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Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE CHEMISTRY

Topic Paper: 9 Pollution, carbon dioxide and methane as greenhouse gases
(Chemistry of the atmosphere)

Part 2

Time allowed: 25 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

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.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



20 Marks



Q5. Limestone is used as a building material. Acid rain erodes limestone.

- (a) Limestone contains calcium carbonate.
The symbol equation for the reaction of calcium carbonate with hydrochloric acid is shown.



Describe a test to show that carbon dioxide is produced in this reaction.

Give the result of the test.

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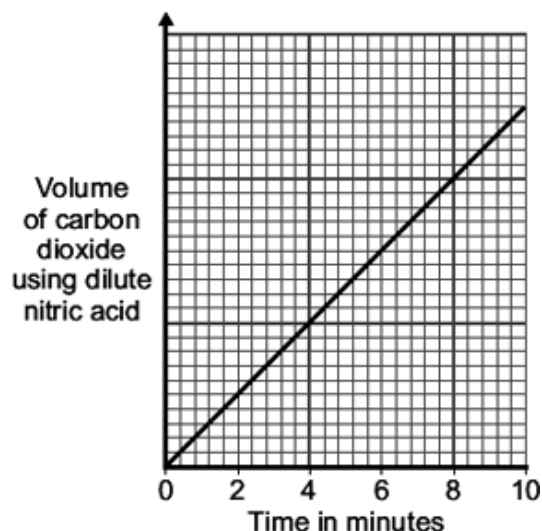
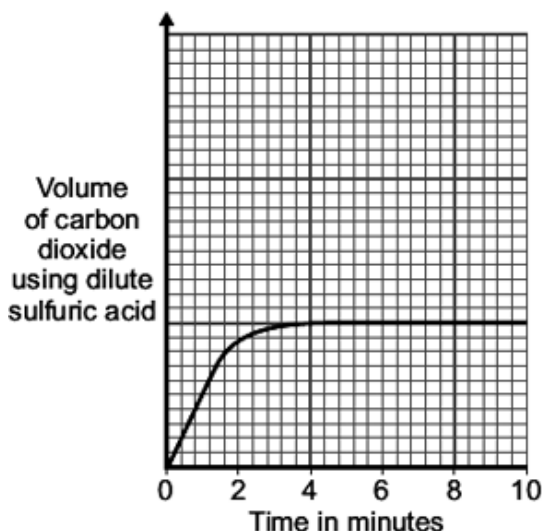
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(2)

- (b) Gases from vehicle exhausts produce sulfuric acid and nitric acid.

A student investigated the reaction of these two acids with calcium carbonate (limestone). The type of acid was changed but all other variables were kept the same. The student measured the volume of carbon dioxide produced each minute for a total of 10 minutes. He did this first for the reaction between dilute sulfuric acid and a cube of calcium carbonate (limestone). The student repeated the experiment using dilute nitric acid in place of the dilute sulfuric acid. The results are shown below.



- (i) State **two** variables that must be kept the same for this investigation.

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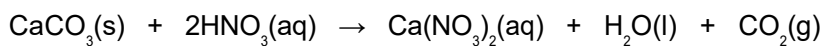
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(2)



(ii) Reacting calcium carbonate with sulfuric acid gave different results to nitric acid.

The symbol equations for the reaction of calcium carbonate with sulfuric acid and with nitric acid are shown below.



Describe how the results for sulfuric acid are different **and** use the symbol equations to explain this difference.

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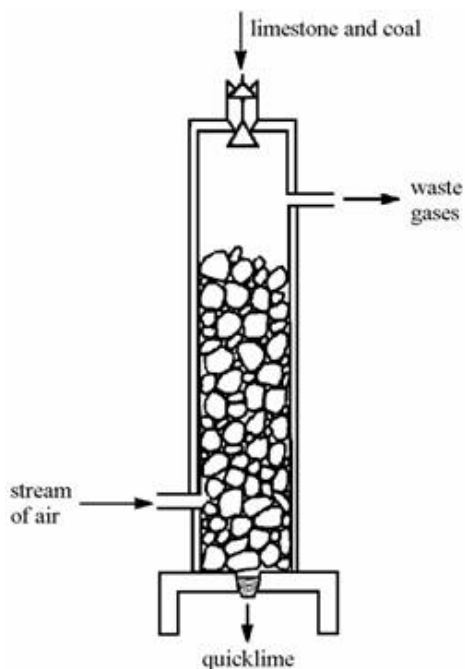
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(3)
(Total 7 marks)

Q6. Limestone is an important raw material.

The diagram shows a lime kiln. The limestone is heated by the burning coal.





(i) Suggest why hot air is blown into the lime kiln.

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.....

(1)

(ii) Give **two** reasons why carbon dioxide is produced in the lime kiln.

Reason 1

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Reason 2

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(2)

(Total 3 marks)

Q7. The amount of carbon dioxide in the Earth's atmosphere has changed since the Earth was formed.

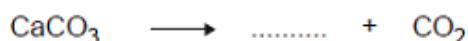
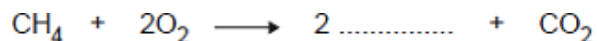
The amount of carbon dioxide continues to change because of human activities.

(a) Cement is produced when a mixture of calcium carbonate and clay is heated in a rotary kiln. The fuel mixture is a hydrocarbon and air.

Hydrocarbons react with oxygen to produce carbon dioxide.

Calcium carbonate decomposes to produce carbon dioxide.

(i) Complete each chemical equation by writing the formula of the other product.



(2)

(ii) Hydrocarbons and calcium carbonate contain *locked up* carbon dioxide.

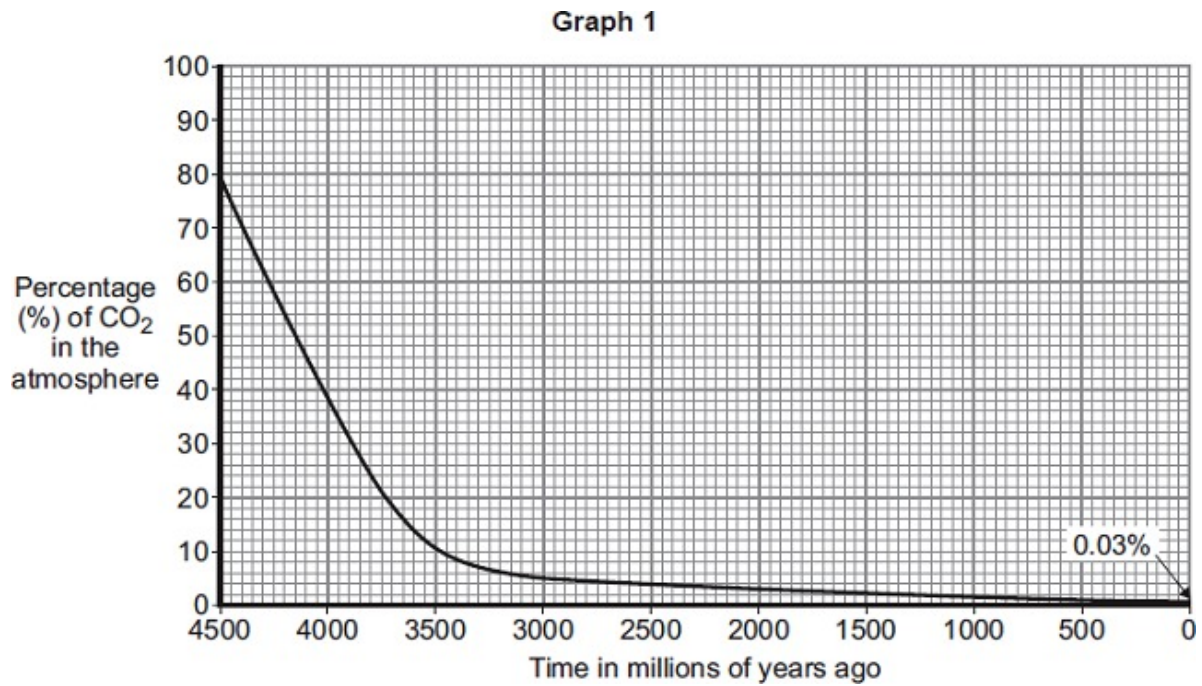
What is *locked up* carbon dioxide?

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(2)



- (b) **Graph 1** shows how the percentage of carbon dioxide in the atmosphere changed in the last 4500 million years.



Use information from **Graph 1** to answer these questions.

- (i) Describe how the percentage of carbon dioxide has changed in the last 4500 million years.

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(2)

- (ii) Give **two** reasons why the percentage of carbon dioxide has changed.

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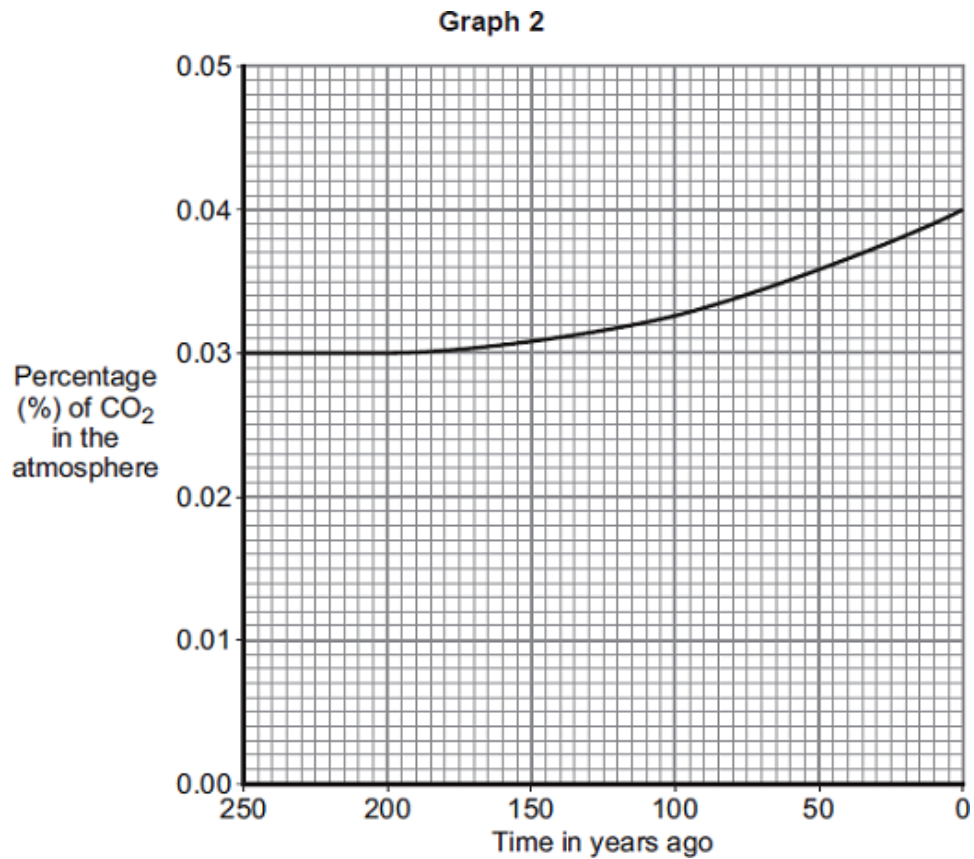
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(2)



- (c) **Graph 2** shows how the percentage of carbon dioxide in the atmosphere changed in the last 250 years.



Should we be concerned about this change in the percentage of carbon dioxide?

Explain your answer.

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(2)
(Total 10 marks)



- M1.** (a) (i) 3 / three 1
- (ii) 5 / five 1
- (b) carbon dioxide / CO₂
for a correct emission 1
- (causes) global warming / climate change / greenhouse gas
explanation must be correct for named emission
ignore ozone layer
- or**
(cement) particles / smoke (1)
(causes) asthma / dust / (global) dimming (1)
accept breathing problems
- or**
sulfur dioxide / SO₂ / nitrogen oxides / NO_x (1)
(causes) acid rain (1)
do not accept nitrogen or water vapour for emissions
do not accept no named emission 1
- (c) (i) any **two** from:
ignore contamination without explanation
- contain metals/ filaments / wires
accept named metal(s)
- contain other / toxic chemicals / materials
accept named chemical(s) / material(s)
- different type of glass
accept glass would not met/
ignore thicker / thinner glass 2