Name _____ Date _____ Period _____

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Classifying Acids & Bases

Chemistry

Brønsted-Lowry: acid = H^+ donor, base = H^+ acceptor. Conjugate pairs differ by one H^+. Strong acids: HCl, HBr, HI, HNO_3, H_2SO_4, $HClO_4$. Not on the list? Treat it as weak.

1. Label the acid, base, conjugate acid, and conjugate base in each reaction.

(a) $HNO_3 + H_2O \rightarrow H_3O^+ + NO_3^-$

(b) $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$

(c) $HF + NH_3 \rightleftharpoons F^- + NH_4^+$

(d) $HCO_3^- + OH^- \rightleftharpoons CO_3^{2-} + H_2O$

2. Write the conjugate base of each acid.

(a) HCl

(b) H_2SO_4

(c) NH_4^+

(d) H_2O

3. Write the conjugate acid of each base.

(a) NH_3

(b) OH^-

(c) CO_3^{2-}

(d) H_2O

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4. Classify each as a strong acid, weak acid, strong base, or weak base.

(a) HBr

(b) HF

(c) $Ca(OH)_2$

(d) NH_3

(e) $HClO_4$

(f) $HC_2H_3O_2$

5. Rank these acids from strongest to weakest: HNO_2 ($K_a = 4.5 \times 10^{-4}$), HCN (6.2×10^{-10}), $HC_2H_3O_2$ (1.8×10^{-5}), $HClO_2$ (1.1×10^{-2}).

6. Water is amphoteric. Use problem 1 to explain what that means.

7. Which is the stronger acid: 0.001 M HCl or 1.0 M $HC_2H_3O_2$? Explain the difference between strong and concentrated.

8. Why does the Brønsted-Lowry definition explain NH_3 as a base better than Arrhenius does?

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