

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 \longrightarrow +

- (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.

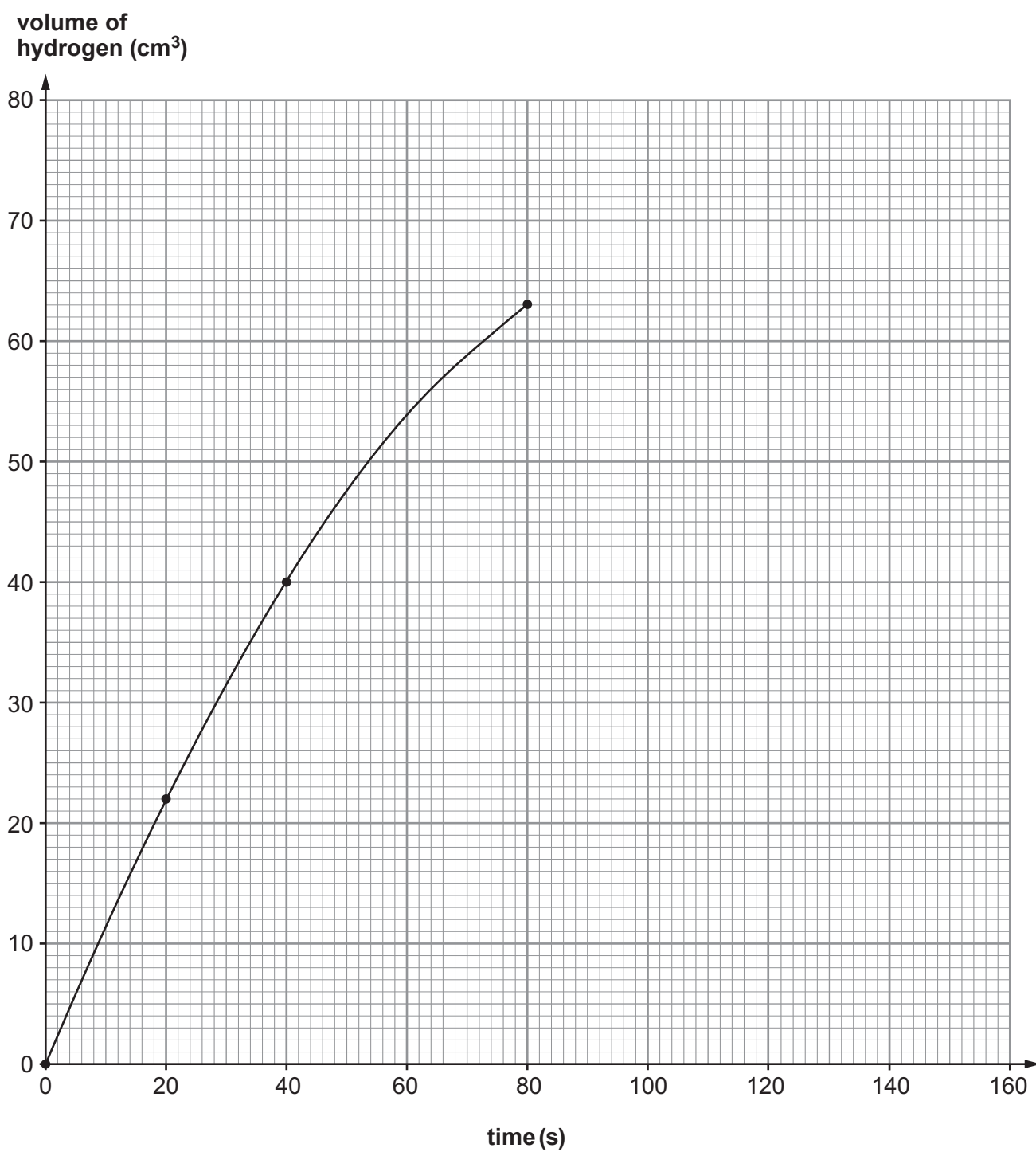
The results of her experiment are shown below.

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

(i) Complete the graph of her results.

[3]

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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]

..... cm³

- (iii) State **one** way in which Kate can improve the validity of her experiment. [1]

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- (iv) Explain what happens to the pH during this reaction. [2]

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- (v) Predict the volume of hydrogen you would expect to be collected after 200 s. Give **one** reason for your answer. [2]

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- (c) Kate wants to compare the volume of hydrogen given off every 20 seconds if she repeated the experiment with iron instead of magnesium. State **two** variables that need to be controlled to ensure a fair test. [2]

1.

2.

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

[3]

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]

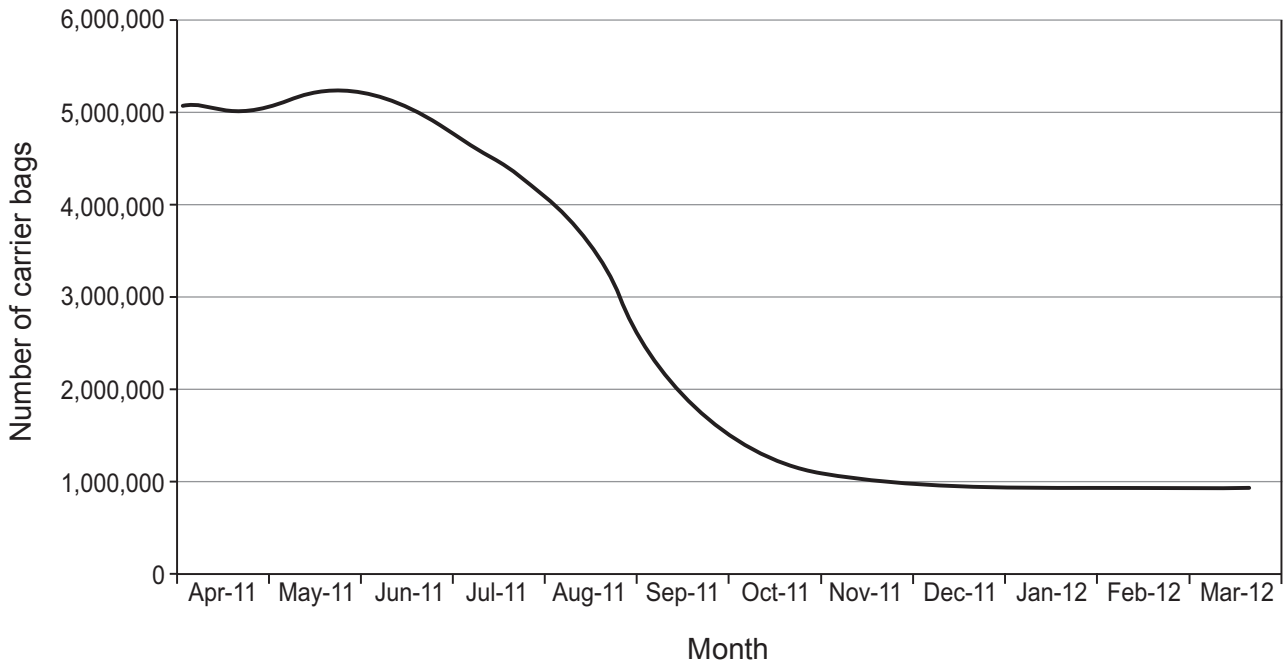
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3. On 1 October 2011, Wales became the first UK country to introduce a charge for plastic single-use carrier bags. In the latest estimates from the Welsh Government, they claim that there has been an 80-90% drop in 'plastic single-use' carrier bags.

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]

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(b) Explain the benefits of using less plastic.

Your answer should refer to:

- use of resources
- economic impact
- environmental impact.

[6 QWC]

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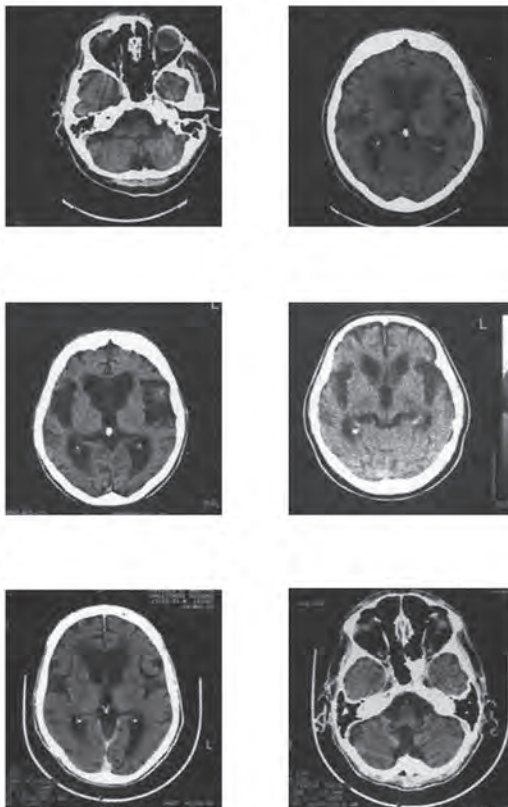
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4. Huntington's is an inherited genetic disease caused by a dominant allele and is not usually diagnosed until 35 to 45 years of age. The diagnosis is usually confirmed by genetic testing and CAT scan.



- (a) Give **three** reasons why a CAT scan is used in the diagnosis of Huntington's. [3]

1.
2.
3.

- (b) (i) Complete the Punnett square to show the offspring produced by a heterozygous father and a mother who does not suffer from Huntington's. [3]

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- (ii) Calculate the chance that their first child will suffer from Huntington's. [1]

..... %

- (c) Explain what advice could be given to this couple to avoid the possibility of producing a child suffering with Huntington's. [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

- (a) The data in the table shows that the number of boys that have admitted to smoking has dropped by 44.5% from 2001 to 2013.

Calculate the percentage drop for girls over the same period. [2]

Drop = %

- (b) (i) State **one** assumption that has been made in the recorded information above. [1]

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- (ii) State how the data could be **scientifically** confirmed. [1]

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- (c) The ban on smoking in public places was introduced in 2007. Use the information in the table to comment on the impact of this ban on smoking in 11-15 year olds. [3]

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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}I	2.5 seconds
iodine-123	^{123}I	13.2 hours
iodine-131	^{131}I	8 days

(i) State what is meant by the term *half-life*. [2]

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(ii) Calculate the **fraction** of the original amount of iodine-123 that would be left in the body after 66 hours. [2]

Fraction =

(iii) Iodine is absorbed by the thyroid. Explain why iodine-123 is the most suitable for this technique. [2]

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(iv) Explain why a patient should only have a limited number of gamma camera investigations in a year. [2]

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END OF PAPER

Periodic Table of the Elements

	1	2		3	4	5	6	7	0
1									
2	lithium 3 Li	beryllium 4 Be		boron 5 B	carbon 6 C	nitrogen 7 N	oxygen 8 O	fluorine 9 F	helium 2 He
3	sodium 11 Na	magnesium 12 Mg		aluminium 13 Al	silicon 14 Si	phosphorus 15 P	sulfur 16 S	chlorine 17 Cl	argon 18 Ar
4	potassium 19 K	calcium 20 Ca			gallium 31 Ga	zinc 30 Zn	copper 29 Cu	nickel 28 Ni	
5	rubidium 37 Rb	strontium 38 Sr			indium 49 In	cadmium 48 Cd	silver 47 Ag	palladium 46 Pd	
6	caesium 55 Cs	barium 56 Ba					rhodium 45 Rh	iron 26 Fe	
7	francium 87 Fr	radium 88 Ra					osmium 76 Os	nickel 28 Ni	
							iridium 77 Ir	platinum 78 Pt	
							gold 79 Au	mercury 80 Hg	
							thallium 81 Tl	lead 82 Pb	
							bismuth 83 Bi	polonium 84 Po	
							antimony 51 Sb	tellurium 52 Te	
							tin 50 Sn	iodine 53 I	
							germanium 32 Ge	bromine 35 Br	
							arsenic 33 As	selenium 34 Se	
							indium 49 In	cadmium 48 Cd	
							vanadium 23 V	chromium 24 Cr	
							niobium 41 Nb	molybdenum 42 Mo	
							zirconium 40 Zr	technetium 43 Tc	
							hafnium 72 Hf	rhenium 75 Re	
							tantalum 73 Ta	tungsten 74 W	
							lutetium 71 Lu	osmium 76 Os	
							scandium 21 Sc	manganese 25 Mn	
							titanium 22 Ti	iron 26 Fe	
							yttrium 39 Y	rhodium 45 Rh	
							cobalt 27 Co	platinum 78 Pt	
							nickel 28 Ni	gold 79 Au	
							zinc 30 Zn	mercury 80 Hg	
							gallium 31 Ga	lead 82 Pb	
							indium 49 In	thallium 81 Tl	
							tin 50 Sn	bismuth 83 Bi	
							antimony 51 Sb	polonium 84 Po	
							germanium 32 Ge	astatine 85 At	
							arsenic 33 As	radon 86 Rn	
							seleเนียม 34 Se		
							bromine 35 Br		
							iodine 53 I		
							xenon 54 Xe		
							krypton 36 Kr		
							argon 18 Ar		
							neon 10 Ne		
							fluorine 9 F		
							oxygen 8 O		
							nitrogen 7 N		
							carbon 6 C		
							boron 5 B		
							hydrogen 1 H		