Chem.G11-Q3W4-Oxidation Reduction Reactions-Qs. Bank

True/False
Indicate whether the statement is true or false.

____ 1. $Fe + CuSO_4 \longrightarrow Cu + Fe_2(SO_4)_3$ is a balanced equation for the redox reaction.

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 2. What are the oxidation and reduction half-reactions for the redox reaction of $Fe + F_2 \longrightarrow FeF_3$?
   a. $Fe \longrightarrow Fe^{3+} + 3e^-$, $F_2 + 2e^- \longrightarrow 2F^-$
   b. $F_2 + 2e^- \longrightarrow 2F^-$, $Fe \longrightarrow Fe^{3+} + 3e^-$
   c. $Fe + 3e^- \longrightarrow Fe^{3+}$, $F_2 + 2e^- \longrightarrow 2F$
   d. $F_2 + 2e^- \longrightarrow 2F^-$, $Fe + 3e^- \longrightarrow Fe^{3+}$

____ 3. Identify the oxidation half-reactions for the redox reaction of 2 Silver(s) + Chlorine(g) $\longrightarrow$ 2 Silver chloride.
   a. Silver $\longrightarrow$ Silver ion + electron
   b. Silver + electron $\longrightarrow$ Silver ion
   c. Silver + 2 electron $\longrightarrow$ Silver ion
   d. Silver ion + 2 electron $\longrightarrow$ Silver

____ 4. An oxidation reaction occurs only in the presence of _____.
   a. oxygen
   b. hydrogen
   c. a metal
   d. a reduction reaction

____ 5. When an element is reduced, its oxidation number _____.
   a. stays the same
   b. decreases
   c. increases
   d. may increase or decrease

____ 6. The substance that is oxidized in the reaction $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$ is _____.
   a. Fe_2O_3
   b. Al_2O_3
   c. Al
   d. Fe

____ 7. A silver vase exposed to the air for a long time is most likely to have an outer coating of _____.
   a. silver metal
   b. silver sulfide
   c. silver oxide
   d. hydrogen sulfide

____ 8. An element or compound losing electrons to a more electronegative element is _____.
   a. oxidation
   b. reduction
   c. redox
   d. combination

____ 9. For every oxidation reaction that occurs, a _____ reaction must also take place.
   a. combustion
   b. decomposition
   c. reduction
   d. synthesis

____ 10. Electrons gained and lost during a redox reaction can be determined by examining the _____ of the elements involved.
   a. symbols
   b. oxidation number
   c. formulas
   d. coefficients

____ 11. Reduction is a(n) _____.
a. redox reaction
b. loss of electrons
c. half-reaction
d. agent

____ 12. In the equation $Al + Cl_2 \rightarrow AlCl_3$, the oxidation number of Al changes from _____ to _____.
a. 0, 3+
b. 3+, 0
c. 0, 1-
d. -1, 0

____ 13. In the equation $Al + Cl_2 \rightarrow AlCl_3$, the oxidation number of Cl changes from _____ to _____.
a. 0, 3+
b. 3+, 0
c. 0, 1-
d. -1, 0

____ 14. In a redox reaction, the reducing agent is _____.
a. oxidized
b. reduced
c. redoxed
d. also the oxidizing agent

____ 15. When iron is obtained from iron ore according to the equation $2Fe^{3+} + 3O^{2-} + 3CO \rightarrow 2Fe + 3CO_2$, what is the reducing agent?
a. Fe^{3+}
b. Fe
c. O^{2-}
d. C^{2+}

____ 16. Chemiluminescent reactions release _____.
a. heat
b. light
c. odors
d. gases

____ 17. During respiration, what element is reduced?
a. carbon
b. hydrogen
c. oxygen
d. magnesium

____ 18. Is the following reaction a redox reaction? $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$
a. yes
b. no
c. if energy is added
d. It is impossible to determine.

____ 19. When silver reacts with sulfur to form tarnish, what element is the oxidizing agent?
a. Ag
b. Ag^{+}
c. S
d. S^{2-}

____ 20. How do mammals keep from freezing during the winter?
a. hibernation
b. chemiluminescence
c. oxidation of fats stored in the body
d. combustion

____ 21. All of the following are biochemical redox processes except _____.
a. bioluminescence
b. respiration
c. photosynthesis
d. corrosion

Completion

Complete each statement.

22. A substance that oxidizes another substance by accepting its electron is called a(n) _____ agent.

23. A _____ is one of the two parts of a redox reaction-the oxidation half alone or the reduction half alone.

24. The equation $2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$ is a typical _____ in which ethane gas (C_2H_6) is burned to produce carbon dioxide and water.

25. In an oxidation-reduction reaction, oxygen gas is the _____ and ethane is the _____.

26. Because carbon atoms in ethane lose electrons in an oxidation-reduction reaction, they can be said to have undergone _____.

27. In the equation $2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$, the oxidation number of oxygen has gone from 0 to 2-, so it has undergone _____.

28. A substance that gains electrons in a chemical reaction is known as a(n) _____.

29. In the reaction $2Fe + O_2 \rightarrow 2FeO$, iron loses electrons to oxygen and is, therefore, a(n) _____.

30. A reaction like $2Fe + O_2 \rightarrow 2FeO$, in which electrons are gained and lost by the reactants, is known as a(n) _____.

31. Hydrogen gas is used for some industrial operations because of its tendency to give up electrons, bringing about the chemical reaction known as _____ in some other substance.

32. Chlorine gas can be used to bring about the reaction known as _____ because of its tendency to take electrons from another substance.

Matching

Match each item with the correct item below.

a. reducing agent
b. $Ag^0 \rightarrow Ag^+ + e^-$
c. a common oxidizing agent
d. oxidation
e. $Fe^{3+} + 3e^- \rightarrow Fe^0$
f. rust
g. oxidation number = 0
h. reduction
i. 2-
j. redox reaction

____ 33. loss of electrons
____ 34. gain of electrons
____ 35. Fe_2O_3
____ 36. combustion
____ 37. an element in its free form
____ 38. oxide ion
____ 39. formation of tarnish
____ 40. blast furnace
____ 41. always oxidized
____ 42. oxygen

Match each item with the correct item below.

a. oxidizing agent
b. reducing agent
c. both

____ 43. O_2
____ 44. SO_2
____ 45. O_2^{2-}
____ 46. F_2
____ 47. K^+
____ 48. Cl^-
____ 49. H_2

____ 50. CO
____ 51. Na
____ 52. Ca^{2+}
____ 53. Cu^{+}
____ 54. Fe^{3+}
____ 55. I_2
____ 56. S^{2-}
____ 57. Cr^{3+}

Short Answer

58. Define the type of the half-reaction in $Fe \longrightarrow Fe^{3+} + 3e^{-}$.

59. Derive oxidation and reduction half-reactions from the redox equation of $NH_3(g) + NO_2(g) \longrightarrow N_2(g) + H_2O(l)$.

60. Tell whether the following equation represents an oxidation or reduction half-reaction, then write in the correct value for *X* in the equation: $O_2 + X \rightarrow 2O^{2-}$

61. Tell whether the following equation represents an oxidation or reduction half-reaction, then write in the correct value for *X* in the equation: $Fe^{3+} + e^{-} \rightarrow X$

62. Tell whether the following equation represents an oxidation or reduction half-reaction, then write in the correct value for *X* in the equation: $OCl^{-} + X \rightarrow Cl^{-}$

63. Tell whether the following equation represents an oxidation or reduction half-reaction, then write in the correct value for *X* in the equation: $H_2S \rightarrow SO_2 + X$

64. Tell whether the following equation represents an oxidation or reduction half-reaction, then write in the correct value for *X* in the equation: $X \rightarrow Cu^{2+} + 2e^{-}$

65. Tell whether the following equation represents an oxidation or reduction half-reaction, then write in the correct value for *X* in the equation: $ClO_3^{-} + 6e^{-} \rightarrow Cl^{X}$

66. The dark spots on a photographic film consist entirely of silver atoms formed when silver ions are reduced by light. What is incorrect about this statement?

Balance each equation for a half-reaction by rewriting the equation and inserting the correct coefficients needed.

67. $2Al^{3+}(aq) + e^{-} \rightarrow Al(s)$

68. $Mn^{2+}(aq) + 4H_2O(l) \rightarrow MnO_4^{-}(aq) + 8H^{+}(aq) + e^{-}$

69. In the following reaction, tell which element is oxidized and which is reduced. $2Na + Cl_2 \rightarrow 2NaCl$

70. In the following reaction, tell which element is oxidized and which is reduced. $MgCl_2 \rightarrow Mg + Cl_2$

71. In the following reaction, tell which element is oxidized and which is reduced. $C + 2S \rightarrow CS_2$

72. In the following reaction, tell which element is oxidized and which is reduced.
$2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$

73. In the following reaction, tell which element is oxidized and which is reduced.

$2H_2O \rightarrow 2H_2 + O_2$

74. In the following reaction, tell which element is oxidized and which is reduced. $C + O_2 \rightarrow CO_2$

75. In the following reaction, tell which element is oxidized and which is reduced.
$Cl_2 + 2NaBr \rightarrow 2NaCl + Br_2$

76. In the equation $Al + Cl_2 \rightarrow AlCl_3$, what element is reduced?

77. In the equation $Al + Cl_2 \rightarrow AlCl_3$, what element is the reducing agent?

78. In the equation $Al + Cl_2 \rightarrow AlCl_3$, write the balanced equation for the reduction half-reaction.

79. In the equation $Al + Cl_2 \rightarrow AlCl_3$, write a balanced equation for the redox reaction.

Problem

80. When lead sulfide reacts with oxygen, the precipitate of lead oxide is formed and sulfur dioxide gas is evolved. Balance the redox equation by the half-reaction method.

$PbS + O_2 \longrightarrow PbO + SO_2$

The net ionic equation for the redox reaction is

$S^{2-} + O_2 \longrightarrow SO_2 + O^{2-}$

Chem.G11-Q3W4-Oxidation Reduction Reactions-Qs. Bank
Answer Section

TRUE/FALSE

1. ANS: F
   The balanced equation for the redox reaction is represented as:

   $2Fe + 3CuSO_4 \longrightarrow 3Cu + Fe_2(SO_4)_3$

   PTS: 1 DIF: 1 REF: Page 555
   OBJ: 16.1.1 Analyze the characteristics of an oxidation-reduction reaction.
   TOP: Analyze the characteristics of an oxidation-reduction reaction.
   KEY: Balancing equation MSC: 2
   NOT: /T/ In a balanced equation, the number of atoms should be equal in a forward and backward reaction.
   /F/ Correct!

MULTIPLE CHOICE

2. ANS: A
   In an oxidation half-reaction, an atom is oxidized by losing electrons and in a reduction half-reaction, an atom is reduced by gaining electrons.

	Feedback
A	Correct!
B	When an atom loses electrons, an oxidation half-reaction occurs.
C	The oxidation number of an atom increases, when an atom loses electrons.
D	In a reduction half-reaction, the oxidation number of an atom decreases.

   PTS: 1 DIF: 2 REF: Page 557 | Page 558
   OBJ: 16.1.3 Identify the substances that are oxidized and those that are reduced in a redox reaction.
   TOP: Identify the substances that are oxidized and those that are reduced in a redox reaction.
   KEY: Half-reaction MSC: 2
3. ANS: A
   In an oxidation half-reaction, an atom is oxidized by losing electrons and in a reduction half-reaction, an atom is reduced by gaining electrons.

	Feedback
A	Correct!
B	When an atom loses electron, an oxidation half-reaction occurs.
C	The oxidation number of an atom increases, when an atom loses electrons.
D	In a reduction half-reaction, the oxidation number of an atom decreases.

   PTS: 1 DIF: 2 REF: Page 557 | Page 558
   OBJ: 16.1.3 Identify the substances that are oxidized and those that are reduced in a redox reaction.
   TOP: Identify the substances that are oxidized and those that are reduced in a redox reaction.
   KEY: Half-reaction MSC: 2
4. ANS: D PTS: 1 DIF: B OBJ: 16-1

5. ANS: B PTS: 1 DIF: B OBJ: 16-1
6. ANS: A PTS: 1 DIF: B OBJ: 16-1
7. ANS: B PTS: 1 DIF: B OBJ: 16-5
8. ANS: A PTS: 1 DIF: B OBJ: 16-2
9. ANS: C PTS: 1 DIF: B OBJ: 16-1
10. ANS: B PTS: 1 DIF: B OBJ: 16-1
11. ANS: C PTS: 1 DIF: B OBJ: 16-2
12. ANS: A PTS: 1 DIF: B OBJ: 16-1
13. ANS: C PTS: 1 DIF: B OBJ: 16-1
14. ANS: A PTS: 1 DIF: B OBJ: 16-4
15. ANS: D PTS: 1 DIF: A OBJ: 16-4
16. ANS: B PTS: 1 DIF: B OBJ: 16-1
17. ANS: C PTS: 1 DIF: B OBJ: 16-6
18. ANS: B PTS: 1 DIF: B OBJ: 16-2
19. ANS: C PTS: 1 DIF: A OBJ: 16-4
20. ANS: C PTS: 1 DIF: A OBJ: 16-6
21. ANS: D PTS: 1 DIF: B OBJ: 16-6

COMPLETION

22. ANS: oxidizing

    PTS: 1 DIF: 1 REF: Page 562
    OBJ: 16.1.4 Distinguish oxidizing and reducing agents in redox reactions.
    TOP: Distinguish oxidizing and reducing agents in redox reactions.
    KEY: Oxidizing agent MSC: 1
23. ANS: half-reaction

    PTS: 1 DIF: 1 REF: Page 557 | Page 558
    OBJ: 16.1.3 Identify the substances that are oxidized and those that are reduced in a redox reaction.
    TOP: Identify the substances that are oxidized and those that are reduced in a redox reaction.
    KEY: Half-reaction MSC: 1
24. ANS: oxidation-reduction reaction

    PTS: 1 DIF: B OBJ: 16-1
25. ANS: oxidizing agent; reducing agent

    PTS: 1 DIF: B OBJ: 16-4
26. ANS: oxidation

    PTS: 1 DIF: B OBJ: 16-2
27. ANS: reduction

    PTS: 1 DIF: B OBJ: 16-2
28. ANS: oxidizing agent

    PTS: 1 DIF: B OBJ: 16-4
29. ANS: reducing agent

PTS: 1 DIF: B OBJ: 16-4

30. ANS: oxidation-reduction reaction

PTS: 1 DIF: B OBJ: 16-1

31. ANS: reduction

PTS: 1 DIF: B OBJ: 16-4

32. ANS: oxidation

PTS: 1 DIF: B OBJ: 16-4

MATCHING

33. ANS: D PTS: 1 DIF: B OBJ: 16-2
34. ANS: H PTS: 1 DIF: B OBJ: 16-2
35. ANS: F PTS: 1 DIF: B OBJ: 16-3
36. ANS: J PTS: 1 DIF: B OBJ: 16-1
37. ANS: G PTS: 1 DIF: B OBJ: 16-3
38. ANS: I PTS: 1 DIF: B OBJ: 16-3
39. ANS: B PTS: 1 DIF: B OBJ: 16-3
40. ANS: E PTS: 1 DIF: B OBJ: 16-5
41. ANS: A PTS: 1 DIF: B OBJ: 16-2
42. ANS: C PTS: 1 DIF: B OBJ: 16-5

43. ANS: A PTS: 1 DIF: B OBJ: 16-4
44. ANS: C PTS: 1 DIF: B OBJ: 16-4
45. ANS: C PTS: 1 DIF: B OBJ: 16-4
46. ANS: A PTS: 1 DIF: B OBJ: 16-4
47. ANS: A PTS: 1 DIF: B OBJ: 16-4
48. ANS: B PTS: 1 DIF: B OBJ: 16-4
49. ANS: B PTS: 1 DIF: B OBJ: 16-4
50. ANS: C PTS: 1 DIF: B OBJ: 16-4
51. ANS: B PTS: 1 DIF: B OBJ: 16-4
52. ANS: A PTS: 1 DIF: B OBJ: 16-4
53. ANS: C PTS: 1 DIF: B OBJ: 16-4
54. ANS: A PTS: 1 DIF: B OBJ: 16-4
55. ANS: C PTS: 1 DIF: B OBJ: 16-4
56. ANS: B PTS: 1 DIF: B OBJ: 16-4
57. ANS: C PTS: 1 DIF: B OBJ: 16-4

SHORT ANSWER

58. ANS:
The given half-reaction is an oxidation half-reaction.

PTS: 1 DIF: 1 REF: Page 557 | Page 558

OBJ: 16.1.3 Identify the substances that are oxidized and those that are reduced in a redox reaction.
TOP: Identify the substances that are oxidized and those that are reduced in a redox reaction.
KEY: Half-reaction MSC: 1

59. ANS:

The oxidation half-reaction is $2N^{3-} \longrightarrow N_2 + 6e^-$

The reduction half-reaction is $2N^{4+} + 8e^- \longrightarrow N_2$

PTS: 1 DIF: 2 REF: Page 557 | Page 558
OBJ: 16.1.3 Identify the substances that are oxidized and those that are reduced in a redox reaction.
TOP: Identify the substances that are oxidized and those that are reduced in a redox reaction.
KEY: Half-reaction MSC: 2

60. ANS:
reduction; $X = 4e^-$

PTS: 1 DIF: B OBJ: 16-2

61. ANS:
reduction; $X = Fe^{2+}$

PTS: 1 DIF: B OBJ: 16-2

62. ANS:
reduction; $X = 2e^-$

PTS: 1 DIF: B OBJ: 16-2

63. ANS:
oxidation; $X = 6e^-$

PTS: 1 DIF: B OBJ: 16-2

64. ANS:
oxidation; $X = Cu^O$

PTS: 1 DIF: B OBJ: 16-2

65. ANS:
reduction; X = -

PTS: 1 DIF: B OBJ: 16-2

66. ANS:
Many silver ions are activated only by light and then reduced later by the developer.

PTS: 1 DIF: A OBJ: 16-5

67. ANS:
$2Al^{3+}(aq) + 6e^- \rightarrow 2Al(s)$

PTS: 1 DIF: B OBJ: 16-1

68. ANS:
$Mn^{2+}(aq) + 4H_2O(l) \rightarrow MnO_4^-(aq) + 8H^+(aq) + 5e^-$

PTS: 1 DIF: B OBJ: 16-1

69. ANS:

Na is oxidized; Cl is reduced.

PTS: 1 DIF: B OBJ: 16-3

70. ANS:
Cl is oxidized; Mg is reduced.

PTS: 1 DIF: B OBJ: 16-3

71. ANS:
C is oxidized; S is reduced.

PTS: 1 DIF: B OBJ: 16-3

72. ANS:
Al is oxidized; H is reduced.

PTS: 1 DIF: B OBJ: 16-3

73. ANS:
O is oxidized; H is reduced.

PTS: 1 DIF: B OBJ: 16-3

74. ANS:
C is oxidized; O is reduced.

PTS: 1 DIF: B OBJ: 16-3

75. ANS:
Br is oxidized; Cl is reduced.

PTS: 1 DIF: B OBJ: 16-3

76. ANS:
Cl_2

PTS: 1 DIF: B OBJ: 16-3

77. ANS:
Al

PTS: 1 DIF: B OBJ: 16-4

78. ANS:
$3Cl_2 + 6e^- \rightarrow 6Cl^-$

PTS: 1 DIF: A OBJ: 16-2

79. ANS:
$2Al + 3Cl_2 \rightarrow 2AlCl_3$

PTS: 1 DIF: B OBJ: 16-2

PROBLEM

80. ANS:
$2PbS + 3O_2 \longrightarrow 2PbO + 2SO_2$

PTS: 1 DIF: 3 REF: Page 557
OBJ: 16.1.3 Identify the substances that are oxidized and those that are reduced in a redox reaction.
TOP: Identify the substances that are oxidized and those that are reduced in a redox reaction.
KEY: Half-reaction MSC: 2
NOT: First, write the oxidation half-reaction and reduction half-reaction for the net ionic equation, then balance the atoms and charge in each half-reaction. Adjust the coefficients so that the number of electrons lost in oxidation equals the number of electrons gained in reduction. Add the balanced half-reaction and return the spectator ion.