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Printed **First** Name: | | | | | | | | | | | | | | | |

Social Security # | | | | | | | | | | | |

School: | | | Barnard | | | College | | | Engineering | | | General Studies | | | Other

Chemistry 1404y Section 1

Exam 2

April 26, 2000

1. Please make sure you have your CUID to present to the TAs.
2. Please fill in your name and CUID number as indicated above.
3. Read and acknowledge your understanding of the statement in the box below:

**ACADEMIC PRINCIPLES: GUIDELINES FOR STUDENTS**

It is our obligation to warn you that any instance of academic dishonesty, attempted or actual, that comes to our attention will be handled with failure or expulsion from the course. Academic dishonesty includes but is not limited to:

1. Plagiarism: Failure to acknowledge ideas or phrases used in any paper, exercise, or project submitted in a course but gained from another person.
2. Self-plagiarism: The submission of one piece of work in more than one course without the explicit permission of the instructors involved.
3. The submission of work as one's own which has been prepared by or purchased from another.
4. **Cheating on examinations or tests:** To give or receive assistance from written material, another person, his or her paper, or any other source during an examination or test.
5. Falsification or misrepresentation of data in any course work.
6. Violating the limits of acceptable collaboration in course work set forth by a faculty member or department.
7. Removing, hiding, or altering library materials so as to hinder the research of others.
8. Facilitating academic dishonesty by enabling another to engage in such behavior.

Ignorance of College policy shall not be a defense in any disciplinary proceedings. The University holds each member of the community responsible for understanding these principles and for abiding by them. By signing my name below, I affirm that I have read and understood this document.

\_\_\_\_\_  
Name (Signature)

April 26, 2000  
Date

5. Please turn to page 2 and read the instructions carefully, but do not turn to page 3 until you are instructed to do so.
6. As on all exams, do look through for easy problems before struggling with difficult ones!

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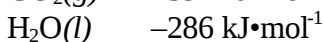
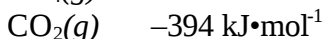
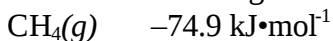
- On Side 2 of the Bubble Sheet print your first and last name in the box provided.
- Please fill in the IDENTIFICATION NO. in the space provided and as indicated.  
0 (note: Your Identification No. is your SOCIAL SECURITY NUMBER)
- Blacken the one response that best answers the question or completes the statement. There is only one correct answer to each question. Any question with more than one answer will not be counted. Your score will be the total number of correct answers; therefore, it is to your advantage to answer every question.
- PLEASE DO NOT make any other marks... anywhere on the bubble sheet... can count against your grade...



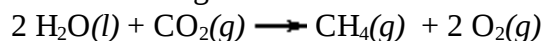
5. An ideal gas expands against a constant external pressure of 1.00 atmosphere from a volume of 10.0 liters to a volume of 20.0 liters. During this expansion the gas absorbs 505 J of heat. What is  $\Delta E$  for this process?

- (1)  $-1520 \text{ J}$
- (2)  $-508 \text{ J}$
- (3)  $0.0 \text{ J}$
- (4)  $508 \text{ J}$
- (5)  $1015 \text{ J}$

6. Consult the following standard heats of formation:



What is the heat of reaction for the following?



- (1)  $-755 \text{ kJ}$
- (2)  $-605 \text{ kJ}$
- (3)  $605 \text{ kJ}$
- (4)  $891 \text{ kJ}$
- (5)  $1040 \text{ kJ}$

7. One kg of liquid water at an initial temperature of 323 K is brought into contact with one kg of iron causing the temperature of the water to fall by 10.0 K and that of the iron to rise by 93.3 K. The heat capacity of liquid water is  $75.4 \text{ kJ} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$ . What is the heat capacity of iron?

- (1)  $8.11 \text{ kJ}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$
- (2)  $17.2 \text{ kJ}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$
- (3)  $25.1 \text{ kJ}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$
- (4)  $37.7 \text{ kJ}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$
- (5)  $93.3 \text{ kJ}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$

8. For the following reaction, it is known that  $\Delta H = -1110 \text{ kJ}\cdot\text{mol}^{-1}$  at 1000 K. What is  $\Delta E$  for this reaction?

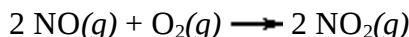


- (1)  $-1150 \text{ kJ}$
- (2)  $-1120 \text{ kJ}$
- (3)  $-1110 \text{ kJ}$
- (4)  $-1102 \text{ kJ}$
- (5)  $+1100 \text{ kJ}$

9. A measurement shows that 61.6 kJ of heat are released when 2 moles of benzene condense from the vapor at the normal boiling point, 353 K. What is the entropy change associated with this condensation?

- (1)  $41.3 \text{ J}\cdot\text{K}^{-1}$
- (2)  $61.6 \text{ J}\cdot\text{K}^{-1}$
- (3)  $82.6 \text{ J}\cdot\text{K}^{-1}$
- (4)  $87.3 \text{ J}\cdot\text{K}^{-1}$
- (5)  $174 \text{ J}\cdot\text{K}^{-1}$

10. Using the following data, calculate the standard free energy change for the following reaction at 298 K:



$$\Delta H_f^\circ(\text{NO}) = +90.4 \text{ kJ}\cdot\text{mol}^{-1}$$

$$\Delta H_f^\circ(\text{NO}_2) = +33.9 \text{ kJ}\cdot\text{mol}^{-1}$$

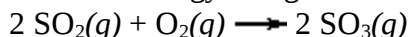
$$S_{298}(\text{NO}) = 210 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$$

$$S_{298}(\text{NO}_2) = 240 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$$

$$S_{298}(\text{O}_2) = 205 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$$

- (1)  $-145 \text{ kJ}$
- (2)  $-113 \text{ kJ}$
- (3)  $-69.8 \text{ kJ}$
- (4)  $-34.9 \text{ kJ}$
- (5)  $+113 \text{ kJ}$

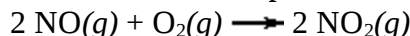
11. For the following reaction, the standard free energy change is  $-140.0$  kJ at  $298$  K.



What is the equilibrium constant for this reaction at 298 K?

- (1)  $6.09 \times 10^{-26}$
- (2)  $2.89 \times 10^{-25}$
- (3)  $4.79 \times 10^6$
- (4)  $3.47 \times 10^{24}$
- (5)  $3.16 \times 10^{56}$

12. Using the data given in problem 10, calculate the temperature at which  $\Delta G = 0$  for the reaction



- (1) 232 K
- (2) 298 K
- (3) 400 K
- (4) 522 K

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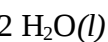
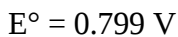
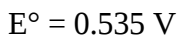
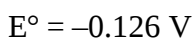
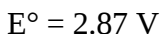
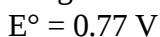
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(5) 779 K

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