

Surname	Centre Number	Candidate Number
Other Names		0



**New GCSE**

4472/01

**ADDITIONAL SCIENCE  
FOUNDATION TIER  
CHEMISTRY 2**

A.M. MONDAY, 21 May 2012

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	4	
2	9	
3	6	
4	10	
5	7	
6	6	
7	6	
8	6	
9	6	
<b>Total</b>	<b>60</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you will need a calculator and a 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 of the necessity for good English and orderly presentation in your answers.

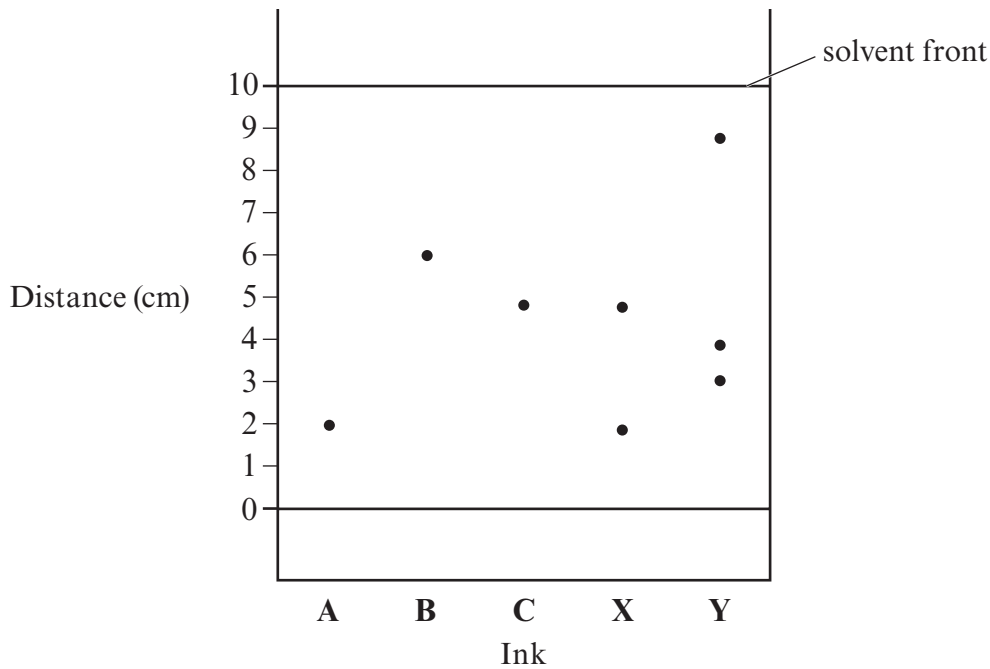
Assessment will take into account the quality of written communication (QWC) used in your answer to question 7.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

Answer **all** questions.

1. James and Lucy were investigating colours in ink. They were given three pure substances, **A**, **B** and **C**, and two mixtures **X** and **Y**.

They carried out a paper chromatography experiment.  
The chromatogram produced is shown in the diagram below.



- (a) (i) Which substances were found in mixture **X**? [1]

.....

- (ii) What did the experiment tell them about mixture **Y**? [1]

.....  
.....

- (b) The  $R_f$  value of a substance can be used to identify that substance.  
The  $R_f$  value is given by the formula

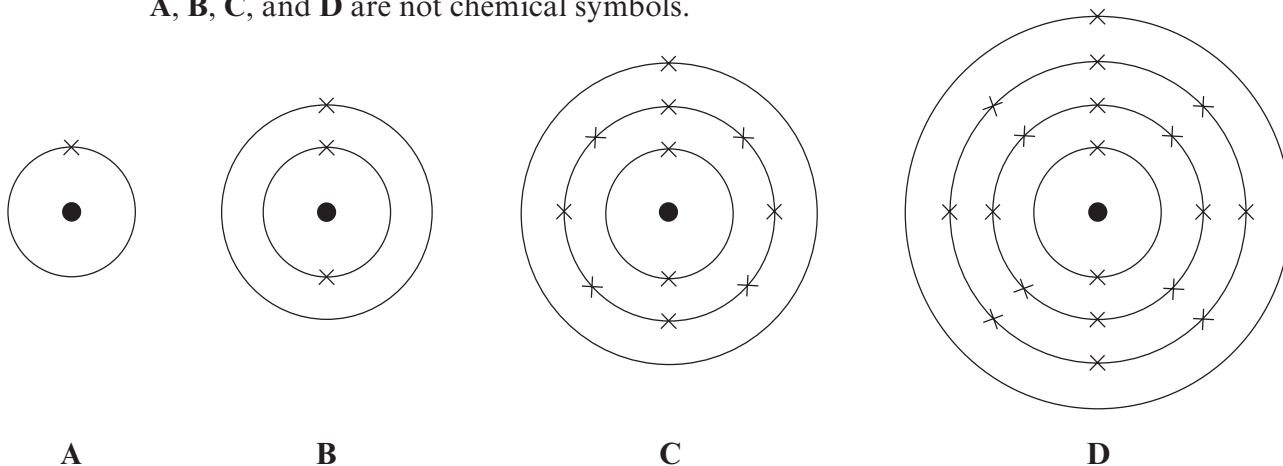
$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent front}}$$

- Calculate the  $R_f$  value for **B**. [2]

.....  
.....  
.....

2. (a) The following diagrams represent four atoms, **A**, **B**, **C** and **D**.

**A**, **B**, **C**, and **D** are not chemical symbols.



(i) Give the electronic structure of **C**. ..... [1]

(ii) Give the atomic number of **B**. ..... [1]

(iii) State which period of the Periodic Table element **D** belongs to. [1]

.....

(iv) Which of the above diagrams represents an atom of potassium? [1]

.....

(v) Name the particle found in the nucleus of **all** atoms. [1]

.....

(b) (i) Calculate the relative molecular mass ( $M_r$ ) of calcium carbonate,  $\text{CaCO}_3$ .

$$A_r(\text{Ca}) = 40 \quad A_r(\text{C}) = 12 \quad A_r(\text{O}) = 16 \quad [2]$$

.....  
.....

(ii) Calculate the percentage by mass of calcium in calcium carbonate. [2]

.....  
.....

3. (a) The table below shows some properties of five substances.

Substance	Melting point (°C)	Electrical conductivity	Density (g/cm <sup>3</sup> )	Structure
carbon dioxide	-78	poor	0.002	simple covalent
copper	1083	good	8.92	metallic
graphite	3730	good	2.25	giant covalent
nitrogen	-210	poor	0.00013	
sodium chloride	801	good when molten or dissolved in water	2.17	giant ionic

- (i) Name the substance with the **lowest** melting point in the table.

.....

[1]

- (ii) Complete the table by giving the structure of nitrogen.

[1]

- (iii) Name a substance from the table which is a non-metallic element.

[1]

.....

- (b) Give **two** reasons why copper is used to make saucepan bases.

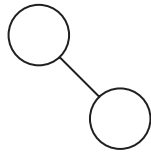
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1. ....

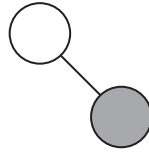
2. ....

(c) Give the letter of the diagram below that represents the structure of sodium chloride.

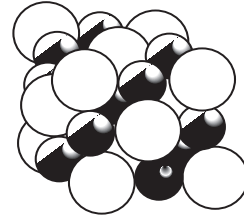
[1]



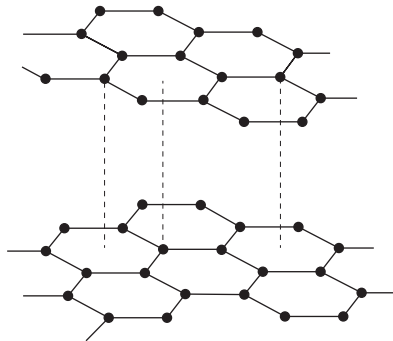
A



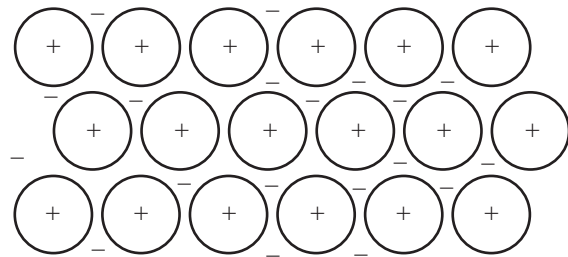
B



C



D

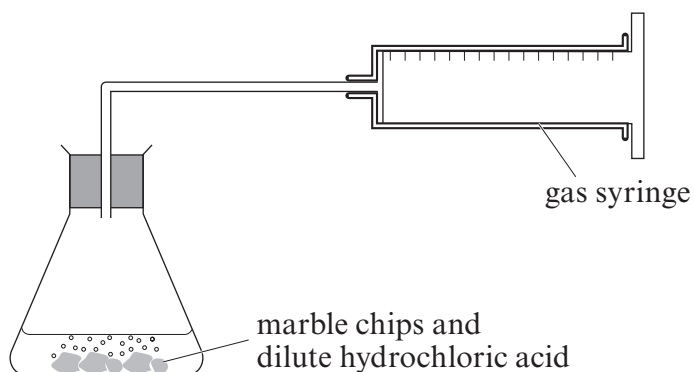


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..... represents the structure of sodium chloride.

4. Marble chips are made of calcium carbonate and react with dilute hydrochloric acid to give off carbon dioxide.

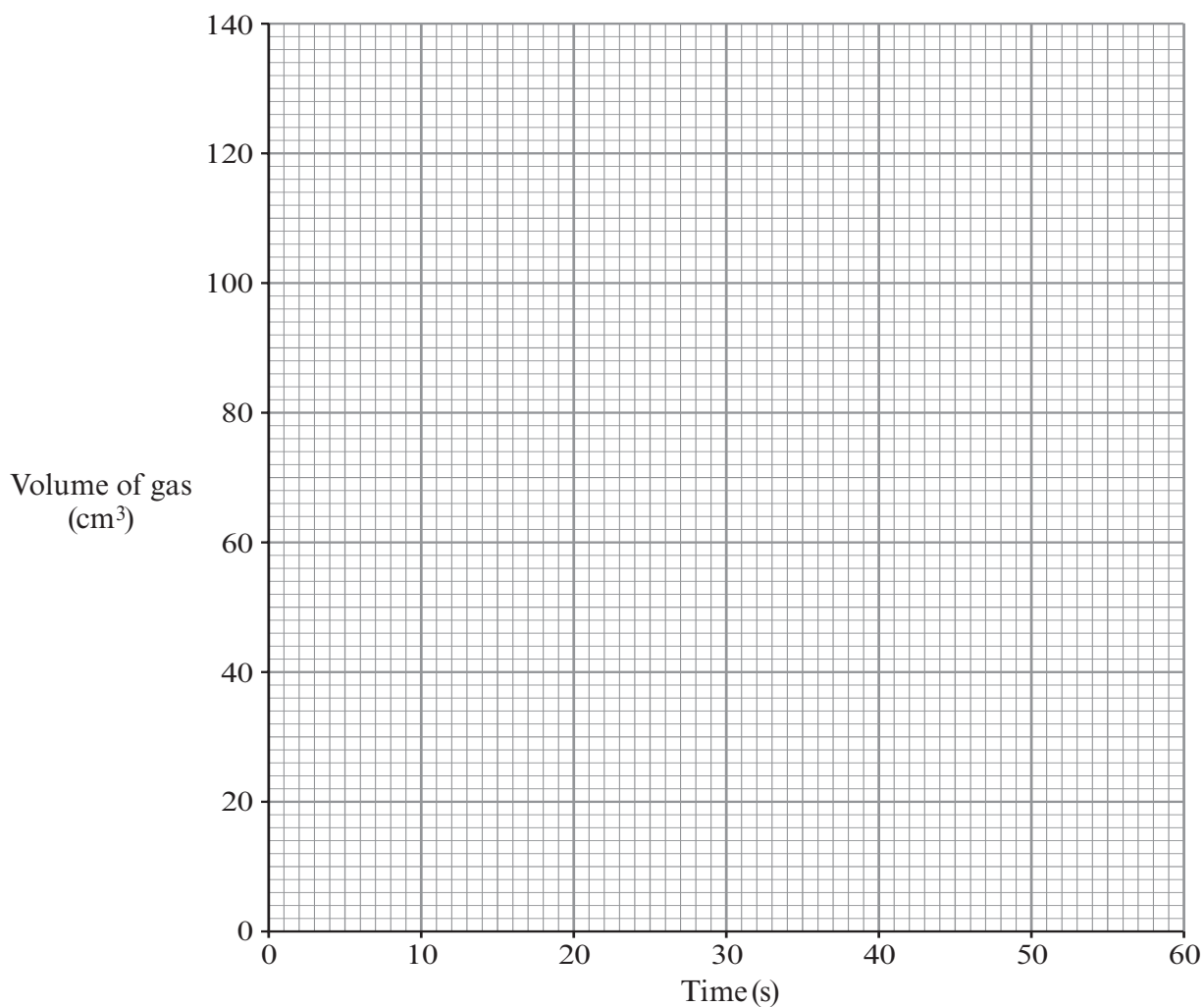
*Excess* marble chips and 100 cm<sup>3</sup> of hydrochloric acid were placed in the flask in the apparatus shown below.



The volume of gas given off was measured every 10 seconds and recorded in the table below.

Time (s)	0	10	20	30	40	50	60
Volume of gas (cm <sup>3</sup> )	0	52	80	92	114	120	120

- (a) (i) Plot the results from the table on the grid below and draw a smooth curve of best fit. [3]



- (ii) Find the time taken for the reaction to finish and state how you reached your answer. [2]

.....

.....

- (iii) Complete the following statement by placing a tick (✓) in the box next to the correct answer.  
Using the **graph**, give the reason for your choice.

The reaction is proceeding at its fastest rate from [2]

0-10 s

10-20 s

20-30 s

30-40 s

40-50 s

50-60 s

*Reason* .....

.....

- (b) State **two** ways in which this reaction could be made to go faster. [2]

1. ....

.....

2. ....

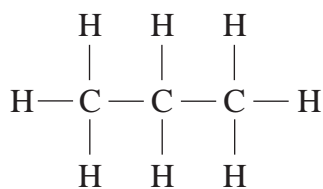
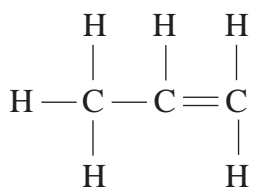
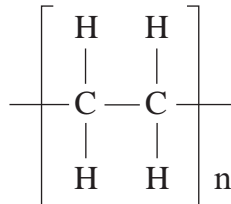
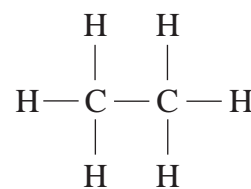
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- (c) If the acid had been in *excess*, instead of the marble chips, state **one** different observation that would have been made at the end of the experiment. [1]

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5. The following diagrams show the structural formulae of four organic compounds, **A**, **B**, **C** and **D**.

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

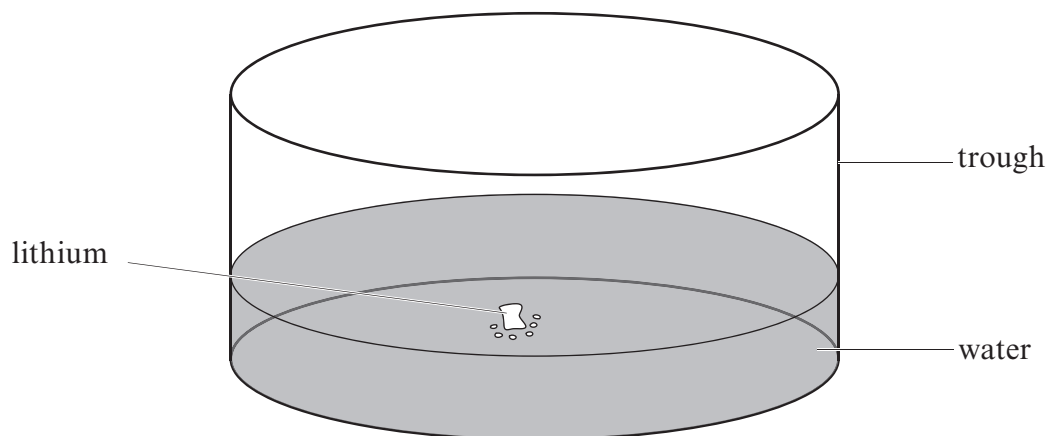
- (a) (i) Give the **molecular** formula of **B**. ..... [1]
- (ii) State which of the above compounds is an alkene. [1]  
.....
- (iii) State which of the above is a polymer. .... [1]
- (b) Draw the **structural** formula for butane,  $\text{C}_4\text{H}_{10}$ . [1]

- (c) You have been given two plastics (polymers) – PVC and melamine. PVC is a thermoplastic and melamine is a thermoset. You are asked to carry out a simple test on both plastics in order to identify them. State what you would do and give the expected result for both. [3]
- .....
- .....
- .....
- .....



6. This question is about the reactions of Group 1 metals.

The following diagram shows how lithium reacts with water.



- (a) Apart from wearing goggles, give **one** safety precaution taken when carrying out this experiment. [1]

- (b) Complete the following **word** equation for the reaction that takes place. [2]

lithium + water  $\longrightarrow$  ..... + .....

- (c) Name the **least** reactive metal in Group 1. [1]

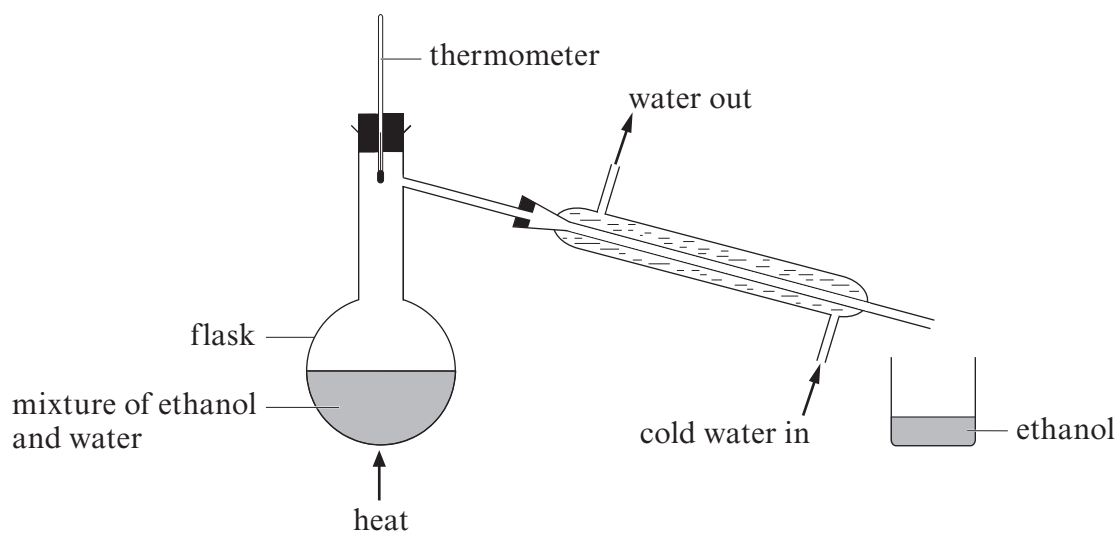
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- (d) Describe what differences you would have observed if potassium had been added to the water in the trough instead of lithium. [2]

.....  
 .....  
 .....

7. A mixture of ethanol and water can be separated by distillation.

A diagram of the apparatus which can be used is shown below.



Describe what happens during the process and explain how this method of separation works.  
[6 QWC]

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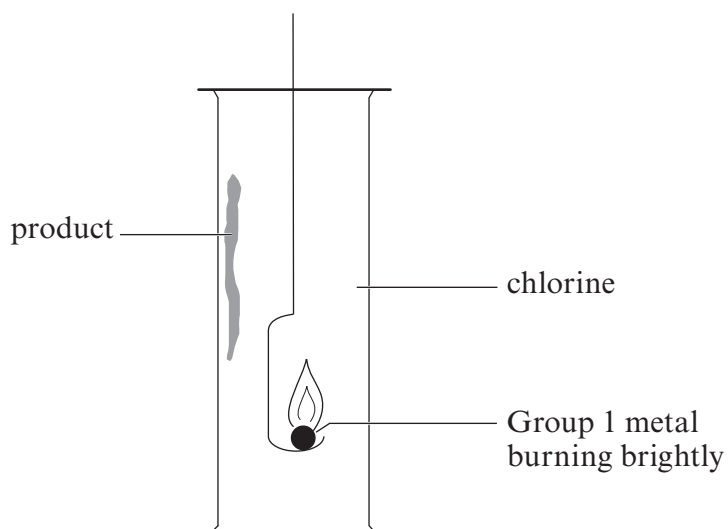
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8. Group 1 metals react vigorously when heated and lowered into a gas jar of chlorine,  $\text{Cl}_2$ , as shown in the diagram below.



- (a) When a flame test was carried out on the product of such a reaction a yellow flame was seen. Identify the Group 1 metal that was used. [1]

.....

- (b) Give the balanced **symbol** equation for the reaction. [3]

..... + .....  $\longrightarrow$  .....

- (c) Describe how you would test for chloride ions in a solution of the product, giving the expected observation. [2]

.....

.....

9. The following table contains information about the numbers of particles contained within atoms and ions **A-F**.

**A, B, C, D, E** and **F** are **not** chemical symbols.

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
Number of electrons	8	10	9	10	10	11
Number of neutrons	10	10	10	10	12	12
Number of protons	8	8	9	10	10	11

- (a) State the group and period of the Periodic Table to which **A** belongs. [1]

*Group* ..... *Period* .....

- (b) (i) Choose the letter **A-F** which represents an ion. [1]

.....

- (ii) Give the charge of this ion. .... [1]

- (c) Give the letter **A-F** which represents an atom/ion with a mass number of 20. [1]

.....

- (d) Choose the letters **A-F** which represent isotopes and give the reason for your choice. [2]

.....

.....

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**FORMULAE FOR SOME COMMON IONS**

<b>POSITIVE IONS</b>		<b>NEGATIVE IONS</b>	
<b>Name</b>	<b>Formula</b>	<b>Name</b>	<b>Formula</b>
<b>Aluminium</b>	<b>Al<sup>3+</sup></b>	<b>Bromide</b>	<b>Br<sup>-</sup></b>
<b>Ammonium</b>	<b>NH<sub>4</sub><sup>+</sup></b>	<b>Carbonate</b>	<b>CO<sub>3</sub><sup>2-</sup></b>
<b>Barium</b>	<b>Ba<sup>2+</sup></b>	<b>Chloride</b>	<b>Cl<sup>-</sup></b>
<b>Calcium</b>	<b>Ca<sup>2+</sup></b>	<b>Fluoride</b>	<b>F<sup>-</sup></b>
<b>Copper(II)</b>	<b>Cu<sup>2+</sup></b>	<b>Hydroxide</b>	<b>OH<sup>-</sup></b>
<b>Hydrogen</b>	<b>H<sup>+</sup></b>	<b>Iodide</b>	<b>I<sup>-</sup></b>
<b>Iron(II)</b>	<b>Fe<sup>2+</sup></b>	<b>Nitrate</b>	<b>NO<sub>3</sub><sup>-</sup></b>
<b>Iron(III)</b>	<b>Fe<sup>3+</sup></b>	<b>Oxide</b>	<b>O<sup>2-</sup></b>
<b>Lithium</b>	<b>Li<sup>+</sup></b>	<b>Sulfate</b>	<b>SO<sub>4</sub><sup>2-</sup></b>
<b>Magnesium</b>	<b>Mg<sup>2+</sup></b>		
<b>Nickel</b>	<b>Ni<sup>2+</sup></b>		
<b>Potassium</b>	<b>K<sup>+</sup></b>		
<b>Silver</b>	<b>Ag<sup>+</sup></b>		
<b>Sodium</b>	<b>Na<sup>+</sup></b>		
<b>Zinc</b>	<b>Zn<sup>2+</sup></b>		

