| Surname | Centre Number | Candidate Number |
|-------------|------------------|---------------------|
| Other Names | | 0 |



GCSE

4782/02

SCIENCE B

UNIT 2: Science and Life in the Modern World HIGHER TIER

P.M. TUESDAY, 10 June 2014

1 hour

| For Examiner's use only | | | | | |
|-------------------------|-----------------|-----------------|--|--|--|
| Question | Maximum Mark | Mark Awarded | | | |
| 1. | 13 | | | | |
| 2. | 8 | | | | |
| 3. | 9 | | | | |
| 4. | 9 | | | | |
| 5. | 7 | | | | |
| 6. | 14 | | | | |
| Total | 60 | | | | |

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer all questions.

Write your answers in the spaces provided in this booklet.

If you run out of space, use the continuation pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question 3(b) and 6(a).

A periodic table is printed on page 16.

Answer all questions.

1. Neutralisation reactions occur when acids and alkali react together. Metals can also neutralise acids. The general equation for the reaction between a metal and acid is given by:

(a) Complete the word equation for the reaction below.

[2]

magnesium + hydrochloric acid ---- +

(b) Kate is studying the reaction between hydrochloric acid and the metal magnesium.

In her experiment she:

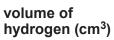
- 1. measured 25 cm³ dilute hydrochloric acid at 20 °C with a measuring cylinder;
- 2. added the acid to a conical flask;
- 3. added 1 g of magnesium to the acid and started a stop watch;
- **4.** measured the total volume of gas every 20 seconds.

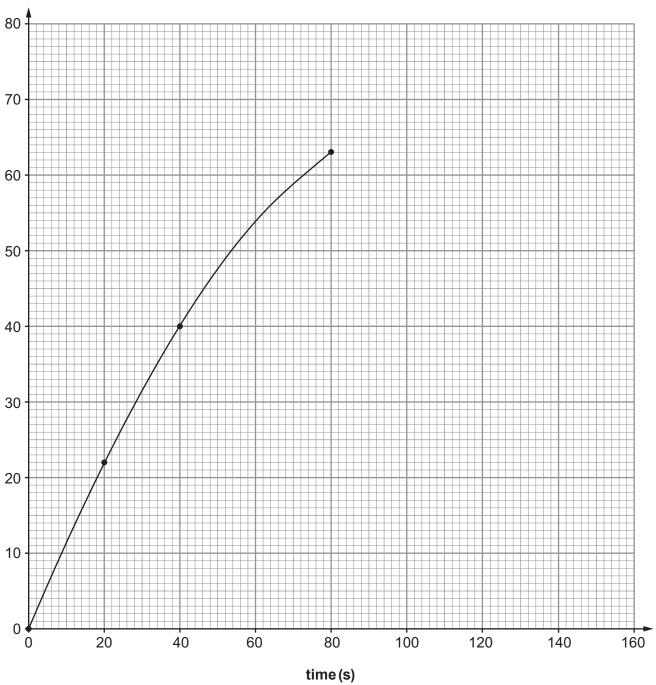
The results of her experiment are shown below.

Kate's Results

| Time (s) | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
|--|---|----|----|----|----|-----|-----|-----|-----|
| Volume of hydrogen (cm ³) | 0 | 22 | 40 | | 63 | 68 | 71 | 72 | 72 |

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| | (ii) | Kate has lost her result for 60 s. Use your graph to estimate the volume of gas at 60 s. [1] |
|-----|-------|--|
| | | cm ³ |
| | (iii) | State one way in which Kate can improve the validity of her experiment. [1] |
| | (iv) | Explain what happens to the pH during this reaction. [2] |
| | | |
| | (v) | Predict the volume of hydrogen you would expect to be collected after 200 s. Give one reason for your answer. [2] |
| | | |
| (c) | the e | wants to compare the volume of hydrogen given off every 20 seconds if she repeated experiment with iron instead of magnesium. State two variables that need to be rolled to ensure a fair test. [2] |
| | 1. | |
| | 2. | |

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[3]

2. (a) Complete the following table about the extraction of iron in the blast furnace.

| Raw material | Chemical name | The purpose of the raw material |
|--------------|-------------------|---|
| limestone | calcium carbonate | Removes impurities which form the waste called slag |
| hot air | oxygen | Allows the coke to burn |
| coke | carbon | |
| haematite | | |

(b) The table below shows information about the materials required for the production of **one tonne** of iron.

Complete the table to calculate the total cost of producing **one** tonne of iron. [3]

| Raw material | Mass needed (tonnes) | Cost per tonne of raw material (£) | Cost in producing one tonne of iron (£) |
|--------------|----------------------|------------------------------------|---|
| iron ore | 1.75 | 60.50 | |
| coke | 0.25 | 120.90 | 30.22 |
| limestone | 0.25 | | 20.00 |
| hot air | 4.0 | 2.25 | 9.00 |
| | | Total cost | £ |

| (c) | Aluminium is also extracted from its ore. Explain why aluminium cannot be extracted in a blast furnace using coke (carbon). [2 | | | | | | |
|-----|--|--|--|--|--|--|--|
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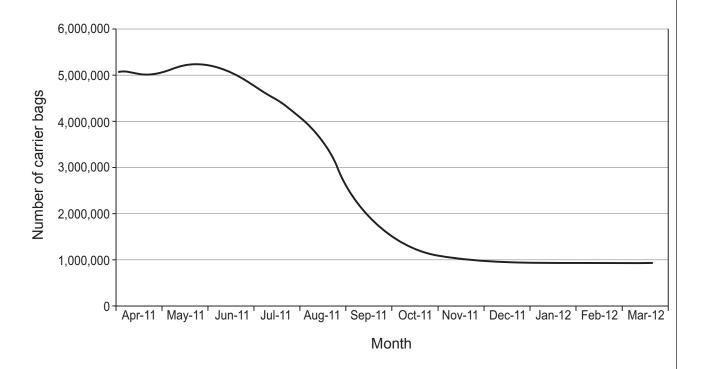
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3. On 1 October 2011, Wales became the first UK country to introduce a charge for plastic single-use carrier bags. In the latest estimates from the Welsh Government, they claim that there has been an 80-90% drop in 'plastic single-use' carrier bags.

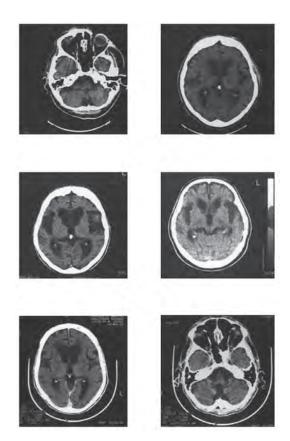
The following graph shows the decline in the number of 'plastic single use' carrier bags sold in a major supermarket chain in Wales for the period April 2011 – March 2012.



(a) Use the information in the graph to explain whether the claim made by the Welsh government is valid. [3]

| | | | Exar |
|-----|--|---------|------|
| (b) | Explain the benefits of using less plastic. | | or |
| | Your answer should refer to: use of resources economic impact environmental impact. | [6 QWC] | |
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4. Huntington's is an inherited genetic disease caused by a dominant allele and is not usually diagnosed until 35 to 45 years of age. The diagnosis is usually confirmed by genetic testing and CAT scan.



| (a) | Give | three reasons why a CAT scan is used in the diagnosis of Huntington's. | [3] |
|-----|------|--|---|
| | 1. | | |
| | | | · · · · · · · · · · · · · · · · · · · |
| | 2. | | |
| | | | • |
| | 3. | | |
| | | | |

| (b) | (i) | Complete the Punnet father and a mother w | t square to show the off tho does not suffer from I | spring produced by a he Huntington's. | eterozygous [3] | on |
|-----|---------------|--|--|--|-----------------|----|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | /::\ | | | offer force I breating the o'c | F41 | |
| | (ii) | Calculate the chance | that their first child will su | iffer from Huntington's. | [1] | |
| | | | | | | |
| | | | | | % | |
| (c) | Expl child | ain what advice could t suffering with Huntingt | pe given to this couple to on's. | avoid the possibility of p | producing a [2] | |
| | • | | | | | |
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5. In the UK about 100 000 people die due to smoking related diseases each year. The table below indicates the estimated numbers of 11-15 year olds that **admitted** to have started smoking in the years 2001-2013. These estimates have been based on questionnaires completed each year by about 1 000 pupils.

Estimated Number of Children Aged 11-15 Starting Smoking, UK, 2001-2013

| Year | Boys | Girls |
|------|---------|---------|
| 2001 | 128 000 | 172 000 |
| 2003 | 128 000 | 160 000 |
| 2005 | 128 000 | 190 000 |
| 2007 | 85 000 | 100 000 |
| 2009 | 75 000 | 101 000 |
| 2011 | 74 000 | 81 000 |
| 2013 | 71 000 | 73 000 |

| | 2013 | 71 000 | 73 000 | | |
|---|-------------------|---|---|---|--|
| The data in the table shows that the number of boys that have admitted to smoking h dropped by 44.5% from 2001 to 2013. | | | | | |
| Calcu | ulate the percent | tage drop for girls over the s | same period. | [2] | |
| | | | | | |
| | | | | | |
| | | | Drop = | % | |
| (i) | State one assu | mption that has been made | in the recorded information | n above. [1] | |
| | | | | | |
| (ii) | State how the o | data could be scientifically | confirmed. | [1] | |
| , , | | - | | | |
| | | | | ······ | |
| | | | | mation in the [3] | |
| *********** | | | | | |
| | The dropp Calcu | (i) State one assurting (ii) State how the control of the percent (iii) State how the percent (iii) State how the percent (iiii) State how the percent (iiii) State how the percent (iiii) State how | The data in the table shows that the number of I dropped by 44.5% from 2001 to 2013. Calculate the percentage drop for girls over the second of the second | The data in the table shows that the number of boys that have admitted to stropped by 44.5% from 2001 to 2013. Calculate the percentage drop for girls over the same period. Drop = | |

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6. The image of the thyroid gland below is from a gamma camera.



- (a) Describe how iodine-123 is used to generate an image from the gamma camera. Your answer should refer to: [6 QWC]
 - how it is administered;
 - · detecting the radiation;
 - formation of the image.

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(b) The table below shows some isotopes of iodine.

| Radio-isotope | Symbol | Half-life | | |
|---------------|--------|-------------|--|--|
| iodine-111 | 111 | 2.5 seconds | | |
| iodine-123 | 123 | 13.2 hours | | |
| iodine-131 | 131 | 8 days | | |

| (i) | State what is meant by the term <i>half-life</i> . | [2] |
|-------|---|------------|
| (ii) | Calculate the fraction of the original amount of iodine-123 that would be left in t body after 66 hours. | he [2] |
| | Fraction = | |
| (iii) | lodine is absorbed by the thyroid. Explain why iodine-123 is the most suitable this technique. | for [2] |
| | | |
| (iv) | Explain why a patient should only have a limited number of gamma came investigations in a year. | era [2] |
| | | |

END OF PAPER

Periodic Table of the Elements

| | | E | _ | _ | c | _ | _ | |
|---|---|-------------------|-----------------------------|------------------------------|--|---|---|-----------------------------|
| C | | helium 2 He | neon 10 Ne | argon 18 Ar | krypton 36 | xenon 54 Xe | radon 86 Rn | |
| ^ | - | | fluorine 9 | chlorine 17 CI | bromine 35 Br | iodine 53 | astatine 85 At | |
| Œ | 0 | | oxygen 8 | sulfur 16 S | selenium 34 Se | tellurium 52 Te | bismuth polonium 83 84 Bi Po | |
| ע | 0 | | nitrogen 7 | phosphorus 15 P | arsenic 33 AS | antimony tellurium 51 Sb Te | bismuth 83 Bi | |
| 4 | † | | carbon 6 | silicon 14 Si | germanium 32 Ge | tin 50 Sn | lead 82 Pb | |
| ď | 0 | | boron 5 B | aluminium 13 AI | gallium 31 Ga | Indium 49 | mercury thallium 80 81 Hg TI | |
| | | | | | zinc 30 Zn | Cadmium 48 Cd | mercury 80 Hg | |
| | | | | | copper 29 Cu | silver 47 Ag | blog 79 Au | |
| | | | | | nickel 28 | palladium 46 Pd | platinum 78 Pt | |
| | | hydrogen 1 | | | cobalt 27 | rhodium 45 Rh | iridium 77 | |
| | | | | | iron 26 Fe | ruthenium 44 RU | osmium 76 OS | |
| umber 50 | | | | | manganese 25 Mn | technetium 43 TC | rhenium 75 Re | |
| element name atomic number symbol | | | | | chromium 24 Cr | molybdenum 42 Mo | tungsten 74 W | |
| | | | | | vanadium 23 | yttrium zirconium niobium molybdenum technetium ruthenium rhodium rhodium Y Zr Nb MO TC Ru Rh | Lutetiumhafniumtantalumtungstenrheniumosmium717273747576LuHfTaWReOs | |
| | | | | | titanium 22 Ti | zirconium 40 Zr | hafnium 72 Hf | |
| | | | | | potassium calcium scandium titanium vanadium chromium manganese 19 20 21 23 24 25 K Ca Sc Ti V Cr Mn | yttrium 39 | lutetium 71 Lu | |
| C | 7 | | lithium beryllium 3 4 Li Be | sodium magnesium 12 Na Mg | calcium 20 Ca | rubidium strontium 37 38 Rb Sr | caesium barium 55 56 CS Ba | radium 88 Ra |
| ~ | - | | lithium 3 Li | sodium 11 Na | potassium 19 K | rubidium 37 Rb | caesium 55 CS | francium 87 Fr |

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