Quiz 11

Questions 1 through 3 will use the data shown below.

<table>
<thead>
<tr>
<th>ΔH°</th>
<th>S°</th>
</tr>
</thead>
<tbody>
<tr>
<td>kJ/mol</td>
<td>J/(K mol)</td>
</tr>
<tr>
<td>CH₃OH (l)</td>
<td>-238.66</td>
</tr>
<tr>
<td>CH₃OH (g)</td>
<td>-200.66</td>
</tr>
<tr>
<td>R = 8.314 J/(K mol)</td>
<td></td>
</tr>
</tbody>
</table>

1. What is the normal boiling point of methanol, CH₃OH?
   a. 0°C  
   b. 188°C  
   c. 561 K  
   d. 337°C

2. What is the vapor pressure of methanol at 25°C?
   a. 25 torr  
   b. 13 torr  
   c. 30 torr  
   d. 215 torr

3. What is the vapor pressure of methanol at 50°C?
   a. 50 torr  
   b. 26 torr  
   c. 260 torr  
   d. 430 torr

4. Which quantity does not necessarily have a value of zero under the conditions specified?
   a. ln Q under standard conditions  
   b. ΔG° at equilibrium
   c. ΔS° for Ne (g)  
   d. ΔG at equilibrium

   Well, it will be zero only if ΔS is at eq under std cond.
5. The reaction shown below takes place in acid solution. What is the coefficient of $\text{H}^+$ when the half-reactions have been balanced and combined to give the overall equation?

$$\text{Sn} (s) + \text{NO}_3^-(aq) \rightarrow \text{Sn}^{4+}(aq) + \text{N}_2\text{O} (g)$$

a. 4  
(b) 10  
(c) 20  
d. 5

$$\text{Sn} \rightarrow \text{Sn}^{4+} + 4\text{H}^+ + \text{O}_2 + 2\text{NO}_3^- \rightarrow \text{N}_2\text{O} + 5\text{H}_2\text{O}$$

6. The reaction shown below takes place in alkaline (basic) solution. What is the coefficient of $\text{OH}^-$ when the half-reactions have been balanced and combined to give the overall equation?

$$\text{Be} (s) + \text{SO}_3^{2-}(aq) \rightarrow \text{S}_2\text{O}_3^{2-}(aq) + \text{Be}_2\text{O}_3^{2-}$$

a. 2  
(b) 6  
(c) 0  
d. 4

$$2\text{Be} + 2\text{SO}_3^{2-} \rightarrow \text{S}_2\text{O}_3^{2-} + \text{Be}_2\text{O}_3^{2-}$$

7. What is the overall reaction for the electrochemical cell represented by the shorthand notation shown below?

$$\text{Pt(s)} | \text{Fe}^{2+}, \text{Fe}^{3+} || \text{MnO}_4^-(aq), \text{Mn}^{2+}(aq), \text{H}^+(aq) | \text{Pt(s)}$$

- a. $5\text{Fe}^{2+} + \text{MnO}_4^- + 8\text{H}^+ \rightarrow 5\text{Fe}^{3+} + \text{Mn}^{2+} + 4\text{H}_2\text{O}$
- b. $3\text{Fe}^{2+} + \text{MnO}_4^- + 8\text{H}^+ \rightarrow 3\text{Fe}^{3+} + \text{Mn}^{2+} + 4\text{H}_2\text{O}$
- c. $\text{Fe}^{2+} + \text{MnO}_4^- + 8\text{H}^+ \rightarrow \text{Fe}^{3+} + \text{Mn}^{2+} + 4\text{H}_2\text{O}$
- d. $\text{Fe}^{2+} + 2\text{MnO}_4^- + 16\text{H}^+ \rightarrow \text{Fe}^{3+} + 2\text{Mn}^{2+} + 8\text{H}_2\text{O}$

8. What happens at the cathode in the electrochemical cell represented by the shorthand notation shown in Question 7?

a. $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$  
b. hydrogen in an acid is reduced to hydrogen in water

c. oxygen in permanganate ion is oxidized to oxygen in water  
d. $\text{MnO}_4^- + \rightarrow \text{Mn}^{2+}$