Find equilibrium ion concentrations for a saturated aluminum hydroxided solution and the mass of aluminum hydroxide in mg required to saturate 2500 mL of solution.

$$Al(OH)_3(s) \rightleftharpoons Al^{3+} + 3\,OH^{1-} \qquad\qquad Ksp \,=\, 3 \text{ x } 10^{-33}$$

Let s represent the solubility of $Al(OH)_3$

$$[Al^{3+}] = \text{ s}$$
$$[OH^{1-}] = \text{ 3s}$$

$$K_{sp} \,=\, [Al^{3+}][OH^{1-}]^3$$
$$3 \text{ x } 10^{-33} \,=\, (s)(3s)^3$$
$$3 \text{ x } 10^{-33} \,=\, (s)(27s^3)$$
$$3 \text{ x } 10^{-33} \,=\, 27s^4$$
$$s \,=\, 3.25 \text{ x } 10^{-9} \text{ mol/L}$$

$$[Al^{3+}] \,=\, 3.25 \text{ x } 10^{-9} \text{ M}$$

$$[OH^{1-}] \,=\, 3 \text{ x } (3.25 \text{ x } 10^{-9} \text{ M})$$
$$\,=\, 9.74 \text{ x } 10^{-9} \text{ M}$$

$$2500 \text{ mL x } \frac{1 \text{ L}}{1000 \text{ mL}} \text{ x } \frac{3.25 \text{ x } 10^{-9} \text{ mol}}{1 \text{ L}} \text{ x } \frac{78.01 \text{ g Al(OH)}_3}{1 \text{ mol Al(OH)}_3} \text{ x } \frac{1000 \text{ mg}}{1 \text{ g}} \,=\, 6.34 \text{ mg Al(OH)}_3$$