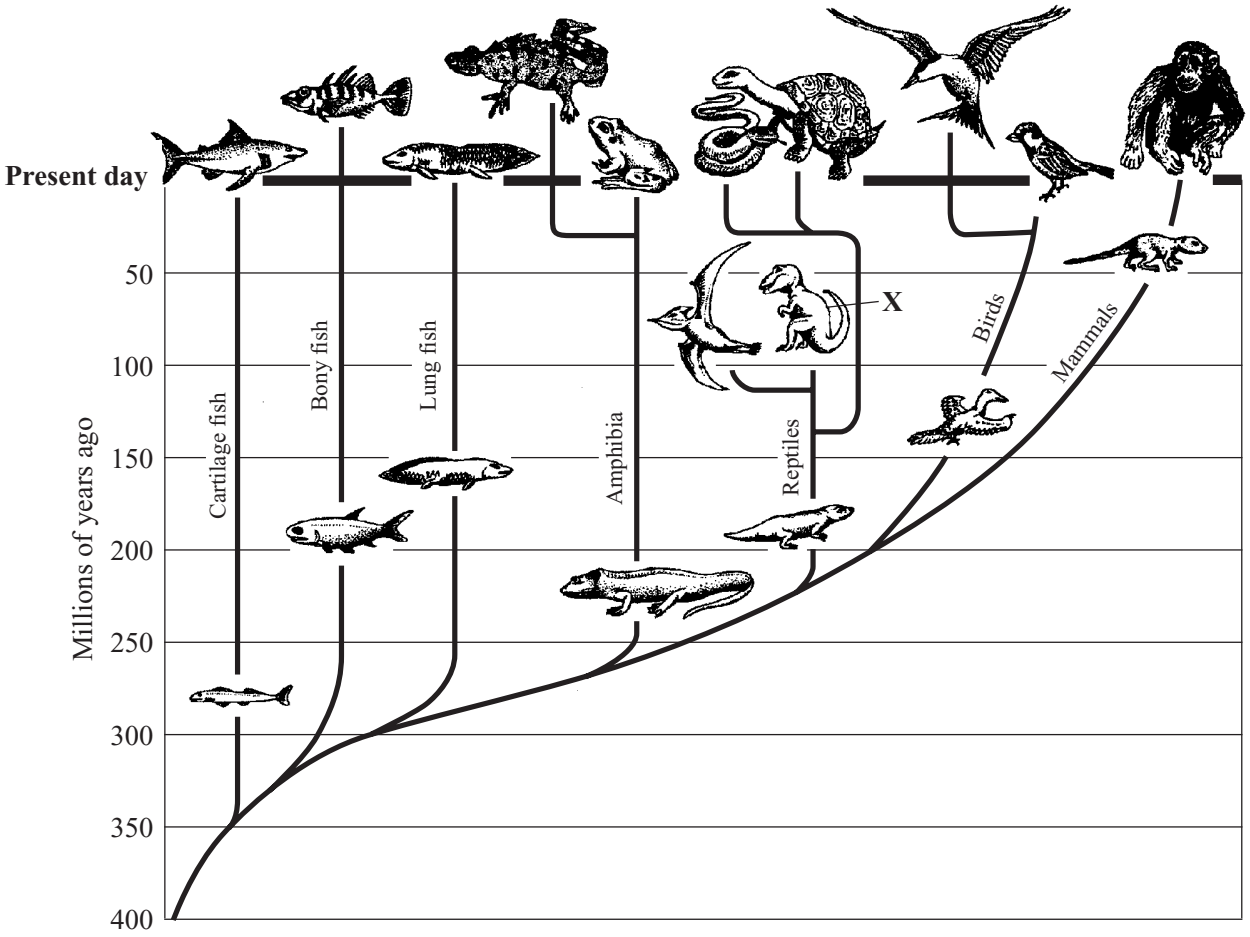
| Total (Column 2) → | | | |
| TOTAL | | | |
| Examiner's Initials | | | |

## 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)*

6

## STRUCTURES AND BONDING

**3** (a) Helium is used to fill party balloons.

Which **two** of the following are properties that make helium suitable for filling party balloons?

Place a tick ( ✓ ) in the box against each suitable property.

Coloured ☐

Exists as individual atoms ☐

Less dense than air ☐

Poor conductor of heat ☐

Very unreactive ☐

*(2 marks)*

(b) The table shows the names of some gases.

Use the correct formulae from the box to complete the table. The first one has been done for you.

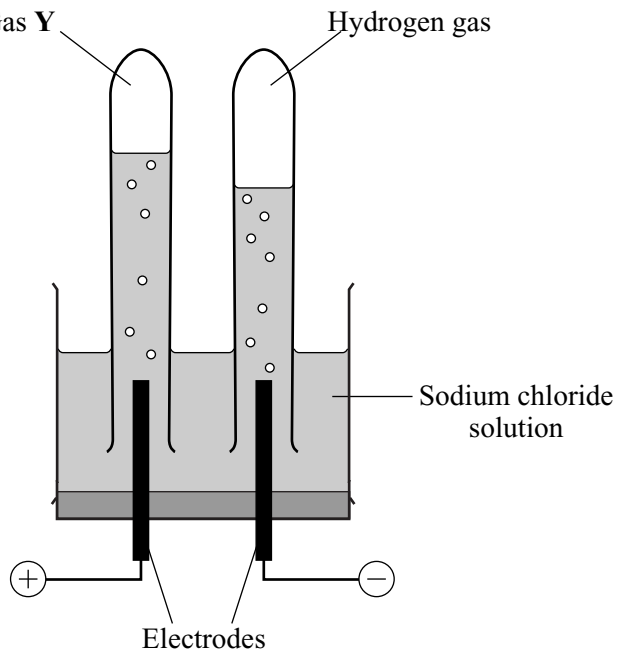
| $CH_4$ | $CO_2$ | $H_2$ | HCl | $NH_3$ | $O_2$ |
|---|---|---|---|---|---|

| **Gas** | **Formula** |
|---|---|
| Oxygen | $O_2$ |
| Carbon dioxide | |
| Hydrogen chloride | |
| Ammonia | |

*(3 marks)*

5

**4** The diagram shows the electrolysis of sodium chloride solution.




(a) Name gas **Y**. .....

*(1 mark)*

(b) Describe the test for hydrogen.

.....

.....

.....

.....

*(2 marks)*

(c) Hydrogen is formed when sodium reacts with water. Sodium hydroxide is also formed.

Complete the word equation for this reaction.

..... + ..... → ..... + .....

*(2 marks)*

(d) Complete the sentences.

Silver chloride is used in making ..... .

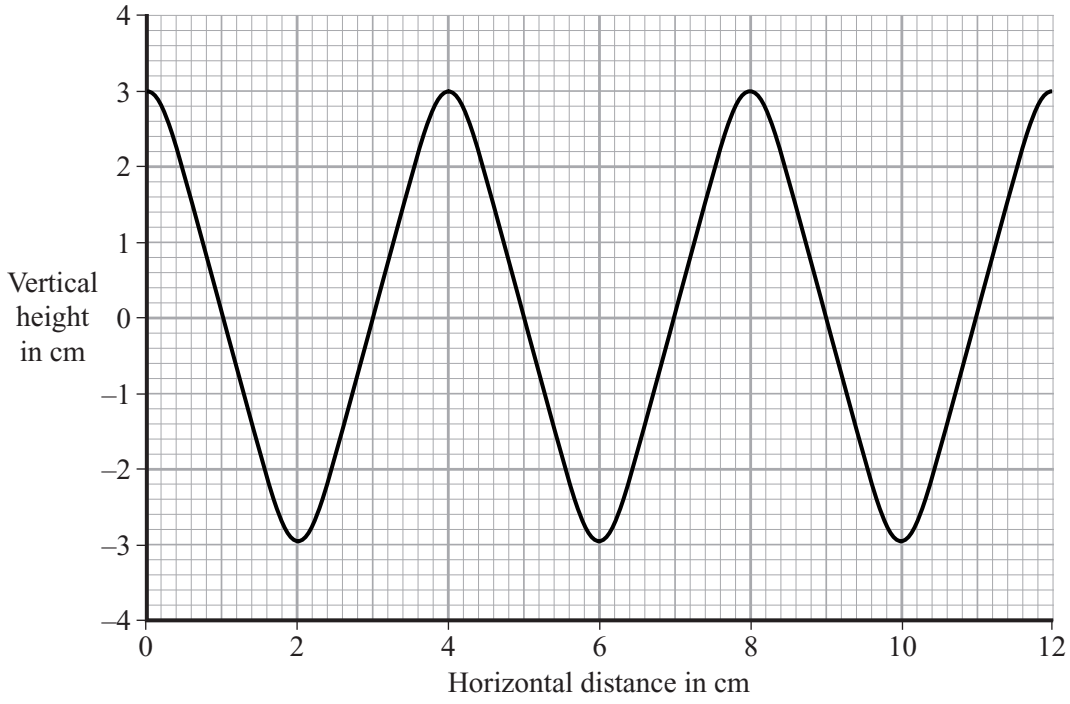
This is because it is reduced to silver by ..... .

*(2 marks)*

7

## 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.

.....

.....

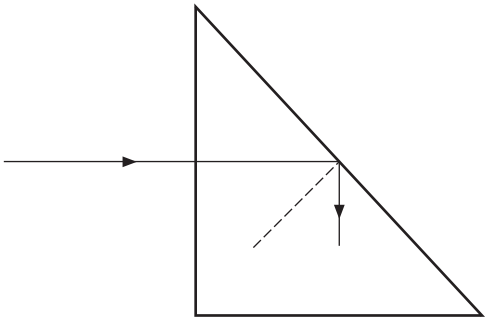
Frequency = .....

*(3 marks)*

5

**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 |
|---|---|---|

.....

.....

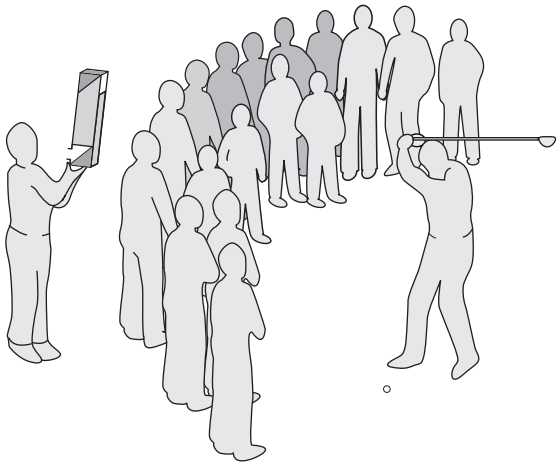
.....

.....

.....

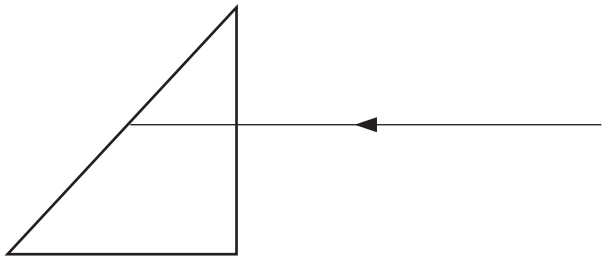
*(3 marks)*

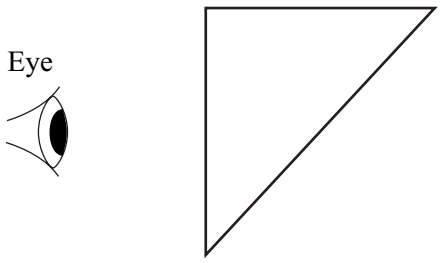
(b) Periscopes can be used to look over the heads of other people.



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 ▶**

LEAVE MARGIN BLANK

## QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

**7** (a) The block of metallic elements in the centre of the periodic table is known as the transition metals.

Which **three** of the following are properties of transition metals?

Place a tick ( ✓ ) in the box against each correct property.

Hard, tough and strong ☐

Low density ☐

Low melting point ☐

React quickly with water ☐

Used as catalysts ☐

Used in making electrical cables ☐

*(3 marks)*

(b) Potassium nitrate is a salt. It is made by reacting potassium hydroxide solution with dilute nitric acid.

Complete the word equation for this **type** of reaction.

..... + alkaline hydroxide solution → salt + .....

*(2 marks)*

(c) Use the Reactivity Series of Metals on the Data Sheet to help you to answer this question.

(i) Name **one** metal that could be extracted from its ore using carbon.

.....

(ii) Name **one** metal that could be extracted from its ore using hydrogen.

.....

*(2 marks)*

7

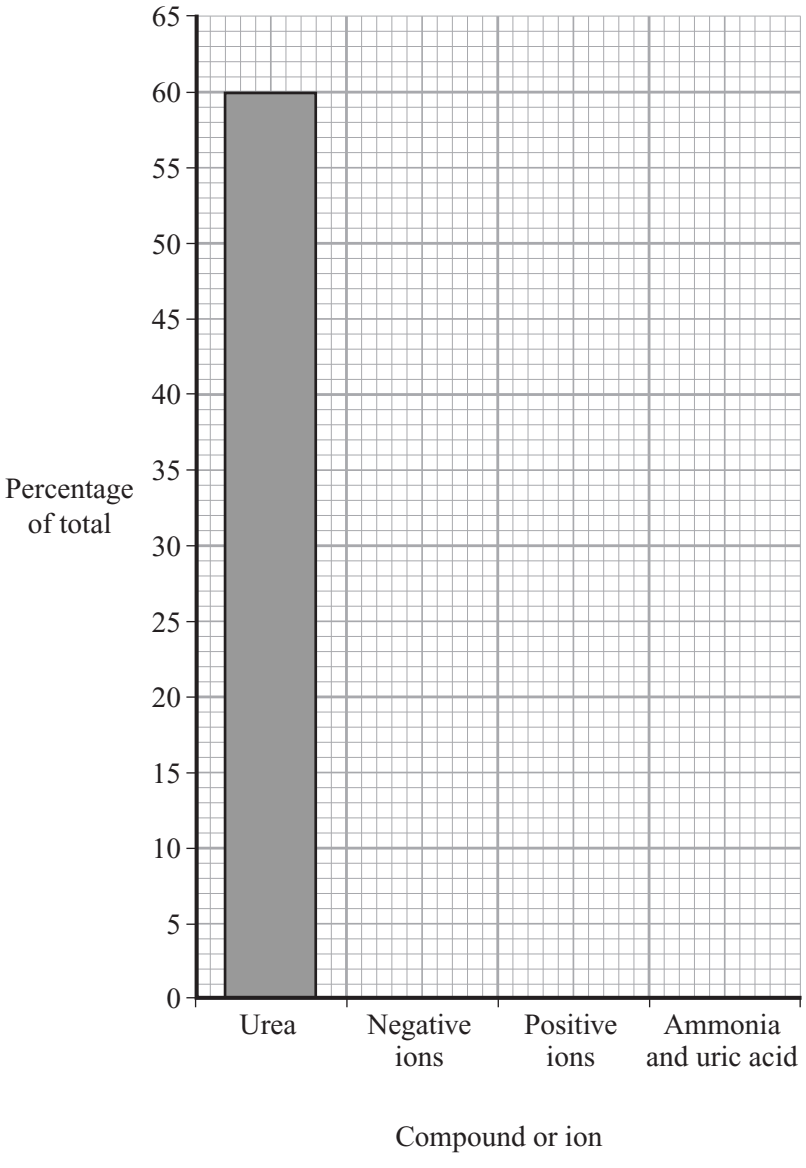
**NO QUESTIONS APPEAR ON THIS PAGE**

**TURN OVER FOR THE NEXT QUESTION**

**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)*

7

**TURN OVER FOR THE NEXT QUESTION**

## 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)*

6

**10** In some methods of reproduction, clones are made.

(a) Explain what is meant by a clone.

.....

.....

.....

.....

*(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.*

Describe, in as much detail as you can, **one** way in which an embryo can be cloned.

.....

.....

.....

.....

.....

.....

*(3 marks)*

5

**TURN OVER FOR THE NEXT QUESTION**

## STRUCTURES AND BONDING

**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.

.....

.....

.....

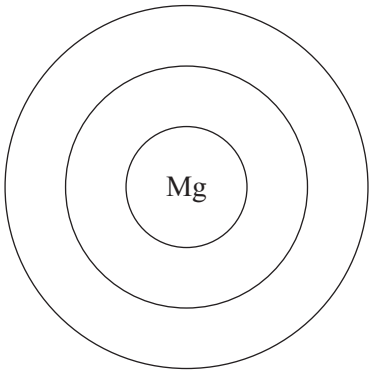
.....

.....

.....

*(3 marks)*

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




*(1 mark)*

4

**12** (a) Magnesium burns in oxygen, forming magnesium oxide.

This equation represents the reaction.

$$Mg\,(s) \quad + \quad O_2\,(g) \quad \rightarrow \quad MgO\,(s)$$

(i) Balance the equation. *(1 mark)*

(ii) Give the meaning of the state symbols (s) and (g).

(s).....

(g) ..... *(2 marks)*

(b) Use the Formulae of Some Common Ions table on the Data Sheet to help you to answer this question.

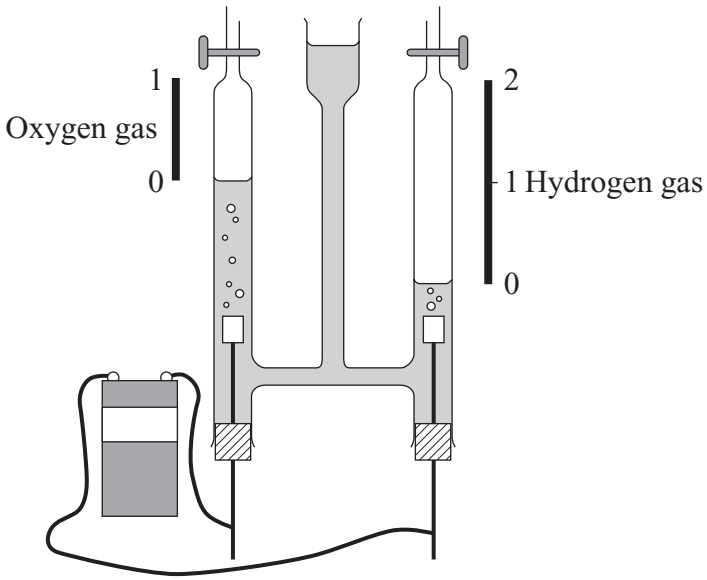
Magnesium also reacts with chlorine to form magnesium chloride.

Give the formula of magnesium chloride ..... *(1 mark)*

4

**TURN OVER FOR THE NEXT QUESTION**

**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 $H_2O$.

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?

.....

.....

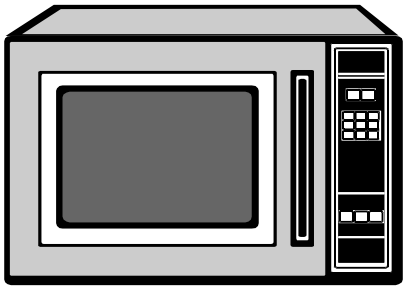
*(1 mark)*

4

**TURN OVER FOR THE NEXT QUESTION**

## WAVES AND RADIATION

**14** (a) Microwave ovens can be used to heat many types of food.



(i) Describe, in as much detail as you can, how microwaves heat food.

.....

.....

.....

.....

*(2 marks)*

(ii) Microwaves have a frequency of 10 000 million Hz. Their wavelength is 0.03 m.

Calculate the speed of microwaves.

Show clearly how you work out your answer.

.....

.....

.....

Speed of microwaves..... m/s

*(2 marks)*

(b) Another type of wave has been used to investigate the structure of the inside of the Earth.

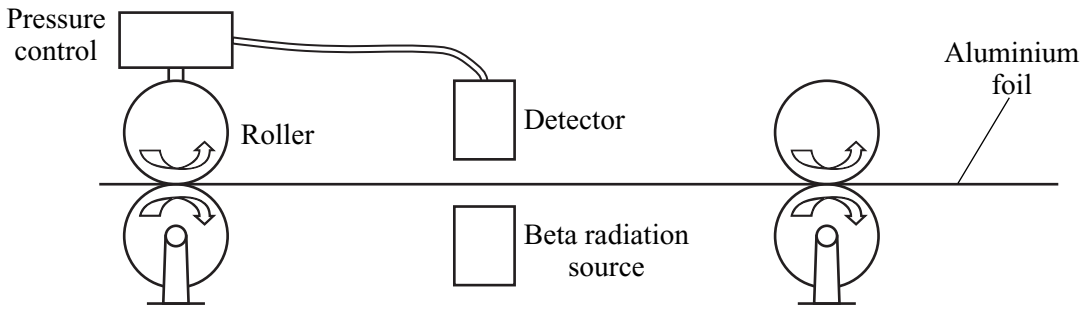
(i) Name this type of wave. .....

(ii) Name the instrument used to detect this type of wave. .....

*(2 marks)*

6

**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.

.....

.....

.....

.....

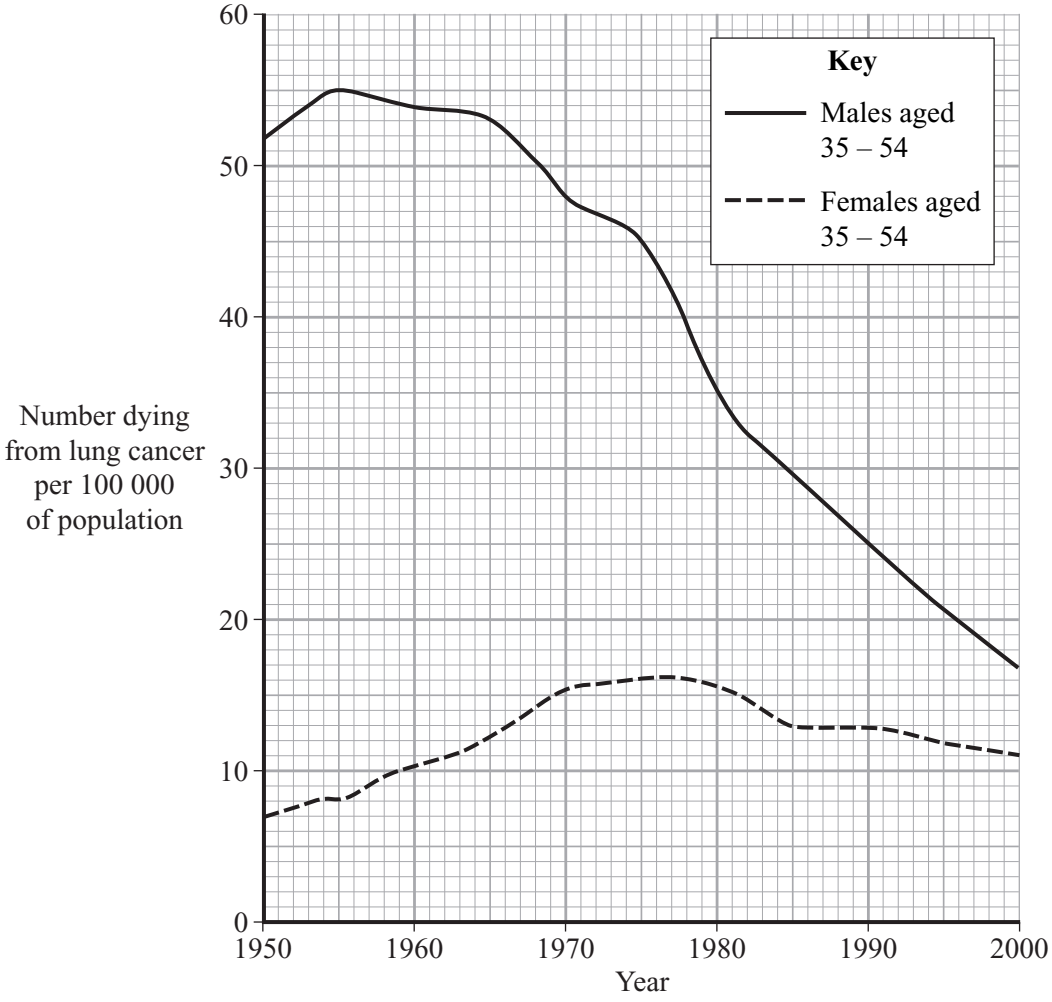
*(2 marks)*

5

## 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?

.....

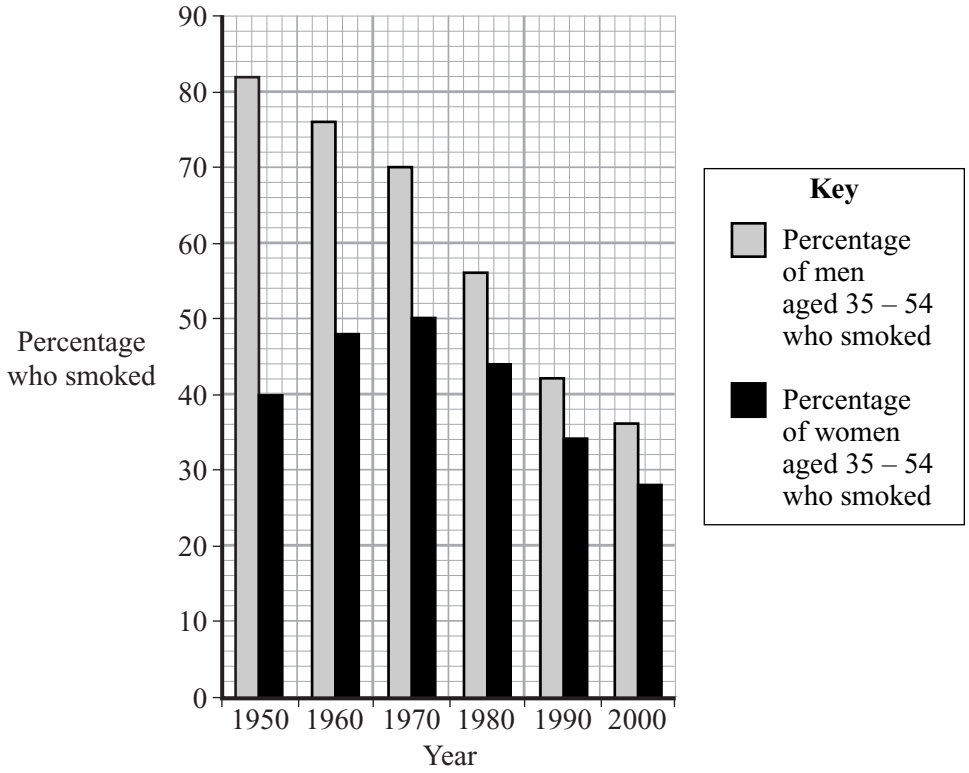
.....

Number of men.....

*(1 mark)*

**QUESTION 16 CONTINUES ON THE NEXT PAGE**

(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**