Oxford Cambridge and RSA

GCSE Chemistry A (Gateway Science)

J248/02 C4-C6 and C7 Foundation (Foundation Tier)

Question Set 9

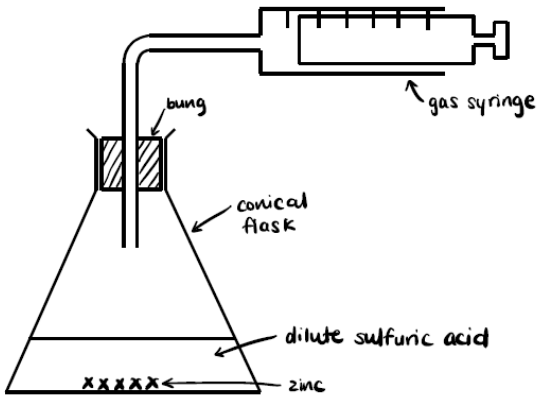
1 Zinc and dilute sulfuric acid react to make hydrogen.

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

A student measures the rate of this reaction by measuring the **loss in mass** of the reaction mixture.

She finds that the change in mass is very small and difficult to measure.

(a) Draw a labelled diagram to show a **better way** of measuring the rate of this reaction.



[3]

(b) The reaction between zinc and dilute sulfuric acid is slow.

The student decides to try and find a catalyst for this reaction.

She tests four possible substances.

Each time she adds 0.5 g of the substance to 1.0 g of zinc and 25 cm^3 of dilute sulfuric acid.

Look at her table of results.

Substance added	Colour of substance at start	Colour of substance at end	Relative rate of reaction
no substance			1
calcium sulfate powder	white	white	1
copper powder	pink	pink	10
copper(II) sulfate powder	blue	pink	30
manganese(IV) oxide powder	black	black	1

(i) It is important to do the reaction with **only** zinc and dilute sulfuric acid and no substance added.

Explain why.

To allow a comparison between with and without the added substance [1]

(ii) It is important to do all of the reactions with the same concentration of acid.

Explain why.

The rate of reaction would change (increase) if concentration of acid is changed (increased) [1]

(iii) Which of the substances could be a catalyst for the reaction between zinc and dilute sulfuric acid?

Explain your answer.

[2]

Copper (II) powder - because it causes the reaction to go faster without changing the colour of the substance.

(iv) There is **not** enough evidence to confirm which substance is a catalyst.

Suggest an extra piece of experimental evidence that could be collected to confirm which substance is a catalyst.

Measure the mass of catalyst before and after reaction and its mass must be constant. [1]

(v) The student does the experiment with copper, zinc and dilute sulfuric acid again.

This time she uses a lump of copper rather than copper powder. Predict, with reasons, the relative rate of reaction.

The rate of reaction would be above 1 but below 10 because lump of copper has smaller surface area than copper powder (given that same mass is used) As a result, there would be less collisions between the particles. 2]

Total Marks for Question Set 9: 10

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