3) Complete the following table indicating the coordination number and oxidation state of the transition metal in the following compounds:

<table>
<thead>
<tr>
<th>Coordination Compound</th>
<th>Coordination number</th>
<th>Oxidation state</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Zn(NH₃)₆]Cl₂</td>
<td>6</td>
<td>+2</td>
</tr>
<tr>
<td>Na[CuCl₂]</td>
<td>2</td>
<td>+1</td>
</tr>
<tr>
<td>K₂[CoCl₄]</td>
<td>4</td>
<td>+2</td>
</tr>
<tr>
<td>K₃[V(C₂O₄)₃]</td>
<td>6</td>
<td>+3</td>
</tr>
</tbody>
</table>

Sketch the structure of the zinc complex ion.

![Zinc complex ion diagram]

(10 points)

4) The reduction potentials for Ni²⁺ and Sn²⁺ are as follows:

Ni²⁺ + 2 e⁻ ⇌ Ni \quad E^\circ = -0.23 \text{ V}
Sn²⁺ + 2 e⁻ ⇌ Sn \quad E^\circ = -0.14 \text{ V}

Calculate the equilibrium constant at 25 °C for the reaction

Sn²⁺ + Ni ⇌ Sn + Ni²⁺

(a) 1.9 x 10⁻⁴
(b) 1.9
(c) 3.0
(d) 1.5 x 10¹³
(e) 1.1 x 10³

E^\circ_{\text{cell}} = -0.14 - (-0.23) = 0.09 \text{ V}

\[R T \ln K = n F E^\circ_{\text{cell}}\]

\[\ln K = \frac{2 \times (96,485)}{(8.314)(298)} (0.09)\]

\[\Rightarrow K = 1107\]

(5 points)