Homework - Worksheet

STRONG

$$H_2SO_{4(aq)} \longrightarrow 2H^+_{(aq)} + SO_4^{2-}{}_{(aq)}$$

0.624M   1.248 M
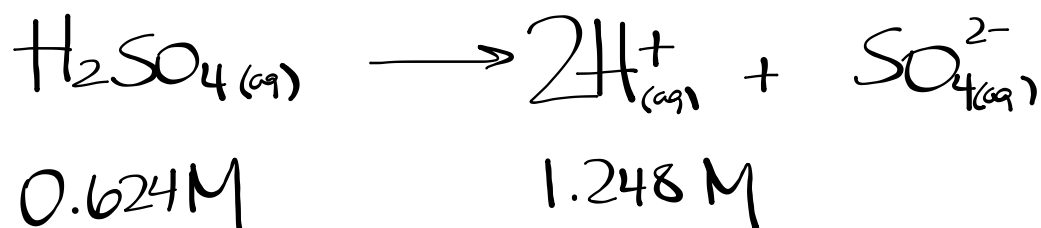
pH + pOH = 14.00

pOH = 14.000 − (−0.096)

pOH = 14.096

$pH = -\log[H_3O^+_{(aq)}]$

$pH = -\log[1.248]$

pH = −0.096

Pure Substance
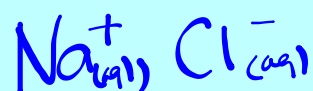
....Think High vs. Low Solubility

Entities in Water

$$Na^+_{(aq)} \quad Cl^-_{(aq)}$$

$NaCl_{(s)}$

$CaCO_{3(s)}$

Pure Substance

Entities in Water

....Think High vs. Low Solubility

$NaOH_{(s)}$

$Na^+_{(aq)}, OH^-_{(aq)}$

$Ca(OH)_{2(s)}$

Pure Substance

....Think High vs. Low Solubility

Entities in Water

$HCl_{(g)}$
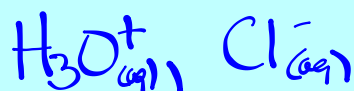
Strong vs. Weak Acid
(back cover)

$H_3O^+_{(aq)}$, $Cl^-_{(aq)}$

$CH_3COOH_{(l)}$

$CH_3COOH_{(aq)}$

Pure Substance

Entities in Water

....Think High vs. Low Solubility

$C_{12}H_{22}O_{11(s)}$

$C_{12}H_{22}O_{11(aq)}$

$C_8H_{18(l)}$
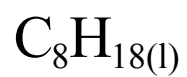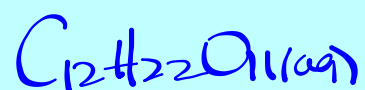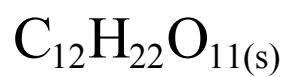
Predicting Acid-Base Reactions

1. List all entities (ions, atoms, or molecules) initially present.

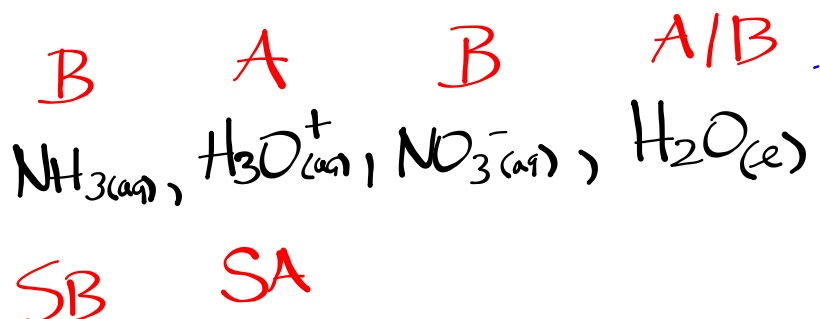2. Identify all possible acids and bases, using Bronsted-Lowry definition.

3. Identify the strongest acid and strongest base, using table of acids and bases.

4. Transfer one proton from the acid to the base and predict the conjugate acid and conjugate base as products.

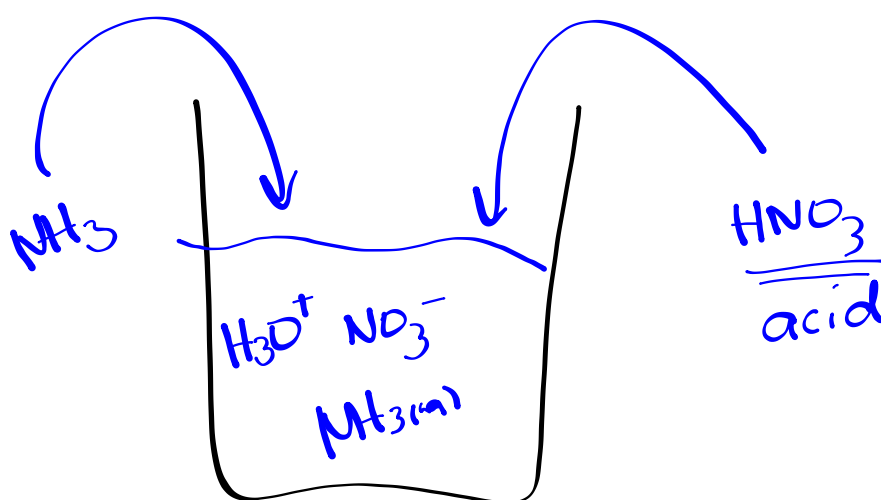5. Predict the position of the equilibrium.

Sample Problem

Ammonium nitrate fertilizer is produced by the quantitative reaction of aqueous ammonia with nitric acid. Write a balanced acid-base equilibrium equation.

$$NH_{3(aq)} \text{ and } HNO_{3(aq)}$$

All entities in solution:

$$\overset{B}{NH_{3(aq)}}, \quad \overset{A}{H_3O^+_{(aq)}}, \quad \overset{B}{NO^-_{3(aq)}}, \quad \overset{A/B}{H_2O_{(\ell)}}$$

$$\underset{SB}{NH_{3(aq)}} \quad \underset{SA}{H_3O^+_{(aq)}}$$

$$H_3O^+_{(aq)} + NH_{3(aq)} \longrightarrow H_2O_{(\ell)} + NH^+_{4(aq)}$$
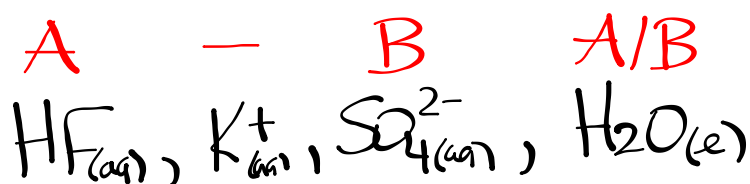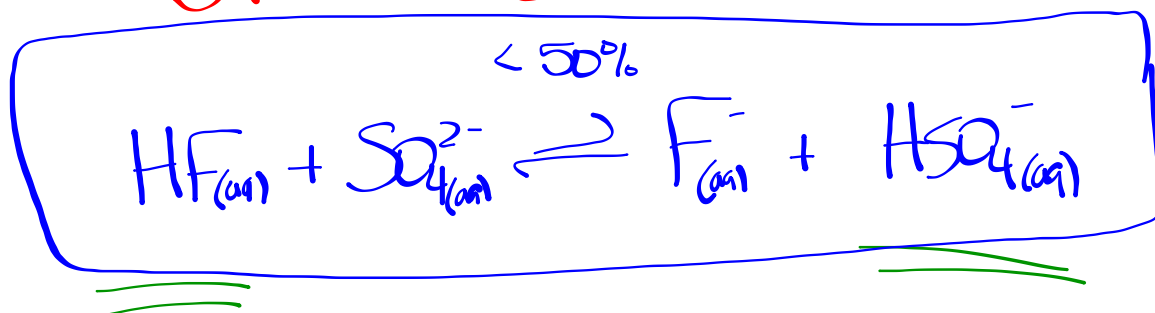
NH_3

H_3O^+ NO_3^-

$NH_{3(aq)}$

HNO_3
$\overline{acid}$

Sample Problem

Write a balanced acid-base equilibrium equation for the reaction of hydrofluoric acid and potassium sulfate.

$$HF_{(aq)} \text{ and } K_2SO_{4(aq)}$$

$$\begin{array}{ccc} A & - & B & A/B \\ HF_{(aq)}, & K^+_{(aq)}, & SO_4^{2-}_{(aq)}, & H_2O_{(\ell)} \end{array}$$

SA   SB

$$< 50\%$$

$$HF_{(aq)} + SO_4^{2-}_{(aq)} \rightleftharpoons F^-_{(aq)} + HSO_4^-_{(aq)}$$

Homework

Predicting Acid-Base Equilibria

Worksheet