Exam Six **CHM 203 (Dr. Mattson)** **2 December 2005**	***Academic Integrity Pledge:*** *In keeping with Creighton University's ideals and with the Academic Integrity Code adopted by the College of Arts and Sciences, I pledge that this work is my own and that I have neither given nor received inappropriate assistance in preparing it.* *Signature:*

Instructions: Show all work whenever a calculation is required! You will receive credit for ***how*** you worked each problem as well as for the correct answer. This exam is worth 50 points. BOX YOUR ANSWERS! Questions worth ONE point, unless noted.

1. (2 pts) Write the chemical reaction that corresponds to the heat of formation reaction for ammonium phosphate.

2. (3 pts) Given the following equations:

$$4\ NH_3(g) + 7\ O_2 \longrightarrow 4\ NO_2(g) + 6\ H_2O(g) \quad \Delta H = -1133\ kJ$$

$$2\ NO(g) + O_2 \longrightarrow 2\ NO_2(g) \qquad \Delta H = -112\ kJ$$

Showing all work, estimate ΔH_{rxn} for:

$$4\ NH_3(g) + 5\ O_2(g) \longrightarrow 4\ NO(g) + 6\ H_2O(g)$$

3. (4 pts) Suppose we performed the following in a bomb calorimeter:

$$2\ NO(g) + O_2 \longrightarrow 2\ NO_2(g) \quad \Delta H = -112\ kJ$$

In our experiment, we charged the bomb with 1.5 g NO(g) and excess oxygen. The calorimeter had a calorimeter constant (including the water) of 4.922 kJ/deg and the initial temperature of the water was 19.2 ^{o}C. Determine the final temperature of the bomb calorimeter.

4. (3 pts) Which of the following processes is/are exothermic?

Boiling water on the stove

Snow melting on a warm day

Wood burning

5. (3 pts) Which is the largest pressure:

800 mmHg, 1.6 atm or 122 kPa?

Show work for credit.

6. (3 pts) An open-ended manometer contains a reservoir of mercury in its trap and a sample of xenon in its globe. The external pressure is 745 mmHg and the level of mercury is 2.4 cm higher in the arm of the trap closest to the xenon sample than in the arm of the trap open to the air. Sketch the manometer and determine the pressure of the xenon.

7. (3 pts) At what temperature will 45 g hydrogen gas occupy a volume of 31.4 L at a pressure of 1100 mmHg?

8. (3 points) A bicycle tire is inflated to a pressure of 70 psi at 25 ^{o}C. What is its pressure at 35 ^{o}C?

9. (4 pts) An unknown gas has a density of 1.78 g/L at 95 ^{o}C at 730 mmHg. What is its MM?

10. (4 pts) What is the density of krypton at STP?

11. (4 pts) The density of a gas in a compressed gas cylinder is 15.3 g/L at 100 atm and 25 ^{o}C. What would its density be at 1 atm and 40 ^{o}C?

12. (3 pts) Suppose 17.0 mol helium and 5.0 mol methane were mixed. What is the mole fraction of each?

13. (3 pts) Refer again to the helium-methane mixture described in the previous problem. If the total pressure of the mixture is 1.4 atm, what is the partial pressure of each gas?

14. (5 points) T/F

T F At O K molecules have KE = infinity

T F The average KE and speed increases as the temperature decreases

T F All gases have the same KE at a given temperature.

T F All gases have the same average KE at a given temperature.

T F The average speed of He is greater than the average speed of Xe at constant T and P

15. (3 pts) What volume of NO(g) is expected from the reaction of 72 L O_2(g) and excess NH_3(g)?

$$4\ NH_3(g) + 5\ O_2(g) \longrightarrow 4\ NO(g) + 6\ H_2O(l)$$

16. (BONUS 2 point) Sign your name on the signature line on the front and print your name here:

Your exam score (50 possible): _____

PrenHall work (0 — 5 max.): _____

Adjusted exam score (50 max.): _____

Determine your grade:

A ≥ 46.5; B+ ≥ 43.5; B ≥ 41.0;C+ ≥ 37.5; C ≥ 34.00; D ≥ 30.00

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Answers

1. 3/2 $N_2(g)$ + 6 $H_2(g)$ + 2 $O_2(g)$ + 1/4 $P_4(s)$ $\longrightarrow$ 1 $(NH_4)_3PO_4$
2. ΔH = -909 kJ
3. 19.77 ^oC.
4. Wood burning
5. 1.6 atm
6. 721 mmHg
7. 24.6 K
8. 72.3 psi
9. 56 g/mol
10. 3.79 g/L
11. 0.15 g/L
12. X_{He} = 0.773 and X_{CH4} = 0.227
13. 1.1 atm He and 0.3 atm CH_4.
14. F F F T T
15. 57.6 L NO