

Chemistry 121  
Spring 2005  
Test 4, FORM A

Name: \_\_\_\_\_

Instructions: You have 75 minutes to complete this 100-point exam. You may use a simple scientific calculator. No programmable calculators allowed.

**I. Multiple Choice** (15 pts, 3 points each) Carefully and clearly circle the best answer. If you circle two answers, *one of which is correct*, you will receive 1 point.

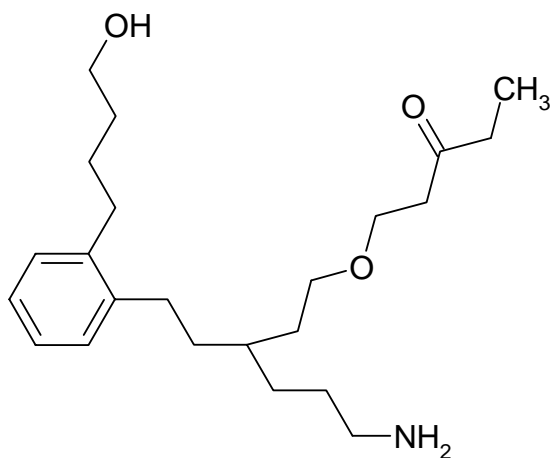
1. The standard reference conditions for studies of the gaseous state of matter has the values:
  - a. temperature: 0.00 K; pressure: 1.000 standard atmosphere
  - b. temperature: 0.00 °C; pressure: 1.000 standard millimeters of mercury
  - c. temperature: 273 K; pressure: 1.000 standard atmosphere
  - d. temperature: 298 K; pressure: 1.000 standard atmosphere
  - e. none of the above
  
2. According to the kinetic theory of gases, the average kinetic energy of the gas particles in a gas sample is directly proportional to the: (remember  $\bar{E}_{kinetic} = \frac{3RT}{2N_A}$ )
  - a. Pressure
  - b. Volume
  - c. Temperature
  - d. Molar mass
  - e. None of the above.
  
3. What is the complimentary base pairing for the following molecule? AGCCGU
  - a. UGCCAG
  - b. UGCCGA
  - c. TCGGCA
  - d. UCGGCA
  - a. UCGGCT
  
4. Which one of the following covalent compounds will exhibit hydrogen bonding in the liquid state?
  - a. H<sub>2</sub> – C – F<sub>2</sub>
  - b. Cl<sub>2</sub> – N – H
  - c. H<sub>2</sub> – P – Cl
  - d. H – Br
  - e. NCl<sub>3</sub>
  
5. Which one of the following is not a component of DNA?
  - a. Phosphate
  - b. Sugar
  - c. Ribose
  - d. Thymine
  - e. Hydrogen bonding

**II. Short Answer and Calculations** (85 pts): Clearly indicate your answer in the space provided. Partial credit will be given for correct work. If I cannot read the work, it will not be graded.

1. (10 pts) Arrange the following molecules in order of increasing intermolecular attractive forces:  $\text{GeCl}_4$ ,  $\text{CCl}_4$ ,  $\text{SiCl}_4$  and  $\text{SnCl}_4$ .

2. (10 pts) Rank the following solutions in order of increasing boiling point: 0.100 *m*  $\text{MgBr}_2$ , 0.100 *m*  $\text{MgSO}_4$ , pure water, 0.100 *m*  $(\text{NH}_4)_3\text{PO}_4$  and 0.100 *m* sucrose ( $\text{C}_{11}\text{H}_{22}\text{O}_{11}$ )

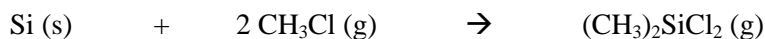
3. (10 pts) Circle and identify the functional groups in the following molecule.



4. (10 pts) Fill-in the blank
- A single cell with 0.015M  $\text{K}^+$  inside and 0.0015M  $\text{K}^+$  outside is termed \_\_\_\_\_.
  - Network solids are held together by \_\_\_\_\_.
  - A(n) \_\_\_\_\_ does not have any interactions between the molecules and does not have any molecular volume.
  - The movement of gases through a tiny opening in a vacuum is termed \_\_\_\_\_.
  - \_\_\_\_\_ is resistance to flow.

5. (10 pts) A cylinder fitted with a movable piston and filled with a gas has a volume of 16.44 L at 22°C when the applied pressure is 772.2 mmHg. The temperature of the oil bath surrounding it was increased to 184°C, and the load on the piston was changed. Careful measurement now gave a value of 16.60 L for the volume. What is the final pressure in the system?

6. (15 pts) Silicones are polymeric substances that are used as lubricants, as anti-static agents and in waterproof caulk. The starting place in making them is the reaction below. What mass (in grams) of  $(\text{CH}_3)_2\text{SiCl}_2$  is produced if 525. g Si is allowed to react with  $\text{CH}_3\text{Cl}$  gas at a pressure of 1.075 atm, a volume of 250. L and a temperature of 23°C? (MM of Si = 28.09 g/mol, MM of  $(\text{CH}_3)_2\text{SiCl}_2$  = 129.06 g/mol)



7. (10 pts) A flask contains a mixture of hydrogen and neon at a pressure of 739.2 mmHg. What are the partial pressures of hydrogen and neon if the mixture contains 0.992 mol of hydrogen and 0.397 mol of neon? Report the pressures in **atmospheres (atm)**.

8. (10 pts) Pick **ONE** of the following essay questions to answer in 5 - 6 grammatically correct sentences.
- Describe the two structures of carbon that we discussed and indicate the types of forces that hold each structure together.
  - Describe the three main components of RNA, the principal job of RNA, its structure and what holds the structure together.