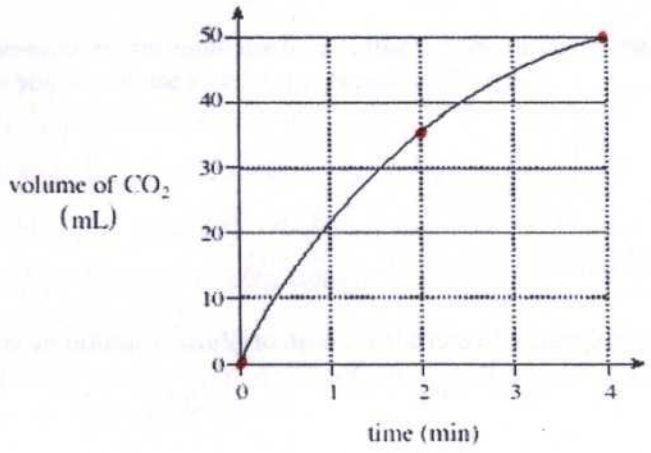
9. Given the following reaction and graph:

$$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(\ell)}$$



a) Calculate the average rate of reaction in mL CO_2 /min for the time interval 0 – 2 min. (2 marks)

(2) $\frac{35\ mL}{2\ min} = 17.5\ \frac{mL}{min}$ (17.5 mL/min)

(150)

Answer 20 mL/min

b) Calculate the average rate of reaction in mL CO_2 /min for the time interval 2 – 4 min. (2 marks)

(2) $\frac{15\ mL}{2\ min} = 7.5\ \frac{mL}{min}$ (7.5 mL/min)

Answer 8 mL/min

c) Explain why the rate in (b) is less than the rate in (a) (1 mark)

(1) As the rx. proceeds, the [HCl] decreases so the reaction slows down.

10. Given the reaction: $Sn_{(s)} + 2\ HCl_{(aq)} \rightarrow H_{2(g)} + SnCl_{2(aq)}$
Give 4 methods by which the rate of this reaction could be increased (4 marks)

(4) Grind the Sn(s) into a powder (inc. surface area)
Increase the [HCl]
Increase the temperature
Add a catalyst

(9/9)