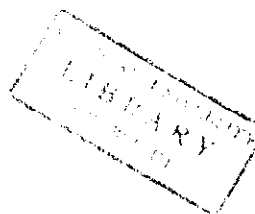


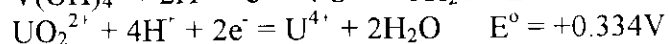
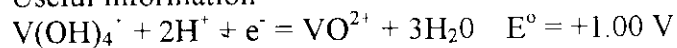
CHEM 215
Final
Feb 1999



Name.....

20 pts each

Useful information

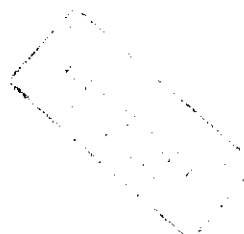


[1] Balance, then generate equilibrium constant expressions for the following reaction:



Calculate K_{eq} .

Use the shorthand notation (line diagram) to describe this cell.



[2] What is the source of

- (a) the asymmetry potential in a membrane electrode?
- (b) The boundary potential in a membrane electrode?
- (c) A junction potential in a glass/calomel electrode?
- (d) The potential of a crystalline membrane electrode used to determine the concentration of F⁻?

[3] Describe each of the sources of potential loss when a current is passed through an electrochemical cell. Which can be minimized and how?

[4] Sketch the following:

Linear scan voltammogram with no solution stirring.

Linear scan voltammogram at a rotating disk.

Polarogram using the dropping mercury electrode.

Explain the appearance of the polarogram.

Label all axes.

[5] Write energy level diagrams (excitation, relaxation) that describe the process of absorption, fluorescence and phosphorescence. Why does phosphorescence have a longer lifetime than fluorescence?

[6] Sketch labeled diagrams of a phototube and a photomultiplier tube (PMT). Describe how the PMT works and why it is more sensitive than the phototube.

[7] Why are atomic absorption lines narrower than molecular absorption lines?
Sketch the line source used for atomic absorption spectroscopy and explain how it works.

[8] The chromatogram below was obtained using gas chromatography at 100 °C of components A,B,C,D. A was not retained at all on the column. Using a ruler, estimate the following:

- retention times for all components
- capacity factors for all components
- number of theoretical plates for component C
- resolution between peak B and C
- selectivity factor between C and D

Present your results in tabulated form and show calculations.

What modification could you make to your experiment so that D elutes more quickly without affecting the retention of A, B, C?

