

Write your name here	
Surname	Other names
<b>Edexcel Certificate</b> <b>Edexcel International GCSE</b>	
Centre Number <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div>	Candidate Number <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; display: inline-block; width: 40px; height: 20px; margin: 2px;"></div>
<h1 style="margin: 0;">Chemistry</h1> <p style="margin: 5px 0;"><b>Unit: KCH0/4CH0</b></p> <p style="margin: 5px 0;"><b>Paper: 2C</b></p>	
Wednesday 16 January 2013 – Morning <b>Time: 1 hour</b>	Paper Reference <b>KCH0/2C</b> <b>4CH0/2C</b>
<b>You must have:</b> Ruler Calculator	Total Marks <div style="border: 1px solid black; width: 60px; height: 40px; margin: 5px auto;"></div>

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

### Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

**P41539A**

©2013 Pearson Education Ltd.

1/1/1/1/1/



PEARSON

# THE PERIODIC TABLE

0

7

6

5

4

3

Group

2

1

Period

4	He	Helium	2
---	----	--------	---

1	H	Hydrogen	1
---	---	----------	---

7	Li	Lithium	3	9	Be	Beryllium	4	23	Na	Sodium	11	24	Mg	Magnesium	12	39	K	Potassium	19	40	Ca	Calcium	20	45	Sc	Scandium	21	48	Ti	Titanium	22	51	V	Vanadium	23	52	Cr	Chromium	24	55	Mn	Manganese	25	56	Fe	Iron	26	59	Co	Cobalt	27	59	Ni	Nickel	28	63.5	Cu	Copper	29	65	Zn	Zinc	30	70	Ga	Gallium	31	73	Ge	Germanium	32	75	As	Arsenic	33	79	Se	Selenium	34	84	Kr	Krypton	36	86	Rb	Rubidium	37	88	Sr	Strontium	38	89	Y	Yttrium	39	91	Zr	Zirconium	40	93	Nb	Niobium	41	96	Mo	Molybdenum	42	101	Ru	Ruthenium	44	106	Pd	Palladium	46	108	Ag	Silver	47	112	Cd	Cadmium	48	115	In	Indium	49	119	Sn	Tin	50	122	Sb	Antimony	51	127	I	Iodine	53	131	Xe	Xenon	54	133	Cs	Caesium	55	137	Ba	Barium	56	179	Hf	Hafnium	72	181	Ta	Tantalum	73	186	Re	Rhenium	75	190	Os	Osmium	76	192	Ir	Iridium	77	195	Pt	Platinum	78	197	Au	Gold	79	201	Hg	Mercury	80	204	Tl	Thallium	81	207	Pb	Lead	82	209	Bi	Bismuth	83	210	Po	Polonium	84	210	At	Astatine	85	222	Rn	Radon	86
---	----	---------	---	---	----	-----------	---	----	----	--------	----	----	----	-----------	----	----	---	-----------	----	----	----	---------	----	----	----	----------	----	----	----	----------	----	----	---	----------	----	----	----	----------	----	----	----	-----------	----	----	----	------	----	----	----	--------	----	----	----	--------	----	------	----	--------	----	----	----	------	----	----	----	---------	----	----	----	-----------	----	----	----	---------	----	----	----	----------	----	----	----	---------	----	----	----	----------	----	----	----	-----------	----	----	---	---------	----	----	----	-----------	----	----	----	---------	----	----	----	------------	----	-----	----	-----------	----	-----	----	-----------	----	-----	----	--------	----	-----	----	---------	----	-----	----	--------	----	-----	----	-----	----	-----	----	----------	----	-----	---	--------	----	-----	----	-------	----	-----	----	---------	----	-----	----	--------	----	-----	----	---------	----	-----	----	----------	----	-----	----	---------	----	-----	----	--------	----	-----	----	---------	----	-----	----	----------	----	-----	----	------	----	-----	----	---------	----	-----	----	----------	----	-----	----	------	----	-----	----	---------	----	-----	----	----------	----	-----	----	----------	----	-----	----	-------	----

Key

Relative atomic mass	Symbol	Name	Atomic number
----------------------	--------	------	---------------



**BLANK PAGE**



**Answer ALL questions.**

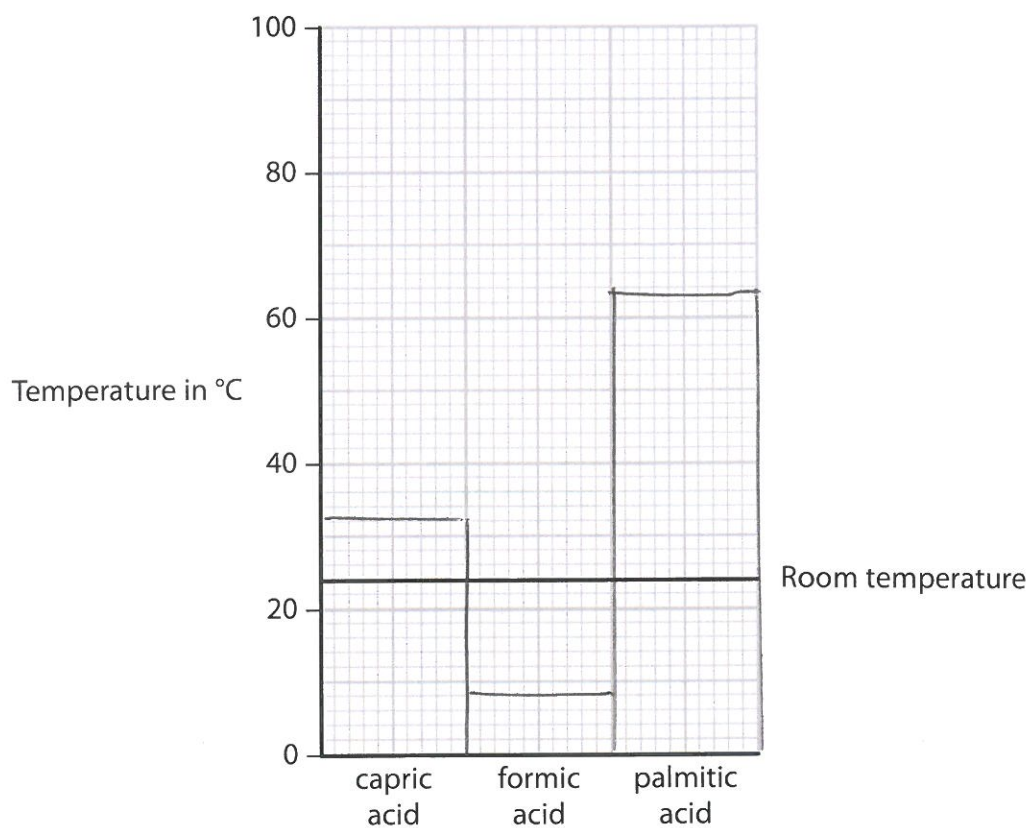
1 The melting points of three related compounds are

capric acid	32 °C
formic acid	8 °C
palmitic acid	63 °C

The boiling point of all these compounds is above 100 °C

(a) Use the grid to draw a bar chart of the melting points.

(2)



(b) Room temperature has been marked on the grid.

Use your bar chart to give the physical state of each acid at room temperature.

(2)

capric acid solid

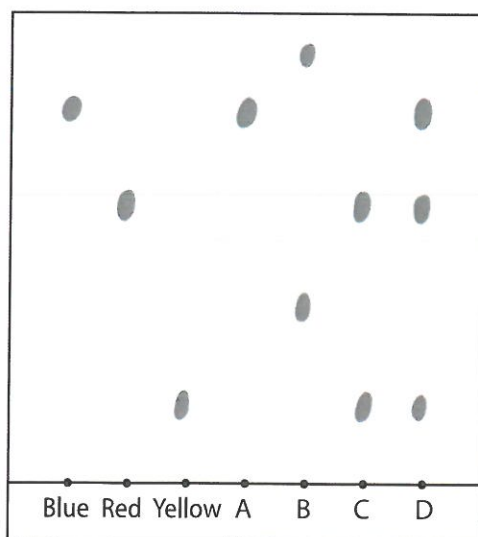
formic acid liquid

palmitic acid solid

**(Total for Question 1 = 4 marks)**



2 A student produces this chromatogram for four dyes, **A**, **B**, **C** and **D**.



(a) Put a cross (☒) in a box to indicate your answer.

(i) Which one of the dyes contains three colours?

(1)

☐ **A**

☐ **B**

☐ **C**

☒ **D**

(ii) Which one of the dyes contains one colour only?

(1)

☒ **A**

☐ **B**

☐ **C**

☐ **D**

(b) Each dye is made from one or more of the colours blue, red and yellow.

The student thinks that the result for one dye is incorrect.

Suggest which result is incorrect. Explain your answer.

(2)

The incorrect result is B

because The spots do not line up

(Total for Question 2 = 4 marks)





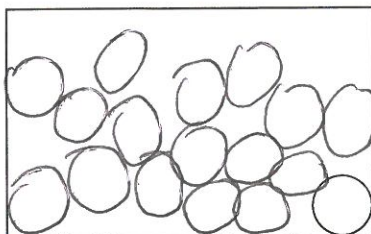
3 The photograph shows an aeroplane that has a rocket motor.



(a) One of the tanks on the aeroplane contains liquid oxygen.

- (i) Complete the diagram to show the arrangement of the particles in a liquid. One particle has been drawn for you.

(2)



- (ii) Much more oxygen can be stored in the tank when the oxygen is a liquid rather than a gas.

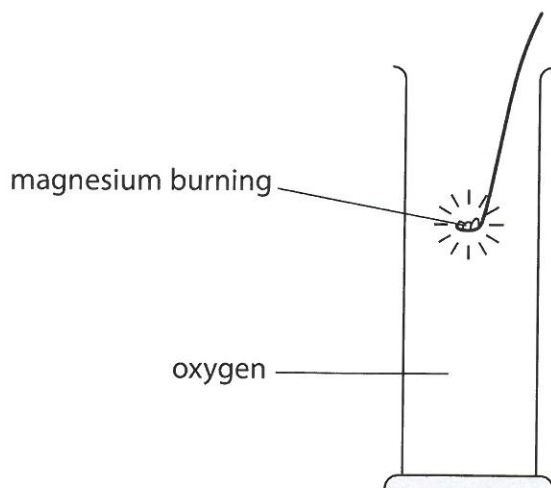
Give a reason for this in terms of the arrangement of the particles.

(1)

Closer together



3 (b) Magnesium burns in oxygen to form magnesium oxide.



(i) State **two** observations that can be made when magnesium burns in oxygen.

(2)

1 White flame

2 White smoke/powder

(ii) Give the formula of magnesium oxide.

(1)

MgO

(c) A small amount of magnesium oxide is dissolved in water. When universal indicator is added to this solution, the indicator turns blue.

(i) What does the observation with the indicator show about magnesium oxide?

(1)

base/alkali

(ii) Identify the ion that is responsible for the universal indicator turning blue.

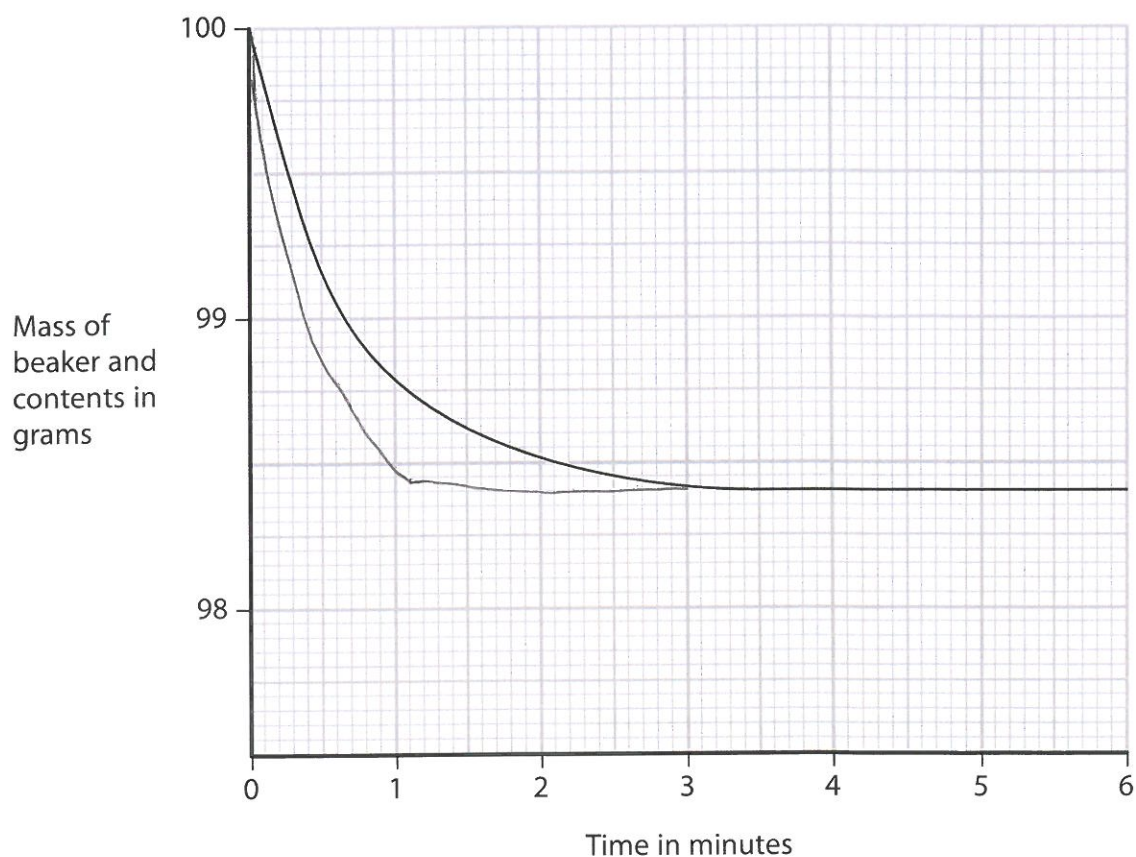
(1)

OH<sup>-</sup>

(Total for Question 3 = 8 marks)



- 4 An excess of dilute hydrochloric acid was added to a lump of calcium carbonate in a beaker. The mass of the beaker and contents was recorded every 30 seconds. The graph shows the results.



The equation for the reaction is



- (a) State **two** observations that can be made when dilute hydrochloric acid is added to calcium carbonate.

(2)

- 1 Fizzing.
- 2 Calcium carbonate (dissolves) disappears

- (b) Give the test for carbon dioxide gas.

(2)

Test limewater

Result Milky.





- 4 (c) Describe the relationship between the mass of the beaker and contents, and the time. (1)

Mass decreases as time increases

- (d) (i) After how many minutes did the reaction stop? (1)

3.5 min

- (ii) State why the reaction eventually stopped. (1)

calcium carbonate completely reacted

- (e) Identify the compounds, other than water, present in the solution in the beaker

- (i) after two minutes (1)

calcium chloride + HCl

- (ii) after five minutes (1)

" + "

- (f) The experiment was repeated using the same mass of calcium carbonate, but as a powder instead of a single lump.

On the graph, sketch the curve you would expect to obtain from this second experiment. (2)

(Total for Question 4 = 11 marks)



5 **Soluble salts** can be made by reacting an acid with a metal hydroxide, a metal oxide, or a metal carbonate.

**Insoluble salts** can be made by using a precipitation reaction.

- (a) Complete the table to show which acid or metal compound is used to make each salt listed.

For each metal compound, state whether it would be used as a solid or in aqueous solution.

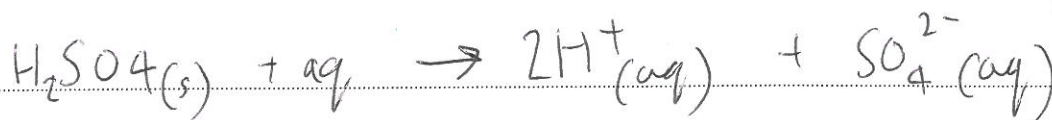
(5)

Salt made	Acid used	Metal compound	
		Name	Solid or aqueous solution
copper(II) sulfate	sulfuric acid	copper(II) oxide	Solid Garnet
silver chloride	hydrochloric acid	Silver nitrate	aqueous solution
potassium nitrate	nitric	potassium carbonate	aq

- (b) An acid is a source of hydrogen ions,  $H^+$

Write an equation to show the ions formed when sulfuric acid is dissolved in water.

(2)



- 5 (c) Lead(II) chloride is an insoluble salt that can be prepared by reacting lead(II) nitrate with sodium chloride.

Describe how you would prepare a **pure, dry** sample of lead(II) chloride starting from solid lead(II) nitrate and solid sodium chloride.

(5)

- dissolve both in water
- mix the two solutions.
- filter.
- wash residue
- dry on filter paper

(Total for Question 5 = 12 marks)



6 This is a recipe for making plum wine.

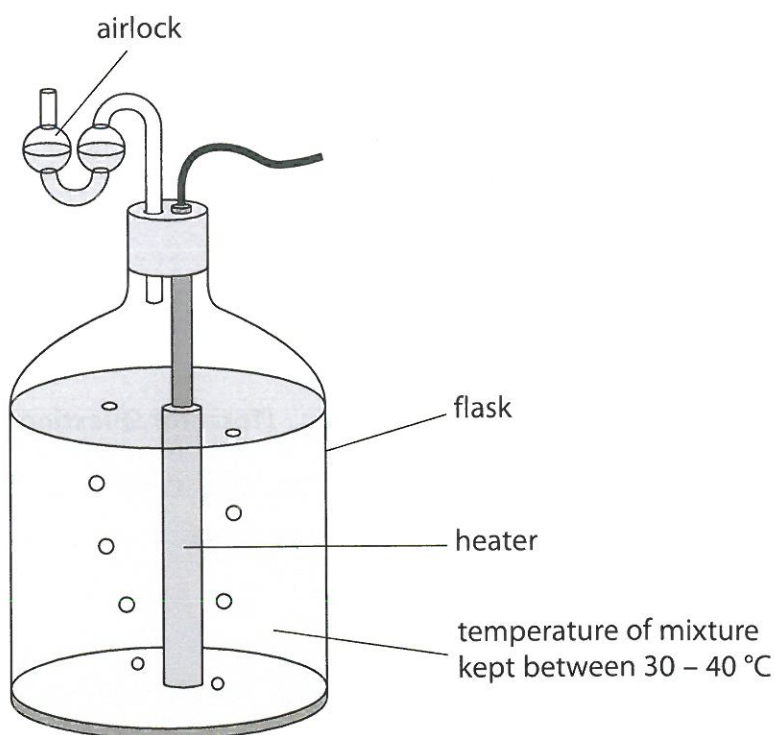
Dissolve 1.5 kg of sugar in 5 dm<sup>3</sup> of warm water.

Add yeast and 8 kg of plums.

Pour the mixture into a flask.

Leave the flask for several weeks until the reaction has stopped.

Remove the solid yeast and pour the clear liquid into bottles.

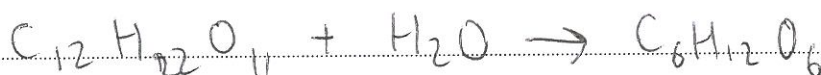


(a) Sugar contains sucrose,  $C_{12}H_{22}O_{11}$

When yeast is added, water reacts with sucrose to form glucose,  $C_6H_{12}O_6$

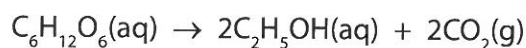
Write a chemical equation for this reaction.

(1)





6 (b) The glucose is then converted into ethanol by the yeast



(i) How would you know when the reaction has stopped?

(1)

no more bubbles

(ii) How could the solid yeast be removed from the mixture?

(1)

filtration

(c) Ethanol can be converted into chloroethene,  $\text{CH}_2=\text{CHCl}$ , in three stages.

Stage 1 Ethanol is dehydrated to form ethene,  $\text{CH}_2=\text{CH}_2$

Stage 2 Ethene is converted into 1,2-dichloroethane,  $\text{CH}_2\text{ClCH}_2\text{Cl}$

Stage 3 1,2-dichloroethane is converted into chloroethene and hydrogen chloride

(i) Why is the reaction in **Stage 1** described as dehydration?

(1)

removal of water

(ii) Identify the catalyst used in the reaction in **Stage 1**.

(1)

$\text{Al}_2\text{O}_3$

(iii) Suggest the name or formula of the substance used to react with ethene in **Stage 2**.

(1)

$\text{Cl}_2$

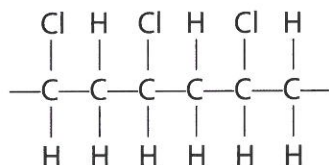
(iv) Write a chemical equation for the reaction in **Stage 3**.

(1)



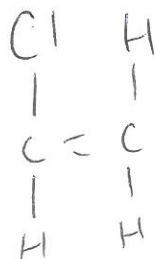
- 6 (d) Chloroethene can be used to make the polymer poly(chloroethene), also known as PVC.

The displayed formula for part of the PVC molecule is



- (i) Draw a displayed formula for a chloroethene molecule.

(1)



- (ii) Describe, in terms of structure and bonding, what happens when chloroethene molecules are converted into poly(chloroethene).

(3)

- one bond in the double bond breaks
- monomers join together
- to form a long chain
- polymer contains only single bonds.

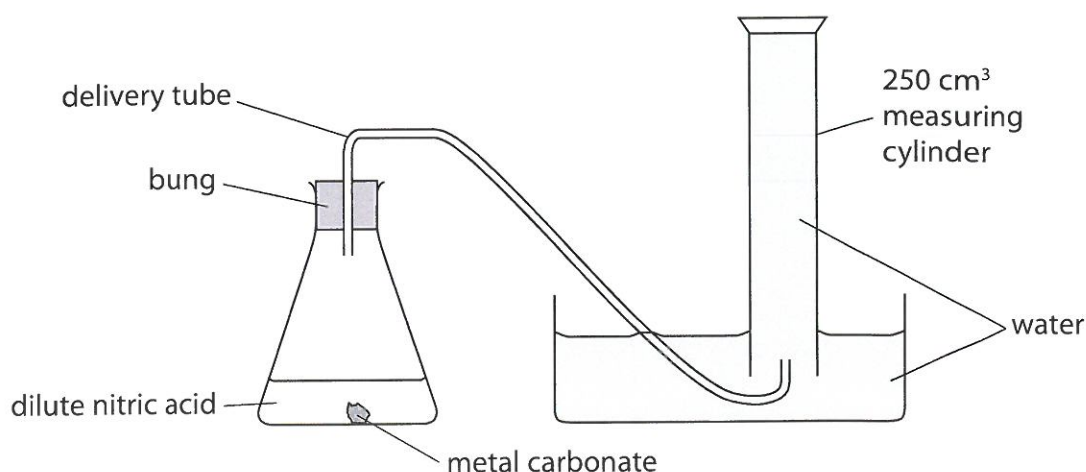
(Total for Question 6 = 11 marks)



**BLANK PAGE**



- 7 A student set up this apparatus to measure the volume of carbon dioxide given off when a sample of a carbonate of a Group 2 metal was reacted with dilute nitric acid.



She weighed out some of the carbonate and put it in a conical flask. She then added an excess of dilute nitric acid.

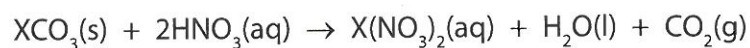
After adding the acid she placed the bung and delivery tube into the conical flask.

She measured the total volume of gas collected at room temperature and pressure (rtp) in the measuring cylinder.

Her results are shown in the table.

Mass of Group 2 carbonate	0.888 g
Volume of gas collected	144 cm <sup>3</sup>

The equation for the reaction is



where X is the symbol for the Group 2 metal.





- 7 (a) (i) Calculate the amount, in moles, of carbon dioxide gas collected.  
(Assume that one mole of gas has a volume of 24 000 cm<sup>3</sup> at rtp)

(2)

$$\frac{144}{24000}$$

Amount of carbon dioxide gas collected = 0.006 mol

- (ii) Deduce the amount, in moles, of the carbonate that reacted.

(1)

Amount of carbonate reacted = 0.006 mol

- (iii) Using the mass of the carbonate and your answer to (a)(ii), calculate the relative formula mass ( $M_r$ ) of this carbonate.

Give your answer to the nearest whole number.

(2)

$$M_r = \frac{\text{mass}}{\text{moles}} = \frac{0.888}{0.006}$$

Relative formula mass = 148

- (iv) Calculate a value for the relative atomic mass of the Group 2 metal, X, and use the Periodic Table on page 2 to suggest its identity.

(3)

$$CO_3 = 12 + (16 \times 3) = 60$$

$$148 - 60 = 88$$

Relative atomic mass of X = 88

Identity of X = Sr



7 (b) After the student had completed the experiment she was told that the metal carbonate was calcium carbonate.

She calculated that 0.888 g of calcium carbonate would produce 213 cm<sup>3</sup> of carbon dioxide.

She was certain that she had measured the mass of the metal carbonate correctly.

Suggest **two** reasons why the volume of gas she collected was less than 213 cm<sup>3</sup>.

(2)

1.
  - gas lost between adding acid + replacing bung.
  - leak
2.
  - gas dissolves in water
  - carbonate was impure.
  - Temp below 25°C.

(Total for Question 7 = 10 marks)

(TOTAL FOR PAPER = 60 MARKS)

