CHEMISTRY 16
FINAL EXAM

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(Version I)

An optical scoring machine will grade this examination. The machine is not programmed to accept the correct one of two sensed answers and will not sense answers which are lightly marked. Mark your answer sheet carefully with a No. 2 soft lead pencil and erase any undesired marks COMPLETELY. Avoid making any extraneous marks on the answer sheet other than the information requested below.

On the answer sheet:

1. Print your name in the space for NAME (last name first, circle your last name).

2. In the space marked SUBJECT print your student number.

3. In the space marked HOUR print Summer II '98.

Check to see that you have 50 examination questions, periodic table and scratch paper when the exam begins.

HAND IN ONLY THE ANSWER SHEET.

Useful Equations and Constants:

\[ 1 \text{C} \times \text{V} = 1 \text{J} \]
\[ R = 0.08206 \text{ L-atom/mol-K} = 8.314 \text{ J/mol-K} \]
\[ F = 96,500 \text{ C/mol e}^- \]
\[ K_w = 1.0 \times 10^{-14} \text{ at } 25^\circ \text{C} \]
\[ K_w(H_2O) = 1.86 \text{ kg}^-\text{C/mol} \]
\[ K_b(H_2O) = 0.52 \text{ kg}^-\text{C/mol} \]

\[ x = \frac{-b \pm (b^2 - 4ac)^{1/2}}{2a} \]
\[ \ln[A] = \ln[A]_0 + -kt \quad \text{OR} \quad \log[A] = \log[A]_0 + -kt/2.303 \]
\[ [A]/[A]_0 = \exp(-kt) \]
\[ 1/[A] = 1/[A]_0 + kt \]

\[ \Delta G = \Delta G^o + RT \ln Q \]
\[ \Delta G^o = -nF \varepsilon \]

\[ E = E^o - (RT/nF) \ln Q \]

\[ F1 \]
1. If 0.0339 mol of a nonelectrolyte is dissolved in 0.0550 kg of benzene C₆H₆, the freezing point of the resulting solution is:

\( K_f(C₆H₆) = 5.12 \text{ kg} \cdot \text{°C/mol; } T_f(C₆H₆) = +5.48\text{°C} \)

A. +8.64°C  
B. +4.66°C  
C. -1.57°C  
D. +2.32°C  
E. -3.61°C

2. C₄H₈ decomposes by first order kinetics with \( k = 9.2 \times 10^{-3} \text{ sec}^{-1} \) at 500°C. How long will it take for a 0.100 M sample of C₄H₈ to decompose to 20% of its original value at 500°C?

A. 175 sec  
B. 21 sec  
C. 110 sec  
D. 250 sec  
E. 57 sec

3. Refer to the reaction below. If the rate of disappearance of N₂O₅ is \( 6.0 \times 10^{-3} \text{ M/sec} \), then the rate of appearance of NO₂ is:

\[
4 \text{ N}_2\text{O}_5 \rightarrow 8 \text{ NO}_2 + 2 \text{ O}_2
\]

A. \( 3.0 \times 10^{-3} \text{ M/sec} \)  
B. \( 6.0 \times 10^{-3} \text{ M/sec} \)  
C. \( 1.2 \times 10^{-2} \text{ M/sec} \)  
D. \( 4.8 \times 10^{-2} \text{ M/sec} \)  
E. Not enough information is given to answer this question.

4. The pH of apples is 3.10. The concentration of hydronium ion \( \text{H}_3\text{O}^+ \) in apples is:

A. \( 7.9 \times 10^{-4} \text{ M} \)  
B. \( 6.5 \times 10^{-12} \text{ M} \)  
C. \( 1.0 \times 10^{-7} \text{ M} \)  
D. \( 3.1 \times 10^{-9} \text{ M} \)  
E. \( 1.3 \times 10^{-11} \text{ M} \)

5. The pH of 0.0025 M NaOH is:

A. 2.60  
B. 11.70  
C. 11.40  
D. 9.86  
E. 7.25
6. SnS has $K_{sp} = 3.23 \times 10^{-28}$. Addition of HCl will __________ the solubility of SnS in water, while addition of $K_2S$ will __________ the solubility.

$$\text{SnS(s)} \leftrightarrow \text{Sn}^{2+}(aq) + \text{S}^{2-}(aq) \quad K_{sp} = 3.23 \times 10^{-28}$$

A. increase; decrease
B. increase; increase
C. decrease; decrease
D. decrease; increase
E. not alter; decrease

7. A certain reaction is endothermic ($\Delta H = +$) and entropy is decreasing ($\Delta S = -$) from reactants to products. Which one of the following statements pertaining to the reaction spontaneity is TRUE?

A. The reaction is spontaneous at all temperatures.
B. The reaction is nonspontaneous at low temperatures but spontaneous at high temperatures.
C. The reaction is nonspontaneous at all temperatures.
D. The reaction is spontaneous at low temperatures but nonspontaneous at high temperatures.
E. There is no way to decide without the value for $\Delta G$.

8. Sodium reacts violently with water according to the equation:

$$2 \text{Na}(s) + 2 \text{H}_2\text{O}(l) \rightarrow 2 \text{NaOH}(aq) + \text{H}_2(g)$$

The resulting solution has a higher temperature than the water prior to the addition of sodium. The signs for $\Delta H^\circ$ and $\Delta S^\circ$ are:

A. $\Delta H^\circ$ is positive and $\Delta S^\circ$ is positive.
B. $\Delta H^\circ$ is negative and $\Delta S^\circ$ is positive.
C. Not enough information given. Need standard heats of formation and molar entropies to calculate $\Delta H^\circ$ and $\Delta S^\circ$.
D. $\Delta H^\circ$ is positive and $\Delta S^\circ$ is negative.
E. $\Delta H^\circ$ is negative and $\Delta S^\circ$ is negative.

9. Calculate $\Delta S^\circ$ for the following reaction:

$$\text{N}_2(g) + 2 \text{O}_2(g) \rightarrow 2 \text{NO}_2(g)$$

given

$$S^\circ(\text{N}_2(g)) = 191.5 \text{ J/K-mol}$$
$$S^\circ(\text{O}_2(g)) = 205.0 \text{ J/K-mol}$$
$$S^\circ(\text{NO}_2(g)) = 240.0 \text{ J/K-mol}$$

A. $-156.5 \text{ J/K}$
B. $-121.5 \text{ J/K}$
C. $+15.5 \text{ J/K}$
D. $+636.5 \text{ J/K}$
E. $-313.0 \text{ J/K}$
10. For the reaction \(3 \text{C}_2\text{H}_6(\text{g}) \rightarrow \text{C}_6\text{H}_6(\text{l})\) \(\Delta G^\circ=-503\) kJ, the equilibrium constant \(K\) at 25°C is:

A. \(4.93 \times 10^{-3}\)
B. \(1.48 \times 10^{88}\)
C. \(5.71 \times 10^{10}\)
D. \(6.74 \times 10^{-49}\)
E. 1.23

11. Consider the reaction:

\[
\text{N}_2(\text{g}) + 3 \text{F}_2(\text{g}) \rightarrow 2 \text{NF}_3(\text{g}) \quad \Delta H^\circ=-249\) kJ and \(\Delta S^\circ=-278\) J/K
\]

Calculate \(\Delta G^\circ\) at 500K and state whether the equilibrium composition should favor reactants or products at 500 K.

A. \(-110\) kJ; reactants are favored
B. \(+1.39 \times 10^9\) kJ; reactants are favored
C. \(-388\) kJ; products are favored
D. \(-110\) kJ; products are favored
E. \(-139\) kJ; products are favored

12. Consider the reaction:

\[
\text{SiCl}_4(\text{g}) + 2 \text{Mg}(\text{s}) \rightarrow 2 \text{MgCl}_2(\text{s}) + \text{Si}(\text{s})
\]

Calculate \(\Delta G^\circ\) at 25°C given the values below:

\[
\Delta G_f^\circ(\text{SiCl}_4(\text{g}))=-620.\) kJ/mol
\]
\[
\Delta G_f^\circ(\text{MgCl}_2(\text{s}))=-592.\) kJ/mol
\]

A. \(-564\) kJ
B. \(+28\) kJ
C. \(+385\) kJ
D. \(-1212\) kJ
E. \(-28\) kJ

13. At 2600 K, \(\Delta G^\circ=+775\) kJ for the reaction below:

\[
\text{B}_3\text{C}(\text{s}) \leftrightarrow 4\text{B}(\text{g}) + \text{C}(\text{s})
\]

If the partial pressure of the gaseous boron \(\text{B}(\text{g})\) is \(1.0 \times 10^5\) atm over a mixture of the two solids, \(\Delta G\) at 2600 K is ____________ and the reaction is ____________ in the forward direction.

A. \(-220.\) kJ; spontaneous
B. \(-270\) kJ; spontaneous
C. \(-220\) kJ; nonspontaneous
D. \(+114\) kJ; spontaneous
E. \(+746\) kJ; nonspontaneous
14. A galvanic cell

A. uses electrical energy to drive a nonspontaneous chemical reaction.
B. does not involve a redox reaction.
C. has $E^\circ_{\text{cell}} = 0$
D. converts chemical energy of a spontaneous chemical reaction into electricity.
E. has $E^\circ_{\text{cell}} < 0$.

15. The net cell reaction for a galvanic cell is:

$$\text{Fe(s)} + \text{Ni}^{2+}(aq) \rightarrow \text{Fe}^{2+}(aq) + \text{Ni(s)}$$

The shorthand notation for this cell is:

A. Fe(s)|Ni$^{2+}$(aq)||Fe$^{2+}$(aq)|Ni(s)
B. Fe(s)|Fe$^{2+}$(aq)||Ni$^{2+}$(aq)|Ni(s)
C. Ni(s)|Fe$^{2+}$(aq)||Ni$^{2+}$(aq)|Fe(s)
D. Ni(s)|Ni$^{2+}$(aq)||Fe$^{2+}$(aq)|Fe(s)
E. Fe(s)|Ni(s)||Ni$^{2+}$(aq)|Fe$^{2+}$(aq)

16. Determine the standard net cell potential $E^\circ_{\text{cell}}$ for the following net cell reaction

$$3 \text{ Cr}^{3+} + \text{ Al} \rightarrow 3 \text{ Cr}^{2+} + \text{ Al}^{3+} \quad E^\circ_{\text{cell}} = ?$$

given

$$\text{Cr}^{3+} + 1e^- \rightarrow \text{Cr}^{2+} \quad E^o = -0.41 \text{ V}$$
$$\text{Al}^{3+} + 3e^- \rightarrow \text{Al} \quad E^o = -1.66 \text{ V}$$

A. -2.07 V
B. +1.25 V
C. -0.43 V
D. +0.43 V
E. +0.14 V

17. The standard net cell potential $E^\circ_{\text{cell}}$ for the reaction below is +0.19 V.

$$\text{Ni}^{2+} + \text{Fe(s)} \rightarrow \text{Fe}^{2+} + \text{Ni(s)} \quad E^\circ_{\text{cell}} = +0.19 \text{ V}$$

The standard Gibbs free energy $\Delta G^\circ$ (in units of kJ) for this reaction is:

A. -37 kJ
B. -254 kJ
C. +18 kJ
D. -73 kJ
E. -18 kJ
18. Which of the following conditions does NOT specify a spontaneous reaction in the forward direction?

A. \( \Delta S_{\text{total}} < 0 \)
B. \( Q < K \)
C. \( E_{\text{cell}}^\circ > 0 \)
D. \( \Delta G^\circ < 0 \)
E. All of the above specify nonspontaneous reactions.

19. Which of the following acts as a weak electrolyte when dissolved in water?

A. \( \text{C}_{12}\text{H}_{22}\text{O}_{11} \) (sugar)
B. KOH
C. HNO₃
D. HC₂H₃O₂
E. KBr

20. The conjugate base of HCO₃⁻ is _______ while the conjugate acid of H₂O is _______.

A. \( \text{H}_2\text{CO}_3; \text{OH}^- \)
B. \( \text{OH}^-; \text{H}_2\text{O}^+ \)
C. \( \text{CO}_3^{2-}; \text{H}_3\text{O}^+ \)
D. \( \text{CO}_2; \text{H}^+ \)
E. None of the above is correct.

21. When HCl is added to a HF/NaF buffer the _______ from the HCl will neutralize the _______ of the buffer.

A. \( \text{H}_3\text{O}^+; \text{HF} \)
B. \( \text{Cl}^-; \text{Na}^+ \)
C. \( \text{OH}^-; \text{HF} \)
D. \( \text{H}_2\text{O}^+; \text{OH}^- \)
E. \( \text{H}_3\text{O}^+; \text{F}^- \)

22. The pH of a buffer containing 1.5 M HNO₂ and 0.50 M NaNO₂ is:
\( K_a(\text{HNO}_2) = 4.6 \times 10^{-4} \)

A. 3.34
B. 11.14
C. 1.76
D. 3.90
E. 2.86
23. Which of the indicators below should be used to detect the endpoint in a titration of $\text{HC}_2\text{H}_3\text{O}_2$ with $\text{NaOH}$?

A. Methyl green  0.2-1.8  yellow to blue  
B. Ethyl red  4.0-5.8  colorless to red  
C. Bromothymol blue  6.0-7.6  yellow to blue  
D. Thymol blue  8.2-9.8  colorless to red  
E. Any of the indicators in A-D will do.

24. Which one of the following dissolves in water to give a neutral solution?

A. $\text{AlCl}_3$  
B. $\text{NaClO}_4$  
C. $\text{NaOH}$  
D. $\text{NH}_4\text{Br}$  
E. $\text{NaC}_2\text{H}_3\text{O}_2$

25. Addition of which of the following to an aqueous solution saturated with $\text{Ag}_2\text{SO}_4$ ($K_{sp} = 1.19 \times 10^{-5}$) will increase the solubility of the $\text{Ag}_2\text{SO}_4$?

A. $\text{HCl}$  
B. $\text{Na}_2\text{SO}_4$  
C. $\text{AgNO}_3$  
D. $\text{NH}_3$  
E. All will increase the solubility of $\text{Ag}_2\text{SO}_4$.

26. The molar solubility of $\text{Ag}_3\text{PO}_4$ in pure water is: 

$K_{sp}(\text{Ag}_3\text{PO}_4) = 1.05 \times 10^{-16}$

A. $1.97 \times 10^{-9}$ M  
B. $3.89 \times 10^{-18}$ M  
C. $1.05 \times 10^{-16}$ M  
D. $2.86 \times 10^{-6}$ M  
E. $4.44 \times 10^{-3}$ M

27. The only factor which will change the value of the equilibrium constant $K$ is:

A. an increase in product concentrations.  
B. a decrease in reactant concentrations.  
C. An increase or decrease in volume.  
D. an increase or decrease in temperature.  
E. the addition of a catalyst.
28. The equilibrium constant expression for the decomposition of barium nitrate by the reaction below is:

\[ 2 \text{Ba(NO}_3\text{)}_2(s) \leftrightarrow 4 \text{NO}_2(g) + 2 \text{BaO(s)} + \text{O}_2(g) \]

A. \( K = ([\text{NO}_2]^4 \times [\text{BaO}]^3 \times [\text{O}_2]) / ([\text{Ba(NO}_3\text{)}_2]^2) \)

B. \( K = ([\text{NO}_2]^4 \times [\text{O}_2]) \)

C. \( K = ([\text{Ba(NO}_3\text{)}_2]^2) / ([\text{NO}_2]^4 \times [\text{BaO}]^3 \times [\text{O}_2]) \)

D. \( K = 1 / ([\text{NO}_2]^4 \times [\text{O}_2]) \)

E. \( K = (4 \times [\text{NO}_2] \times [\text{O}_2]) \)

29. Which one of the following aqueous solutions will have the lowest freezing point?

A. 0.25 m AlBr₃

B. 0.25 m NaBr

C. 0.25 m C₁₂H₂₂O₁₁(sugar)

D. 0.25 m HF

E. 0.25 m CaBr₂

30. Consider the reaction below at equilibrium.

\[ 2 \text{BrCl(g)} \leftrightarrow \text{Br}_2(g) + \text{Cl}_2(g) \quad \Delta H = +20 \text{ kJ} \]

Which of the following stresses applied to a mixture of the three gases at equilibrium will cause the formation of more Cl₂?

A. Increase the pressure by reducing the volume.

B. Add a catalyst.

C. Raise the temperature.

D. Remove half of the gaseous BrCl.

E. Add more gaseous Br₂.

31. Silver forms a soluble complex ion \([\text{Ag(S}_2\text{O}_3\text{)}_2]^{3-}\) with \( K_f = 2.9 \times 10^{13} \). The equilibrium concentration of \( \text{Ag}^+ \) in a 0.20 M solution of \([\text{Ag(S}_2\text{O}_3\text{)}_2]^{3-}\) is:

\[ \text{Ag}^+(\text{aq}) + 2 \text{S}_2\text{O}_3^{2-}(\text{aq}) \leftrightarrow [\text{Ag(S}_2\text{O}_3\text{)}_2]^{3-}(\text{aq}) \quad K_f = 2.9 \times 10^{13} \]

A. 1.7 \times 10^{-15} \text{ M}

B. 3.4 \times 10^{-14} \text{ M}

C. 1.2 \times 10^{-5} \text{ M}

D. 1.7 \times 10^{-13} \text{ M}

E. 0.20 \text{ M}

32. Geometric isomers are possible for which of the following:

(Where M=central metal cation and X, Y designate different ligands)

A. MX₂Y₂ (tetrahedral)

B. MX₃Y (square planar)

C. MX₂Y₂ (square planar)

D. MX₃Y₂ (octahedral)

E. Geometric isomers are possible for C and D.
33. Use crystal field theory to decide how many unpaired electrons in the metal 3d orbitals for the octahedral complexes below.

\[
\begin{array}{cc}
[MnF_6]^{3-} & [Mn(CN)_6]^{3-} \\
A. & four \\
B. & three \\
C. & five \\
D. & two \\
E. & two \\
\end{array}
\]

34. Consider the reaction and rate law below

\[
(\text{CH}_3)_2\text{CBr} + \text{OH}^- \rightarrow (\text{CH}_3)_2\text{COH} + \text{Br}^- \\
\text{Rate} = k[(\text{CH}_3)_2\text{CBr}]
\]

Which of the following will NOT increase the rate of reaction?

A. Increase the reaction temperature.
B. Add a positive catalyst for the forward reaction.
C. Increase the concentration of (CH₃)₂CBr.
D. Increase the concentration of OH⁻
E. All of the above.

35. Al₂(SO₄)₃ is dissolved in water such that the concentration of SO₄²⁻ is 0.20 M. What is the concentration of Al³⁺?

A. 0.067 M
B. 0.13 M
C. 0.60 M
D. 0.30 M
E. 0.39 M

36. In the qualitative analysis scheme, initial separation of the metal cations into Groups I-V is based on

A. differences in acid/base properties of the metal cations.
B. amphoteric properties.
C. differences in \( K_p \) values.
D. ability to form ammonia complexes.
E. hydrolysis of the metal cations.
37. Determine the rate law for the reaction below:
\[ S_2O_8^{2-}(aq) + 3 I^-(aq) \rightarrow 2 SO_4^{2-}(aq) + I_3^-(aq) \]
given the initial rate data:

\[
\begin{array}{cccc}
\text{Exp #} & [S_2O_8^{2-}] & [I^-] & \text{Initial Rxn Rate (M/sec)} \\
1 & 0.10 & 0.10 & 3.60 \times 10^{-3} \\
2 & 0.20 & 0.10 & 7.20 \times 10^{-3} \\
3 & 0.10 & 0.30 & 10.8 \times 10^{-3} \\
\end{array}
\]

A. Rate = \( k[S_2O_8^{2-}][I^-]^3 \)
B. Rate = \( k[S_2O_8^{2-}][I^-]^2 \)
C. Rate = \( k[I^-]^2 \)
D. Rate = \( k[S_2O_8^{2-}][I^-] \)
E. Rate = \( k[S_2O_8^{2-}][I^-] \)

38. A three step mechanism has been suggested for formation of COCl₂:

1: \( \text{Cl}_2 \rightarrow 2 \text{Cl} \) (fast)
2: \( \text{Cl} + \text{CO} \rightarrow \text{COCl} \) (fast)
3: \( \text{COCl} + \text{Cl}_2 \rightarrow \text{COCl}_2 + \text{Cl} \) (slow)

The intermediate is \[ \underline{__________} \] and the molecularity of the rate determining step is \[ \underline{______} \].

A. COCl; bimolecular
B. CO; unimolecular
C. COCl₂; bimolecular
D. Cl₂; bimolecular
E. COCl; unimolecular

39. Calculate \( K_c \) for the reaction below:
\[ 2 \text{NO}(g) + \text{O}_2(g) \rightleftharpoons 2 \text{NO}_2(g) \]
At Eq:
\[
\begin{array}{ccc}
0.200 \text{M} & 0.100 \text{M} & 0.250 \text{M} \\
\end{array}
\]

A. 0.0800
B. 0.0641
C. 12.5
D. 15.6
E. 3.95

40. Consider the equilibrium below:
\[ 2 \text{SO}_2(g) + \text{O}_2(g) \rightleftharpoons 2 \text{SO}_3(g) \]
\( K_c = 5.00 \) at 1300 K

If the initial concentrations are: \([\text{SO}_2]=1.20 \text{ M}, [\text{O}_2]=0.45 \text{ M}, \) and \([\text{SO}_3]=2.10 \text{ M}, \) the reaction will:

A. be at equilibrium.
B. shift to the left to reach equilibrium.
C. shift to the right to reach equilibrium.
D. not shift at all unless the temperature is increased.
E. None of the above.
41. Para-aminobenzoic acid (PABA; a weak acid with $K_a = 2.2 \times 10^{-4}$) is used in some sunscreens and hair conditioning products. The acid equilibrium can be represented as below (HA represents PABA):

$$
HA(aq) + H_2O \leftrightarrow A^-(aq) + H_3O^+(aq) \quad K_a = 2.2 \times 10^{-4}
$$

The pH of a 0.10 M solution of PABA is:

A. 2.83  
B. 5.69  
C. 6.91  
D. 11.17  
E. 3.78

42. Which of the following is NOT a Lewis base?

A. $H_2O$  
B. $NH_3$  
C. $K^+$  
D. $Cl^-$  
E. $OH^-$

43. Which of the following is a buffer?

A. 0.5 M HCl/0.1 M NaCl  
B. 0.5 M NaOH/0.1 M NaCl  
C. 0.5 M NH$_3$/0.1 M NaOH  
D. 0.5 M HClO$_2$/0.1 M NaClO$_2$  
E. 0.5 M HClO$_2$/0.5 M NaOH

44. 25.0 mL of 0.100 M HNO$_3$ is titrated with 0.150 M NaOH. What is the pH of the solution after the addition of 12.0 mL of NaOH?

A. 0.15  
B. 1.72  
C. 2.51  
D. 12.28  
E. 7.00
45. A solution is 0.010 M in Mn\(^{2+}\), Zn\(^{2+}\), Pb\(^{2+}\) and Cu\(^{2+}\) and 0.010 M in H\(_2\)S at a pH=0.50. Calculate the ion product. Which metal cations will precipitate as the sulfide?

\[
\text{MS(s) + 2H}_2\text{O}^+(aq) \leftrightarrow M^{2+}(aq) + \text{H}_2\text{S(aq) + 2 H}_2\text{O}^+ \quad K_{spA}
\]

\[
\begin{align*}
\text{MnS} & \quad 3 \times 10^{-16} \\
\text{ZnS} & \quad 3 \times 10^{-2} \\
\text{PbS} & \quad 3 \times 10^{-7} \\
\text{CuS} & \quad 6 \times 10^{-16}
\end{align*}
\]

A. Mn\(^{2+}\)  
B. Cu\(^{2+}\)  
C. Pb\(^{2+}\) and Cu\(^{2+}\)  
D. Zn\(^{2+}\), Pb\(^{2+}\) and Cu\(^{2+}\)  
E. All will precipitate.

46. 10.0 mL of 0.20 M HC\(_2\)H\(_3\)O\(_2\) is titrated with 0.15 M NaOH. The volume of base needed to reach the equivalence point is ____________.

A. 7.5 mL  
B. 13 mL  
C. 3.0 mL  
D. 10 mL  
E. 30 mL

47. Consider the titration in the last question. If the concentration of NaC\(_2\)H\(_3\)O\(_2\) at the equivalence point is 0.086 M, the pH at the equivalence point is:

\(K_A(\text{H}_2\text{C}_2\text{H}_3\text{O}_2)=1.8 \times 10^{-5}\)

A. 6.90  
B. 10.03  
C. 5.26  
D. 9.63  
E. 8.84

48. A 1.138 g sample of naproxen (an anti-inflammatory agent) is dissolved in 0.0297 L of benzene solution. The osmotic pressure of the resulting solution is 4.00 atm at 20°C. The molar mass of naproxen is:

A. 176 g/mol  
B. 307 g/mol  
C. 3.80 \times 10^4 g/mol  
D. 230 g/mol  
E. None of the above.
49. The standard net cell potential $E_{\text{cell}}^\circ$ is -0.40 V for the cell specified below.

$$\text{Pt(s)}|\text{H}_2(\text{g}, \text{2.0 atm})|\text{H}^+(\text{aq}, \text{0.0050 M})||\text{Cd}^{2+}(\text{0.50 M})|\text{Cd(s)}$$

The net cell potential $E_{\text{cell}}$ under the nonstandard conditions specified above is:

(HINT: Write the net cell reaction first)

A. -0.60 V  
B. +0.36 V  
C. -0.26 V  
D. +0.54 V  
E. -0.35 V

50. Mark the same answer as Question #49. This means that Question #49 is worth double.
Backtest from Summer II '998

Version I Key

(White)

1 D
2 A
3 C
4 A
5 C
6 A
7 C
8 B
9 B
10 B
11 D
12 A
13 A
14 D
15 B
16 B
17 A
18 A
19 D
20 C
21 E
22 E
23 D
24 B
25 D
26 E
27 D
28 B
29 A
30 C
31 C
32 E
33 A
34 D
35 B
36 C
37 E
38 A
39 D
40 B
41 A
42 C
43 D
44 B
45 C
46 B
47 E
48 D
49 C
50 C

A: HHHHH
B: HHHH H
C: HHHHH
D: HHHHH
E: HHHH

41 42 43 44 45 46 47 48 49 50