

## WS 4.1-4.4 Arrhenius and Brønsted-Lowry Acids and Bases

Name: \_\_\_\_\_

- Classify as acids, bases, salts, or molecular:  
 a) HI                      b) LiCl                      c) Ca(OH)<sub>2</sub>                      d) O<sub>2</sub>                      e) Na<sub>2</sub>CO<sub>3</sub>  
 f) CH<sub>3</sub>COOH                      g) RbOH                      h) C<sub>6</sub>H<sub>11</sub>O<sub>6</sub>                      i) H<sub>3</sub>PO<sub>4</sub>                      j) XeF<sub>6</sub>                      k) Zn(CH<sub>3</sub>COO)<sub>2</sub>
- What is an electrolyte?
- Which of the following solutions are poor electrolyte solutions?  
 a) acid solutions    b) base solutions    c) neutral ionic solutions    d) neutral molecular solutions
- According to Arrhenius, which ions are responsible for acidic and basic properties of solutions?
- Write the balanced equation for the following dissociation of hydrogen fluoride in water:
- How can you distinguish between:  
 a) an acid and a base  
  
 b) an ionic and a molecular solution
- What is the definition of acid and base according to Brønsted-Lowry?
- Circle the amphiprotic substances. Label others as acids or bases according to Brønsted-Lowry.  
 a. H<sub>2</sub>CO<sub>3</sub>                      b. NH<sub>3</sub>                      c. CO<sub>3</sub><sup>2-</sup>                      d. SO<sub>4</sub><sup>2-</sup>                      e. NH<sub>4</sub><sup>+</sup>  
 f. H<sub>2</sub>PO<sub>4</sub><sup>-</sup>                      g. PO<sub>4</sub><sup>3-</sup>                      h. HCO<sub>3</sub><sup>-</sup>                      i. HPO<sub>4</sub><sup>2-</sup>                      j. HC<sub>2</sub>O<sub>4</sub><sup>-</sup>

Amphiprotic substances have both an \_\_\_\_\_ and a \_\_\_\_\_ in their chemical formula  
 Acids want to \_\_\_\_\_ an H<sup>+</sup>    Bases want to \_\_\_\_\_ an H<sup>+</sup>.

- Label each reactant as acid or base.  
 a)        HF        +        SO<sub>3</sub><sup>2-</sup> → F<sup>-</sup>        +        HSO<sub>3</sub><sup>-</sup>  
 b)        HCO<sub>3</sub><sup>-</sup> +        HSO<sub>3</sub><sup>-</sup> → SO<sub>4</sub><sup>2-</sup> +        H<sub>2</sub>CO<sub>3</sub>
- Label the acids and bases for the forward and reverse reactions.  
*HINT: The product with the "extra H" is the acid for the reverse reaction.*  
 a)        HIO<sub>3</sub>    +        NO<sub>2</sub><sup>-</sup>        →        HNO<sub>2</sub> +        IO<sub>3</sub><sup>-</sup>  
 b)        H<sub>2</sub>PO<sub>4</sub><sup>-</sup> +        HC<sub>2</sub>O<sub>4</sub><sup>-</sup>        →        H<sub>2</sub>C<sub>2</sub>O<sub>4</sub> +        HPO<sub>4</sub><sup>2-</sup>  
 c)        Al(H<sub>2</sub>O)<sub>6</sub><sup>3+</sup> +        SO<sub>3</sub><sup>2-</sup>        →        HSO<sub>3</sub><sup>-</sup> +        Al(H<sub>2</sub>O)<sub>5</sub><sup>2+</sup>