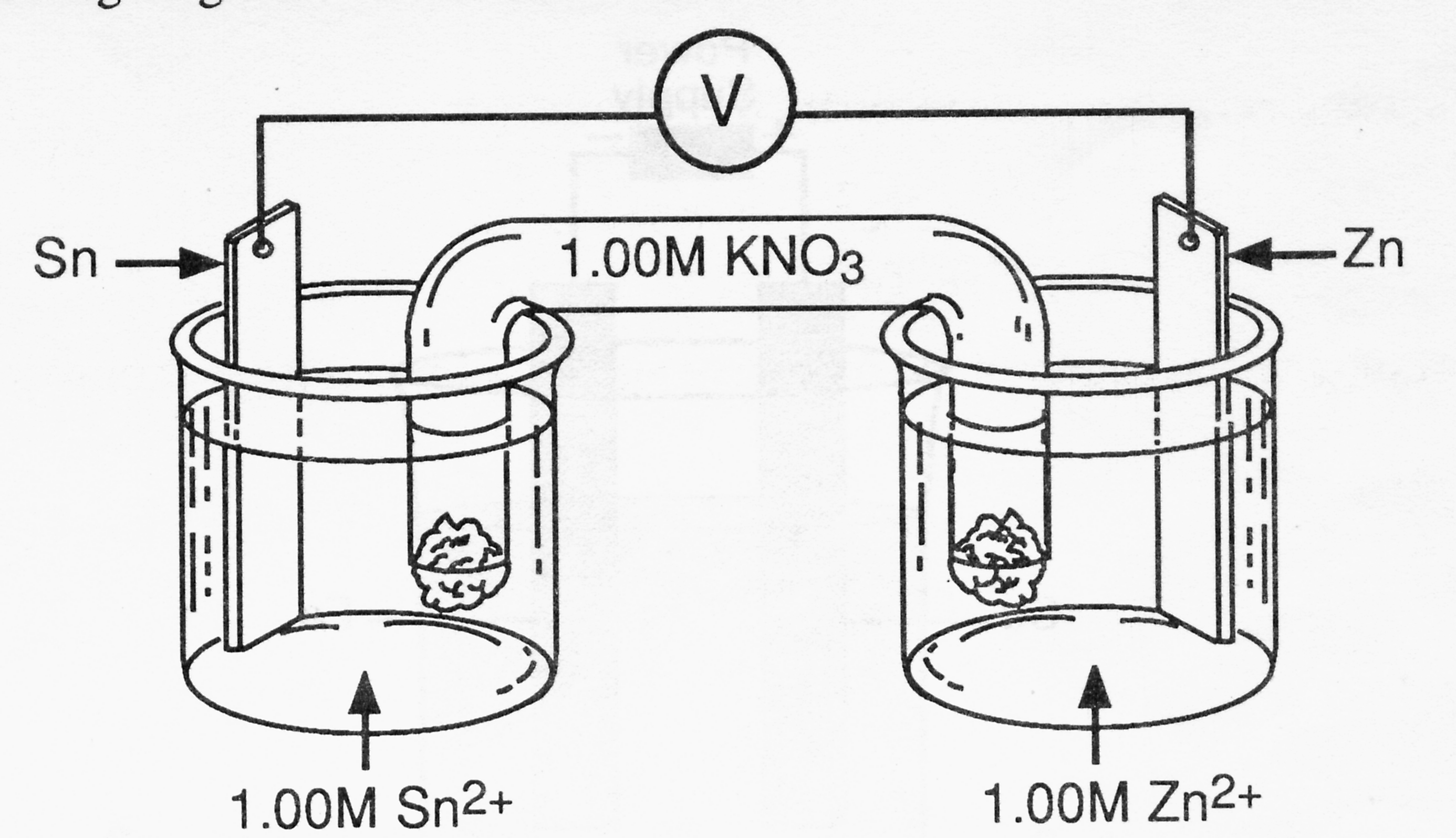
**Use the following diagram to answer question 46 and 47.**



Pb

1M Al(NO3)3

Al

1M Pb(NO3)2

46. When the external circuit is completed in the above electrochemical cell at standard conditions, what is the reaction at the anode?

A. Al3+(*aq*) + 3e− → Al(*s*)

B. Pb2+(*aq*) + 2e− → Pb(*s*)

C. Al(*s*) → Al3+(*aq*) + 3e−

D. Pb(*s*) → Pb2+(*aq*) + 2e−

47. As the above cell continues to operate, the solution in the lead half-cell will

A. increase in [Pb2+] and [K+]

B. increase in [Pb2+] and decrease in [K+]

C. decrease in [Pb2+] and [K+]

D. decrease in [Pb2+] and increase in [K+]

48. How many grams of Ba are produced when 2.00 mol of electrons are used in the electrolysis of molten barium chloride?

A. 68.5 g

B. 71.0 g

C. 137 g

D. 275 g

49. Consider this redox equation:

BrO3− + 6H+ + 3Sb3+ → Br− + 3Sb5+ + 3H2O

Which of the following loses electrons?

A. H+

B. Sb3+

C. H2O

D. BrO3−

50. Consider the following redox equation:

10CO2 + K2SO4 + 2MnSO4 + 8H2O → 2KMnO4 + 5H2C2O4 + 3H2SO4

The reducing agent in this reaction is

A. CO2

B. H2O

C. K2SO4

D. MnSO4

51. At standard conditions, which of the following is the strongest oxidizing agent?

A. Ca

B. Cu2+

C. NO3− in acid

D. MnO4− in base

52. At standard conditions, Fe2+ reacts spontaneously with

A. I2

B. Co

C. Br−

D. Ag+

53. What is the oxidation number of C in C2O42− ?

A. 0

B. 3+

C. 4+

D. 6+

54. Which of the following half-reactions is balanced?

A. 2NO3− + 2H2O + 2e− → N2O4 + 4OH−

B. 2NO3− + 2H2O → N2O4 + 2e− + 4OH−

C. 2NO3− + 4OH− → N2O4 + 2H2O + 2e−

D. 2NO3− + 4OH− + 2e− → N2O4 + 2H2O

55. In an electrochemical cell, electrons flow from the

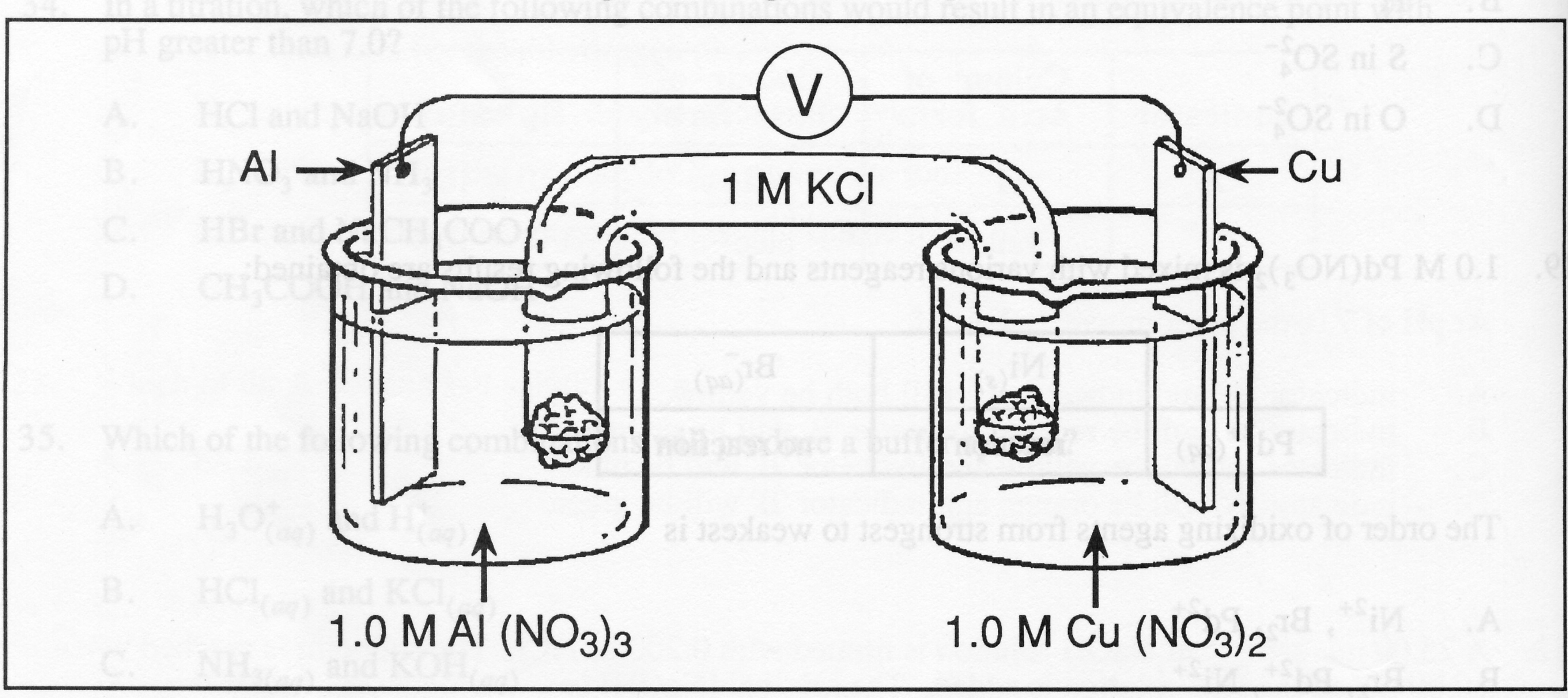
A. anode to the cathode through the salt bridge.

B. cathode to the anode through the salt bridge.

C. anode to the cathode through the external circuit.

D. cathode to the anode through the external circuit.

56. Given the following electrochemical cell:



##### Co

##### Fe

##### 1.00 M Co2+

##### 1.00 M Fe2+

As this cell operates, the

A. mass of the Co electrode increases and the [Fe2+] increases.

B. mass of the Fe electrode increases and the [Co2+] increases.

C. mass of the Co electrode increases and the [Fe2+] decreases.

D. mass of the Fe electrode increases and the [Co2+] decreases.

57. Which of the following redox equations represents a reaction in an electrolytic cell?

A. Cu2+ + Ni → Cu + Ni2+

B. Hg2+ + Ni → Hg + Ni2+

C. 2Ag+ + Ni → 2Ag + Ni2+

D. 2Al3+ + 3Ni → 3Ni2+ + 2Al

58. A material that provides cathodic protection for iron must

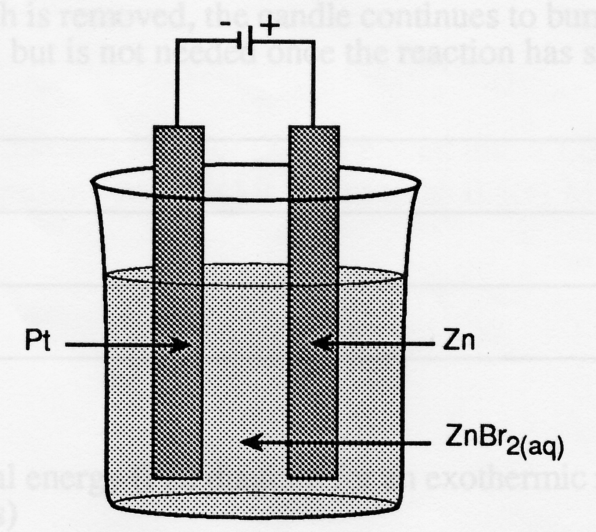
A. be more easily reduced than iron.

B. be more easily oxidized that iron.

C. be a better oxidizing agent than iron.

D. have a more positive standard reduction potential (E°) value than iron.

59. Given this electrolytic cell:



The reaction which takes place at the anode is

A. Zn → Zn2+ + 2e−

B. Zn2+ + 2e− → Zn

C. Br2 + 2e− → 2Br−

D. 2H2O → O2 + 4H+ + 4e−

60. An aqueous solution contains Na+ , Ni2+ , Zn2+ , and Cu2+ . Which ions can be extracted by electrolysis of the solution?

A. Na+ , Zn2+ , Ni2+

B. Cu2+ , Ni2+ , Na+

C. Zn2+ , Na+ , Cu2+

D. Ni2+ , Cu2+ , Zn2+

61. If a substance has lost electrons it

A. has been reduced.

B. has been oxidized.

C. has acted as a cathode.

D. has acted as an oxidizing agent.

62. A student investigating redox reactions recorded the following results:

V2+ + Te2− → no reaction

U4+ + Te2+ → U3+ + Te

Based on these results, the strengths of the oxidizing agents, arranged from strongest to weakest, are

A. V2+, Te, U4+

B. U4+, Te, V2+

C. U3+, Te2−, V2+

D. V2+, Te2−, U3+

63. Some S2O82−(*aq*), SO42−(*aq*), Cu2+(*aq*) and Cu(*s*) are placed in a container at standard conditions. Which of the following equations represents the predicted spontaneous reaction that would occur?

A. 2SO42− + Cu→ S2O82− + Cu2+

B. S2O82− + Cu → 2SO42− + Cu2+

C. S2O82− + Cu2+ → 2SO42− + Cu

D. 2SO42− + Cu2+ → S2O82− + Cu

64. Consider this redox equation:

C2O42− + MnO2 → Mn2+ + 2CO2

As a result of this reaction the oxidation number of each C atom has

A. increased by 1.

B. increased by 2.

C. decreased by 2.

D. decreased by 4.

65. When W2O5 is converted to WO2 in a redox reaction, the W has been

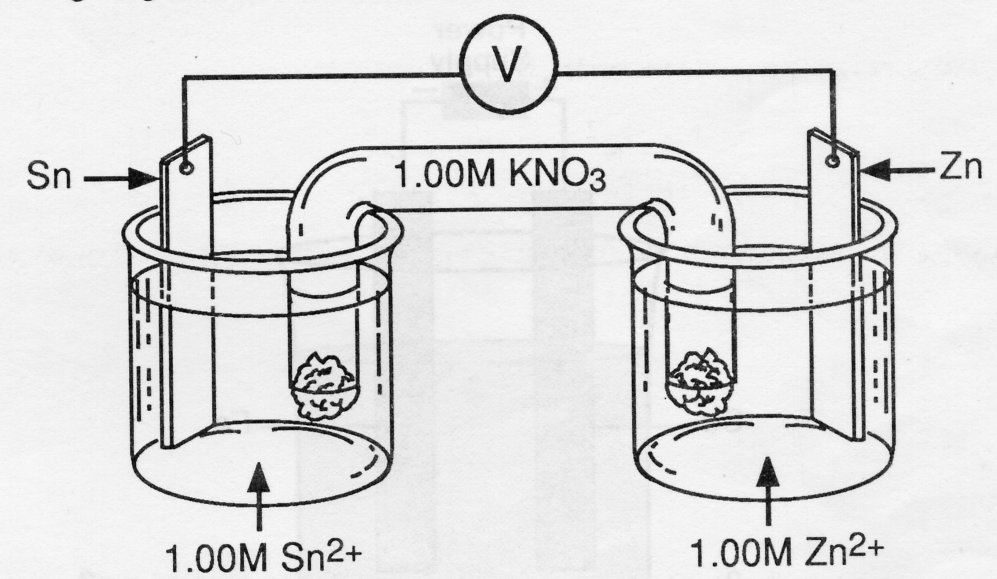
A. reduced since its oxidation number has increased.

B. reduced since its oxidation number has decreased.

C. oxidized since its oxidation number has increased.

D. oxidized since its oxidation number has decreased.

66. Consider the following diagram of an electrochemical cell:



The reaction that takes place at the anode is

A. Sn → Sn2+ + 2e−

B. Zn → Zn2+ + 2e−

C. Sn → 2e− + Sn

D. Zn2+ + 2e− → Zn

67. A student wants to determine the [Sn2+] in a solution of SnCl2 by a redox titration. A suitable ion to use would be

A. Br−

B. Cr3+

C. Pb2+

D. MnO4−

68. Which of the following metals could be used to make a container in which to store NiCl2 solution without a reaction occurring?

A. Cr

B. Pb

C. Co

D. Mn

69. When a metal undergoes corrosion, it

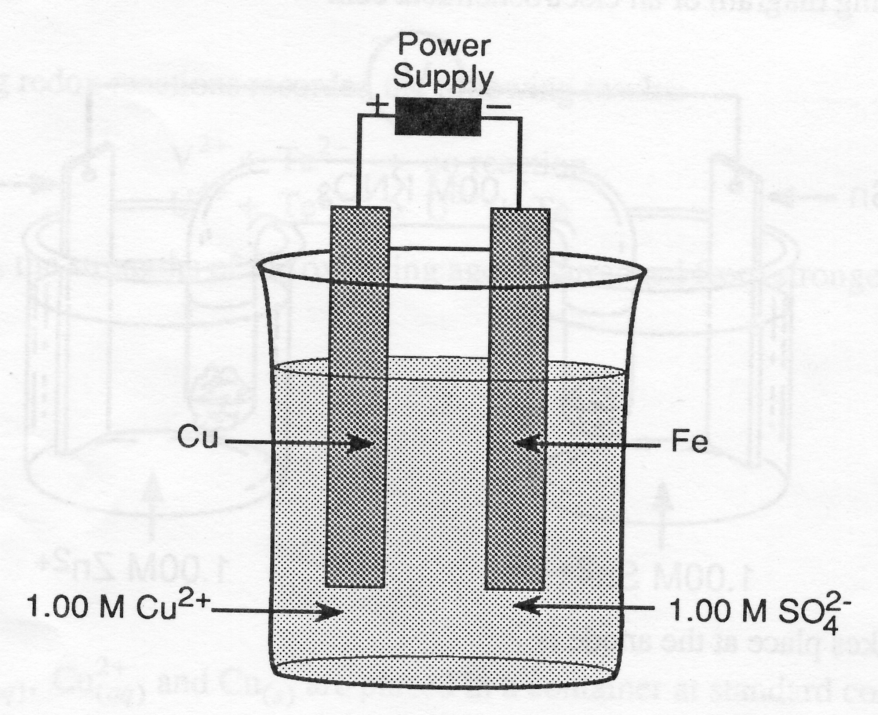
A. loses electrons.

B. becomes reduced.

C. acts as an oxidizing agent.

D. decreases in oxidation number.

70. Consider the following diagram of a chemical cell:



If this cell operates as an electrolytic cell to plate Cu onto Fe, which of the following acts as the anode?

A. Cu

B. Fe

C. SO42−

D. Cu2+

71. When electrolysis of molten Al2O3 is carried out, which of the following reactions will occur at the cathode?

A. 2O2− → O2 + 4e−

B. Al3+ + 3e− → Al

C. Al2O3 → 2Al3+ + 3O2−

D. 2H2O + 2e− → H2 + 2OH−