READ THESE DIRECTIONS CAREFULLY BEFORE STARTING THE EXAMINATION!

It is *extremely* important that you fill in the answer sheet EXACTLY as indicated, otherwise your answer sheet may not be processed; ALL entries are to be made on SIDE 1 of the answer sheet. Use a #2 pencil (or softer); fill in the circles completely and firmly. Erasures must be complete. Use only the following categories:

<table>
<thead>
<tr>
<th>NAME:</th>
<th>Print your name starting at the first space, LAST NAME first, then a space, followed by your FIRST NAME, then another space, followed by your MIDDLE INITIAL. Fill in the correct circles below your printed name corresponding to the letters of your name; for the spaces, fill in the top blank circle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>STUDENT NUMBER:</td>
<td>This is <strong>VERY IMPORTANT!</strong> Under IDENTIFICATION NUMBER, put in your <strong>8 DIGIT STUDENT ID NUMBER</strong> (do not use the 9 at the beginning of your number) beginning in column A and continuing through column H, column I will be blank, (do NOT use column J at this time); be sure to fill in the correct circles (a common error to be avoided is mistaking &quot;0&quot; for &quot;)I&quot;).</td>
</tr>
<tr>
<td>TEST FORM:</td>
<td>Fill in the &quot;4&quot; blank in the J column under IDENTIFICATION NUMBER (to indicate Hour Examination IV).</td>
</tr>
<tr>
<td>SPECIAL CODES:</td>
<td>Use for course and section number; in positions K-P write in one of the following:</td>
</tr>
<tr>
<td></td>
<td>Dr. Ades 107-001, 107-002</td>
</tr>
<tr>
<td>SIGNATURE:</td>
<td>You <strong>MUST</strong> sign the examination answer sheet (bubble sheet) on the line directly above your printed name. Use your legal signature.</td>
</tr>
</tbody>
</table>

**Answering Questions:**
Starting with answer "1" on SIDE 1, fill in the circle indicating the one best answer for each of the **60 questions** in this examination. Your score is the sum of the appropriate credit for each response.

**Grading and Reporting:**
The examination scores will be posted in Blackboard as soon as possible after the examination. If an error has occurred in scoring your answers, inform your instructor within 48 hours of the posting of your score.

**BE SURE THAT YOUR TEST HAS 60 QUESTIONS, A PERIODIC TABLE, AND TWO SHEETS OF SCRATCH PAPER.** You may **NOT** use your own scratch paper during this examination. Cell phones, computer, and pagers are to be turned off and out of sight during the exam. **All** exam paper, scratch paper, and scantrons must be handed in at the end of the exam. You may **not** take any exam materials away from the exam room.
Questions 1 – 15 cover Exam I material

1. Which of the following displays both dispersion and dipole-dipole forces?

A. C₂F₆          C. SO₃
B. CO₂          D. PF₃

2. Which of the following has the molecule with the **higher** boiling point listed **first**?

A. N₂, O₂          C. NH₃, PH₃
B. CH₃F, CH₃Cl      D. CH₃CH₃, CH₃CH₂CH₃

3. The intermolecular force(s) responsible for the fact that CH₄ has the lowest boiling point in the series CH₄, SiH₄, GeH₄, SnH₄ is/are

A. hydrogen bonding.
B. dispersion forces.
C. mainly hydrogen bonding but also dipole-dipole forces.
D. dispersion and dipole-dipole forces.

4. To determine the \( \Delta H_{\text{vap}} \) of a compound from experimental data, one plots

A. \( P \) vs \( T \)          C. \( P \) vs \( 1/T \)
B. \( \ln P \) vs \( 1/T \)      D. \( \ln P \) vs \( T \)

5. How much heat is needed to melt 225 g of acetone, C₃H₆O(s) at –94.8°C, which is the normal freezing point of C₃H₆O(s)? The \( \Delta H_{\text{fus}} \) of C₃H₆O(s) is 5.69 kJ/mol and the specific heat capacity is 2.15 J/g·°C.

A. 13.5 kJ          C. 484 kJ
B. 83.4 kJ          D. 22.1 kJ
6. A substance with strong intermolecular forces will have a

A. low boiling point.  
B. low vapor pressure.  
C. small heat of vaporization.  
D. low critical temperature and pressure.

7. A compound crystallizes in a cubic lattice with X ions on the corners, and Y ions in the body center and on the faces. What is the empirical formula of the compound?

A. $XY_2$  
B. $XY_3$  
C. $X_2Y_3$  
D. $XY_4$

8. Barium metal crystallizes in a body-centered cubic lattice with a density of 3.50 g/cm$^3$. What is the edge length of the barium unit cell?

A. 507 pm  
B. 412 pm  
C. 137 pm  
D. 319 pm

9. A solid has a boiling point of 1200$^\circ$C and is a nonconductor of electricity. This solid most likely is a(n)

A. molecular solid.  
B. ionic solid.  
C. network covalent solid.  
D. metallic solid.

10. Which of the following liquids would not be a good solvent for HI?

A. CO$_2$  
B. H$_2$CO  
C. NH$_3$  
D. CH$_3$OH
11. CO$_2$(g) is **most** soluble in water at ___partial pressure of CO$_2$ and ___temperature.

A. low, low  
B. low, high  
C. high, low  
D. high, high

12. What is the molality of an aqueous 1.69 M (NH$_4$)$_2$SO$_4$ solution? The density of the solution is 1.117 g/mL.

A. 1.89 m  
B. 1.51 m  
C. 1.96 m  
D. 1.89 m

13. The ideal value of the van’t Hoff factor, $i$, for (NH$_4$)$_2$SO$_3$ is

A. 7  
B. 5  
C. 3  
D. 1

14. What is the freezing point of an aqueous solution that contains 0.100 mole of NaCl and 0.100 mole of Al(NO$_3$)$_3$ in 1.00 kg of water? $K_f$ for water is 1.86°C/m.

A. −0.372 °C  
B. −1.12 °C  
C. −0.930 °C  
D. −1.74 °C

15. Which of the following aqueous solutions will have the **highest** osmotic pressure?

A. 0.50 M C$_6$H$_{12}$O$_6$  
B. 0.30 M NaNO$_3$  
C. 0.15 M CaCl$_2$  
D. 0.15 M (NH$_4$)$_2$SO$_4$
Questions 16 – 30 cover Exam II material

16. The rate of consumption of Br\textsuperscript{-} at some point in time for the reaction below is 2.00 M/s. What is the rate of consumption of H\textsuperscript{+} at the same time?

\[ 5\text{Br}^- (aq) + \text{BrO}_3^- (aq) + 6\text{H}^+ (aq) \rightarrow 3\text{Br}_2 (aq) + 3\text{H}_2\text{O}(l) \]

A. 2.40 M/s  
B. 3.60 M/s  
C. 0.600 M/s  
D. 2.00 M/s

17. For the reaction \(2\text{NO}(g) + \text{Cl}_2(g) \rightarrow 2\text{NOCl}(g)\), which one of the following can you correctly assume?

A. The rate law is: rate = \(k[\text{NO}]^2[\text{Cl}_2]\).
B. The rate law cannot be determined from the data given.
C. The reaction is first order in \(\text{NO}(g)\).
D. The reaction is second order.

18. A reaction is second order in \(A\) and second order in \(B\). What is the effect on the rate of the reaction when the concentration of \(A\) is tripled and the concentration of \(B\) is doubled?

A. The rate increases by a factor of 18.  
B. The rate quadruples.  
C. The rate increases by a factor of 36.  
D. The rate increases by a factor of 16.

19. What data should be plotted for the reaction \(A \rightarrow \text{Products}\) to show that the experimental data fits a zero-order reaction (is a straight line plot)?

A. \([A]\) vs time  
B. \([A]\) vs temperature  
C. \(\ln[A]\) vs time  
D. \(\frac{1}{[A]}\) vs time
20. Initial rate data (shown below) for the reaction $A(g) + B_2(g) \rightarrow AB_2(g)$ were collected.

<table>
<thead>
<tr>
<th>[A] (M)</th>
<th>[B$_2$] (M)</th>
<th>Initial rate (M/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00</td>
<td>1.00</td>
<td>0.300</td>
</tr>
<tr>
<td>4.00</td>
<td>1.00</td>
<td>0.600</td>
</tr>
<tr>
<td>4.00</td>
<td>2.00</td>
<td>0.848</td>
</tr>
</tbody>
</table>

What is the rate law for the reaction?

A. $\text{Rate} = k[A][B_2]^{1/2}$        C. $\text{Rate} = k[B_2]^{-1/2}$
B. $\text{Rate} = k[A][B_2]^{3/2}$        D. $\text{Rate} = k[A][B_2]$

21. The gas phase reaction

$$2\text{NOBr} \rightarrow 2\text{NO} + \text{Br}_2$$

was monitored as a function of time. A plot of $1/\text{[NOBr]}$ versus time yields a straight line with slope $0.800 \text{ M}^{-1}\text{s}^{-1}$. If the initial concentration of NOBr is 0.250 M and the reaction mixture initially contains no products, what is the concentration of NO after 20.0 s?

A. 0.100 M  C. 0.050 M
B. 0.200 M  D. 0.150 M

22. Which of the following is true for a reaction when the temperature is lowered?

A. The rate constant decreases and the activation energy increases.
B. The rate constant and the activation energy decrease.
C. The rate constant increases and the rate decreases.
D. The rate constant and the rate decrease.
23. The following mechanism has been proposed for a gas phase reaction.

\[
\begin{align*}
\text{NO}_2 + \text{SO}_2 & \rightarrow \text{NO} + \text{SO}_3 \\
\text{NO}_2 + \text{SO}_2 & \rightarrow \text{NO} + \text{SO}_3 \\
2 \text{ NO} + \text{O}_2 & \rightarrow 2\text{NO}_2
\end{align*}
\]

Which one of the following is a reaction intermediate for the reaction?

A. NO₂  
B. SO₂  
C. SO₃  
D. NO

24. Which of the following statements is true?

A. A \( K_{eq} \ll 1 \) implies that the forward reaction is favored.
B. At equilibrium, the rate of the forward reaction is equal to the rate of the reverse reaction.
C. At equilibrium, all chemical reactions have stopped.
D. The equilibrium state can only be reached by starting with reactants only.

25. What is \( K_c \) for the reaction

\[
\text{SO}_2(g) + \text{NO}_3(g) \rightleftharpoons \text{SO}_3(g) + \text{NO}_2(g)
\]
given

\[
\begin{align*}
2\text{SO}_3(g) & \rightleftharpoons 2\text{SO}_2(g) + \text{O}_2(g) \quad K_c = 2.3 \times 10^{-7} \\
2\text{NO}_3(g) & \rightleftharpoons 2\text{NO}_2(g) + \text{O}_2(g) \quad K_c = 1.4 \times 10^{-3}
\end{align*}
\]

A. \( 3.2 \times 10^{-10} \)  
B. \( 3.0 \times 10^{3} \)  
C. \( 1.3 \times 10^{-2} \)  
D. 78
26. Solid NH₄Cl is introduced into an evacuated vessel at some temperature. The following reaction takes place.

\[ \text{NH}_4\text{Cl}(s) \rightleftharpoons \text{NH}_3(g) + \text{HCl}(g) \]

At equilibrium, \( K_p = 0.400 \) for the reaction at the same temperature. What is the total gas pressure at equilibrium? (Some of the solid is present also.)

A. 0.800 atm  
B. 1.26 atm  
C. 0.200 atm  
D. 1.60 atm

27. A mixture of 0.100 mol of NO, 0.0500 mol of H₂, and 0.100 mol of H₂O is placed in a 1.00 L reaction vessel at 300 K and the following equilibrium established:

\[ 2\text{NO}(g) + 2\text{H}_2(g) \rightleftharpoons \text{N}_2(g) + 2\text{H}_2\text{O}(g) \]

At equilibrium \([\text{N}_2] = 0.010 \text{ M}\). What is the equilibrium concentration of NO?

A. 0.010 M  
B. 0.090 M  
C. 0.120 M  
D. 0.080 M

28. The reaction

\[ 2\text{H}_2(g) + \text{O}_2(g) \rightleftharpoons 2\text{H}_2\text{O}(g) \]

is exothermic. Which of the following conditions of temperature and pressure will maximize the formation of the products?

A. high temperature, high pressure  
B. high temperature, low pressure  
C. low temperature, high pressure  
D. low temperature, low pressure
29. \( K = 29 \) at 25 \(^{\circ}\)C and \( K = 0.0011 \) at 100 \(^{\circ}\)C. Therefore, the reaction is

A. exothermic  
B. endothermic  
C. isotonic  
D. ergonomic

30. What is the conjugate base of OH\(^-\)?

A. H\(_2\)O  
B. H\(_3\)O\(^+\)  
C. O\(^2-\)  
D. OH\(^-\)

31. What is the hydronium ion concentration in an aqueous solution when pH = 3.44?

A. \(3.6 \times 10^{-4}\) M  
B. \(2.8 \times 10^{-11}\) M  
C. \(3.6 \times 10^{-10}\) M  
D. \(2.8 \times 10^{-10}\) M

32. Which one of the following statements is true for an aqueous 1.00 M solution of HClO\(_2\)?

A. The pH is 0.00  
B. \([\text{H}_3\text{O}^+] = [\text{ClO}_2^-]\)  
C. \([\text{ClO}_2^-] = 0.500\) M  
D. \([\text{H}_3\text{O}^+] = 1.00\) M

33. What is the original molarity of an aqueous solution of chloroacetic acid (HC\(_2\)H\(_2\)O\(_2\)Cl) whose pH is 1.95? \(K_a\) for chloroacetic acid is \(1.4 \times 10^{-3}\).

A. 0.10 M  
B. 0.011 M  
C. 0.022 M  
D. 0.090 M
34. What is the pH of an aqueous solution that is 0.50 M in HNO₃ and 0.50 M in boric acid (H₃BO₃)? $K_a = 5.4 \times 10^{-10}$ for H₃BO₃.

A. 0.69  
B. 0.00  
C. 0.30  
D. The $K_a$ for HNO₃ is needed to calculate the pH.

35. Which one of the following will form a **basic** solution in water?

A. NH₄Br  
B. CH₃NH₃NO₃  
C. NaI  
D. KCN

36. What is the pH of a 0.45 M hydroxylammonium chloride, HONH₃Cl, solution? $K_b = 1.1 \times 10^{-8}$ for hydroxylamine, HONH₂.

A. 9.85  
B. 3.19  
C. 4.15  
D. 11.10

37. Which one of the following is the **weakest** base?

A. OI⁻  
B. OBr⁻  
C. OCl⁻  
D. OF⁻

38. When **ammonium chloride** (NH₄Cl) is added to an aqueous solution of **ammonia** (NH₃), the pH of the solution

A. increases.  
B. decreases.  
C. is unchanged.  
D. is 0.00
39. Which of the following combinations would be **best** to prepare a buffer whose pH is 4.00?

<table>
<thead>
<tr>
<th>Option</th>
<th>Combination</th>
<th>Buffering Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>NH₄Cl/NH₃</td>
<td>( K_b ) for C₅H₅NH = 1.8 \times 10^{-5}</td>
</tr>
<tr>
<td>B.</td>
<td>C₁₀H₁₅N₂Br/C₁₀H₁₄N</td>
<td>( K_b ) for C₁₀H₁₄N₂ = 1.0 \times 10^{-6}</td>
</tr>
<tr>
<td>C.</td>
<td>HF/NaF</td>
<td>( K_a ) for HF = 3.5 \times 10^{-4}</td>
</tr>
<tr>
<td>D.</td>
<td>HClO/NaCl</td>
<td>( K_a ) for HClO = 2.9 \times 10^{-8}</td>
</tr>
</tbody>
</table>

40. Addition of which of the following **will** destroy the buffering ability of 1.00 L of a solution that contains 1.50 mol HNO₂ and 1.00 mol NaNO₂? Assume no volume change.

<table>
<thead>
<tr>
<th>Option</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>1.00 mol NaOH</td>
</tr>
<tr>
<td>B.</td>
<td>0.50 mol HCl</td>
</tr>
<tr>
<td>C.</td>
<td>0.10 mol NaOH</td>
</tr>
<tr>
<td>D.</td>
<td>1.20 mol HCl</td>
</tr>
</tbody>
</table>

41. What is the pH of a solution made by mixing 100.00 mL of 0.100 M ammonia (NH₃) with 20.00 mL of 0.200 M HCl? \( K_b \) for ammonia is 1.8 \times 10^{-5}.

<table>
<thead>
<tr>
<th>Option</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>9.17</td>
</tr>
<tr>
<td>B.</td>
<td>9.43</td>
</tr>
<tr>
<td>C.</td>
<td>4.04</td>
</tr>
<tr>
<td>D.</td>
<td>8.98</td>
</tr>
</tbody>
</table>

42. A 100.0 mL sample of 0.500 M butanoic acid is titrated with 0.500 M KOH. What is the pH at the equivalence point of the titration? \( K_a \) for butanoic acid is 1.5 \times 10^{-5}.

<table>
<thead>
<tr>
<th>Option</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>9.11</td>
</tr>
<tr>
<td>B.</td>
<td>4.74</td>
</tr>
<tr>
<td>C.</td>
<td>4.70</td>
</tr>
<tr>
<td>D.</td>
<td>10.26</td>
</tr>
</tbody>
</table>
43. An indicator has a $K_a = 2 \times 10^{-7}$. The nonionized form of the indicator is yellow and the ionized form is blue. What is the color of the indicator in a solution whose pH is 4.2?

A. yellow  
B. green  
C. yellow-green  
D. blue

44. Which one of the following curves represents the titration of a 0.10 M strong base by a strong acid?

A.  

B.  

C.  

D.  

45. Which of the following is the correct relationship between molar solubility, $S$, and the solubility product for Ag$_3$PO$_4$?

A. $K_{sp} = S^2$  
B. $K_{sp} = 4S^3$  
C. $K_{sp} = 27S^4$  
D. $K_{sp} = 108S^5$
46. In which aqueous system is Fe(OH)\(_2\) least soluble.

A. at pH = 5.0
B. in 0.30 M NaNO\(_3\)
C. in water only
D. in 0.20 M Fe(NO\(_3\))\(_2\)

47. What is the solubility of CaF\(_2\) in 0.010 M KF? \(K_{sp}\) of CaF\(_2\) = 1.46 × 10\(^{-10}\).

A. 1.46 × 10\(^{-8}\) M
B. 1.46 × 10\(^{-14}\) M
C. 1.46 × 10\(^{-6}\) M
D. 1.46 × 10\(^{-12}\) M

48. What minimum concentration of NaOH is needed to start precipitation of Ba(OH)\(_2\) from 0.100 M Ba(NO\(_3\))\(_2\)? \(K_{sp}\) of Ba(OH)\(_2\) is 5.0 × 10\(^{-3}\).

A. 0.0050 M
B. 0.50 M
C. 0.071 M
D. 0.22 M

49. Will a precipitate of MgF\(_2\) form when 200.0 mL of 4.0 × 10\(^{-4}\) M MgCl\(_2\) is mixed with 200.0 mL of 4.0 × 10\(^{-4}\) M NaF? \(K_{sp}\) of MgF\(_2\) is 5.16 × 10\(^{-11}\).

A. No, because Q > \(K_{sp}\)
B. No, because Q < \(K_{sp}\)
C. Yes, because Q > \(K_{sp}\)
D. Yes, because Q < \(K_{sp}\)

50. Which of the following is not more soluble in acid than in pure water?

A. AgBr
B. Mg(OH)\(_2\)
C. CaS
D. PbF\(_2\)
51. Which one of the following is true?

A. The $K_{sp}$ for Ca(OH)$_2$ is the same in water as it is in 0.10 M NaOH.
B. The $K_{sp}$ and molar solubility of Ca(OH)$_2$ are the same.
C. The addition of CaCl$_2$ to a solution containing Ca(OH)$_2$ does not affect the molar solubility of Ca(OH)$_2$.
D. The molar solubility of Ca(OH)$_2$ is the same in water as it is in the presence of 0.10 M NaOH.

52. Which one of the following has the species with the larger entropy value listed first? There is one mole of each substance and the temperature is the same for each pair.

A. Ar(g), F$_2$(g)  
B. Na(s), NaCl(s)  
C. F$_2$(g), Cl$_2$(g)  
D. H$_3$COCH$_2$OH(l), H$_3$CCH$_2$OH(l)

53. What is $\Delta S^{\circ}_{\text{rxn}}$ for the following reaction?

$$4 \text{NH}_3(g) + 5 \text{O}_2(g) \rightarrow 4 \text{NO}(g) + 6 \text{H}_2\text{O}(g)$$

Use the following $S^{\circ}$'s:

- $\text{NH}_3(g) = 192.8 \text{ J/K}$
- $\text{O}_2(g) = 205.2 \text{ J/K}$
- $\text{NO}(g) = 210.8 \text{ J/K}$
- $\text{H}_2\text{O}(g) = 188.8 \text{ J/K}$

A. $-336.6 \text{ J/K}$  
B. $1.205 \times 10^3 \text{ J/K}$  
C. $287.4 \text{ J/K}$  
D. $178.8 \text{ J/K}$

54. Which one of the following reactions has the most positive $\Delta S_{\text{rxn}}$?

A. $4\text{Fe}(s) + 3\text{O}_2(g) \rightleftharpoons 2\text{Fe}_2\text{O}_3(s)$  
B. $2\text{NH}_3(g) \rightleftharpoons \text{N}_2(g) + 3\text{H}_2(g)$  
C. $2\text{NO}_2(g) \rightleftharpoons 2\text{NO}(g) + \text{O}_2(g)$  
D. $2\text{H}_2\text{O}(l) \rightleftharpoons 2\text{H}_2(g) + \text{O}_2(g)$
55. Sodium carbonate can be made by heating sodium bicarbonate.

\[ 2 \text{NaHCO}_3(s) \rightarrow \text{Na}_2\text{CO}_3(s) + \text{CO}_2(g) + \text{H}_2\text{O}(g) \]

The reaction is endothermic. Therefore, the reaction is spontaneous

A. at low temperatures only.  
B. at high temperatures only.  
C. at all temperatures.  
D. at no temperature.

56. What are the signs of \( \Delta H \), \( \Delta S \), and \( \Delta G \), respectively, for steam condensing at 75\(^\circ\)C and 1 atm pressure?

A. -, -, -  
B. +, +, -  
C. +, -, +  
D. -, +, +

57. Ozone \((\text{O}_3)\) in the atmosphere reacts with nitrogen monoxide:

\[ \text{O}_3(g) + \text{NO}(g) \rightarrow \text{NO}_2(g) + \text{O}_2(g) \]

The \( \Delta G^0 \) for the reaction at 25\(^\circ\)C is –198 kJ. What is \( K_p \) at this temperature?

A. \( 1.96 \times 10^{-35} \)  
B. 4.38  
C. \( 5.10 \times 10^{34} \)  
D. 0.228

58. What are the coefficients \( a \) and \( c \) when the following reaction is balanced in basic solution according to convention?

\[ a \text{Ag(s)} + b \text{CN}^- (aq) + c\text{O}_2(g) \rightarrow d \text{Ag(CN)}_2^- (aq) \]

A. \( a=4, c=1 \)  
B. \( a=2, c=5 \)  
C. \( a=3, c=2 \)  
D. \( a=5, c=3 \)
59. Which of the following is true for the following electrochemical cell?

\[ \text{Fe(s)} || \text{Fe}^{2+}(aq) || \text{MnO}_4^-(aq), \text{H}^+(aq), \text{Mn}^{2+}(aq) || \text{Pt(s)} \]

A. \( \text{Fe}^{2+} \) is oxidized at the anode.  
B. Pt is reduced at the anode. 
C. \( \text{MnO}_4^- \) is reduced at the cathode. 
D. \( \text{Fe} \) is the oxidizing agent.

60. What is \( E^o \) for the reaction \( 2 \text{Fe(s)} + 3 \text{Cl}_2(g) \rightarrow 6 \text{Cl}^-(aq) + 2 \text{Fe}^{3+}(aq) \)? Use the following reduction potentials.

\[
\begin{align*}
\text{Cl}_2(g) + 2 \text{e}^- & \rightarrow 2 \text{Cl}^- (aq) \quad E^o = 1.36 \text{ V} \\
\text{Fe}^{3+}(aq) + 3 \text{e}^- & \rightarrow \text{Fe(s)} \quad E^o = -0.04 \text{ V}
\end{align*}
\]

A. \(-4.16 \text{ V}\)  
B. \(4.16 \text{ V}\)  
C. \(1.40 \text{ V}\)  
D. \(1.32 \text{ V}\)
CHE 107 FALL 2011 Final Exam Key

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