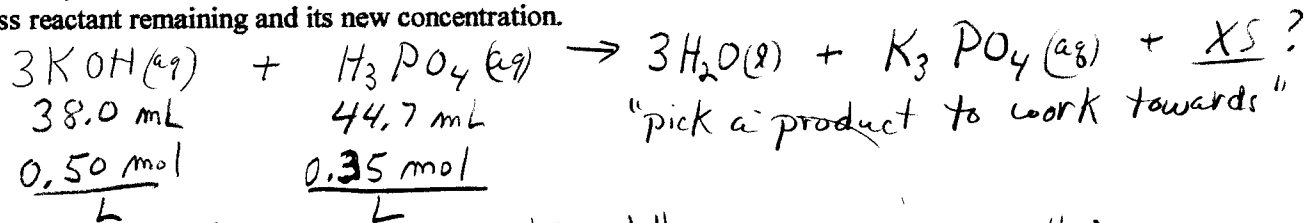


Show all work to receive credit.

1. (10 Pts) 38.0 mL of 0.50 M KOH were combined with 44.7 mL of 0.35 M H₃PO₄. Determine the moles of the excess reactant remaining and its new concentration.



Based on KOH: $\frac{38.0 \text{ mL KOH}}{1000 \text{ mL KOH}} \times \frac{0.50 \text{ mol KOH}}{1 \text{ mol KOH}} \times \frac{3 \text{ mol H}_2\text{O}}{3 \text{ mol KOH}} = 0.019 \text{ mol H}_2\text{O}$

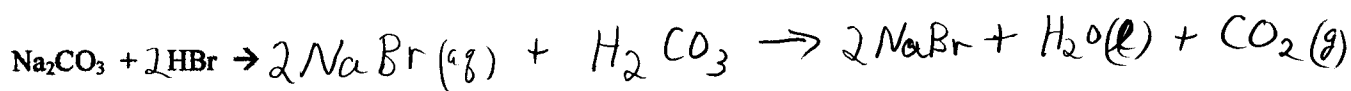
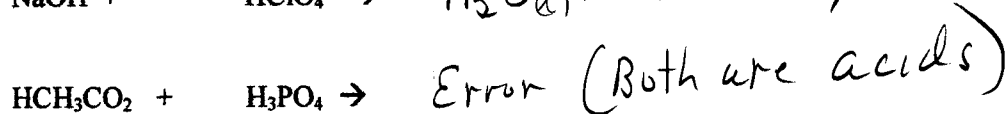
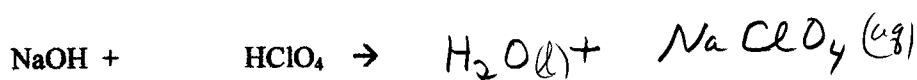
Based on H₃PO₄: $\frac{44.7 \text{ mL H}_3\text{PO}_4}{1000 \text{ mL H}_3\text{PO}_4} \times \frac{0.35 \text{ mol H}_3\text{PO}_4}{1 \text{ mol H}_3\text{PO}_4} \times \frac{3 \text{ mol H}_2\text{O}}{1 \text{ mol H}_3\text{PO}_4} = 0.046935 \text{ mol H}_2\text{O}$

Difference is related XS H₃PO₄: $0.0469 - 0.019 = 0.0279 \text{ mol H}_2\text{O}$ from XS

$$\frac{0.0279 \text{ mol H}_2\text{O}}{3 \text{ mol H}_2\text{O}} \times \frac{1 \text{ mol H}_3\text{PO}_4}{1 \text{ mol H}_3\text{PO}_4} = 0.0093 \text{ mol H}_3\text{PO}_4$$

$$\frac{0.0093 \text{ mol H}_3\text{PO}_4}{(38.0 \times 10^{-3} + 44.7 \times 10^{-3}) \text{ L}_{\text{solution}}} = 0.113 \text{ mol H}_3\text{PO}_4/\text{L}$$

2. (6 Pts) Complete and balance each of the following:



4. (3 Pts) What volume of 10.0 M HNO₃ is required to prepare 900 mL of 3.0 M HNO₃ solution?

$$M_1 V_1 = M_2 V_2$$

$$(10.0 \text{ M})(V_1) = (3.0 \text{ M})(900 \text{ mL})$$

$$V_1 = 270 \text{ mL of } 10.0 \text{ M HNO}_3$$

5. (6 Pts) In the following reactions identify the acid, base, conjugate acid, and the conjugate base.

