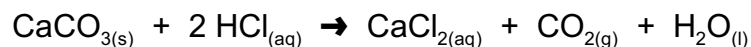


Reaction Rates

1. What does 'reaction rate' mean in
 - a) qualitative terms _____
 - b) quantitative terms _____
2. Give 3 everyday examples of each:
 - a) fast reaction _____
 - b) slow reaction _____

3. 9.6 g of marble chips (CaCO_3) is added to a beaker of 2.00 mol/L hydrochloric acid resulting in the reaction below. After 4 min 15 sec the reaction is complete and there is no visible evidence of any marble chips at the bottom of the beaker



- a) Determine the rate of this reaction in g/min AND in moles/min.

- b) How would the time change if 3.00 mol/L $\text{HCl}_{(aq)}$ were used? _____
- c) Suggest TWO other methods of measuring the rate of this reaction quantitatively.

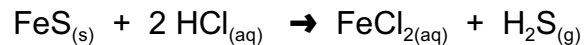
4. 8.80 g of Mg is added to a beaker containing $\text{H}_2\text{SO}_{4(aq)}$ at 20 °C. After 3.00 min there was 5.20 g of Mg unreacted at the bottom of the beaker.

- a) Calculate the rate of this reaction in grams per second.
- b) Predict the reaction rate if the same reaction were conducted at 30 °C.

5. For each of the following, indicate how the rate of reaction might be measured.

- a) $\text{N}_{2(g)} + 3 \text{H}_{2(g)} \rightarrow 2 \text{NH}_{3(g)}$ _____
- b) $\text{CaCO}_{3(s)} + 2 \text{HCl}_{(aq)} \rightarrow \text{CaCl}_{2(aq)} + \text{H}_2\text{O}_{(g)} + \text{CO}_{2(g)}$ _____
- c) $\text{N}_{2(aq)} + 5 \text{O}_{2(g)} + \text{H}_2\text{O}_{(l)} \rightarrow 2 \text{HNO}_{3(aq)}$ _____
- d) $2 \text{SO}_{2(g)} + \text{O}_{2(s)} \rightarrow 2 \text{SO}_{3(g)}$ _____
- e) $\text{P}_{4(s)} + 5 \text{O}_{2(g)} \rightarrow \text{P}_4\text{O}_{10(aq)}$ _____

6. Iron(II) sulfide reacts with dilute hydrochloric acid as shown below:



List 2 changes that could be made to this reaction that could increase the rate.

7. Use Collision Theory to fully explain each of the following observations:

- a) Wood shavings burn more rapidly than a log.

- b) Fuels burn more rapidly in pure oxygen than in air.

- c) Nitroglycerin is a liquid that can explode when shaken yet it can be stored in a glass bottle for many years without reacting.

- d) Aluminum siding covers the exterior of many buildings but a bottle of powdered aluminum is marked 'flammable'.

- e) $\text{I}^-_{(aq)}$ reacts rapidly with $\text{Pb}^{2+}_{(aq)}$ but $\text{Pb}_{(s)}$ reacts very slowly with $\text{I}_{2(s)}$

- f) propane - C_3H_8 - burns more rapidly than kerosene - $\text{C}_{10}\text{H}_{22}$.
