

CHE 107 FINAL EXAM - PART A July 31, 2013

University of Kentucky

Department of Chemistry

READ THESE DIRECTIONS CAREFULLY BEFORE STARTING THE EXAMINATION!

It is *extremely* important that you fill in the answer sheet EXACTLY as indicated, otherwise your answer sheet may not be processed; ALL entries are to be made on SIDE 1 of the answer sheet. Use a #2 pencil (or softer); fill in the circles completely and firmly. Erasures must be complete. Use only the following categories:

NAME:	Print your name starting at the first space, LAST NAME first, then a space, followed by your FIRST NAME, then another space, followed by your MIDDLE INITIAL. Fill in the <u>correct</u> circles below your printed name corresponding to the letters of your name; for the spaces, fill in the top blank circle.
STUDENT NUMBER:	This is VERY IMPORTANT! Under IDENTIFICATION NUMBER, put in your 8 DIGIT STUDENT ID NUMBER (do not use the 9 at the beginning of your number) beginning in column A and continuing through column H, column I will be blank, (do NOT use column J at this time); be sure to fill in the correct circles (a common error to be avoided is mistaking "0" for "1").
TEST FORM:	Fill in the "4" blank in the J column under IDENTIFICATION NUMBER (to indicate Examination IV).
SPECIAL CODES:	Use for course and section number; in positions K-P write in the following: Dr.Blue 107-020
SIGNATURE:	You MUST sign the examination answer sheet (bubble sheet) on the line directly above your printed name. Use your legal signature.

Answering Questions:

Starting with answer "1" on SIDE 1, fill in the circle indicating the one best answer for each of the **25 questions** in this examination. Your score is the sum of the appropriate credit for each response. On the day following the examination, an examination key will be posted on Blackboard.

Grading and Reporting:

The examination scores will be posted in Blackboard as soon as possible after the examination. If an error has occurred in scoring your answers, inform your instructor within 48 hours of the posting of your score.

BE SURE THAT YOUR TEST HAS 25 QUESTIONS, A PERIODIC TABLE, AND ONE SHEET OF SCRATCH PAPER. You may NOT use your own scratch paper during this examination. Cell phones, computers, and pagers are to be turned off and out of sight during the exam.

Questions 1 – 13 cover material from Exam 1

1. Which intermolecular forces are present in $\text{NCl}_3(l)$?
- A. ion-dipole only
 - B. dispersion, dipole-dipole, and hydrogen bonding
 - C. dispersion and dipole-dipole
 - D. dispersion only
-
2. Which one of the following has the species with the **lower** boiling point listed **first**?
- A. I_2 , Cl_2
 - B. CH_4 , CHCl_3
 - C. $\text{CH}_3\text{CH}_2\text{OH}$, CH_3OCH_3
 - D. HF , HCl
-
3. Antimony has a normal boiling point of 1860 K and $\Delta H_{\text{vap}} = 77.14$ kJ/mol. What is the vapor pressure of antimony when the temperature is increased to 1920 K?
- A. 560 torr
 - B. 1100 torr
 - C. 725 torr
 - D. 888 torr
-
4. How much heat is needed to sublime 360.4 g of $\text{H}_2\text{O}(s)$ at 0°C ? The molar mass of H_2O is 18.02 g/mol and ΔH_{sub} for ice at 0°C is 54.15 kJ/mol.
- A. 535.6 k
 - B. 1083 kJ
 - C. 2005 kJ
 - D. 800.4 kJ
-
5. A hypothetical crystalline unit cell contains halide atoms, X, located on all 12 edges, and one metal atom, M, in the center of the unit cell. What is the correct formula for the metal halide?
- A. MX_3
 - B. MX_4
 - C. MX_6
 - D. MX_{12}
-

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6. Which of the following statements regarding crystalline solids is **false**?
- A. Xe(s) is a non-bonding atomic solid held together by dispersion forces.
 - B. NaCl(s) is a molecular solid with a relatively low melting point.
 - C. Diamond is a network covalent solid made up of carbon atoms that are each covalently bound to four other carbons.
 - D. Fe(s) is a metallic atomic solid held together by metallic bonds that allow the solid to conduct electricity.

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7. Which one of the following is **most** soluble in H₂O?

- A. CH₃OH
- B. CCl₄
- C. C₆H₁₄
- D. CS₂

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8. Ammonium chloride has a solubility of 28.3 g NH₄Cl per 100 g of water at 25°C. If exactly 50.0 g NH₄Cl is dissolved in 200 g of water, what type of a solution will result?

- A. A saturated solution.
- B. A supersaturated solution.
- C. An unsaturated solution.
- D. A hyposaturated solution.

-
9. Oxygen is **most** soluble in water at

- A. high temperature and low partial pressure of oxygen.
 - B. high temperature and high partial pressure of oxygen.
 - C. low temperature and high partial pressure of oxygen.
 - D. low temperature and low partial pressure of oxygen.
-

10. An aqueous 1.25 *m* K₂SO₄ solution contains

- A. 1.25 g of K₂SO₄ in 1.00 L of water.
- B. 1.25 g of K₂SO₄ in 100 g of solution.
- C. 1.25 mol of K₂SO₄ in 1.00 kg of solution.
- D. 1.25 mol of K₂SO₄ in 1.00 kg of water.

11. What is the molality of a 0.875 *M* C₆H₈O₆ solution? The density of the solution is 1.22 g/mL and the molar mass of C₆H₈O₆ is 176 g/mol.

- A. 0.802 *m*
- B. 0.821 *m*
- C. 0.904 *m*
- D. 0.953 *m*

12. What is the freezing point of an aqueous 2.23 *m* ethylene glycol solution? The freezing point constant, *K_f*, of water is 1.86°C/*m*.

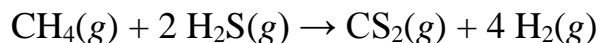
- A. 5.48 °C
- B. 1.14 °C
- C. -2.00 °C
- D. -4.15 °C

13. Which of the following 0.100 *m* solutions will have the **highest** osmotic pressure?

- A. (NH₄)₃PO₄
- B. CaCl₂
- C. NaNO₃
- D. C₆H₁₂O₆

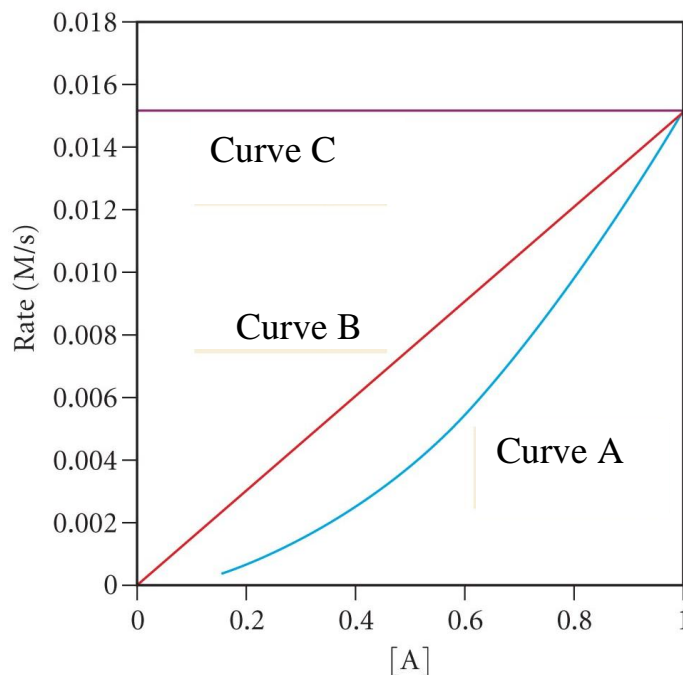
Questions 14 – 26 cover material from Exam 2

14. If H₂(*g*) appears at a rate of 0.900 *M/s* at a particular moment in the reaction below, what is the rate of H₂S(*g*) consumption at the same instant?



- A. 3.85 *M/s*
 - B. 2.05 *M/s*
 - C. 0.450 *M/s*
 - D. 0.140 *M/s*
-

15. The initial rate of the reaction, $A \rightarrow \text{products}$, was found to be proportional to the square of the concentration of A. Which curve below best represents the plot of rate vs. $[A]$ for this reaction?



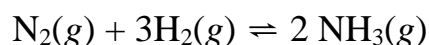
- A. No curves shown represent the plot of rate vs. $[A]$ for the reaction described.
- B. Curve A
- C. Curve B
- D. Curve C
-
16. The reaction, $A + B \rightarrow \text{products}$, was found to be second order in A and first order in B. What is the effect on the rate of the reaction when the concentration of A is tripled and the concentration of B is doubled?
- A. The rate increases by a factor of 8.
- B. The rate increases by a factor of 12.
- C. The rate increases by a factor of 18.
- D. The rate increases by a factor of 24.

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21. Given the balanced chemical equation and K_c , what can be said about the equilibrium concentrations of reactants and products?



- A. The equilibrium lies far to the left and the concentration of HCl will be significantly higher than the concentration of the products.
- B. The equilibrium lies far to the left and the concentration of the products will be significantly higher than the concentration of HCl.
- C. The equilibrium lies far to the right and the concentration of the products will be significantly higher than the concentration of HCl.
- D. The equilibrium lies far to the right and the concentration of HCl will be significantly higher than the concentration of the products.
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22. At some temperature, $K_p = 25.0$ for

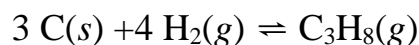


Find K_p at the same temperature for



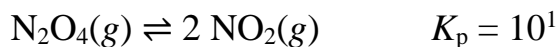
- A. 0.0400 C. 0.00160
- B. 675 D. 0.600
-

23. Which of the following is the correct equilibrium constant expression, K_c , for the reaction below?



- A. $K_c = \frac{[\text{C}_3\text{H}_8]}{[\text{H}_2]^4}$ C. $K_c = \frac{[\text{C}_3\text{H}_8]}{[\text{C}]^3[\text{H}_2]^4}$
- B. $K_c = \frac{[\text{C}_3\text{H}_8]}{[\text{C}][\text{H}_2]}$ D. $K_c = \frac{[\text{C}_3\text{H}_8]}{3[\text{C}] + 4[\text{H}_2]}$
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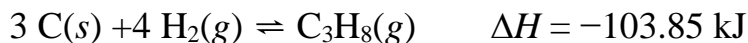
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24. Which way will the reaction proceed given the initial pressures of $P(\text{N}_2\text{O}_4) = 55.0 \text{ atm}$ and $P(\text{NO}_2) = 15.0 \text{ atm}$?



- A. To the right because $Q > K$ C. To the left because $Q < K$
B. To the right because $Q < K$ D. To the left because $Q > K$
-
25. What is the equilibrium concentration of Cl_2 given an initial concentration of 0.500 M NOCl ?



- A. $4.52 \times 10^{-3} \text{ M}$ C. $2.25 \times 10^{-2} \text{ M}$
B. $5.15 \times 10^{-4} \text{ M}$ D. $1.19 \times 10^{-3} \text{ M}$
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26. Given the following reaction



which one of the following will result in the **largest** increase the amount of $\text{C}_3\text{H}_8(g)$?

- A. Add heat and decrease the pressure.
B. Add $\text{C}(s)$ and add heat.
C. Remove $\text{H}_2(g)$ and increase the volume.
D. Add $\text{H}_2(g)$ and remove heat.
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Answer Key:

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