Chem.G11-Q3W2-Acids and bases-Qs. Bank

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

____ 1. One physical property of acids is a _____.
a. slippery feel
b. pink color
c. sour taste
d. presence of hydrogen

____ 2. Acids react with carbonates to produce _____.
a. hydrogen
b. a base
c. a hydronium ion
d. carbon dioxide

____ 3. The top industrial chemical produced in the United States for many years has been _____.
a. sulfuric acid
b. ammonia
c. hydrochloric acid
d. oxygen

____ 4. An example of a polyprotic acid is _____.
a. HCl
b. $HC_2H_3O_2$
c. H_2SO_4
d. HCN

____ 5. Ammonia is considered to be a base because it _____.
a. loses hydroxide ions in water
b. contains the hydroxide ion
c. contains hydrogen
d. accepts hydrogen ions

____ 6. A piece of blue litmus paper placed into water through which carbon dioxide gas is bubbled will _____.
a. turn pink
b. remain blue
c. show no change
d. lose its color

____ 7. Oxides of nitrogen and sulfur are _____.
a. acids
b. bases
c. acidic anhydrides
d. basic anhydrides

____ 8. The weak acid in the following list is _____.
a. hydrochloric acid
b. sulfuric acid
c. nitric acid
d. acetic acid

____ 9. An acidic solution would have a pH of _____.
a. less than 7
b. more than 7
c. 7 or above
d. 7 or below

____ 10. Conductivity of an acid or a base in water is affected by all of the following except _____.
a. strength
b. an indicator
c. molarity
d. pH

____ 11. Acids produce _____ in order to conduct electricity in water.
a. H^+
b. H_2O
c. H_3O^+
d. OH^-

Completion
Complete each statement.

12. Nonmetal oxides are called _____ because they react with water to form acids.
13. _____ is a mathematical scale by which the concentration of hydronium ions in solution is expressed.
14. A base that dissociates completely in water solution is known as a(n) _____.
15. In an acid, a(n) _____ can be transferred to water.
16. During the process known as _____, a covalent compound breaks apart into ions.
17. A substance that produces hydronium ions when it dissolves in water is said to be a(n) _____.
18. A(n) _____ is another name for a metallic oxide.
19. A(n) _____ is an acid that dissociates completely in water solution.
20. The combination of a water molecule and a hydrogen ion is a(n) _____.
21. A(n) _____ is a substance that produces hydroxide ions in water.
22. An acid that ionizes to only a slight degree in water is a(n) _____.
23. The reaction between an acid and a base is a(n) _____.
24. A(n) _____ is a base that does not ionize to a very great extent in water.

Matching

Match each of the following equations with the letter that tells what the pH of the final solutions that form would be.

a. low (about 1-2)
b. moderately low (about 5-6)
c. neutral (7)
d. moderately high (about 8-9)
e. high (about 13-14)

____ 25. $NaOH + H_2O \rightarrow$
____ 26. $NaOH + HCl \rightarrow$
____ 27. $H_2O \rightarrow$
____ 28. $NH_3 + H_2O \rightarrow$
____ 29. $H_2O + CO_2 \rightarrow$
____ 30. $HCl + H_2O \rightarrow$

The graph in Figure 14-1 shows data collected when the probe of a pH meter was inserted into each of seven beakers containing the solutions described below. Match each of the solutions with a correct graph line.

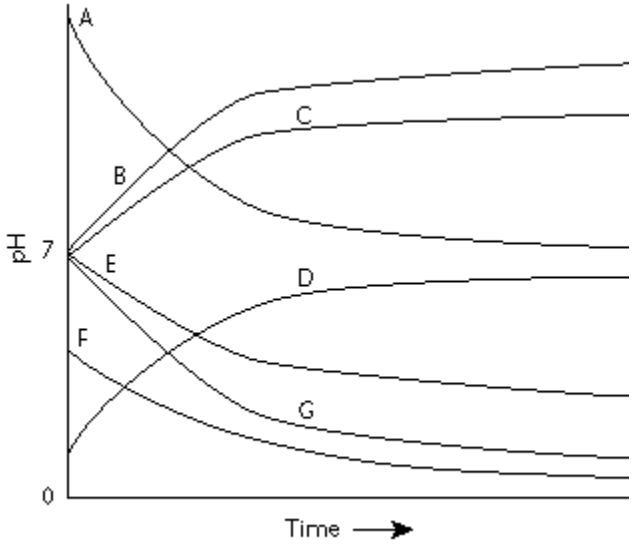

Figure 14-1

____ 31. Carbon dioxide gas is slowly bubbled into distilled water.
____ 32. Hydrogen chloride gas is slowly bubbled into distilled water.
____ 33. Pellets of sodium hydroxide are dissolved in distilled water.
____ 34. Ammonia gas is slowly bubbled into distilled water.
____ 35. 10 mL of 1*M* NaOH is added to 10 mL of 1*M* HCl a few drops at a time.
____ 36. 10 mL of 1*M* acetic acid is added to 10 mL of 1*M* sodium hydroxide a few drops at a time.
____ 37. 1 mL of 1*M* HCl is added to 1*M* acetic acid a few drops at a time.

Short Answer

38. Hypothesize a reason that acids are sometimes used as food additives.
39. Explain why it is incorrect to say that all acids turn indicators pink.
40. Since methane (CH_4) contains hydrogen atoms, why is it not considered to be an acid?
41. Write a set of equations that describes the ionization of phosphoric acid (H_3PO_4).
42. How does the concentration of hydrogen ions in a solution with a pH of 3 differ from a solution with a pH of 6?
43. Acid rain has been blamed for damage to bridges made of iron and steel. Write two chemical equations that would show how such damage might come about.
44. Give the formula for sodium hydroxide, and identify it as a strong base or a weak base.
45. Write the formula for hydroiodic acid, and identify it as a weak acid or a strong acid.
46. You test several solutions and find that they have pHs of 4.7, 10.8, 6.2, 1.6, 8.2, and 11.4. Which solution has the highest concentration of hydronium ions? Of hydroxide ions? Which solution is the closest to being neutral?
47. Classify each of the following as an acid, a base, or neither when mixed with water: SO_2, $HC_6H_5CO_2$, CsOH, and C_3H_8.
48. Use a chemical equation to show how aqueous carbonic acid fits the definition of an acid.
49. Write the balanced equation for the reaction when hydrochloric acid reacts with magnesium.
50. Hydrogen selenide, H_2Se, is a gas with a disagreeable odor. It reacts slightly with water to form relatively few hydronium ions and HSe^- ions. Classify hydrogen selenide according to whether it is a strong acid, a weak acid, a strong base, or a weak base.
51. Write the balanced equation for the reaction of sulfuric acid with rubidium carbonate.
52. Find the pH values of the solutions with the following hydronium ion concentrations: $10^{-13}M$, $10^{-6}M$, and $0.1M$.
53. Find the pH values of the solutions with the following hydroxide ion concentrations: $10^{-9}M$, $10^{-12}M$, and $0.01M$.
54. You want to prepare sodium sulfate by an acid-base reaction. Write a reaction that will do this.
55. Identify the first compound in the following reaction as an acid or a base: $C_2H_7N + H_2O \rightarrow C_2H_7NH^+ + OH^-$.
56. Estimate the molarity of HCOOH, $HCOO^-$, and H_3O^+ in $0.80M$ HCOOH.
57. A solution of copper(II) chloride is tested and is found to have a pH of 4.0. Compare the hydronium ion and hydroxide ion concentrations to those of a neutral solution.
58. Consider the oxide SeO_2. Tell whether it is an acidic anhydride or a basic anhydride. Write an equation to demonstrate its acid-base chemistry.
59. In an aqueous solution of ammonia, compare the concentrations of hydronium ions, hydroxide ions, ammonium ions (NH_4^+), and ammonia molecules.
60. Which of the following solutions is the best conductor of electricity? Which is the weakest conductor?

    a) $0.05M$ HCOOH

b) 0.05*M* HCl
c) 5.0*M* HCl
d) 5.0*M* HCOOH

61. What are the molarities of KOH, K^+, OH^-, and H_3O^+ in a 0.10*M* solution of KOH? What is the pH of the solution?

62. What are the molarities of HCl, H_3O^+, Cl^-, and OH^- in a 0.0010*M* solution of HCl? What is the pH of the solution?

63. How can a weak acid and a strong base have the same conductivity in water?

Problem

This table summarizes some properties of eight compounds. Complete the table by supplying the correct information in the spaces provided.

Compound	Degree of ionization	Acid or base	Strong or weak	Ionization equation
$HC_2O_3O_2$	2%	acid	weak	$HC_2H_3O_2 + H_2O \rightarrow H_3O^+ + C_2H_3O_2^-$
RbOH	100%	**a.**	**b.**	**c.**
HCN	**d.**	acid	**e.**	**f.**
H_2O	10^{-5}%	both	**g.**	**h.**
H_3PO_4	**i.**	**j.**	**k.**	**l.**
m.	0.01%	**n.**	**o.**	$CH_3NH_2 + H_2O \rightarrow CH_3NH_3^+ + OH^-$
KNO_3	**p.**	**q.**	**r.**	**s.**
HFO_4	**t.**	**u.**	strong	**v.**

64. a. _____
65. b. _____
66. c. _____
67. d. _____
68. e. _____
69. f. _____
70. g. _____
71. h. _____
72. i. _____
73. j. _____
74. k. _____
75. l. _____
76. m. _____
77. n. _____
78. o. _____
79. p. _____
80. q. _____
81. r. _____
82. s. _____

83. t. _____
84. u. _____
85. v. _____

Chem.G11-Q3W2-Acids and bases-Qs. Bank
Answer Section

MULTIPLE CHOICE

1.	ANS: C	PTS: 1	DIF: B	OBJ: 14-1
2.	ANS: D	PTS: 1	DIF: B	OBJ: 14-2
3.	ANS: A	PTS: 1	DIF: B	OBJ: 14-1
4.	ANS: C	PTS: 1	DIF: B	OBJ: 14-5
5.	ANS: D	PTS: 1	DIF: B	OBJ: 14-1
6.	ANS: A	PTS: 1	DIF: B	OBJ: 14-2
7.	ANS: C	PTS: 1	DIF: B	OBJ: 14-1
8.	ANS: D	PTS: 1	DIF: B	OBJ: 14-6
9.	ANS: A	PTS: 1	DIF: B	OBJ: 14-7
10.	ANS: B	PTS: 1	DIF: B	OBJ: 14-4
11.	ANS: C	PTS: 1	DIF: B	OBJ: 14-4

COMPLETION

12. ANS: acidic anhydrides

    PTS: 1 DIF: B OBJ: 14-2
13. ANS: pH

    PTS: 1 DIF: B OBJ: 14-7
14. ANS: strong base

    PTS: 1 DIF: B OBJ: 14-5
15. ANS: acidic hydrogen

    PTS: 1 DIF: B OBJ: 14-3
16. ANS: ionization

    PTS: 1 DIF: B OBJ: 14-5
17. ANS: acid

    PTS: 1 DIF: B OBJ: 14-3
18. ANS: basic anhydride

    PTS: 1 DIF: B OBJ: 14-1
19. ANS: strong acid

    PTS: 1 DIF: B OBJ: 14-5
20. ANS: hydronium ion

    PTS: 1 DIF: B OBJ: 14-3

21. ANS: base

PTS: 1 DIF: B OBJ: 14-3

22. ANS: weak acid

PTS: 1 DIF: B OBJ: 14-5

23. ANS: neutralization reaction

PTS: 1 DIF: B OBJ: 14-2

24. ANS: weak base

PTS: 1 DIF: B OBJ: 14-5

MATCHING

25.	ANS: E	PTS: 1	DIF: B	OBJ: 14-6
26.	ANS: C	PTS: 1	DIF: B	OBJ: 14-6
27.	ANS: C	PTS: 1	DIF: B	OBJ: 14-6
28.	ANS: D	PTS: 1	DIF: B	OBJ: 14-6
29.	ANS: B	PTS: 1	DIF: B	OBJ: 14-6
30.	ANS: A	PTS: 1	DIF: B	OBJ: 14-6
31.	ANS: E	PTS: 1	DIF: B	OBJ: 14-7
32.	ANS: G	PTS: 1	DIF: B	OBJ: 14-7
33.	ANS: B	PTS: 1	DIF: B	OBJ: 14-7
34.	ANS: C	PTS: 1	DIF: B	OBJ: 14-7
35.	ANS: D	PTS: 1	DIF: B	OBJ: 14-7
36.	ANS: A	PTS: 1	DIF: B	OBJ: 14-7
37.	ANS: F	PTS: 1	DIF: B	OBJ: 14-7

SHORT ANSWER

38. ANS:
They have sour (tart) tastes.

PTS: 1 DIF: B OBJ: 14-1

39. ANS:
The statement is true only for litmus.

PTS: 1 DIF: B OBJ: 14-1

40. ANS:
The H^+ ions are not released in water solution.

PTS: 1 DIF: B OBJ: 14-2

41. ANS:
$H_3PO_4 \rightarrow H^+ + H_2PO_4^-$; $H_2PO_4^- \rightarrow H^+ + HPO_4^{2-}$; $HPO_4^{2-} \rightarrow H^+ + PO_4^{3-}$

PTS: 1 DIF: A OBJ: 14-2

42. ANS:
The concentration of hydrogen ions is 1000 times greater.

PTS: 1 DIF: B OBJ: 14-7

43. ANS:
Two possible equations are:
$2Fe + 6HNO_3 \rightarrow 2Fe(NO_3)_3 + 3H_2$; $2Fe + 3H_2SO_4 \rightarrow Fe_2(SO_4)_3 + 3H_2$

PTS: 1 DIF: A OBJ: 14-1

44. ANS:
NaOH, strong base

PTS: 1 DIF: B OBJ: 14-5

45. ANS:
HI, strong acid

PTS: 1 DIF: B OBJ: 14-5

46. ANS:
1.6, 11.4, 6.2

PTS: 1 DIF: B OBJ: 14-7

47. ANS:
acid, acid, base, and neither

PTS: 1 DIF: B OBJ: 14-2

48. ANS:
$H_2CO_3(aq) + H_2O(l) \rightarrow H_3O^+(aq) + HCO_3^-(aq)$
or $H_2CO_3(aq) \rightarrow H^+(aq) + HCO_3^-(aq)$

PTS: 1 DIF: B OBJ: 14-2

49. ANS:
$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

PTS: 1 DIF: B OBJ: 14-2

50. ANS:
weak acid

PTS: 1 DIF: B OBJ: 14-5

51. ANS:
$Rb_2CO_3(s) + H_2SO_4(aq) \rightarrow Rb_2SO_4(aq) + CO_2(g) + H_2O(l)$

PTS: 1 DIF: B OBJ: 14-2

52. ANS:
13, 6, 1

PTS: 1 DIF: B OBJ: 14-7

53. ANS:
5, 2, 12

PTS: 1 DIF: B OBJ: 14-7

54. ANS:
$2NaOH(aq) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$

PTS: 1 DIF: B OBJ: 14-2

55. ANS:
base

PTS: 1 DIF: B OBJ: 14-2

56. ANS:
Because HCOOH dissociates so little, its concentration is approximately 0.80*M*. The concentrations of H_3O^+ and $HCOO^-$ are equal, but much less than 0.80*M*.

PTS: 1 DIF: B OBJ: 14-6

57. ANS:
The H_3O^+ concentration is 1000 times greater than the H_3O^+ concentration in a neutral solution; the OH^- concentration is 1/1000 of the OH^- concentration in a neutral solution.

PTS: 1 DIF: B OBJ: 14-7

58. ANS:
$SeO_2(s) + H_2O(l) \rightarrow H_2SeO_3(aq) \rightarrow H^+(aq) + HSeO_3^-(aq)$; acidic anhydride

PTS: 1 DIF: B OBJ: 14-2

59. ANS:
Ammonia dissociates only slightly, so the concentration of ammonia molecules is much higher than the concentrations of ammonium ions and hydroxide ions, which are equal. The solution is basic, so the hydroxide ion concentration is higher than the hydronium ion concentration.

PTS: 1 DIF: B OBJ: 14-6

60. ANS:
5.0*M* HCl is the best conductor; 0.05*M* HCOOH is the weakest conductor

PTS: 1 DIF: B OBJ: 14-4

61. ANS:
KOH: 0; K^+: 0.10*M*;
OH^-: 0.10*M* or $10^{-1}M$;
H_3O^+: $10^{-14}/10^{-1}M = 10^{-13}M$
The pH is 13.

PTS: 1 DIF: A OBJ: 14-6

62. ANS:
HCl: 0;
H_3O^+: 0.0010*M* or $10^{-3}M$;
Cl^-: 0.0010*M*;
OH^-: $10^{-14}/10^{-3}M = 10^{-11}M$
The pH is 3.

PTS: 1 DIF: A OBJ: 14-7

63. ANS:

The conductivity of an acid or a base in water depends upon the number of ions present in the solution. A very dilute solution of a strong base could have the same conductivity as a weak acid in water.

PTS: 1 DIF: A OBJ: 14-4

PROBLEM

64. ANS:
base

PTS: 1 DIF: A OBJ: 14-1

65. ANS:
strong

PTS: 1 DIF: A OBJ: 14-6

66. ANS:
$RbOH \rightarrow Rb^{+} + OH^{-}$

PTS: 1 DIF: A OBJ: 14-6

67. ANS:
<5%

PTS: 1 DIF: A OBJ: 14-5

68. ANS:
weak

PTS: 1 DIF: A OBJ: 14-6

69. ANS:
$HCN + H_2O \rightarrow H_3O^{+} + CN^{-}$

PTS: 1 DIF: A OBJ: 14-5

70. ANS:
weak

PTS: 1 DIF: A OBJ: 14-6

71. ANS:
$H_2O + H_2O \rightarrow H_3O^{+} + OH^{-}$

PTS: 1 DIF: A OBJ: 14-6

72. ANS:
<5%

PTS: 1 DIF: A OBJ: 14-5

73. ANS:
acid

PTS: 1 DIF: A OBJ: 14-1

74. ANS:
weak

PTS: 1 DIF: A OBJ: 14-6

75. ANS:
$H_3PO_4 + H_2O \rightarrow H_30^+ + H_2PO_4^-$

PTS: 1 DIF: A OBJ: 14-5

76. ANS:
CH_3NH_2

PTS: 1 DIF: A OBJ: 14-1

77. ANS:
base

PTS: 1 DIF: A OBJ: 14-1

78. ANS:
weak

PTS: 1 DIF: A OBJ: 14-6

79. ANS:
100%

PTS: 1 DIF: A OBJ: 14-5

80. ANS:
neither

PTS: 1 DIF: A OBJ: 14-1

81. ANS:
N/A

PTS: 1 DIF: A OBJ: 14-6

82. ANS:
N/A ($KNO_3 \rightarrow K^+ + NO_3^-$)

PTS: 1 DIF: A OBJ: 14-6

83. ANS:
100%

PTS: 1 DIF: A OBJ: 14-5

84. ANS:
acid

PTS: 1 DIF: A OBJ: 14-1

85. ANS:
$HFO_4 + H_2O \rightarrow H_3O^+ + FO_4^-$

PTS: 1 DIF: A OBJ: 14-5