	Marks
What is the molar solubility of magnesium hydroxide in a buffer solution at pH 9.24?	3

At pH 9.24,

pOH = 14.00 – 9.24 = 4.76

$[OH^-(aq)] = 10^{-pOH} = 10^{-4.76}$ M

From 2012-N-6, $K_{sp} = [Mg^{2+}(aq)][OH^-(aq)]^2$ so

$[Mg^{2+}(aq)] = K_{sp} / [OH^-(aq)]^2 = 7.1 \times 10^{-12} / (10^{-4.76})^2 = 0.024$ M

Answer: **0.024 M**

Do the relative solubilities of magnesium hydroxide in water and the buffer solution support the concept of the common ion effect? Explain your reasoning.

Yes. The $[OH^-(aq)]$ in the saturated $Mg(OH)_2$ solution is 2.4×10^{-4} M, higher than the $[OH^-(aq)]$ in the buffer solution which remains constant at $10^{-4.76}$ M, *i.e.* 1.7×10^{-5} M.

Normally the solubility of a solid decreases because of a high concentration of one of its ions. In this situation, the opposite is observed. Regardless of how much $Mg(OH)_2$ dissolves, the $[OH^-]$ remains below that seen in a saturated solution of $Mg(OH)_2$. Therefore the solubility of $Mg(OH)_2$ increases in this particular buffer.

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.