Name: _____

1)   Given the reaction:

$$3Mg(s) + 2Cr^{3+}(aq) \rightleftharpoons 3Mg^{2+}(aq) + 2Cr(s)$$
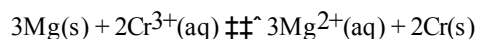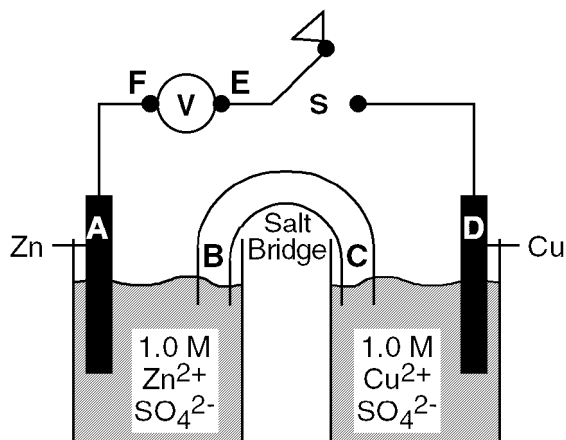
Based on the *Standard Electrode Potentials** chemistry reference table, what is the potential (E^0) for the overall reaction?

A) -1.63 volts   B) -3.11 volts   C) +1.63 volts   D) +3.11 volts

Questions 2 and 3 refer to the following:

The diagram below represents a voltaic cell.

2)   Which of the following statements correctly describes the direction of flow for the ions in this cell when the switch is closed?

A) Ions do not move through the salt bridge in either direction.
B) Ions move through the salt bridge in both directions.
C) Ions move through the salt bridge from C to B, only.
D) Ions move through the salt bridge from B to C, only.

3)   When the switch is closed, which group of letters correctly represents the direction of electron flow?

A) A , B , C , D B) D , E , F , A C) A , F , E , D D) D , C , B , A

4)   According to the *Activity Series* chemistry reference table, which element will react spontaneously with Al^{3+} at 298 K?

A) Cu   B) Ni   C) Li   D) Au

Questions 5 and 6 refer to the following:

The diagram below represents a voltaic cell at 298 K and 1 atmosphere.
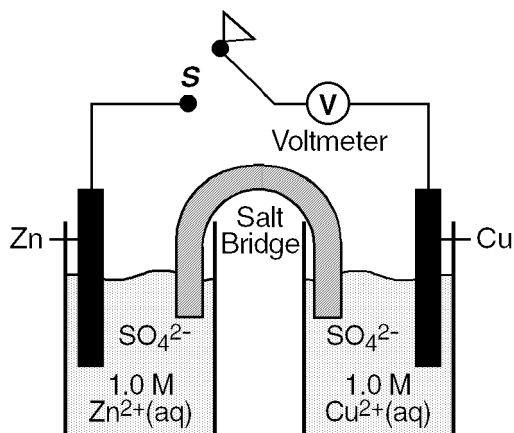
5)   Which species represents the cathode?

A) Cu^{2+} B) Zn^{2+} C) Zn   D) Cu

6) When switch S is closed, electrons in the external circuit will flow from

   A) Zn to Cu   B) Zn to Zn^{2+} C) Cu to Zn   D) Cu to Zn^{2+}

7) Which reaction occurs when a strip of magnesium metal is placed in a solution of $CuCl_2$?

   A) The magnesium metal is oxidized.   C) The chloride ion is oxidized.
   B) The magnesium metal is reduced.   D) The chloride ion is reduced.

8) In order for a redox reaction to be spontaneous, the potential (E^0) for the overall reaction must be

   A) greater than zero   C) zero
   B) less than -1   D) between zero and -1

9) According to the *Activity Series* chemistry reference table, which metal will react spontaneously with H^+?

   A) Cr   B) Cu   C) Ag   D) Au

10) Given the reaction:

$$Zn(s) + Br_2(aq) \rightleftharpoons Zn^{2+}(aq) + 2Br^-(aq)$$
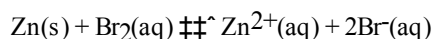
Based on the *Standard Electrode Potentials** chemistry reference table, what is the net cell potential (E^0) for the overall reaction?

   A) 0.33 V   B) -1.09 V   C) +1.85 V   D) +0.76 V

11) A student wishes to set up an voltaic cell. The following list of materials and equipment will be used:

   ◻ two 250-mL beakers
   ◻ wire
   ◻ one piece of Zn metal
   ◻ 125 mL of 0.10 M $Zn(NO_3)_2$
   ◻ voltmeter
   ◻ switch
   ◻ one piece of Pb metal
   ◻ 125 mL of 0.10 M $Pb(NO_3)_2$

For the cell to operate properly, the student will also need

   A) an external path for electrons   C) an anode
   B) a salt bridge   D) a cathode

12) What is the voltage for a chemical cell that has reached equilibrium?

   A) between 0 and 1   B) greater than 1   C) 1   D) 0

13) According to the *Activity Series* chemistry reference table, which metal will react spontaneously with Ag^+ ions, but *not* with Zn^+ ions?

   A) Cu   B) Mg   C) Au   D) Al

14) In a voltaic cell the anode is the electrode at which

   A) oxidation occurs and protons are lost   C) oxidation occurs and electrons are lost
   B) reduction occurs and protons are lost   D) reduction occurs and electrons are lost

Questions 15 through 17 refer to the following:

The diagram below represents a voltaic cell at 298 K.

$$Ni^0(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag^0(s)$$
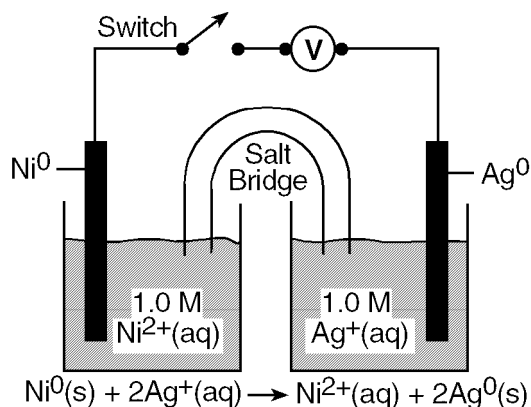
15) As the reaction in this cell takes place, the concentration of Ni^{2+} ions

   A) decreases and the concentration of Ag^+ ions increases

   B) increases and the concentration of Ag^+ ions increases

   C) increases and the concentration of Ag^+ ions decreases

   D) decreases and the concentration of Ag^+ ions decreases

16) In the given reaction, the Ag^+ ions

   A) lose protons   B) gain electrons   C) gain protons   D) lose electrons

17) According to the *Standard Electrode Potentials** chemistry reference table, what is the potential (E^0) for the cell when the switch is closed?

   A) 1.86 V   B) 1.34 V   C) 1.06 V   D) 0.54 V

18) The diagram below represents an voltaic cell.
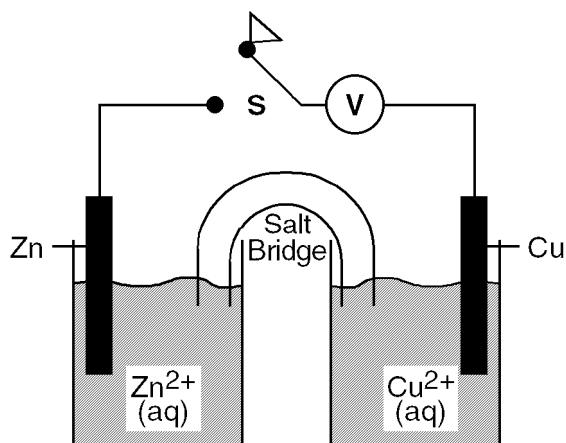
When switch *S* is closed, which particles undergo reduction?

   A) Cu atoms   B) Zn^{2+} ions   C) Zn atoms   D) Cu^{2+} ions

19) According to the *Activity Series* chemistry reference table, which molecule is *most* easily reduced?

   A) Br_2 B) Cl_2 C) F_2 D) I_2

Questions 20 and 21 refer to the following:

The voltaic cell below is at 298 K and 1 atmosphere.

20) When switch S is closed, which series of letters shows the path and direction of the electron flow?

    A) *FED*   B) *DEF*   C) *ABC*   D) *CBA*

21) Which part of the electrochemical cell permits the flow of ions from one half-cell to the other?

    A) *A*   B) *B*   C) *D*   D) *E*

22) Based on the *Activity Series* chemistry reference table, which element will replace Pb from $Pb(NO_3)_2(aq)$?

    A) Ag(s)   B) Cu(s)   C) Mg(s)   D) Au(s)

23) According to the *Activity Series* chemistry reference table, which metal will react spontaneously with $Cr^{3+}(aq)$, but *not* with $Ca^{2+}(aq)$?

    A) Pb   B) Ba   C) Co   D) Mg

24) Based on the *Standard Electrode Potentials** chemistry reference table, which pair will react spontaneously?

    A) I_2 and F^- B) I_2 and Ag   C) I_2 and Zn   D) I_2 and Cl^-

25) Based on the *Activity Series* chemistry reference table, which reaction will take place spontaneously?

    A) $Mg(s) + Ca^{2+}(aq) \leftrightarrow Mg^{2+}(aq) + Ca(s)$ C) $Ba(s) + (aq) + 2Na^+(s) \leftrightarrow Ba^{2+}(aq) + 2Na(s)$

    B) $I_2(g) + 2Br^-(aq) \leftrightarrow 2I^-(aq) + Br_2(g)$ D) $Cl_2(g) + 2F^-(aq) \leftrightarrow 2Cl^-(aq) + F_2(g)$

26) Which metal will react with hydrochloric acid to yield hydrogen gas as one of the products?

    A) Au   B) Cu   C) Ca   D) Ag

Questions 27 and 28 refer to the following:

The diagram below represents a voltaic cell at 298 K. The equation under the diagram represents the net cell reaction.

$$2Al^0(s) + 3Cu^{2+}(aq) \longrightarrow 2Al^{3+}(aq) + 3Cu^0(s)$$

27) When switch *S* is closed, electrons in the external circuit will flow from

A) Cu to Cu^{2+} B) Cu to Al   C) Al to Cu   D) Al to Al^{3+}

28) According to the *Standard Electrode Potentials* chemistry reference table, what is the maximum potential (E^0) for the cell when switch *S* is closed?

A) -2.00 volts   B) -1.32 volts   C) 2.00 volts   D) 1.32 volts

29) Which reaction will take place spontaneously?

A) $Pb + 2H^+ \rightleftharpoons Pb^{2+} + H_2$

B) $2Ag + 2H^+ \rightleftharpoons 2Ag^+ + H_2$

C) $2Au + 6H^+ \rightleftharpoons 2Au^{3+} + 3H_2$

D) $Cu + 2H^+ \rightleftharpoons Cu^{2+} + H_2$

30) What is the electron flow in a wire connecting the Zn and Cu electrodes of a zinc-copper voltaic cell at standard conditions?

A) from positive Cu to negative Zn

B) from negative Zn to positive Cu

C) from positive Zn to negative Cu

D) from negative Cu to positive Zn

31) According to the *Activity Series* chemistry reference table, which species can reduce Cr^{3+} ions?

A) Fe^{2+} B) Al   C) Ni   D) Sn^{2+}

32) According to the *Standard Electrode Potentials* chemistry reference table, which can act as *both* a reducing agent and an oxidizing agent?

A) Au^{3+} B) Zn^{2+} C) Fe^{2+} D) Al^{3+}

33) Given the reaction:

$$Fe(s) + Cu^{2+} \rightleftharpoons Fe^{2+} + Cu(s)$$

Based on *Standard Electrode Potentials* chemistry reference table, what is the potential (E^0) for the overall reaction?

A) +0.11 V   B) -0.79 V   C) -0.11 V   D) +0.79 V

34) Based on the *Standard Electrode Potentials* chemistry reference table, which half-cell has a *lower* reduction potential than the standard hydrogen half-cell?

A) $Cl_2(g) + 2e^- \rightleftharpoons 2Cl^-$

B) $Cu^{2+} + 2e^- \rightleftharpoons Cu(s)$

C) $Fe^{2+} + 2e^- \rightleftharpoons Fe(s)$

D) $I_2(s) + 2e^- \rightleftharpoons 2I^-$

35) At 298 K, which metal will release H$_2$(g) when reacted with HCl(aq)?

A) Au(s)   B) Ag(s)   C) Zn(s)   D) Hg(l)

36) Given the chemical cell reaction:

$2Ag^+ + Zn^0 \rightleftharpoons 2Ag^0 + Zn^{2+}$

Based on the *Standard Electrode Potentials** chemistry reference table, what is the net potential (E^0) for the cell?

A) 2.36 V   B) 0.04 V   C) 1.56 V   D) 0.84 V

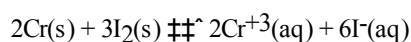37) Which metal will react with HCl(aq) to produce hydrogen gas?

A) Cu   B) Ag   C) Au   D) Zn

38) Based on the *Standard Electrode Potentials** chemistry reference table, what is the cell voltage (E^0) for the overall reaction?

$Mg(s) + 2Ag^+(aq) \rightleftharpoons Mg^{2+}(aq) + 2Ag(s)$

A) +3.97 V   B) +2.37 V   C) +1.57 V   D) +3.17 V

39) Given the reaction:

$2Cr(s) + 3I_2(s) \rightleftharpoons 2Cr^{+3}(aq) + 6I^-(aq)$

Based on the *Standard Electrode Potentials** chemistry reference table, the potential difference (E^0) of this cell is

A) 2.36 V   B) 0.14 V   C) 0.20 V   D) 1.28 V

40) A discharging lead-acid battery is *best* described as a(n)

A) voltaic cell that produces an electric current   C) electrolytic cell that produces an electric current
B) voltaic cell that uses an electric current   D) electrolytic cell that uses an electric current

41) What is the purpose of the salt bridge in a voltaic cell?

A) It prevents ion migration.   C) It allows ion migration.
B) It prevents electron flow.   D) It allows electron flow.

42) Based on the *Standard Electrode Potentials** chemistry reference table, what is the oxidation potential (E^0) of the half-reaction $Cu(s) \rightleftharpoons Cu^+ + e^-$?

A) -0.34 volt   B) +0.34 volt   C) -0.52 volt   D) +0.52 volt

43) Which species acts as the anode when the reaction $Zn(s) + Pb^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Pb(s)$ occurs in a voltaic cell?

A) Pb(s)   B) Zn(s)   C) Zn^{2+}(aq)   D) Pb^{2+}(aq)

44) According to the *Activity Series* chemistry reference table, which will reduce Mg^{2+} to Mg(s)?

A) Ag(s)   B) Fe(s)   C) Ba(s)   D) Pb(s)

45) A standard hydrogen half-cell is connected to a standard silver half-cell by means of a wire and a salt bridge. According to the *Standard Electrode Potentials** chemistry reference table, the maximum standard potential (E^0) for the cell is

A) -0.80 volt   B) +0.80 volt   C) +1.60 volts   D) -1.60 volts

Questions 46 and 47 refer to the following:

The diagram below represents a voltaic cell. The reaction occurs at 1 atmosphere and 298 K.

$Zn^0(s) + Pb^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Pb^0(s)$
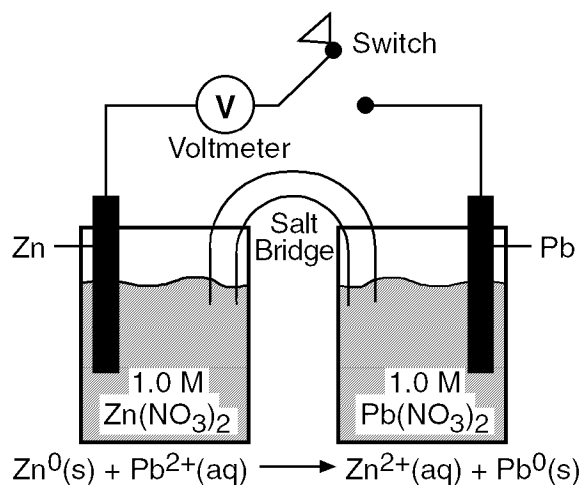
46) According to the *Standard Electrode Potentials** chemistry reference table, what is the cell potential (E^0) when the switch is closed?

A) -0.63 V   B) -0.89 V   C) +0.63 V   D) +0.89 V

47) What occurs when the switch is closed?

A) Zn is reduced and electrons flow to the Pb electrode.   C) Pb is oxidized and electrons flow to the Zn electrode.
B) Zn is oxidized and electrons flow to the Pb electrode.   D) Pb is reduced and electrons flow to the Zn electrode.

48) Which metal will react spontaneously with 1 M HCl at 298 K and 1 atmosphere?

A) Cu   B) Au   C) Hg   D) Mg

49) Based on the *Standard Electrode Potentials** chemistry reference table, which half-cell has a *lower* electrode potential than the standard hydrogen half-cell?

A) $Cu^+ + e^- \rightleftharpoons Cu(s)$ C) $Pb^{2+} + 2e^- \rightleftharpoons Pb(s)$
B) $Hg^{2+} + 2e^- \rightleftharpoons Hg(l)$ D) $Au^{3+} + 3e^- \rightleftharpoons Au(s)$

50) Which atom-ion pair will react spontaneously under standard conditions?

A) $Mg + Sr^{2+}$ B) $Mg + Ba^{2+}$ C) $Mg + Li^+$ D) $Mg + Ag^+$

51) Which ion is *most* easily oxidized?

A) Cl^- B) Br^- C) I^- D) F^-

52) Given the reaction:

$Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$
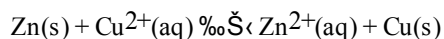
When the chemical cell reaction reaches equilibrium, the measured voltage will be

A) 1.10 V   B) 0.76 V   C) 0.00 V   D) 0.34 V

53) Based on the *Activity Series* chemistry reference table, which ion will react spontaneously with Co(s)?

A) Ag^+ B) Li^+ C) Al^{3+} D) Zn^{2+}

Questions 54 and 55 refer to the following:

The diagram below represents a voltaic cell at 298 K and 1 atmosphere.
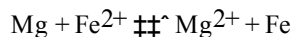

$$Mg(s) + 2Ag^+(aq) \longrightarrow Mg^{2+}(aq) + 2Ag(s)$$
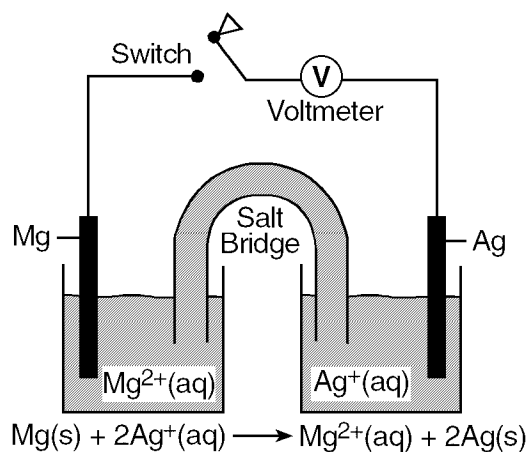
54) Which species is oxidized when the switch is closed?

A) Ag(s) B) $Ag^+(aq)$ C) Mg(s) D) $Mg^{2+}(aq)$

55) When the switch is closed, electrons flow from

A) $Ag^+(aq)$ to $Mg^{2+}(aq)$ C) Ag(s) to Mg(s)
B) $Mg^{2+}(aq)$ to $Ag^+(aq)$ D) Mg(s) to Ag(s)
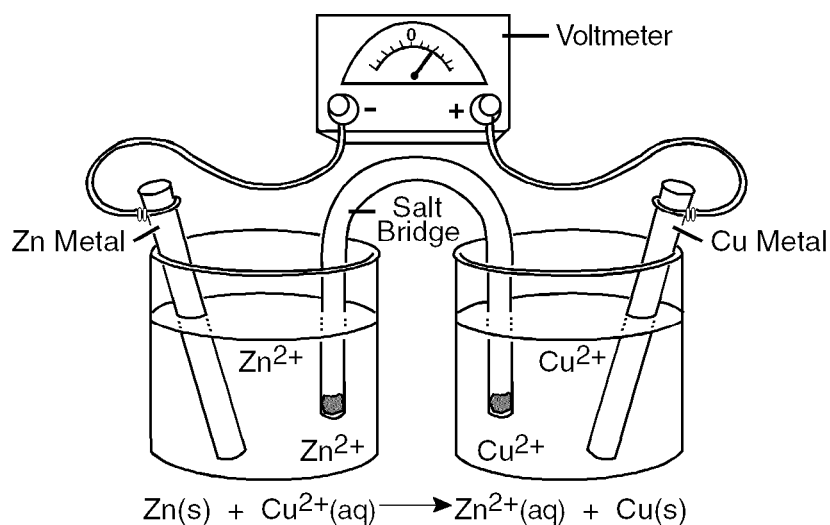
56)

$$Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$$

According to the *Standard Electrode Potentials** chemistry reference table, what is the potential (E^0) of this cell?

A) -0.42 V B) -1.10 V C) +1.10 V D) +0.42 V

57) Based on the *Standard Electrode Potentials** chemistry reference table, which half-cell has a *greater* reduction potential than the standard hydrogen half-cell?

A) $Ni^{2+} + 2e^- \ddagger\ddagger \hat{} Ni(s)$ C) $Pb^{2+} + 2e^- \ddagger\ddagger \hat{} Pb(s)$
B) $Sn^{4+} + 2e^- \ddagger\ddagger \hat{} Sn^{2+}$ D) $Na^+ + e^- \ddagger\ddagger \hat{} Na(s)$

58) A chemical cell has a net reaction of $Cu + 2Ag^+ \permil\check{S}\langle Cu^{2+} + 2Ag$. At equilibrium, the cell potential, in volts, is

A) +0.80 B) +0.34 C) -0.46 D) 0.00

59) According to the *Standard Electrode Potentials** chemistry reference table, what is the standard reduction potential (E^0) for a Mg(s) half-cell?

A) +1.19 V B) -2.37 V C) +2.37 V D) -1.19 V

60) According to the *Standard Electrode Potentials** chemistry reference table, which species can reduce Fe^{3+} to Fe^{2+}?

A) Ag(s)　　　　　　　B) Br⁻　　　　　　　C) Au(s)　　　　　　　D) I⁻

61) Given the reaction:

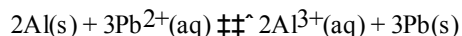$$2Cr(s) + 3Cu^{2+} \rightleftharpoons 3Cu(s) + 2Cr^{3+}$$

Based on the *Standard Electrode Potentials** chemistry reference table, the cell potential (E^0) for the overall reaction is

A) +0.40 V　　　　　　B) -0.40 V　　　　　　C) +1.08 V　　　　　　D) -1.08 V

62) Given the overall cell reaction:

$$Zn(s) + 2Ag^+(aq) \rightleftharpoons Zn^{+2}(aq) + 2Ag(s)$$

Which of the following will occur as the cell operates?

A) The amount of Zn(s) will increase.　　　　C) The concentration of Zn^{+2}(aq) will increase.

B) The amount of Ag(s) will decrease.　　　　D) The concentration of Ag^+(aq) will increase.

63) Which half-cell reaction serves as the arbitrary standard used to determine the standard electrode potentials?

A) $Na^+ + e^- \rightleftharpoons Na(s)$　　　　　　C) $2H^+ + 2e^- \rightleftharpoons H_2(g)$

B) $F_2(g) + 2e^- \rightleftharpoons 2F^-$　　　　　　D) $Ag^+ + e^- \rightleftharpoons Ag(s)$

64) Given the reaction:

$$2Au^{3+}(aq) + 3Ni^0 \rightleftharpoons 2Au^0 + 3Ni^{2+}(aq)$$

Based on the *Standard Electrode Potentials** chemistry reference table, the cell potential (E^0) for the overall reaction is

A) 2.28 volts　　　　　B) 1.24 volts　　　　　C) 1.76 volts　　　　　D) 3.78 volts

65) Which ion will oxidize Fe?

A) Mg^{2+}　　　　　　B) Zn^{2+}　　　　　　C) Ca^{2+}　　　　　　D) Cu^{2+}

66) According to the *Standard Electrode Potentials** chemistry reference table, which halogen will react spontaneously with Au(s) to produce Au^{3+}?

A) Cl_2　　　　　　　B) Br_2　　　　　　　C) F_2　　　　　　　D) I_2

67) Given the reaction:

$$Zn(s) + Ni^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Ni(s)$$

Based on the *Standard Electrode Potentials** chemistry reference table, what is the cell voltage (E^0) for the overall reaction?

A) 0.76 V　　　　　　B) 1.02 V　　　　　　C) 0.50 V　　　　　　D) 0.26 V

68) A voltaic cell differs from an electrolytic cell because in a voltaic cell there is

A) an anode and a cathode　　　　　　　C) a redox reaction that produces an electric current

B) an electric current that causes a redox reaction　　　　D) a positive and negative electrode

69) The overall reaction in a voltaic cell is $Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$. As the reaction in this cell takes place, the

A) mass of the Cu(s) electrode decreases　　　　C) mass of the Zn(s) electrode decreases

B) Zn^{2+}(aq) concentration remains the same　　　　D) Cu^{2+}(aq) concentration remains the same

70) The number of electrons moving in a wire is measured in

A) degrees　　　　　　B) ampheres　　　　　　C) volts　　　　　　D) joules

71) The half-reaction $2H^+(aq) + 2e^- \rightleftharpoons H_2(g)$ will occur when H^+(aq) reacts with

A) Ag(s)　　　　　　　B) Hg(l)　　　　　　　C) Pb(s)　　　　　　　D) Cu(s)

72) Given the overall cell reaction:

$$Cu^{+2} + X \rightleftharpoons X^{+2} + Cu$$

According to the *Activity Series* chemistry reference table, X must represent

A) Zn^{2+} B) Ag   C) Zn   D) Ag^+

73) According to the *Standard Electrode Potentials** chemistry reference table, which half-reaction has a reduction potential (E^0) of +1.50 volts?

A) $Au^{3+} + 3e^- \rightleftharpoons Au(s)$ C) $Ba^{2+} + 2e^- \rightleftharpoons Ba(s)$

B) $Cr^{3+} + 3e^- \rightleftharpoons Cr(s)$ D) $Sn^{2+} + 2e^- \rightleftharpoons Sn(s)$

74) Which metal will react with hydrochloric acid and produce $H_2(g)$?

A) Ag   B) Cu   C) Mg   D) Au

75) Which half-reaction is used as the standard for determining the relative reducing tendencies of other *Activity Series* metals?

A) $Na^+ + e^- \rightleftharpoons Na(s)$ C) $2H^+ + 2e^- \rightleftharpoons H_2(g)$

B) $F_2(g) + 2e^- \rightleftharpoons 2F^-$ D) $Ag^+ + e^- \rightleftharpoons Ag(s)$

76) Based on the *Activity Series* chemistry reference table, which ion is *most* easily oxidized?

A) I^- B) F^- C) Br^- D) Cl^-

77) Based on the *Activity Series* chemistry reference table, which metal will react with H^+ ions to produce $H_2(g)$?

A) Mg   B) Au   C) Cu   D) Ag

78) Given the reaction:

$$2Na(s) + Cl_2(g) \rightleftharpoons 2Na^+ + 2Cl^-$$

Based on the *Standard Electrode Potentials** chemistry reference table, what is the potential (E^0) for the overall reaction?

A) +4.07 V   B) -4.07 V   C) +1.35 V   D) -1.35 V

79) The diagram below represents a voltaic cell at 298 K.

$$2Al(s) + 3Ni^{2+}(aq) \rightarrow 2Al^{3+}(aq) + 3Ni(s)$$

When the switch is closed, electrons flow from

A) Al(s) to Ni(s)   C) $Al^{3+}(aq)$ to $Ni^{2+}(aq)$

B) $Ni^{2+}(aq)$ to $Al^{3+}(aq)$ D) Ni(s) to Al(s)

80) Given the reaction:

$Mg + Fe^{2+} \rightleftharpoons Mg^{2+} + Fe$

Based on the *Standard Electrode Potentials** chemistry reference table, the potential difference (E^0) of this cell is

A) 2.81 volts   B) 1.93 volts   C) 0.44 volts   D) 2.37 volts

81) According to the *Activity Series* chemistry reference table, which ion will react spontaneously with Ag?

A) Mg^{2+} B) Mn^{2+} C) Al^{3+} D) Au^{3+}

82) The diagram below represents a voltaic cell.
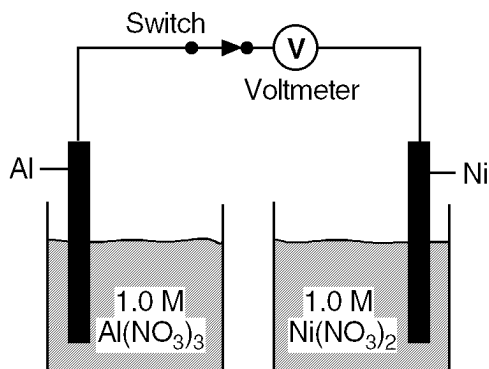
In order for the cell to operate, it should be provided with

A) an anode   C) a salt bridge
B) an external path for electrons   D) a cathode

83) Given the reaction:

$2Al(s) + 3Pb^{2+}(aq) \rightleftharpoons 2Al^{3+}(aq) + 3Pb(s)$

Based on the *Standard Electrode Potentials** chemistry reference table, the potential (E^0) for the overall reaction is

A) 3.71 V   B) 1.79 V   C) 2.93 V   D) 1.53 V

84) Given the reaction:

$2Fe^{3+} + 2I^- \rightleftharpoons 2Fe^{2+} + I_2$
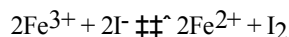
Based on the *Standard Electrode Potentials** chemistry reference table, the net potential (E^0) for the overall reaction is

A) 2.08 V   B) 1.31 V   C) 0.23 V   D) 1.00 V

85) In a voltaic cell composed of two half-cells, ions are allowed to flow from one half-cell to another by means of

A) electrodes   C) a salt bridge
B) a voltmeter   D) an external conductor

86) According to the *Standard Electrode Potentials** chemistry reference table, which overall reaction in a chemical cell has the *highest* net potential (E^0)?

A) $Mg(s) + 2H^+ \rightleftharpoons Mg^{2+} + H_2(g)$ C) $Zn(s) + 2H^+ \rightleftharpoons Zn^{2+} + H_2(g)$
B) $Sn(s) + 2H^+ \rightleftharpoons Sn^{2+} + H_2(g)$ D) $Ni(s) + 2H^+ \rightleftharpoons Ni^{2+} + H_2(g)$

87) What type of chemical reaction generates the electrical energy produced by a battery?

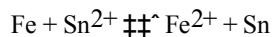A) addition   C) oxidation-reduction
B) substitution   D) neutralization

88) According to the *Activity Series* chemistry reference table, which reaction will take place spontaneously?

A) $Sr^{2+} + Sn(s) \rightleftharpoons Sr(s) + Sn^{2+}$

C) $Au^{3+} + Al(s) \rightleftharpoons Au(s) + Al^{3+}$

B) $Fe^{2+} + Cu(s) \rightleftharpoons Fe(s) + Cu^{2+}$

D) $Ni^{2+} + Pb(s) \rightleftharpoons Ni(s) + Pb^{2+}$

89) Which of the following will oxidize $Zn(s)$ to Zn^{2+}, but will *not* oxidize $Pb(s)$ to Pb^{2+}?

A) Co^{2+}
B) Mg^{2+}
C) Al^{3+}
D) Au^{3+}

90) Given the reaction:

$$Fe + Sn^{2+} \rightleftharpoons Fe^{2+} + Sn$$

Based on the *Standard Electrode Potentials** chemistry reference table, what is the potential difference (E^0) of this cell?

A) 0.59 V
B) 0.14 V
C) 0.45 V
D) 0.31 V

91) According to the *Standard Electrode Potentials** chemistry reference table, which reaction will occur spontaneously?

A) $Ag^+ + Cu(s) \rightleftharpoons Ag(s) + Cu^+$

C) $Mg^{2+} + Sn^{2+} \rightleftharpoons Mg(s) + Sn^{4+}$

B) $Co^{2+} + Cu(s) \rightleftharpoons Co(s) + Cu^{2+}$

D) $Fe^{2+} + Hg(l) \rightleftharpoons Fe(s) + Hg^{2+}$

92) Which metal will react spontaneously with $HCl(aq)$?

A) Au
B) Cu
C) Ca
D) Ag

93) The type of reaction in an voltaic cell is *best* described as a

A) spontaneous oxidation reaction, only
C) spontaneous oxidation-reduction reaction

B) nonspontaneous oxidation-reduction reaction
D) nonspontaneous oxidation reaction, only

94) According to the *Standard Electrode Potentials** chemistry reference table, what is the standard electrode potential (E^0) for the oxidation of $Cu(s)$ to Cu^{2+}?
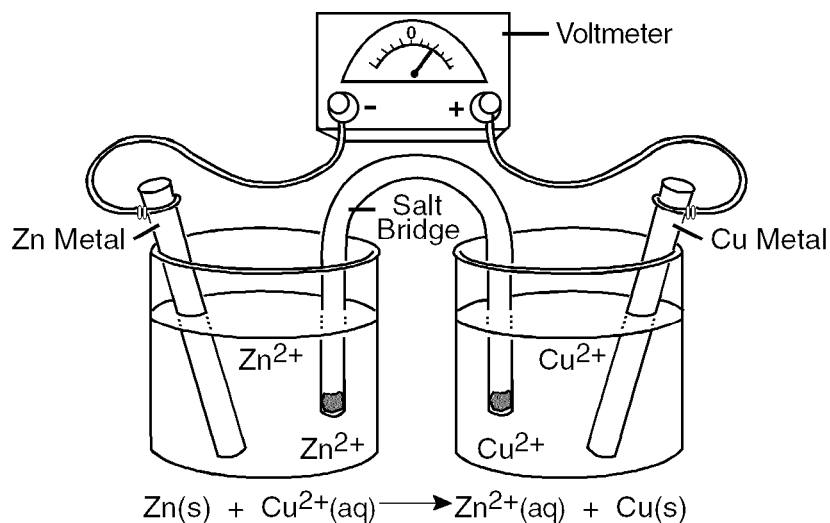
A) +0.34 V
B) -0.34 V
C) +0.52 V
D) -0.52 V

95) Given the reaction:
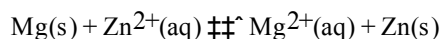
$$Mg(s) + Zn^{2+}(aq) \rightleftharpoons Mg^{2+}(aq) + Zn(s)$$

Based on the *Standard Electrode Potentials** chemistry reference table, what is the cell voltage (E^0) for the overall reaction?

A) +3.13 V
B) -3.13 V
C) +1.61 V
D) -1.61 V

96)

Zn(s) + Cu²⁺(aq) ⟶ Zn²⁺(aq) + Cu(s)

When this cell operates, the electrons flow from the

A) zinc half-cell to the copper half-cell through the wire
B) zinc half-cell to the copper half-cell through the salt bridge
C) copper half-cell to the zinc half-cell through the salt bridge
D) copper half-cell to the zinc half-cell through the wire

97) According to the *Activity Series* chemistry reference table, which metal reacts spontaneously with Ni^{+2}?

A) Sn   B) Ag   C) Cu   D) Fe

98) Electrochemical cells that produce positive E^0 values have

A) oxidation half-reactions, only

C) redox reactions that occur spontaneously

B) redox reactions that do not occur spontaneously

D) reduction half-reactions, only

99) Based on the *Activity Series* chemistry reference table, which metal will reduce Sn^{2+} to Sn?

A) Cu   B) Au   C) Fe   D) Ag

100) According to the *Activity Series* chemistry reference table, which metal can reduce Ni^{2+} ions?

A) Pb   B) Cu   C) Fe   D) Ag

101) According to the *Activity Series* chemistry reference table, which metal will react spontaneously with hydrochloric acid?

A) zinc   B) copper   C) silver   D) gold