

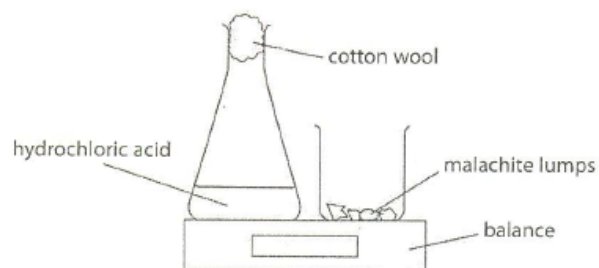
GRTT INTERNATIONAL GCSE CHEMISTRY

ACTIVITY 3 - ANSWER 1

The copper(II) carbonate in the mineral, malachite, reacts with hydrochloric acid according to this equation.



Some students investigate the effect of changing the concentration of acid on the rate of this reaction. The diagram shows the apparatus they use.



This is the method they use:

- set the balance to zero
- add an excess of malachite lumps to the conical flask and replace the cotton wool
- start a timer and record the balance reading after one minute.

The experiment is repeated using different concentrations of hydrochloric acid. The mass and number of malachite lumps are kept the same in each experiment.

(a) The table shows the results obtained in one series of experiments.

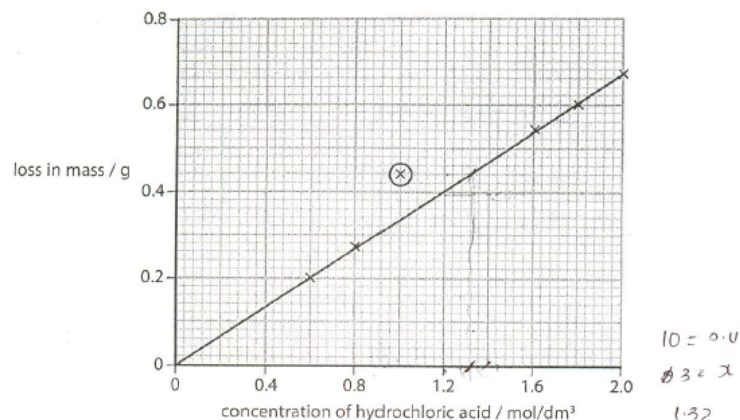
concentration of hydrochloric acid / mol/dm ³	0.6	0.8	1.0	1.6	1.8	2.0
balance reading / g	-0.20	-0.27	-0.44	-0.54	-0.60	-0.67

State why the balance readings have negative values.

(1)

Carbon dioxide (CO₂) gas escaped from the conical flask and since the balance was set to zero, negative values were shown.

(b) The graph shows the results of this series of experiments.



The circled point indicates an anomalous result.

(i) Suggest **one** mistake the students could have made to produce this result.

(1)

The concentration of HCl used may have been higher than 1.0, approximately 1.32 mol/dm³ or lower may have been used.

(ii) State the relationship shown by the graph.

(1)

As the concentration of HCl increases, the loss in

mass increases. The concentration and loss in mass are directly proportional. A linear relationship is shown.

(c) Explain why an increase in the concentration of the acid causes an increase in the rate of the reaction. You should use the particle collision theory in your answer.

(2)

HCl molecules are more present if the concentration is high thus the chance that the malachite lumps collide with the molecules would be higher. Thus, more successful collisions per unit time. Thus rate of reaction increases.

(Total for Question 8 = 5 marks)