Name _____ Date _____ Class _____

# 19.1 ACID-BASE THEORIES

## Section Review

### Objectives

- Define the properties of acids and bases
- Compare and contrast acids and bases as defined by the theories of Arrhenius, Brønsted-Lowry, and Lewis

### Vocabulary

- monoprotic acids
- diprotic acids
- triprotic acids
- conjugate acid
- conjugate base
- conjugate acid–base pair
- hydronium ion ($H_3O^+$)
- amphoteric
- Lewis acid
- Lewis base

### Part A Completion

*Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.*

Compounds can be classified as acids or bases according to ___1___ different theories. An ___2___ acid yields hydrogen ions in aqueous solution. An Arrhenius base yields ___3___ in aqueous solution. A Brønsted-Lowry acid is a ___4___ donor. A Brønsted-Lowry base is a proton ___5___. In the Lewis theory, an acid is an ___6___ acceptor. A Lewis base is an electron-pair ___7___.

An acid with one ionizable hydrogen atom is called a ___8___ acid, while an acid with two ionizable hydrogen atoms is called a ___9___ acid.

A ___10___ is a pair of substances related by the gain or loss of a hydrogen ion. A substance that can act as both an acid and a base is called ___11___.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____

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## Part B True-False

*Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.*

_____ **12.** Hydrochloric acid is a strong acid that is diprotic.

_____ **13.** The ammonium ion, $NH_4^+$, is a Brønsted-Lowry base.

_____ **14.** A Brønsted-Lowry base is a hydrogen-ion acceptor.

_____ **15.** A compound can act as both an acid and a base.

_____ **16.** $PBr_3$ is a Lewis base.

## Part C Matching

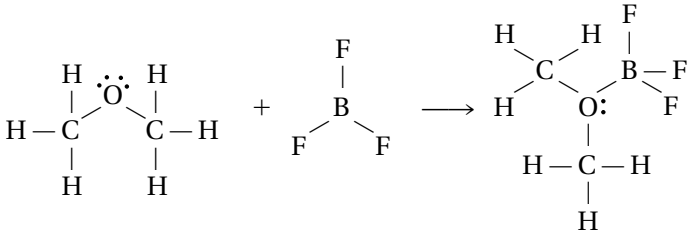
*Match each description in Column B to the correct term in Column A.*

| Column A | Column B |
|---|---|
| _____ **17.** monoprotic acids | **a.** tastes sour and will change the color of an acid-base indicator |
| _____ **18.** triprotic acids | **b.** an electron-pair donor |
| _____ **19.** acid properties | **c.** a water molecule that gains a hydrogen ion |
| _____ **20.** base properties | **d.** acids that contain three ionizable hydrogens |
| _____ **21.** conjugate base | **e.** particle that remains when an acid has donated a hydrogen ion |
| _____ **22.** conjugate acid | **f.** an electron-pair acceptor |
| _____ **23.** hydronium ion ($H_3O^+$) | **g.** acids that contain one ionizable hydrogen |
| _____ **24.** Lewis acid | **h.** tastes bitter and feels slippery |
| _____ **25.** Lewis base | **i.** particle formed when a base gains a hydrogen ion |

## Part D Problem

*Answer the following in the space provided.*

**26.** Identify the Lewis acid and Lewis base in the following reaction. Explain.



dimethyl ether boron trifluoride