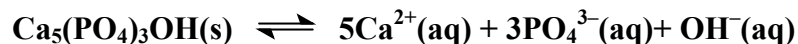|	**Marks**

- Teeth are made from hydroxyapatite, $Ca_5(PO_4)_3OH$. Why does an acidic medium promote tooth decay and how can the decay be stopped using fluoridation of drinking water? Use chemical equations where appropriate.

Hydroxyapatite dissolves according to the equation:

$$Ca_5(PO_4)_3OH(s) \rightleftharpoons 5Ca^{2+}(aq) + 3PO_4^{3-}(aq) + OH^-(aq)$$

This equilibrium lies far to the left so that hydroxyaptite does not dissolve to any significant degree. However, the addition of H_3O^+ (i.e. an acidic medium) will decrease [OH⁻(aq)] and push the reaction to the right (Le Chatelier's principle).

Fluoridation of water promotes the replacement of OH⁻ with F⁻ to form $Ca_5(PO_4)_3F(s)$. This compound is much less water soluble than $Ca_5(PO_4)_3OH$:

$$Ca_5(PO_4)_3F(s) \rightleftharpoons 5Ca^{2+}(aq) + 3PO_4^{3-}(aq) + F^-(aq)$$
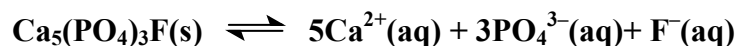
F⁻ is a weaker base than OH⁻ so this equilibrium is less affected by the addition of H_3O^+. As the enamel is less soluble, this promotes less tooth decay.