Name _____ Class _____ Date _____

Relative Strengths of Acids and Bases

DIRECTIONS: Write on the line at the right of each statement the letter preceding the word or expression that best completes the statement.

1. A species that remains when an acid has lost a proton is called a (a) conjugate base; (b) conjugate acid; (c) strong base; (d) strong acid. A 1
2. Conjugate acids and bases figure prominently in which theory of acids and bases? (a) traditional (b) Lewis (c) Bronsted (d) none of the above C 2
3. In the reaction $HF + H_2O \rightleftarrows H_3O^+ + F^+$, the two bases are (a) HF and H_2O; (b) HF and H_3O^+; (c) HF and F^-; (d) H_2O and F^-. D 3
4. In the reaction $NH_3 + HClO_3 \rightleftarrows NH_4^+ + ClO_3^-$, the conjugate base of $HClO_3$ is (a) ClO_3^-; (b) NH_3; (c) NH_4^+; (d) not shown. A 4
5. In the reaction $HC_2H_3O_2 + NH_3 \rightleftarrows C_2H_3O_2^- + NH_4^+$, a conjugate acid-base pair is (a) $HC_2H_3O_2$ and NH_3; (b) $C_2H_3O_2^-$ and NH_4^+; (c) $HC_2H_3O_2$ and $C_2H_3O_2^-$; (d) none of the above. C 5
6. A base is weak if its tendency to (a) attract a proton is great; (b) attract a proton is slight; (c) donate a proton is great; (d) donate a proton is slight. B 6
7. If a substance has a great tendency to give up protons, its conjugate will have a (a) great tendency to give up protons; (b) great tendency to accept protons; (c) slight tendency to give up protons; (d) slight tendency to accept protons. D 7
8. If ClO_4^- in the equation $NH_3 + HClO_4 \rightarrow NH_4^+ + ClO_4^-$ is a weak base, then HCO_4 is a (a) strong acid; (b) strong base; (c) weak acid; (d) weak base. A 8
9. In order for a proton-transfer reaction to approach completion, the acidic and basic strengths of the reactants must be (a) much lower than those of the products; (b) much higher than those of the products; (c) slightly lower than those of the products; (d) roughly equal to those of the products. B 9
10. Given that $HC_2H_3O_2$ is a weak acid and H_2O is a weak base, the reaction $HC_2H_3O_2 + H_2O \rightarrow H_3O^+ + C_2H_3O_2^-$ (a) goes nearly to completion; (b) favors reactants; (c) slightly favors products; (d) does not occur. B 10
11. Acid-base reactions that have a great tendency to proceed in the forward direction have (a) an equal tendency to proceed in the reverse direction; (b) a slightly lower tendency to proceed in the reverse direction; (c) a greater tendency to proceed in the reverse direction; (d) almost no tendency to proceed in the reverse direction. D 11
12. Which of the following is amphoteric? (a) H_2SO_4 (b) SO_4^{2-} (c) H^+ (d) HSO_4^- D 12
13. Which of the following is amphoteric? (a) H_3PO_4 (b) H^+ (c) HPO_4^{2-} (d) PO_4^{3-} C 13
14. In the reaction $H_2O + HSO_4^- \rightleftarrows SO_4^{2-} + H_3O^+$, HSO_4^- acts as a(n) (a) acid; (b) base; (c) spectator series; (d) salt. A 14
15. Explain the difference between a conjugate base and its acid. a conjugate base is made from an acid losing its H+ (proton) 15

*use Pg 471

For each of the reactions below identify the acid and base and the conjugate acid and base, tell which is the strong acid and base and which is weak, and tell which direction the reaction will go.

16. $HCl + H_2O \rightleftharpoons H_3O^+ + Cl^-$
acid (A) base (B) conj. Acid (CA) conj Base (CB)

17. $HCl + NH_3 \rightleftharpoons NH_4^+ + Cl^-$
A B CA CB

18. $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$
B A CA CB

19. $H_2SO_4 + H_2O \rightleftharpoons H_3O^+ + HSO_4^-$
A B CA CB

20. $HC_2H_3O_2 + H_2O \rightleftharpoons H_3O^+ + C_2H_3O_2^-$
A B CA CB

21. $HCO_3^- + H_2O \rightleftharpoons H_2CO_3 + OH^-$
B A CA CB

22. $HCl + SO_4^{2-} \rightleftharpoons HSO_4^- + Cl^-$
A B CA CB