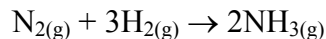


CH302 Test Practice Questions

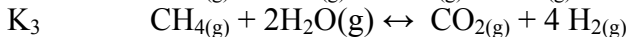
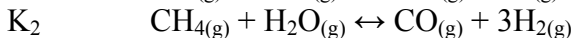
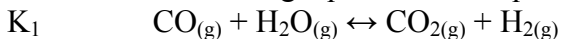
1. The reaction for the synthesis of ammonia



is exothermic. Increasing the temperature applied to the system

- I) increases the amount of NH_3 .
 - II) decreases the amount of NH_3 .
 - III) changes the value of K_{eq} .
 - IV) does not change the value of K_{eq} .
- A. I and III only
 - B. II and III only
 - C. I and IV only
 - D. II and IV only

2. Given the following equilibria and equilibrium constants



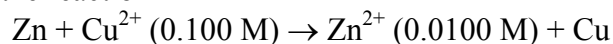
The correct expression for K_3 in terms of K_1 and K_2 is

- A. $K_3 = K_1 + K_2$
- B. $K_3 = K_1 - K_2$
- C. $K_3 = K_1 K_2$
- D. $K_3 = K_1 / K_2$
- E. Cannot be determined from this information.

3. The solubility of a gas such as O_2 in water (decreases, increases, stays the same) with increasing temperature.

4. For a first-order reaction, after 230 s, 33% of the reactants remain. Calculate the rate constant for the reaction.

5. For the reaction



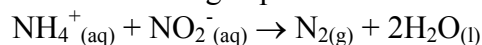
the change in standard molar Gibbs free energy is -212.27 kJ/mol and the change in molar Gibbs free energy is -217.98 kJ/mol . What is the voltage produced by the cell in which this reaction occurs with the concentrations as shown in the equation and at 25°C ?

6. What is the H^+ ion concentration in a 0.50 mol/L solution of a weak base that has an ionization constant (K_b) of 2.0×10^{-8} ?

7. Which is the strongest base: ClO^- , ClO_3^- , ClO_4^- , Cl^- ?

8. In the reaction $\text{B}(\text{OH})_3 + \text{H}_2\text{O} \rightarrow \text{B}(\text{OH})_2\text{O}^- + \text{H}_3\text{O}^+$
 $\text{B}(\text{OH})_3$ is acting as: a. base / acid / neither.

15. Given the following experimental information for the reaction

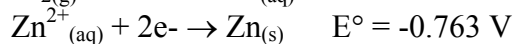
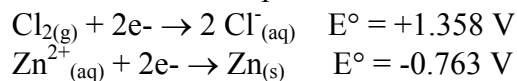


What is the rate law expression for this reaction?

Experiment	Initial concentration of NH_4^+	Initial concentration of NO_2^-	Initial Rate $\text{mol L}^{-1} \text{s}^{-1}$
1	0.10 M	0.0050 M	1.35×10^{-7}
2	0.20 M	0.010 M	5.40×10^{-7}
3	0.10 M	0.010 M	2.70×10^{-7}

16. A 100 mL sample of a liquid is contained in a 500 mL closed container at 50°C. If the temperature was increased, the vapor pressure of the liquid would (increase/decrease/stay the same).

17. What is E°_{cell} for the voltaic cell utilizing this reaction: $\text{Zn}(\text{s}) + \text{Cl}_2(\text{g}) \rightarrow \text{ZnCl}_2(\text{aq})$
Given: Standard reduction potentials



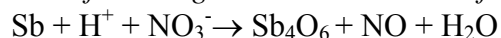
18. Calculate the pH of a 0.08 M HCl solution.

19. Calculate the pH of a 1.0 M HCN solution ($K_a = 6.2 \times 10^{-10}$).

20. Adding HF to water will reduce / increase / have no effect on the pH.

21. Calculate the pH of a solution containing 0.50 M CH_3COOH , $K_a = 1.8 \times 10^{-5}$, and 0.50 M sodium acetate, NaCH_3COO .

Consider the following unbalanced reaction for questions 22 and 23:



22. What is the oxidizing agent?

- A. Sb
- B. H^+
- C. NO_3^-
- D. Sb_4O_6
- E. NO

23. What is the coefficient for H^+ in the balanced equation (using the set of smallest whole numbers)?

- A. 7
- B. 1
- C. 8
- D. 2
- E. 4

24. Which of the following aqueous solutions, formed by mixing the two components in each case, would act as an acid-base buffer solution?

- A. 100 ml of 1M HCl and 100 ml of 1M NaOH
- B. 100 ml of 1M NH₄Cl and 100 ml of 1M NH₃
- C. 100 ml of 1M NH₃ and 100 ml of 1M HC₂H₃O₂
- D. 10 ml of 1M HCl and 100 ml of 1M NaCl

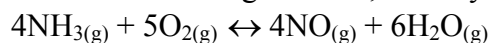
25. The solubility of M₂Y₃ is 1 x 10⁻¹⁰ mole per liter. What is the K_{sp} for the compound?

- A. 3.6 x 10⁻⁴⁹
- B. 6 x 10⁻²⁸
- C. 1 x 10⁻²⁰
- D. 1 x 10⁻⁵⁶

26. If the ionization constant for an acid, HA, is equal to that of a base, BOH, then the solution of the salt, BA, in water (at 25°C) is expected to have a pH

- A. greater than 7.
- B. equal to 7.
- C. less than 7.
- D. which is impossible to predict.

27. Consider the following reaction, initially at equilibrium.



The addition of more O₂ would:

- A. decrease the number of moles of NH₃ present.
- B. increase the number of moles of NH₃ present.
- C. decrease the number of moles of NO present.
- D. cause no change in the number of moles of H₂O present.

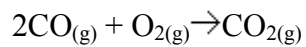
28. At 400°C the reaction H_{2(g)} + I_{2(g)} ↔ 2HI_(g) has an equilibrium constant, K_p, of 50.00. If an equilibrium mixture of H₂, I₂, and HI is such that the partial pressure of H₂ is 0.200 atm., and the partial pressure of I₂ is 0.250 atm., the *total* pressure of the equilibrium mixture is:

- A. 3.61 atm
- B. 2.03 atm
- C. 0.45 atm
- D. 32.07 atm

29. Consider a reaction which is endothermic and which is accompanied by a decrease in the randomness of the system. This reaction would ____ spontaneous at ____ temperature.

- A. be, a high
- B. be, a low
- C. not be, a low
- D. not be, a high
- E. not be, any

30. If the heat of formation, ΔH°_f , of $\text{CO}_{2(g)}$ is -94 kcal/mol while the heat of formation, ΔH°_f , of $\text{CO}(g)$ is -26 kcal/mol , the enthalpy change would be ___ for the unbalanced reaction below:



- A. -68 kcal/mol
- B. -120 kcal/mol
- C. -136 kcal/mol
- D. -240 kcal/mol
- E. Insufficient information given

CH302 Practice Questions Answers

1. B
2. C
3. decreases
4. 0.00482 s^{-1}
5. 1.13 volts
6. $1.0 \times 10^{-10} \text{ mol/L}$
7. ClO^-
8. an acid
9. 2 the equation is $2\text{MnO}_4^- (\text{aq}) + 3\text{NO}_2^- (\text{aq}) \rightarrow 2\text{MnO}_2 (\text{s}) + 3\text{NO}_3^- (\text{aq}) + 2\text{OH}^- (\text{aq})$
10. left
11. C
12. $2 \times 10^{-2} \text{ M}$ Note a simplifying assumption has been made: $0.5 - 2x \approx 0.5$
13. left
14. it would sublime
15. $\text{Rate} = (2.7 \times 10^{-4} \text{ L mol}^{-1} \text{ s}^{-1}) [\text{NH}_4^+][\text{NO}_2^-]$
16. increase
17. 2.121 V
18. 1.10
19. 4.60
20. reduce
21. 4.74
22. C the equation is $4\text{Sb} + 4\text{H}^+ + 4\text{NO}_3^- \rightarrow \text{Sb}_4\text{O}_6 + 4\text{NO} + 2\text{H}_2\text{O}$
23. E
24. B
25. A
26. B
27. A
28. B
29. E
30. C