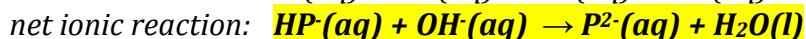
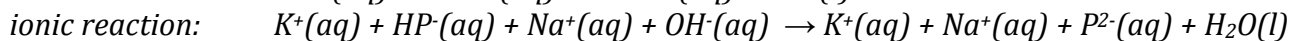


You must show your work for full credit.

Exp 2 Questions

1. Potassium hydrogen phthalate (abbreviated KHP – with P for phthalate not phosphorous) is used to standardize NaOH. Write the net ionic reaction for what occurs in the standardization titration starting with aqueous KHP (the solid is dissolved in water). (1 pt)



2. How many mL of 3.0 M NaOH are needed to make 1.00 L of 0.10 M NaOH. (2 pts)

This is a dilution calculation where the moles of NaOH are constant:

$$n(NaOH)_{conc. sol} = n(NaOH)_{dil. sol} \text{ or } V_{conc.}[NaOH]_{conc.} = V_{dil.}[NaOH]_{dil.}$$

$$\text{or } V_{conc.} = (1.00 \text{ L})(0.10 \text{ mol/L}) / (3.0 \text{ mol/L})(1000 \text{ mL/L}) = \mathbf{33 \text{ mL}}$$

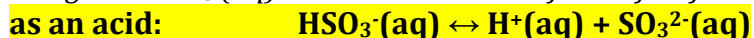
3. The 0.10 M NaOH solution made in Question 2 will eventually need to have its concentration known accurately. Why does the volume measured in Question 2 not need to be made accurately? (1 pt)

The NaOH solution will be standardized by KHP titration. Therefore, an exact volume of NaOH is not needed.

Acid/Base problems

4. Write two chemical equations showing how NaHSO₃ can react with water as an acid and as a base. (2 pts)

$NaHSO_3(aq) \rightarrow Na^+(aq) + HSO_3^-(aq)$ (we ignore Na⁺ as it will not react further, while we can recognise HSO₃⁻(aq) as the intermediate form of sulfurous acid)



5. Sulfurous acid can lose two protons with K_{a1} = 1.6 x 10⁻² and K_{a2} = 6.4 x 10⁻⁸. Is hydrogen sulfite ion acidic, basic, or neutral in water? Explain your answer. K_w = 1.0 x 10⁻¹⁴ (3 pts)

The K for the acid reaction is K_{a2} and equals 6.4 x 10⁻⁸. The K for the base reaction involves H₂SO₃ and HSO₃⁻ (which are only in the first K reaction), so it must be the base reaction related to the K_{a1} reaction: $K = K_w/K_{a1} = 6.3 \times 10^{-13}$. The acid reaction has a much greater K value, so we can expect the solution to be **acidic**.

6. List a compound that can be added to ammonia to make a buffer solution. (1 pt)

An ammonium salt (e.g. NH₄X where X is a halide) or a strong acid (e.g. HCl)