

## Chapter 02: Basic Chemistry

### Herlihy: The Human Body in Health and Illness, 7th Edition

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#### MULTIPLE CHOICE

1. Which of the following is located in the orbits surrounding the nucleus?
- Isotopes
  - Protons
  - Electrons
  - Neutrons

ANS: C                    PTS: 1

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

ANS: D                    PTS: 1

3. The sharing of electrons is referred to as:
- covalent bonding.
  - ionic bonding.
  - radioactive decay.
  - isotope formation.

ANS: A                    PTS: 1

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

ANS: C                    PTS: 1

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

ANS: A                    PTS: 1

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

ANS: C                    PTS: 1

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

ANS: D                    PTS: 1

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                    PTS: 1

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

ANS: B                    PTS: 1

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

ANS: B                    PTS: 1

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

ANS: B                    PTS: 1

12. Which of the following is an anion?
- NaCl
  - KCl
  - H<sub>2</sub>SO<sub>4</sub>
  - HCO<sub>3</sub><sup>-</sup>

ANS: D                    PTS: 1

13. Bases can be classified as being:
- acidic or alkaline.
  - weak or strong.

- c. neutral or biased.
- d. reactive or passive.

ANS: B                    PTS: 1

14. Which of the following represents bicarbonate, an anion that is important in acid–base regulation?
- a. HCl
  - b. Ca(OH)<sub>2</sub>
  - c. HCO<sub>3</sub><sup>-</sup>
  - d. KCl

ANS: C                    PTS: 1

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

ANS: D                    PTS: 1

16. [H<sup>+</sup>] refers to:
- a. an isotope of hydrogen.
  - b. heavy hydrogen.
  - c. hydrogen bonding.
  - d. hydrogen ion concentration.

ANS: D                    PTS: 1

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

ANS: B                    PTS: 1

18. 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                    PTS: 1

19. What is the energy-transferring molecule?
- a. H<sup>+</sup>
  - b. ATP
  - c. Ca<sup>2+</sup>
  - d. NaCl

ANS: B                    PTS: 1

20. Which of the following acts as a catalyst?
- An acid
  - An enzyme
  - A buffer
  - ATP

ANS: B                    PTS: 1

21.  $\text{Fe}^{2+}$  is formed when iron:
- gains 2 protons.
  - gains 2 electrons.
  - loses 2 protons.
  - loses 2 electrons.

ANS: D                    PTS: 1

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

ANS: D                    PTS: 1

23. Which of the following carries lopsided charge?
- An anion
  - A cation
  - A polar molecule
  - An ion

ANS: C                    PTS: 1

24. 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                    PTS: 1

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

ANS: A                    PTS: 1

26. Iron can be a(n):
- anion.

- b. electrolyte.
- c. acid.
- d. cation.

ANS: D                    PTS: 1

27. 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                    PTS: 1

28. 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                    PTS: 1

29. 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                    PTS: 1

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

ANS: C                    PTS: 1

31. 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                    PTS: 1

32. As assessment of a patient's electrolytes is performed by collecting a sample of the patient's:
- a. saliva.
  - b. urine.
  - c. blood.
  - d. hair follicles.

ANS: C                    PTS: 1

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

ANS: D                    PTS: 1

34. An atom has 2 protons, 2 neutrons, and 2 electrons; it has an atomic:
- number of 6.
  - mass of 2.
  - mass of 4.
  - number of 4.

ANS: C                    PTS: 1

35. 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                    PTS: 1

36. 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                    PTS: 1

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

ANS: C                    PTS: 1

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

ANS: B                    PTS: 1

39. Which of the following best describes a solution in which alcohol is the solvent?
- Tincture

- b. Alkaline
- c. Acid
- d. Aqueous

ANS: A                    PTS: 1

40. A combination of sugar granules and iron filings is best described as a(n):
- a. mixture.
  - b. colloidal suspension.
  - c. tincture.
  - d. isotope.

ANS: A                    PTS: 1

41. Which of the following can neutralize  $H^+$ ?
- a.  $Ca^{2+}$
  - b.  $Na^+$
  - c.  $OH^-$
  - d.  $H_2O$

ANS: C                    PTS: 1

42. 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                    PTS: 1

43. 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                    PTS: 1

44. 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                    PTS: 1

45. 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                    PTS: 1

46. Which of the following is true of  $\text{Cl}^-$ ?
- Is an electrolyte.
  - Is an anion.
  - Increases pH.
  - Decreases pH.

ANS: B                      PTS: 1

47. Which of the following is most descriptive of HCl?
- Is called *bicarbonate*.
  - Is an acid.
  - Raises pH.
  - Dissociates into  $\text{Na}^+$  and  $\text{Cl}^-$ .

ANS: B                      PTS: 1

48. Water is a(n):
- molecule.
  - aqueous solvent.
  - compound.
  - All are correct

ANS: D                      PTS: 1

49. 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                      PTS: 1

50. 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                      PTS: 1

51. 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                      PTS: 1

52. ATP:
- is a buffer, removing  $\text{H}^+$  from solution.
  - is an energy transfer molecule.



- c. is a radioactive isotope of phosphate.
- d. ionizes to  $H^+$ , thereby lowering pH.

ANS: B                    PTS: 1

53. Which of the following is most descriptive of the nucleus of the atom?
- a. Contents determine the atomic number
  - b. Contents determine the atomic mass
  - c. "Home" of the protons
  - d. All are correct

ANS: D                    PTS: 1

54. Which of the following is most descriptive of ionic and covalent?
- a. Types of bonding in which the electrons are shared.
  - b. 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                    PTS: 1

55. 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                    PTS: 1

56. 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                    PTS: 1

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

ANS: C                    PTS: 1

58. A patient with a blood pH of 7.28:
- a. has an excess of  $H^+$  ions.
  - 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                    PTS: 1

59. A solution with a pH of 8:
- is more acidic than blood.
  - is more acidic than stomach contents.
  - has more  $H^+$  than urine.
  - is more alkaline than blood.

ANS: D                    PTS: 1

60. The pH of urine:
- is always more alkaline than blood.
  - is always acidic.
  - can be acidic or alkaline.
  - is more acidic than stomach contents.

ANS: C                    PTS: 1

61. 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                    PTS: 1

62. 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                    PTS: 1

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

ANS: B                    PTS: 1

64. 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 are correct

ANS: D                    PTS: 1

65. An atom of oxygen shares its outer shell electrons with two hydrogen atoms thereby:
- forming an acid.
  - ionizing.
  - forming a molecule of water.

d. forming an anion and cation.

ANS: C                    PTS: 1

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

ANS: C                    PTS: 1

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

ANS: A                    PTS: 1

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

ANS: D                    PTS: 1

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

ANS: C                    PTS: 1

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

ANS: C                    PTS: 1

71. In the reaction  $HCl \rightarrow H^+ + Cl^-$ :
- HCl ionizes, thereby yielding the cation ( $H^+$ ) and anion ( $Cl^-$ ).
  - hydrochloric acid dissociates into an anion and cation.
  - HCl dissociates into a hydrogen ion and chloride ion.
  - All are correct

ANS: D                    PTS: 1

72. 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 options are true.

ANS: C

PTS: 1