Question 32 **(4 marks)**

Many marine animals have shells that consist mainly of calcium carbonate. These shells are built from dissolved calcium and carbonate ions.

As the amount of atmospheric carbon dioxide increases, more carbon dioxide dissolves in the ocean. There is increasing concern that as more carbon dioxide dissolves, it will be more difficult for calcium carbonate to form.

Use the following equations to explain why an increasing concentration of atmospheric carbon dioxide will decrease the formation of calcium carbonate.

$$CO_2(g) \rightleftharpoons CO_2(aq) \quad \text{Equation 1}$$

$$CO_2(aq) + H_2O(\ell) + CO_3^{2-}(aq) \rightleftharpoons 2\ HCO_3^-(aq) \quad \text{Equation 2}$$

$$Ca^{2+}(aq) + CO_3^{2-}(aq) \rightleftharpoons CaCO_3(s) \quad \text{Equation 3}$$