CHE 226 **ANALYTICAL CHEMISTRY** **Spring 2005**

FINAL EXAM – May 5, 2005

Name _____

WRITE YOUR NAME ON EACH EXAM PAGE NOW. THERE ARE 10 QUESTIONS WORTH 155 POINTS TOTAL ON THIS EXAM.

Show clearly all work on these pages. ***Use the proper number of significant figures and the correct units in all final answers***. You must show your calculations and/or reasoning, ***including equations***, on a question to obtain any credit; no credit for answers appearing out of the blue. ***Your work must be understandable at the time it is being graded to obtain any partial credit.***

Very little will be subtracted for routine *arithmetic* errors, but all numerical answers must be shown to the proper number of significant figures. Programmable calculators as well as a single 8.5 by 11 "cheat sheet" are allowed, but may not be shared with anyone else. Tables of data and other information that may be useful are appended to the back of the exam. Use the backs of the pages as scrap paper. Anything written on the *backs* of pages is totally irrelevant to the grading process.

Unless otherwise stated, assume all solutions are aqueous, density = 1.0000 g/mL; activity coefficients are unity (*i.e.*, activity = concentration); temperature, $T = 298$ K; $K_w = 1.008 \times 10^{-14}$.

QUESTION 1	_____ /10	QUESTION 7	_____ /32
QUESTION 2	_____ /10	QUESTION 8	_____ /20
QUESTION 3	_____ /28	QUESTION 9	_____ / 8
QUESTION 4	_____ /10	QUESTION 10	_____ /11
QUESTION 5	_____ /12		
QUESTION 6	_____ /14	**TOTAL**	_____ /155

Name _____

1. (10 points) Cyanate ion in waste solutions from gold mining operations can be destroyed by treatment with hypochlorite ion in basic solution. Write a balanced oxidation-reduction equation for this reaction:

$$OCN^{-1}_{(aq)} + OCl^{-1}_{(aq)} \rightarrow CO_3^{-2}_{(aq)} + N_{2(g)} + Cl^{-1}_{(aq)}$$

2. (10 points) For the following electrochemical reaction:

$$2\ IO_3^-{}_{(aq)} + 5\ SO_{2(g)} + 4\ H_2O_{(l)} \rightarrow 8\ H^+_{(aq)} + 5\ SO_4^{-2}{}_{(aq)} + 1\ I_{2(s)}$$

a) (5 points) Calculate E°_{cell}. Is this reaction spontaneous?

b) (3 points) Calculate ΔG°.

c) (2 points) What type of electrochemical cell is this?

Name _____

3. (28 points) A house is tested for radon once in the summer and again in the winter. The results, reported as parts per million of radon, are tabulated below.

Sample #	Summer (ppm)	Winter (ppm)
1	0.26	0.37
2	0.27	0.48
3	0.17	0.33
4	0.30	0.50
5	0.28	0.42
Sum	1.28	2.10
Mean	0.26	0.42

a) (2 points) What is the median winter measurement?

b) (5 points) Calculate the standard deviation for the winter measurements.

c) (3 points) Calculate the standard error of the mean for the winter measurements.

d) (8 points) If it is assumed that radon is typically stays fairly evenly distributed throughout a house, can any of the summer measurements be rejected as an outlier at the 90% confidence level? At the 95% confidence level?