N

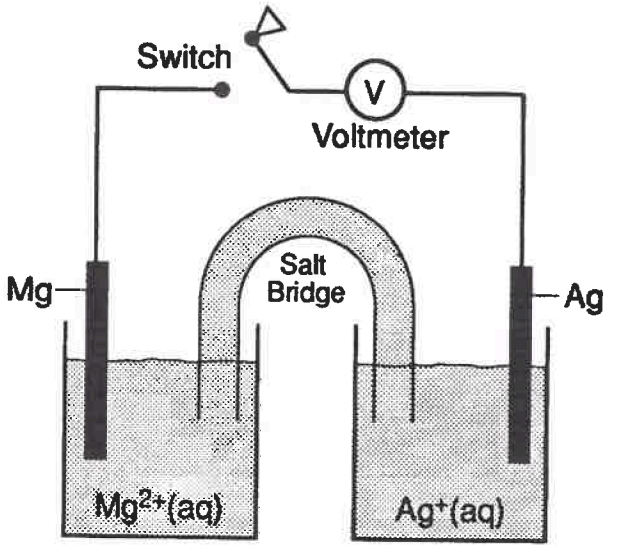
STANDARD ELECTRODE POTENTIALS	
Ionic Concentrations 1 M Water At 298 K, 1 atm	
Half-Reaction	E^0 (volts)
$F_2(g) + 2e^- \rightarrow 2F^-$	+2.87
$8H^+ + MnO_4^- + 5e^- \rightarrow Mn^{2+} + 4H_2O$	+1.51
$Au^{3+} + 3e^- \rightarrow Au(s)$	+1.50
$Cl_2(g) + 2e^- \rightarrow 2Cl^-$	+1.36
$14H^+ + Cr_2O_7^{2-} + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$	+1.23
$4H^+ + O_2(g) + 4e^- \rightarrow 2H_2O$	+1.23
$4H^+ + MnO_2(s) + 2e^- \rightarrow Mn^{2+} + 2H_2O$	+1.22
$Br_2(\ell) + 2e^- \rightarrow 2Br^-$	+1.09
$Hg^{2+} + 2e^- \rightarrow Hg(\ell)$	+0.85
$Ag^+ + e^- \rightarrow Ag(s)$	+0.80
$Hg_2^{2+} + 2e^- \rightarrow 2Hg(\ell)$	+0.80
$Fe^{3+} + e^- \rightarrow Fe^{2+}$	+0.77
$I_2(s) + 2e^- \rightarrow 2I^-$	+0.54
$Cu^+ + e^- \rightarrow Cu(s)$	+0.52
$Cu^{2+} + 2e^- \rightarrow Cu(s)$	+0.34
$4H^+ + SO_4^{2-} + 2e^- \rightarrow SO_2(aq) + 2H_2O$	+0.17
$Sn^{4+} + 2e^- \rightarrow Sn^{2+}$	+0.15
$2H^+ + 2e^- \rightarrow H_2(g)$	0.00
$Pb^{2+} + 2e^- \rightarrow Pb(s)$	-0.13
$Sn^{2+} + 2e^- \rightarrow Sn(s)$	-0.14
$Ni^{2+} + 2e^- \rightarrow Ni(s)$	-0.26
$Co^{2+} + 2e^- \rightarrow Co(s)$	-0.28
$Fe^{2+} + 2e^- \rightarrow Fe(s)$	-0.45
$Cr^{3+} + 3e^- \rightarrow Cr(s)$	-0.74
$Zn^{2+} + 2e^- \rightarrow Zn(s)$	-0.76
$2H_2O + 2e^- \rightarrow 2OH^- + H_2(g)$	-0.83
$Mn^{2+} + 2e^- \rightarrow Mn(s)$	-1.19
$Al^{3+} + 3e^- \rightarrow Al(s)$	-1.66
$Mg^{2+} + 2e^- \rightarrow Mg(s)$	-2.37
$Na^+ + e^- \rightarrow Na(s)$	-2.71
$Ca^{2+} + 2e^- \rightarrow Ca(s)$	-2.87
$Sr^{2+} + 2e^- \rightarrow Sr(s)$	-2.89
$Ba^{2+} + 2e^- \rightarrow Ba(s)$	-2.91
$Cs^+ + e^- \rightarrow Cs(s)$	-2.92
$K^+ + e^- \rightarrow K(s)$	-2.93
$Rb^+ + e^- \rightarrow Rb(s)$	-2.98
$Li^+ + e^- \rightarrow Li(s)$	-3.04

O

VAPOR PRESSURE OF WATER			
°C	torr (mmHg)	°C	torr (mmHg)
0	4.6	26	25.2
5	6.5	27	26.7
10	9.2	28	28.3
15	12.8	29	30.0
16	13.6	30	31.8
17	14.5	40	55.3
18	15.5	50	92.5
19	16.5	60	149.4
20	17.5	70	233.7
21	18.7	80	355.1
22	19.8	90	525.8
23	21.1	100	760.0
24	22.4	105	906.1
25	23.8	110	1074.6

Name: **Red Cat gets fat and An Ox gets skinny** **Redox 2**

Base your answers to questions **1** and **2** on the equation and diagram below represent an electrochemical cell at 298 K and 1 atmosphere.



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

1. Which species is oxidized when the switch is closed?
   (1) Mg(s) (3) Ag(s)
   (2) Mg^{2+} (aq) (4) Ag^{+}(aq)

2. When the switch is closed, electrons flow from
   (1) Mg^{2+}(aq) to Ag^{+}(aq) (3) Mg(s) to Ag(s)
   (2) Ag^{+}(aq) to Mg^{2+}(aq) (4) Ag(s) to Mg(s)

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3. Based on Reference Table J, which reaction will take place spontaneously?
   (1) $Pb + 2\,H^{+} \rightarrow Pb^{2+} + H_2$
   (2) $2\,Ag + 2\,H^{+} \rightarrow 2\,Ag^{+} + H_2$
   (3) $Cu + 2\,H^{+} \rightarrow Cu^{2+} + H_2$
   (4) $2\,Au + 6\,H^{+} \rightarrow 2\,Au^{3+} + 3\,H_2$

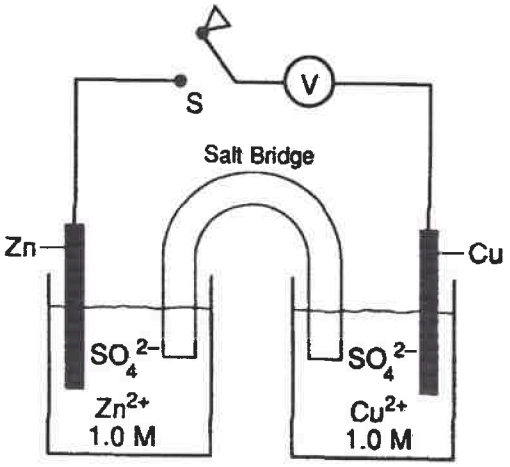
4. Given the reaction:

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

   What is the net potential (E^0) for the overall reaction?
   (1) +0.51 V (3) –1.03 V
   (2) +1.03 V (4) –0.51 V

5. In a chemical cell composed of two half-cells, ions are allowed to flow from one half-cell to another by means of
   (1) electrodes (3) a voltmeter
   (2) an external conductor (4) a salt bridge

Base your answers to questions **6** and **7** on the diagram below which represents a chemical cell at 298 K and 1 atmosphere.



6. Which species represents the cathode?
   (1) Cu (3) Zn
   (2) Zn^{2+} (4) Cu^{2+}

7. When switch S is closed, electrons in the external circuit will flow from
   (1) Zn to Cu (3) Cu to Zn^{2+}
   (2) Cu to Zn (4) Zn to Zn^{2+}

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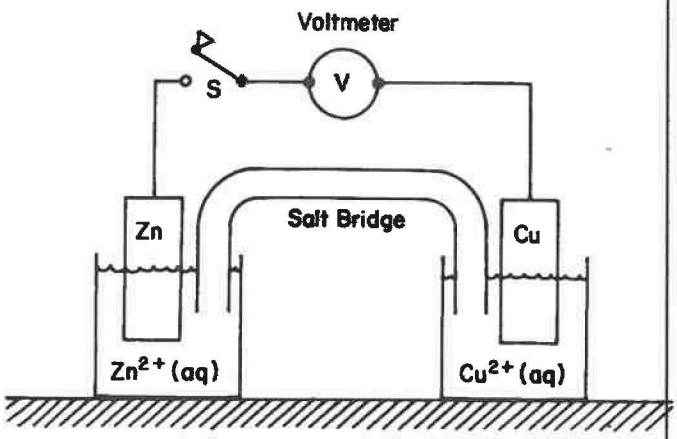
8. Which statement describes the redox reaction that occurs when an object is electroplated?
   (1) It is non-spontaneous and requires an electric current.
   (2) It is spontaneous and requires an electric current.
   (3) It is non-spontaneous and produces an electric current.
   (4) It is spontaneous and produces an electric current.

9. In order for a redox reaction to be spontaneous, the potential (E°) for the overall reaction must be
   (1) between zero and –1 (3) zero
   (2) greater than zero (4) less than –1

Version 3

10. The diagram below represents an electrochemical cell.



When switch *S* is closed, which particles undergo reduction?

(1) Cu atoms
(2) Cu^{2+} ions
(3) Zn^{2+} ions
(4) Zn atoms

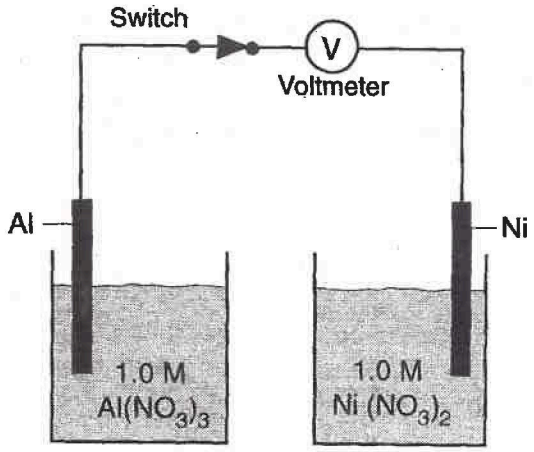
11. Given the reaction:

$2\ Au^{3+}(aq) + 3\ Ni^{\circ} \rightarrow 2\ Au^{\circ} + 3\ Ni^{2+}(aq)$

The cell potential (E°) for the overall reaction is

(1) 2.22 volts
(2) 1.76 volts
(3) 3.78 volts
(4) 1.24 volts

12. The diagram below represents a chemical cell.



In order for the cell to operate, it should be provided with

(1) an anode
(2) a salt bridge
(3) an external path for electrons
(4) a cathode

13. An electrolytic cell is different from an electrochemical cell because in an electrolytic cell

(1) a spontaneous reaction occurs
(2) a redox reaction occurs
(3) an electric current is produced
(4) an electric current causes a chemical reaction

14. A standard zinc half-cell is connected to a standard copper half cell by means of a wire and a salt bridge. Which electronic equation represents the oxidation reaction that takes place?

(1) $Cu^0 - 2e^- \rightarrow Cu^{2+}$
(2) $Zn^{2+} + 2e^- \rightarrow Zn^0$
(3) $Cu^{2+} + 2e^- \rightarrow Cu^0$
(4) $Zn^0 - 2e^- \rightarrow Zn^{2+}$

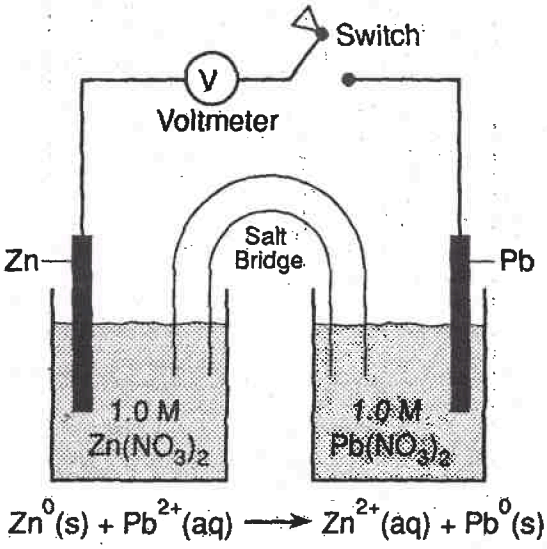
15. Given the reaction:

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

Based on Reference Table X, what is the potential (E°) for the overall reaction?

(1) +4.07 V
(2) –1.36 V
(3) +1.36 V
(4) –4.07 V

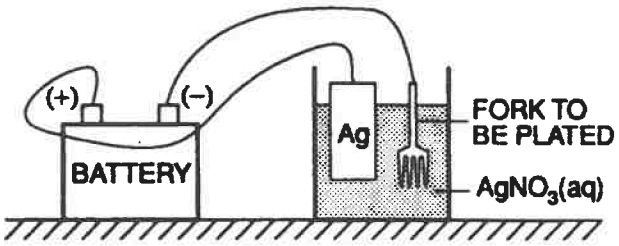
Base your answers to questions **16** and **17** on the diagram of the chemical cell shown below. The reaction occurs at 1 atmosphere and 298 K.



16. When the switch is closed, what occurs?
    (1) Pb is reduced and electrons flow to the Zn electrode.
    (2) Zn is oxidized and electrons flow to the Pb electrode.
    (3) Pb is oxidized and electrons flow to the Zn electrode.
    (4) Zn is reduced and electrons flow to the Pb electrode.

17. When the switch is closed, the cell voltage (E^0) is
    (1) +0.63 V
    (2) +0.89 V
    (3) –0.63 V
    (4) –0.89 V

Base your answers to questions **18** and **19** on the diagram below which represents the electroplating of a metal fork with Ag(s).



18. Which equation represents the half-reaction that takes place at the fork?
    (1) $Ag(s) \rightarrow Ag^+ + e^-$
    (2) $Ag^+ + e^- \rightarrow Ag(s)$
    (3) $AgNO_3 \rightarrow Ag^+ + NO_3^-$
    (4) $Ag^+ + NO_3^- \rightarrow AgNO_3$

19. Which part of the electroplating system is provided by the fork?
    (1) the cathode, which is the negative electrode
    (2) the anode, which is the negative electrode
    (3) the anode, which is the positive electrode
    (4) the cathode, which is the positive electrode

20. Which statement is true about oxidation and reduction in an electrochemical cell?
    (1) Both occur at the anode.
    (2) Oxidation occurs at the cathode and reduction occurs at the anode.
    (3) Both occur at the cathode.
    (4) Oxidation occurs at the anode and reduction occurs at the cathode.

SIDE 2

RESCORE | MARK ✓

Redox2 test
V-3

	T	F				
51	●	②	③	④	⑤	1
52	①	②	●	④	⑤	3
53	●	②	③	④	⑤	1
54	①	●	③	④	⑤	2
55	①	②	③	●	⑤	4
56	●	②	③	④	⑤	1
57	●	②	③	④	⑤	1
58	●	②	③	④	⑤	1
59	①	●	③	④	⑤	2
60	①	●	③	④	⑤	2
61	①	●	③	④	⑤	2
62	①	●	③	④	⑤	2
63	①	②	③	●	⑤	4
64	①	②	③	●	⑤	4
65	●	②	③	④	⑤	1
66	①	●	③	④	⑤	2
67	●	②	③	④	⑤	1
68	①	●	③	④	⑤	2
69	●	②	③	④	⑤	1
70	①	②	③	●	⑤	4
71	①	②	③	④	⑤	
72	①	②	③	④	⑤	
73	①	②	③	④	⑤	
74	①	②	③	④	⑤	
75	①	②	③	④	⑤	

	T	F
76	①	② ③ ④ ⑤
77	①	② ③ ④ ⑤
78	①	② ③ ④ ⑤
79	①	② ③ ④ ⑤
80	①	② ③ ④ ⑤
81	①	② ③ ④ ⑤
82	①	② ③ ④ ⑤
83	①	② ③ ④ ⑤
84	①	② ③ ④ ⑤
85	①	② ③ ④ ⑤
86	①	② ③ ④ ⑤
87	①	② ③ ④ ⑤
88	①	② ③ ④ ⑤
89	①	② ③ ④ ⑤
90	①	② ③ ④ ⑤
91	①	② ③ ④ ⑤
92	①	② ③ ④ ⑤
93	①	② ③ ④ ⑤
94	①	② ③ ④ ⑤
95	①	② ③ ④ ⑤
96	①	② ③ ④ ⑤
97	①	② ③ ④ ⑤
98	①	② ③ ④ ⑤
99	①	② ③ ④ ⑤
100	①	② ③ ④ ⑤

KEY ITEM COUNT

20

0 ●
1 1
● 2
3 3
4 4
5 5
6
7
8
9

2 FEED THIS DIRECTION

DO NOT WRITE IN THIS AREA

SCORE	20 100	# CORRECT % CORRECT
RESCORE		# CORRECT % CORRECT
ROSTER NUMBER	KEY	SCORE RESCORE

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