Electrochemistry – Multiple Choice Questions

__ 1. Which of these chemical reactions is an oxidation-reduction reaction?

A. $Fe + S \rightarrow FeS$
B. $CO_2 + H_2O \rightarrow H_2CO_3$
C. $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$
D. $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

__ 2. What happens to the oxidizing agent in an oxidation-reduction reaction?

A. It is oxidized as it gains electrons.
B. It is oxidized as it loses electrons.
C. It is reduced as it gains electrons.
D, It is reduced as it loses electrons.

__ 3. In which substance does bromine have an oxidation number of +1?

A. Br_2 B. HBr C. HBrO D. $HBrO_2$

__ 4. Which statement is true for an electrochemical cell?

A. Oxidation occurs at the anode only.
B. Reduction occurs at the anode only.
C. Oxidation occurs at both the anode and cathode.
D. Reduction occurs at both the anode and cathode.

__ 5. Given the equation: $2Cr(s) + 3Pb^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Pb(s)$, which is the correct reduction half reaction?

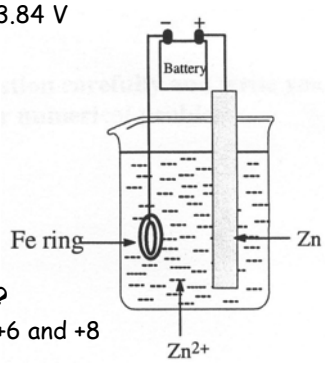
A. $Cr(s) \rightarrow Cr^{3+}(aq) + 3e^-$
B. $Cr(s) + 3e^- \rightarrow Cr^{3+}(aq)$
C. $Pb^{2+}(aq) \rightarrow Pb(s) + 2e^-$
D. $Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$

__ 6. What is the E° for an electrochemical cell with the following reaction? $2Au^{3+} + 3Co \rightarrow 3Co^{2+} + 2Au$

A. -1.22 V B. 1.78 V C. 1.22 V D. 3.84 V

__ 7. An iron ring is plated with zinc metal in the apparatus below.
Which of the following is true?

A. It is a voltaic cell and the reaction is spontaneous.
B. It is a voltaic cell and the reaction is not spontaneous.
C. It is an electrolytic cell and the reaction is spontaneous.
D. It is an electrolytic cell and the reaction is not spontaneous.



__ 8. What are the oxidation state of vanadium in the ions VO^{2+} and VO_4^{3-} respectively?

A. +4 and +5 B. +4 and +8 C. +6 and +5 D. +6 and +8

__ 9. Which one of the following reactions is a redox reaction?

A. $Pb^{2+}(aq) + 2Cl^-(aq) \rightarrow PbCl_2(s)$
B. $AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(aq)$
C. $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$
D. $2Al(s) + 3Cl_2(g) \rightarrow 2AlCl_3(s)$

__ 10. Consider the following unbalanced redox equation:

$$\_\_CH_3OH(l) + \_\_Cr_2O_7^{2-}(aq) + \_\_H^+(aq) \rightarrow \_\_CH_2O(aq) + \_\_ Cr^{3+}(aq) + \_\_H_2O(l)$$

Which of the following sets of numbers will balance the equation?

A. 1, 1, 14, 1, 2, 7 B. 3, 1, 8, 3, 2, 7 C. 3, 1, 8, 3, 2, 8 D. 3, 1, 14, 3, 2, 8

__ 11. In which of the following does sulfur have an oxidation number of +7?

A. HSO_3^- B. SO_3 C. H_2SO_4 D. $H_2S_2O_8$

__ 12. What happens to the reducing agent in an oxidation-reduction reaction?

A. It is oxidized as it gains electrons.
B. It is oxidized as it loses electrons.
C. It is reduced as it gains electrons.
D. It is reduced as it loses electrons.

__ 13. What is the term for the electrode where oxidation occurs?

A. anode B. cathode C. oxidizing agent D. reducing agent

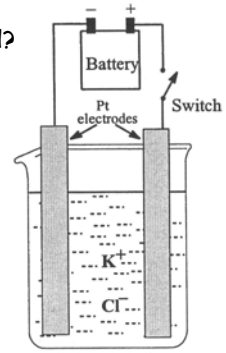
__ 14. Which of the following is true for an electrolytic cell?
A. An electric current is produced by a chemical reaction.
B. A nonspontaneous reaction is forced to occur.
C. Electrons flow towards the anode.
D. Electrons flow through the salt bridge.

__ 15. Which species is the oxidizing agent in the following reaction? $Cl_2(aq) + 2I^-(aq) \rightarrow I_2(aq) + 2Cl^-(aq)$
A. Cl_2 B. I^- C. I_2 D. Cl^-

__ 16. Which of the following statements is true for the reaction: $2Fe^{3+}(aq) + 2Br^-(aq) \rightarrow 2Fe^{2+}(aq) + Br_2(l)$
A. E° = -1.83 V and it is not spontaneous
B. E° = +0.29 V and it is spontaneous
C. E° = -0.29 V and it is not spontaneous
D. E° = +1.83 V and it is spontaneous.

__ 17. The cell potential, E°, for an oxidation-reduction reaction was found to equal 1.10 V. What can be said about this reaction?
A. at equilibrium B. endothermic C. nonspontaneous D. spontaneous

__ 18. The diagram shows the electrolysis of molten KCl. What occurs when the switch is closed?
A. Positive ions move toward the anode and gain electrons.
B. Positive ions move toward the anode and lose electrons.
C. Positive ions move toward the cathode and gain electrons.
D. Positive ions move toward the cathode and lose electrons.



__ 19. Consider the following standard reduction potentials:
$2H^+ + 2e^- \rightarrow H_2$ E° = 0.00 V
$Sn^{2+} + 2e^- \rightarrow Sn$ E° = -0.14 V
$Cd^{2+} + 2e^- \rightarrow Cd$ E° = -0.40 V
Which pair of substances will react spontaneously?
A. Sn with Cd^{2+} B. Cd^{2+} with H^+ C. Cd with H_2 D. Cd with Sn^{2+}

__ 20. What does the reducing agent do in an oxidation-reduction reaction?
A. gains electrons from the oxidizing agent
B. loses electrons to the oxidizing agent
C. is always reduced
D. is reduced by the oxidizing agent

__ 21. In these incomplete half-reactions which reactant is an oxidizing agent?
$Ag(s) \rightarrow Ag^+(aq)$
$Cl^-(aq) \rightarrow Cl_2(g)$
$Fe^{3+}(aq) \rightarrow Fe^{2+}(aq)$
$Sn^{2+}(aq) \rightarrow Sn^{4+}(aq)$
A. Ag(s) B. $Cl^-(aq)$ C. $Fe^{3+}(aq)$ D. $Sn^{2+}(aq)$

__ 22. What is the oxidation number of nitrogen in nitric acid, HNO_3?
A. +2 B. +3 C. +4 D. +5

__ 23. In an electrochemical cell, electrons travel in which direction?
A. from the anode to the cathode through the external circuit
B. from the anode to the cathode through the porous cup
C. from the cathode to the anode through the external circuit
D. from the cathode to the anode through the porous cup.

__ 24. In the reaction of Sn^{2+} with ClO_3^- to form Cl^- and Sn^{4+} in acid solution, what is the change in the oxidation number of Cl?
A. a decrease of 6 B. a decrease of 4 C. a decrease of 2 D. an increase of 2