

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

Per: \_\_\_\_\_

1. List four characteristic properties of acids and four characteristic properties of bases.

Acids	Bases

2. Fill in the chart below by providing simple definitions.

	Acid	Base
Arrhenius's Definition		
Brønsted-Lowry Definitions		

3. a. Write the correct symbol for the hydrogen ion: \_\_\_\_\_

- b. Write the correct symbol for a hydronium ion: \_\_\_\_\_

4. Define the term **amphoteric**.

5. Write balanced equations for the:

- a. Dissociation of calcium hydroxide,  $\text{Ca}(\text{OH})_2$

- b. Ionization of nitric acid,  $\text{HNO}_3$

6. Write the equation for the ionization of nitric acid,  $\text{HNO}_3$ , showing the formation of the hydronium ion.

7. Identify the hydrogen-ion donor & acceptor (present on the reactant side of each equation) in each of the following reactions:

	<u>H<sup>+</sup> donor (the acid)</u>	<u>H<sup>+</sup> acceptor (the base)</u>
a. $\text{HNO}_3(l) + \text{H}_2\text{O}(l) \rightarrow \text{H}_3\text{O}^+(aq) + \text{NO}_3^-(aq)$	_____	_____
b. $\text{C}_2\text{H}_5\text{NH}_2(l) + \text{H}_2\text{O}(l) \rightarrow \text{C}_2\text{H}_5\text{NH}_3^+(aq) + \text{OH}^-(aq)$	_____	_____
c. $\text{CH}_3\text{CO}_2\text{H}(l) + \text{H}_2\text{O}(l) \rightarrow \text{CH}_3\text{CO}_2^-(aq) + \text{H}_3\text{O}^+(aq)$	_____	_____

8. For each acid listed in question 7, identify its conjugate base.

<u>Acid (Reactant side of equation)</u>	<u>Conjugate Base</u>
a.	_____
b.	_____
c.	_____

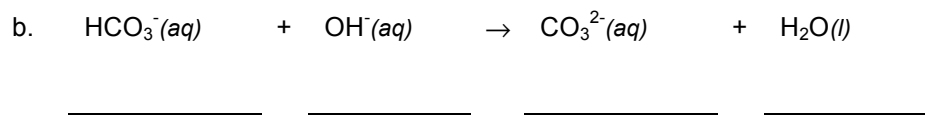
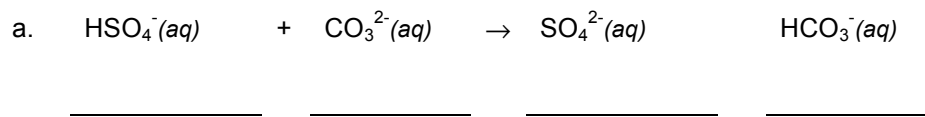
9. Write the formulas for the conjugate base of each of the following acids.

a. $\text{H}_2\text{SO}_3$	b. $\text{HCO}_3^-$	c. $\text{NH}_4^+$
_____	_____	_____

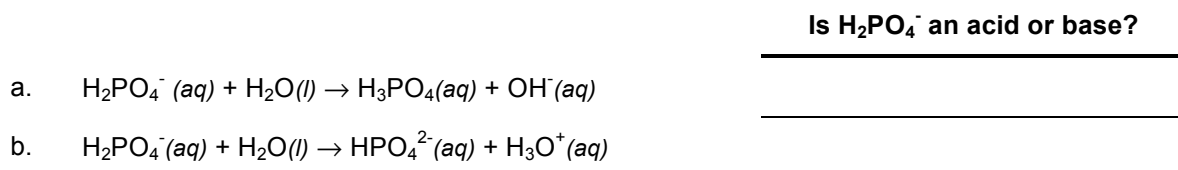
10. Write the formulas for the conjugate acid of each of the following bases.

a. $\text{H}_2\text{O}$	b. $\text{CO}_3^{2-}$	c. $\text{PH}_3$
_____	_____	_____

11. For each of the following reactions, identify the Brønsted-Lowry acid and Brønsted-Lowry base on the reactant side of the equation, and the conjugate acid and conjugate base on the product side.



12. Consider the following two reactions. In which reaction does  $\text{H}_2\text{PO}_4^-$  act as a base? In which does it act as an acid?



13. Calculate the pH's of strong acid solutions with the following  $\text{H}^+$  concentrations. Show your work.

- |                             |                              |                           |                              |
|-----------------------------|------------------------------|---------------------------|------------------------------|
| a. 1.0 M                    | b. $1.0 \times 10^{-5}$ M    | c. $1.5 \times 10^{-5}$ M | d. $2.0 \times 10^{-5}$ M    |
| e. $3.00 \times 10^{-12}$ M | f. $1.125 \times 10^{-15}$ M | g. 12.0 M                 | h. $0.875 \times 10^{-10}$ M |

14. Calculate the  $\text{H}_3\text{O}^+$  concentrations for solutions with the following pH's. Show your work.

- |         |         |          |         |
|---------|---------|----------|---------|
| a. 2.00 | b. 2.25 | c. 2.5   | d. 3.0  |
| e. 7    | f. 9.50 | g. 12.15 | h. 14.0 |