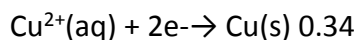
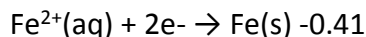


## Answer on Question #52868 – Chemistry – General chemistry

### Question:

At STP, a galvanic cell was set up having the following half-reactions.



The copper half-cell contained 100.0 mL of 1.00 M  $\text{CuSO}_4$ , The lead half-cell contained 50.0 mL of 0.100 M  $\text{FeSO}_4$ , to which was added 50.0 mL of 0.300 M NaOH. The cell potential was measured to be 1.155 V. What is the concentration of  $\text{Fe}^{2+}$  in the iron half-cell?

### Solution:

$$E = E^0 - \frac{RT}{nF} \log \frac{c(\text{Fe}^{2+})}{c(\text{Cu}^{2+})}$$

$$E = E^0 - \frac{0.0592}{2} \log \frac{c(\text{Fe}^{2+})}{c(\text{Cu}^{2+})}$$

$$E^0 = \varphi(\text{Cu}^{2+}/\text{Cu}) - \varphi(\text{Fe}^{2+}/\text{Fe}) = 0.34 + 0.41 = 0.75$$

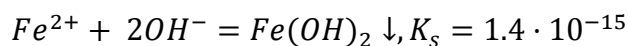
$$1.115 = 0.75 - \frac{0.0592}{2} \log \frac{c(\text{Fe}^{2+})}{c(\text{Cu}^{2+})}$$

$$\log \frac{c(\text{Fe}^{2+})}{c(\text{Cu}^{2+})} = -2 \cdot \left( \frac{1.155 - 0.75}{0.0592} \right)$$

$$\frac{c(\text{Fe}^{2+})}{c(\text{Cu}^{2+})} = 2 \cdot 10^{-14}$$

$$c(\text{Fe}^{2+}) = 2 \cdot 10^{-14} \text{ mol L}^{-1}$$

Such a low concentration can be explained with the formation of insoluble iron (II) hydroxide with NaOH addition:



**Answer:**  $2 \cdot 10^{-14} \text{ mol L}^{-1}$