Name _____ Date _____ Period _____

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9.8 Galvanic (Voltaic) and Electrolytic Cells

AP Chemistry

Use the terms anode, cathode, oxidation, and reduction in your answers. Electrons flow through the wire; ions flow through the salt bridge.

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1. A galvanic cell runs the reaction $Ni(s) + 2Ag^{+}(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s)$. The Ni electrode is in $Ni(NO_3)_2(aq)$, the Ag electrode is in $AgNO_3(aq)$, and the salt bridge holds $KNO_3(aq)$.

(a) Write the half-reaction at the anode and at the cathode. Label which electrode is which.

(b) In which direction do electrons flow in the wire? (c) Which way do K^{+} and NO_3^{-} move in the salt bridge?

(d) Which electrode gains mass? Which ion concentration decreases as the cell runs?

2. Label each description as galvanic or electrolytic.

Description	Galvanic or electrolytic?
(a) A flashlight battery is in use.	
(b) A phone battery is recharging.	
(c) The cell reaction is thermodynamically unfavored.	
(d) The cell makes electricity on its own.	
(e) Electricity is used to plate copper onto a key.	

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3. The Ni/Ag cell in problem 1 is connected to an outside power source that forces the reaction to run in reverse: $2Ag(s) + Ni^{2+}(aq) \rightarrow 2Ag^{+}(aq) + Ni(s)$.

(a) Is this a galvanic or electrolytic cell? (b) Which electrode is now the anode, and which gains mass? (c) Why is a power source needed?

4. A cell runs $Zn(s) + 2Fe^{3+}(aq) \rightarrow Zn^{2+}(aq) + 2Fe^{2+}(aq)$. The Fe^{3+}/Fe^{2+} half-cell uses a platinum (Pt) wire as its electrode.

(a) Which electrode is the cathode? Write its half-reaction. (b) Why is Pt used, and does the Pt electrode gain or lose mass?

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