

K_{sp} Problem: Common Ion Effect

Determine the solubility of lead iodide in a
0.5M KI solution

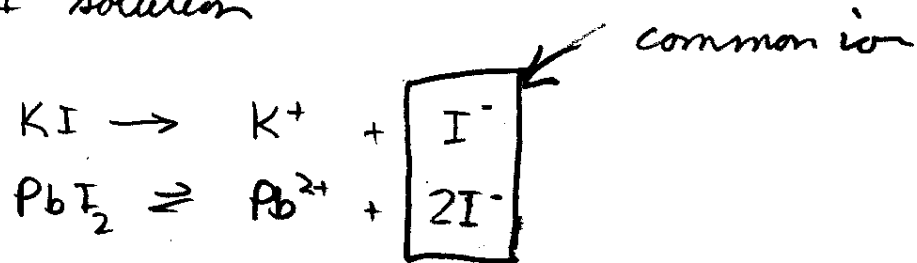
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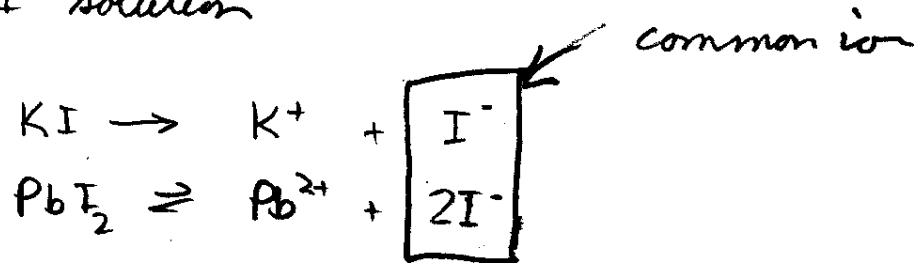
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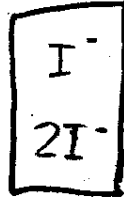
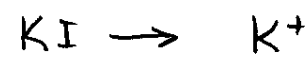


Let s represent the solubility

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common ion

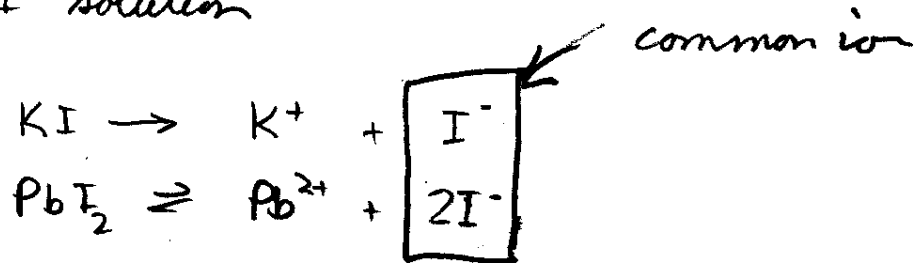
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$$\therefore [\text{Pb}^{2+}] =$$

$$[\text{I}^-] =$$

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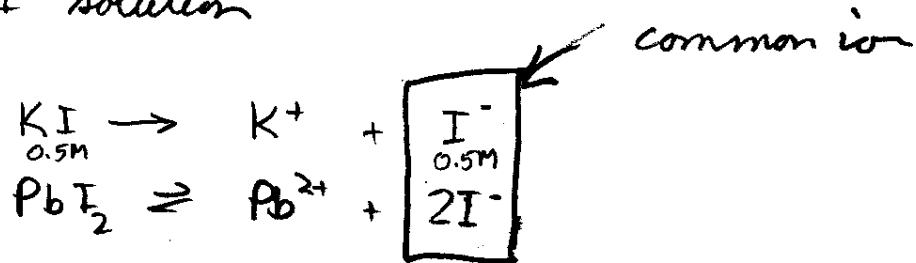
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$$\therefore [\text{Pb}^{2+}] = s$$

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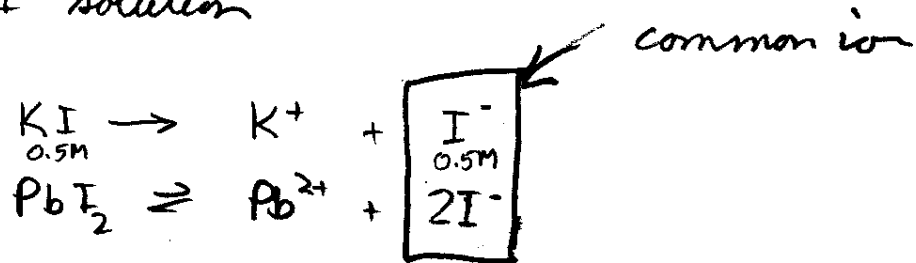
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↙ contribution from KI

↖ contribution from PbI₂

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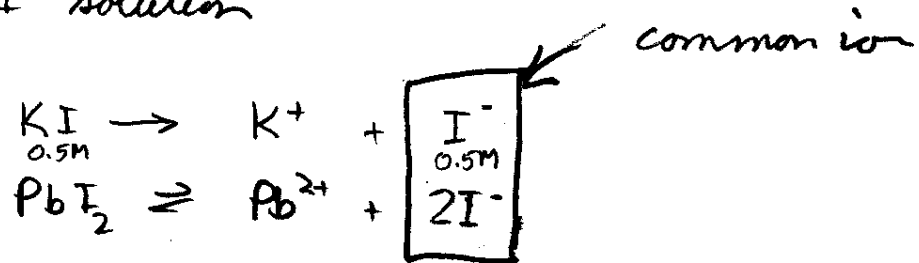
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$$K_{sp} = [\text{Pb}^{2+}][\text{I}^-]^2$$

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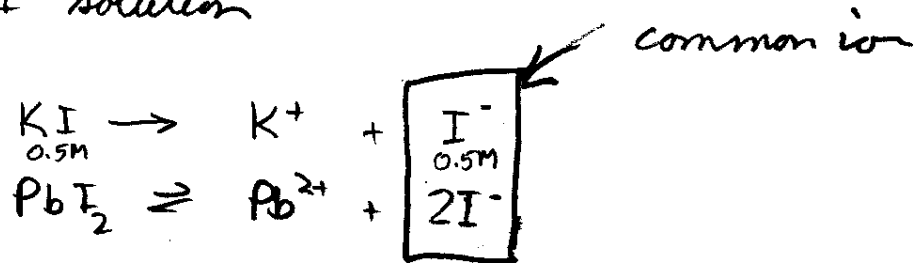
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$$K_{sp} = [\text{Pb}^{2+}][\text{I}^-]^2$$

$$7.1 \times 10^{-9} = s(2s + 0.5)^2$$

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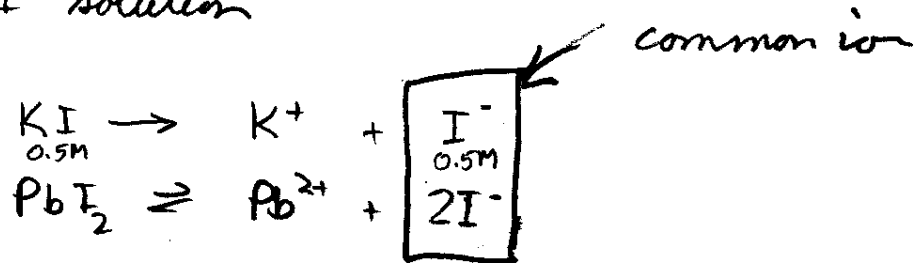
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* use methods to solve a cubic or !!

$$\text{assume } 2s \ll 0.5 \therefore 2s + 0.5 \approx 0.5$$

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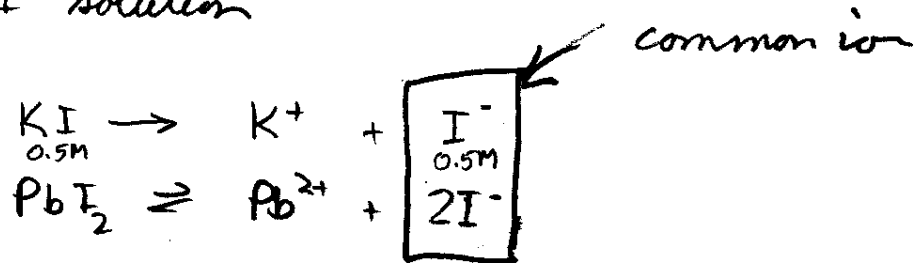
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$$s = 2.84 \times 10^{-8} \text{ mol/L}$$

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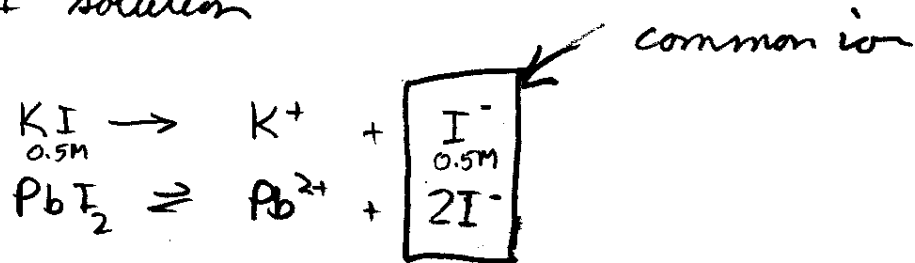
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Note the solubility will be lower than in pure water