Marks 6

- Explain what is meant by the "common ion effect".

The solubility of a salt is reduced by the presence of one of its constituent ions (the common ion) already in the solution. The presence of the common ion drives the equilibrium towards precipitation through Le Chatelier's principle.

Magnesium hydroxide is sparingly soluble. Write down the chemical equation for its dissolution in water and the expression for K_{sp}.

$Mg(OH)_2(s) \rightleftharpoons Mg^{2+}(aq) + 2OH^-(aq)$

$K_{sp} = [Mg^{2+}(aq)][OH^-(aq)]^2$

What is the molar solubility of magnesium hydroxide in water? $K_{sp} = 7.1 \times 10^{-12}$

The molar solubility is the number of the moles that dissolve per litre. From the chemical equation, if *s* mol of the solid dissolves in a litre, then:

$[Mg^{2+}(aq)] = s$ M and
$[OH^-(aq)] = 2s$ M

Hence,

$K_{sp} = [Mg^{2+}(aq)][OH^-(aq)]^2 = (s)(2s)^2 = 4s^3 = 7.1 \times 10^{-12}$

$s = 1.2 \times 10^{-4}$

Answer: **1.2×10^{-4} M**

What is the pH of a saturated solution of magnesium hydroxide in water?

From above,

$[OH^-(aq)] = 2s$ M $= 2 \times (1.2 \times 10^{-4})$ M $= 2.4 \times 10^{-4}$ M

Hence,

$pOH = -\log_{10}[OH^-(aq)] = -\log_{10}(2.4 \times 10^{-4}) = 3.62$

$pH = 14.00 - pOH = 14.00 - 3.62 = 10.38$

Answer: **10.38**