Name:

Date:

# C9 - Test 5
# ATMOSPHERE
# Advanced

**GCSE**

CHEMISTRY

AQA - Triple Science

Mark

Grade

## Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

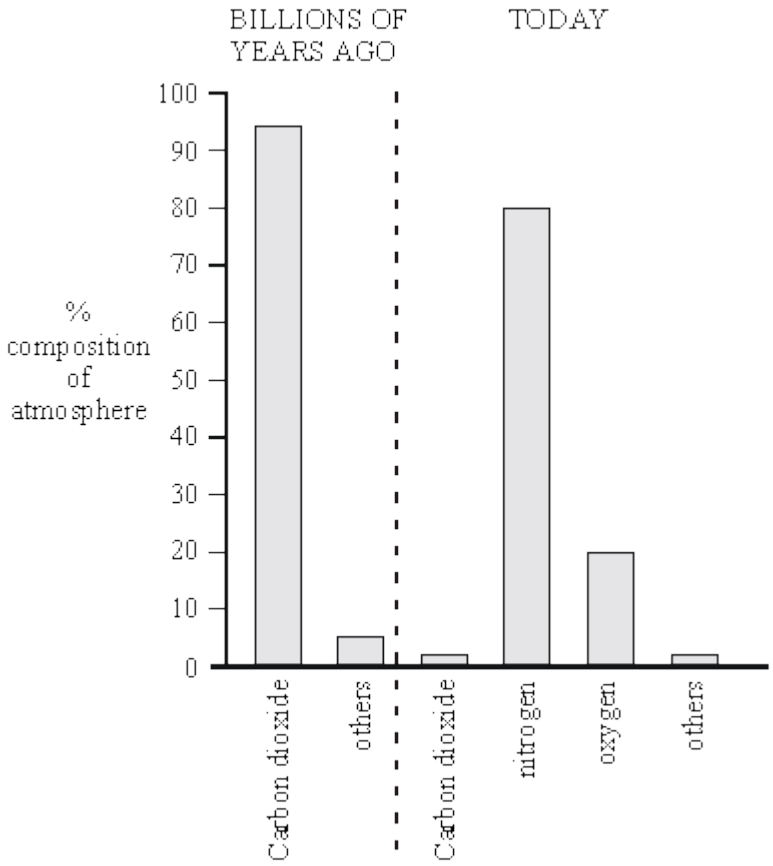
## Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

## Information

- The marks for the questions are shown in brackets

**1.** The bar chart shows the composition of the Earth's atmosphere today, and as it was billions of years ago.




(a) Use information from the bar chart to describe how the atmosphere today is different from the atmosphere of billions of years ago.

_____

_____

_____

_____

**(2)**

(b) Describe the processes which have brought about the changes in the proportions of these gases in the air over billions of years.

_____

_____

_____

_____

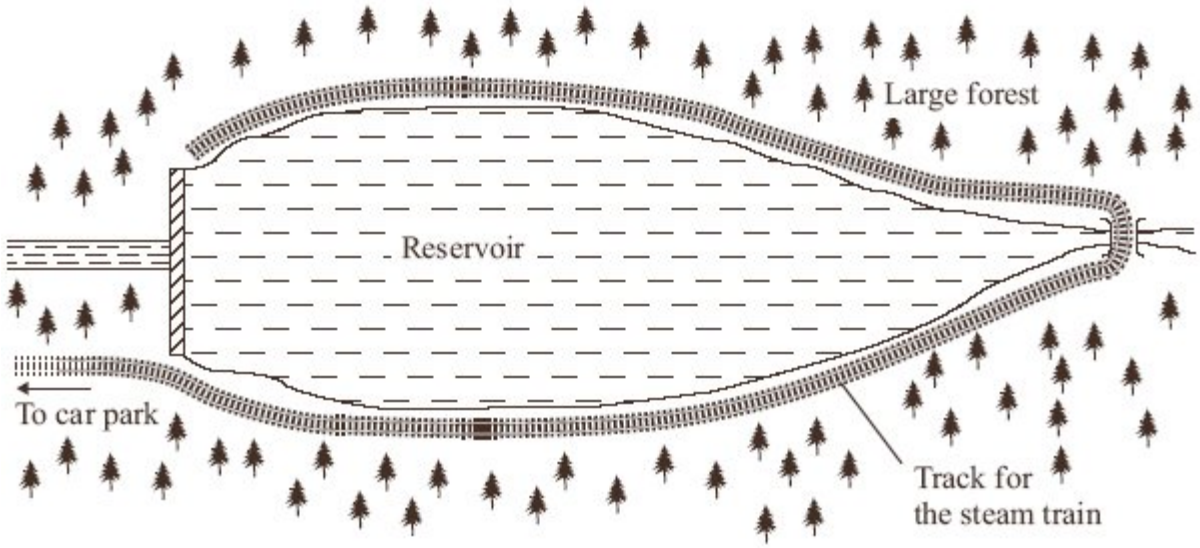
_____

_____

**(4)**

**(Total 6 marks)**

**2.** A large reservoir is surrounded by trees. Planners need to protect the environment. The distance around the reservoir is many kilometres. There will be only one road access to a car park a few kilometres from the reservoir. From the car park people would be transported to accommodation, activities or places of interest by steam train.



(a) Coal contains carbon and small amounts of sulfur. The steam train would cause environmental problems if coal were used as the fuel.

Explain why.

**(4)**

(b) The planners have stated that, as a result of using the steam train, there must be no overall increase of carbon dioxide added to the atmosphere. The steam train would be considered as 'carbon neutral' if wood, from the surrounding forest, were used as the fuel.

Suggest why.

**(3)**

**(Total 7 marks)**

**3.** This question is about the temperature of the Earth's atmosphere.

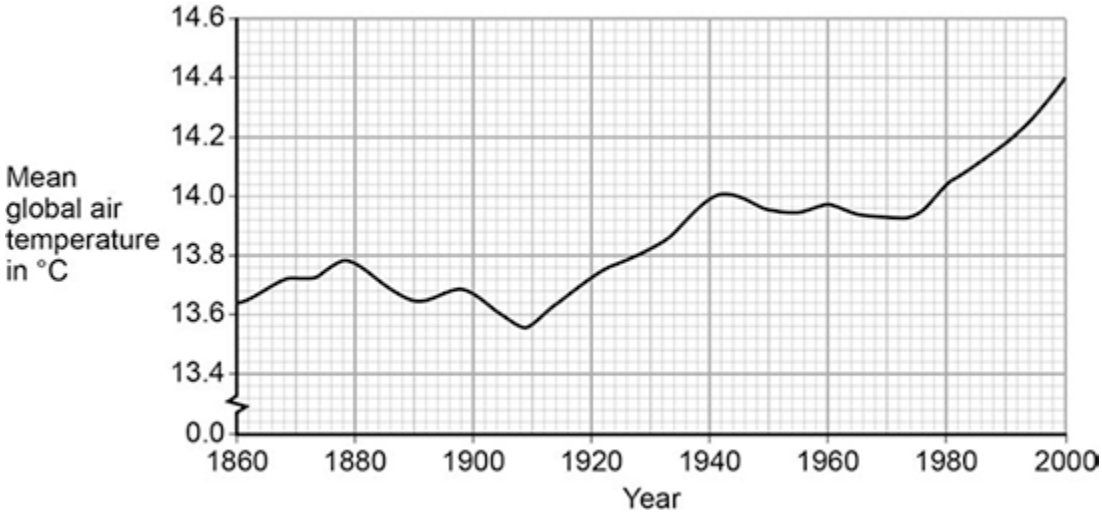
(a) Give **one** reason why it is difficult to produce models for future climate change.

**(1)**

(b) Describe how carbon dioxide helps to maintain temperatures on Earth.

**(3)**

(c) The figure below shows the change in mean global air temperature from 1860 to 2000.




Explain how human activities have contributed to the main trend shown from 1910 in the figure above.

**(3)**

**(Total 7 marks)**

**4.** This information about diesel was printed in a magazine.

Almost all of the crops that we eat can be converted into fuel for cars.
Vegetable oils can be used as biodiesel. Diesel from crude oil is called fossil diesel.
When either biodiesel or fossil diesel burn they both produce similar amounts of carbon dioxide.
Both types of diesel produce carbon monoxide. However, biodiesel produces fewer carbon particles and less sulfur dioxide.

(a) Carbon monoxide can be produced when diesel burns in a car engine. Explain how.

**(2)**

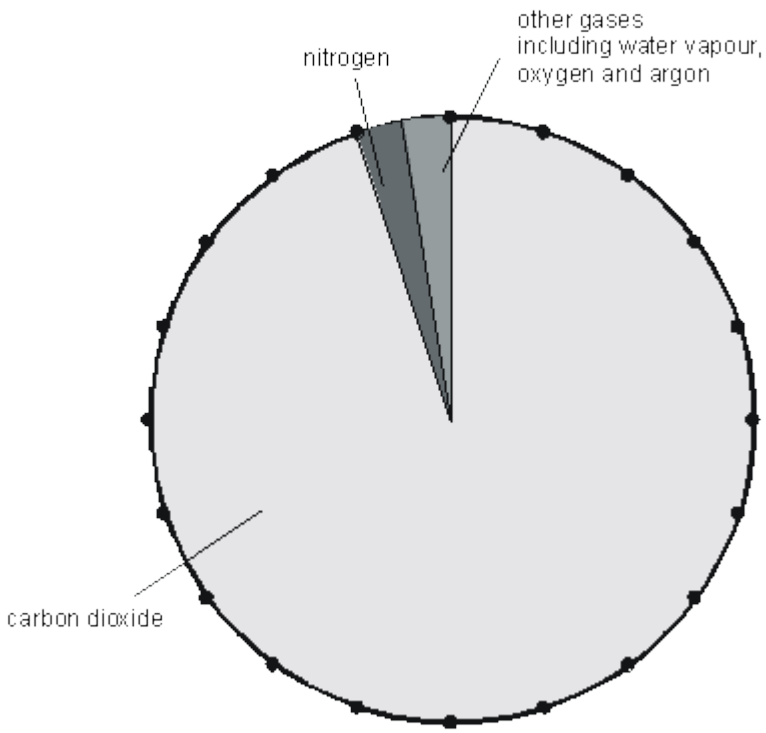
(b) Use the information at the start of this question and your knowledge and understanding to evaluate the use of biodiesel compared with fossil diesel as a fuel for cars.

Remember to give a conclusion to your evaluation.

**(5)**

**(Total 7 marks)**

**5.** The pie chart below shows the composition of the atmosphere on the planet Mars.




(a) Use the pie chart above to calculate the percentage of carbon dioxide in the atmosphere on Mars.

_____

_____

_____%

**(2)**

(b) The atmosphere on Earth is very different from that on Mars. One important difference is that the Earth's atmosphere contains a large amount of oxygen.

Give **two** other ways in which the Earth's atmosphere is different from the atmosphere on Mars.

1. _____

_____

2. _____

_____

**(2)**

(c) When the Earth was formed its atmosphere is thought to have been similar to the atmosphere on Mars. Explain how green plants and other organisms have changed the composition of the Earth's atmosphere.

**(4)**

**(Total 8 marks)**

**6.** Sulfur is a non-metal.

Sulfur burns in the air to produce sulfur dioxide, $SO_2$

(a) Why is it important that sulfur dioxide is **not** released into the atmosphere?

Tick (✓) **one** box.

Sulfur dioxide causes acid rain. ☐

Sulfur dioxide causes global dimming. ☐

Sulfur dioxide causes global warming. ☐

**(1)**

(b) Sulfur dioxide dissolves in water.

What colour is universal indicator in a solution of sulfur dioxide?
Give a reason for your answer.

**(2)**

(c) Sulfur dioxide is a gas at room temperature.

The bonding in sulfur dioxide is covalent.

Explain, in terms of its structure and bonding, why sulfur dioxide has a low boiling point.

_____

_____

_____

_____

_____

_____

**(3)**

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

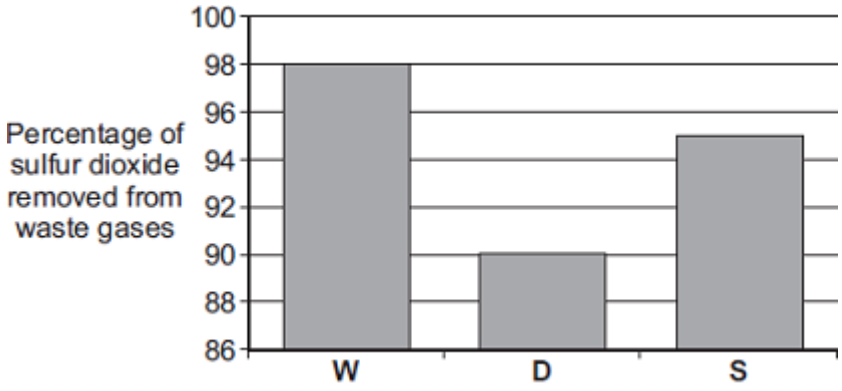
Sulfur dioxide is produced when fossil fuels are burned.

It is important that sulfur dioxide is not released into the atmosphere.

Three of the methods used to remove sulfur dioxide from gases produced when fossil fuels are burned are:

- wet gas desulfurisation (**W**)
- dry gas desulfurisation (**D**)
- seawater gas desulfurisation (**S**).

Information about the three methods is given in the bar chart and in **Table 1** and **Table 2**.




Method of removing sulfur dioxide

**Table 1**

| Method | Material used | How material is obtained |
|---|---|---|
| **W** | Calcium carbonate, $CaCO_3$ | Quarrying |
| **D** | Calcium oxide, CaO | Thermal decomposition of calcium carbonate: $CaCO_3 \longrightarrow CaO + CO_2$ |
| **S** | Seawater | From the sea |

**Table 2**

| Method | What is done with waste material |
|---|---|
| **W** | Solid waste is sold for use in buildings.<br>Carbon dioxide is released into the atmosphere. |
| **D** | Solid waste is sent to landfill. |
| **S** | Liquid waste is returned to the sea. |

Evaluate the three methods of removing sulfur dioxide from waste gases.

Compare the three methods and give a justified conclusion.

**(6)**

**(Total 12 marks)**