Carbon dioxide in the breath and in the classroom

Questions

- What is the stoichiometric reaction equation for the formation of the precipitation of carbon dioxide and calcium hydroxide?
- Why does the precipitation disappear again when there is a surplus of carbon dioxide? (Note: Whether the re-dissolving visibly occurs depends on the initial concentration of the calcium hydroxide.)
  Set out the stoichiometric reaction equation for this.
  What type of reaction is this?
- What is the overall stoichiometric equation for the combustion of sugar in the human body?
- What is the stoichiometric reaction equation for the combustion of octane?

Answers

- Stoichiometric reaction equation for the formation of a precipitate from calcium carbonate:
  Step 1: $CO_2 + H_2O \rightarrow H_2CO_3$

  Step 2: $Ca(OH)_{2\ dissolved} + H_2CO_{3\ dissolved} \rightarrow CaCO_{3\ insoluble} + 2\ H_2O$

  Step 3: $CaCO_{3\ insoluble} + H_2CO_{3\ dissolved} \rightarrow Ca^{2+}_{dissolved} + 2\ HCO_{3\ dissolved}^{-}$

- Firstly, the carbon dioxide dissolves in the water and forms carbonic acid (step 1). The basic calcium hydroxide is neutralized by the carbonic acid and precipitates out as calcium carbonate (step 2), until it is used up. If more carbon dioxide is added, the surplus carbonic acid breaks up the calcium carbonate and it is dissolved as hydrogen carbonate (step 3). These are therefore acid-alkaline reactions.

- Combustion of sugar (glucose): $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$

- Combustion of octane: $2C_8H_{18} + 25\ O_2 \rightarrow 16\ CO_2 + 18\ H_2O$

© Siemens Stiftung 2017. Content licensed under CC BY-SA 4.0 international