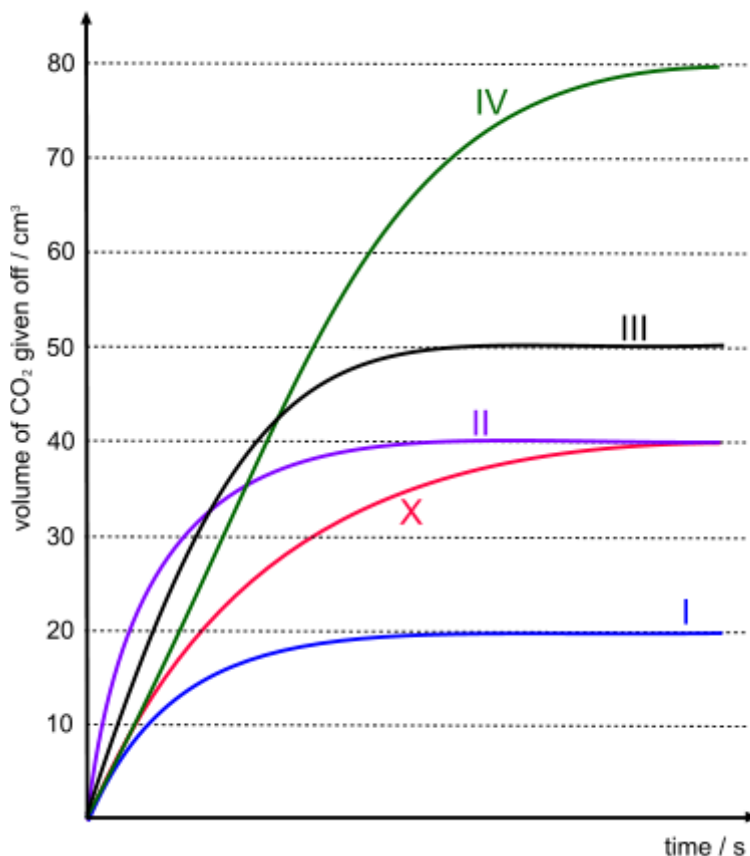


RATES GRAPHS



0.20 g of small marble chips and 20.0 cm³ of 0.20 mol/dm³ hydrochloric acid react exactly together and these were used in experiment X. Experiment X was carried out at 20°C. The experiment should have produced 48 cm³ of CO₂.

1 Why is less than 48 cm³ of gas collected?

Comment on each of the following answers:

- 2 20.0 cm³ of 0.40 mol/dm³ hydrochloric acid was used in experiment IV. This was needed to produce twice as much gas.
- 3 Experiment II used the same amounts as in experiment X but it must have been carried out at a higher temperature because the rate of reaction is faster but the same amount of gas was produced.
- 4 0.20 g of medium marble chips were reacted with 20.0 cm³ of 0.20 mol/dm³ hydrochloric acid in experiment III. Although the amounts of chemicals used are the same, more gas was collected because the rate of reaction was slower and so less gas was lost at the start.
- 5 Three possibilities for experiment I (all at 20°C) are
 - 0.20 g of small marble chips and 20.0 cm³ of 0.10 mol/dm³ hydrochloric acid.
 - 0.10 g of small marble chips and 20.0 cm³ of 0.20 mol/dm³ hydrochloric acid.
 - 0.20 g of small marble chips and 10.0 cm³ of 0.20 mol/dm³ hydrochloric acid.

Decide which set of conditions probably produced the curve shown.

6 A set of conditions for experiment III could have been:

0.40 g of CaCO₃ powder, 20.0 cm³ of 0.25 mol/dm³ hydrochloric acid, 30 °C.

7 A set of conditions for experiment IV could have been:

0.40 g of small marble chips, 10.0 cm³ of 0.80 mol/dm³ hydrochloric acid, 20 °C.