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AP Chemistry – Acids & Bases – 47

Name _____Per ___

1. Consider the reaction $H_{2(g)} + F_{2(g)} \rightarrow 2HF_{(g)}$. (a) Using thermochemical data, calculate $\Delta G°$ at 298 K.

(b) Calculate ΔG at 298 K if the reaction mixture consists of 8.0 atm of H_2, 4.5 atm of F_2, and 0.36 atm of HF.

2. Write the equilibrium-constant expression and calculate the value of the equilibrium constant at 298 K for the reaction $NaHCO_{3(s)} \leftrightarrow NaOH_{(s)} + CO_{2(g)}$.

3. What is the difference between the Arrhenius and the Brønsted-Lowry definitions of a base?

4. When ammonia is dissolved in water, it behaves both as an Arrhenius base and as a Brønsted-Lowry base. Explain.

5. Give the conjugate acid of the following Brønsted-Lowry bases:
(a) $HAsO_4^{2-}$

(b) CH_3NH_2

(c) SO_4^{2-}

(d) $H_2PO_4^-$

6. Write an equation for the reaction in which $H_2C_6H_7O_5^-{}_{(aq)}$ acts as a base in $H_2O_{(l)}$. Designate the acid, base, conjugate acid and base.

7. Write an equation for the reaction in which $H_2C_6H_7O_5^-{}_{(aq)}$ acts as an acid in $H_2O_{(l)}$. Designate the acid, base, conjugate acid and base.

8. Predict the products of the following acid-base reactions, and also predict whether the equilibrium lies to the left or right.
(a) $Cl^-_{(aq)} + H_3O^+_{(aq)} \leftrightarrow$

(b) $H_2O_{(l)} + HNO_{2(aq)} \leftrightarrow$

(c) $NO_3^-{}_{(aq)} + H_2O_{(l)} \leftrightarrow$

9. (a) Write a chemical equation that illustrates the autoionization of water. (b) Write the expression for the ion-product constant for water, K_w.

10. A solution is described as basic. What is meant by this statement?

11. The fermentation of glucose produces ethyl alcohol and carbon dioxide:
$C_6H_{12}O_{6(aq)} \rightarrow 2C_2H_5OH_{(aq)} + 2CO_{2(g)}$ (a) How many moles of carbon dioxide are produced when 0.400 moles of glucose reacts in this fashion?

(b) How many grams of glucose are needed to form 7.50 g of ethyl alcohol?

(c) How many grams of carbon dioxide form when 7.50 g of ethyl alcohol are produced?

12. When hydrogen sulfide gas is bubbled into a solution of sodium hydroxide, the reaction forms sodium sulfide and water. How many grams of sodium sulfide are formed if 2.00 g of hydrogen sulfide is bubbled into a solution containing 2.00 g of sodium hydroxide, if the sodium sulfide is produced at 92.0% yield?

13. How would you prepare 100.0 mL of 0.200 M $AgNO_3$ solution starting with pure solute?

14. An experiment calls for you to use 250. mL of 1.00 M HNO_3 solution. All you have available is a bottle of 6.00 M HNO_3. How would you prepare the desired solution?