**Quiz 7**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. An electrochemical cell is based on the following two **unbalanced** half-reactions (14 points):
2. MnO4- (aq) $→$ MnO2 (s) E° = 1.68 V
3. Pb2+ (aq) → Pb (s) E° = -0.13 V
	1. What is the standard cell potential for the Galvanic cell?

$E\_{cell}^{°}=E\_{cathode}^{°}-E\_{anode}^{°}=1.68 V-\left(0.13 V\right)=1.81 V$

* 1. Write the balanced oxidation half-reaction:

Pb (s) → Pb2+ (aq) + 2 e-

* 1. Write the balance reduction half-reaction:

MnO4- (aq) + 4 H+ (aq) + 3 e- → MnO2 (s) + 2 H2O (l)

* 1. Write the balanced redox reaction:

Red: (MnO4- (aq) + 4 H+ (aq) + 3 e- → MnO2 (s) + 2 H2O (l)) × 2

Ox: + (Pb (s) → Pb2+ (aq) + 2 e-) × 3

2 MnO4- (aq) + 8 H+ (aq) + 6 e- + 3 Pb (s) → 2 MnO2 (s) + 4 H2O (l) + 3 Pb2+ (aq) + 6 e-

2 MnO4- (aq) + 8 H+ (aq) + 3 Pb (s) → 2 MnO2 (s) + 4 H2O (l) + 3 Pb2+ (aq)

* 1. How many electrons are being transferred? \_\_\_\_6\_
1. The temperature dependence of the equilibrium constant of the reaction:

2 CO2 (g) $⇌$ 2 CO (g) + O2 (g)

can be expressed as ln(Kp) = 20.1 – (66,662 K)/T (6 points).

1. What is the standard enthalpy in kJ/mol of the forward process?

$$m=-\frac{ΔH°}{R}⇒ΔH°=-mR=-\left(-66,6662 K\right)\left(8.314 \frac{J}{mol K}\right)×\frac{1 kJ}{1000 J}=554.2\frac{kJ}{mol}$$

1. What is the standard entropy of the forward process?

$$b=\frac{ΔS°}{R}⇒ΔS°=bR=\left(20.1\right)\left(8.314 \frac{J}{mol K}\right)=167\frac{J}{mol K} $$