Multiple Choice Questions #7

In answering questions 1 - 2, consider the following titration curve.

1. Which one of the following combinations does the titration curve represent?
   A  Addition of a strong base to a weak acid
   B  Addition of a weak base to a strong acid
   C  Addition of a weak acid to a strong base
   D  Addition of a strong acid to a strong base
   E  Addition of a strong acid to a weak base

2. What is the value of the $pK_a$ that can be obtained from this titration curve?
   A  11.3  B  10.0  C  9.3  D  5.3  E  1.8

3. Arrange the given acids in order of DECREASING acid strength. Relevant $pK_a$ values are given where appropriate.
   acetic acid, CH$_3$COOH  $pK_a = 4.76$, carbonic acid, H$_2$CO$_3$  $pK_{a1} = 6.35$
   hydrofluoric acid, HF  $pK_a = 3.17$, nitrous acid, HNO$_2$  $pK_a = 3.15$

   A  H$_2$CO$_3 >$ CH$_3$COOH $>$ HF $>$ HNO$_2 >$ HNO$_3$
   B  HNO$_3 >$ HNO$_2 >$ HF $>$ CH$_3$COOH $>$ H$_2$CO$_3$
   C  CH$_3$COOH $>$ H$_2$CO$_3$ $>$ HF $>$ HNO$_3 >$ HNO$_2$
   D  HNO$_3 >$ H$_2$CO$_3 >$ CH$_3$COOH $>$ HF $>$ HNO$_2$
   E  HNO$_2 >$ HF $>$ CH$_3$COOH $>$ H$_2$CO$_3 >$ HNO$_3$
4. Which of the following gases can be liquefied at 25 °C?

<table>
<thead>
<tr>
<th>Gas</th>
<th>Critical point</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH₃Cl</td>
<td>144 °C, 66 atm</td>
</tr>
<tr>
<td>SO₂</td>
<td>158 °C, 78 atm</td>
</tr>
<tr>
<td>CH₄</td>
<td>-82 °C, 46 atm</td>
</tr>
</tbody>
</table>

A  SO₂ only  
B  CH₄ only  
C  CH₃Cl and SO₂  
D  all of them  
E  none of them

5. Which one of the following is a coordination isomer of the complex salt, \(\text{trans-}[\text{Cr(H₂O)}₄\text{Cl₂}]\text{Br}\)?

A  \(\text{cis-}[\text{Cr(H₂O)}₄\text{Cl₂}]\text{Br}\)  
B  \(\text{trans-}[\text{Cr(H₂O)}₄\text{BrCl}]\text{Cl}\)  
C  \(\text{trans-}[\text{Cr(H₂O)}₄\text{Br₂}]\text{Cl}\)  
D  \(\text{trans-}[\text{CrBr₂(H₂O)}₄]\text{Cl}\)  
E  \(\text{trans-}[\text{CrCl₂(H₂O)}₄]\text{Br}\)

6. How many isomers are possible for the complex ion \([\text{Ni(en)}₃]^{2+}\) (en = NH₂CH₂CH₂NH₂)?

A  1  
B  2  
C  3  
D  4  
E  5

7. How many isomers are possible for the complex ion \([\text{Ni(en)}₂\text{I₂}]\) (en = NH₂CH₂CH₂NH₂)?

A  1  
B  2  
C  3  
D  4  
E  5

8. How many isomers are possible for the complex \(\text{PtCl₂en}\) (en = NH₂CH₂CH₂NH₂)?

A  1  
B  2  
C  3  
D  4  
E  5