Centre No.						Paper Reference						Surname		Initial(s)	
Candidate No.						**7**	**0**	**8**	**1**	**/**	**0 1**	Signature			

Paper Reference(s)

7081/01

London Examinations GCE

Chemistry

Ordinary Level

Paper 1

Wednesday 20 May 2009 – Afternoon

Time: 1 hour 15 minutes

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
Total	

Materials required for examination	**Items included with question papers**
Nil	Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

Information for Candidates

A Periodic Table is printed on the back cover of this question paper.
Calculators may be used.
The total mark for this paper is 100.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 14 questions in this question paper. Any blank pages are indicated.

DATA

One mole of any gas occupies 24 000 cm^3 at room temperature and atmospheric pressure.
One mole of electrons carries a charge of 96 500 coulombs or 1 faraday.

Advice to Candidates

Write your answers neatly and in good English.
In calculations, show **all** the steps in your working.

Printer's Log. No.

N31493A

Turn over

edexcel
advancing learning, changing lives

Answer ALL the questions.

1. Complete the table.

Name of compound	Formula of compound	Formula of cation	Formula of anion
calcium bromide	$CaBr_2$	Ca^{2+}	Br^-
ammonium sulphate			SO_4^{2-}
tin(II) nitrate	$Sn(NO_3)_2$		
	Fe_2O_3		O^{2-}
sodium phosphate	Na_3PO_4	Na^+	

(Total 7 marks)

2. Complete the following sentences by inserting the name or formula of the appropriate element or compound.

(a) When magnesium reacts with ...., the products

are magnesium chloride and .... gas.

(2)

(b) A gas that burns in air to form water as the only product

is ....

(1)

(c) When sodium nitrate is heated strongly, ... gas

is evolved.

(1)

(d) When copper reacts with nitric acid, the brown

gas .... is evolved.

(1)

(e) When sulphur dioxide dissolves in aqueous sodium hydroxide, the products are

....

and water.

(1)

(Total 6 marks)

Q2

3. The following table shows the properties of five substances labelled **A** to **E**.

Substance	Melting point (°C)	Boiling point (°C)	Electrical conductivity		Effect of heating in air
			When solid	When molten	
A	−157	−152	poor	poor	no reaction
B	650	1105	good	good	burns to form a solid oxide
C	765	1405	poor	good	no reaction
D	−130	36	poor	poor	burns to form two products
E	114	444	poor	poor	burns to form an acidic gas

Put a cross (☒) in the correct box to indicate which substance (**A, B**, **C**, **D** or **E**) could be:

(a) a metal

   A   **B**   **C**   **D**   **E**

   ☒   ☒   ☒   ☒   ☒

(1)

(b) a non-metal

   A   **B**   **C**   **D**   **E**

   ☒   ☒   ☒   ☒   ☒

(1)

(c) a noble gas

   A   **B**   **C**   **D**   **E**

   ☒   ☒   ☒   ☒   ☒

(1)

(d) a hydrocarbon

   A   **B**   **C**   **D**   **E**

   ☒   ☒   ☒   ☒   ☒

(1)

(e) an ionic solid

   A   **B**   **C**   **D**   **E**

   ☒   ☒   ☒   ☒   ☒

(1)

Q3

(Total 5 marks)

4. Use the Periodic Table on page 20 to help you complete the following statements.

(a) The relative atomic mass of iodine is

....

(1)

(b) The number of electrons in an atom of zinc is

....

(1)

(c) The number of neutrons in an atom of potassium is

....

(1)

(d) The number of electrons in the outer shell of an atom of lead is

....

(1)

(e) The number of electrons in an ion of calcium is

....

(1)

(f) The electronic configuration of an atom of sulphur is

....

(1)   Q4

(Total 6 marks)

5. Complete the following statements by inserting the missing **colours**.

    (a) When magnesium ribbon is burned in air, a .... solid is formed.

                                                             (1)

    (b) On heating, iodine sublimes to form a .... vapour.

                                                             (1)

    (c) When aqueous ammonia is added to aqueous copper(II) sulphate,

        a .... precipitate is formed which dissolves in excess

        ammonia to form a .... solution.

                                                             (2)

    (d) When chlorine is passed into aqueous sodium bromide, the colourless solution turns ....

                                                             (1)

    (e) When anhydrous cobalt chloride is dissolved in water, a .... solution is formed.

                                                             (1)

    (f) When carbon dioxide is bubbled through aqueous calcium hydroxide, a .... precipitate is formed.

                                                             (1)   **Q5**

(Total 7 marks)

6. (a) Balance the equations.

(i) .... $NaOH + Al(NO_3)_3 \rightarrow Al(OH)_3 + $ .... $NaNO_3$

(1)

(ii) $2Ca(NO_3)_2 \rightarrow$ .... $CaO + $ .... $NO_2 + O_2$

(1)
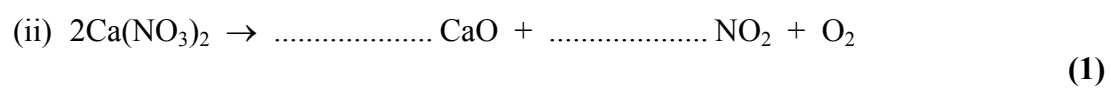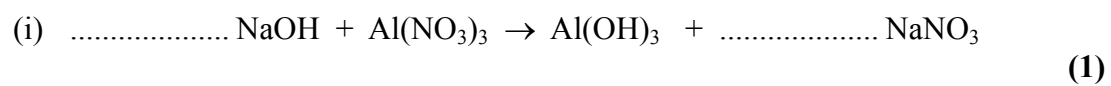
(b) Write a balanced equation for each of the following reactions.

(i) The reaction of aluminium with bromine to form aluminium bromide.

....

(2)

(ii) The reaction of calcium hydroxide with ammonium chloride to form calcium chloride, ammonia and water.

....

(2)
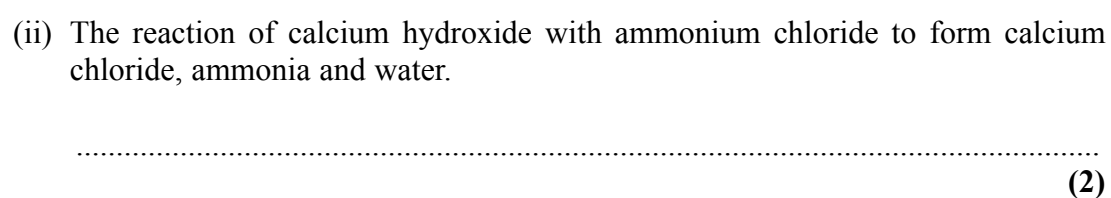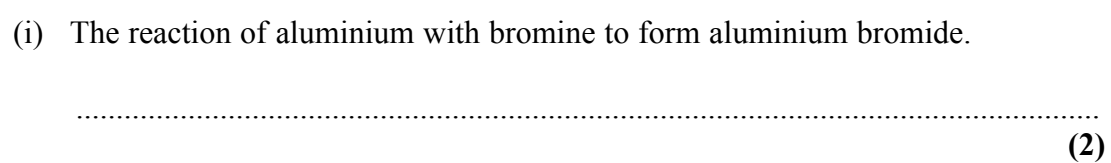
(c) Write the following equation as an ionic equation, showing only the ions involved in the reaction.

$Ca(NO_3)_2(aq) + Na_2CO_3(aq) \rightarrow CaCO_3(s) + 2NaNO_3(aq)$

....

(2) Q6
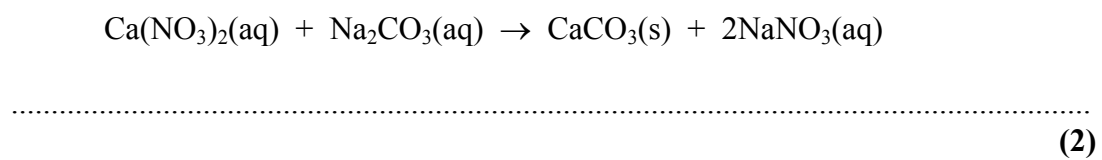
(Total 8 marks)

7. (a) Three experiments were set up to investigate the rate of rusting of iron under different conditions. Each involved an iron nail being placed in a test tube of water open to the air.

Experiment 1: an iron nail only.

Experiment 2: an iron nail with magnesium ribbon wrapped around it.

Experiment 3: an iron nail with copper wire wrapped around it.

(i) Arrange the experiments in order of rate of rusting, starting with the one that will rust fastest.

....
(1)

(ii) Give the reason for the slow reaction in the experiment where rusting is the slowest.

....

....

....
(2)

(b) (i) Draw a labelled diagram for an experiment to show that an iron nail will **not** rust in air if there is no water present.

(2)

(ii) Draw a labelled diagram for an experiment to show that an iron nail will **not** rust in water if there is no air present.
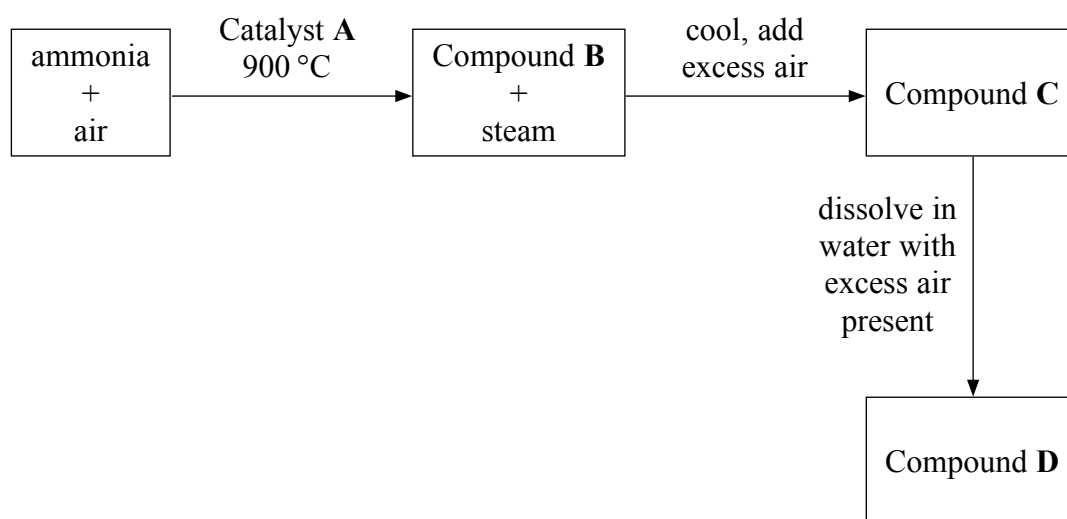
(2)

Q7

(Total 7 marks)

N 3 1 4 9 3 A 0 9 2 0

8. Identify, by name or formula, **A** to **D** in the following reaction scheme.

```
┌──────────┐   Catalyst A    ┌────────────┐   cool, add    ┌────────────┐
│ ammonia  │    900 °C       │ Compound B │   excess air   │            │
│    +     │ ──────────────▶ │     +      │ ─────────────▶ │ Compound C │
│   air    │                 │   steam    │                │            │
└──────────┘                 └────────────┘                └────────────┘
                                                                  │
                                                         dissolve in
                                                         water with
                                                         excess air
                                                         present
                                                                  │
                                                                  ▼
                                                           ┌────────────┐
                                                           │ Compound D │
                                                           └────────────┘
```

A ....

B ....

C ....

D ....

(Total 4 marks)

9. A white powder was thought to be potassium sulphite.

(a) When aqueous hydrochloric acid was added to the powder, a pungent smelling gas was evolved that turned blue litmus red.

Identify the gas and give a further chemical test that would confirm its identity.

Identity of gas: ....

Test: ....

....

Results: ....

(3)

(b) Give a test to show that the powder contains potassium ions.

Test: ....

Result: ....

(2)

(Total 5 marks)

10. Use the information in the table to answer the questions below.

Test	Solution of hydrogen chloride in water	Solution of hydrogen chloride in methylbenzene
Electrical conductivity	good	poor
Reaction with sodium carbonate	Bubbles of colourless gas evolved	No reaction

(a) State what the electrical conductivity indicates about the **type** of particles present in each solution of hydrogen chloride.

Solution in water: ....

Solution in methylbenzene: ....

(2)

(b) (i) Identify the particle responsible for the reaction of the aqueous solution of hydrogen chloride with sodium carbonate. Write an equation for the reaction of this particle with the CO_3^{2-} ion; include state symbols.

Particle: ....

Equation: ....

(3)

(ii) Explain why sodium carbonate has no reaction with the solution of hydrogen chloride in methylbenzene.

....

....

(1)

(Total 6 marks)

11. An excess of marble chips, $CaCO_3$, was added to aqueous nitric acid in a conical flask at room temperature. A plug of cotton wool was placed in the neck of the flask and the flask was weighed every minute for six minutes. The results are shown below.

Time/min	0	1	2	3	4	5	6
Loss in mass/g	0.00	0.56	0.87	1.00	1.06	1.08	1.08

The equation for the reaction is

$$CaCO_3(s) + 2HNO_3(aq) \rightarrow Ca(NO_3)_2(aq) + CO_2(g) + H_2O(l)$$
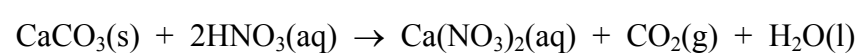
(a) State why the mass of the flask and contents decreased.

....

(1)

(b) Why was a plug of cotton wool used?

....

(1)

(c) Plot the results on the grid below and draw a line of best fit through the points.

Loss in mass / g

Time / min
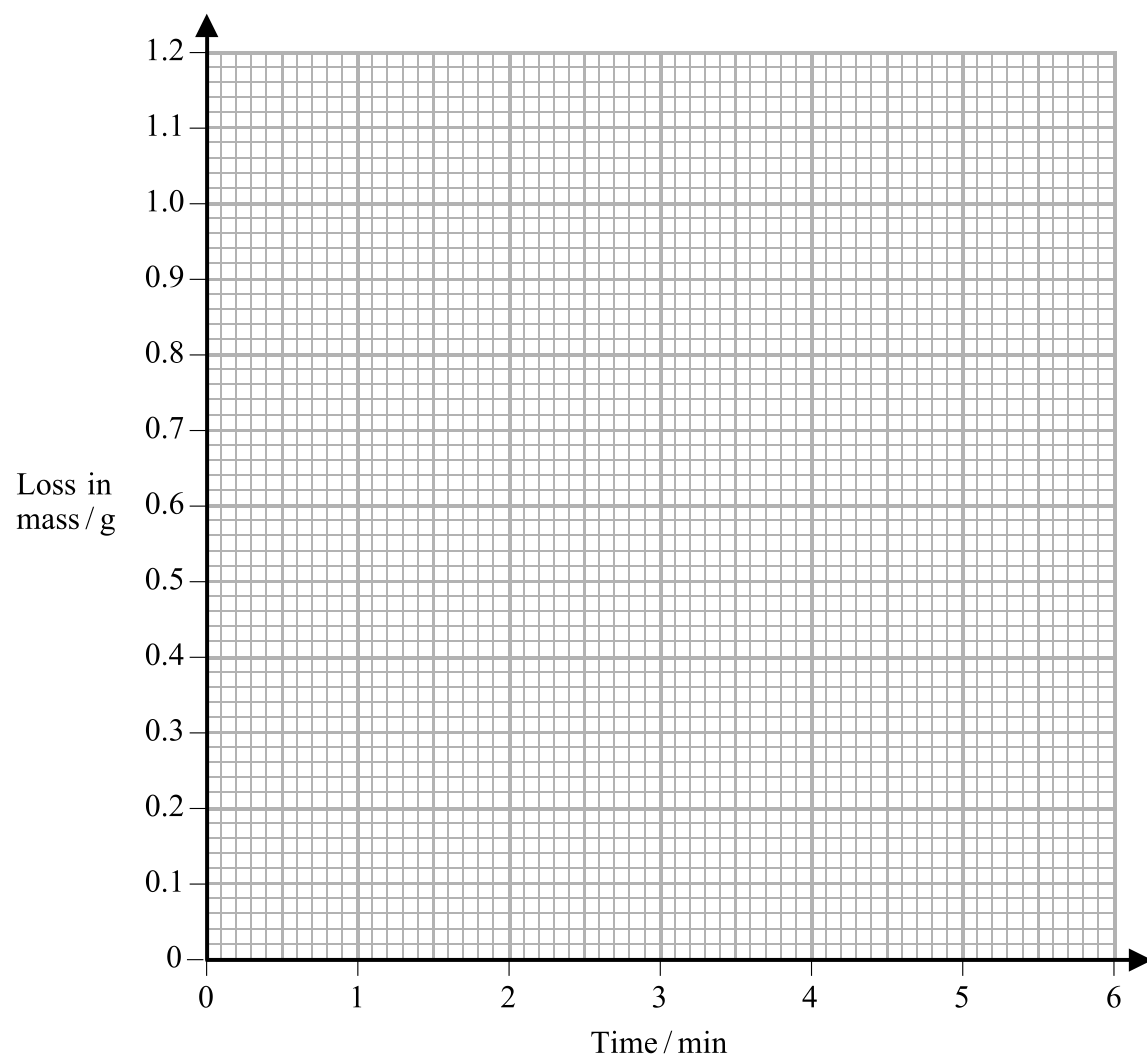
(3)

(d) (i) Use the graph to describe how the rate of reaction changes during the experiment.

....

....

(1)

(ii) Explain in terms of collision theory why the rate changes during the experiment.

....

....

....

(2)

(e) State **two** ways by which the rate of reaction could be increased.

....

....

....

(2)

(f) Calculate the volume of carbon dioxide produced in 1 minute at room temperature and atmospheric pressure.

....

....

....

(2)

(Total 12 marks)

Q11

12. (a) Two types of uranium atoms are $^{235}_{92}U$ and $^{238}_{92}U$.

   (i) What is the name given to these two types of atoms?

   ....

   (1)

   (ii) Complete the table to show the numbers of protons, neutrons and electrons in each atom.

	protons	neutrons	electrons
$^{235}_{92}U$			
$^{238}_{92}U$			

   (3)

   (iii) Explain why the two atoms have the same chemical properties.

   ....

   ....

   (1)

   (b) One mole of a substance contains a number of specified particles equal to the Avogadro Constant, L.

   State, in terms of L, the number of

   (i) atoms in 20 g of neon:

   ....

   (1)

   (ii) molecules in 20 g of hydrogen gas:

   ....

   (1)

   (iii) electrons needed to discharge 2 moles of Zn^{2+} ions during electrolysis.

   ....

   (1)

   (Total 8 marks)

13. (a) Nylon is a polyamide that can be made from the monomers below.

$$HOOC(CH_2)_4COOH \qquad H_2N(CH_2)_6NH_2$$

(i) Complete the central section to show the arrangement of all the bonds in the missing part of the polymer chain of nylon.

$$—\overset{\displaystyle}{\underset{\displaystyle O}{C}}—(CH_2)_4—\; .... \;—(CH_2)_6—\overset{\displaystyle}{\underset{\displaystyle H}{N}}—$$
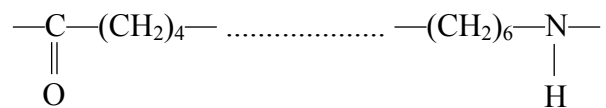
(1)

(ii) What is the name given to this type of polymerisation?

....

(1)

(b) Chloroethene, $CH_2\!=\!CHCl$, can be polymerised to form poly(chloroethene).

(i) Draw the displayed formula of chloroethene.

(1)

(ii) Draw the displayed formula of the repeating unit in poly(chloroethene).

(1)

(iii) What is the name given to this type of polymerisation?

....

(1)

(iv) Use chloroethene and poly(chloroethene) to explain the difference between the terms *saturated* and *unsaturated*.

Chloroethene: ....

....

Poly(chloroethene): ....

....

(2)

(v) Draw the displayed formula for the product of the reaction between chloroethene and chlorine.

(1)

Q13

(Total 8 marks)

14. (a) Give two differences in physical properties between a metal and a non-metal.

Difference 1: ....

....

Difference 2: ....

....

(2)

(b) Write an equation for and name the product of the reaction that takes place when water is added to

(i) calcium oxide

Equation ....

Name of product ....

(2)

(ii) sulphur dioxide

Equation...

Name of product...

(2)

(c) Calcium oxide is an ionic compound.

  (i) Draw the full electron arrangement of the calcium ion and the oxide ion present in calcium oxide. Include the charges on the ions.

calcium ion   oxide ion

(4)

  (ii) Explain what is meant by an **ionic bond**.

....

....

(1)   **Q14**

(Total 11 marks)

TOTAL FOR PAPER: 100 MARKS

END

THE PERIODIC TABLE

Period

Group							
1	2		3	4	5	6	7	0

1

| 1 H Hydrogen 1 | | | | | | | | 2 He Helium 4 |

2

| 3 Li Lithium 7 | 4 Be Beryllium 9 | | 5 B Boron 11 | 6 C Carbon 12 | 7 N Nitrogen 14 | 8 O Oxygen 16 | 9 F Fluorine 19 | 10 Ne Neon 20 |

3

| 11 Na Sodium 23 | 12 Mg Magnesium 24 | | 13 Al Aluminium 27 | 14 Si Silicon 28 | 15 P Phosphorus 31 | 16 S Sulphur 32 | 17 Cl Chlorine 35.5 | 18 Ar Argon 40 |

4

| 19 K Potassium 39 | 20 Ca Calcium 40 | 21 Sc Scandium 45 | 22 Ti Titanium 48 | 23 V Vanadium 51 | 24 Cr Chromium 52 | 25 Mn Manganese 55 | 26 Fe Iron 56 | 27 Co Cobalt 59 | 28 Ni Nickel 59 | 29 Cu Copper 63.5 | 30 Zn Zinc 65 | 31 Ga Gallium 70 | 32 Ge Germanium 73 | 33 As Arsenic 75 | 34 Se Selenium 79 | 35 Br Bromine 80 | 36 Kr Krypton 84 |

5

| 37 Rb Rubidium 86 | 38 Sr Strontium 88 | 39 Y Yttrium 89 | 40 Zr Zirconium 91 | 41 Nb Niobium 93 | 42 Mo Molybdenum 96 | 43 Tc Technetium 99 | 44 Ru Ruthenium 101 | 45 Rh Rhodium 103 | 46 Pd Palladium 106 | 47 Ag Silver 108 | 48 Cd Cadmium 112 | 49 In Indium 115 | 50 Sn Tin 119 | 51 Sb Antimony 122 | 52 Te Tellurium 128 | 53 I Iodine 127 | 54 Xe Xenon 131 |

6

| 55 Cs Caesium 133 | 56 Ba Barium 137 | 57 La Lanthanum 139 | 72 Hf Hafnium 179 | 73 Ta Tantalum 181 | 74 W Tungsten 184 | 75 Re Rhenium 186 | 76 Os Osmium 190 | 77 Ir Iridium 192 | 78 Pt Platinum 195 | 79 Au Gold 197 | 80 Hg Mercury 201 | 81 Tl Thallium 204 | 82 Pb Lead 207 | 83 Bi Bismuth 209 | 84 Po Polonium 210 | 85 At Astatine 210 | 86 Rn Radon 222 |

7

| 87 Fr Francium 223 | 88 Ra Radium 226 | 89 Ac Actinium 227 |

Key

Atomic number
Symbol
Name
Relative atomic mass