1 This question is about some gases present in air.

(a) Which is the most common gas in dry air? **(1)**

- ☒ **A** argon
- ☒ **B** carbon dioxide
- ☒ **C** nitrogen
- ☒ **D** oxygen

(b) Which gas makes up about 1 % of dry air? **(1)**

- ☒ **A** argon
- ☒ **B** carbon dioxide
- ☒ **C** nitrogen
- ☒ **D** oxygen

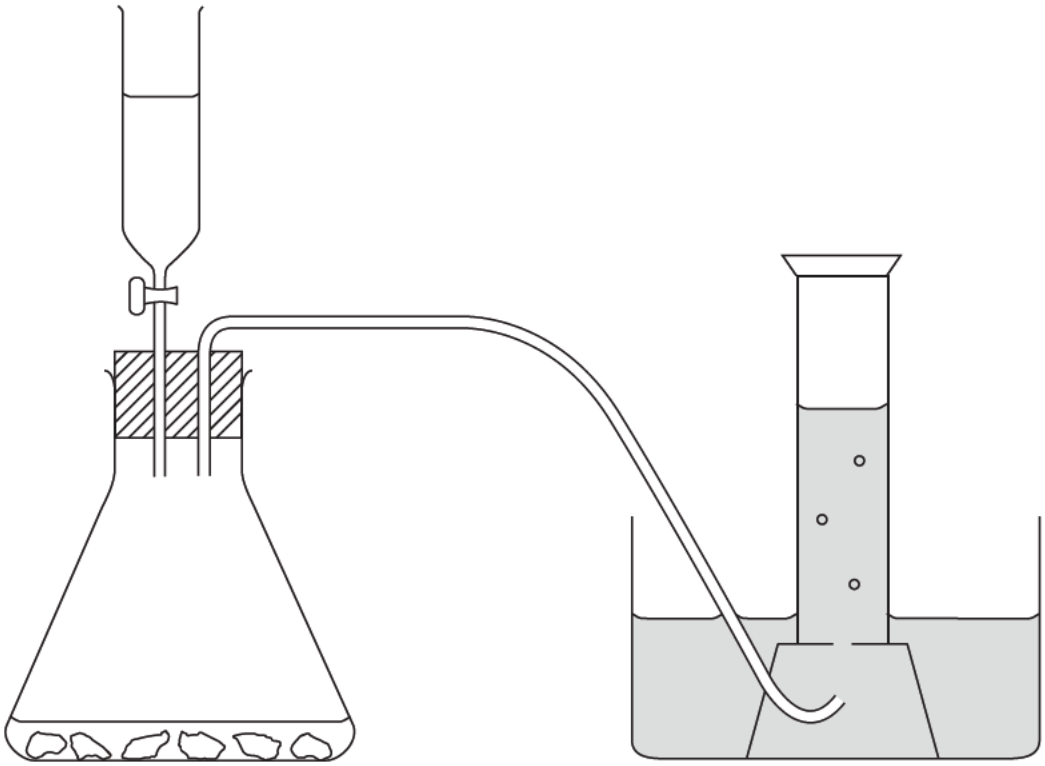
(c) A piece of copper is heated in air.

State the formula and colour of the compound formed. **(2)**

formula .....

colour .....

(d) The diagram shows apparatus that can be used to prepare carbon dioxide in the laboratory.



(i) The liquid in the tap funnel is

(1)

☒ **A** calcium chloride solution

☒ **B** concentrated sulfuric acid

☒ **C** dilute hydrochloric acid

☒ **D** hydrogen peroxide solution

(ii) The solid in the conical flask is

(1)

☒ **A** calcium carbonate

☒ **B** calcium sulfate

☒ **C** copper(II) oxide

☒ **D** manganese(IV) oxide

(iii) The diagram shows the gas being collected over water.

Suggest another way to collect the gas.

(1)

(e) Limewater can be used in a test for carbon dioxide.

(i) Complete this equation, by inserting state symbols, for the reaction used to test for carbon dioxide.

(1)

CO_2(.....) + $Ca(OH)_2$(.....) → $CaCO_3$(.....) + H_2O(.....)

(ii) State the observation made in this test.

(1)

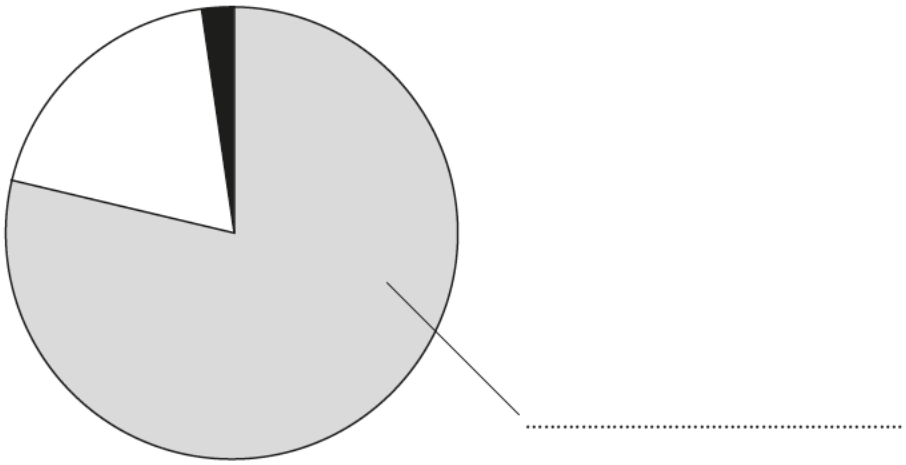
.....

.....

(Total for Question 1 = 9 marks)

2 Many chemical reactions occur in the atmosphere.

(a) The pie chart shows the relative amounts of some gases in air.



.....

(i) Label the pie chart with the name of the gas that makes up most of the air.

(1)

(ii) What is the approximate percentage of oxygen in air?

Place a cross (☒) in one box.

(1)

- ☐ 1
- ☐ 20
- ☐ 25
- ☐ 78

(iii) Use words from the box to complete the sentences about some of the other gases in air.

Each word may be used once, more than once or not at all.

(2)

diatomic	**ogen**	**eactive**	**ater**

One of the gases in air is argon. It is called a noble gas because it is

very ..... .

The percentage of ..... vapour in air varies with the weather.

(b) Rain water is naturally slightly acidic because carbon dioxide dissolves in it.
The word equation for the reaction that occurs is:

carbon dioxide + water → carbonic acid

Acid rain is more acidic because pollutant gases in the atmosphere also dissolve in water.

(i) Identify the acid formed when sulfur dioxide reacts with water.

(1)

.....

(ii) Identify another pollutant gas that forms acid rain.

(1)

.....

(iii) State **two** problems caused by acid rain.

(2)

1 .....

.....

2 .....

.....

(Total for Question 2 = 8 marks)

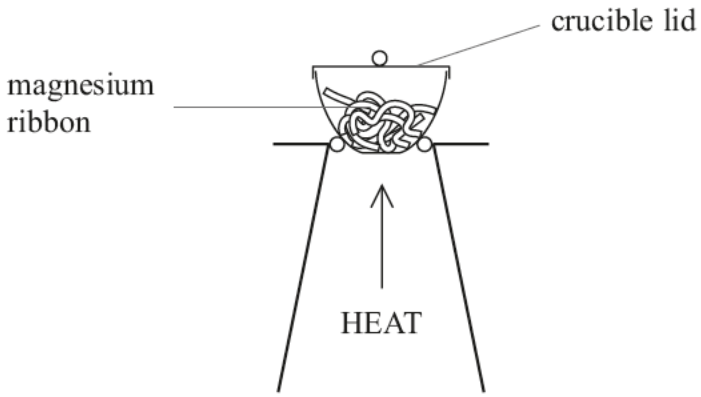
3 When magnesium is burned in air, it reacts with oxygen, O_2, to form magnesium oxide, MgO

A class of students investigated the relationship between the mass of magnesium burned and the mass of magnesium oxide formed.

Each student was given a different mass of clean magnesium to heat.

The students used the following method.

- Weigh a crucible and lid
- Place the magnesium ribbon in the crucible, replace the lid, and reweigh
- Heat the crucible as shown in the diagram until the magnesium burns



- Lift the lid from time to time until there is no sign of further reaction
- Allow the crucible and lid to cool and reweigh
- Repeat the heating, cooling and reweighing until two consecutive masses are the same
- Calculate the mass of magnesium oxide formed

(a) (i) Why is it necessary to lift the lid from time to time while heating?

(1)

.....

.....

.....

(ii) Why is it necessary to repeat the heating until two consecutive masses are the same?

(1)

.....

.....

.....

(b) Show how the mass of magnesium oxide formed can be calculated from the readings obtained.

(1)

.....

.....

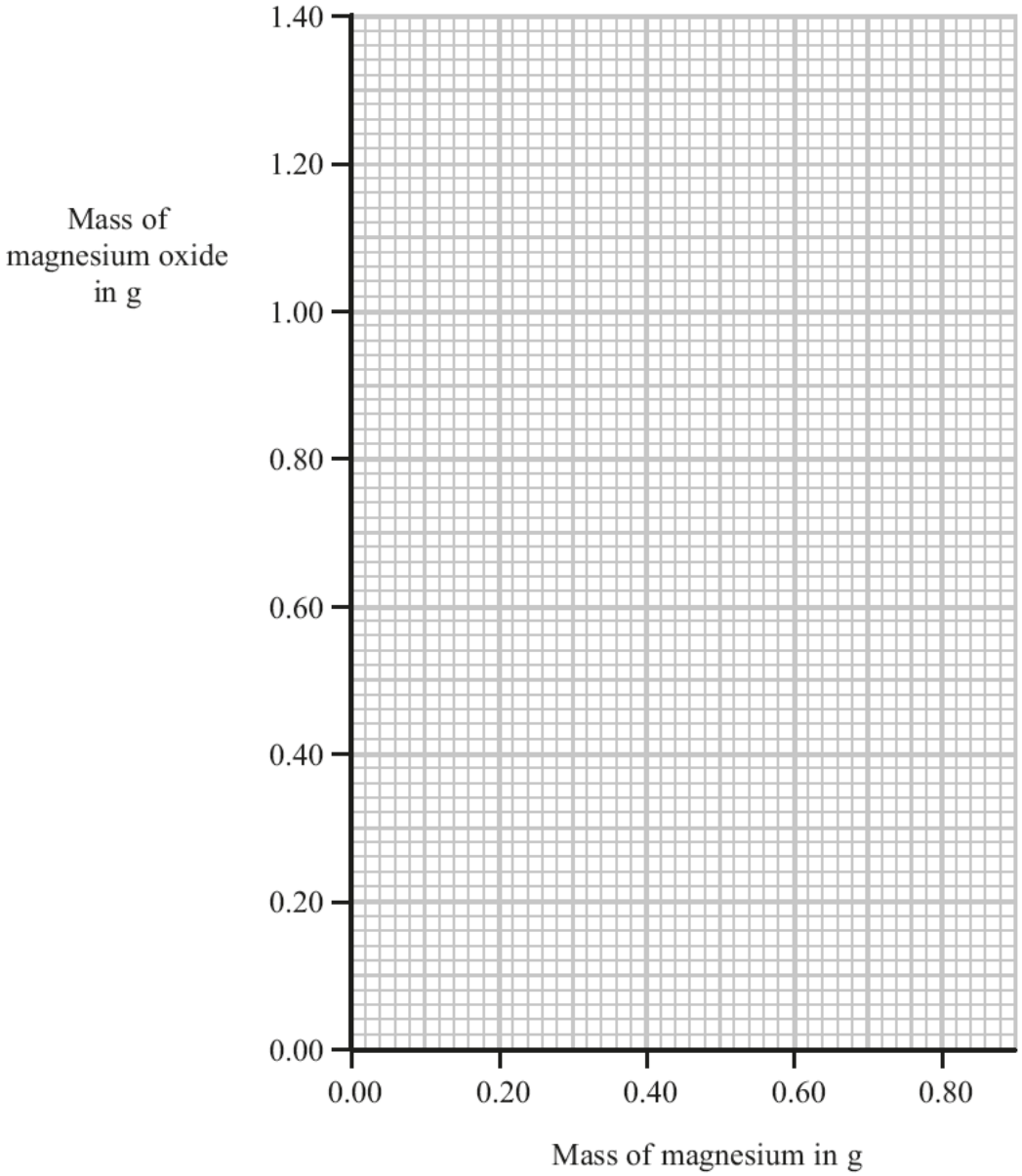
.....

(c) The results of each experiment are given in the table.

Mass of magnesium in g	Mass of magnesium oxide in g
0.24	0.40
0.26	0.64
0.42	0.70
0.62	1.04
0.70	1.20
0.80	1.33

(i) Plot the results on the grid and draw a straight line of best fit.

(3)



(ii) Draw a circle around the anomalous result.

(1)

(iii) Use your graph to find the mass of magnesium oxide formed when 0.48 g of magnesium is burned.

(1)

.....

.....

(Total for Question 3 8 marks)