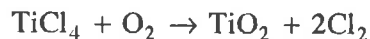


ELECTROCHEMISTRY MONSTER REVIEW

1. Which of the following represents a redox reaction?

- A. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- B. $\text{SiCl}_4 + 2\text{Mg} \rightarrow \text{Si} + 2\text{MgCl}_2$
- C. $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow 2\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
- D. $\text{AgBr} + 2\text{S}_2\text{O}_3^{2-} \rightarrow \text{Ag}(\text{S}_2\text{O}_3)_2^{3-} + \text{Br}^-$

2. Consider the following reaction:



Each oxygen atom is

- A. reduced and loses $2e^-$
- B. reduced and gains $2e^-$
- C. oxidized and loses $2e^-$
- D. oxidized and gains $2e^-$

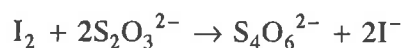
3. When NO_2 acts as a reducing agent, a possible product is

- A. NO
- B. N_2O
- C. N_2O_4
- D. N_2O_5

4. Which of the following 1.0 M solutions will react spontaneously with lead?

- A. KCl
- B. CuCl_2
- C. ZnCl_2
- D. MgCl_2

5. Consider the following redox reaction:



In a titration, 40.00 mL of $\text{Na}_2\text{S}_2\text{O}_3$ is needed to react completely with 4.0×10^{-3} mol I_2 . What is the concentration of $\text{Na}_2\text{S}_2\text{O}_3$?

- A. 0.10 M
- B. 0.16 M
- C. 0.20 M
- D. 0.32 M

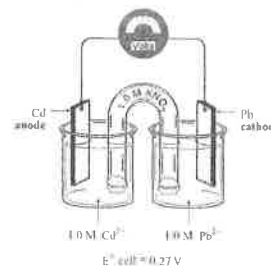
6. In an operating electrochemical cell the function of a salt bridge is to

- A. allow hydrolysis to occur.
- B. allow a non-spontaneous reaction to occur.
- C. permit the migration of ions within the cell.
- D. transfer electrons from the cathode to the anode.

7. As the cell operates, electrons flow toward

- A. the Pb electrode, where Pb is oxidized.
- B. the Cd electrode, where Cd is oxidized.
- C. the Pb electrode, where Pb^{2+} is reduced.
- D. the Cd electrode, where Cd^{2+} is reduced.

Use the following diagram to answer questions 7+8



8. The E° value for the reduction of Cd^{2+} is

- A. -0.40 V C. $+0.14 \text{ V}$
B. -0.27 V D. $+0.40 \text{ V}$

9. The following reaction occurs in an electrochemical cell:



The E° for the cell is

- A. 0.40 V C. 1.08 V
B. 0.75 V D. 2.50 V

10. During the corrosion of magnesium, the anode reaction is

- A. $\text{Mg} \rightarrow \text{Mg}^{2+} + 2\text{e}^-$
B. $\text{Mg}^{2+} + 2\text{e}^- \rightarrow \text{Mg}$
C. $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$
D. $\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightarrow 4\text{OH}^-$

11. A molten binary salt, ZnCl_2 , undergoes electrolysis. The cathode reaction is

- A. $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$ C. $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
B. $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$ D. $\text{Zn}^{2+} + 2\text{e}^- \rightarrow \text{Zn}$

12. Manganese has an oxidation number of +4 in

- A. MnO
- B. MnO₂
- C. Mn₂O₃
- D. Mn₂O₇

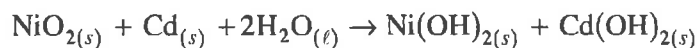
13. In which reaction is nitrogen reduced?

- A. $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$
- B. $4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O}$
- C. $\text{Cu}^{2+} + 2\text{NO}_2 + 2\text{H}_2\text{O} \rightarrow \text{Cu} + 4\text{H}^+ + 2\text{NO}_3^-$
- D. $4\text{Zn} + 10\text{H}^+ + \text{NO}_3^- \rightarrow 4\text{Zn}^{2+} + \text{NH}_4^+ + 3\text{H}_2\text{O}$

14. An oxidizing agent will cause which of the following changes?

- A. $\text{PtO}_2 \rightarrow \text{PtO}$
- B. $\text{PtO}_3 \rightarrow \text{PtO}_2$
- C. $\text{Pt}(\text{OH})_2 \rightarrow \text{Pt}$
- D. $\text{Pt}(\text{OH})_2^{2+} \rightarrow \text{PtO}_3$

15. Consider the overall reaction of the rechargeable nickel-cadmium battery:



Which of the following occurs at the **anode** as the reaction proceeds?

- A. Cd loses $2e^-$ and forms $\text{Cd}(\text{OH})_{2(s)}$
- B. Cd gains $2e^-$ and forms $\text{Cd}(\text{OH})_{2(s)}$
- C. NiO_2 loses $2e^-$ and forms $\text{Ni}(\text{OH})_{2(s)}$
- D. NiO_2 gains $2e^-$ and forms $\text{Ni}(\text{OH})_{2(s)}$

16. Which of the following will oxidize Fe^{2+} ?

- A. $\text{I}_{2(s)}$
- B. $\text{Ni}_{(s)}$
- C. $\text{Zn}_{(s)}$
- D. $\text{Br}_{2(l)}$

17. Consider the following half-reaction in a basic solution:



The balanced half-reaction is

- A. $\text{Ag}_2\text{O}_3 + 4\text{H}^+ + 4e^- \rightarrow 2\text{AgO} + 2\text{H}_2\text{O}$
- B. $\text{Ag}_2\text{O}_3 + 2\text{H}^+ + 2e^- \rightarrow 2\text{AgO} + \text{H}_2\text{O}$
- C. $\text{Ag}_2\text{O}_3 + \text{H}_2\text{O} + 2e^- \rightarrow 2\text{AgO} + 2\text{OH}^-$
- D. $\text{Ag}_2\text{O}_3 + 2\text{H}_2\text{O} + 4e^- \rightarrow 2\text{AgO} + 4\text{OH}^-$

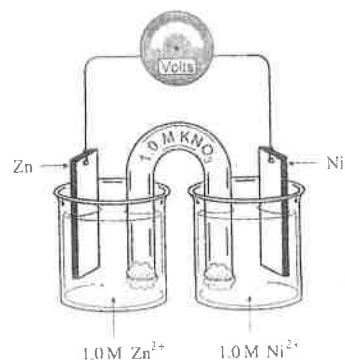
18. The concentration of $\text{Fe}^{2+}_{(aq)}$ can be determined by a redox titration using

- A. KBr
- B. SnCl_2
- C. KMnO_4 (basic)
- D. KBrO_3 (acidic)

19. Consider the following electrochemical cell:

Which of the following occurs as the cell operates?

- A. Zinc electrode is reduced and increases in mass.
- B. Zinc electrode is reduced and decreases in mass.
- C. Zinc electrode is oxidized and increases in mass.
- D. Zinc electrode is oxidized and decreases in mass.



20. Which of the following reactants would produce an E° of $+0.63\text{ V}$?

- A. $\text{Ag}^+ + \text{I}_2$
- B. $\text{Pb}^{2+} + \text{Zn}$
- C. $\text{Mg}^{2+} + \text{Ca}$
- D. $\text{Zn}^{2+} + \text{Mn}$

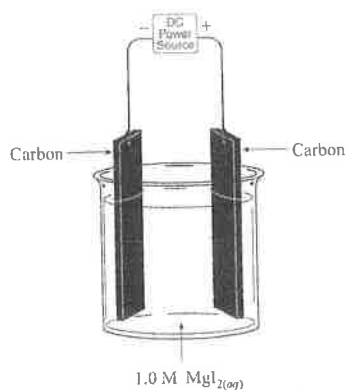
21. The process of applying an electric current through a cell to produce a chemical change is called

- A. corrosion.
- B. ionization.
- C. hydrolysis.
- D. electrolysis.

22. Consider the following electrolytic cell:

The cathode reaction is

- A. $2\text{I}^- \rightarrow \text{I}_2 + 2\text{e}^-$
- B. $\text{Mg}^{2+} + 2\text{e}^- \rightarrow \text{Mg}$
- C. $\text{H}_2\text{O} \rightarrow \frac{1}{2}\text{O}_2 + 2\text{H}^+ + 2\text{e}^-$
- D. $2\text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{OH}^-$



23. A chemical process involving the loss of electrons is a definition of

- A. oxidation. C. galvanization.
B. reduction. D. cathodic protection.

24. Which of the following is **not** a redox reaction?

- A. $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ C. $\text{CuS} + 2\text{O}_2 + \text{C} \rightarrow \text{Cu} + \text{SO}_2 + \text{CO}_2$
B. $\text{SO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{S}_2\text{O}_7$ D. $4\text{Ag} + 2\text{H}_2\text{S} + \text{O}_2 \rightarrow 2\text{Ag}_2\text{S} + 2\text{H}_2\text{O}$

25. A reducing agent will cause which of the following changes?

- A. $\text{ClO}_3^- \rightarrow \text{ClO}_2$ C. $\text{H}_3\text{PO}_3 \rightarrow \text{H}_3\text{PO}_4$
B. $\text{NO}_2^- \rightarrow \text{N}_2\text{O}_4$ D. $\text{HS}_2\text{O}_4^- \rightarrow \text{H}_2\text{SO}_3$

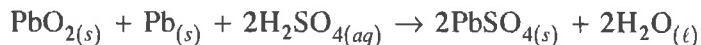
26. The oxidation number of zinc in a reaction increases by 2. This indicates that

- A. zinc is reduced and loses 2 electrons. C. zinc is oxidized and loses 2 electrons.
B. zinc is reduced and gains 2 electrons. D. zinc is oxidized and gains 2 electrons.

27. Which metal will react spontaneously with water?

- A. Ca
B. Ni
C. Pb
D. Hg

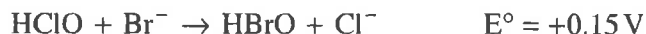
28. Consider the following redox reaction which occurs in a lead-acid storage cell:



The balanced reduction half-reaction is

- A. $\text{Pb} \rightarrow \text{Pb}^{2+} + 2\text{e}^-$
B. $\text{Pb} + \text{SO}_4^{2-} \rightarrow \text{PbSO}_4 + 2\text{e}^-$
C. $2\text{H}_2\text{SO}_4 + 2\text{Pb} + 2\text{e}^- \rightarrow 2\text{PbSO}_4 + 2\text{H}_2\text{O}$
D. $\text{PbO}_2 + 4\text{H}^+ + \text{SO}_4^{2-} + 2\text{e}^- \rightarrow \text{PbSO}_4 + 2\text{H}_2\text{O}$

29. Consider the following redox reactions:



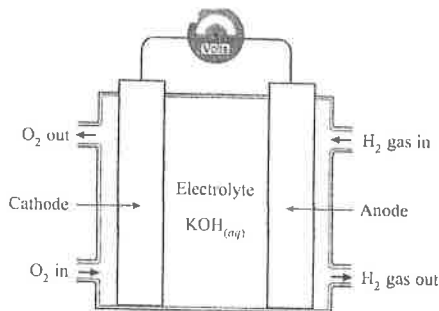
The relative strength of the oxidizing agents from strongest to weakest is

- A. $\text{HIO} > \text{HBrO} > \text{HClO}$
B. $\text{HClO} > \text{HIO} > \text{HBrO}$
C. $\text{HBrO} > \text{HIO} > \text{HClO}$
D. $\text{HClO} > \text{HBrO} > \text{HIO}$

30. Consider the following diagram of a fuel cell in which H_2 and O_2 combine to produce H_2O under basic conditions:

The reaction at the anode is

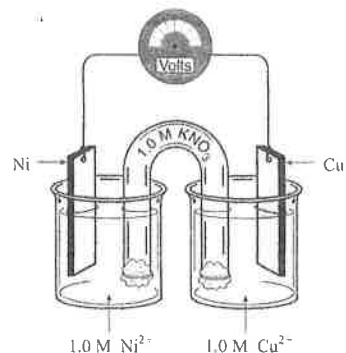
- A. $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
 B. $\frac{1}{2}\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2\text{O}$
 C. $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$
 D. $\text{H}_2 + 2\text{OH}^- \rightarrow 2\text{H}_2\text{O} + 2\text{e}^-$



31. As the cell operates, observations include

	Mass of Nickel Electrode	Concentration of Copper Ions
A.	decreases	increases
B.	decreases	decreases
C.	increases	increases
D.	increases	decreases

Use the following diagram to answer questions 31 + 32

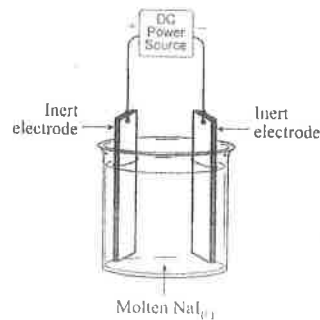


32. What is the cell potential, E° , for this cell?

- A. 0.08 V
 B. 0.26 V
 C. 0.60 V
 D. 0.78 V

33. Consider the following electrolytic cell:

- A. I^- migrates to the anode and gains electrons.
 B. I^- migrates to the cathode and loses electrons.
 C. Na^+ migrates to the anode and loses electrons.
 D. Na^+ migrates to the cathode and gains electrons.



34. Which of the following are necessary for electroplating to occur using an electrolytic cell?

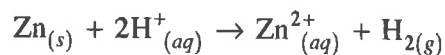
I.	Two electrodes
II.	A metal ion being reduced
III.	A direct current power source

- A. I and II only.
 B. I and III only.
 C. II and III only.
 D. I, II, and III.

35. The pH of acid rain could be (1 mark)

- A. 5.0 C. 9.0
- B. 7.0 D. 11.0

36. Consider the following reaction: (1 mark)



The species being oxidized is

- A. H₂ C. Zn
- B. H⁺ D. Zn²⁺

37. When SO₄²⁻ reacts to form S₂O₆²⁻, the sulphur atoms (2 marks)

- A. lose electrons and are reduced.
- B. gain electrons and are reduced.
- C. lose electrons and are oxidized.
- D. gain electrons and are oxidized.

38. Which of the following is a list of metals in order from strongest to weakest reducing agents? (1 mark)

- A. Au > Ni > Rb
- B. Ni > Au > Rb
- C. Ni > Rb > Au
- D. Rb > Ni > Au

39. Consider the following spontaneous reaction:



Which of the following statements is correct? (1 mark)

- A. Mg is a weaker reducing agent than H₂ C. Mg is a stronger reducing agent than H₂
- B. Mg is a weaker reducing agent than H⁺ D. Mg is a stronger reducing agent than H⁺

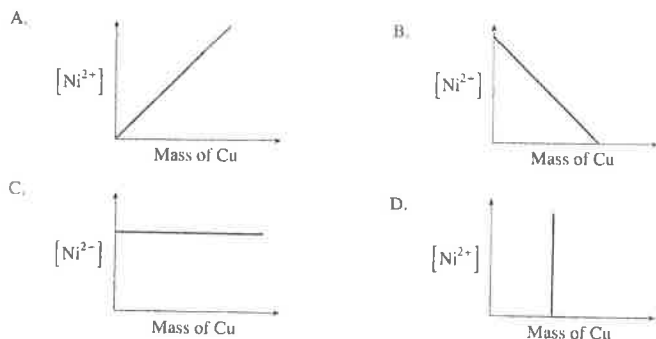
40. Which of the following will **not** react spontaneously with H₂O at standard conditions? (1 mark)

- A. F₂ C. Na
- B. Ca D. Sn

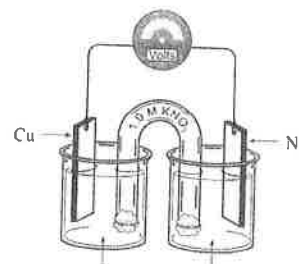
41. When a piece of Cu is placed in 1.0M AgNO₃, (1 mark)

- A. the [Ag⁺] increases. C. the [NO₃⁻] decreases.
- B. the [Cu²⁺] increases. D. no change occurs.

42. Which of the following diagrams represents the relationship between $[\text{Ni}^{2+}]$ and the mass of the Cu electrode as the cell above is in operation? (1 mark)



Use the following diagram to answer questions 42+43



43. The E° for the above cell is (1 mark)

- A. -0.04 volts C. $+0.04$ volts
 B. -0.60 volts D. $+0.60$ volts

44. Which of the following describes an electrochemical cell? (2 marks)

	E°_{cell}	Type of reaction
A.	positive	spontaneous
B.	positive	non-spontaneous
C.	negative	spontaneous
D.	negative	non-spontaneous

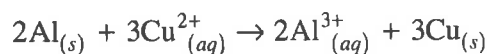
45. Which of the following aqueous solutions should **not** be used as an electrolyte in an electrolytic cell? (1 mark)

- A. 1.0 M KOH
 B. $1.0\text{ M H}_2\text{SO}_4$
 C. 1.0 M CuSO_4
 D. $1.0\text{ M C}_6\text{H}_{12}\text{O}_6$

46. When $1.0\text{ M Na}_2\text{SO}_4$ is electrolyzed, the solution near the anode becomes (2 marks)

- A. basic and bubbles form.
 B. acidic and bubbles form.
 C. basic and no bubbles form.
 D. acidic and no bubbles form.

47. Consider the following spontaneous reaction: (1 mark)



In this reaction, the oxidizing agent is

- A. Al
- B. Cu
- C. Al^{3+}
- D. Cu^{2+}

48. Bromine has an oxidation number of +3 in (1 mark)

- A. KBrO
- B. KBrO_2
- C. KBrO_3
- D. KBrO_4

49. In an experiment, Te reacts spontaneously with Ag^+ but not with Ti^{2+} .
The relative strength of oxidizing agents from strongest to weakest is (2 marks)

- A. $\text{Ag}^+ > \text{Te}^{4+} > \text{Ti}^{2+}$
- B. $\text{Ag}^+ > \text{Ti}^{2+} > \text{Te}^{4+}$
- C. $\text{Te}^{4+} > \text{Ti}^{2+} > \text{Ag}^+$
- D. $\text{Ti}^{2+} > \text{Te}^{4+} > \text{Ag}^+$

50. A piece of Au does not react spontaneously with 1.0 M HCl.
Which of the following statements is true? (1 mark)

- A. Au is a weaker reducing agent than H_2
- B. Au is a stronger reducing agent than H_2
- C. Au is a weaker oxidizing agent than H^+
- D. Au is a stronger oxidizing agent than H^+

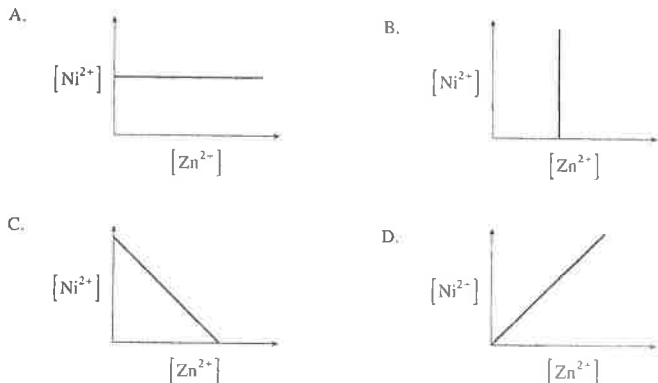
51. Which two species will react spontaneously with each other at standard conditions? (1 mark)

- A. Cl_2 and Br^-
- B. Zn and Al^{3+}
- C. Au and Sn^{2+}
- D. I_2 and SO_4^{2-}

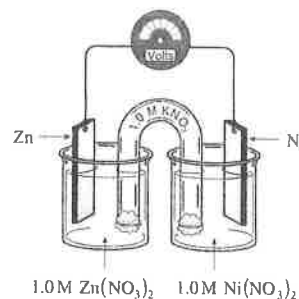
52. What occurs when a piece of Zn is placed in 1.0 M $\text{Cu}(\text{NO}_3)_2$? (1 mark)

- A. $[\text{Cu}^{2+}]$ decreases
- B. $[\text{Zn}^{2+}]$ decreases
- C. $[\text{NO}_3^-]$ increases
- D. no change occurs

53. Which of the following diagrams represents the relationship between $[Zn^{2+}]$ and $[Ni^{2+}]$ as the cell is in operation? (1 mark)



Use the following diagram to answer questions 53-55



54. The E° for the cell in the diagram is (1 mark)

- A. -1.02 Volts
- B. -0.50 Volts
- C. +0.50 Volts
- D. +1.02 Volts

55. Which of the following does not affect the cell potential? (1 mark)

- A. $[Ni^{2+}]$
- B. $[Zn^{2+}]$
- C. temperature
- D. surface area of the electrodes

56. What type of ions move toward each electrode in an electrolytic cell? (2 marks)

	Anode	Cathode
A.	anions	cations
B.	cations	anions
C.	anions	anions
D.	cations	cations

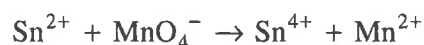
57. The electrolysis of 1.0 M NaI using inert electrodes will produce (2 marks)

- A. sodium and iodine.
- B. sodium and oxygen.
- C. hydrogen and iodine.
- D. hydrogen and oxygen.

58. Which of the following describes a strong oxidizing agent? (1 mark)

- A. a substance which loses electrons readily
- B. a substance which gains electrons readily
- C. a substance which has a large increase in oxidation number
- D. a substance which has a small increase in oxidation number

59. Consider the following unbalanced redox reaction: (2 marks)



Which of the following describes the change in Sn^{2+} ?

- A. loses electrons and is reduced
- B. gains electrons and is reduced
- C. loses electrons and is oxidized
- D. gains electrons and is oxidized

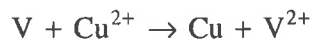
60. A solution containing Pd^{2+} reacts spontaneously with Ga to produce Pd and Ga^{3+} . However, a solution containing Pd^{2+} does not react with Pt. The metals, in order of increasing strength as reducing agents, are (1 mark)

- A. $\text{Pt} < \text{Pd} < \text{Ga}$
- B. $\text{Pt} < \text{Ga} < \text{Pd}$
- C. $\text{Ga} < \text{Pt} < \text{Pd}$
- D. $\text{Ga} < \text{Pd} < \text{Pt}$

61. Which of the following can act as an oxidizing agent, but **not** as a reducing agent? (1 mark)

- A. Cr
- B. Cl^-
- C. Cu^+
- D. Na^+

62. Solid copper forms spontaneously in the following reaction: (1 mark)

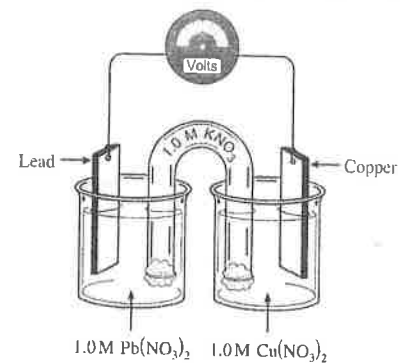


Based on this observation, Cu^{2+} is a

- A. weaker reducing agent than V^{2+}
- B. weaker oxidizing agent than V^{2+}
- C. stronger reducing agent than V^{2+}
- D. stronger oxidizing agent than V^{2+}

63. Which of the following could be used to determine the $[\text{Fe}^{2+}]$ by a redox titration? (1 mark)

- A. I_2
- B. Cl^-
- C. Cu^{2+}
- D. MnO_4^- (acidified)



64. What happens to the lead electrode?

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

65. As the cell operates, what happens to the ions in the salt bridge?

- A. K^+ and NO_3^- will both migrate toward the Pb half-cell.
- B. K^+ and NO_3^- will both migrate toward the Cu half-cell.
- C. K^+ will migrate toward the Cu half-cell and NO_3^- will migrate toward the Pb half-cell.
- D. K^+ will migrate toward the Pb half-cell and NO_3^- will migrate toward the Cu half-cell.

66. What is the initial cell voltage?

(1 mark)

- A. +0.02 V
- B. +0.21 V
- C. +0.28 V
- D. +0.47 V

67. Consider the following:

(2 marks)

I.	electrolysis of water
II.	electroplating of copper
III.	rusting of iron

Which of the above involve non-spontaneous redox reactions?

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

68. A copper spoon was electroplated with silver. Which of the following reactions occurred at the cathode during electroplating?

(1 mark)

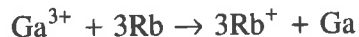
- A. $Ag \rightarrow Ag^+ + e^-$
- B. $Ag^+ + e^- \rightarrow Ag$
- C. $Cu \rightarrow Cu^{2+} + 2e^-$
- D. $Cu^{2+} + 2e^- \rightarrow Cu$

69. An oxidizing agent is

(2 marks)

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

70. Consider the following spontaneous reaction:



What happens in this reaction?

(1 mark)

- A. Rb is reduced.
- B. Rb gains electrons.
- C. Ga^{3+} loses electrons.
- D. Ga^{3+} acts as an oxidizing agent.

71. What is the oxidation number of S in $\text{S}_2\text{O}_6^{2-}$?

(1 mark)

- A. +3
- B. +5
- C. +6
- D. +7

72. Which of the following is the weakest oxidizing agent?

(1 mark)

- A. Cl_2
- B. Al^{3+}
- C. Sn^{2+}
- D. acidified $\text{Cr}_2\text{O}_7^{2-}$

73. Which of the following could react spontaneously with Ag metal?

(1 mark)

- A. Cl^-
- B. Fe^{2+}
- C. acidified SO_4^{2-}
- D. acidified NO_3^-

74. Which of the following could be titrated using acidified MnO_4^- ions?

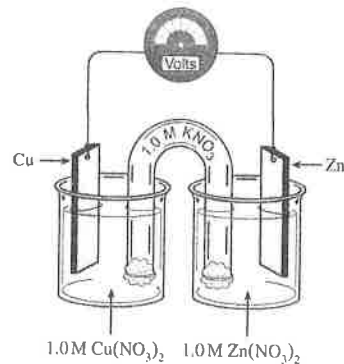
(1 mark)

- A. Na^+
- B. IO_3^-
- C. SO_4^{2-}
- D. H_2O_2

75. What happens to the zinc electrode?

- A. Mass increases as it is reduced.
- B. Mass decreases as it is reduced.
- C. Mass increases as it is oxidized.
- D. Mass decreases as it is oxidized.

Use the following diagram to answer questions 75-76



76. Calculate the E° for the above cell.

- A. -0.42 V
- B. 0.91 V
- C. 1.10 V
- D. 1.30 V

77. What happens to iron as it corrodes?

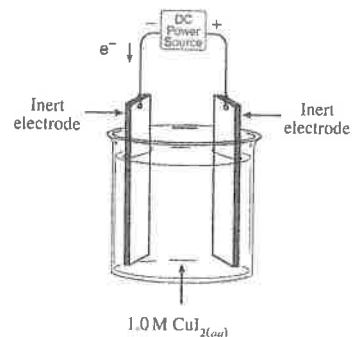
- A. It loses electrons and is reduced.
- B. It gains electrons and is reduced.
- C. It loses electrons and is oxidized.
- D. It gains electrons and is oxidized.

(2 marks)

78. What reaction occurs at the cathode?

- A. $2\text{I}^- \rightarrow \text{I}_2 + 2\text{e}^-$
- B. $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
- C. $\text{H}_2\text{O} \rightarrow \frac{1}{2}\text{O}_2 + 2\text{H}^+ + 2\text{e}^-$
- D. $2\text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{OH}^-$

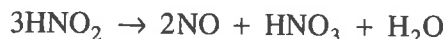
Use the following diagram to answer questions 78+79



79. What happens to the $[\text{I}^-]$ in the operating cell?

- A. $[\text{I}^-]$ increases overall.
- B. $[\text{I}^-]$ decreases overall.
- C. $[\text{I}^-]$ remains constant overall.
- D. $[\text{I}^-]$ decreases near the anode and increases near the cathode.

80. The equation for the decomposition of nitrous acid is

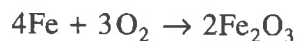


Which of the following is correct?

(1 mark)

- A. This is a redox reaction.
- B. This is an acid-base reaction.
- C. This is a reduction half equation.
- D. This is an oxidation half equation.

81. An equation for the rusting of iron is shown below:



Which of the following is false?

(1 mark)

- A. This is a redox reaction.
- B. O₂ is the oxidizing agent.
- C. Metallic iron is reduced to Fe³⁺.
- D. Metallic iron is the reducing agent.

82. In which of the following chemical changes will there be an oxidation number change of +3 ?

(1 mark)

- A. Cr³⁺ → Cr²⁺
- B. ClO⁻ → ClO₂⁻
- C. Cr³⁺ → Cr₂O₇²⁻
- D. Mn²⁺ → MnO₄⁻

83. Which of the following ions can be reduced by Pb_(s) under standard conditions?

(1 mark)

- A. Cu⁺
- B. Cr³⁺
- C. Sn²⁺
- D. Ca²⁺

84. Consider the following equation for the combustion of ethane:



The change in oxidation number for carbon is equivalent to

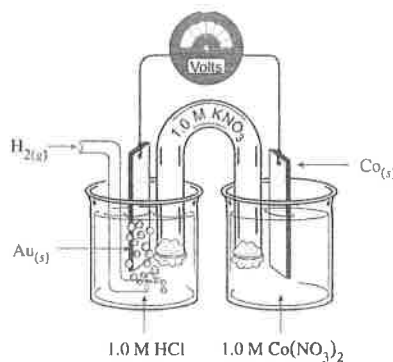
(1 mark)

- A. 1 electron lost.
- B. 7 electrons lost.
- C. 1 electron gained.
- D. 7 electrons gained.

85. Consider the diagram

Identify the cathode half reaction.

- A. H₂ → 2H⁺ + 2e⁻
- B. 2H⁺ + 2e⁻ → H₂
- C. Au³⁺ + 3e⁻ → Au
- D. Co²⁺ + 2e⁻ → Co

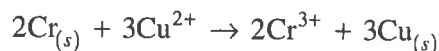


(2 marks)

86. As a standard Zn / Ag electrochemical cell operates, in which direction do anions move and how does the mass of the cathode change? (2 marks)

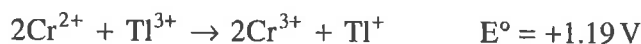
	Anion Direction	Mass of Cathode
A.	towards Zn electrode	increases
B.	towards Ag electrode	increases
C.	towards Zn electrode	decreases
D.	towards Ag electrode	decreases

87. What is the standard cell potential for the following reaction: (1 mark)

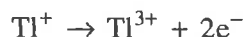


- A. -1.08 V C. +1.08 V
 B. +0.40 V D. +2.50 V

88. Consider the following:



Identify the standard potential for the half-cell reaction:



(1 mark)

- A. -0.78 V C. +0.78 V
 B. +1.60 V D. +1.19 V

89. The electrolysis of aqueous Rb_2SO_4 solution using carbon electrodes produces changes in the solution around the electrodes. How will the pH change around the anode and the cathode? (2 marks)

	pH around the Anode	pH around the Cathode
A.	increase	increase
B.	decrease	decrease
C.	increase	decrease
D.	decrease	increase

90. The same amount of electricity (same number of moles of electrons) is used to carry out the electrolysis of $\text{PdCl}_{2(aq)}$ and $\text{AgNO}_{3(aq)}$ solutions in separate cells. The masses of Pd and Ag produced were measured and compared. Which of the following is true about the mass of Pd produced? (1 mark)

- A. The mass of Pd produced is not related to the mass of Ag.
 B. The mass of Pd produced is approximately half that of Ag.
 C. The mass of Pd produced is approximately twice that of Ag.
 D. The mass of Pd produced is approximately the same as that of Ag.

91. Which equation represents a redox reaction?

(1 mark)

- A. $C + O_2 \rightarrow CO_2$
- B. $NH_3 + HCl \rightarrow NH_4Cl$
- C. $2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$
- D. $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$

92. What is a typical characteristic of a strong oxidizing agent?

(1 mark)

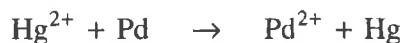
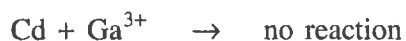
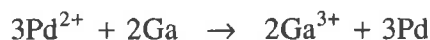
- A. It is readily oxidized.
- B. It easily loses electrons.
- C. It has a negative oxidation number.
- D. It has a positive reduction potential.

93. When U_3O_8 (pitchblende) is dissolved in nitric acid, it changes into $UO_2(NO_3)_2$ (uranyl nitrate). What is the change in oxidation number for uranium?

(1 mark)

- A. $+2\frac{2}{3}$
- B. $+\frac{2}{3}$
- C. $-3\frac{1}{3}$
- D. -10

94. The metals Hg, Cd, Ga and Pd react as follows:



Which of the following metals is the strongest reducing agent?

(2 marks)

- A. Pd
- B. Ga
- C. Cd
- D. Hg

95. Which of the following metals can be oxidized by 1.0 M Fe^{2+} ?

(1 mark)

- A. Sn
- B. Co
- C. Cr
- D. Ag

96. What is the equation for the half-reaction that occurs at the cathode?

- A. $Ag \rightarrow Ag^+ + e^-$
- B. $Ag^+ + e^- \rightarrow Ag$
- C. $Zn \rightarrow Zn^{2+} + 2e^-$
- D. $Zn^{2+} + 2e^- \rightarrow Zn$

Use the following diagram to answer question 96-98

