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Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Chemistry Paper 1F

Thursday 17 May 2018

Morning

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the periodic table (enclosed).

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



J U N 1 8 8 4 6 4 C 1 F 0 1

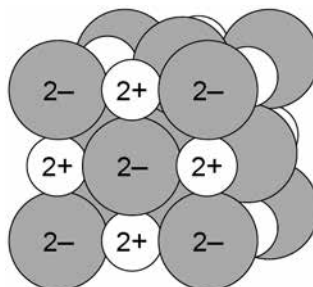
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0 1

This question is about structure and bonding.

0 1 . 1

Figure 1 shows part of the structure of calcium oxide (CaO).**Figure 1**

What type of bonding is present in calcium oxide?

[1 mark]Tick **one** box.

Covalent

☐

Ionic

☐

Macromolecular

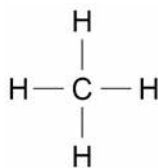
☐

Metallic

☐

0 1 . 2 Figure 2 shows a particle of methane (CH_4).

Figure 2



What type of particle is present in **Figure 2**?

[1 mark]

Tick **one** box.

An ion

☐

A lattice

☐

A molecule

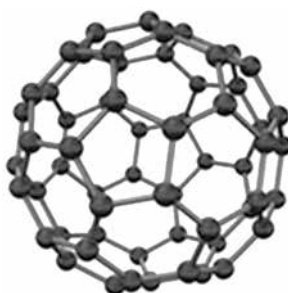
☐

A polymer

☐

0 1 . 3 Figure 3 shows the structure of C_{60}

Figure 3



Complete the sentence.

Choose the answer from the box.

[1 mark]

diatomic

giant ionic

a fullerene

giant metallic

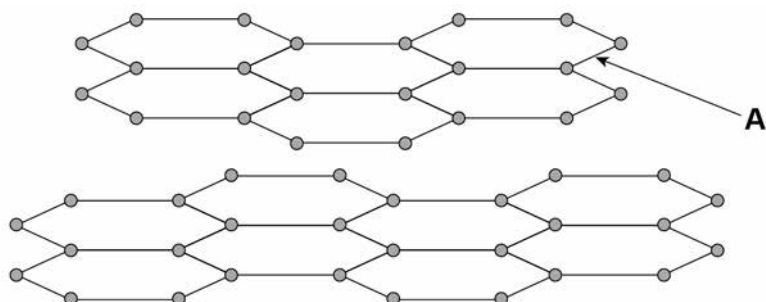
The structure of C_{60} is _____.

Turn over ►



Figure 4 shows the structure of graphite.

Figure 4



0 1 . 4 What type of bond is labelled **A** in **Figure 4**?

[1 mark]

Tick **one** box.

covalent

☐

double

☐

ionic

☐

metallic

☐

0 1 . 5 In graphite, each carbon atom forms bonds with other carbon atoms as shown in **Figure 4**

How many electrons does **one** carbon atom use to form **one** bond?

[1 mark]

Tick **one** box.

1

☐

2

☐

3

☐

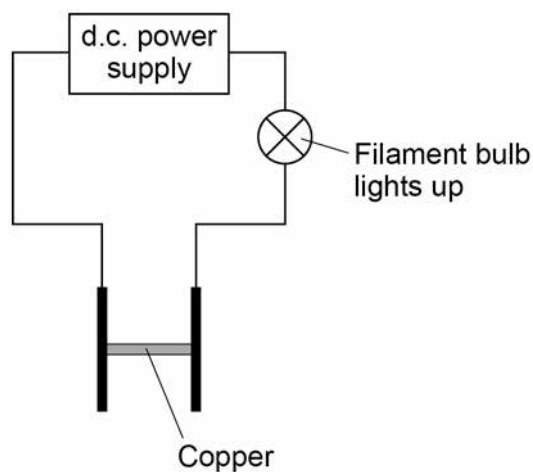
4

☐


An electric current is passed through copper.

Figure 5 shows the apparatus used.

Figure 5



0 1 . 6

Complete the sentence.

Choose the answer from the box.

[1 mark]

gas	liquid	solid	solution
-----	--------	-------	----------

Figure 5 shows that copper conducts electricity as a _____.

0 1 . 7

Complete the sentence.

Choose the answer from the box.

[1 mark]

atoms	electrons	ions	molecules
-------	-----------	------	-----------

Copper conducts electricity because of the movement of delocalised _____.

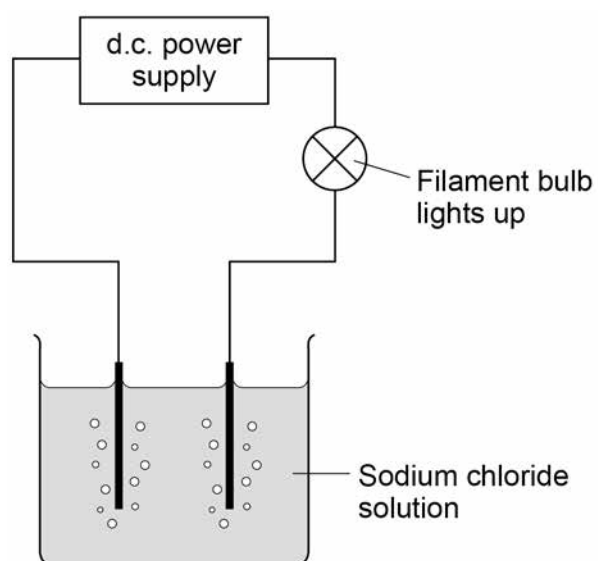
Turn over ►



0 1 . 8

Figure 6 shows the apparatus used to investigate the effect of electricity on sodium chloride solution.

Figure 6



Complete the sentence.

Choose the answer from the box.

[1 mark]

dissolved

gaseous

molten

Figure 6 shows that sodium chloride conducts electricity when _____.



0 1 . 9 Sodium chloride is made up of ions.

Figure 7 shows the apparatus used to investigate the effect of electricity on solid sodium chloride and molten sodium chloride.

Figure 7

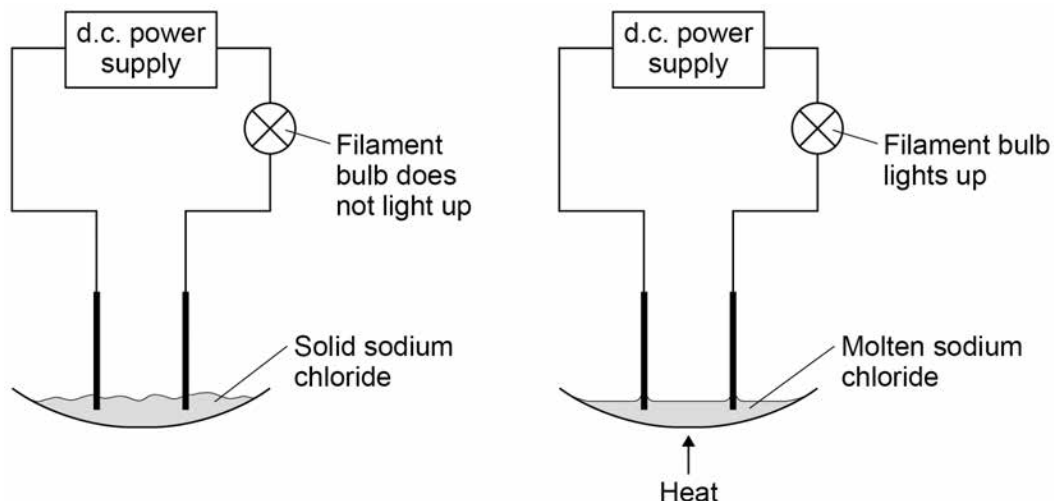


Table 1 shows the results.

Table 1

	Solid sodium chloride	Molten sodium chloride
Observation	The filament bulb does not light up	The filament bulb lights up
Deduction	Does not conduct electricity	Does conduct electricity

Draw **one** line from each statement to the correct reason.

[2 marks]

Statement

Reason

Solid sodium chloride does not conduct electricity.

The ions are fixed.

The ions are mobile.

Molten sodium chloride conducts electricity.

The ions are neutral.

The ions are vibrating.



0 2

This question is about the halogens.

0 2 . 1

Which group in the periodic table is known as the halogens?

[1 mark]

Tick **one** box.

Group 1

☐

Group 2

☐

Group 7

☐

Group 0

☐

0 2 . 2

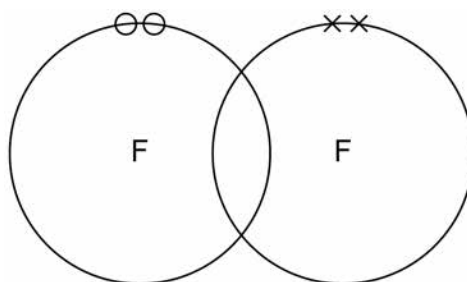
A fluorine atom has 7 electrons in the outer shell.

Figure 8 shows part of a dot and cross diagram to represent a molecule of fluorine (F_2).

Complete the dot and cross diagram.

You should show only the electrons in the outer shells.

[2 marks]

Figure 8

0 2 . 3

Chlorine reacts with potassium bromide solution.

Complete the word equation.

[2 marks]

chlorine + potassium bromide → _____ + _____



0 2 . 4 What type of reaction happens when chlorine reacts with potassium bromide solution? **[1 mark]**

Tick **one** box.

decomposition

☐

displacement

☐

neutralisation

☐

precipitation

☐

0 2 . 5 Complete the sentence.

Choose the answer from the box.

[1 mark]

an atom

an electron

a neutron

a proton

Chlorine is more reactive than bromine.

This is because chlorine gains _____ more easily.

0 2 . 6 How does the size of a chlorine atom compare with the size of a bromine atom?

Complete the sentence.

Choose the answer from the box.

[1 mark]

bigger than

the same size as

smaller than

A chlorine atom is _____ a bromine atom.

Turn over ►



[1 mark]

[1 mark]

$$\text{Cl}_2 + \quad \text{F}_2 \rightarrow 2 \text{ClF}_3$$

Use the following words in your answer:

weak

[3 marks]

[illegible]

0 3

This question is about acids and bases.

0 3 . 1

Which ion is found in all acids?

[1 mark]Tick **one** box.

Cl^- ☐
 H^+ ☐
 Na^+ ☐
 OH^- ☐

0 3 . 2

Zinc nitrate can be produced by reacting an acid and a metal oxide.

Name the acid and the metal oxide used to produce zinc nitrate.

[2 marks]

Acid _____

Metal oxide _____

0 3 . 3In an equation, zinc nitrate is written as $\text{Zn}(\text{NO}_3)_2(\text{aq})$.

What does (aq) mean?

[1 mark]Tick **one** box.Dissolved in water ☐Insoluble ☐Not all reacted ☐Reactant ☐**0 3 . 4**

The pH of a solution is 8

Some hydrochloric acid is added to the solution.

Suggest the pH of the solution after mixing.

[1 mark]

pH = _____

Turn over ►

0 3 . 5 **Table 2** shows the solubility of three solids in water at room temperature.

Table 2

Solid	The mass of the solid that dissolves in 100 cm ³ of water
Phosphorus oxide	50 g
Silicon dioxide	0 g
Sodium hydroxide	100 g

A teacher labelled these three solids **A**, **B** and **C**.

She gave a student the information shown in **Table 3**

Table 3

Solid	Observation when added to water	pH of the solid in water
A	colourless solution	14
B	colourless solution	2
C	solid does not dissolve	7

Describe a method that could be used to identify each of the three solids **A**, **B** and **C**.

You must use an indicator in the method.

Use information in **Table 2** and **Table 3**

[4 marks]



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[illegible]

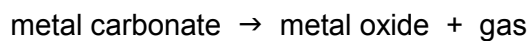
[1 mark]

A ☐ **B** ☐ **C** ☐ **D** ☐

Turn over ►



Group 2 metal carbonates break down when heated to produce a metal oxide and a gas.



0 4 . 2 Name the two products when calcium carbonate (CaCO_3) is heated.

[2 marks]

_____ and _____

0 4 . 3 What type of reaction happens when a compound breaks down?

[1 mark]

Tick **one** box.

burning

☐

decomposition

☐

neutralisation

☐

reduction

☐

0 4 . 4 The metal carbonate takes in energy from the surroundings to break down.

What type of reaction takes in energy from the surroundings?

[1 mark]

Tick **one** box.

combustion

☐

electrolysis

☐

endothermic

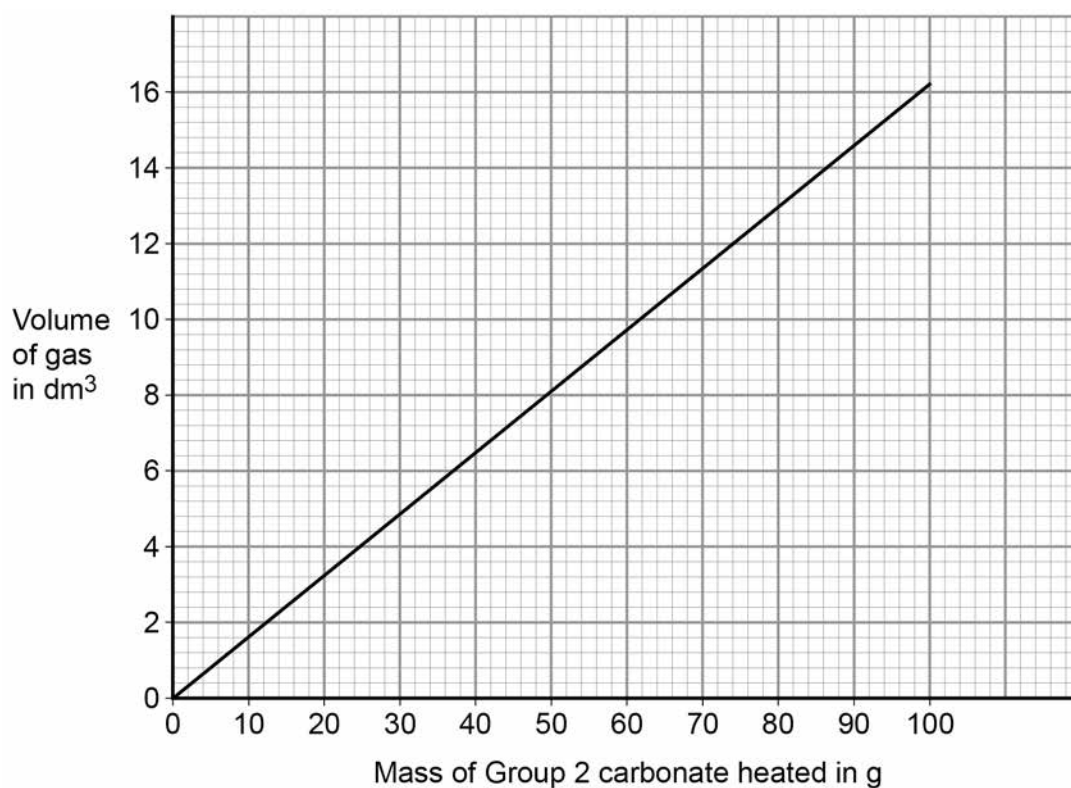
☐

exothermic

☐

0 4 . 5

Figure 10 shows the volume of gas produced when a Group 2 metal carbonate is heated.

Figure 10

The student collected 5.2 dm³ of gas.

What mass of the Group 2 metal carbonate is heated?

[1 mark]

Mass = _____ g

0 4 . 6

Calculate the mass of the Group 2 carbonate needed to produce 24 dm³ of gas.

Use your answer from question **04.5** to help you.

[2 marks]

Mass = _____ g

Turn over ►

0 4 . 7

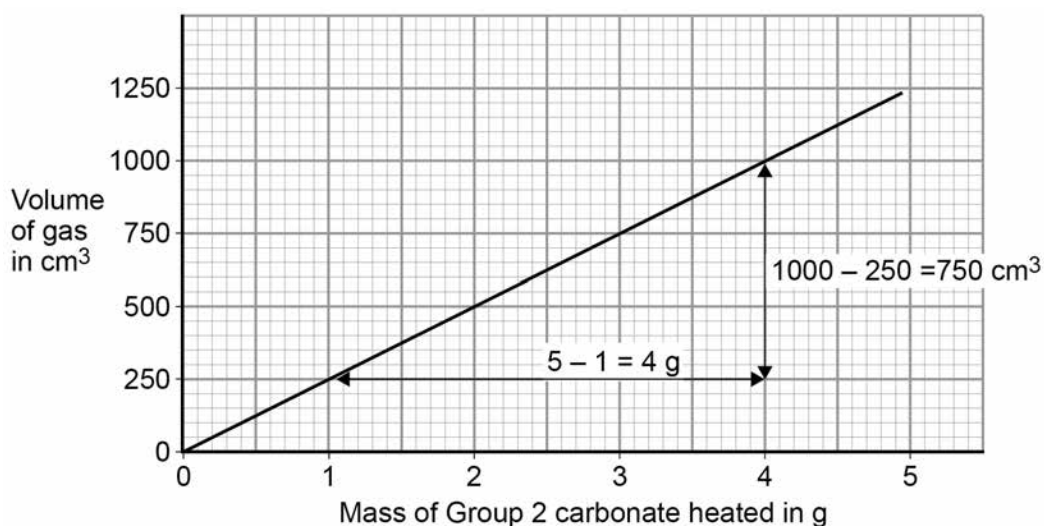
A student heated different masses of a Group 2 carbonate. The student measured the volume of gas produced.

Figure 11 shows a graph of the student's results.

The student calculates the gradient of the line in **Figure 11**

The student makes **two** mistakes.

Figure 11



Correct formula for gradient = $\frac{\text{Increase in volume of gas}}{\text{Increase in mass of Group 2 metal carbonate heated}}$

Student's calculation = $\frac{4}{750} = 0.00533 \text{ cm}^3 \text{ per g}$

Identify the **two** mistakes the student makes.

Calculate the correct gradient of the line.

[4 marks]

Mistake 1 _____

Mistake 2 _____

Calculation _____

Gradient = _____ $\text{cm}^3 \text{ per g}$



0 4 . 8

A student repeated the experiment with a different Group 2 metal carbonate (XCO_3).

The relative formula mass (M_r) of XCO_3 is 84

Relative atomic masses (A_r): C = 12 O = 16

Calculate the relative atomic mass (A_r) of X.

Name metal X.

Use the periodic table.

[4 marks]

Relative atomic mass (A_r) = _____

Metal X is _____

16

Turn over for the next question

Turn over ►

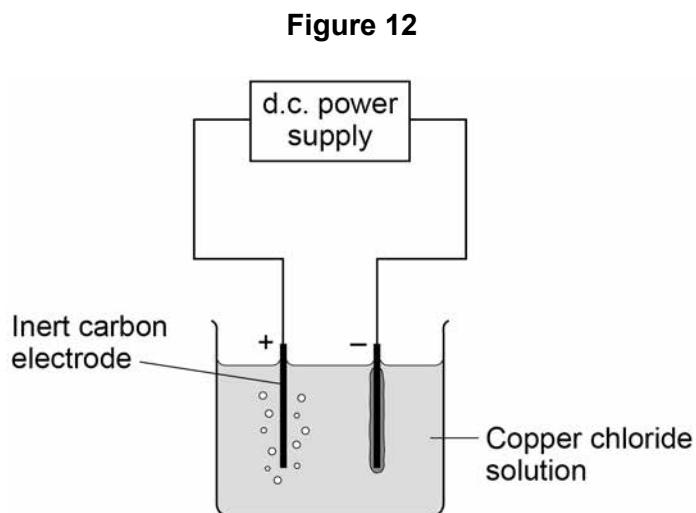


0 5

This question is about electrolysis.

A student investigates the mass of copper produced during electrolysis of copper chloride solution.

Figure 12 shows the apparatus.

**0 5****1**

Which gas is produced at the positive electrode (anode)?

[1 mark]

Tick **one** box.

carbon dioxide

☐

chlorine

☐

hydrogen

☐

oxygen

☐

0 5 . 2 Copper is produced at the negative electrode (cathode).

What does this tell you about the reactivity of copper?

[1 mark]

Tick **one** box.

Copper is less reactive than hydrogen

☐

Copper is less reactive than oxygen

☐

Copper is more reactive than carbon

☐

Copper is more reactive than chlorine

☐

Table 4 shows the student's results.

Table 4

	Total mass of copper produced in mg			
Time in mins	Experiment 1	Experiment 2	Experiment 3	Mean
1	0.60	0.58	0.62	0.60
2	1.17	1.22	1.21	1.20
4	2.40	2.41	2.39	2.40
5	3.02	X	3.01	3.06

0 5 . 3 Determine the **mean** mass of copper produced after 3 minutes.

[1 mark]

Mass = _____ mg

Question 5 continues on the next page

Turn over ►



0 5 . 4

Calculate the mass **X** of copper produced in **Experiment 2** after 5 minutes.Use **Table 4** on page 19**[2 marks]**

Mass **X** = _____ mg

0 5 . 5

The copper chloride solution used in the investigation contained 300 grams per dm^3 of solid CuCl_2 dissolved in 1 dm^3 of water.The students used 50 cm^3 of copper chloride solution in each experiment.

Calculate the mass of solid copper chloride used in each experiment.

[3 marks]

Mass = _____ g



Figure 13 shows the positions of sodium and chlorine in the periodic table.

[2 marks]

Similarity _____

[4 marks]

[illegible]

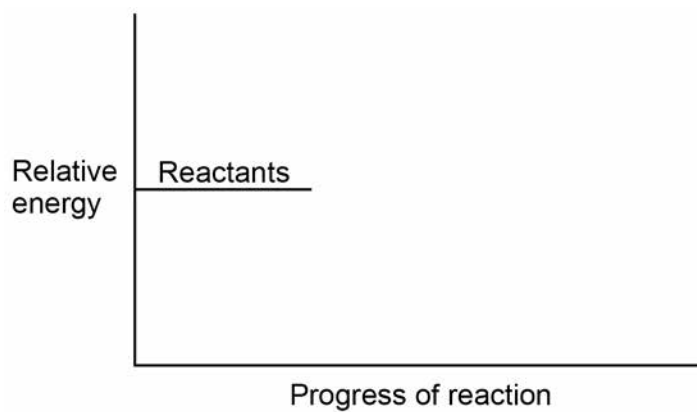
0 6 . 3

The reaction between sodium and chlorine is an exothermic reaction.

Complete the reaction profile for the reaction between sodium and chlorine.

[2 marks]

Figure 14



8



6



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