

Herlihy: The Human Body in Health and Illness, 3rd Edition

Test Bank

Chapter 2: Basic Chemistry

MULTIPLE CHOICE

1. Which of the following is located in the orbits surrounding the nucleus?
- A. isotopes
 - B. protons
 - C. electrons
 - D. neutrons

ANS: C

The electrons are in orbits surrounding the nucleus. The protons and neutrons are located within the nucleus.

PTS: 1

2. Which of the following is a measurement of hydrogen ion concentration $[H^+]$?
- A. atomic number
 - B. atomic weight
 - C. isotope
 - D. pH

ANS: D

The measurement of $[H^+]$ is the pH.

PTS: 1

3. The sharing of electrons is referred to as
- A. covalent bonding.
 - B. ionic bonding.
 - C. radioactive decay.
 - D. isotope formation.

ANS: A

The sharing of electrons is known as covalent bonding. The donation of the electrons forms ionic bonds. Isotope formation concerns the numbers of neutrons.

PTS: 1

4. Which element must be present for a substance to be classified as organic?
- A. iodine
 - B. iron
 - C. carbon

D. calcium

ANS: C

An organic compound contains carbon.

PTS: 1

5. A cation is a(n)

- A. positively charged ion.
- B. electrolyte.
- C. isotope.
- D. ion that has an atomic weight of 2.

ANS: A

A cation is a positively charged ion. Electrolytes dissociate to form ions.

PTS: 1

6. Which of the following is an anion?

- A. sodium ion
- B. potassium ion
- C. chloride ion
- D. calcium ion

ANS: C

An anion is a negatively charged ion (Cl^-).

PTS: 1

7. This ion has 8 protons in the nucleus and 9 electrons in its orbits. It is therefore a(n)

- A. cation.
- B. electrolyte.
- C. acid.
- D. anion.

ANS: D

The excess negative charge makes this ion an anion. A cation carries a positive charge.

PTS: 1

8. Which of the following is true of an anion?

- A. An anion always ionizes to form electrolytes.
- B. An anion always has an atomic weight of 15.
- C. An anion carries a negative charge.
- D. Hydrogen ion is an anion.

ANS: C

An anion carries a negative charge. An anion cannot ionize to form an electrolyte. Hydrogen ion is a cation.

PTS: 1

9. NaCl, table salt, is called a(n)

- A. anion.
- B. electrolyte.
- C. cation.
- D. ion.

ANS: B

NaCl is an electrolyte and can ionize to form ions (cations and anions).

PTS: 1

10. Which process refers to the dissociation of NaCl into Na^+ and Cl^- ?

- A. radioactivity
- B. ionization
- C. covalent bonding
- D. hydrogen bonding

ANS: B

The dissociation of NaCl to Na^+ and Cl^- is called ionization.

PTS: 1

11. Which of the following is descriptive of the chemical reaction in the previous question?

- A. $\text{cation} + \text{anion} \rightarrow \text{electrolyte}$
- B. $\text{electrolyte} \rightarrow \text{cation} + \text{anion}$
- C. $\text{electrolyte} + \text{anion} \rightarrow \text{cation}$
- D. neutralization of an acid by a base

ANS: B

The dissociation of NaCl to Na^+ (cation) and Cl^- (anion) is called ionization.

PTS: 1

12. Which of the following is an anion?

- A. NaCl
- B. KCl
- C. H_2SO_4
- D. HCO_3^-

ANS: D

HCO_3^- (bicarbonate) carries a negative charge and is an anion. The other molecules are called electrolytes.

PTS: 1

13. Which of the following represents bicarbonate, an anion that is important in acid-base regulation?
- A. HCl
 - B. CaCO_3
 - C. HCO_3^-
 - D. KCl

ANS: C

The chemical symbol for bicarbonate is HCO_3^-

PTS: 1

14. Which compound is the universal solvent?
- A. carbon dioxide
 - B. oxygen
 - C. ATP
 - D. water

ANS: D

The universal solvent is water, meaning that most substances can dissolve in water.

PTS: 1

15. $[\text{H}^+]$ refers to
- A. an isotope of hydrogen.
 - B. heavy hydrogen.
 - C. hydrogen bonding.
 - D. hydrogen ion concentration.

ANS: D

$[\text{H}^+]$ refers to hydrogen ion concentration; the brackets mean concentration.

PTS: 1

16. Which compound is a waste product of cellular metabolism?
- A. oxygen
 - B. carbon dioxide
 - C. catalyst
 - D. ATP

ANS: B

Carbon dioxide is a waste product of cellular metabolism.

PTS: 1

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

A catalyst increases the speed of a chemical reaction; many catalysts are enzymes.

PTS: 1

18. What is the energy-transferring molecule?
- A. H^+
 - B. ATP
 - C. Ca^{2+}
 - D. NaCl

ANS: B

The energy-transferring molecule is ATP. Food is metabolized, releasing its stored energy. The energy is used to make ATP. The ATP then gives up the energy to chemical reactions that require energy.

PTS: 1

19. Which of the following acts as a catalyst?
- A. an acid
 - B. an enzyme
 - C. a buffer
 - D. ATP

ANS: B

An enzyme functions as a catalyst, increasing the rate of a chemical reaction.

PTS: 1

20. The word *ferrous* refers to
- A. an acid solution.
 - B. an alkaline solution.
 - C. any cation.
 - D. iron.

ANS: D

The word ferrous refers to iron (Fe^{2+}).

PTS: 1

21. Na^+

- A. is an anion.
- B. is an electrolyte.
- C. bonds ionically with Ca^{2+} .
- D. is a cation.

ANS: D

Na^+ is a cation, a positively charged ion.

PTS: 1

22. Which of the following carries no net electrical charge?

- A. an anion
- B. a cation
- C. a polar molecule
- D. an ion

ANS: C

A polar molecule carries no net electrical charge; the charges within the molecule are lopsided (one end positive, the other end negative).

PTS: 1

23. Which of the following illustrates antacid activity?

- A. $\text{NaCl} \rightarrow \text{Na}^+ + \text{Cl}^-$
- B. $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$
- C. $\text{Mg}(\text{OH})_2 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$
- D. $\text{KCl} \rightarrow \text{K}^+ + \text{Cl}^-$

ANS: C

An antacid is a substance (base) that neutralizes an acid (H^+). This is illustrated by $\text{Mg}(\text{OH})_2$, the antacid that reacts with the acid (HCl).

PTS: 1

24. Zinc, selenium, cobalt, and iodine are all

- A. trace elements.
- B. compounds.
- C. radioactive.
- D. isotopes of hydrogen.

ANS: A

Zinc, selenium, cobalt, and iodine are trace elements.

PTS: 1

25. Iron is a(n)

- A. anion.
- B. electrolyte.

- C. acid.
- D. cation.

ANS: D

Iron is a cation, carrying a positive charge.

PTS: 1

26. Which of the following is described by: 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

The molecule described is water, H₂O.

PTS: 1

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

A solution with a pH of 6.8 is acidic. A pH of 7 is neutral. A pH >7.0 is alkaline; a pH <7.0 is acidic.

PTS: 1

28. What happens when HCl is added to a solution with a pH of 7.45?
- A. The pH will be greater than 7.45.
 - B. The solution will become more alkaline.
 - C. The [H⁺] of the solution will increase.
 - D. The pH will be greater than 8.0.

ANS: C

The HCl adds H⁺ to the solution, making it more acidic and decreasing the pH.

PTS: 1

29. Which pH is considered neutral?
- A. 7.35
 - B. 7.45
 - C. 7.00
 - D. 14.0

ANS: C

A pH of 7.0 is neutral. A pH >7.0 is alkaline; a pH <7.0 is acidic.

PTS: 1

30. Blood has a pH range of 7.35 to 7.45 and therefore
- A. is acidic.
 - B. is 3-4 times more viscid (thicker) than water.
 - C. has a pH that is similar to urine and stomach contents.
 - D. is alkaline.

ANS: D

Blood pH is alkaline because it is greater than pH 7.0.

PTS: 1

31. In which of the following is the number of hydrogen ions greater?
- A. an alkaline solution
 - B. a basic solution
 - C. blood
 - D. urine

ANS: D

[H⁺] is greater in urine, since urine is usually acidic. The other solutions are alkaline (basic) with a higher pH.

PTS: 1

32. An atom has 2 protons, 2 neutrons, and 2 electrons; it has an atomic
- A. number of 6.
 - B. weight of 2.
 - C. weight of 6.
 - D. number of 4.

ANS: C

The atom has an atomic weight of 4 (numbers of protons and neutrons).

PTS: 1

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

ANS: C

An isotope is an atom that has the same atomic number (numbers of protons) but a different atomic weight (differing numbers of neutrons).

PTS: 1

34. An atom has 1 proton, 0 neutrons, and 1 electron. What will convert this atom to a cation?
- A. add 1 neutron
 - B. add 1 proton
 - C. lose 1 electron
 - D. add 1 proton, 2 neutrons, and eliminate 1 electron

ANS: C

The loss of an electron will convert this atom to a cation, a positively charged ion.

PTS: 1

35. The heart pushes blood into the blood vessels as chemical energy is converted to this form of energy.
- A. thermal
 - B. radiant
 - C. mechanical
 - D. nuclear

ANS: C

Chemical energy is converted to mechanical energy.

PTS: 1

36. Which of the following best describes a solution in which water is the solvent?
- A. colloidal suspension
 - B. aqueous solution
 - C. tincture
 - D. isotope

ANS: B

A solution with water as the solvent is an aqueous solution. If the solvent is alcohol, it is called a tincture.

PTS: 1

37. Which of the following best describes a solution in which alcohol is the solvent?
- A. tincture
 - B. alkaline
 - C. acid
 - D. aqueous

ANS: A

A solution with alcohol as the solvent is a tincture.

PTS: 1

38. A combination of sugar granules and iron filings is best described as a
- A. mixture.
 - B. colloidal suspension.
 - C. tincture.
 - D. isotope.

ANS: A

A combination of sugar granules and iron filings is a mixture (the components can be separated by ordinary physical means, such as the use of a magnet).

PTS: 1

39. Which of the following can neutralize H^+ ?
- A. Ca^{2+}
 - B. Na^+
 - C. OH^-
 - D. H_2O

ANS: C

H^+ (acid) can be neutralized by OH^- (base).

PTS: 1

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

HCO_3^- is an anion, not an electrolyte.

PTS: 1