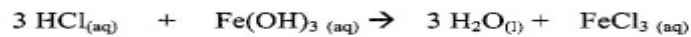


KEY

5. Given the balanced equation:

a) It takes 19.56 mL of 0.50 M HCl to titrate a 25.0 mL sample of a solution of $\text{Fe}(\text{OH})_3$. Calculate the $[\text{Fe}(\text{OH})_3]$ $\frac{\text{mol}}{\text{M/L}}$

$$\text{moles HCl} = 0.50 \text{ M} \times 0.01956 \text{ L} = 0.00978 \text{ mol HCl}$$

$$\text{mole Fe}(\text{OH})_3 = 0.00978 \text{ mol HCl} \times \frac{1 \text{ mol Fe}(\text{OH})_3}{3 \text{ mol HCl}} = \frac{0.00326 \text{ mol}}{\text{Fe}(\text{OH})_3}$$

$$[\text{Fe}(\text{OH})_3] = \frac{0.00326 \text{ mol Fe}(\text{OH})_3}{0.0250 \text{ L Fe}(\text{OH})_3} = \boxed{0.130 \text{ M}}$$

b) What mass of $\text{Fe}(\text{OH})_3$ is needed to completely react with 10.0 mL of 0.50M HCl solution?

$$\text{moles HCl} = 0.50 \text{ M} \times 0.0100 \text{ L} = 0.00500 \text{ mol HCl}$$

$$0.00500 \text{ mol HCl} \times \frac{1 \text{ mol Fe}(\text{OH})_3}{3 \text{ mol HCl}} \times \frac{106.8 \text{ g Fe}(\text{OH})_3}{1 \text{ mol Fe}(\text{OH})_3} = \boxed{0.178 \text{ g Fe}(\text{OH})_3}$$

c) What volume of 0.50M HCl is required to titrate a 21.36 gram sample of iron (III) hydroxide?

$$21.36 \text{ g Fe}(\text{OH})_3 \times \frac{1 \text{ mol Fe}(\text{OH})_3}{106.8 \text{ g Fe}(\text{OH})_3} \times \frac{3 \text{ mol HCl}}{1 \text{ mol Fe}(\text{OH})_3} = 0.600 \text{ mol HCl}$$

 $\frac{\text{mol}}{\text{M/L}}$

$$\text{L} = \frac{\text{mol}}{\text{M}} = \frac{0.600 \text{ mol}}{0.50 \text{ M}} = \boxed{1.20 \text{ L}}$$