Q1.

Titan is a moon of the planet Saturn.

The table below shows the percentages of some gases in the atmosphere of Titan and in the atmosphere of the Earth.

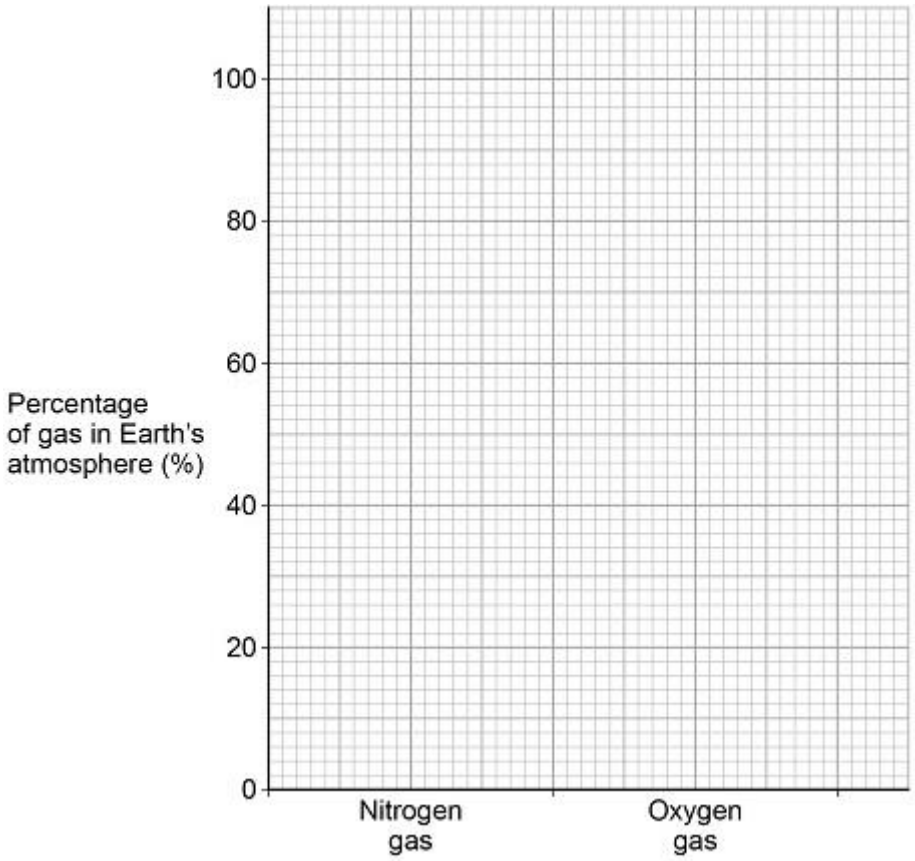
Gas	Percentage of gas in atmosphere (%)	
	Titan	**Earth**
Nitrogen	98	78
Oxygen	Zero	21
Methane	1.4	0.0002
Argon	0.14	0.9
Carbon dioxide	0.0001	0.04

(a) Which **two** gases are present in smaller percentages on the Earth than on Titan?

_____ and _____

(1)

(b) Complete the bar chart in the figure below to show the percentages of nitrogen gas and oxygen gas in the Earth's atmosphere.



(2)

(c) Why are algae less likely to photosynthesise on Titan than Earth?

Use the table above.

Tick (✓) **one** box.

Titan's atmosphere contains too little argon. ☐

Titan's atmosphere contains too little carbon dioxide. ☐

Titan's atmosphere contains too little methane. ☐

Titan's atmosphere contains too little nitrogen. ☐

(1)

(d) Titan is warmer than the other moons of Saturn because of the greenhouse effect.

How do greenhouse gases trap energy from the sun?

Tick (✓) **one** box.

All wavelengths of radiation are reflected back to the surface of Titan. ☐

Long wavelength radiation is reflected back to the surface of Titan. ☐

Short wavelength radiation is reflected back to the surface of Titan. ☐

(1)

As well as methane, the atmosphere of Titan contains small amounts of propene gas. Methane is an alkane and propene is an alkene.

(e) Bromine water is an orange solution used to identify alkenes.

Draw **one** line from each gas to its effect on bromine water.

Gas	Effect on bromine water
	Forms a blue solution
Methane	Forms a colourless solution
	Forms a green solution
Propene	Forms a white precipitate
	No effect

(2)

(f) Propene reacts with water (steam) to make propanol.

The ratio of the masses of propene and water that react is:

Propene : water

7 : 3

Calculate the mass of propene that reacts with 21 g water.

_____

Mass = _____ g

(2)

(Total 9 marks)

Q2.

Titan is a moon of the planet Saturn.

The following table shows the percentages of the gases in the atmosphere of Titan.

Gas	**Percentage of gas in atmosphere (%)**
Nitrogen	98.4
Methane	1.4
Other gases	0.2

(a) Some scientists think that living organisms could have evolved on Titan.

Explain why these organisms could **not** have evolved in the same way that life is thought to have evolved on Earth.

Use the table.

(3)

(b) Saturn has other moons.

The other moons of Saturn have no atmosphere.

Titan is warmer than the other moons of Saturn because its atmosphere contains the greenhouse gas methane.

Explain how this greenhouse gas keeps Titan warmer than the other moons of Saturn.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(c) The atmosphere of Titan contains small amounts of propene.

Describe a test to show that propene is an unsaturated hydrocarbon.

Give the result of the test.

Test _____

_____

Result _____

_____

(2)

(Total 8 marks)

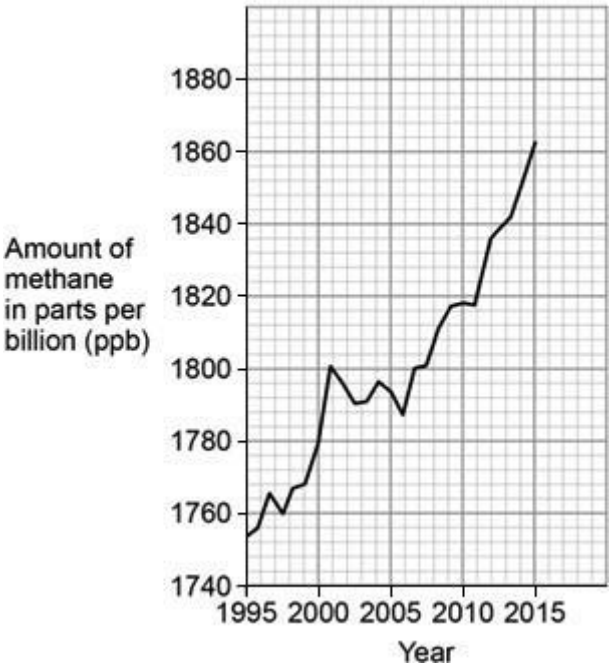
Q3.

Methane gas is present in the atmosphere.

Most scientists think methane is a cause of global climate change.

Figure 1 shows the changes in the amount of methane in the atmosphere from 1995 to 2015.

Figure 1



(a) Calculate the increase in the amount of methane between 1999 and 2012.

Amount in 1999 _____ ppb

Amount in 2012 _____ ppb

Increase in amount of methane = _____ ppb

(2)

(b) How did the amount of methane in the atmosphere change between 2003 and 2005?

Tick (✓) **one** box.

Methane levels fell. ☐

Methane levels rose. ☐

Methane levels rose and fell. ☐

Methane levels stayed the same. ☐

(1)

(c) Name **two** activities that increase the amount of methane in the atmosphere.

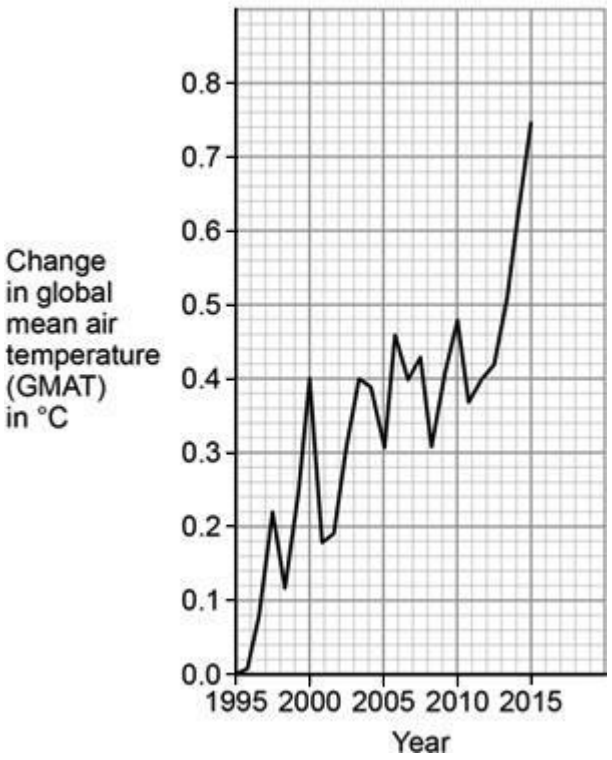
1. _____

2. _____

(2)

Figure 2 shows the changes in global mean air temperature (GMAT) from 1995 to 2015.

Figure 2



(d) What patterns in global mean air temperature (GMAT) between 1995 and 2015 are shown in **Figure 2**?

Tick (✓) **two** boxes.

- The largest increase in GMAT was between 1995 and 1996. ☐
- There was a continuous increase in GMAT. ☐
- There was a fall in GMAT in some years. ☐
- There was an overall decrease in GMAT. ☐
- There was an overall increase in GMAT. ☐

(2)

(e) Increasing air temperatures can result in rising sea levels.

Give **one** reason why.

_____

(1)

(f) What could be an effect of rising sea levels on coastal areas?

Tick (✓) **one** box.

- Reduced rainfall ☐
- Flooding of low lying areas ☐
- Global dimming ☐
- More land for houses ☐

(1)

(g) Between 2004 and 2010:

- the global mean air temperature (GMAT) increased by 0.09 °C
- global mean sea level (GMSL) increased by 9 mm.

Estimate the increase in GMSL produced by a 1 °C increase in GMAT.

Tick (✓) **one** box.

- 0.1 mm ☐
- 1 mm ☐
- 10 mm ☐
- 100 mm ☐

(1)

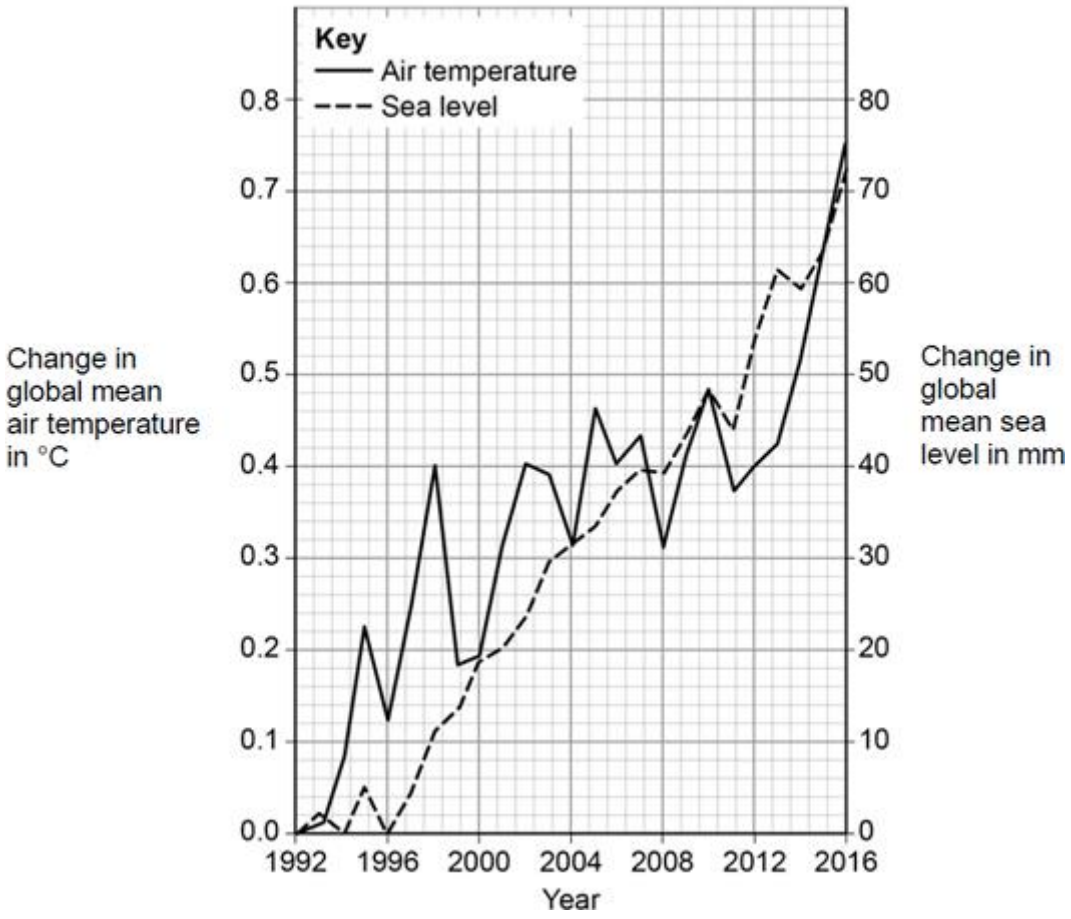
(Total 10 marks)

Q4.

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.

Figure 1



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

Use **Figure 1**.

_____

_____

_____

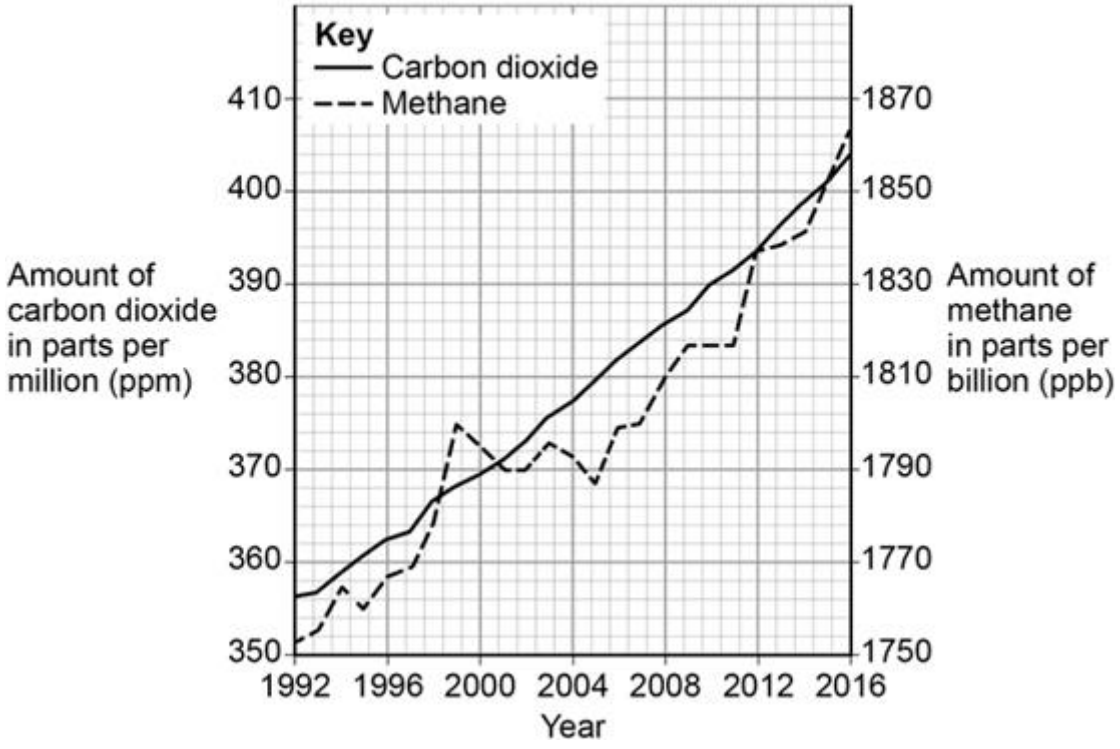
Mean yearly increase in sea level = _____ mm / year

(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)

Q5.

Greenhouse gases affect the temperature of the Earth.

(a) Which gas is a greenhouse gas?

Tick **one** box.

Argon ☐

Methane ☐

Nitrogen ☐

Oxygen ☐

(1)

(b) An increase in global temperature will cause climate change.

What is **one** possible effect of climate change?

Tick **one** box.

Deforestation ☐

Global dimming ☐

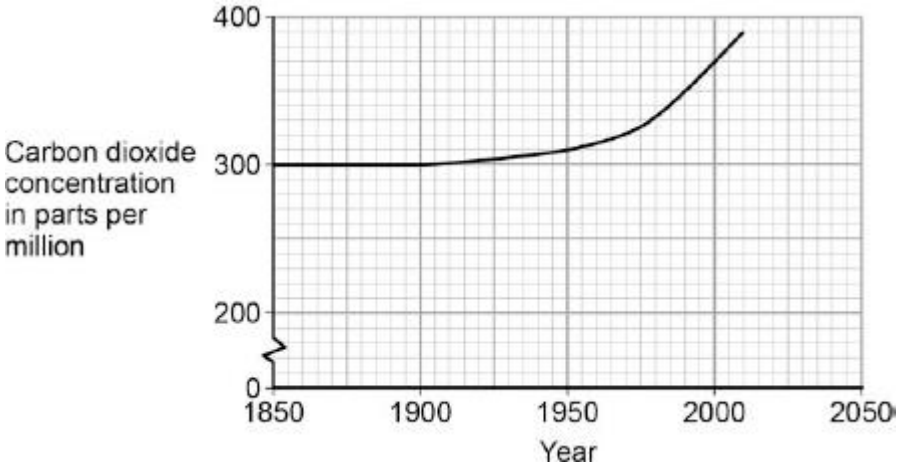
Sea levels rising ☐

Volcanic activity ☐

(1)

(c) Carbon dioxide is also a greenhouse gas.

The figure below shows how the concentration of carbon dioxide in the atmosphere has changed since 1850.



Which process is the reason for the change in carbon dioxide concentration shown on the figure above?

Tick **one** box.

Burning of fossil fuels ☐

Carbon capture ☐

Formation of sedimentary rocks ☐

Photosynthesis ☐

(1)

(d) Give **three** conclusions that can be made from the figure above.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(Total 6 marks)

Q6.

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.

_____

_____

_____

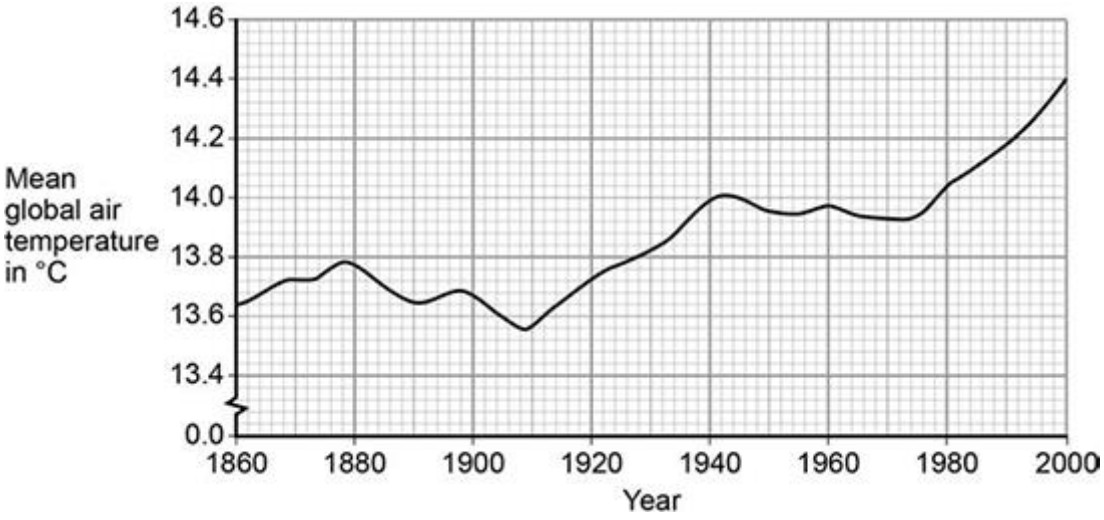
_____

_____

_____

(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)

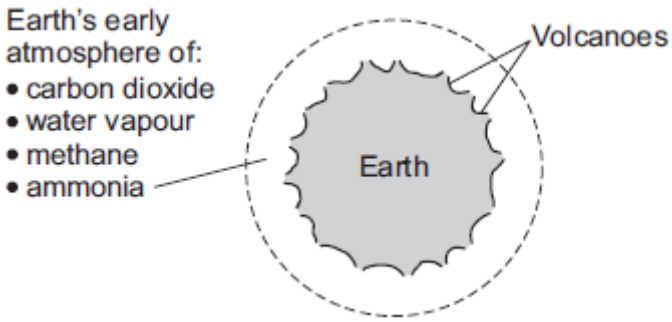
(Total 7 marks)

Q7.

This question is about the Earth and its atmosphere.

(a) **Figure 1** shows the Earth and its atmosphere billions of years ago.

Figure 1



The boiling point of water is 100 °C.

Suggest **one** reason why there was no liquid water on the Earth's surface billions of years ago.

_____

_____

(1)

(b) The Earth's atmosphere today contains nitrogen, oxygen, argon, carbon dioxide and other gases.

(i) Draw **one** line from each substance to a description of the substance.

Substance	Description of the substance
air	compound
carbon dioxide	element
argon	hydrocarbon
	metal
	mixture

(3)

(ii) Which gas in the Earth's atmosphere is used when hydrocarbons burn?

Tick (✓) **one** box.

carbon dioxide ☐

nitrogen ☐

oxygen ☐

(1)

(iii) What percentage of the Earth's atmosphere is nitrogen?

Tick (✓) **one** box.

about 40% ☐

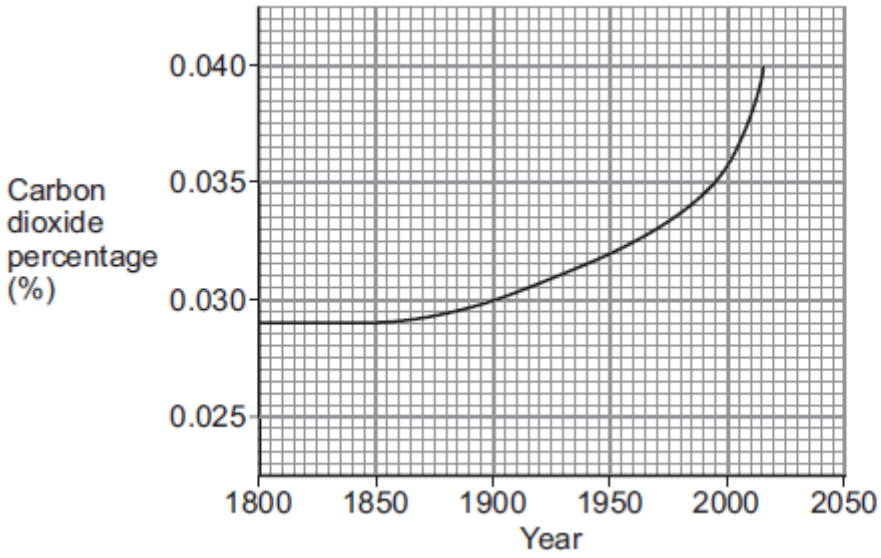
about 60% ☐

about 80% ☐

(1)

(c) **Figure 2** shows the carbon dioxide percentage (%) in the Earth's atmosphere since the year 1800.

Figure 2



(i) What was the carbon dioxide percentage in 1900?

_____ %

(1)

(ii) Describe, in detail, how the carbon dioxide percentage changed from 1900 to 2015.

_____

_____

_____

_____

(2)

(iii) Suggest **two** reasons for the change in the carbon dioxide percentage from 1900 to 2015.

1. _____

_____

2._____

_____

(2)

(Total 11 marks)