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, 9 June 2015

1 hour

For Examiner's use only						
Question	Maximum Mark	Mark Awarded				
1.	13					
2.	15					
3.	9					
4.	13					
5.	10					
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.

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 **2**(*b*) and **5**(i).

A periodic table is printed on page 12.

Answer all questions.

- 1. Dilute sulfuric acid reacts with sodium carbonate. This reaction forms a salt, a gas and water.
 - (a) Complete the word equation for this reaction.

[2]

sulfuric	sodium		
+		+	+ water
acid	carbonate		

(b) A student performed the reaction above and measured the volume of gas given off.

The student followed this method:

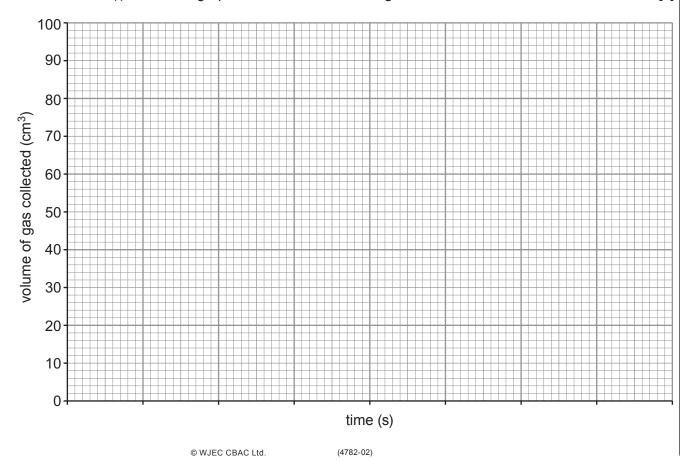
- 1. measured 25 cm³ dilute sulfuric acid;
- 2. added the acid to a conical flask;
- 3. added the sodium carbonate to the acid (in excess) and started a stop watch;
- 4. collected the gas;
- 5. measured the total volume of gas produced every 20 seconds.

The results are shown in the table below.

Time (s)	0	20	40	80	100	120	140	160
Volume of gas collected (cm³)	0	22	38	62	70	77	80	80

(i) Plot the graph to show the volume of gas collected.

[4]



	(ii) Use your graph to estimate the volume of gas collected after 1 minute.						
	(iii)	Predict the volume of gas you would expect to be collected after 3 minutes.	[2]				
		Volume after 3 minutes cm ³					
		Give one reason for your answer.					
(c)	If the	e student repeated this experiment, he would need the same volume and concentrat cid.	ion				
	State	e two other variables the student would need to control to ensure a fair test.	[2]				
	2.						
(d)	Dilut	e sulfuric acid has a pH of 2. Explain what happens to the pH during this reaction	ı. [2]				

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2.	(a)	is m	radio-isotope iodine-131 is used in the treatment of thyroid cancer. The ixed with water and given to the patient to drink. This is an example otherapy.	
		(i)	Explain how iodine-131 radiotherapy affects thyroid cancer cells.	[2]
		(ii)	Explain how external radiotherapy differs to internal therapy.	[2]
	(b)	Patie	ents who have undergone this treatment are given the following advice: DO NOT: use public transport; share cups, glasses, utensils or towels; visit young children or pregnant mothers; spend more than 30 minutes with visitors; breast feed. DO: travel alone; flush the toilet at least twice after use.	
		Expl:	ain why this advice should be strictly followed.	[6 QWC]

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or	ıly

(c) Many different isotopes of radioactive iodine are used in medicine.

Isotope of iodine	Half life	Uses			
123	13 hours	diagnostic nuclear imaging			
125	60 days	treatment of prostate cancer in radiotherapy			
¹³¹ I 8 days		treatment of thyroid cancer in radiotherapy			

(i) Explain what is meant by the statement 'iodine-131 has a half-life of 8 days'.

(ii) A patient was injected with ¹²⁵I (iodine-125) on Jan 1st 2015. Calculate the fraction of the original amount that was left in his body on May 1st 2015. [3]

January									
SUN	MON	TUE	WED	THU	FRI	SAT			
				1	2	3			
4	5	6	7	8	9	10			
11	12	13	14	15	16	17			
18	19	20	21	22	23	24			
25	26	27	28	29	30	31			

February										
SUN	MON	TUE	WED	THU	FRI	SAT				
1	2	3	4	5	6	7				
8	9	10	11	12	13	14				
15	16	17	18	19	20	21				
22	23	24	25	26	27	28				

March									
SUN	MON	TUE	WED	THU	FRI	SAT			
1	2	3	4	5	6	7			
8	9	10	11	12	13	14			
15	16	17	18	19	20	21			
22	23	24	25	26	27	28			
29	30	31		\Box		\Box			

A	ori					
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

M	ay					
SUN	MON	TUE	WED	THU	FRI	SAT
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Ju	ıne)				
SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Fraction

[2]

3. The table below shows some of the physical properties of group 1 and group 7 elements.

Group 1

Element	Melting point °C	Boiling point °C	Density g/cm ³
lithium	180	1340	0.5
sodium	98	880	0.98
potassium	63	760	0.86

Group 7

Element	Melting point °C	Boiling point °C	Density g/cm ³
fluorine	-220	-188	0.0016
chlorine	-101	-35	0.0029
bromine	-7	59	3.1
	•		•

(i)	Describe the trends in boiling points for both groups.	[2]
		•••••

(ii) Complete the table to give the state (solid, liquid or gas) of the named elements at 20°C.The first one has been done for you.

Element	Solid	Liquid	Gas
sodium	1		
chlorine			
bromine			

(iii)	Sodium reacts with water to form sodium hydroxide, an alkaline solution, and a gas. Complete the balanced symbol equation for this reaction.	[2
	+ + 2NaOH +	

(iv) Ethanoic acid (vinegar) reacts with sodium hydroxide. The equation is shown below.

In a titration 25.0 $\rm cm^3$ of dilute ethanoic acid is needed to neutralise 20.0 $\rm cm^3$ of sodium hydroxide solution of concentration 0.25 $\rm mol/dm^3$.

Calculate the concentration of the ethanoic acid in mol/dm³.

[3]

Use the equation:

Concentration = mol/dm³

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)	Explain how mutations can cause diseases like Huntington's.	tree below shows how Huntington's could be inherited. Father Mother Wey unaffected male affected female unaffected female affected male r is said to be 'heterozygous for Huntington's'. Use the family tree to explain if
(b)	The family tree below shows how Huntington's could be inherited.	
	Father Mother	
	Key	
	unaffected male affected female	
	unaffected female affected male	
	The mother is said to be 'beterozygous for Huntington's' Use the fam	nily tree to eval
	this statement is correct.	illy tree to expr
(c)	Carriers of this disease can now be identified earlier in life. Describe t posed by this prior knowledge in a disease like Huntington's.	the ethical prob

(d) Polydactylism is an unusual feature in the hand. Like Huntington's this feature is also inherited by a dominant allele. The family tree shows how this feature can be inherited for four members of a family.



(i) Complete the family tree to show the genotypes of the offspring in this family tree.

Key	
unaffected male	affected female
unaffected female	affected male

(ii) Complete the Punnett square and calculate the chance of the homozygous polydactyl son (DD) and an unaffected female producing a child suffering from this condition. [3]

Chance =%

(e)	The i	mage of the hand is formed by an X-ray. Describe how the X-ray is able to form this e. [2]	
reatr	nents	al Institute for Health and Clinical Excellence (NICE) approves new drugs and in the NHS in the UK. New drugs undergo stringent testing before they can be r general use.	
	(i)	Describe the main steps in testing and developing a new medical drug. [6 QWC]	
		In your account:	
		describe the type of testing that is performed;	
		 identify some of the ethical issues that need to be taken into consideration in this process. 	
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END OF PAPER

(ii)	NICE is also responsible for performing a peer review process for every new treatment developed. Describe what is meant by the term 'peer review process'. [2]	only
(iii)	Aspirin is a medicine that was developed and approved many years ago. It is a common treatment for cardiovascular disease. Describe the positive and negative effects it has on the patients who take it. [2]	

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Examiner

Periodic Table of the Elements

		-			_			1
	0	helium 2 He	neon 10 Ne	argon 18 Ar	krypton 36 Kr	xenon 54 Xe	radon 86 Rn	
	_		fluorine 9	chlorine 17 CI	bromine 35	iodine 53	astatine 85 At	
	9		oxygen 8	sulfur 16 S	arsenic selenium 33 34 AS Se	tellurium 52 Te	polonium 84 Po	
	2		carbon nitrogen 6 7 C N	phosphorus 15 P		antimony tellurium 51 Sb Te	bismuth 83 Bi	
	4		carbon 6 C	silicon 14 Si	germanium 32 Ge	tin 50 Sn	lead 82 Pb	
	က		boron 5 B	aluminium 13 AI	gallium 31 Ga	Indium 49	thallium 81	
					zinc 30 Zn	Cadmium 48 Cd	mercury thallium 80 81 Hg TI	
					copper 29 Cu	silver 47 Ag	90ld 79 Au	
					nickel 28	palladium 46 Pd	platinum 78 Pt	
		hydrogen 1			cobalt 27	rhodium 45 Rh	iridium 77	
					iron 26	ruthenium 44 Ru	osmium 76 OS	
name Jol					manganese 25 Mn	technetium 43 TC	rhenium 75 Re	
element name atomic number Symbol					chromium 24 Cr	molybdenum 42 MO	Lutetiumhafnium 71tantalum 72tungsten 73rhenium 74LuHfTaWRe	
]				vanadium 23	niobium 41 Nb	tantalum 73 Ta	
					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	rubidium strontium yttrium zirconium niobium molybdenum technetium ruthenium rhodium rhodium strontium zirconium niobium molybdenum technetium ruthenium rhodium rhodium strontium zirconium zirconi	lutetium 71 Lu	
	7		lithium beryllium 3 4 Li Be	sodium magnesium	calcium 20 Ca	strontium 38 Sr	barium 56 Ba	radium 88 Ra
	-		lithium 3	sodium 11 Na	potassium 19 K	rubidium 37 Rb	caesium 55 CS	francium 87 Fr

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