

Centre Number						Candidate Number				
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Other Names										
Candidate Signature										



General Certificate of Secondary Education
Higher Tier
June 2015

Science A
Unit Chemistry C1

Chemistry
Unit Chemistry C1

CH1HP
H

Tuesday 9 June 2015 1.30 pm to 2.30 pm

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

For this paper you must have:

- a ruler
 - the Chemistry Data Sheet (enclosed).
- You may use a calculator.

Time allowed

- 1 hour

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 3(b) 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.



J U N 1 5 C H 1 H P O 1

G/KL/110342/Jun15/E3

CH1HP

Answer **all** questions in the spaces provided.

1 This question is about atomic structure and elements.

1 (a) Complete the sentences.

1 (a) (i) The atomic number of an atom is the number of
[1 mark]

1 (a) (ii) The mass number of an atom is the number of
.....
[1 mark]

1 (b) Explain why an atom has no overall charge.

Use the relative electrical charges of sub-atomic particles in your explanation.
[2 marks]

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1 (c) Explain why fluorine and chlorine are in the same group of the periodic table.

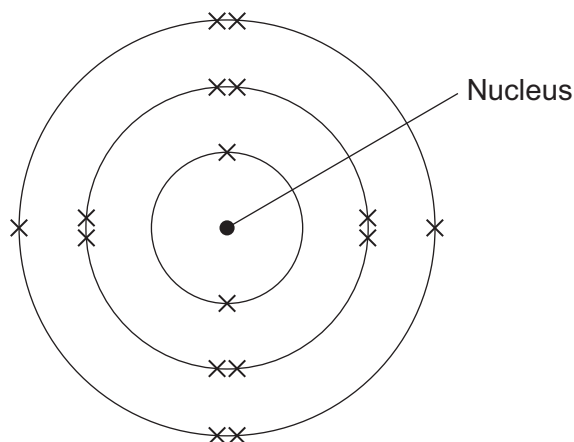
Give the electronic structures of fluorine and chlorine in your explanation.
[2 marks]

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- 1 (d) **Figure 1** shows the electronic structure of an atom of a non-metal.

Figure 1



What is the chemical symbol of this non-metal?

[1 mark]

Tick (✓) **one** box.

Ar ☐

O ☐

S ☐

Si ☐

- 1 (e) When elements react, their atoms join with other atoms to form compounds.

Complete the sentences.

- 1 (e) (i) Compounds formed when non-metals react with metals consist of particles called

[1 mark]

- 1 (e) (ii) Compounds formed from only non-metals consist of particles called

[1 mark]

Turn over ►



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ANSWER IN THE SPACES PROVIDED**



2 Limestone is used to make many different materials.

2 (a) Heating limestone produces calcium oxide and carbon dioxide.

Complete the sentences.

2 (a) (i) The main compound in limestone is calcium
[1 mark]

2 (a) (ii) The reaction to produce calcium oxide from limestone is thermal
[1 mark]

2 (a) (iii) Calcium hydroxide is produced when calcium oxide reacts with
[1 mark]

2 (a) (iv) Calcium hydroxide is used to neutralise acids because it is an
[1 mark]

Question 2 continues on the next page

Turn over ►



2 (b) Cement is made from limestone and clay.

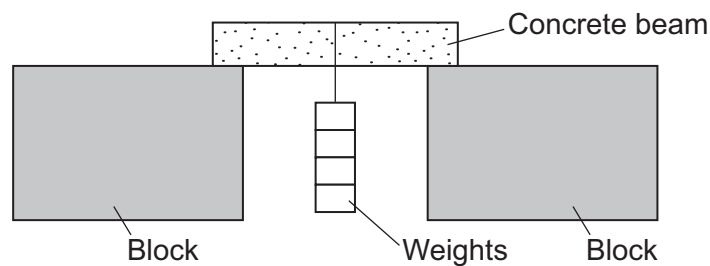
Concrete is made by mixing cement with water, sand and aggregate (small pieces of rock).

A group of students did an investigation on the amount of aggregate needed to make the strongest concrete beam.

The students used this method:

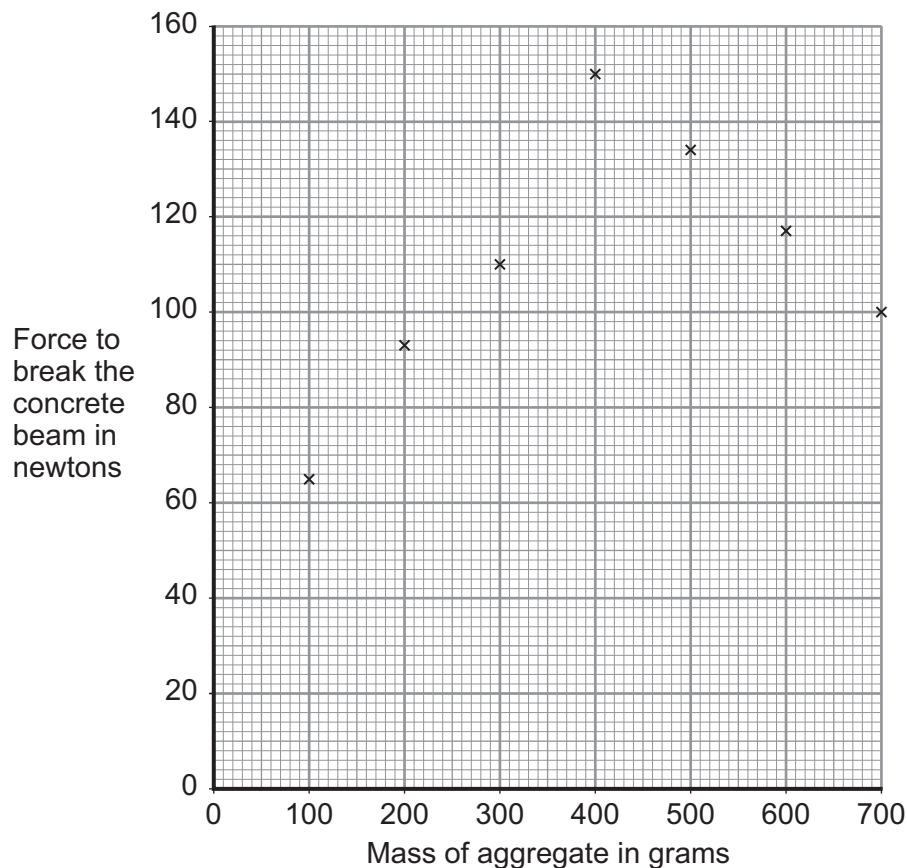
- use the same mass of cement and the same mass of sand but change the mass of aggregate to make seven different concrete mixtures
- use the different concrete mixtures to make beams of the same size
- add weights, as shown in **Figure 2**, until the concrete beam breaks.

Figure 2



The students' results are plotted on the graph in **Figure 3**.

Figure 3



- 2 (b) (i)** One of the points is anomalous.

Complete the graph in **Figure 3** by drawing **two** straight lines of best fit.

[2 marks]

- 2 (b) (ii)** Describe **one** way the students could improve the method so that their results are more accurate for each graph point.

[2 marks]

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- 2 (b) (iii)** What force is needed to break a concrete beam containing no aggregate?

Show your working on the graph.

[2 marks]

Force = ... newtons

- 2 (b) (iv)** One of the students concluded that:

‘The force needed to break a concrete beam increases as the mass of aggregate increases.’

The student’s conclusion is **not completely** correct. Use values from the graph to explain why.

[3 marks]

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3 This question is about life, the Earth and its atmosphere.

3 (a) There are many theories about how life was formed on Earth.

Suggest **one** reason why there are many theories.

[1 mark]

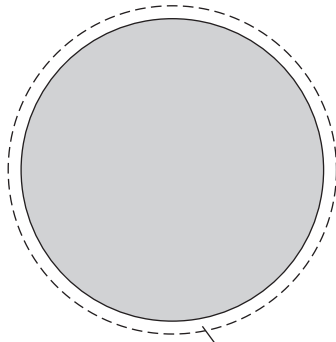
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3 (b) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

This Earth and its atmosphere today are not like the early Earth and its atmosphere.

The early Earth
Most of the surface
was covered by volcanoes



Most of the atmosphere
was carbon dioxide and
water vapour

The Earth today
Most of the surface
is covered by oceans



Most of the atmosphere
is nitrogen and oxygen

Describe and explain how the surface of the early Earth and its atmosphere have changed to form the surface of the Earth and its atmosphere today.

[6 marks]

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Extra space

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Turn over for the next question

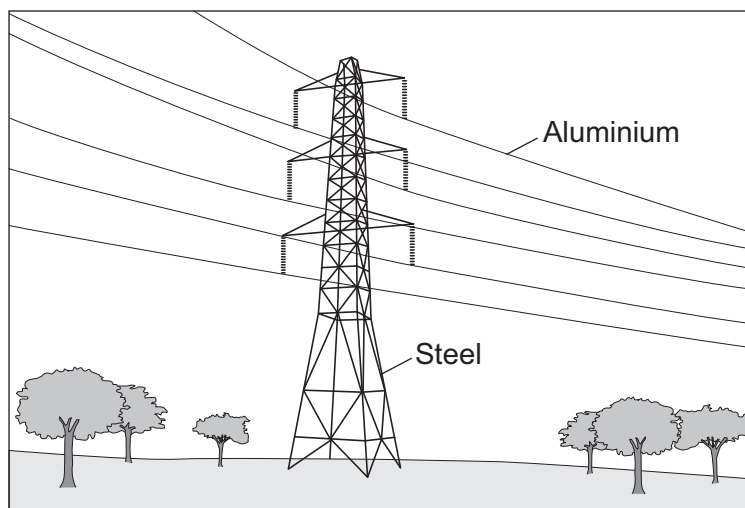
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4 This question is about metals.

Figure 4 shows the metals used to make pylons and the wires of overhead cables.

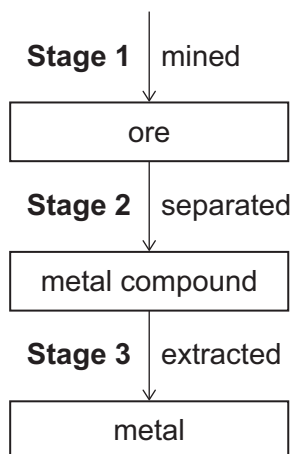
Figure 4



4 (a) An ore contains a metal compound.

A metal is extracted from its ore in three main stages, as shown in **Figure 5**.

Figure 5



Explain why **Stage 2** needs to be done.

[2 marks]

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4 (b) Cast iron from a blast furnace contains 96% iron and 4% carbon.

4 (b) (i) Cast iron is not suitable for the manufacture of pylons.

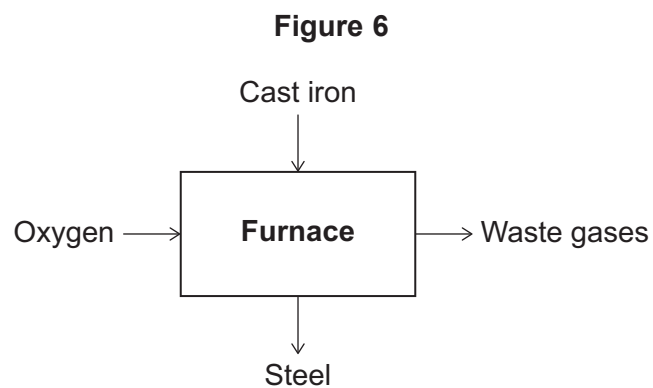
Give **one** reason why.

[1 mark]

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4 (b) (ii) Most cast iron is converted into steel, as shown in **Figure 6**.



Describe how cast iron is converted into steel.

Use **Figure 6** to help you to answer this question.

[2 marks]

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Question 4 continues on the next page

Turn over ►



4 (c) Aluminium and copper are good conductors of electricity.

4 (c) (i) State **one** property that makes aluminium more suitable than copper for overhead cables.

[1 mark]

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4 (c) (ii) How can you tell that copper is a transition metal and aluminium is **not** a transition metal from the position of each metal in the periodic table?

[2 marks]

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4 (c) (iii) Copper can be extracted from solutions of copper salts by adding iron.

Explain why.

[2 marks]

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5 Crude oil is a fossil fuel.

5 (a) Describe how crude oil is separated into fractions.

[4 marks]

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5 (b) Fuel oil is one of the fractions from crude oil.

Power stations burn fuel oil to generate electricity. The waste gases from the combustion of fuel oil contain carbon dioxide, water vapour, sulfur dioxide and oxides of nitrogen.

The waste gases are passed through a suspension of limestone in water. Limestone is mainly calcium carbonate.

Suggest how the use of a suspension of limestone decreases one of the environmental impacts that the waste gases would cause.

[3 marks]

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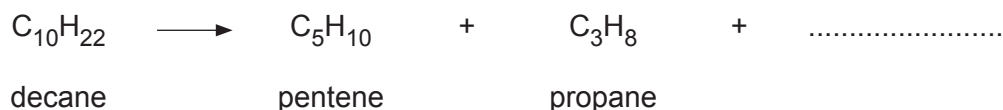
5 (c) Some fractions from crude oil contain large hydrocarbon molecules.

5 (c) (i) Hydrocarbon molecules, such as decane, can be cracked to produce smaller, more useful molecules.

Write the correct formula of the third product to complete the chemical equation.

You do not need to give the name of this product.

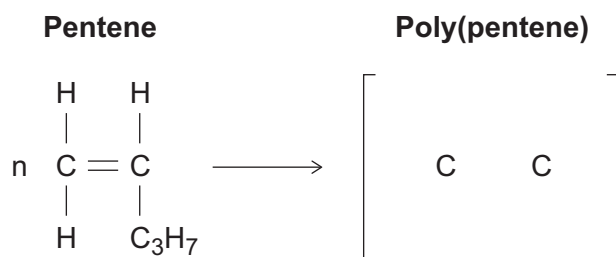
[1 mark]



5 (c) (ii) Pentene is used to produce poly(pentene).

Complete the equation and the displayed structure of poly(pentene).

[3 marks]



5 (c) (iii) Some polymers are described as smart polymers.

Suggest **one** property of a smart polymer that is different to that of an ordinary polymer.

[1 mark]

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12

Turn over for the next question

Turn over ►



6 Useful materials, including foods and fuels, are produced from plants.

6 (a) Some plants have seeds that contain vegetable oils.

6 (a) (i) Give **one** reason why vegetable oils are important foods and fuels.

[1 mark]

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6 (a) (ii) State the **two** main stages used to extract a sample of vegetable oil from seeds.

[2 marks]

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6 (b) One property of a vegetable oil gives the oil an advantage over water for cooking foods.

Explain how.

[2 marks]

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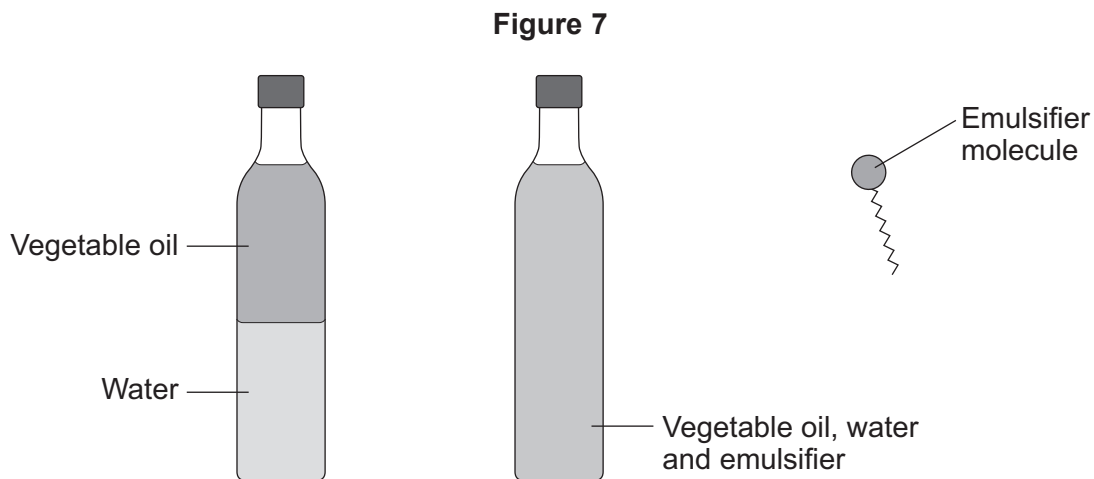
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6 (c) Vegetable oils and water do not mix.

An emulsion is made by shaking a vegetable oil and water with an emulsifier, as shown in **Figure 7**.



Explain how the emulsifier molecules are able to produce an emulsion that is a stable mixture containing the vegetable oil and water.

Use the diagram of the emulsifier molecule to help you to answer this question.

[4 marks]

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END OF QUESTIONS



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