Chem 1B, Spring 2009
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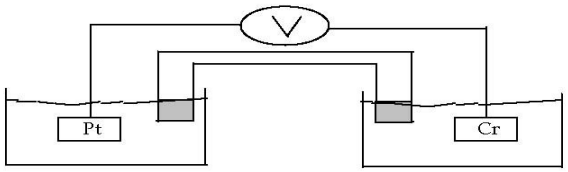
PRACTICE QUESTIONS FOR QUIZ 2

1. Consider the galvanic cell shown below (the contents of each half-cell are written beneath each compartment).



0.50 *M* Br_2
0.10 *M* Br^-

0.20 *M* Cr^{3+}

The standard reduction potentials are as follows:

$Cr^{3+} + 3e^- \rightarrow Cr(s)$ $\quad E° = -0.73$ V
$Br_2(aq) + 2e^- \rightarrow 2Br^-$ $\quad E° = +1.09$ V

What is $E°$ for this cell?

A) 1.82 V
B) 0.36 V
C) 4.75 V
D) 1.79 V
E) 4.40 V

2. Which metal, Al or Ni, could reduce Zn^{2+} to Zn(*s*) if placed in a $Zn^{2+}(aq)$ solution?

$Zn^{2+} + 2e^- \rightarrow Zn$ $\quad E° = -0.76$ V
$Al^{3+} + 3e^- \rightarrow Al$ $\quad E° = -1.66$ V
$Ni^{2+} + 2e^- \rightarrow Ni$ $\quad E° = -0.23$ V

A) Al
B) Ni
C) Both Al and Ni would work.
D) Neither Al nor Ni would work.
E) This cannot be determined.

3. If oxidation of H_2O occurs at the anode, how many moles of oxygen gas will evolve for every 1.56×10^2 g of Cr(*s*) deposited?

A) 4.50 mol
B) 3.00 mol
C) 2.00 mol
D) 4.00 mol
E) 1.50 mol

4. The following initial rate data were found for the reaction
$2MnO_4^- + 5H_2C_2O_4 + 6H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

$[MnO_4^-]_0$	$[H_2C_2O_4]_0$	$[H^+]_0$	Initial Rate (*M*/s)
1×10^{-3}	1×10^{-3}	1.0	2×10^{-4}
2×10^{-3}	1×10^{-3}	1.0	8×10^{-4}
2×10^{-3}	2×10^{-3}	1.0	1.6×10^{-3}
2×10^{-3}	2×10^{-3}	2.0	1.6×10^{-3}

i. Which of the following is the correct rate law?

A) Rate = $k[MnO_4^-]^2[H_2C_2O_4]^5[H^+]^6$
B) Rate = $k[MnO_4^-]^2[H_2C_2O_4][H^+]$
C) Rate = $k[MnO_4^-][H_2C_2O_4][H^+]$
D) Rate = $k[MnO_4^-]^2[H_2C_2O_4]$
E) Rate = $k[MnO_4^-][H_2C_2O_4]^2$

ii. What is the value of the rate constant?

A) $2 \times 10^5\ M \bullet s^{-1}$
B) $2 \times 10^5\ M^{-2} \bullet s^{-1}$
C) $200\ M^{-1} \bullet s^{-1}$
D) $200\ M^{-2} \bullet s^{-1}$
E) $2 \times 10^{-4}\ M \bullet s^{-1}$

5. The decomposition of $N_2O_5(g)$ to $NO_2(g)$ and $O_2(g)$ obeys first-order kinetics. Assume the form of the rate law is

$$\text{Rate} = -\frac{\Delta[N_2O_5]}{\Delta t} = k[N_2O_5]$$

where $k = 3.4 \times 10^{-5}\ s^{-1}$ at 25°C.

i. What is the initial rate of reaction at 25°C where $[N_2O_5]_0 = 5.0 \times 10^{-2}\ M$?

A) 3.4×10^{-5} mol/L • s
B) 1.7×10^{-6} mol/L • s
C) 6.8×10^{-4} mol/L • s
D) 5.0×10^{-2} mol/L • s
E) none of these

ii. What is the half-life for the reaction described?

A) 5.9×10^{5} s
B) 2.0×10^{4} s
C) 2.4×10^{-5} s
D) 7.4×10^{2} s
E) none of these