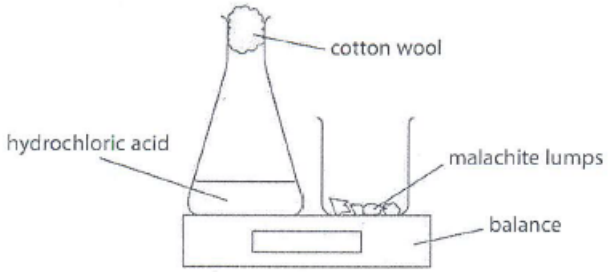
GRTT INTERNATIONAL GCSE CHEMISTRY

ACTIVITY 3 - ANSWER 2

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

$$CuCO_3(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(g) + CO_2(g)$$

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.

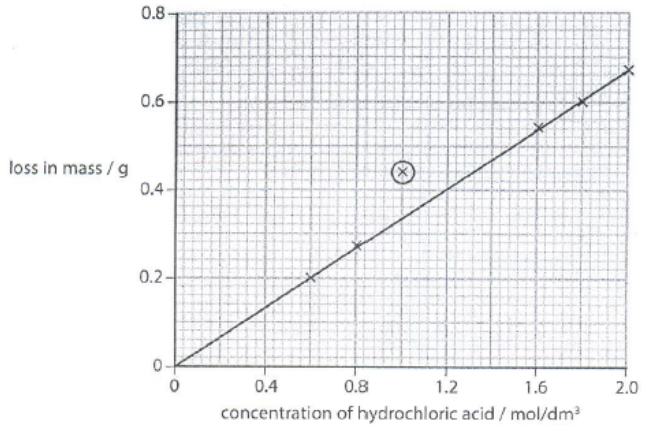
concentration of hydrochloric acid / mol/dm³	0.6	0.8	1.0	1.6	1.8	2.0
balance reading / g	−0.20	−0.27	−0.44	−0.54	−0.60	−0.67

State why the balance readings have negative values.

(1)

gas (CO_2) escapes so the mass reduces.

(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)

added hydrochloric acid which has high concentration.

(ii) State the relationship shown by the graph.

(1)

directly proportional / linear relationship

(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)

When concentration increase, the number of particle per unit volume increases. Hence the number of colision per unit time increases causing the rate of reaction to increase.