Oxygen & Oxides

Question Paper

Level	GCSE
Subject	Chemistry
Exam Board	Edexcel IGCSE
Module	Double Award (Paper 1C)
Topic	Chemistry of the Elements
Sub-Topic	Oxygen & Oxides
Booklet	Question Paper

Time Allowed: **73 minutes**

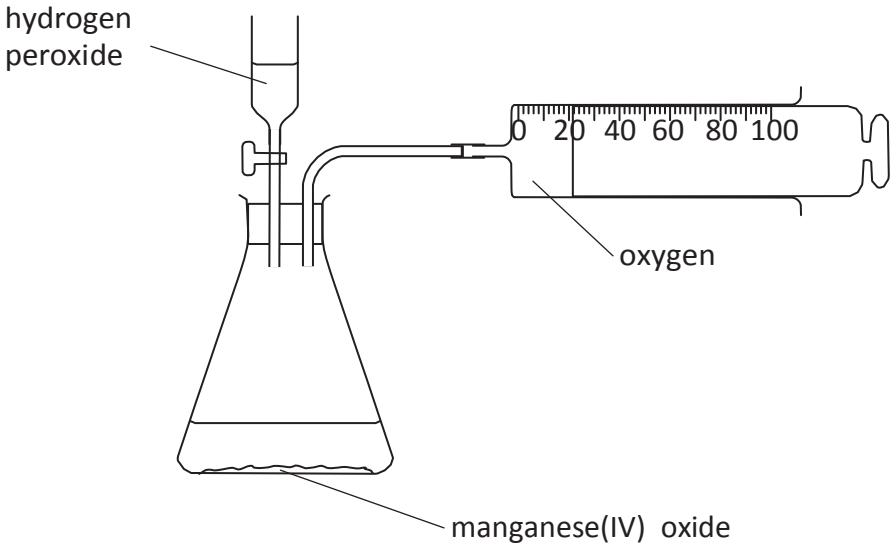
Score: **/61**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	70%	60%	55%	50%	<50%

1 The apparatus in the diagram is used to collect the oxygen produced by the decomposition of hydrogen peroxide, H_2O_2



(a) Write a chemical equation for the decomposition of hydrogen peroxide.

(2)

(b) Describe a test to show that the gas collected in the syringe is oxygen.

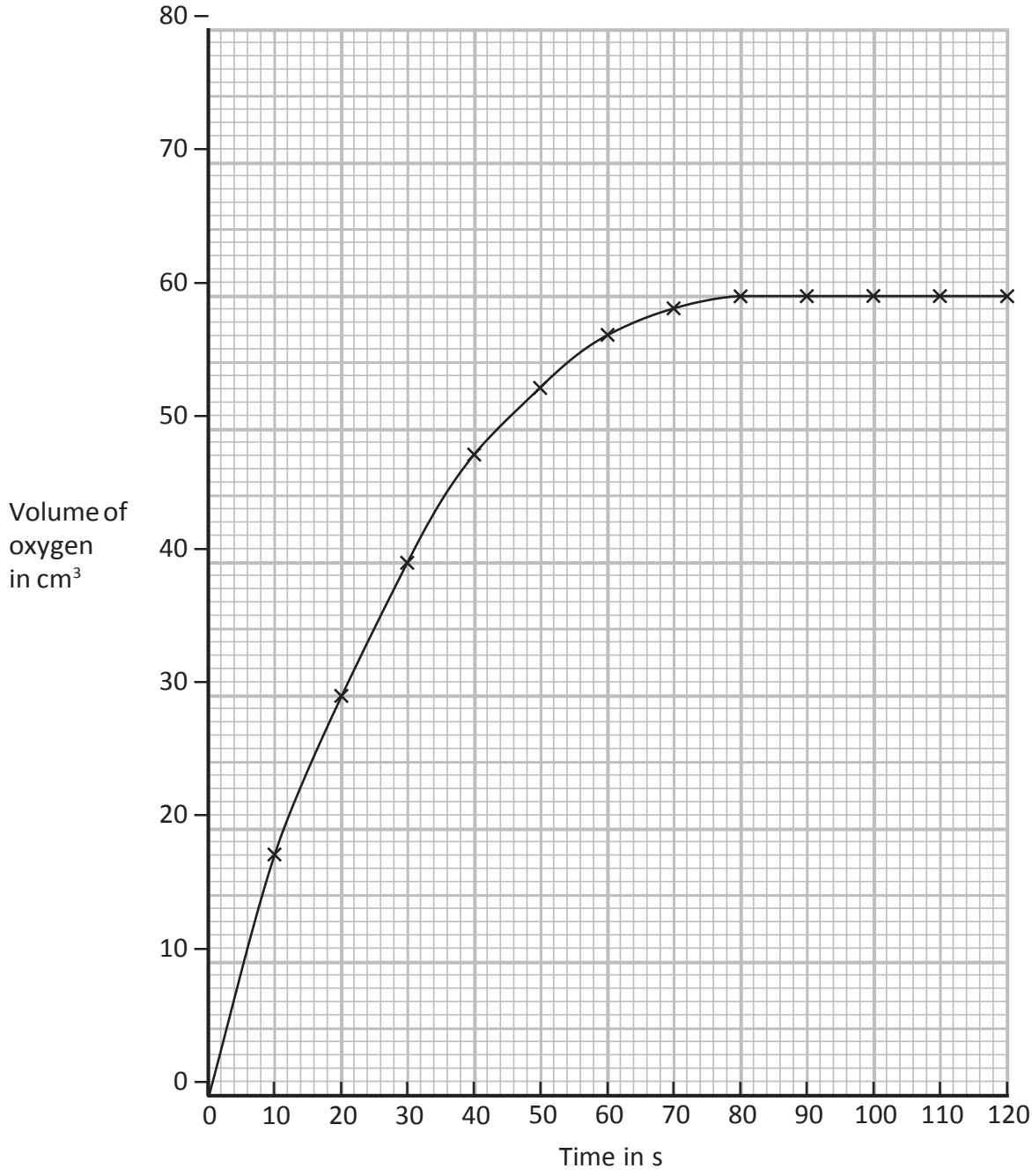
(1)

(c) Manganese(IV) oxide is a catalyst for this reaction.

State and explain the effect of a catalyst on the rate of this reaction.

(3)

(d) The graph shows the results from an experiment using a 0.50 mol/dm^3 solution of hydrogen peroxide at 25 °C.



(i) On the same axes, sketch the curve you would expect with the same volume of a 0.25 mol/dm^3 solution of hydrogen peroxide at 25 °C. Label this curve **A**.

(2)

(ii) On the same axes, sketch the curve you would expect with the same volume of a 0.50 mol/dm^3 solution of hydrogen peroxide at 35 °C. Label this curve **B**.

(2)

(Total for Question 1 = 10 marks)

2 Most metals are extracted in a blast furnace or by electrolysis.

(a) (i) The chemical equations for two reactions that occur during the extraction of aluminium are

A $Al^{3+} + 3e^- \rightarrow Al$

B $\underline{C} + O_2 \rightarrow CO_2$

For each of these reactions, complete the table to show whether the underlined species is being oxidised or reduced. In each case, explain your choice.

(3)

Reaction	Species oxidised or reduced	Explanation of choice
A		
B		

(ii) Reaction **A** takes place at the negative electrode during the extraction of aluminium.

Write an ionic half-equation for the reaction at the positive electrode.

(2)

.....

(iii) Reaction **B** gives a waste product during the extraction of aluminium.

What effect does this reaction have on the positive electrodes?

(1)

.....

.....

(iv) Reaction **B** is also important in the extraction of iron in a blast furnace.

Name the raw material that reacts with oxygen and state why the reaction is important.

(2)

Raw material .....

Importance of reaction .....

.....

(b) Galena (PbS) and cerussite ($PbCO_3$) are two ores of lead. A mining company is considering which of these two ores to use for the extraction of lead.

The equations for the reactions occurring are

Process using galena:

$$2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$$

$$2PbO + C \rightarrow 2Pb + CO_2$$

Process using cerussite:

$$PbCO_3 \rightarrow PbO + CO_2$$

$$2PbO + C \rightarrow 2Pb + CO_2$$

(i) Both processes form carbon dioxide, which the mining company hopes to sell.

Complete the table to show **two** uses of carbon dioxide and a property on which each use depends.

(4)

Use	Property

(ii) One disadvantage of using galena is that the sulfur dioxide produced can cause acid rain.

Write a chemical equation to show the formation of an acidic solution from sulfur dioxide and state one effect of acid rain.

(2)

Equation .....

Effect .....

.....

(c) The company uses a sample of cerussite containing 500 g of $PbCO_3$

Calculate the maximum mass of lead that can be obtained from this sample of cerussite.

(3)

Mass of lead = ... g

(Total for Question 2 = 17 marks)

3 Some of the gases used in industry are stored in cylinders.

(a) The cylinders are painted in different colours according to which gas is stored in them.

Why is it an advantage to use different colours?

(1)

.....

.....

(b) The table gives information about five gases. There is no information given about air.

Name of gas	argon	carbon dioxide	helium	oxygen	hydrogen	air
Formula of gas	Ar	CO_2	He	O_2	H_2	
Relative formula mass (M_r) of gas	40	44	4	32	2	

(i) Which two gases in the table are noble gases?

(1)

..... and .....

(ii) Which gas in the table makes up approximately 21% of air?

(1)

.....

(iii) Why is it not possible to give the information about air in the table?

(1)

.....

.....

(iv) Hydrogen and helium have both been used in balloons.

State one advantage of using helium instead of hydrogen.

(1)

.....

(c) State which one of the gases in the table is used in

(i) the manufacture of ammonia

(1)

.....

(ii) the manufacture of fire extinguishers

(1)

.....

(iii) the manufacture of fizzy drinks

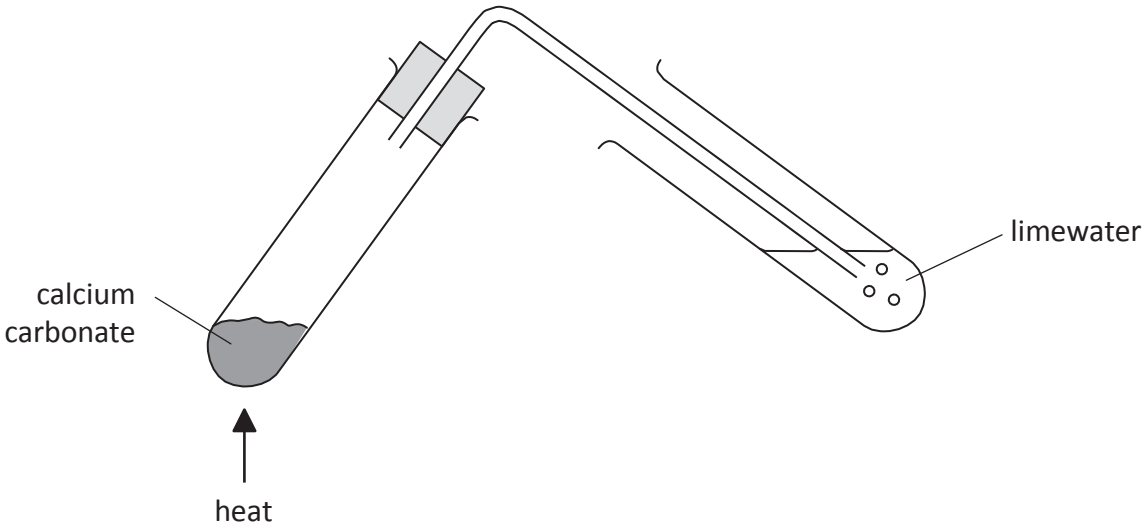
(1)

.....

(Total for Question 3 = 8 marks)

4 Some powdered calcium carbonate was heated strongly in a test tube.

The gas given off was bubbled through limewater.



The equation for the reaction taking place in the heated tube is

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

(a) What type of chemical reaction is taking place when calcium carbonate is heated?

(1)

- ☒ **A** dehydration
- ☒ **B** oxidation
- ☒ **C** reduction
- ☒ **D** thermal decomposition

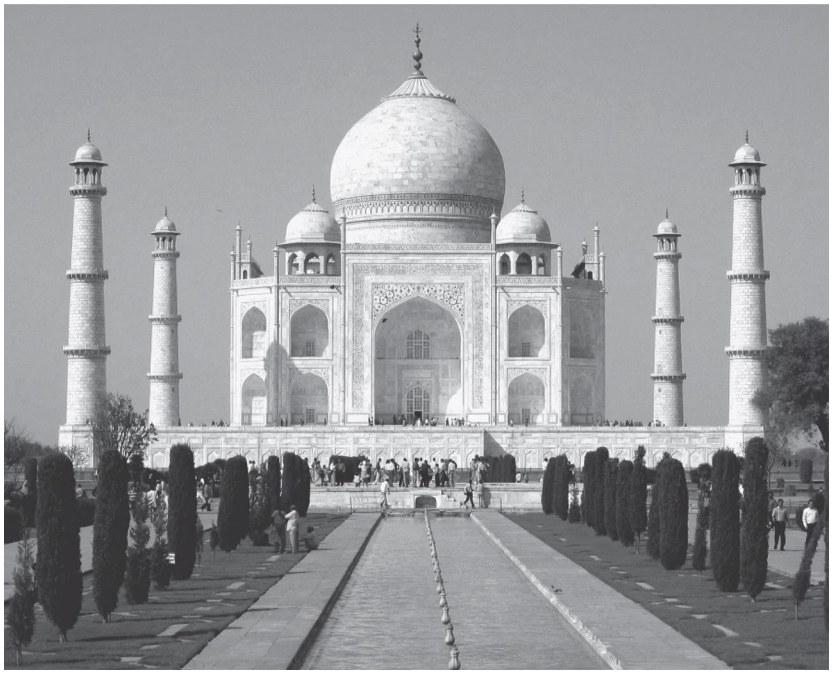
(b) State the appearance of the limewater before and after the gas was bubbled through it.

(2)

appearance before .....

appearance after .....

(c) The Taj Mahal is a famous building in India. It is made out of a form of calcium carbonate called marble.



The appearance of the marble has changed gradually over the years because of the effects of sulfur dioxide in the atmosphere.

Describe how sulfur dioxide has caused this change in appearance.

(3)

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(Total for Question 4= 6 marks)

5 Air is a mixture of gases.

The table gives the formulae of three gases and their approximate percentage by volume in a sample of dry, unpolluted air.

Gas	Percentage by volume
CO_2	0.04
N_2	78
O_2	21

(a) (i) Give the names of the two main gases in the sample of air.

(1)

..... and .....

(ii) Give the name of the gas that makes up most of the remaining 0.96% of the air.

(1)

.....

(b) State a use for N_2

(1)

.....

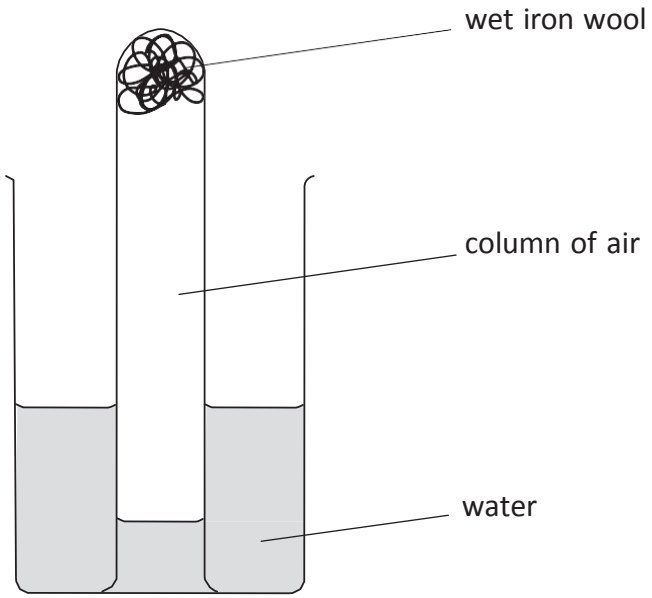
.....

(c) Give the name of a gas present in **polluted** air that causes acid rain.

(1)

.....

d) A student used this apparatus to find the percentage by volume of oxygen in a sample of air.



She used this method.

- place some wet iron wool in the bottom of a test tube
- invert the test tube in a beaker containing water
- measure the height of the column of air in the test tube
- leave the test tube for one week
- measure the new height of the column of air

The table shows her results.

Initial height of column of air in mm	80
Final height of column of air in mm	63

(i) Some of the iron turned into rust.

Write a word equation for this reaction.

(2)

.....

(ii) Use the student's results to calculate the percentage of oxygen in this sample of air.

(2)

Percentage of oxygen .....

(e) The student left the apparatus for another week and measured the height of the column of air again.

From this measurement, how could she tell whether all of the oxygen in the test tube had been used up in the first week?

(1)

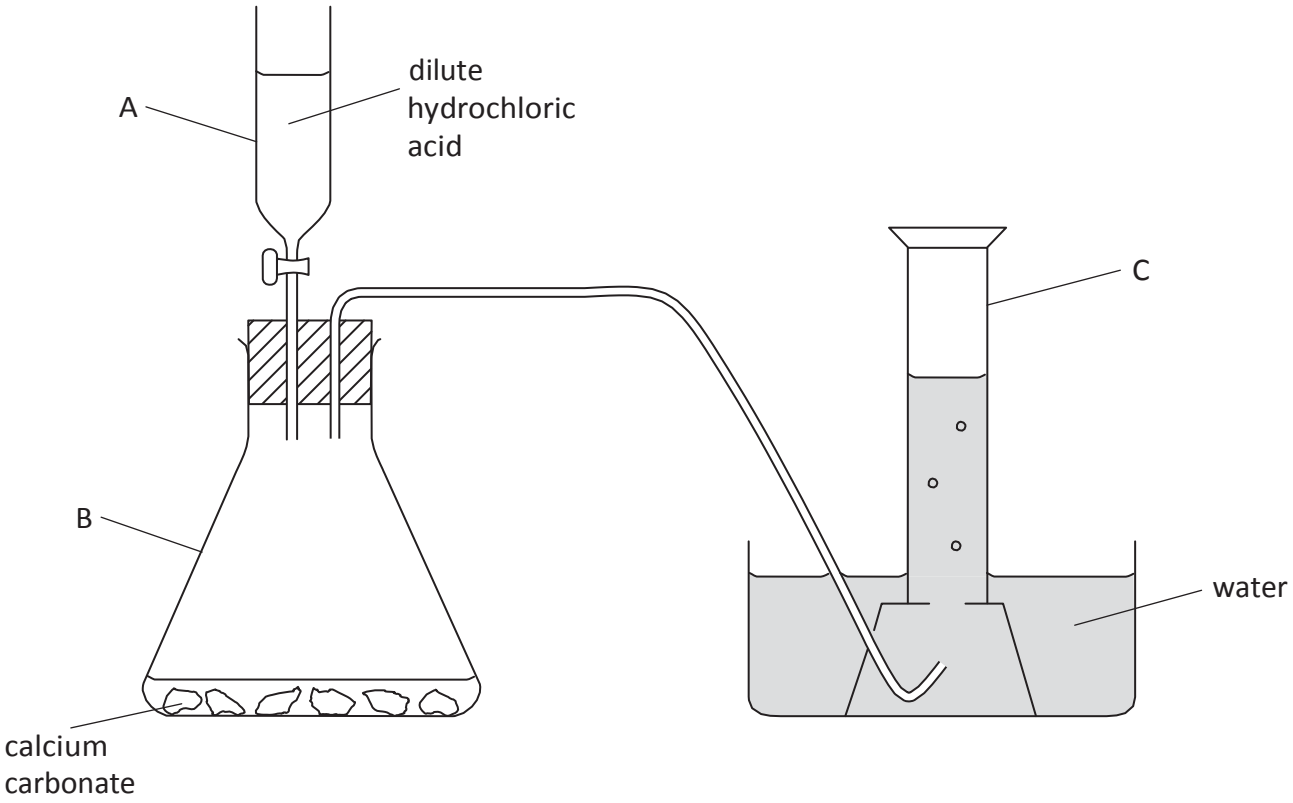
.....

.....

(Total for Question 5 = 9 marks)

6 This apparatus can be used to make and collect carbon dioxide.

This is done by adding dilute hydrochloric acid to calcium carbonate.



(a) Give the names of the pieces of apparatus labelled A, B and C.

(3)

A .....

B .....

C .....

(b) When an excess of carbon dioxide is bubbled through limewater, reaction 1 occurs, followed by reaction 2.

The equations for these reactions are

reaction 1 $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$

reaction 2 $CaCO_3(s) + H_2O(l) + CO_2(g) \rightarrow Ca(HCO_3)_2(aq)$

Suggest two observations that would be made when excess carbon dioxide is bubbled through limewater.

(2)

1 .....

.....

2 .....

.....

(c) Carbon dioxide is used in some fire extinguishers because it does not support combustion.

State another property of carbon dioxide that makes it suitable for use in fire extinguishers.

(1)

.....

.....

(d) Carbon dioxide is slightly soluble in water. The solution formed has a pH of 5.6

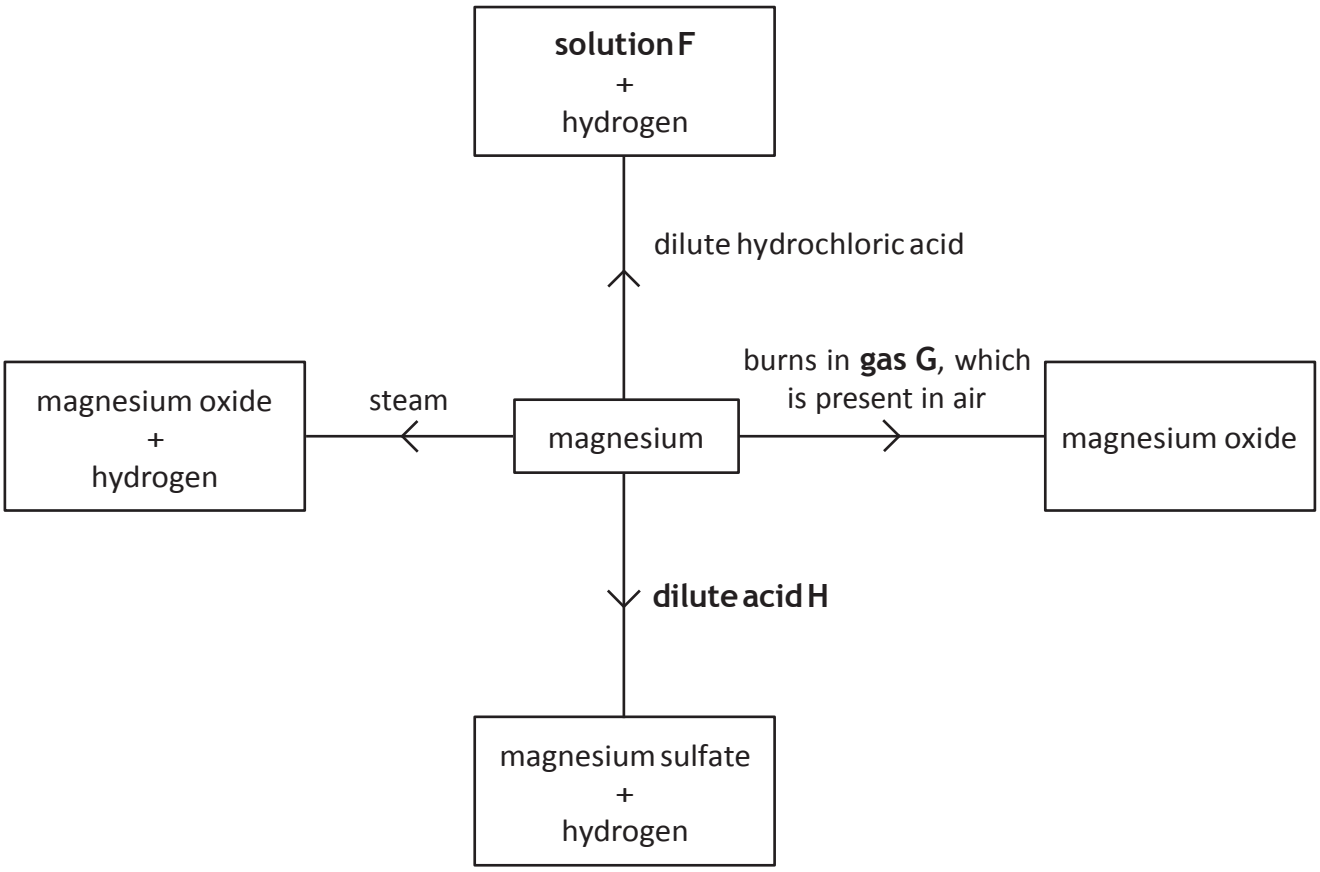
Which is the best description of a solution of carbon dioxide in water?

(1)

- ☒ **A** strongly acidic
- ☒ **B** strongly alkaline
- ☒ **C** weakly acidic
- ☒ **D** weakly alkaline

(Total for Question 6 = 7 marks)

7 The diagram shows some of the reactions of magnesium.



(a) Complete the table to give the identity of substances F, G and H.

(3)

Substance	Identity
solution F	
gas G	
dilute acid H	

(b) Write a chemical equation for the reaction between magnesium and steam.

(1)

.....

(Total for Question 7 = 4 marks)