

Name \_\_\_\_\_  
CHM 116 AM

I. D. # \_\_\_\_\_  
February 8, 2006

### Test I-B

Place your name on this test booklet and ParSCORE Test Form. Fill in the rectangles of your I.D. number on the ParSCORE Test Form. Also fill in **Form B on the Test Form**.

Place your I. D. number on this test booklet. Memorize the I.D. number. It will be your number on all future tests. This exam consists of 7 pages and 1 periodic chart. Make sure you have the correct number of pages and that the pages are numbered correctly.

This exam consists of two parts. Part I consists of 16 multiple choice items which must be answered on the ParSCORE Test Form with a number 2 pencil. Make a heavy black mark filling the rectangle associated with your answer. Part I is worth 112 points. Part II consists of 3 questions which must be answered in detail in this test booklet. The points assigned for each question in Part II are indicated. Total points are 152.

$$R = 0.0821 \frac{L \text{ atm}}{\text{mol K}} = 62.4 \frac{L \text{ mmHg}}{\text{mol K}}$$

For water  $K_f = 1.86^\circ\text{C/m}$      $K_b = 0.512^\circ\text{C/m}$

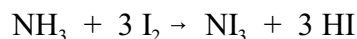
$$\pi = MRT$$

1. For the reaction



the rate of disappearance of  $\text{I}^-$  at a particular time and concentration is  $2.5 \times 10^{-3}$  M/s. what is the rate of appearance of  $\text{I}_2$ .

- A)  $1.0 \times 10^{-3}$  M/s  
 B)  $3.0 \times 10^{-3}$  M/s  
 C)  $1.5 \times 10^{-3}$  M/s  
 D)  $2.0 \times 10^{-3}$  M/s  
 E)  $6.0 \times 10^{-3}$  M/s
2. What is the rate equation or rate expression for the following reaction?



- A) rate =  $k[\text{NH}_3][\text{I}_2]$   
 B) rate =  $k[\text{NH}_3][\text{I}_2]^3$   
 C) rate =  $k[\text{NH}_3]^3[\text{I}_2]$   
 D) rate =  $k[\text{NI}_3][\text{HI}]$   
 E) impossible to determine without additional information
3.  $2\text{NO}_{(g)} + 2\text{H}_{2(g)} \rightarrow \text{N}_{2(g)} + 2\text{H}_2\text{O}_{(g)}$

For the above reaction, the following rate data were obtained at 800 deg C.

Initial Concentrations		Initial Rate of Reaction (mol/L s)
[NO]	[H <sub>2</sub> ]	
0.0010	0.0030	$4.0 \times 10^{-7}$
0.0030	0.0030	$3.6 \times 10^{-6}$
0.0030	0.0015	$1.8 \times 10^{-6}$

The rate expression is:

- A) rate =  $k[\text{NO}][\text{H}_2]$       D) rate =  $k[\text{NO}]^2[\text{H}_2]$   
 B) rate =  $k[\text{NO}][\text{H}_2]^2$       E) rate =  $k[\text{NO}]^3[\text{H}_2]$   
 C) rate =  $k[\text{NO}]^2[\text{H}_2]^2$
4. Which of the following rate laws represents a second-order reaction?

- A) rate =  $k[\text{A}]$       C) rate =  $k[\text{A}]^2$   
 B) rate =  $k[\text{A}]^{1/2}$       D) rate =  $k[\text{A}][\text{C}]^2$

5 Which of the following solutions can be prepared by only using a balance to make mass measurements?

- (1) a 1.0 molal solution of KCl
- (2) a 1.0 molar solution of KCl
- (3) a 10.0% by mass solution of KCl

- A) 1 only      B) 2 only      C) 3 only      D) 1 and 2 only  
E) 1 and 3 only

6-7. For questions 6 and 7 consider the following Key List of water solutions:

**Key List**

- A) pure water
- B) 0.001 m  $C_{12}H_{22}O_{11}$
- C) 0.001 m NaCl
- D) 0.002 m KCl
- E) 0.001 m  $CaCl_2$

6. Which of the solutions in the **Key List** will have the highest freezing point (assume ideal behavior)?

7. Which solution will have the same freezing point of 0.004 m  $C_6H_{12}O_6$ ?

8. What is the freezing point of a solution of 6.20 g of a nonelectrolyte ( $m = 180$ ) dissolved in 200 g of acetic acid ( $K_f = 3.9$ )? The freezing point of pure acetic acid is  $16.6^\circ C$ .

- A)  $15.9^\circ C$       B)  $16.6^\circ C$       C)  $16.5^\circ$       D)  $16.7^\circ C$   
E)  $17.3^\circ C$

9. What is the osmotic pressure of a solution that contains 1.22 g of sucrose ( $m = 342$ ) dissolved to make 100.0 mL water solution at  $25^\circ C$ ?

- A) 6.32 mm      B) 108 mm      C) 249 mm      D) 497 mm  
E) 663 mm

10. The mole fraction of alcohol in a certain solution of ethyl alcohol in water is 0.20. This means that for each mole of alcohol there are how many moles of water?

- A) 8.0      B) 2.0      C) 5.0      D) 4.0      E) 1.0

11. Consider the following pairs of liquids. Which lettered response contains all the pairs that are miscible and none that are immiscible?
- (1) benzene,  $C_6H_6$  and hexane,  $C_6H_{14}$
  - (2) water,  $H_2O$ , and methanol,  $CH_3OH$
  - (3) water,  $H_2O$ , and hexanol,  $C_6H_{13}OH$
- A) 1 only      B) 1 and 2 only      C) 1, 2 and 3  
D) 2 and 3 only      E) 2 only
12. A solution of sodium thiosulfate,  $Na_2S_2O_3$ , in water is available. If a small crystal of  $Na_2S_2O_3$  is added to the solution, within seconds, crystal growth spreads throughout the solution. The original solution was
- A) saturated      C) supersaturated  
B) unsaturated      D) dilute
13. A solution for intravenous feeding contains 4.80 g of glucose (mm = 180.2 g/mol),  $C_6H_{12}O_6$ , in 90.0 g of water. What is the molality of glucose?
- A) 53.3 m      B) 0.0533 m      C) 2.96 m      D) 0.296 m  
E) 2.00 m
14. When a nonvolatile solute is added to a volatile solvent, the solution vapor pressure \_\_\_\_\_, the boiling point \_\_\_\_\_, and the freezing point \_\_\_\_\_.
- A) decreases, increases, decreases  
B) increases, increases, decreases  
C) increases, decreases, increases  
D) decreases, decreases, increases
15. The vapor pressure of a solution containing a nonvolatile solute is directly proportional to the
- A) mole fraction of the solute  
B) mole fraction of the solvent  
C) molarity of the solvent  
D) molality of the solvent



