

SUPeR Chemistry

CH 223 Practice Exam

This exam has been designed to help you practice working multiple choice problems over the topics presented in CH 223. The actual exams for each section of CH 223 will be different and you should not assume that this practice exam is representative of those exams.

To get the most benefit from this practice exam, treat it like a real exam. Do not start it until you feel prepared. Allow 50 minutes to complete the exam and use no materials except a calculator and periodic table.

1. In which of the following does the reaction go farthest to completion?
- A) $K_c = 10^5$
 - B) $K_c = 10^{-5}$
 - C) $K_c = 1000$
 - D) $K_c = 100$
 - E) $K_c = 1$
2. For the reaction $2\text{H}_2\text{S}(\text{g}) \rightleftharpoons 2\text{H}_2(\text{g}) + \text{S}_2(\text{g})$, $K_c = 4500$ at a particular temperature. What will happen when 0.010 mole of H_2S , 1.0 mol of H_2 and 1.5 mol of S_2 are added to a 1.0 L container at that temperature?
- A) Nothing, the system is at equilibrium.
 - B) More H_2S will be formed.
 - C) More H_2 will be formed than S_2 .
 - D) More S_2 will be formed than H_2 .
3. For the reaction system $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$, $\Delta H = -92 \text{ kJ}$. To shift the equilibrium and increase the yield of ammonia, we should
- 1. increase the temperature
 - 2. decrease the temperature
 - 3. increase the pressure by decreasing the volume.
 - 4. decrease the pressure by increasing the volume.
- A) 1 only
 - B) 2 only
 - C) 1 and 3 only
 - D) 2 and 3 only
 - E) 1 and 4 only

4. A 1.00 L vessel initially contains 0.777 mol of SO_3 at 1100K. What is the value of K_c at this temperature if 0.520 mol of SO_3 remains at equilibrium?



- A) 0.0315 B) 0.0637 C) 0.129 D) 31.7 E) 7.75

5. Consider the following equilibrium reaction:



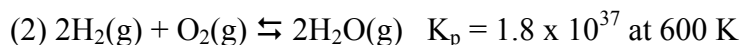
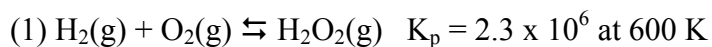
with $K = 1.6 \times 10^{-5}$. 1.00 mole of pure NOCl and 1.00 mol of pure Cl_2 are placed in a 1.00 L container. What is the equilibrium concentration of $\text{NO}(\text{g})$?

- A) 1.0 M B) $1.6 \times 10^{-5}\text{M}$ C) 0.50 M D) $6.2 \times 10^{-4}\text{M}$ E) $4 \times 10^{-3}\text{M}$

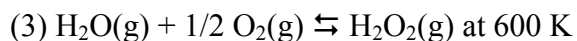
6. What is the $[\text{H}^+]$ in a solution that is 0.10 M in NaF and 0.20 M in HF ?
 $K_a = 7.2 \times 10^{-4}$.

- A) $3.5 \times 10^{-4}\text{M}$
B) 7.0×10^{-4}
C) $1.4 \times 10^{-3}\text{M}$
D) 0.20 M

7. Use the reactions



to find K_p for



A) 4.4×10^{43}

B) 9.8×10^{24}

C) 1.2×10^{-4}

D) 5.4×10^{-13}

E) 2.6×10^{-31}

8. Given 100.0 mL of a buffer that is 0.50 M in HOCl and 0.40 M in NaOCl, what is the pH after 10.0 mL of 1.0 M NaOH has been added? K_a for HOCl = 3.5×10^{-8} .

A) 6.45

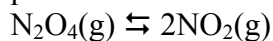
B) 6.64

C) 7.36

D) 7.45

E) 7.55

9. Exactly 1.0 mol of N_2O_4 is placed in an empty 1.0 L container and is allowed to reach equilibrium described by the equation



If at equilibrium the N_2O_4 is 20% dissociated, what is the value of the equilibrium constant for the reaction under these conditions?

A) 0.05

B) 0.2

C) 0.5

D) 20

E) 400

10. The best description of an aqueous solution of a strong acid is:

- A) 5% ionization, $\text{pH} > 7$
- B) 5% ionization, $\text{pH} < 7$
- C) 100% ionization, $\text{pH} > 7$
- D) 100% ionization, $\text{pH} < 7$

11. The pH of $3.6 \times 10^{-5} \text{ M HNO}_3$ is

- A) 5.2
- B) 4.4
- C) 4.7

12. Which solution is the most basic?

- A) $\text{pOH} = 5.2$
- B) $[\text{OH}^-] = 2.5 \times 10^{-6} \text{ M}$
- C) $\text{pH} = 8.6$

13. A 0.10 M solution of an acid HA has $[\text{H}_3\text{O}^+] = 10^{-5}$. What is K_a for the acid?

- A) 10^{-10}
- B) 10^{-5}
- C) 10^{-9}

14. Which statement is FALSE?

- A) a Lewis base donates electrons
- B) HOClO_3 is a stronger oxyacid than HOClO_2
- C) OH^- is the conjugate base of H_3O^+

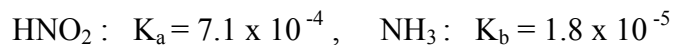
15. If methyl amine CH_3NH_2 has $K_b = 4.4 \times 10^{-4}$ then K_a for CH_3NH_3^+ is:

- A) 2.3×10^{-11}
- B) 3.8×10^{-9}
- C) 4.4×10^{-10}

16. Which statement is FALSE?

- A) $0.5 \text{ M H}_2\text{SO}_3$ ($K_{a1} = 10^{-2}$; $K_{a2} = 10^{-7}$) has $[\text{H}_2\text{SO}_3] > [\text{HSO}_3^-] > [\text{SO}_3^{2-}]$
- B) Ag^+ in the reaction $\text{Ag}^+ + 2 \text{NH}_3 \rightarrow \text{Ag}(\text{NH}_3)_2^+$ is a Bronsted-Lowry acid
- C) pure water at 25°C has $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-7} \text{ M}$

Ionization constants for Questions 17-20



17. The pH of 0.440 M HNO_2 is

- A) 3.51
- B) 1.75
- C) 4.38
- D) 2.49

18. The degree of ionization in 0.010 M NH_3 is

- A) 1.8%
- B) 0.9%
- C) 3.7%
- D) 4.2%

19. The pH of 0.25 M NaNO_2 is

- A) 8.1
- B) 8.2
- C) 8.3
- D) 8.4

20. Calculate the pH of a 0.05 M solution of the diprotic acid, H_2A , which has

$$K_{a1} = 7.9 \times 10^{-5} \text{ and } K_{a2} = 1.6 \times 10^{-12}.$$

- A) 1.3
- B) 2.7
- C) 3.1
- D) 5.4
- E) 6.5