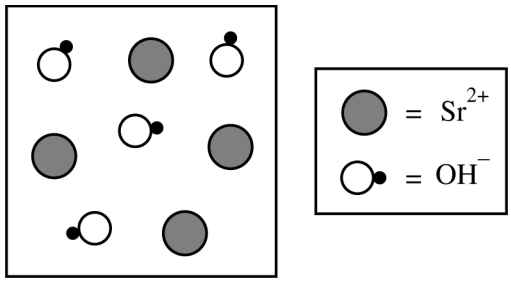
Begin your response to **QUESTION 7** on this page.

7. Strontium hydroxide dissolves in water according to the following equation. The K_{sp} expression for strontium hydroxide is provided.

$$Sr(OH)_2(s) \rightleftarrows Sr^{2+}(aq) + 2\,OH^-(aq) \qquad K_{sp} = [Sr^{2+}][OH^-]^2$$



(a) A student draws the particulate diagram shown to represent the ions present in an aqueous solution of $Sr(OH)_2$. (Water molecules are intentionally omitted.) Identify the error in the student's drawing.

(b) The student prepares a saturated solution by adding excess $Sr(OH)_2(s)$ to distilled water and stirring until no more solid dissolves. The student then determines that $[Sr^{2+}] = 0.043\ M$ in the solution.

(i) Calculate the value of $[OH^-]$ in the solution.

(ii) Calculate the value of K_{sp} for $Sr(OH)_2$.

GO ON TO THE NEXT PAGE.

Continue your response to **QUESTION 7** on this page.

(c) The student prepares a second saturated solution of $Sr(OH)_2$ in aqueous 0.10 M $Sr(NO_3)_2$ instead of water. Will the value of $[OH^-]$ in the second solution be greater than, less than, or equal to the value in the first solution? Justify your answer. (Assume constant temperature.)

STOP

END OF EXAM

Question 7: Short Answer — 4 points

(a) For a correct answer: **1 point**

Accept one of the following:

- *The student's drawing shows an incorrect ratio of* Sr^{2+} *and* OH^- *ions.*
- *The student's drawing is not charge-balanced.*

(b)(i) For the correct calculated value: **1 point**

$$\frac{0.043 \text{ mol } Sr^{2+}}{1 \text{ L}} \times \frac{2 \text{ mol } OH^-}{1 \text{ mol } Sr^{2+}} = 0.086 \ M \ OH^-$$

(ii) For the correct calculated value, consistent with (b)(i): **1 point**

$$K_{sp} = [Sr^{2+}][OH^-]^2 = (0.043)(0.086)^2 = 3.2 \times 10^{-4}$$

Total for part (b) **2 points**

(c) For the correct answer and a valid justification: **1 point**

Less than. Because the $Sr(NO_3)_2(aq)$ *solution already contains a common ion,* $Sr^{2+}(aq)$*, the solubility of* $Sr(OH)_2$ *will be decreased, resulting in a lower value of* $[OH^-]$.

Total for question 7 **4 points**