IGCSE · Cambridge (CIE) · Chemistry

33 mins 4 questions

Alternative to Practical Questions

The Mole & the Avogadro Constant

The Mole / Linking Moles, Mass & Mr / Reacting Masses / Calculating Concentration / Titration Calculations / Empirical & Molecular Formula / Percentage Yield & Purity

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Total Marks **/33**

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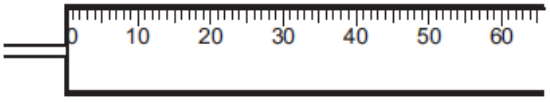
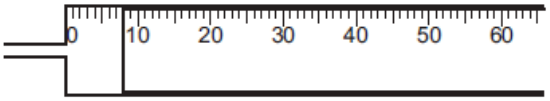
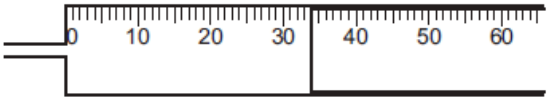
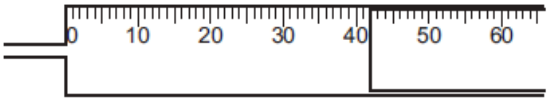
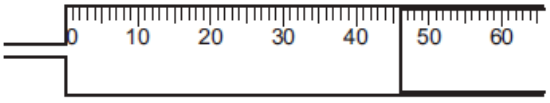
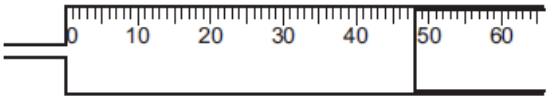
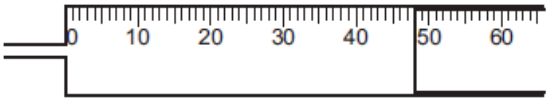
1 (a) A student investigated the reaction of zinc powder with dilute hydrochloric acid using the apparatus below.

The same mass of zinc was added to different volumes of hydrochloric acid at room temperature, 20 °C. The total volume of hydrogen gas given off in each experiment was measured.

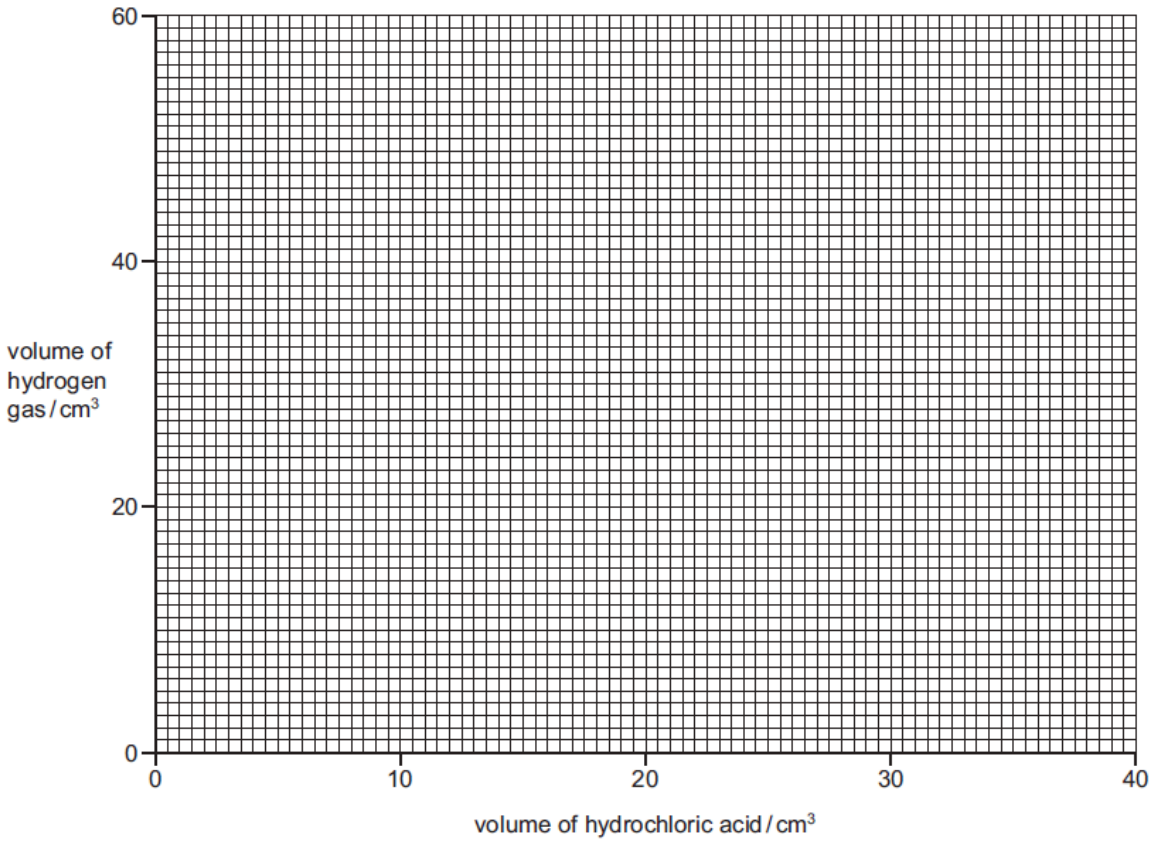
Use the gas syringe diagrams to record the volumes of hydrogen gas in the table.

volume of hydrochloric acid / cm^3	gas syringe diagram	volume of hydrogen gas / cm^3
0		
5		
10		
15		
20		
30		
40		

[3]

(3 marks)

(b) On the grid, plot the points and draw a smooth line graph.



(4 marks)

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(c) i) Which point is inaccurate?

[1]

ii) Suggest a possible reason for this inaccurate measurement.

[1]

iii) Use your graph to work out the volume that would be expected to be formed.

Show clearly on the grid how you got your answer.

[2]

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(4 marks)

(d) Explain why the volume of hydrogen gas does not increase after 30 cm^3 of hydrochloric acid.

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(2 marks)

(e) Sketch on the grid the graph you would expect if the experiments were repeated using the same mass of zinc granules.

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(2 marks)

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2 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.

(6 marks)

3 Beach sand is a mixture of sand and broken shells (calcium carbonate). Calcium carbonate reacts with dilute hydrochloric acid to form a solution of calcium chloride.

Plan an investigation to find out the percentage of shell material in a given sample of beach sand.

(6 marks)

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4 Some documents are stored in containers with packets of silica gel crystals. These crystals absorb water from air that enters the container. Water could damage the documents. Anhydrous cobalt(II) chloride is added to the silica gel. As the crystals absorb water they change colour from blue to pink. Heating the silica gel in an oven removes the water from the crystals so that the crystals can be reused.

Plan an experiment to find the mass of water absorbed by a packet of silica gel crystals.

(6 marks)

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