6 It is thought that the gases in Earth's early atmosphere were released by volcanoes.

The table shows the amounts of different gases released by a volcano.

Which of the gases are carbon dioxide and water vapour?

Gas	Percentage of gas (%)
W	64
X	8
Y	2
Z	26

A **W** and **Z**

B **W** and **Y**

C **X** and **Y**

D **X** and **Z**

Your answer ☐ **[1]**

7 A student adds some metals to different solutions. The table shows their results.

Metal	Solution	Reaction
Copper	nickel sulfate	7
Nickel	tin sulfate	3
Tin	copper sulfate	3

Key:
3 = reaction
7 = no reaction

What do the results tell the student about the reactivity of the three metals?

A All three metals have the same reactivity.

B Copper is the most reactive metal.

C Nickel is the most reactive metal.

D Tin is the most reactive metal.

Your answer ☐ **[1]**

13 Nitrogen is a gas found in the Earth's atmosphere.

(a) The table shows the percentages of different gases found in the Earth's atmosphere.

Gas	Percentage in the Earth's atmosphere (%)
Nitrogen	
Oxygen	20.95
Carbon dioxide	0.38
Other gases	0.92

Calculate the percentage of nitrogen in the Earth's atmosphere.

Percentage of nitrogen = ... % **[2]**

(b) Nitrogen reacts with hydrogen to form ammonia.

The word equation for the reaction is:

nitrogen + hydrogen $\rightleftharpoons$ ammonia

(i) Describe how the word equation shows that the reaction is reversible.

..... **[1]**

(ii) The word equation for the **forward** reaction is:

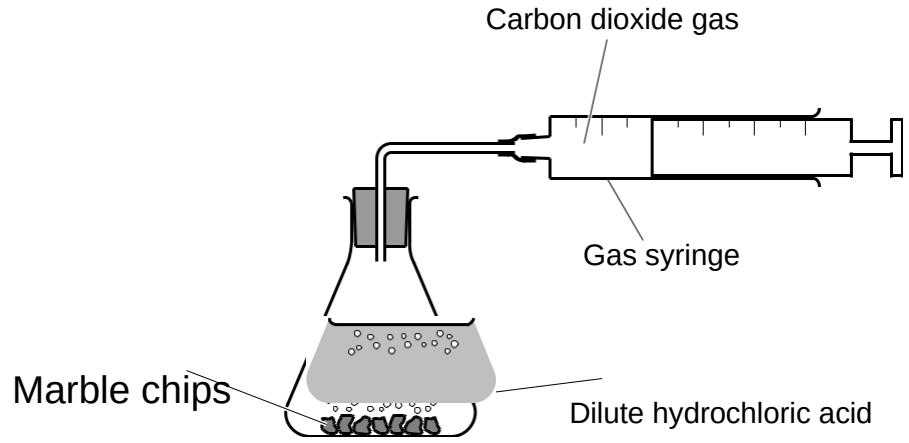
nitrogen + hydrogen $\rightarrow$ ammonia

Write the **word** equation for the **backward** reaction.

..... **[1]**

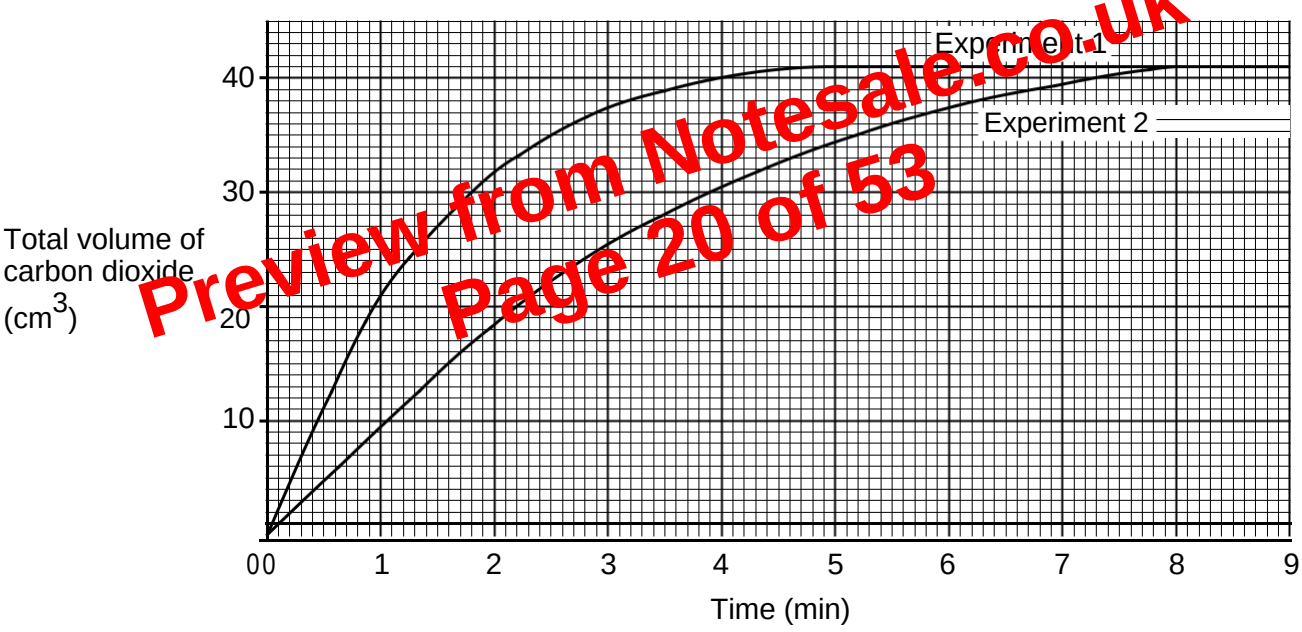
15* A student investigates the rate of reaction between pieces of marble chips and an excess of dilute hydrochloric acid.

The diagram shows the equipment they use.



The student measures the total volume of carbon dioxide gas produced every minute until the reaction finishes.

They do two different experiments and plot a graph of the results.



Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	Alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g., circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	B	1	1.1	
2	B	1	1.1	
3	A	1	2.1	
4	B	1	1.2	
5	B	1	1.1	
6	A	1	2.2	
7	C	1	2.1	
8	C	1	2.1	
9	D	1	1.2	
10	D	1	1.2	

Question			Answer	Marks	AO element	Guidance
	(d)	(i)	(The boiling points) increase ✓	1	3.1a	**ALLOW** (become) higher **/** become less negative / more positive
		(ii)	Between -175 and -225 °C ✓	1	3.2a	**ALLOW** -153 to -245 **NOTE** if answer line is blank check the table, but the answer line takes precedence

Question	Answer	Marks	AO element	Guidance
(b)	**Any two from:** Idea that recycling conserves (raw) materials / (natural) resources ✓ Idea that recycling reduces environmental impact of mining ✓ Idea that recycling uses less energy ✓ Idea that recycling releases less named polluting substances into the environment ✓ Idea that less / no waste (products) /less (goes into) landfill ✓	**2**	**2 x 1.2**	**IGNORE** cost / saves the planet / helps environment / littering **ALLOW** reduce the need to extract finite resources/conserve finite resources **ALLOW** less fossil fuels used **ALLOW** less impact from mining on habitats / less removal trees / less visual/noise pollution e.g., carbon dioxide/greenhouse gases **ALLOW** reduces climate change / reduces global warming / less toxic waste
(c)	**First check answer on the answer line** **If answer = 1400 (kg) award 3 marks** 7500 x $\frac{18}{100}$ ✓ = 1350 ✓ to **2** sig figs = 1400 ✓	**3**	**2 x 2.2** **1.2**	 **ECF** from M2 provided calculation shown
(d)	**2**Al(OH)$_3$ ✓ **3**H$_2$O ✓	**2**	**2 x 2.2**	