

Multiple Choice (5 points each, Put answers in CAPS in the left margin.)

$$R = 8.314 \text{ J/mol}\cdot\text{K} \quad F = 96,500 \text{ C/mol} = 96,500 \text{ J/mol}\cdot\text{V}$$

1. For the slightly soluble salt $\text{Pb}(\text{CN})_2$, adding which of the following would have the **largest** suppression of its solubility on a per mole of added material basis.

- A) HCl B) NaCN C) $\text{Pb}(\text{NO}_3)_2$ D) $\text{Pb}(\text{NO}_3)_4$

2. One way to help metal bridges last longer is to attach a wire to a block of zinc and the other end to the bridge. There is a **strong** flow of electrons from the zinc to the bridge to prevent the latter from rusting. At the same time, oxygen in the air is reduced to form zinc(II) oxide to balance the electron flow for the metal oxidation. In this situation,

- A) $\Delta G < 0, \Delta H < 0, \Delta S < 0$ D) $\Delta G > 0, \Delta H > 0, \Delta S > 0$
 B) $\Delta G < 0, \Delta H > 0, \Delta S < 0$ E) $\Delta G > 0, \Delta H < 0, \Delta S < 0$
 C) $\Delta G < 0, \Delta H < 0, \Delta S > 0$

3. Which of the following batteries is **not** rechargeable.

- A) The alkaline battery D) The lead-acid battery
 B) The nickel-cadmium battery E) All are rechargeable
 C) The nickel metal hydride battery

4. Consider the reaction: $2 \text{Al} + 3 \text{Cu}^{2+} \longrightarrow 2 \text{Al}^{3+} + 3 \text{Cu}$. How many moles (n) of electrons flow in this reaction?

- A) 1 B) 2 C) 3 D) 4 E) 6

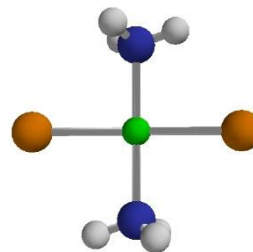
5. For the atoms and ions: $\text{Ag}^+, \text{Al}^{3+}, \text{Fe}^{2+}, \text{H}^+$, which is most easily reduced?

- A) Ag^+ B) Al^{3+} C) Fe^{2+} D) H^+ E) cannot tell from given information

0.80 V	$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$	-0.44 V	$\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}$
-1.66 V	$\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$	0.00 V	$2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{H}_2$

6. The geometry of this molecule is

- A) cis C) meridional
 B) facial D) trans



3. In the electrolysis of AlBr_3 , how much current is required to produce 0.50 mol bromine over a 75 min period? (6 points)
4. Consider the redox reaction $3 \text{Ag}^+_{(\text{aq})} + \text{Al}_{(\text{s})} \rightarrow 3 \text{Ag}_{(\text{s})} + \text{Al}^{3+}_{(\text{aq})}$. Using the data provided in multiple choice question #5, calculate E_{cell}° and ΔG° for the reaction. (8 points)
5. Provide formulas for the following names. (9 points)
- potassium hexacyanochromate(III) –
- hexaamminecobalt(III) chloride –
- diaquodichloroplatinum(II) –
6. What characteristic defines the difference between a transition metal and the other metals on the periodic table? (5 points)
7. Consider a molecule that is chiral. It will have two optical isomers. How are they related to each other? Name one of the two physical properties that differentiate them. Name both for a bonus. (5 points)