Acids & Bases Practice Test

Select the best answer.

1) Acids generally release H_2 gas when they react with

a) nonmetals. b) semimetals.

c) active metals. d) inactive metals.

2) Acids react with

a) bases to produce salts and water. b) salts to produce bases and water.

c) water to produce bases and salts. d) neither bases, salts, nor water.

3) Aqueous solutions of acids

a) always have Faraday properties. b) conduct electricity.

c) have very high boiling points. d) cannot be prepared.

4) Bases make pH paper turn

a) blue. b) red.

c) yellow. d) black.

5) Aqueous solutions of bases

a) always have Faraday properties. b) conduct electricity.

c) have very high boiling points. d) cannot be prepared.

6) Which of the following is perchloric acid?

a) HClO b) $HClO_2$

c) $HClO_3$ d) $HClO_4$

7) Compared with acids that have the suffix *-ic*, acids that have the suffix *-ous* contain

a) more hydrogen. b) more oxygen.

c) less oxygen. d) the same amount of oxygen.

8) What acid is found in vinegar?

a) acetic acid
b) nitric acid
c) phosphoric acid
d) hydrochloric acid

9) What is the basic assumption in the Arrhenius theory?

a) Because acids and bases conduct electric current, they must not produce ions in solution.
b) Because acids and bases conduct electric current, they must produce ions in solution.
c) Only acids conduct electric current in solution.
d) Only bases conduct electric current in solution.

10) Strong acids are

a) strong electrolytes.
b) weak electrolytes.
c) nonelectrolytes.
d) nonionized.

11) Which of the following is NOT a strong acid?

a) HNO_3
b) CH_3COOH
c) H_2SO_4
d) HCl

12) Which of the following is a weak base?

a) KOH
b) $Ca(OH)_2$
c) NH_3
d) HCl

13) A conjugate base is the species that

a) remains after a base has given up a proton.
b) is formed by the addition of a proton to a base.
c) is formed by the addition of a proton to an acid.
d) remains after an acid has given up a proton.

14) A species that remains when an acid has lost a proton is a

a) conjugate base.
b) conjugate acid.
c) strong base.
d) strong acid.

15) In the reaction $HF + H_2O \leftrightharpoons H_3O^+ + F^-$, a conjugate acid-base pair is

a) HF and H_2O.
b) F^- and H_3O^+.
c) H_3O^+ and H_2O.
d) HF and H_3O^+.

16) In the reaction $HClO_3 + NH_3 \leftrightharpoons NH_4^+ + ClO_3^-$, the conjugate base of $HClO_3$ is

a) ClO_3^-.
b) NH_3.
c) NH_4^+.
d) not shown.

17) The conjugate of a weak base is a

a) strong acid.
b) weak acid.
c) strong base.
d) weak base.

18) In the reaction $HSO_4^- + H_2O \leftrightharpoons H_3O^+ + SO_4^{2-}$, the ion HSO_4^- acts as a(n)

a) acid.
b) base.
c) spectator species.
d) salt.

19) What is neutralization?

a) an acid-base reaction that does not include dissocation of ions
b) a reaction of hydronium ions and hydroxide ions to form a salt
c) a reaction of hydronium ions and hydroxide ions to form water molecules
d) a reaction of hydronium ions and hydroxide ions to form water molecules and a salt

20) Which compound is produced by a neutralization?

a) $H_2O(l)$
b) $HNO_3(aq)$
c) $Ca(OH)_2(s)$
d) $H_3PO_4(aq)$

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Read each question or statement, and write your response in the space provided.

21) Use the following equation to explain acid rain: $SO_3(g) + H_2O(l) \rightarrow H_2SO_4(aq)$

Select the best answer.

22) Pure water contains

a) water molecules only.
b) hydronium ions only.
c) hydroxide ions only.
d) water molecules, hydronium ions, and hydroxide ions.

23) What is the concentration of OH^- in pure water?

a) 10^{-7} M
b) 0.7 M
c) 55.4 M
d) 10^{7} M

24) Which expression represents the concentration of OH^- in solution?

a) $10^{-14} - [H_3O^+]$
b) $10^{-14} \times [H_3O^+]$
c) $10^{-14} \div [H_3O^+]$
d) $[OH^-] \div 10^{-14}$

25) Which expression represents the pH of a solution?

a) $\log[H_3O^+]$
b) $-\log[H_3O^+]$
c) $\log[OH^-]$
d) $-\log[OH^-]$

26) The pH of a basic solution is

a) less than 0.
b) less than 7.
c) greater than 7.
d) greater than 14.

27) What is the pH of a 10^{-4} M HCl solution?

a) 4 b) 6

c) 8 d) 10

28) If $[H_3O^+] = 1.7 \times 10^{-3}$ M, what is the pH of the solution?

a) 1.81 b) 2.13

c) 2.42 d) 2.77

29) What is the pH of a 0.027 M KOH solution?

a) 6.47 b) 12.43

c) 12.92 d) 14.11

30) What is the pH of a 0.001 62 M NaOH solution?

a) 3.841 b) 5.332

c) 9.923 d) 11.210

31) What is the hydronium ion concentration of a solution whose pH is 7.30?

a) 1.4×10^{-11} M b) 3.8×10^{-8} M

c) 5.0×10^{-8} M d) 7.1×10^{-6} M

32) What is the hydroxide ion concentration of a solution whose pH is 12.40?

a) 2.5×10^{-2} M b) 4.4×10^{-2} M

c) 8.9×10^{-2} M d) 1.0×10^{-1} M

Solve the following problems. Show your answer and your work.

33) Find $[H_3O^+]$ for a soft drink whose pH is 3.20.

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Select the best answer.

34) An acid-base titration involves a

a) composition reaction. b) neutralization reaction.

c) single-replacement reaction. d) decomposition reaction.

35) In an acid-base titration, equivalent quantities of hydronium ions and hydroxide ions are present

a) at the beginning point. b) at the midpoint.

c) at the endpoint. d) throughout the titration.

36) What is the molarity of an HCL solution if 50.0 mL is neutralized in a titration by 40.0 mL of 0.400 M NaOH?

a) 0.200 M b) 0.280 M

c) 0.320 M d) 0.500 M

37) What is the molarity of an NaOH solution if 4.37 mL is titrated by 11.1 mL of 0.0904 M HNO_3?

a) 0.230 M b) 0.355 M

c) 0.460 M d) 0.620 M

38) If 72.1 mL of 0.543 M H_2SO_4 completely titrates 39.0 mL of KOH solution, what is the molarity of the KOH solution?

a) 0.317 M b) 0.502 M

c) 1.00 M d) 2.01 M

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ANSWER KEY

1) c

2) a

3) b

4) a

5) b

6) d

7) c

8) a

9) b

10) a

11) b

12) c

13) d

14) a

15) c

16) a

17) a

18) a

19) c

20) a

21) Sulfur trioxide gas is produced in industrial processes and released into the atmosphere. It dissolves in atmospheric water in clouds and produces sulfuric acid, which falls to the earth as acid rain or snow.

22) d

23) a

24) c

25) b

26) c

27) a

28) d

29) b

30) d

31) c

32) a

33) $3.2 = -\log[H_3O^+]$
$-3.2 = \log[H_3O^+]$
$\text{antilog}[-3.2] = [H_3O^+] = 6.3 \times 10^{-4}$ M

6.3×10^{-4} M

34) b

35) c

36) c

37) a

38) d