

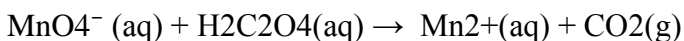
NAME _____

S2014/CHEM1451/Dooley/Exam 4

This has been edited to only contain electro-chem material!!

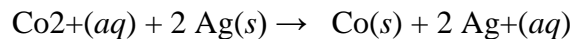
Multiple Choice: (3Pts each)

_____ 1. What element is being oxidized in the following redox reaction?



- a) C
- b) O
- c) Mn
- d) H

_____ 2. What is the reduction half-reaction for the following overall galvanic cell reaction?



- a) $\text{Ag}(\text{s}) + \text{e}^- \rightarrow \text{Ag}^+(\text{aq})$
- b) $\text{Ag}^+(\text{aq}) + \text{e}^- \rightarrow \text{Ag}(\text{s})$
- c) $\text{Co}^{2+}(\text{aq}) + 2 \text{e}^- \rightarrow \text{Co}(\text{s})$
- d) $\text{Co}^{2+}(\text{aq}) + \text{e}^- \rightarrow \text{Co}(\text{s})$

_____ 3. Identify the location of oxidation in an electrochemical cell.

- a) the anode
- b) the cathode
- c) the electrode
- d) the salt bridge
- e) the socket

_____ 4. Determine the redox reaction represented by the following cell notation.



- a) $\text{Cu}(\text{s}) + \text{Mg}^{2+}(\text{aq}) \rightarrow \text{Mg}(\text{s}) + \text{Cu}^{2+}(\text{aq})$
- b) $\text{Mg}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Cu}(\text{s}) + \text{Mg}^{2+}(\text{aq})$
- c) $2 \text{Mg}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Cu}(\text{s}) + 2 \text{Mg}^{2+}(\text{aq})$
- d) $2 \text{Cu}(\text{s}) + \text{Mg}^{2+}(\text{aq}) \rightarrow \text{Mg}(\text{s}) + 2 \text{Cu}^{2+}(\text{aq})$
- e) $3 \text{Mg}(\text{s}) + 2 \text{Cu}^{2+}(\text{aq}) \rightarrow 2 \text{Cu}(\text{s}) + 3 \text{Mg}^{2+}(\text{aq})$

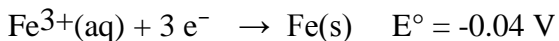
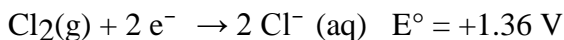
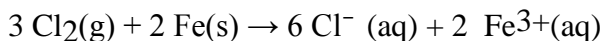
_____5. Which of the following is the strongest reducing agent?

- a) Al(s)
- b) Zn(s)
- c) Mg(s)
- d) Al³⁺(aq)
- e) Mg²⁺(aq)

_____6. Which of the following metals will react in nitric acid but not hydrochloric?

- a) Fe
- b) Pb
- c) Cu
- d) Sn
- e) Ni

_____7. Use the standard half-cell potentials listed below to calculate the standard cell potential for the following reaction occurring in an electrochemical cell at 25°C. (The equation is balanced.)

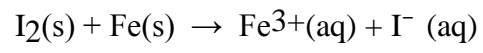


- a) +4.16 V
- b) -1.40 V
- c) -1.32 V
- d) +1.32 V
- e) +1.40 V

_____8. Determine which of the following pairs of reactants will result in a spontaneous reaction at 25°C.

- a) Pb²⁺(aq) + Cu(s)
- b) Ag⁺(aq) + Br⁻ (aq)
- c) Li⁺(aq) + Al(s)
- d) Fe³⁺(aq) + Ni(s)
- e) None of the above pairs will react.

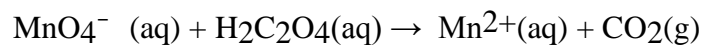
_____9. How many electrons are transferred in the following reaction? (The reaction is unbalanced.)



- a) 1
- b) 2
- c) 6
- d) 3

Short Answer/Problems: Show your work!

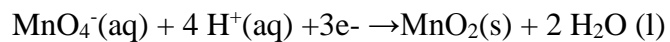
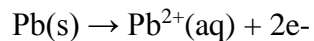
3. Balance the following redox reaction if it occurs in acidic solution.



| Oxidation Half Reaction: | Reduction Half Reaction: |
|--------------------------|--------------------------|
| | |

a) If this reaction occurred in basic conditions, how would the balancing process have changed?

4. An electrochemical cell is based on these two half-reactions:



a) Draw the galvanic cell below. Indicate the direction of e⁻ flow, the positions of each Reactant and Product (Pb(s), Pb²⁺, MnO₄⁻, H⁺ and MnO₂). Because MnO₂ does not conduct electricity, you will need to use a Pt electrode in one half-cell. Do not forget your salt bridge! Use a salt bridge containing KNO₃ solution, and show the directions the ions flow.

b) Calculate E^o_{cell}.

c) If the concentrations of the aqueous ions are changed to the following, what is the new, non-standard E_{cell}? [Pb²⁺] = 0.15M, [MnO₄⁻] = 1.50M, and [H⁺] = 2.0 M