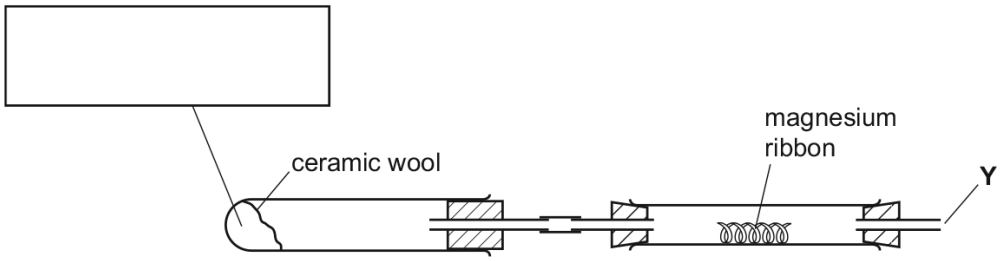
9.1 Properties of metals

01. 0620_s14_qp_63 Q: 1

Steam was passed over heated magnesium ribbon using the apparatus below.



(a) (i) Complete the box to show the substance absorbed by the ceramic wool. [1]

(ii) Indicate on the diagram, with two arrows, where the heat is applied. [1]

(b) (i) Describe the change in the appearance of the magnesium.

..... [2]

(ii) Predict the effect of adding water and a few drops of Universal Indicator to the solid product of the reaction.

.....

..... [2]

(c) Suggest the effect of a lighted splint at point **Y**. Explain your suggestion.

.....

..... [2]

[Total: 8]

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02. 0620_s16_qp_61 Q: 4

Calcium burns in air to form calcium oxide. The reaction is vigorous and some of the calcium oxide can be lost as smoke.
Plan an investigation to determine the maximum mass of oxygen that combines to form calcium oxide when 2 g of calcium granules are burnt in air.
You are provided with common laboratory apparatus and calcium granules.

.....

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.....

.....

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.....

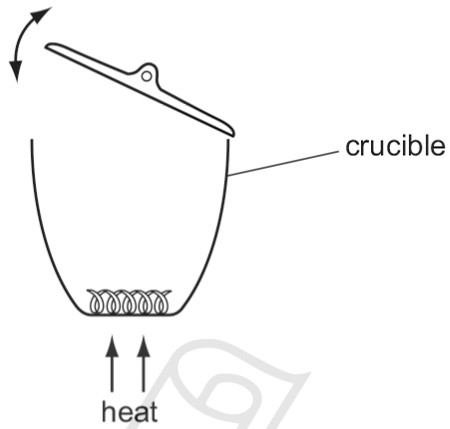
.....

..... [6]

[Total: 6]

03. 0620_w12_qp_61 Q: 3

A student carried out an experiment to find the mass of magnesium oxide formed when magnesium burns in air.
A strip of magnesium ribbon was loosely coiled and placed in a weighed crucible, which was then reweighed.
The crucible was heated strongly for several minutes. During the heating, the crucible lid was lifted and replaced several times as in the diagram below.



The magnesium was converted into magnesium oxide. After cooling, the crucible and contents were reweighed.

(a) Describe the appearance of the

(i) magnesium ..... [1]

(ii) magnesium oxide. ..... [1]

(b) Name the element that reacted with the magnesium.

..... [1]

(c) Why was the lid lifted during heating?

..... [1]

(d) Suggest why the mass of the magnesium oxide was found to be **lower** than expected.

.....

..... [2]

[Total: 6]

04. 0620_w12_qp_62 Q: 3

A student prepared zinc nitrate from zinc oxide.
The zinc nitrate was then heated to change it back into zinc oxide.
The procedure followed was in three steps.

Step 1 Some zinc oxide was put into a weighed evaporating dish and the mass noted. The zinc oxide was transferred into a beaker.

Step 2 A dilute acid was slowly added to the beaker until all the zinc oxide had reacted. Zinc nitrate solution was produced.

Step 3 The solution was evaporated to dryness in the evaporating dish. The resulting solid was heated in a fume cupboard. After cooling, the dish was weighed. The dish was then heated again, cooled and reweighed.

The mass of zinc oxide produced was not the same as the amount used at the start.

(a) What could be used to transfer the zinc oxide in Step 1?

..... [1]

(b) Name the acid used in Step 2.

..... [1]

(c) **(i)** Suggest why the heating in Step 3 was carried out in a fume cupboard.

..... [1]

(ii) Why was the dish reweighed in Step 3?

.....

..... [2]

(d) Suggest **two** reasons why the amount of zinc oxide produced in Step 3 was not the same as the mass of zinc oxide used in Step 1.

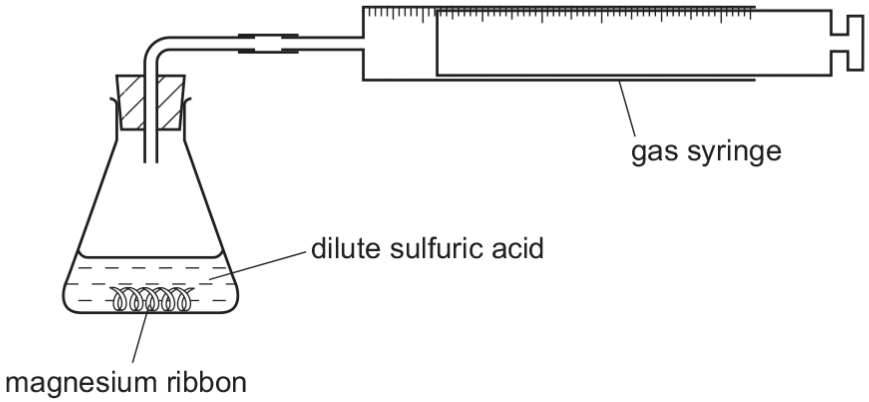
1 .....

2 ..... [2]

[Total: 7]

05. 0620_w12_qp_63 Q: 2

A student carried out two experiments to investigate the speed of reaction between magnesium and excess dilute sulfuric acid.
The apparatus shown below was used to measure the volume of gas produced.



(a) Name the gas produced during the reaction.

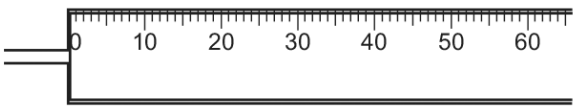
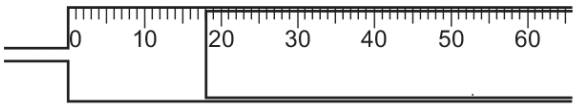
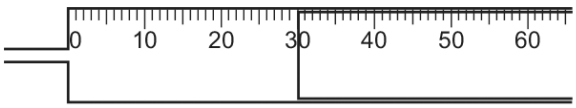
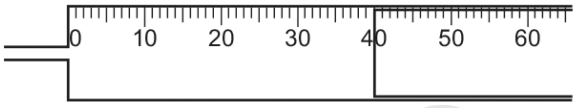
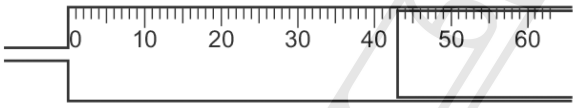
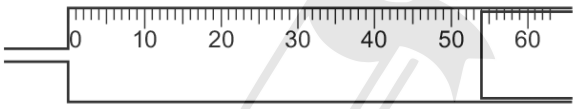
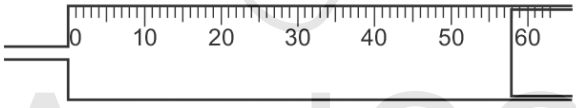
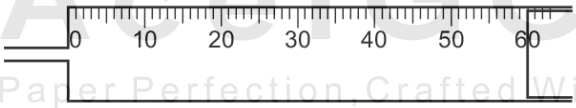
..... [1]

Two experiments were carried out.

Experiment 1

Dilute sulfuric acid was added to magnesium ribbon and the volume of gas produced was measured every minute for seven minutes.

(b) Use the gas syringe diagrams to complete the table of results.

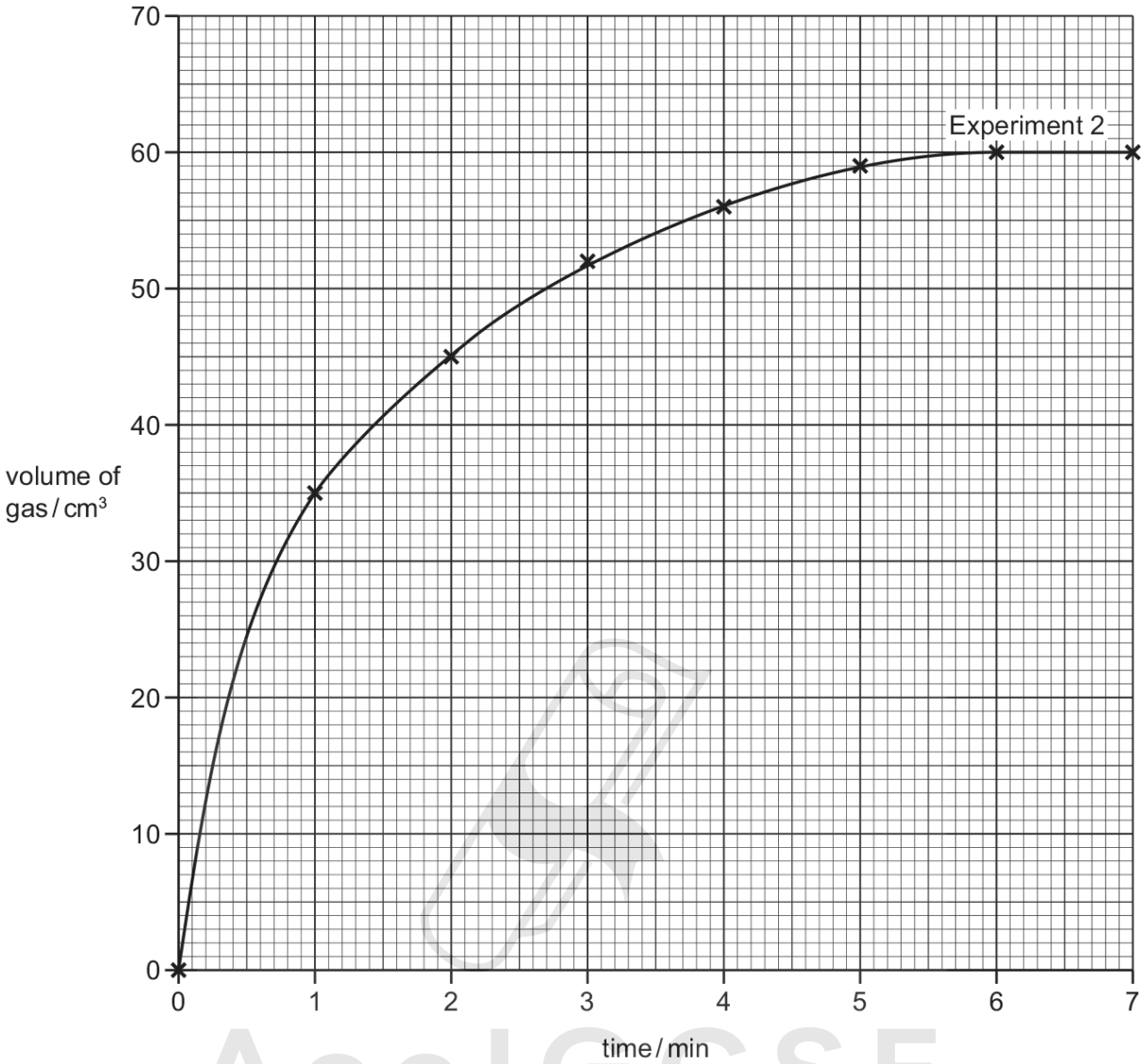
time / min	gas syringe diagram	volume of gas produced / cm^3
0		
1		
2		
3		
4		
5		
6		
7		

[3]

Experiment 2

The results for Experiment 2 have been plotted on the grid opposite and a graph drawn.

(c) Plot the results for Experiment 1 on the grid. Draw a smooth line graph. [4]



(d) **(i)** At which time interval does the volume reading appear to be inaccurate? Explain the reason for your choice.

.....

..... [2]

(ii) What was the total volume of gas that should have been produced at that time? Indicate **on the grid** how you arrived at your answer.

..... [2]

(e) Suggest and explain how the conditions had changed in Experiment 2 compared to Experiment 1.

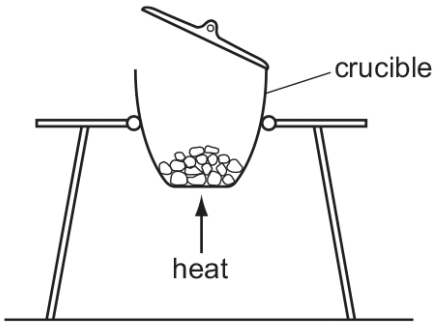
.....

..... [2]

[Total: 14]

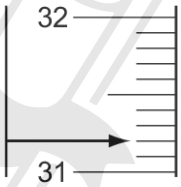
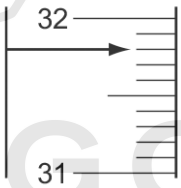
06. 0620_w13_qp_62 Q: 3

A student investigated the formation of calcium oxide by heating calcium in air, using the apparatus shown.



She weighed an empty crucible and its lid. She then added some calcium to the crucible and reweighed it.

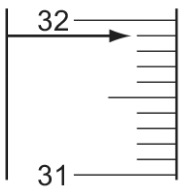
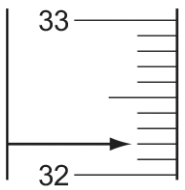
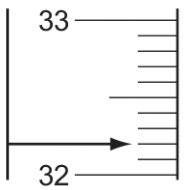
(a) Use the balance diagrams to record the masses in the table.

	balance diagram	mass / g
mass of crucible and lid		
mass of crucible, lid and calcium		

[1]

The student then heated the calcium in the crucible for ten minutes. The lid was raised occasionally using a pair of tongs. After ten minutes, the crucible was allowed to cool and reweighed. This procedure was repeated twice.

(b) Use the balance diagrams to complete the table of results.

time / min	10	20	30
balance diagram			
mass of crucible, lid and calcium oxide / g			

[2]

(c) Why was the lid of the crucible raised occasionally?

..... [1]

(d) Explain why the crucible was heated three times.

.....

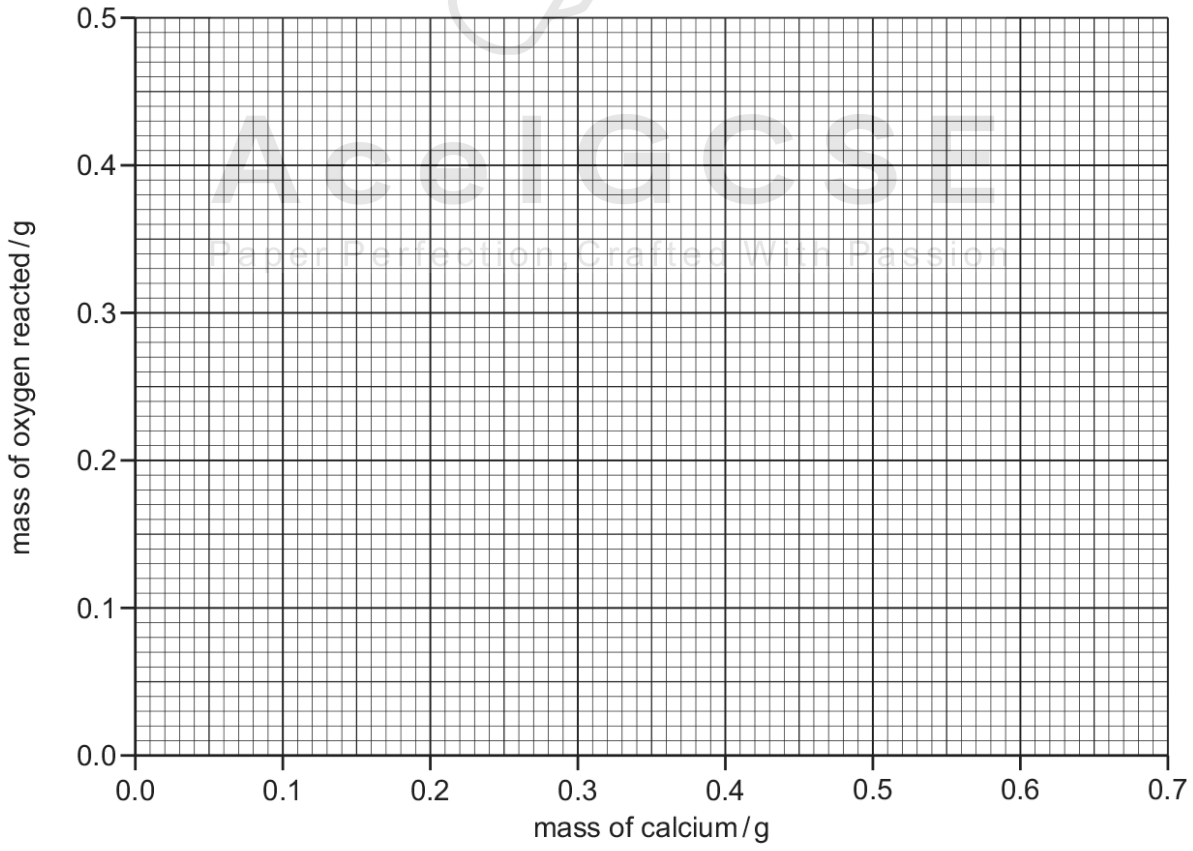
..... [2]

The table shows the results of experiments using different masses of calcium.

experiment	mass of calcium / g	mass of calcium oxide / g	mass of oxygen reacted / g
1	0.12	0.20	0.08
2	0.20	0.32	0.12
3	0.30	0.49	0.19
4	0.40	0.61	
5	0.44	0.72	
6	0.48	0.79	
7	0.56	0.92	

(e) Complete the table of results. [1]

(f) Plot the results on the grid and draw a straight line graph.



[5]

(g) Which result is inaccurate?

..... [1]

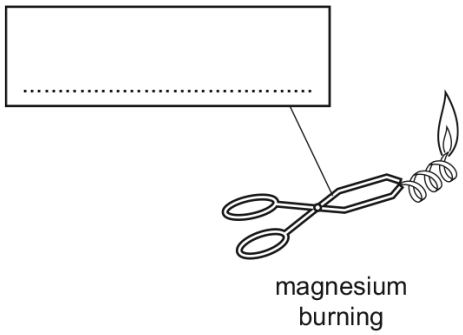
(h) **Use your graph** to work out the mass of calcium oxide formed when 0.7 g of calcium is heated in air. Show clearly on the grid how you used your graph.

[3]

[Total: 16]

07. 0620_w18_qp_62 Q: 1

Magnesium ribbon was burned in air.



(a) Complete the box to name the apparatus. [1]

(b) Suggest the appearance of the product formed when the magnesium ribbon was burned in air.

..... [1]

(c) Name the product formed when the magnesium ribbon was burned in air.

..... [1]

The product from burning the magnesium ribbon in air was added to water and heated. The solution formed was tested with Universal Indicator solution.

(d) Suggest why the product was heated after it had been added to water. Explain your answer.

.....

..... [2]

(e) Suggest the pH value shown when Universal Indicator was added to the mixture.

..... [1]

(f) State **one** safety precaution that should be taken when magnesium is burned in air.

..... [1]

[Total: 7]

01. 0620_s14_ms_63 Q: 1

(a) (i) water (1) [1]
not: steam

(ii) two arrows, one under magnesium, one on wool (1) [1]

(b) (i) grey / silver (1)

white (ash) (1)

glows / ignites / burns (1) max 2 [2]

(ii) dissolves / forms solution / alkali (1)

blue / purple / pH>7 (1) [2]

(c) catches fire / explodes / pops (1)

hydrogen (1) [2]

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02. 0620_s16_ms_61 Q: 4

	any 6 from: weigh calcium; with lid / cover; heat / burn; allow air to enter / lift lid; cool; reweigh CaO; reheat to constant mass; calculate / find the difference;	**6**

03. 0620_w12_ms_61 Q: 3

(a) (i) silver/grey (1) **not:** shiny [1]

(ii) white (1) [1]

(b) oxygen (1) [1]

(c) to let air/oxygen enter or make sure all magnesium reacted owtte (1) [1]

(d) error in weighing (1) [2]

loss of magnesium oxide (1)

some magnesium unreacted (1) max 2

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04. 0620_w12_ms_62 Q: 3

(a) spatula (1) **not:** spoon [1]

(b) nitric/HNO_3 (1) [1]

(c) (i) toxic/poisonous/harmful gas given off or named toxic gas (1) [1]

(ii) idea of ensuring constant mass (1)
reaction complete (1) [2]

(d) (i) spillage (1)
inaccurate weighing (1)
loss by spitting (1)
reaction not complete/owtte (1)
some solid left in beaker (1) [2]

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05. 0620_w12_ms_63 Q: 2

(a) hydrogen (1) [1]

(b) volumes completed correctly [3]

0 18 30 40 43 54 58 60

–1 for each incorrect
ignore extra decimal place e.g. 43.00

(c) points plotted correctly (3) [4]

smooth curve (1)

–1 for each incorrect

(d) **(i)** point at 4 minutes (1) off curve owtte (1) [2]

(ii) 47 – 49 (1) ignore units [2]

indication on graph (1)

(e) magnesium powder/higher temperature/more concentrated acid/catalyst used (1) [2]

faster/more surface area/more collisions (1)

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06. 0620_w13_ms_62 Q: 3

(a) both masses correct 31.2 and 31.8 (1) [1]

(b) all masses correct (2), –1 each incorrect
31.9, 32.2, 32.2 [2]

(c) to allow air/oxygen in (1) [1]
not: release/allow gas to escape

(d) to make sure all calcium reacted/owtte (1)
eliminate anomalies/reduce errors/reference to accuracy (1)
constant mass (1) max [2]
not: fair test/take average/reference to reliability

(e) results table completed for mass of oxygen reacted (1)
0.21, 0.28, 0.31, 0.36 [1]

(f) all points plotted correctly (4), –1 each incorrect
straight line drawn with a ruler through all points except 0.4 g (1) [5]

(g) point at 0.4 g mass calcium / 0.21 g oxygen / Experiment 4 (1) [1]

(h) any evidence of extrapolation / indication (1) 0.45 g oxygen reacted (1)
mass of calcium oxide = 1.15 g(1) [3]

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07. 0620_w18_ms_62 Q: 1

(a)	Tong(s)	1
(b)	White ash / powder / solid / smoke	1
(c)	Magnesium oxide	1
(d)	To dissolve(more solid) / makes a solution	1
	Increases speed / make dissolve completely	1
(e)	>7 and not >14	1
(f)	Goggles / blue glass	1