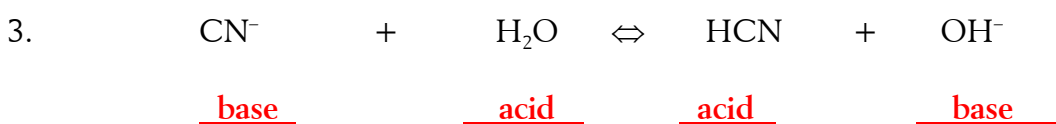
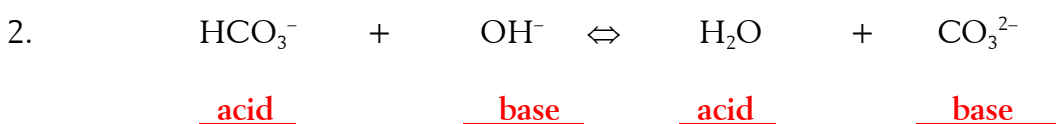
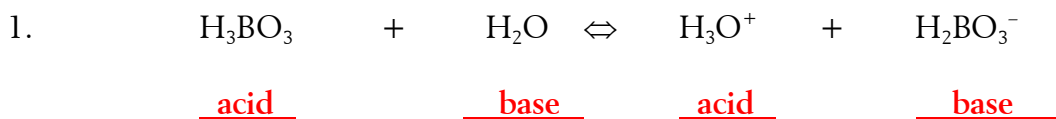


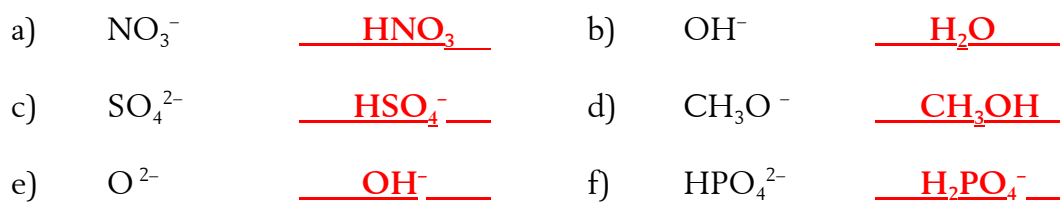
REVIEW QUESTIONS

## Chapter 15

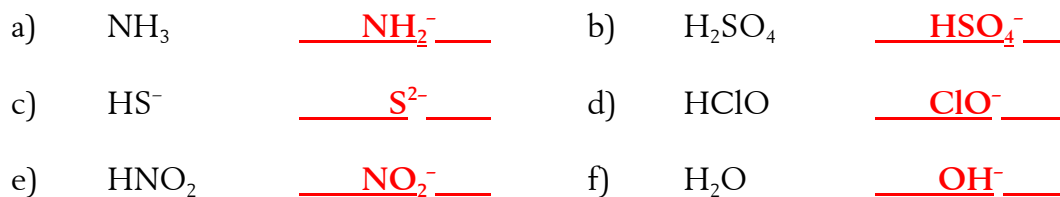
For each reaction shown below, determine the Brønsted-Lowry acid and base and their conjugates:



4. Identify the Brønsted-Lowry acid for each base shown below:



5. Identify the Brønsted-Lowry base for each acid shown below:



6. Complete the missing information in the table below:

$[\text{H}_3\text{O}^+]$	$[\text{OH}^-]$	Acidic/Basic
$1.0 \times 10^{-12}$	$1.0 \times 10^{-2}$	<b>Basic</b>
$3.8 \times 10^{-4}$	$2.6 \times 10^{-11}$	<b>Acidic</b>
$2.4 \times 10^{-11}$	$4.2 \times 10^{-4}$	<b>Basic</b>
$1.0 \times 10^{-5}$	$1.0 \times 10^{-9}$	<b>Acidic</b>
$6.5 \times 10^{-8}$	$1.5 \times 10^{-7}$	<b>Basic</b>

Sample calculations:

$$[\text{OH}^-] = \frac{K_w}{[\text{H}_3\text{O}^+]} = \frac{1.0 \times 10^{-14}}{3.8 \times 10^{-4}} = 2.6 \times 10^{-11}$$

$$[\text{H}_3\text{O}^+] = \frac{K_w}{[\text{OH}^-]} = \frac{1.0 \times 10^{-14}}{4.2 \times 10^{-4}} = 2.4 \times 10^{-11}$$

7. Identify each of the substances below as **strong electrolyte**, **weak electrolyte** or **non-electrolyte**:

- a) KCl      strong electrolyte (salt)
- b) HNO<sub>3</sub>    strong electrolyte (strong acid)
- c) CH<sub>3</sub>OH    non-electrolyte (molecular)
- d) HF        weak electrolyte (weak acid)
- e) H<sub>3</sub>PO<sub>4</sub>    weak electrolyte (weak acid)

8. What are the  $[\text{H}_3\text{O}^+]$  and  $[\text{OH}^-]$  for a solution with a pH of 4.10.

$$[\text{H}_3\text{O}^+] = \text{antilog}(-4.10) = 7.9 \times 10^{-5} \text{ M}$$

$$[\text{OH}^-] = \frac{K_w}{[\text{H}_3\text{O}^+]} = \frac{1.0 \times 10^{-14}}{7.9 \times 10^{-5}} = 1.3 \times 10^{-10} \text{ M}$$

9. If 30.0 mL of 0.400 M H<sub>2</sub>SO<sub>4</sub> is required to neutralize 15.0 mL of a NaOH solution, what is the molarity of NaOH?



$$\text{mol of acid} = 30.0 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{0.400 \text{ mol}}{1 \text{ L}} = 0.0120 \text{ mol}$$

$$\text{mol base} = 0.0120 \text{ mol acid} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol acid}} = 0.0240 \text{ mol NaOH}$$

$$\text{molarity of base} = \frac{0.0240 \text{ mol}}{0.0150 \text{ L}} = 1.60 \text{ M}$$

10. Determine the molarity of a solution of H<sub>3</sub>PO<sub>4</sub> if 25.0 mL of the acid is titrated with 14.0 mL of 0.250 M NaOH to the end point.



$$\text{mol of NaOH} = 14.0 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{0.250 \text{ mol}}{1 \text{ L}} = 0.00350 \text{ mol}$$

$$\text{mol acid} = 0.00350 \text{ mol NaOH} \times \frac{1 \text{ mol acid}}{3 \text{ mol NaOH}} = 0.001167 \text{ mol acid}$$

$$\text{molarity of acid} = \frac{0.001167 \text{ mol}}{0.0250 \text{ L}} = 0.0467 \text{ M}$$

11. Complete and balance the equations below for reactions of acids:

