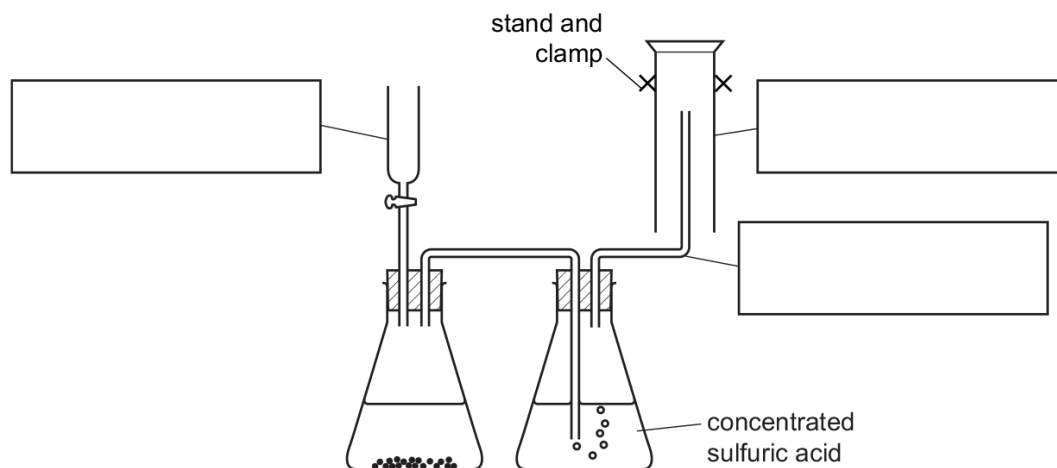


### 10.4 Carbon dioxide and methane

01. 0620\_p20\_qp\_60 Q: 1

The diagram shows the apparatus used to prepare a dry sample of a gas. The gas is more dense than air.



(a) Complete the boxes to name the apparatus. [3]

(b) Identify **one** mistake in the apparatus.

..... [1]

(c) Suggest a reason why the gas is passed through concentrated sulfuric acid.

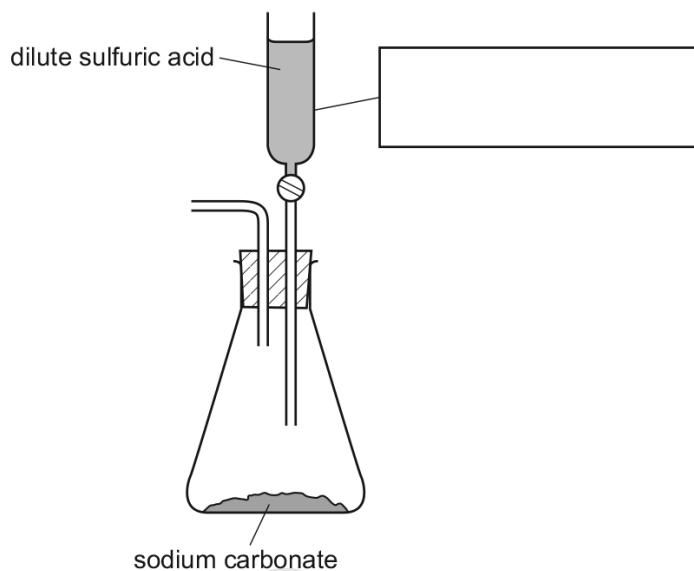
..... [1]

[Total: 5]



03. 0620\_w14\_qp\_63 Q: 1

Sulfuric acid was added to sodium carbonate to prepare and collect a sample of carbon dioxide.



(a) Complete and label the diagram to show how a sample of carbon dioxide should be collected. [2]

(b) Complete the box to identify the piece of apparatus used. [1]

(c) Suggest why it is not necessary to heat the reactants. [1]  
 .....

(d) Give a test to identify carbon dioxide.  
 test .....  
 result ..... [2]

[Total: 6]

10.4. CARBON DIOXIDE AND METHANE

04.0620\_w14\_qp\_63 Q: 4

A student investigated the addition of four different solids, **H**, **J**, **K** and **L**, to water. The same mass of solid, 4 g, was used in each experiment.

Five experiments were carried out.

**(a) Experiment 1**

Using a measuring cylinder, 25 cm<sup>3</sup> of distilled water was poured into a polystyrene cup. The initial temperature of the water was measured.

4 g of solid **H** was added to the water in the cup and the mixture stirred with a thermometer.

The temperature of the liquid mixture was measured after 90 seconds.

Use the thermometer diagrams to record the results in the table below.

The thermometer and the cup were rinsed with water.

**(b) Experiment 2**

Experiment 1 was repeated, using solid **J** instead of solid **H**.

Use the thermometer diagrams to record the initial and final temperatures in the table.

Some of this solution was kept in a test-tube for Experiment 5.

**(c) Experiment 3 and Experiment 4**

Experiment 1 was repeated, using solid **K** and then solid **L**.

Use the thermometer diagrams to record the temperatures in the table. Complete the table.

A little of the solution from Experiment 4 was kept for Experiment 5.

experiment	thermometer diagram	initial temperature / °C	thermometer diagram	final temperature / °C	temperature difference / °C
1					
2					
3					
4					

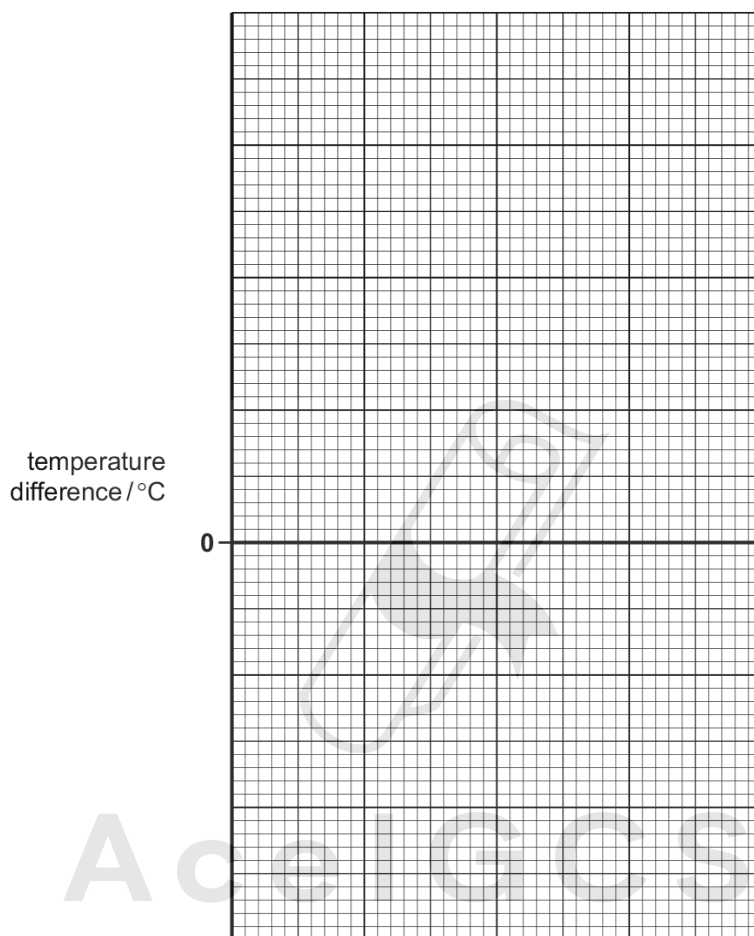
[3]

(d) Experiment 5

A little of the solution from Experiment 2 was poured into a test-tube. The solution from Experiment 4 was added to the test-tube. Observations were noted.

observation	rapid effervescence
-------------	---------------------

(e) Draw a labelled bar chart of the results for Experiments 1, 2, 3 and 4 on the grid below.



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[4]

Use your results and observations to answer the following questions.

(f) Why were the thermometer and polystyrene cup rinsed after each experiment?

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

10.4. CARBON DIOXIDE AND METHANE

- (g) (i) Which experiment produced the smallest temperature change?  
..... [1]
- (ii) Which solids dissolve in water to produce an endothermic change? Explain your choice.  
.....  
..... [2]
- (h) Suggest the temperature change that would occur if
- (i) Experiment 3 was repeated using 50 cm<sup>3</sup> of distilled water,  
.....  
..... [1]
- (ii) 2g of solid L were used in Experiment 4.  
..... [1]
- (iii) Explain your answer to (h)(ii).  
..... [1]
- (i) Predict the temperature of the solution in Experiment 2 after one hour. Explain your answer.  
.....  
..... [2]
- (j) Suggest an explanation for the observations in Experiment 5.  
.....  
..... [2]
- (k) Suggest how the reliability of the results could be checked.  
.....  
..... [2]
- [Total: 20]

01. 0620\_p20\_ms\_60 Q: 1

- (a) tap / separating / dropping funnel; [1]  
 not: burette  
delivery tube; [1]  
 gas jar; [1]  
 allow: measuring cylinder
- (b) gas should be collected downwards / owtte [1]
- (c) to remove water / to remove impurities [1]

02. 0620\_s20\_ms\_63 Q: 4

Question	Answer	Marks
	any six from:  <b>gas volume method</b> <ul style="list-style-type: none"> <li>• weigh both washing powders or equal masses of both washing powders</li> <li>• place in suitable container (flask / boiling tube / test-tube)</li> <li>• add acid</li> <li>• to excess / until no more fizzing</li> <li>• collect gas</li> <li>• in gas syringe or by downward displacement in measuring cylinder</li> <li>• measure volume of gas</li> <li>• largest volume of gas has most sodium carbonate</li> </ul> <b>OR</b> <b>mass loss method</b> <ul style="list-style-type: none"> <li>• weigh both washing powders or equal masses of both washing powders</li> <li>• place in suitable container (flask / boiling tube / test-tube / beaker)</li> <li>• add acid</li> <li>• to excess / until no more fizzing</li> <li>• weigh mixture once acid added</li> <li>• weigh mixture at end</li> <li>• calculate mass drop</li> <li>• largest mass drop has most sodium carbonate</li> </ul>	<b>6</b>

Question	Answer	Marks
	<b>OR</b> <b>titration method</b> <ul style="list-style-type: none"> <li>• weigh both washing powders or equal masses of both washing powders</li> <li>• place in suitable container (flask / beaker)</li> <li>• dissolve in water</li> <li>• add named indicator (not UI)</li> <li>• add acid from burette</li> <li>• stop when indicator changes colour</li> <li>• record start and final reading on burette</li> <li>• largest volume of acid used has most sodium carbonate</li> </ul>	

03. 0620\_w14\_ms\_63 Q: 1

- (a) suitable collection vessel, e.g. syringe / measuring cylinder, burette, test tube or gas jar in trough of water or by downward delivery (1) label (1) [2]
- (b) tap / separating / dropping funnel (1) [1]
- (c) reaction is fast at room temperature (1) [1]  
**allow:** heat not needed / reacts anyway
- (d) limewater (1)  
 turns milky / cloudy / white (1) [2]

04. 0620\_w14\_ms\_63 Q: 4

- (c) table of results
- initial temperature boxes completed correctly (1)  
 21, 22, 22, 19
- final temperature boxes correctly completed (1)  
 41, 16, 11, 32
- differences correct (1)  
 20, -6, -11, 13 [3]
- (e) suitable scale – 2 cm is 5 or 10 °C (1)  
 all 4 bars at correct levels (2),  
 3 correct (1)  
 2 or fewer correct (0)  
 clear unambiguous labels, HJKL or 1, 2, 3, 4 (1) [4]
- (f) to remove impurities / clean (1) [1]
- (g) (i) Experiment 2 / J (1) [1]  
 (ii) Experiments 2 / J **and** 3 / K (1)  
 temperature decreased / energy or heat is absorbed (1) [2]
- (h) (i) (-)5.5(°C) (1) [1]  
 (ii) (+)6.5(°C) (1) [1]  
 (iii) half amount of solid used (1) [1]
- (i) room temperature / initial temperature / 22 °C (1)  
 reaction finished / all dissolved (1) [2]
- (j) carbonate (1)  
 carbon dioxide (1)  
 acid (1) max [2]
- (k) repeat (1)  
 compare results / average results / mean (1) [2]