

Please write clearly in block capitals.	
Centre number	Candidate number
Surname	
Forename(s)	
Candidate signature	

GCSE Chemistry

Foundation Tier Unit Chemistry C3

Wednesday 15 June 2016

Afternoon

Time allowed: 1 hour

Materials

For this paper you must have:

- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 6 should be answered in continuous prose.
 - In this question you will be marked on your ability to:
 - use good English
 - organise information clearly
 - use specialist vocabulary where appropriate.

Advice

In all calculations, show clearly how you work out your answer.





Answer all questions in the spaces provided.																		
	This question is about elements and the periodic table. Use the correct answers from the box to complete the sentences. [3 marks]																	
	atom	s		atoı	mic	weig	hts		(elect	rons	i		pro	ton n	numb	ers	
Newlands' and Mendeleev's periodic tables show the elements in order of their Following the discovery of protons and, the modern periodic table shows the elements in order of their																		
1 (b) Figure 1 shows the position of six elements in the modern periodic table.Figure 1																		
Li Na K						H Fe												
1 (b) (i) Which one of these six elements has the lowest boiling point? [1 mark]																		
1 (b) (ii) Complete the sentence. [1 mark] In the periodic table, rubidium (Rb) is in Group																		
	Li Na K Rb	Atom Newlands their Following periodic ta Figure 1 s Li Na K Rb Which one	atoms Newlands' and their Following the deperiodic table seriodic table se	This question is about the correct answer. atoms Newlands' and Mentheir Following the discover periodic table shows Figure 1 shows the shows t	This question is about el Use the correct answers atoms atom Newlands' and Mendeled their Following the discovery of periodic table shows the Figure 1 shows the position of these six of the six of the sentence.	This question is about eleme Use the correct answers from atoms atomic Newlands' and Mendeleev's their Following the discovery of properiodic table shows the element of the position Li Na K Rb Which one of these six element i) Complete the sentence.	This question is about elements at Use the correct answers from the atoms atomic weig. 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Use the correct answers from the box to complete the sentences. atoms atomic weights electrons proton of their	This question is about elements and the periodic table. Use the correct answers from the box to complete the sentences. atoms atomic weights electrons proton numb.	This question is about elements and the periodic table. Use the correct answers from the box to complete the sentences. [3 marks] atoms atomic weights electrons proton numbers Newlands' and Mendeleev's periodic tables show the elements in order of their Following the discovery of protons and, the modern periodic table shows the elements in order of their Figure 1 shows the position of six elements in the modern periodic table. Figure 1 H Li Na K Fe Rb O Which one of these six elements has the lowest boiling point? [1 mark] [1 mark] [1 mark]

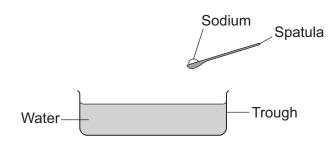


1 (b) (iii) Which of these three elements is the most reactive?	[4 mork]
Tick (✓) one box.	[1 mark]
Lithium (Li)	
Sodium (Na)	
Potassium (K)	
1 (b) (iv) Which two statements are correct?	[2 marks]
Tick (✓) two boxes.	-
Iron has a higher density than potassium.	
Iron is softer than potassium.	
Iron reacts vigorously with water.	
Iron forms ions that have different charges.	
Question 1 continues on the next page	



1 (c) Figure 2 shows sodium being put into water.

Figure 2



Describe **three** observations that can be seen when sodium is put into water.

[3 marks]

1	
2	
-	
3	

2	This question is about water.					
2 (a)	Hard water contains dissolved compounds.					
2 (a) (i)	Which ion causes water to be hard?					
	Tick (✓) one box.					
	Ca ²⁺					
	H ⁺					
	Na ⁺					
2 (a) (ii)	The table has three statements about hard water. Tick (\checkmark) one advantage and tick (\checkmark) one disadvantage of using hard water. [2 marks]					
	Advantage Disadvantage Tick (✓) Tick (✓)					
	Hard water is good for the development of bones.					
	Hard water can be distilled to make pure water.					
	Hard water needs more soap to form lather.					
2 (b)	The two types of hard water are permanent hard water and temporary hard water.					
2 (b) (i)	What forms when permanent hard water reacts with soap? [1 mark]					
	Tick (✓) one box.					
	drinking water					
	scale					
	scum					



2 (b) (ii)	What forms when temporary hard	water is boiled?	[1 ma	rk1
	Tick (✓) one box.		[Thu]
	distilled water			
	pure water			
	soft water			
2 (c)	Water filters used in the home ren quality of the tap water.	move some disso	lved compounds and improve the	
	Draw one line from each substant to tap water.	ce in the water fil	ter to the improvement it makes	
	to tap water.		[3 mark	ks]
	Substance in the water filter		Improvement to tap water	
			improves taste	
	carbon		adds fluoride	
	ion-exchange resin		reduces microbes	
		I		
	silver		replaces water molecules	
		I		
			removes hardness	







3	This question is about energy changes in chemical reactions.	
3 (a)	Complete the word equation for the combustion of hydrogen.	[1 mark]
	hydrogen + oxygen ——▶	
3 (b)	Figure 3 shows a simple energy level diagram.	
	Figure 3	
	Reactants A C Products	
3 (b) (i)	Which arrow, A , B or C , shows the activation energy?	[d mank]
	Tick (✓) one box.	[1 mark]
	A	
	В	
	c	
3 (b) (ii)	What type of reaction is shown by the energy level diagram in Figure 3 ? Give a reason for your answer.	[2 marks]
	Type of reaction	
	Reason	



3 (b) (iii) For a reaction, the value of A is 1370 kJ and C is 3230 kJ. Calculate the value of B .		[1 mark]
	D -	
Overtion 2 continues on the most name	B =	KJ
Question 3 continues on the next page		

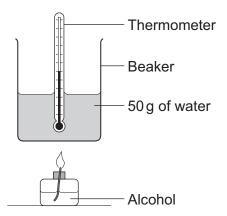


3 (c) Alcohols are used as fuels.

A group of students investigated the amount of energy released when different alcohols are burned.

The students used the apparatus shown in Figure 4.

Figure 4



3 (c) (i) Figure 5 shows the start temperature and the final temperature of the water.

Figure 5

Start temperature Start temperature C - 39 - 39 - 38 - 37

Write the start temperature and the final temperature of the water in **Table 1**. Work out the increase in temperature to complete **Table 1**.

[3 marks]

Table 1

Start temperature of the water in °C	
Final temperature of the water in °C	
Increase in temperature in °C	



3 (c) (ii)	The students worked out the heat energy released by burning 1 g of each alcohol.
	The students used the equation:

Heat energy released = m \times 4.2 \times increase in temperature

Look at Figure 4. What is the value of m?

[1 mark]

m = _____ g

3 (c) (iii) Table 2 shows the students' results.

Table 2

Name of alcohol	Number of carbon atoms in one molecule of alcohol	Heat energy released when 1 g of alcohol is burned in kJ
Methanol	1	11.4
Ethanol	2	14.5
Propanol	3	20.1
Butanol	4	16.8
Pentanol	5	17.2

	Which value of heat energy released is anomalous?	[1 mark]
3 (c) (iv)	Look at Table 2 . What is the relationship between the number of carbon atoms in one molecular.	ule of

What is the relationship between the number of carbon atoms in one molecule of alcohol and the heat energy released when 1 g of the alcohol is burned?

[1 mark]

Question 3 continues on the next page



3 (c) (v) The value in a data book for the amount of heat energy released when 1 g of butanol is burned completely is 36.2 kJ.

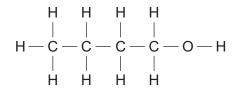
Suggest **two** reasons why the students' result for butanol is lower than the data book value.

[2 marks]

1 ______

2 _____

3 (c) (vi) The displayed structure of butanol is:



What is the functional group of the alcohol?

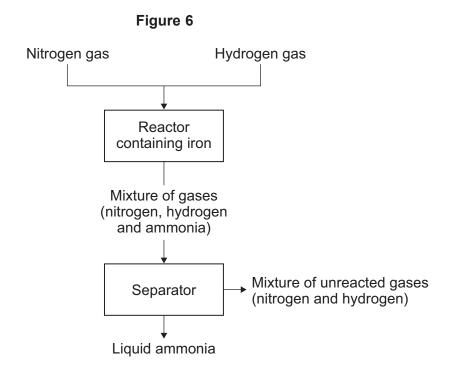
[1 mark]

Tick (\checkmark) one box.

$$-c-c$$

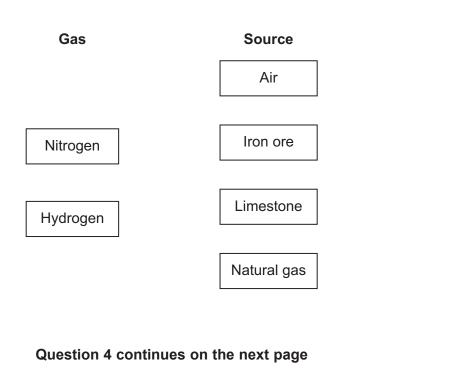
4 This question is about the Haber process.

Figure 6 shows a flow diagram for the Haber process.



4 (a) (i) Nitrogen gas and hydrogen gas are obtained from different sources. Draw **one** line from each gas to its source.

[2 marks]



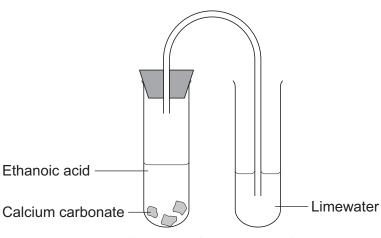


4 (a) (ii)	Explain why iron is used in the reactor for the Haber process.	[2 marks]
4 (a) (iii)	Describe how the ammonia is separated from the other gases.	[2 marks]
4 (a) (iv)	What happens to the mixture of unreacted gases (nitrogen and hydrogen)?	[1 mark]
4 (b)	The reaction to produce ammonia is reversible. Complete the word equation for this reaction.	[2 marks]
	nitrogen +	



- 5 This question is about reactions of ethanoic acid and the analysis of salts.
- **5 (a) Figure 7** shows the apparatus used to investigate the reaction of ethanoic acid with calcium carbonate.





Test tube 1 Test tube 2

5 (a) (i) Describe a change that would be seen in each test tube.

Give a reason for each change.

Γ4	ma	ırk	เรโ
1.			ľ

Test tube 1	 		
Test tube 2			

Question 5 continues on the next page



5 (a) (ii) Complete the displayed structure of ethanoic acid.

[1 mark]



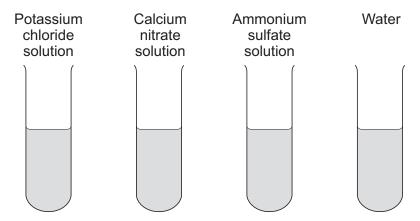
5 (a) (iii) Ethanoic acid is a carboxylic acid. Complete the sentence.

[2 marks]

Carboxylic acids react with alcohols in the presence of an _____ catalyst to produce pleasant-smelling compounds called _____ .

5 (b) Figure 8 shows four test tubes containing three different salt solutions and water.

Figure 8



Each solution and the water was tested with:

- silver nitrate in the presence of dilute nitric acid
- barium chloride in the presence of dilute hydrochloric acid.

Complete the table of results.

[2 marks]

	Potassium chloride solution	Calcium nitrate solution	Ammonium sulfate solution	Water
Test with silver nitrate in the presence of dilute nitric acid			no change	no change
Test with barium chloride in the presence of dilute hydrochloric acid		no change	white precipitate	

5 (c)	Flame tests can be used to identify metal ions.
5 (c) (i)	Complete the following sentences.
	The flame colour for potassium ions is
	The flame colour for calcium ions is
5 (c) (ii)	Give one reason why a flame test would not show the presence of both potassium ions and calcium ions in a mixture.
	[1 mark]

Turn over for the next question

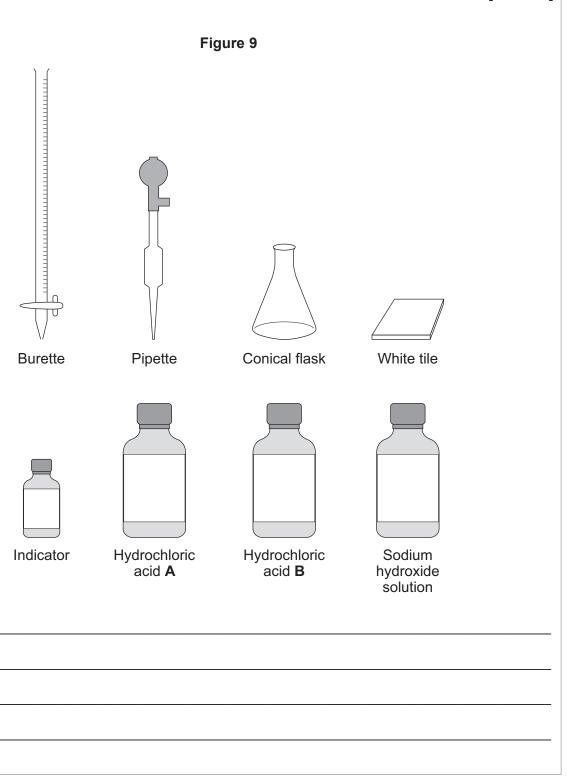
Turn over ▶

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

A student has to check if two samples of hydrochloric acid, **A** and **B**, are the same concentration.

Describe how the student could use the apparatus and the solutions in **Figure 9** to carry out titrations.

[6 marks]





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Extra space			
Extra space	-		
	Extra space		

END OF QUESTIONS



There are no questions printed on this page DO NOT WRITE ON THIS PAGE ANSWER IN THE SPACES PROVIDED

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