



$$K_{sp} = [\text{Fe}^{3+}][\text{OH}^{-}]^3 = 4 \times 10^{-38}$$

$$4 \times 10^{-38} = (x)(3x + 1.0 \times 10^{-7})^3$$

$$x = 4 \times 10^{-17} \text{ M}$$

soluble ✓



$$K_{sp} = (x)(3x + 1 \times 10^{-9})^3 = 4 \times 10^{-38}$$

$$s = 4 \times 10^{-11} \text{ M}$$



$$K_{sp} = (x)(3x + 1.0 \times 10^{-3})^3$$

$$x = 4 \times 10^{-29} \text{ M}$$



$$K_{sp} = [\text{Ba}^{2+}][\text{SO}_4^{2-}] = 1.5 \times 10^{-9}$$



$$m_1 v_1 = m_2 v_2$$

$$(0.020 M)(75.0 \text{ ml}) = x(200.0 \text{ ml}) = 0.0075 M$$



$$m_1 v_1 = m_2 v_2$$

$$(0.040 M)(125 \text{ ml}) = x(200.0 \text{ ml}) = 0.025 M$$

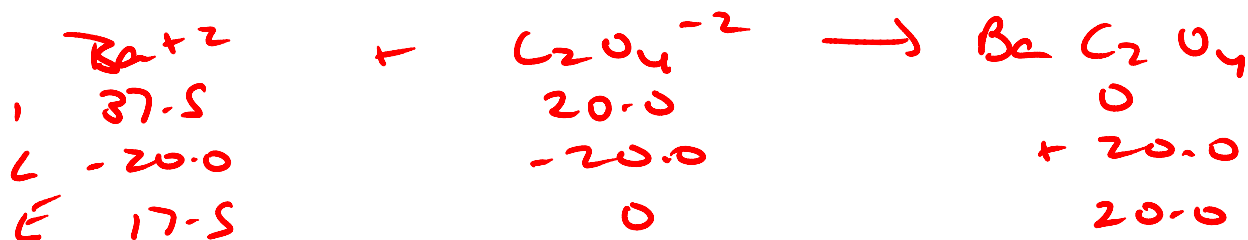
$$Q = (0.0075)(0.025) = 1.9 \times 10^{-4}$$

$$Q > K \quad \underline{\text{yes}}$$



$$\text{K}_2\text{C}_2\text{O}_4 = (0.200 M)(100. \text{ ml}) = 20.0 \text{ mmol}$$

$$\text{BaBr}_2 = (0.250 M)(150. \text{ ml}) = 37.5 \text{ mmol}$$

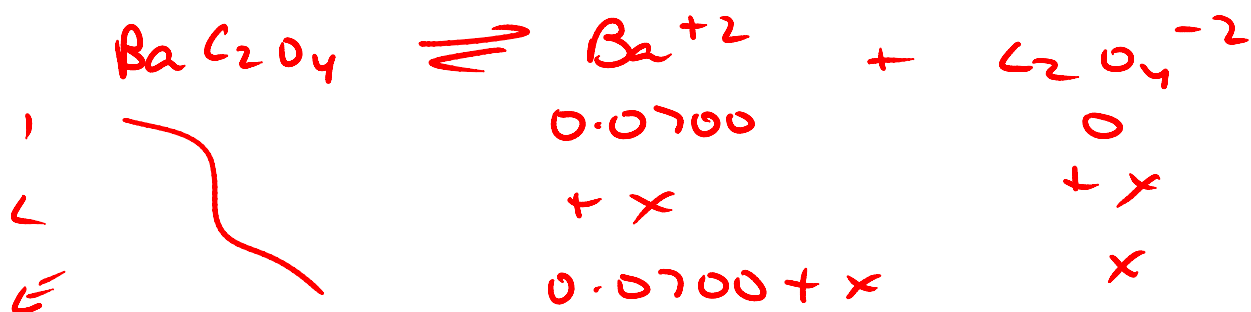


$$[\text{Ba}^{2+}] = \frac{17.5 \text{ mmol}}{250.0 \text{ mL}} = 0.0700 \text{ M}$$

$$\# [\text{K}^{+}] = \frac{2(20.0 \text{ mmol})}{250.0 \text{ mL}} = 0.160 \text{ M}$$

$$\# [\text{Br}^{-}] = \frac{2(37.5 \text{ mmol})}{250.0 \text{ mL}} = 0.300 \text{ M}$$

* these are OK but there is an equilibrium for BaC_2O_4



$$K_{sp} = [\text{Ba}^{2+}][\text{C}_2\text{O}_4^{2-}] = 2.3 \times 10^{-8}$$

$$2.3 \times 10^{-8} = (0.0700 + x)(x)$$

$$x = 3.3 \times 10^{-7} \text{ M} = [\text{C}_2\text{O}_4^{2-}]$$

5% rule ✓

$$[\text{Ba}^{2+}] = 0.0700 \text{ M}$$



$$K_{sp} = [\text{Ag}^+]^3 [\text{PO}_4^{3-}]$$

$$1.8 \times 10^{-18} = x^3 (1.0 \times 10^{-5})$$

$$[\text{Ag}^+] = 5.6 \times 10^{-5} \text{ M}$$

$[\text{Ag}^+] = [\text{AgNO}_3] > 5.6 \times 10^{-5} \text{ M}$ ppt will occur