

Name:

Date:

C9 - Test 6
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

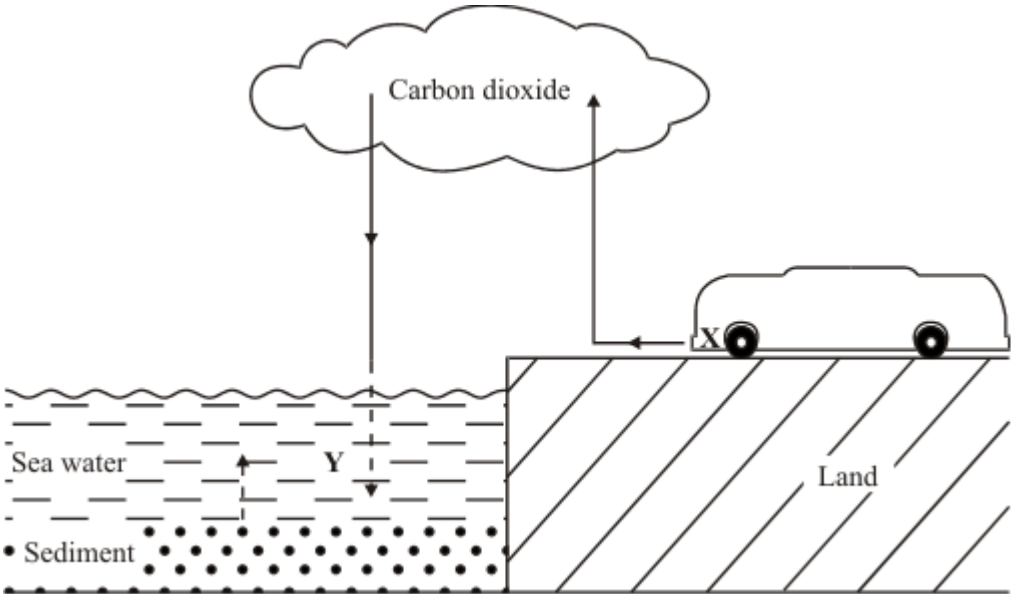
- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1.

The amount of carbon dioxide in the atmosphere is increased by reactions that occur in internal combustion engines (X) and is decreased by reactions in sea water (Y).



Describe, in as much detail as you can, the reactions which take place at X and Y.

(a) X _____

(2)

(b) Y _____

(3)

(Total 5 marks)

2.

Scientists study the atmosphere on planets and moons in the Solar System to understand how the Earth's atmosphere has changed.

(a) Millions of years ago the Earth's atmosphere was probably just like that of Mars today.

The table shows data about the atmosphere of Mars and Earth today.

Mars today		Earth today	
nitrogen	3%	nitrogen	78%
oxygen	trace	oxygen	21%
water	trace	water	trace
Carbon dioxide	95%	Carbon dioxide	trace
Average surface temperature -23°C		Average surface temperature 15°C	

The percentages of some gases in the Earth's atmosphere of millions of years ago have changed to the percentages in the Earth's atmosphere today.

For **two** of these gases describe how the percentages have changed **and** suggest what caused this change.

(2)

- (b) Titan is the largest moon of the planet Saturn.
Titan has an atmosphere that contains mainly nitrogen.
Methane is the other main gas.

Main gases in Titan's atmosphere	Percentage (%)	Boiling point in °C
Nitrogen	95	-196
Methane	5	-164
Average surface temperature -178°C		

When it rains on Titan, it rains methane!

Use the information above and your knowledge and understanding to explain why.

(2)

- (c) Ultraviolet radiation from the Sun produces simple alkenes, such as ethene (C₂H₄) and propene (C₃H₆) from methane in Titan's atmosphere.

State the general formula for alkenes.

(1)

(Total 5 marks)

3.

- (a) Apart from water vapour, two gases account for about 99% of the present atmosphere of our planet.

What are the names of these gases?

_____ and _____

(1)

(b) Scientists now have evidence that, over three billion years ago, our planet's atmosphere was mostly a mixture of water vapour, carbon dioxide, methane and ammonia. Since then the mixture has gradually changed.

(i) Suggest why there is now less water vapour in the atmosphere.

(2)

(ii) Suggest why there is now less carbon dioxide in the atmosphere.

(2)

(c) The following information suggests that the continents of Africa and South America were once joined together but then began to move apart.

Fossilised remains of a large fern-like plant called Glossopteris have been found in the rocks of the Carboniferous period in both Africa and South America.

Fossilised remains of a freshwater reptile called Mesosaurus have been found in the rocks of the Permian period in both Africa and South America.

No fossils of identical organisms have been found in the rocks of the Jurassic or the Cretaceous period in Africa or South America.

The following table gives the names of some of the periods in our planet's geological history.

Start of the period millions of years ago	Name of the period
2	Quaternary
65	Tertiary
136	Cretaceous
190	Jurassic
225	Triassic
280	Permian
345	Carboniferous
395	Devonian
435	Silurian
500	Ordovician
570	Cambrian

- (i) Use this information to suggest when Africa and South America began to move apart.
About _____ million years ago.

(1)

- (ii) What conditions were necessary for Africa and South America to move apart?

(3)

(Total 9 marks)

4.

For 200 million years the proportions of the different gases in the atmosphere have been much the same as today. Over the past 150 years the amount of carbon dioxide in the atmosphere has increased from 0.03% to 0.04%.

(a) Describe how carbon dioxide is released into the atmosphere:

(i) by human and industrial activity;

(2)

(ii) from carbonate rocks by geological activity.

(2)

(b) Explain how the seas and oceans can decrease the amount of carbon dioxide in the atmosphere.

(3)

(c) (i) Give **one** reason why the amount of carbon dioxide in the atmosphere is increasing gradually.

(1)

- (ii) Give **one** effect that increasing levels of carbon dioxide in the atmosphere may have on the environment.

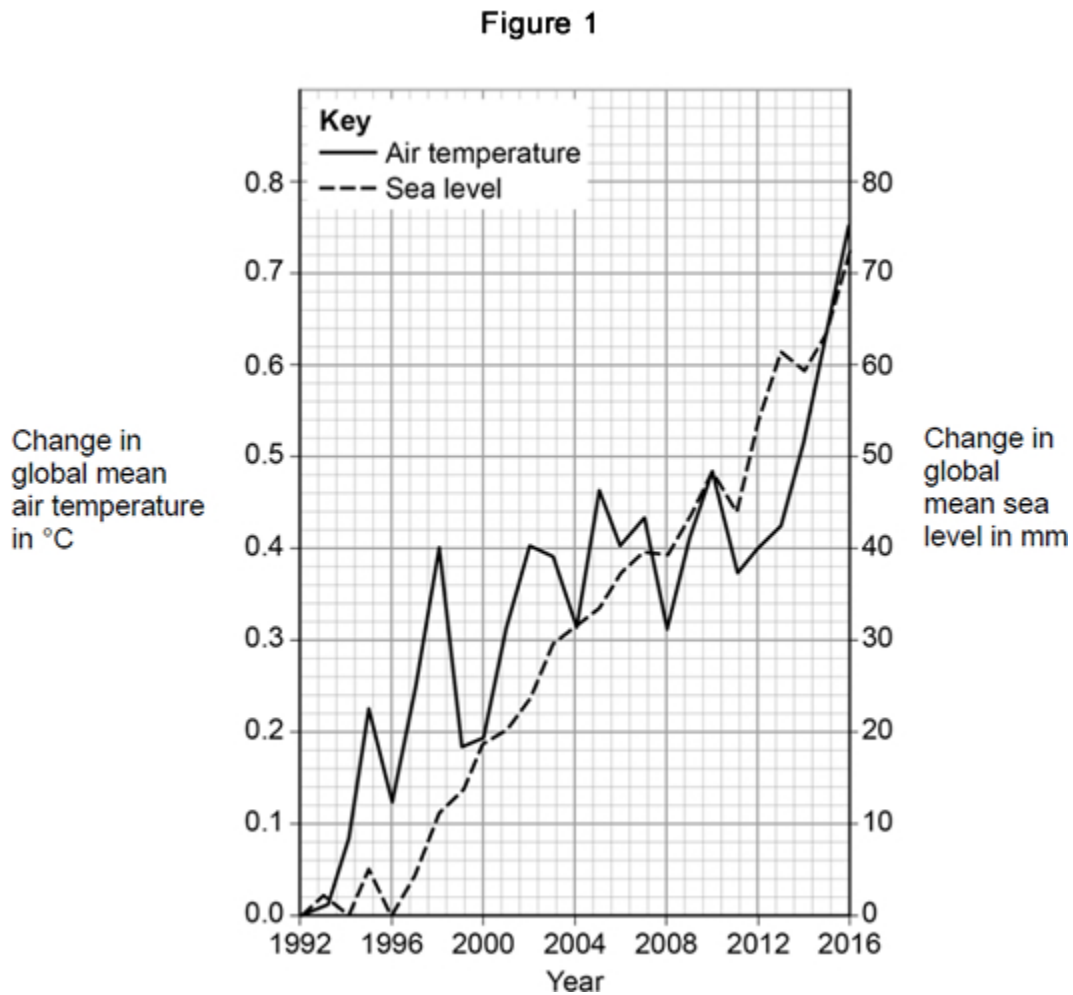
(1)

(Total 9 marks)

5.

This question is about climate change.

Figure 1 shows the changes in the global mean air temperature and global mean sea level from 1992 to 2016.



- (a) Calculate the mean yearly increase in sea level between 1992 and 2016.

Use **Figure 1**.

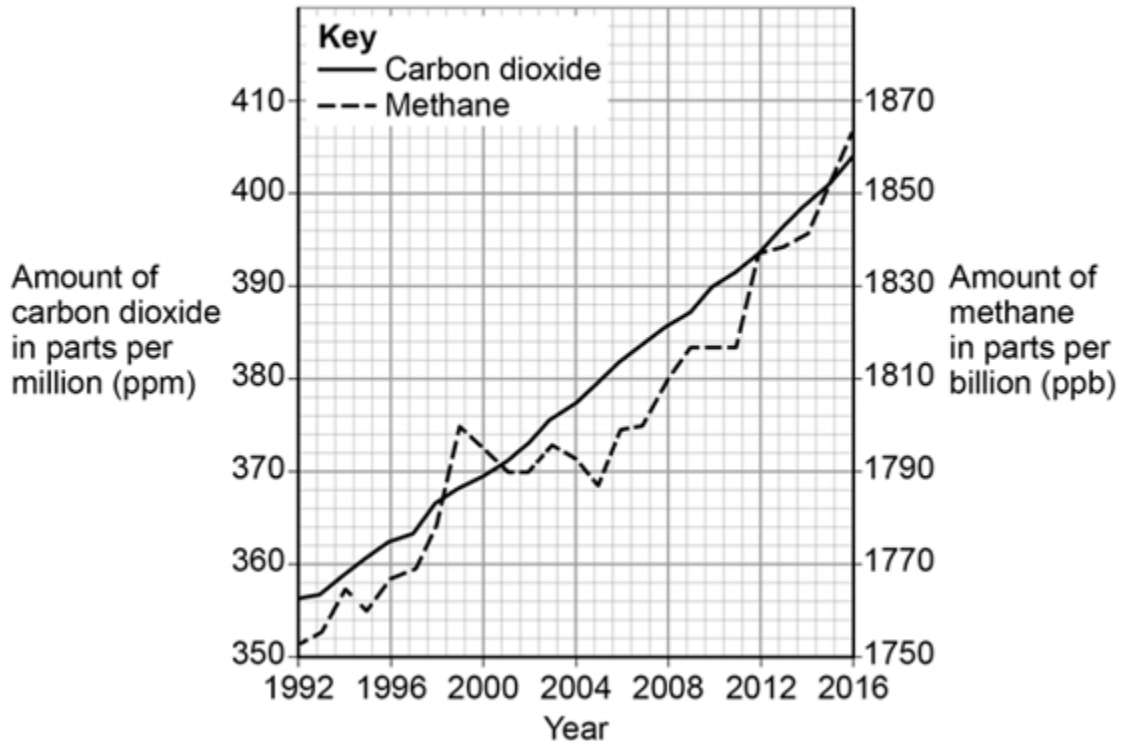
Mean yearly increase in sea level = _____ mm / year

(2)

Most scientists think carbon dioxide and methane are a cause of global climate change.

Figure 2 shows the amounts of these gases in the atmosphere from 1992 to 2016.

Figure 2



(b) Describe the changes in **Figure 1** and in **Figure 2**.

Explain how these changes have taken place.

(6)

(c) The data was collected by a single scientific group.

Give **two** reasons why more evidence is needed to support any conclusions made by this scientific group.

1. _____

2. _____

(2)

(Total 10 marks)

6.

Older cars are tested each year to measure the amount of pollutants contained in exhaust fumes.

The table below shows the maximum allowed percentages of exhaust pollutants for petrol cars.

Age of car in years	Maximum allowed percentage (%) of exhaust pollutant	
	Carbon monoxide	Unburned hydrocarbons
16–24	0.30	0.02
3–16	0.20	0.02

(a) Explain how carbon monoxide is produced when petrol is burned in car engines.

(2)

(b) Suggest **two** reasons why the maximum allowed percentage of carbon monoxide has been decreased for newer cars.

1. _____

2. _____

(2)

(c) Give **one** reason for having a maximum allowed percentage of unburned hydrocarbons in exhaust fumes.

(1)

Oxides of nitrogen are also pollutants contained in exhaust fumes.

(d) Describe how oxides of nitrogen are produced when petrol is burned in car engines.

(2)

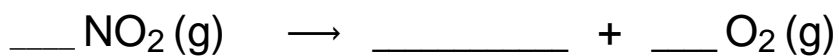
Catalytic converters are fitted to car exhausts to reduce the amount of pollutants released into the atmosphere.

(e) Nitrogen dioxide is an oxide of nitrogen.

Nitrogen dioxide reacts to produce nitrogen and oxygen in catalytic converters.

Complete the equation for this reaction.

The equation should be balanced.



(2)

(f) Give **two** effects of atmospheric pollution which are reduced by using catalytic converters.

1. _____

2. _____

(2)

(g) The catalyst in catalytic converters is a mixture of three elements.

Where in the periodic table are these elements most likely to be found?

Tick **one** box.

Alkali metals

Halogens

Noble gases

Transition metals

(1)
(Total 12 marks)