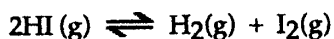


Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

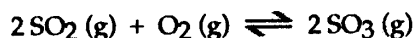
- 1) The molar concentration of hydronium ion in pure water at 25°C is _____.
- A) 1.0×10^{-7} B) 7.00 C) 1.00 D) 1.0×10^{-14} E) 0.00
- 2) The K_a for HCN is 4.9×10^{-10} . What is the value of K_b for CN^- ?
- A) 4.0×10^{-6} B) 2.0×10^{-5} C) 4.9×10^4 D) 4.9×10^{-24} E) 2.0×10^9
- 3) Which one of the following pairs cannot be mixed together to form a buffer solution?
- A) H_3PO_4 , KH_2PO_4
 B) NH_3 , NH_4Cl
 C) KOH, HF
 D) RbOH, HBr
 E) $NaC_2H_3O_2$, HCl ($C_2H_3O_2^-$ = acetate)
- 4) Of the following equilibria, only _____ will shift to the left in response to a decrease in volume.
- A) $4 Fe (s) + 3 O_2 (g) \rightleftharpoons 2 Fe_2O_3 (s)$
 B) $H_2 (g) + Cl_2 (g) \rightleftharpoons 2 HCl (g)$
 C) $2HI (g) \rightleftharpoons H_2 (g) + I_2 (g)$
 D) $2 SO_3 (g) \rightleftharpoons 2 SO_2 (g) + O_2 (g)$
 E) $N_2 (g) + 3 H_2 (g) \rightleftharpoons 2 NH_3 (g)$
- 5) The K_a of acetic acid is 1.7×10^{-5} . The pH of a buffer prepared by combining 50.0 mL of 1.00 M potassium acetate and 50.0 mL of 1.00 M acetic acid is _____.
- A) 2.38 B) 1.70 C) 3.40 D) 0.85 E) 4.77
- 6) The acid-dissociation constants of phosphoric acid (H_3PO_4) are $K_{a1} = 7.5 \times 10^{-3}$, $K_{a2} = 6.2 \times 10^{-8}$, and $K_{a3} = 4.2 \times 10^{-13}$ at 25°C. What is the pH of a 2.5-M aqueous solution of phosphoric acid?
- A) 0.13 B) 0.40 C) 0.87 D) 1.8 E) 2.5
- 7) Classify the following compounds as weak acids (W) or strong acids (S):
- hypochlorous acid perchloric acid chloric acid
- A) W W W B) W S S C) W S W D) S S S E) S W W

- 8) A reaction vessel is charged with hydrogen iodide, which partially decomposes to molecular hydrogen and iodine:



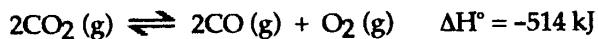
When the system comes to equilibrium at 425°C, $P_{\text{HI}} = 0.708 \text{ atm}$, and $P_{\text{H}_2} = P_{\text{I}_2} = 0.0960 \text{ atm}$. The value of K_{eq} at this temperature is _____.

- A) 6.80×10^{-2}
 - B) 1.84×10^{-2}
 - C) K_{eq} cannot be calculated for this gas reaction when the volume of the reaction vessel is not given.
 - D) 1.30×10^{-2}
 - E) 54.3
- 9) Consider the following equilibrium.



The equilibrium cannot be established when _____ is/are placed in a 1.0-L container.

- A) 1.0 mol $\text{SO}_3(\text{g})$
 - B) 0.75 mol $\text{SO}_2(\text{g})$
 - C) 0.25 mol of $\text{SO}_2(\text{g})$ and 0.25 mol of $\text{SO}_3(\text{g})$
 - D) 0.25 mol $\text{SO}_2(\text{g})$ and 0.25 mol $\text{O}_2(\text{g})$
 - E) 0.50 mol $\text{O}_2(\text{g})$ and 0.50 mol $\text{SO}_3(\text{g})$
- 10) What change will be caused by addition of a small amount of HCl to a solution containing fluoride ions and hydrogen fluoride?
- A) The concentration of fluoride ion will decrease and the concentration of hydrogen fluoride will increase.
 - B) The concentration of hydronium ions will increase significantly.
 - C) The concentration of fluoride ions will increase as will the concentration of hydronium ions.
 - D) The concentration of hydrogen fluoride will decrease and the concentration of fluoride ions will increase.
 - E) The fluoride ions will precipitate out of solution as its acid salt.
- 11) Consider the following reaction at equilibrium:



Le Châtelier's principle predicts that an increase in temperature will _____.

- A) increase the partial pressure of CO
- B) decrease the value of the equilibrium constant
- C) increase the value of the equilibrium constant
- D) decrease the partial pressure of $\text{CO}_2(\text{g})$
- E) increase the partial pressure of $\text{O}_2(\text{g})$

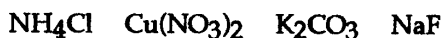
- 12) Of the following, _____ is a weak acid.
 A) HCl B) HF C) HBr D) HClO₄ E) HNO₃
- 13) The equilibrium-constant expression depends on the _____ of the reaction.
 A) stoichiometry
 B) mechanism
 C) stoichiometry and mechanism
 D) temperature
 E) the quantities of reactants and products initially present
- 14) HZ is a weak acid. An aqueous solution of HZ is prepared by dissolving 0.020 mol of HZ in sufficient water to yield 1.00 L of solution. The pH of the solution was 4.93 at 25°C. The K_a of HZ is _____.
 A) 9.9×10^{-2} B) 2.8×10^{-12} C) 1.2×10^{-5} D) 1.4×10^{-10} E) 6.9×10^{-9}
- 15) The relationship between the rate constants for the forward and reverse reactions and the equilibrium constant for the process is $k_{eq} =$ _____.
 A) $k_f - k_r$ B) $k_f k_r$ C) $k_f + k_r$ D) k_r / k_f E) k_f / k_r

- 16) At 22°C, $K_{eq} = 0.070$ for the equilibrium:



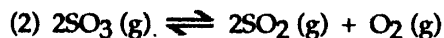
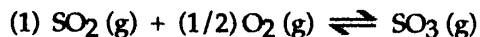
A sample of solid NH₄HS is placed in a closed vessel and allowed to equilibrate. Calculate the equilibrium partial pressure (atm) of ammonia, assuming that some solid NH₄HS remains.

- A) 4.9×10^{-3} B) 0.26 C) 0.070 D) 0.52 E) 3.8
- 17) The pH of a 0.55-M aqueous solution of hypobromous acid, HBrO, at 25°C is 4.48. What is the value of K_a for HBrO?
 A) 2.0×10^{-9} B) 3.0×10^4 C) 3.3×10^{-5} D) 1.1×10^{-9} E) 6.0×10^{-5}
- 18) Of the following substances, an aqueous solution of _____ will form basic solutions.



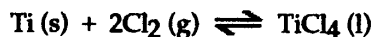
- A) K₂CO₃, NH₄Cl
 B) NH₄Cl, Cu(NO₃)₂
 C) NH₄Cl only
 D) NaF, K₂CO₃
 E) NaF only
- 19) A 25.00-mL sample of 0.723 M HClO₄ is titrated with a 0.273 M KOH solution. The H₃O⁺ concentration after the addition of 10.0 mL of KOH is _____ M.
 A) 1.00×10^{-7} B) 0.273 C) 0.723 D) 2.81×10^{-13} E) 0.440

20) The equilibrium constant for reaction 1 is K. The equilibrium constant for reaction 2 is _____.



- A) $1/2K$ B) K^2 C) $-K^2$ D) $2K$ E) $1/K^2$

21) The equilibrium-constant expression for the reaction



is given by

A) $\frac{[\text{TiCl}_4(\text{l})]}{[\text{Ti}(\text{s})][\text{Cl}_2(\text{g})]^2}$

B) $\frac{[\text{TiCl}_4(\text{l})]}{[\text{Ti}(\text{s})][\text{Cl}_2(\text{g})]}$

C) $\frac{[\text{TiCl}_4(\text{l})]}{[\text{Cl}_2(\text{g})]^2}$

D) $\frac{[\text{Ti}(\text{s})][\text{Cl}_2(\text{g})]^2}{[\text{TiCl}_4(\text{l})]}$

E) $[\text{Cl}_2(\text{g})]^{-2}$

22) What is the conjugate acid of NH_3 ?

- A) NH_2^+ B) NH_4OH C) NH_3 D) NH_3^+ E) NH_4^+

23) What is the pH of an aqueous solution at 25°C in which $[\text{OH}^-]$ is 0.0025 M ?

- A) $+2.60$ B) -2.60 C) $+11.40$ D) -11.40 E) -2.25

24) An acid containing the COOH group is called a _____.

- A) strong acid
B) double oxoacid
C) carbonaceous acid
D) carbo-oxo acid
E) carboxylic acid

25) The hydride ion, H^- , is a stronger base than the hydroxide ion, OH^- . The product(s) of the reaction of hydride ion with water is/ are _____.

- A) $\text{OH}^-(\text{aq}) + \text{H}_2(\text{g})$
B) no reaction occurs
C) $\text{H}_3\text{O}^+(\text{aq})$
D) $\text{H}_2\text{O}_2(\text{aq})$
E) $\text{OH}^-(\text{aq}) + 2\text{H}^+(\text{aq})$

Answer Key

Testname: TEST3_BLUE.TST

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) A
- 2) B
- 3) D
- 4) D
- 5) E
- 6) C
- 7) B
- 8) B
- 9) B
- 10) A
- 11) B
- 12) B
- 13) A
- 14) E
- 15) E
- 16) B
- 17) A
- 18) D
- 19) E
- 20) E
- 21) E
- 22) E
- 23) C
- 24) E
- 25) A