

## Importance of Water

Baking powder for making bread is usually a mixture of a solid acid, HX, and sodium hydrogencarbonate. In making bread, water and a little baking powder are added to flour. The flour paste is then heated in an oven. A gas Y is formed in the baking process which escapes from the dough and eventually a “spongy” bread is formed.

- (a) Name gas Y. [1]
- (b) Suggest a chemical test to identify gas Y. Explain the observation of the test and write an equation (with state symbols) for the reaction involved in the test. [4]
- (c) Explain the role of water added to the flour for the production of gas Y. [2]
- (d) Write an ionic equation for the reaction of the acid, HX, and sodium hydrogencarbonate in the flour paste. [1]
- (e) Heating solid sodium hydrogencarbonate can also help to generate gas Y in the bread making process. Write an equation for this process. [1]

**Suggested Answer:**

- (a) Carbon dioxide 1
- (b) Turn limewater milky. 1
- Carbon dioxide reacts with calcium hydroxide to form a white precipitate (calcium carbonate) 1
- $\text{Ca(OH)}_2(\text{aq}) + \text{CO}_2(\text{g}) \longrightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$  1+1
- (c) In the presence of water, the solid acid ionizes to give  $\text{H}^+(\text{aq})$  ions which 1
- react with sodium hydrogencarbonate to give carbon dioxide. 1
- (d)  $\text{H}^+(\text{aq}) + \text{HCO}_3^-(\text{aq}) \longrightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$  1
- (e)  $2\text{NaHCO}_3(\text{s}) \longrightarrow \text{Na}_2\text{CO}_3(\text{s}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$  1