

# Reactions of Acids

## Question Paper 1

<b>Level</b>	GCSE (9-1)
<b>Subject</b>	Combined Science: Trilogy - Chemistry
<b>Exam Board</b>	AQA
<b>Topic</b>	5.4 Chemical Changes
<b>Sub-Topic</b>	Reactions of Acids
<b>Difficulty Level</b>	Silver Level
<b>Booklet</b>	Question Paper 1

**Time Allowed:** 56 minutes

**Score:** /56

**Percentage:** /100

**Grade Boundaries:**

**Q1.** This question is about calcium.

(a) What type of compound is calcium oxide?

Tick **one** box.

An acid

A base

A carbonate

A salt

(1)

(b) Ionic compounds, such as calcium oxide, have high melting points.

Complete the sentences. Use words from the box.

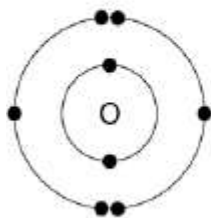
<b>bonds</b>	<b>forces</b>
<b>ions</b>	<b>layers</b>

Calcium oxide has a giant ionic lattice in which there are strong electrostatic ..... of attraction in all directions.

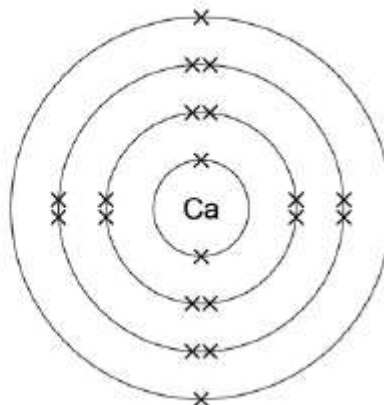
(1)

(c) The figure below shows the electronic structure of an oxygen atom and a calcium atom.

Oxygen atom



Calcium atom



Describe how the calcium atom and the oxygen atom forms calcium oxide.

You should give the charge on each ion formed.

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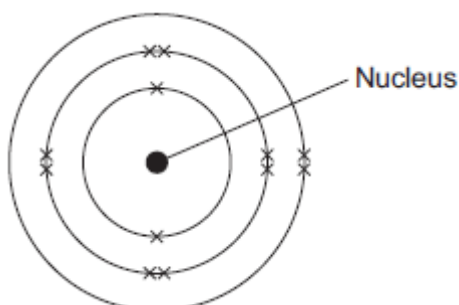
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(4)  
(Total 6 marks)

**Q2.** This question is about magnesium.

- (a) (i) The electronic structure of a magnesium atom is shown below.



Use the correct answer from the box to complete each sentence.

electrons	neutrons	protons	shells
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The nucleus contains protons and .....

The particles with the smallest relative mass that move around the nucleus are called .....

Atoms of magnesium are neutral because they contain the same number of electrons and .....

(3)

(ii) A magnesium atom reacts to produce a magnesium ion.

Which diagram shows a magnesium ion?

Tick (✓) **one** box.


(1)

(b) Magnesium and dilute hydrochloric acid react to produce magnesium chloride solution and hydrogen.



(i) State **two** observations that could be made during the reaction.

1 .....

.....

2 .....

.....

(2)

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

Describe a method for making pure crystals of magnesium chloride from magnesium and dilute hydrochloric acid.

In your method you should name the apparatus you will use.

You do **not** need to mention safety.

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(6)  
(Total 12 marks)

**Q3.**Lead nitrate solution reacts with potassium iodide solution.

The reaction produces a solid.

**Figure 1** shows the reaction occurring.

**Figure 1**



Lead Iodide By Der Kreole (own work) (CC-BY-3.0) via Wikimedia Commons

- (a) (i) Give the name of this type of reaction.

Tick (✓) **one** box.

Combustion

Neutralisation

Precipitation

(1)

- (ii) Write the missing state symbols in the chemical equation.



(2)

- (iii) Complete the word equation for the reaction.

lead nitrate + .....  $\longrightarrow$  lead iodide + .....

(2)

- (iv) How is solid lead iodide separated from the solution?

Draw a ring around the correct answer.

**Distillation**

**Electrolysis**

**Filtration**

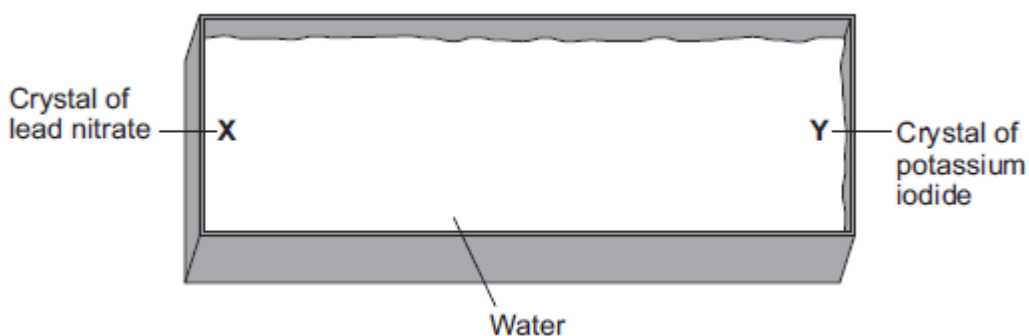
(1)

- (b) A group of students investigated the movement of particles.

The students filled a container with water.

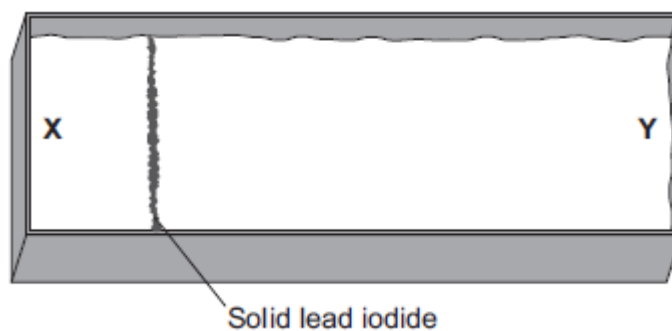
The students added a crystal of lead nitrate at position **X** and a crystal of potassium iodide at position **Y**, as shown in **Figure 2**.

**Figure 2 – view from above**



After 3 minutes solid lead iodide started to form at the position shown in **Figure 3**.

**Figure 3 – view from above**



- (i) Tick (✓) the correct box to complete the sentence.

Lead ions and iodide ions move through the water by

diffusion.

evaporation.

neutralisation.

(1)

- (ii) What conclusion can you make about the speed of movement of lead ions compared with iodide ions?

Give a reason for your answer.

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(2)

- (iii) The students repeated the experiment at a higher temperature.

The solid lead iodide formed after a shorter period of time.

Explain why, in terms of particles.

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(2)

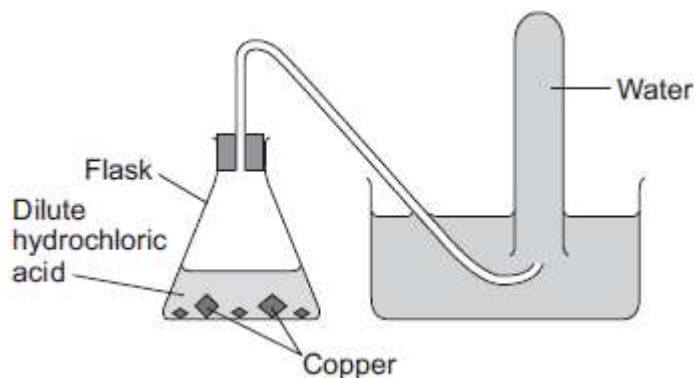
(Total 11 marks)

**Q4.**A student was trying to produce hydrogen gas.

**Figure 1** shows the apparatus she used.

**Figure 1**





- (a) No gas was produced.

The student's teacher said that this was because the substances in the flask did **not** react.

- (i) Suggest why the substances in the flask did **not** react.

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(1)

- (ii) Which two substances could the student have put in the flask to produce hydrogen safely?

Tick (✓) **one** box.

Gold and dilute hydrochloric acid

Potassium and dilute hydrochloric acid

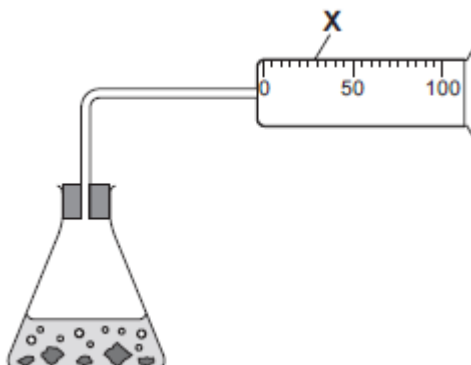
Zinc and dilute hydrochloric acid

(1)

- (b) Another student did produce hydrogen from two substances.

**Figure 2** shows the apparatus the student used to collect and measure the volume of the hydrogen gas.

**Figure 2**



Give the name of the apparatus labelled X.

.....

(1)

(c) The student did the experiment four times. Her results are shown in the table below.

Experiment	Volume of hydrogen collected in one minute in cm <sup>3</sup>
1	49
2	50
3	35
4	48

(i) One of the results is anomalous.

Which result is anomalous? Write your answer in the box.

Give a reason for your choice.

.....

(2)

(ii) Calculate the mean volume of hydrogen collected in one minute.

.....

.....

Mean volume = ..... cm<sup>3</sup>

(2)

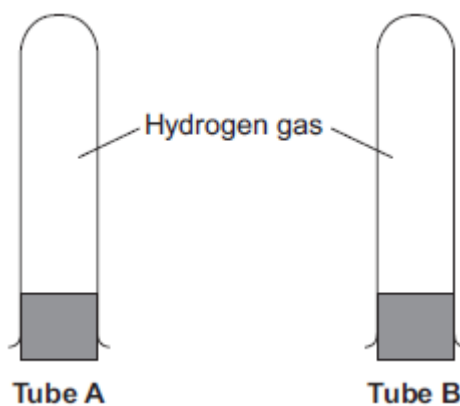
(iii) Give a reason why the experiment should be repeated several times.

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(1)

(d) A teacher collected two tubes full of hydrogen gas, as shown in **Figure 3**.

**Figure 3**



She tested tube **A** with a lighted splint as soon as she took the bung out.

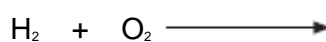
She tested tube **B** with a lighted splint a few seconds after taking the bung out.

(i) Suggest why tube **B** gave a much louder pop than tube **A**.

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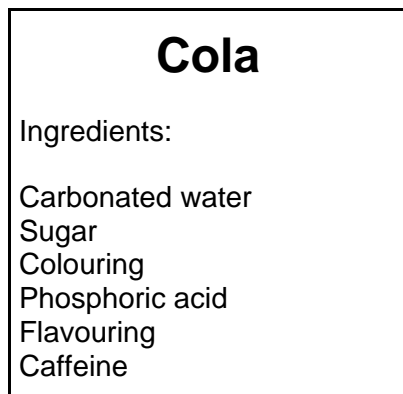
(1)

(ii) Complete and balance the chemical equation for the reaction that takes place when the hydrogen reacts in this test.



(2)  
(Total 11 marks)

Q5. The label shows the ingredients in a drink called Cola.



(a) (i) The pH of carbonated water is 4.5.

The pH of Cola is 2.9.

Name the ingredient on the label that lowers the pH of Cola to 2.9.

.....

(1)

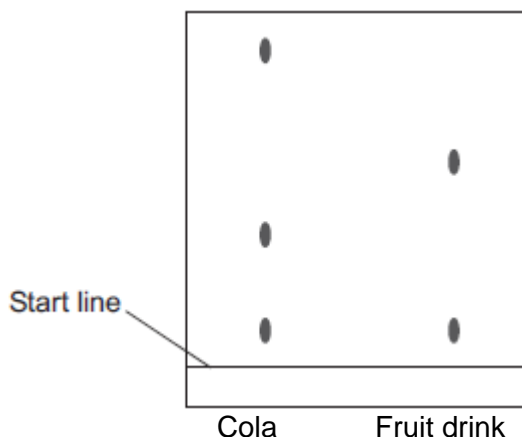
(ii) Which ion causes the pH to be 2.9?

.....

(1)

(b) A student investigated the food colouring in Cola and in a fruit drink using paper chromatography.

The chromatogram in the figure below shows the student's results.



(i) Complete the sentence.

The start line should be drawn with a ruler and .....

Give a reason for your answer.

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(2)

(ii) Suggest **three** conclusions you can make from the student's results.

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(3)

(c) Caffeine can be separated from the other compounds in the drink by gas chromatography.

Why do different compounds separate in a gas chromatography column?

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(1)

(d) Caffeine is a stimulant.

Large amounts of caffeine can be harmful.

(i) Only **one** of the questions in the table **can** be answered by science alone.

Tick (✓) **one** question.

Question	Tick (✓)
Should caffeine be an ingredient in drinks?	
Is there caffeine in a certain brand of drink?	
How much caffeine should people drink?	

(1)

(ii) Give **two** reasons why the other questions **cannot** be answered by science alone.

Reason 1 .....

Reason 2 .....

(2)

(Total 11 marks)

**Q6.** Read the information below and then answer the questions that follow.

It was once thought that organic compounds could only be made in living organisms.  
The living organisms were assumed to have a special life force.  
This life force allowed them to make organic compounds.

Urea is an organic compound produced in animals. It is found in urine. In 1828, Friedrich Wöhler made urea from chemicals which were not obtained from living

things.

Other famous scientists still believed in the idea of a life force. Wöhler made another organic compound in 1845. Most scientists then stopped believing that a life force was needed to make organic compounds.

- (a) How did Wöhler prove that a life force is **not** needed to make organic compounds?

.....  
.....

(1)

- (b) In 1828 most scientists continued to believe that a life force was needed to produce an organic compound.

Suggest why.

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(1)

- (c) In 1845 most scientists stopped believing that a life force was needed to make an organic compound.

Suggest why.

.....  
.....

(1)

- (d) Some scientists repeated Wöhler's experiment.  
These scientists used lead nitrate as one of their starting materials.

Lead nitrate solution can be made by reacting lead with an acid.

- (i) Give the name of this acid .....

(1)

- (ii) State how solid lead nitrate can be obtained from lead nitrate solution.

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(1)  
(Total 5 marks)