

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4782/02



S15-4782-02

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	

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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]



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

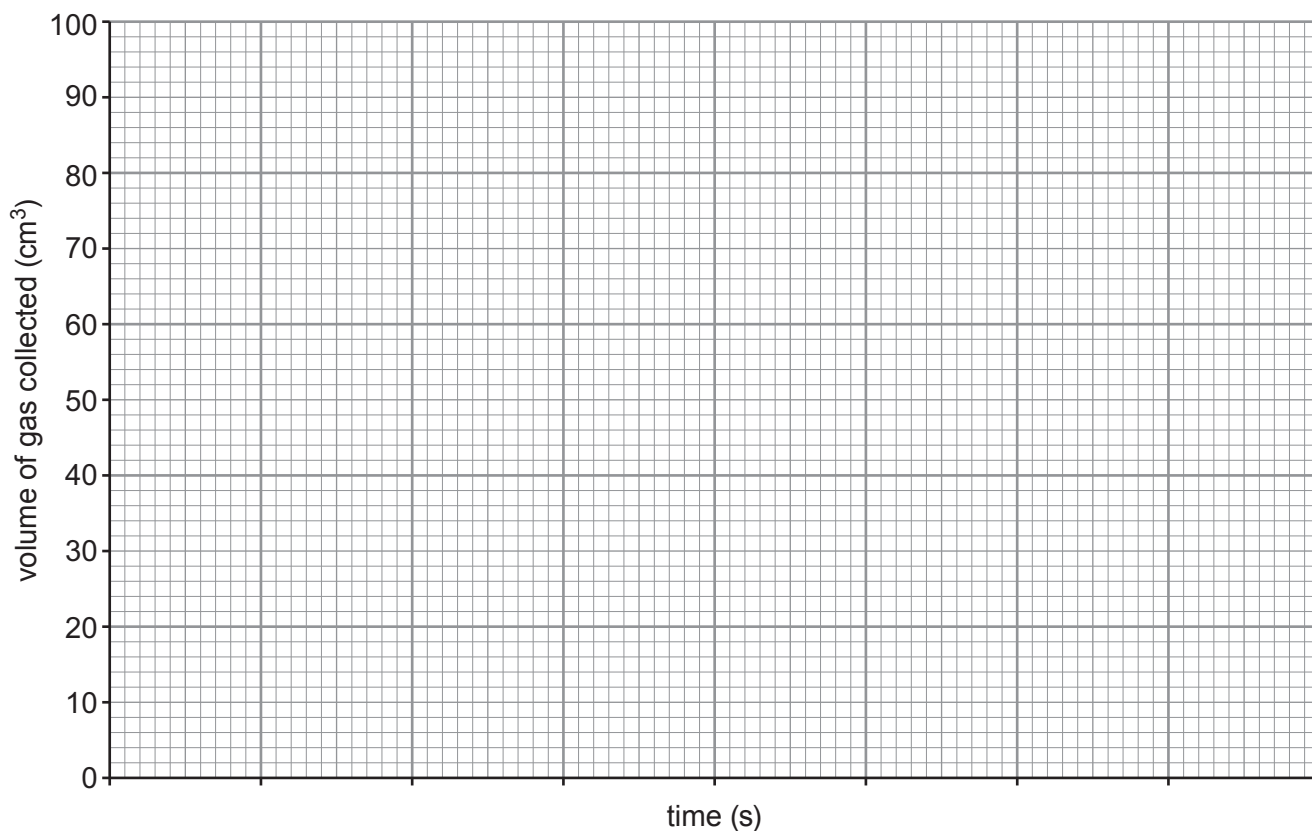
The student followed this method:

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 (cm ³)	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. [1]

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(iii) Predict the volume of gas you would expect to be collected after 3 minutes. [2]

Volume after 3 minutes cm³

Give **one** reason for your answer.

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(c) If the student repeated this experiment, he would need the same volume and concentration of acid.

State **two other** variables the student would need to control to ensure a fair test. [2]

1.

2.

(d) Dilute sulfuric acid has a pH of 2. Explain what happens to the pH during this reaction. [2]

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2. (a) The radio-isotope iodine-131 is used in the treatment of thyroid cancer. The iodine-131 is mixed with water and given to the patient to drink. This is an example of internal radiotherapy.

(i) Explain how iodine-131 radiotherapy affects thyroid cancer cells. [2]

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(ii) Explain how external radiotherapy differs to internal therapy. [2]

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(b) Patients 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.

Explain why this advice should be strictly followed. [6 QWC]

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

Isotope of iodine	Half life	Uses
^{123}I	13 hours	diagnostic nuclear imaging
^{125}I	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*'. [2]

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(ii) A patient was injected with ^{125}I (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							February							March						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3	1	2	3	4	5	6	7	1	2	3	4	5	6	7
4	5	6	7	8	9	10	8	9	10	11	12	13	14	8	9	10	11	12	13	14
11	12	13	14	15	16	17	15	16	17	18	19	20	21	15	16	17	18	19	20	21
18	19	20	21	22	23	24	22	23	24	25	26	27	28	22	23	24	25	26	27	28
25	26	27	28	29	30	31								29	30	31				

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

Fraction

15

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]

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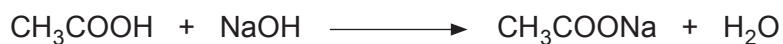
- (ii) Complete the table to give the state (solid, liquid or gas) of the named elements at 20°C. The first one has been done for you. [2]

Element	Solid	Liquid	Gas
sodium	✓		
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]



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



In a titration 25.0 cm³ of dilute ethanoic acid is needed to neutralise 20.0 cm³ of sodium hydroxide solution of concentration 0.25 mol/dm³.

Calculate the concentration of the ethanoic acid in mol/dm³. [3]

Use the equation:

$$\text{conc. of acid} \times \text{vol. of acid} = \text{conc. of alkali} \times \text{vol. of alkali}$$

Concentration = mol/dm³

Examiner
only

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4. Huntington's is an inherited disease that is caused by a dominant allele. Effects of this disease do not tend to appear until the person is over thirty years old. Muscular co-ordination and mental ability are affected.

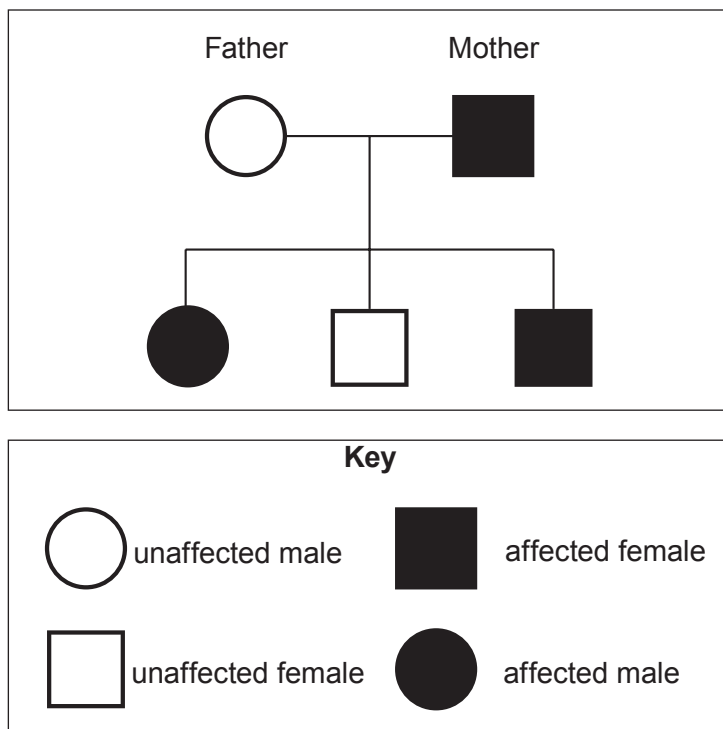
(a) Explain how mutations can cause diseases like Huntington's. [2]

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(b) The family tree below shows how Huntington's could be inherited.



The mother is said to be 'heterozygous for Huntington's'. Use the family tree to explain if this statement is correct. [2]

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(c) Carriers of this disease can now be identified earlier in life. Describe the ethical problems posed by this prior knowledge in a disease like Huntington's. [2]

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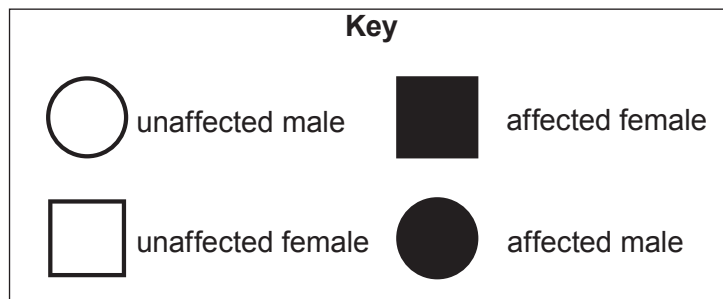
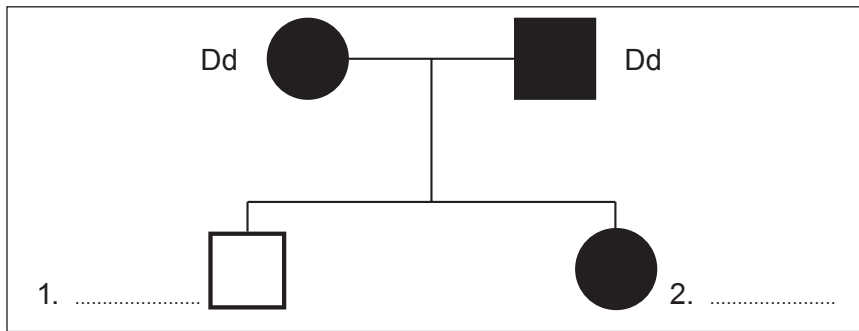
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(d) Polydactyly is an unusual feature in the hand. Like Huntington's this feature is also inherited by a dominant allele. The family tree shows how this feature can be inherited for four members of a family.



(i) Complete the family tree to show the genotypes of the offspring in this family tree. [2]



(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 =%

(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]

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(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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END OF PAPER

