

Chapter 02: Basic Chemistry

Herlihy: The Human Body in Health and Illness, 6th Edition

MULTIPLE CHOICE

1. Which of the following are located in the orbits surrounding the nucleus?
 - a. Isotopes
 - b. Protons
 - c. Electrons
 - d. Neutrons

ANS: C

2. Which of the following is a measurement of hydrogen ion concentration $[H^+]$?
 - a. Atomic number
 - b. Atomic mass
 - c. Isotope
 - d. pH

ANS: D

3. The sharing of electrons is referred to as
 - a. covalent bonding.
 - b. ionic bonding.
 - c. radioactive decay.
 - d. isotope formation.

ANS: A

4. Which element must be present for a substance to be classified as organic?
 - a. Iodine
 - b. Iron
 - c. Carbon
 - d. Calcium

ANS: C

5. A cation is a(n)
 - a. positively charged ion.
 - b. electrolyte.
 - c. isotope.
 - d. ion that has an atomic mass of 2.

ANS: A

6. Which of the following is an anion?
 - a. Sodium ion
 - b. Potassium ion
 - c. Chloride ion
 - d. Calcium ion

ANS: C

7. What kind of ion would have 8 protons in its nucleus and 9 electrons in its orbits?
- Cation
 - Electrolyte
 - Acid
 - Anion

ANS: D

8. Which of the following is true of an anion?
- An anion always ionizes to form electrolytes.
 - An anion always has an atomic mass of 15.
 - An anion carries a negative charge.
 - A hydrogen ion is an anion.

ANS: C

9. NaCl, table salt, is called a(n)
- anion.
 - electrolyte.
 - cation.
 - ion.

ANS: B

10. Which process refers to the dissociation of NaCl into Na^+ and Cl^- ?
- Radioactivity
 - Ionization
 - Covalent bonding
 - Hydrogen bonding

ANS: B

11. Which of the following is descriptive of the chemical reaction in the previous question?
- Cation + anion \rightarrow electrolyte
 - Electrolyte \rightarrow cation + anion
 - Electrolyte + anion \rightarrow cation
 - Neutralization of an acid by a base

ANS: B

12. Which of the following is an anion?
- NaCl
 - KCl
 - H_2SO_4
 - HCO_3^-

ANS: D

13. Which of the following represents bicarbonate, an anion that is important in acid–base regulation?
- HCl

- b. $\text{Ca}(\text{OH})_2$
- c. HCO_3^-
- d. KCl

ANS: C

14. Which compound is the universal solvent?
- a. Carbon dioxide
 - b. Oxygen
 - c. ATP
 - d. Water

ANS: D

15. $[\text{H}^+]$ refers to
- a. an isotope of hydrogen.
 - b. heavy hydrogen.
 - c. hydrogen bonding.
 - d. hydrogen ion concentration.

ANS: D

16. Which compound is a waste product of cellular metabolism?
- a. Oxygen
 - b. Carbon dioxide
 - c. Catalyst
 - d. ATP

ANS: B

17. Which of the following increases the speed of a chemical reaction but is itself not used up in the chemical reaction?
- a. An isotope
 - b. A cation
 - c. A catalyst
 - d. ATP

ANS: C

18. What is the energy-transferring molecule?
- a. H^+
 - b. ATP
 - c. Ca^{2+}
 - d. NaCl

ANS: B

19. Which of the following acts as a catalyst?
- a. An acid
 - b. An enzyme
 - c. A buffer
 - d. ATP

ANS: B

20. Fe^{2+} is formed when iron
- gains 2 protons.
 - gains 2 electrons.
 - loses 2 protons.
 - loses 2 electrons.

ANS: D

21. Which of the following is true of Na^+ ?
- It is an anion.
 - It is an electrolyte.
 - It bonds ionically with Ca^{2+} .
 - It is a cation.

ANS: D

22. Which of the following carries no net electrical charge?
- An anion
 - A cation
 - A polar molecule
 - An ion

ANS: C

23. Which of the following illustrates antacid activity?
- $\text{NaCl} \rightarrow \text{Na}^+ + \text{Cl}^-$
 - $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$
 - $\text{Mg}(\text{OH})_2 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$
 - $\text{KCl} \rightarrow \text{K}^+ + \text{Cl}^-$

ANS: C

24. Zinc, selenium, cobalt, and iodine are all
- trace elements.
 - compounds.
 - radioactive.
 - isotopes of hydrogen.

ANS: A

25. Iron can be a(n)
- anion.
 - electrolyte.
 - acid.
 - cation.

ANS: D

26. Which of the following is described by this statement? One atom of oxygen bonds covalently with two atoms of hydrogen.

- a. Carbon dioxide
- b. A tincture
- c. Water
- d. Neutralization of an acid with a base

ANS: C

27. A solution that has a pH of 6.8
- a. has a neutral pH.
 - b. is alkaline.
 - c. is basic.
 - d. is acidic.

ANS: D

28. What happens when HCl is added to a solution with a pH of 7.45?
- a. The pH will be higher than 7.45.
 - b. The solution will become more alkaline.
 - c. The $[H^+]$ of the solution will increase.
 - d. The pH will be higher than 8.0.

ANS: C

29. Which pH is considered neutral?
- a. 7.35
 - b. 7.45
 - c. 7.00
 - d. 14.0

ANS: C

30. Blood has a pH range of 7.35 to 7.45 and therefore
- a. is acidic.
 - b. is three to four times more viscous (thicker) than water.
 - c. has a pH that is similar to urine and stomach contents.
 - d. is alkaline.

ANS: D

31. In which of the following is the number of hydrogen ions greater?
- a. An alkaline solution
 - b. A basic solution
 - c. Blood
 - d. A solution with a pH of 6.2

ANS: D

32. An atom has 2 protons, 2 neutrons, and 2 electrons; it has an atomic
- a. number of 6.
 - b. mass of 2.
 - c. mass of 4.
 - d. number of 4.

ANS: C

33. An atom has 1 proton, 0 neutrons, and 1 electron; its isotope has
- 2 electrons and 0 neutrons.
 - 2 protons and 2 neutrons.
 - 1 proton and 1 neutron.
 - 2 protons and 0 neutrons.

ANS: C

34. An atom has 1 proton, 0 neutrons, and 1 electron. What will convert this atom to a cation?
- Add 1 neutron.
 - Add 1 proton.
 - Lose 1 electron.
 - Add 1 proton, 2 neutrons, and 1 electron.

ANS: C

35. The heart pushes blood into the blood vessels as chemical energy is converted to which form of energy?
- Thermal
 - Radiant
 - Mechanical
 - Nuclear

ANS: C

36. Which of the following best describes a solution in which water is the solvent?
- Colloidal suspension
 - Aqueous solution
 - Tincture
 - Isotope

ANS: B

37. Which of the following best describes a solution in which alcohol is the solvent?
- Tincture
 - Alkaline
 - Acid
 - Aqueous

ANS: A

38. A combination of sugar granules and iron filings is best described as a(n)
- mixture.
 - colloidal suspension.
 - tincture.
 - isotope.

ANS: A

39. Which of the following can neutralize H^+ ?
- Ca^{2+}

- b. Na^+
- c. OH^-
- d. H_2O

ANS: C

40. Which of the following is incorrect?
- a. Mixtures: suspension, colloidal suspension, solution
 - b. Ions: Na^+ , Cl^- , Ca^{2+} , K^+
 - c. Electrolytes: NaCl , KCl , CaCl_2 , HCO_3^-
 - d. Cations: Na^+ , Ca^{2+} , K^+ , H^+

ANS: C

41. The ionization of salt (NaCl)
- a. produces an acid and a base.
 - b. produces an electrolyte.
 - c. lowers pH.
 - d. produces a cation and an anion.

ANS: D

42. Which of the following is true of iodine and radioactive iodine?
- a. Both have the same atomic numbers.
 - b. Both have the same atomic masses.
 - c. Neither has electrons in its orbit.
 - d. Both create radiation hazards.

ANS: A

43. Which of the following is true of Na^+ ?
- a. Called the *sodium ion*
 - b. Has fewer protons than electrons
 - c. Called an *anion*
 - d. Lowers pH

ANS: A

44. Which of the following is true of Cl^- ?
- a. Is an electrolyte
 - b. Is an anion
 - c. Increases pH
 - d. Decreases pH

ANS: B

45. Which of the following is most descriptive of HCl ?
- a. Is called *bicarbonate*
 - b. Is an acid
 - c. Raises pH
 - d. Dissociates into Na^+ and Cl^-

ANS: B

46. Water is a(n)
- molecule.
 - aqueous solvent.
 - compound.
 - All of the above.

ANS: D

47. An atom that has 3 protons, 4 neutrons, and 3 electrons
- has an atomic mass of 7.
 - is a cation.
 - has an atomic number of 4.
 - has an atomic number of 10.

ANS: A

48. An atom has 3 protons, 4 neutrons, and 3 electrons; another atom has 3 protons, 3 neutrons, and 3 electrons. Which of the following is most descriptive of this pair of atoms?
- Mixture
 - Cation
 - Electrolyte
 - Isotope

ANS: D

49. An atom has 4 protons, 4 neutrons, and 4 electrons. It
- has an atomic number of 8.
 - is a cation.
 - has an atomic mass of 12.
 - has an atomic mass of 8.

ANS: D

50. ATP
- is a buffer, removing H^+ from solution.
 - is an energy transfer molecule.
 - is a radioactive isotope of phosphate.
 - ionizes to H^+ , thereby lowering pH.

ANS: B

51. Which of the following is most descriptive of the nucleus of the atom?
- Contents determine the atomic number
 - Contents determine the atomic mass
 - "Home" of the protons
 - All of the above

ANS: D

52. Which of the following is most descriptive of ionic and covalent?
- Types of bonding in which the electrons are shared
 - Types of bonding in which the electrons are swapped

- c. Types of bonding
- d. Types of bonding found only in reactions in which H^+ is produced

ANS: C

53. An electrolyte
- a. dissociates into ions.
 - b. yields only cations.
 - c. always yields H^+ and lowers pH.
 - d. always removes H^+ and increases pH.

ANS: A

54. A catalyst
- a. is an H^+ -yielding molecule.
 - b. is an acid.
 - c. is an alkali.
 - d. increases the speed of a chemical reaction.

ANS: D

55. Which of the following is most descriptive of the function of an enzyme?
- a. Neutralization
 - b. Ionization
 - c. Catalyst
 - d. pH

ANS: C

56. A patient with a blood pH of 7.28
- a. has an excess of H^+ .
 - b. has a blood pH that is within normal limits.
 - c. is alkalotic.
 - d. has a blood pH that indicates a deficiency of acid.

ANS: A

57. A solution with a pH of 8
- a. is more acidic than blood.
 - b. is more acidic than stomach contents.
 - c. has more H^+ than urine.
 - d. is more alkaline than blood.

ANS: D

58. The pH of urine
- a. is always more alkaline than blood.
 - b. is always acidic.
 - c. can be acidic or alkaline.
 - d. is more acidic than stomach contents.

ANS: C

59. The addition of H^+ to blood
- increases blood pH.
 - makes the blood more acidic.
 - makes the blood more alkaline.
 - changes the blood pH from 7.4 to 7.8.

ANS: B

60. Blood is called a *colloidal suspension* because
- it has a pH of 7.4.
 - it is alkaline.
 - it consists of the suspended plasma proteins.
 - it consists of the sodium and chloride ions.

ANS: C

61. Which of the following is correct about the following reaction: $NaCl \leftrightarrow Na^+ + Cl^-$?
- Neutralization
 - Ionization
 - Anabolic
 - Irreversible

ANS: B

62. An atom of oxygen has an atomic number of 8. Therefore
- it can share electrons with another identical atom.
 - it can share electrons with another oxygen atom.
 - it can form O_2 .
 - All of the above are true.

ANS: D

63. An atom of oxygen shares its outer shell electrons with two hydrogen atoms thereby
- forming an acid.
 - ionizing.
 - forming a molecule of water.
 - forming an anion and cation.

ANS: C

64. A molecule of water has a (+) charge at one and a (-) charge at the other end of the molecule. What is the best description?
- Radioactive
 - Tincture
 - Polar molecule
 - Ionization

ANS: C

65. Intestinal secretions are alkaline. What can decrease its pH?
- The addition of H^+ in the form of HCl
 - Drinking baking soda ($NaHCO_3$)

- c. Neutralization of gastric (stomach) HCl
- d. Drinking lots of water

ANS: A

66. What do the following have in common: Pb, plumbism, and plumber? All terms refer to
- a. persons who work with pipes.
 - b. toxic effects of a trace element.
 - c. toxic cations.
 - d. lead.

ANS: D

67. Which group is correct?
- a. Subatomic particles located within the nucleus: protons, neutrons, electrons
 - b. Common cations: Na^+ , K^+ , HCO_3^- , NH_4^+
 - c. Common molecules: O_2 , N_2 , H_2O
 - d. Bases: NaOH , Na HCO_3^- , HCl

ANS: C

68. Which of the following is most descriptive of a precipitate that forms during a chemical reaction?
- a. Acid
 - b. Base
 - c. Solid
 - d. Solution

ANS: C

69. In the reaction $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$
- a. HCl ionizes, thereby yielding the cation (H^+) and anion (Cl^-).
 - b. hydrochloric acid dissociates into an anion and cation.
 - c. HCl dissociates into a hydrogen ion and chloride ion.
 - d. All of the above are true.

ANS: D

70. Which group is correct?
- a. Blood pH 7.50, alkaline, turns litmus paper pink
 - b. Blood pH 7.2, acidosis, turns litmus paper pink
 - c. Blood pH 7.35, normal blood pH, turns litmus paper blue
 - d. More than one of the above are true.

ANS: C