# Test Bank for Anatomy & Physiology The Unity of Form and Function 8th Edition by Saladin

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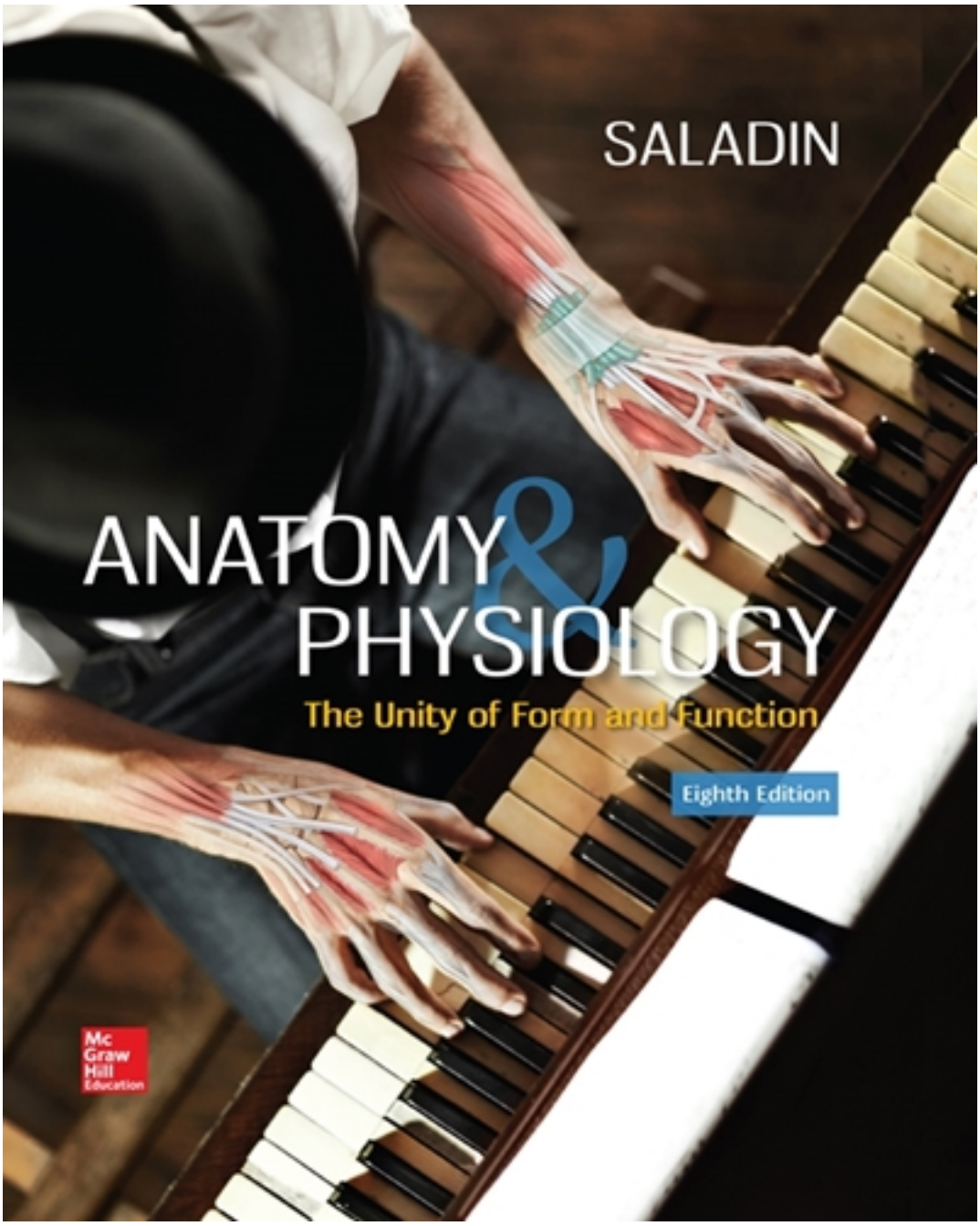


# Test Bank

# Chapter 02 The Chemistry of Life Answer Key

## True / False Questions

1. Minerals are organic elements extracted from the soil by plants.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: O01.01e List the important dietary minerals and describe the major uses of each mineral in the body.*
*HAPS Topic: Module O01 Nutrition.*
*Learning Outcome: 02.01c State the functions of minerals in the body.*
*Section: 02.01*
*Topic: Atoms and molecules*

2. Molecules composed of two or more atoms are called compounds.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01b Distinguish between elements and compounds.*
*Section: 02.01*
*Topic: Atoms and molecules*

3. Hydrogen, deuterium, and tritium are three isotopes of hydrogen.

**TRUE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C01.01c Explain how ions and isotopes are produced by changing the relative number of specific subatomic particles with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01d Explain the basis for radioactivity and the types and hazards of ionizing radiation.*
*Section: 02.01*
*Topic: Atoms and molecules*

4. Potassium, sodium, and chlorine are trace elements.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01b Distinguish between elements and compounds.*
*Section: 02.01*
*Topic: Atoms and molecules*

5. Ionic bonds break apart in water more easily than covalent bonds do.

**TRUE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C02.01a List each type of bond in order by relative strength with respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.01f Define the types of chemical bonds.*
*Section: 02.01*
*Topic: Chemical bonding*

6. A solution is a mixture of two or more substances that are physically blended but *not* chemically combined.

**TRUE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02c Show how three kinds of mixtures differ from each other.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

7. The pH of blood plasma is approximately 7.4, which is slightly acidic.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C03.05 State acidic, neutral, and alkaline pH values.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02d Define acid and base and interpret the pH scale.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

8. The high heat capacity of water makes it a very ineffective coolant.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C03.01 Discuss the physiologically important properties of water.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02b Describe the biologically important properties of water.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

9. In an exchange reaction, covalent bonds are broken and new covalent bonds are formed.

**TRUE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.*
*Section: 02.03*

*Topic: Chemical bonding*

10. Chemical reactions in which larger molecules are broken down into smaller ones are called catabolic reactions.

**TRUE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03e Define metabolism and its two subdivisions.*
*Section: 02.03*
*Topic: Atoms and molecules*

11. The opposite of a dehydration synthesis reaction is a hydrolysis reaction.

**TRUE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.*
*Section: 02.03*
*Topic: Atoms and molecules*

12. Unsaturated fatty acids have as much hydrogen as they can carry.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04e Discuss the types and functions of lipids.*
*Section: 02.04*
*Topic: Organic compounds*

13. A dipeptide is a molecule with two peptide bonds.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04f Discuss protein structure and function.*
*Section: 02.04*
*Topic: Organic compounds*

14. All amino acids have both a carboxyl group and an amino group attached to a central carbon.

**TRUE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04f Discuss protein structure and function.*

*Section: 02.04*
*Topic: Organic compounds*

15. ATP is the body's most important form of long-term energy storage.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C05.01 Describe the generalized reversible reaction for release of energy from ATP and explain the role of ATP in the cell.*
*HAPS Topic: Module C05 Energy transfer using ATP.*
*Learning Outcome: 02.04h Describe the structure, production, and function of ATP.*
*Section: 02.04*
*Topic: Energy transfer using ATP*

## Multiple Choice Questions

16. The most abundant element in the human body, by weight, is _____.

A. nitrogen
B. hydrogen
C. carbon
**D.** oxygen
E. calcium

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01a Identify the elements of the body from their symbols.*
*Section: 02.01*
*Topic: Atoms and molecules*

17. Sodium has an atomic number of 11 and an atomic mass of 23. Sodium has _____.

**A.** 12 neutrons and 11 protons
B. 12 protons and 11 neutrons
C. 12 electrons and 11 neutrons
D. 12 protons and 11 electrons
E. 12 electrons and 11 protons

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C01.01d Distinguish among the terms atomic number, mass number and atomic weight with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01a Identify the elements of the body from their symbols.*
*Section: 02.01*
*Topic: Atoms and molecules*

18. The chemical properties of an atom are determined by its _____.

A. protons
**B.** electrons
C. neutrons
D. protons and neutrons
E. particles

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C01.01b Relate the number of electrons in an electron shell to an atoms chemical stability and its ability to form chemical bonds with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01b Distinguish between elements and compounds.*
*Section: 02.01*
*Topic: Atoms and molecules*

19. Na (atomic no. 11) reacts with Cl (atomic no. 17) to become stable. In the reaction, Na will _____, while Cl will _____.

A. accept one electron; give up one electron
B. give up one proton; accept one proton
C. share one electron with chlorine; share one electron with sodium
D. become an anion; become a cation
**E.** give up one electron; accept one electron

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.01f Define the types of chemical bonds.*
*Section: 02.01*
*Topic: Chemical bonding*

20. Oxygen has an atomic number of 8 and an atomic mass of 16. How many valence electrons does it have?

A. 2
B. 4
**C.** 6
D. 8
E. 16

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C01.01d Distinguish among the terms atomic number, mass number and atomic weight with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01b Distinguish between elements and compounds.*
*Section: 02.01*
*Topic: Atoms and molecules*

21. Oxygen has an atomic number of eight. When two oxygen atoms come together, they form a(n) _____ bond.

A. hydrogen
**B.** nonpolar covalent
C. polar covalent
D. ionic
E. Van der Waals

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.01f Define the types of chemical bonds.*
*Section: 02.01*
*Topic: Chemical bonding*

22. When table salt, sodium chloride (NaCl), is placed in water _____.

A. $Na^+$ and $Cl^-$ form ionic bonds with each other
B. $Na^+$ and $Cl^-$ form polar covalent bonds with each other
C. $Na^+$ and $Cl^-$ form hydrogen bonds with water
**D.** Ionic bonds between $Na^+$ and $Cl^-$ are broken
E. $Na^+$ and $Cl^-$ become separated by their Van der Waals forces

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.01f Define the types of chemical bonds.*
*Section: 02.01*
*Topic: Chemical bonding*

23. The bonding properties of an atom are determined by its _____.

**A.** electrons
B. protons
C. positrons
D. neutrons
E. photons

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C01.01b Relate the number of electrons in an electron shell to an atoms chemical stability and its ability to form chemical bonds with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01f Define the types of chemical bonds.*
*Section: 02.01*
*Topic: Chemical bonding*

24. What type of bond attracts one water molecule to another?

A. An ionic bond
B. A peptide bond
**C.** A hydrogen bond
D. A covalent bond
E. A hydrolytic bond

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.01f Define the types of chemical bonds.*
*Section: 02.01*
*Topic: Chemical bonding*

## Check All That Apply Questions

25. Which of these is a cation? Check all that apply.

__ $O_2$
**X** $K^+$
**X** $Na^+$
**X** $Ca^{2+}$
__ $Cl^-$

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01e Distinguish between ions, electrolytes, and free radicals.*
*Section: 02.01*
*Topic: Chemical bonding*

## Multiple Choice Questions

26. _____ account for 98.5% of the body's weight.

A. Carbon, oxygen, hydrogen, sodium, potassium, and chlorine
B. Carbon, oxygen, iron, sodium, potassium, and chlorine
C. Carbon, nitrogen, hydrogen, sodium, potassium, and chlorine
D. Carbon, oxygen, hydrogen, nitrogen, sodium, and potassium
**E.** Carbon, oxygen, hydrogen, nitrogen, calcium, and phosphorus

*Accessibility: Keyboard Navigation*

*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01a Identify the elements of the body from their symbols.*
*Section: 02.01*
*Topic: Atoms and molecules*

27. _____ differ from one another in their number of neutrons and atomic mass.

A. Cations
B. Anions
**C.** Isotopes
D. Electrolytes
E. Free radicals

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01d Explain the basis for radioactivity and the types and hazards of ionizing radiation.*
*Section: 02.01*
*Topic: Atoms and molecules*

28. When jumping into water you notice resistance. This resistance is caused by water's _____.

A. adhesiveness
**B.** cohesiveness
C. hydrophobic tension
D. hydrophilic tension
E. osmotic equilibrium

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C03.01 Discuss the physiologically important properties of water.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02b Describe the biologically important properties of water.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

29. Which of these is hydrophobic?

A. Glucose
B. $K^+$
C. $Cl^-$
D. Water
**E.** Fat

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C03.01 Discuss the physiologically important properties of water.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02b Describe the biologically important properties of water.*
*Section: 02.02*

*Topic: Inorganic compounds and solutions*

30. Blood contains NaCl, protein, and cells. The NaCl is in a(n) _____, the protein is in a(n) _____, and the cells are in a _____.

A. emulsion; solution; suspension
B. solvent; emulsion; colloid
C. colloid; suspension; solution
D. suspension; colloid; solution
**E.** solution; colloid; suspension

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02c Show how three kinds of mixtures differ from each other.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

31. Which of these is the most appropriate to express the number of molecules per volume?

**A.** Molarity
B. Volume
C. Percentage
D. Weight per volume
E. Milliequivalents per liter

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02e Discuss some ways in which the concentration of a solution can be expressed, and the kinds of information we can derive from the different units of measure.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

32. A solution with pH 4 has _____ the $H^+$ concentration of a solution with pH 8.

A. ½
B. 2 times
C. 4 times
**D.** 10,000 times
E. 1/10,000

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02d Define acid and base and interpret the pH scale.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

33. Which of these has the highest $H^+$ concentration?

**A.** Lemon juice, pH = 2.3
B. Red wine, pH = 3.2
C. Tomato juice, pH = 4.7
D. Saliva, pH = 6.6
E. Household ammonia, pH = 10.8

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C03.05 State acidic, neutral, and alkaline pH values.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02d Define acid and base and interpret the pH scale.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

34. In a workout your muscle cells produce lactate, yet you maintain a constant blood pH because _____.

A. metabolic acids are neutralized in muscle cells before released into the blood
B. metabolic bases are produced at the same rate by muscle cells to neutralize the acids
C. the respiratory system removes excess $H^+$ from the blood before the pH is lowered
**D.** the body contains chemicals called buffers that resist changes in pH
E. endothelial cells secrete excess $H^+$ to prevent a decrease in pH

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02d Define acid and base and interpret the pH scale.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

35. A solution that resists a change in pH when an acid or base is added to it is a(n) _____.

**A.** buffer
B. catalyst
C. reducing agent
D. oxidizing agent
E. colloid

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.02d Define acid and base and interpret the pH scale.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

36. A chemical reaction that removes electrons from an atom is called a(n) _____ reaction.

A. reduction
B. condensation
C. hydrolysis
D. anabolic
**E.** oxidation

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: O02.05 Describe the processes of oxidation, reduction, decarboxylation, and phosphorylation.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03f Define oxidation and reduction, and relate these to changes in the energy content of a molecule.*
*Section: 02.03*
*Topic: Atoms and molecules*

37. The most relevant free energy in human physiology is the energy stored in _____.

A. electrolytes ionized in water
B. free radicals with an odd number of electrons
C. radioisotopes
**D.** the chemical bonds of organic molecules
E. Van der Waals forces

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03a Define energy and work, and describe some types of energy.*
*Section: 02.03*
*Topic: Atoms and molecules*

38. The breakdown of glycogen (an energy-storage compound) is an example of a(n) _____ reaction.

**A.** exergonic
B. endergonic
C. exchange
D. synthesis
E. equilibrium

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.*
*Section: 02.03*
*Topic: Atoms and molecules*

39. Potential energy stored in bonds is released as _____ energy.

A. electromagnetic
B. electrical
**C.** chemical
D. heat
E. kinetic

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.*
*Section: 02.03*
*Topic: Atoms and molecules*

40. The breakdown of glucose to yield carbon dioxide, oxygen, and ATP can be described as _____.

A. anabolic and endergonic
**B.** catabolic and exergonic
C. anabolic and exergonic
D. catabolic and endergonic
E. anabolic and exothermic

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03e Define metabolism and its two subdivisions.*
*Section: 02.03*
*Topic: Cellular respiration*

41. Which one of the following would *not* increase the rate of a reaction?

A. An increase in reactant concentrations
B. A rise in temperature
C. The presence of a catalyst
D. The presence of an enzyme
**E.** A decrease in reactant concentrations

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.03d Identify the factors that govern the speed and direction of a reaction.*
*Section: 02.03*
*Topic: Atoms and molecules*

42. Which of the following terms encompasses all of the other ones?

A. Catabolism
B. Anabolism
**C.** Metabolism
D. Oxidation reactions
E. Reduction reactions

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03e Define metabolism and its two subdivisions.*
*Section: 02.03*
*Topic: Atoms and molecules*

43. The breakdown of starch by digestive enzymes into glucose molecules is a(n) _____ reaction.

A. synthesis
**B.** decomposition
C. exchange
D. anabolic
E. reduction

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.*
*Section: 02.03*
*Topic: Atoms and molecules*

44. Which of the following equations depicts an exchange reaction?

A. $AB \rightarrow A + B$
B. $A + B \rightarrow AB$
**C.** $AB + CD \rightarrow AC + BD$
D. $AB \rightarrow A^- + B^+$
E. $A + B \rightarrow AB \rightarrow C + D$

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.03b Understand how chemical reactions are symbolized by chemical equations.*
*Section: 02.03*
*Topic: Atoms and molecules*

45. A(n) _____ is a group of atoms that determines many of the properties of an organic molecule.

A. carboxyl group
**B.** functional group
C. hydroxyl group
D. amino group
E. phosphate group

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04b Identify some common functional groups of organic molecules from their formulae.*
*Section: 02.04*
*Topic: Organic compounds*

46. Which of the following is *not* an organic compound?

A. $C_{16}H_{18}N_3ClS$
**B.** $Na_2HPO_3(H_2O)_5$
C. $CH_4$
D. $C_3H_7O_2N$

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.01 Define the term organic molecule.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04a Explain why carbon is especially well suited to serve as the structural foundation of many biological molecules.*
*Section: 02.04*
*Topic: Organic compounds*

47. A _____ reaction breaks a _____ down into its monomers.

**A.** hydrolysis; polymer
B. dehydration synthesis; molecule
C. dehydration synthesis; polymer
D. polymer; molecule
E. condensation; reactant

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04c Discuss the relevance of polymers to biology and explain how they are formed and broken by dehydration synthesis and hydrolysis.*
*Section: 02.04*
*Topic: Organic compounds*

48. The formula of an amino group is _____; the formula of a carboxyl group is _____.

A. -COOH; -OH
B. $-CH_3$; $-NH_2$
C. -OH; -SH
**D.** $-NH_2$; -COOH
E. -SH; $-H_2PO_4$

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04b Identify some common functional groups of organic molecules from their formulae.*
*Section: 02.04*
*Topic: Organic compounds*

49. Table sugar is a disaccharide called _____ and is made up of the monomer(s) _____.

A. maltose; glucose and sucrose
**B.** sucrose; glucose and fructose
C. lactose; glucose and galactose
D. glycogen; glucose and fructose
E. glucose; galactose and fructose

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.*
*Section: 02.04*
*Topic: Organic compounds*

50. Which of the following is a disaccharide?

A. Galactose
**B.** Lactose
C. Glucose
D. Fructose
E. Amylose

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.*
*Section: 02.04*
*Topic: Organic compounds*

51. _____ is a monosaccharide, whereas _____ is a polysaccharide.

A. Fructose; sucrose
B. Galactose; maltose
C. Lactose; glycogen
**D.** Glucose; starch
E. Cellulose; glucose

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.*
*Section: 02.04*
*Topic: Organic compounds*

52. In general, _____ have a 2:1 ratio of hydrogen to oxygen.

A. enzymes
B. proteins
C. lipids
**D.** carbohydrates
E. nucleic acids

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.*
*Section: 02.04*
*Topic: Organic compounds*

53. Proteoglycans are composed of _____.

A. carbohydrates and fats
B. nucleic acids and fats
**C.** carbohydrates and proteins
D. proteins and fats
E. nucleic acids and proteins

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.*
*Section: 02.04*
*Topic: Organic compounds*

54. Triglycerides consist of a 3-carbon compound called _____ bound to three _____.

A. pyruvate; fatty acids
B. lactate; glycerols
C. eicosanoid; steroids
**D.** glycerol; fatty acids
E. sterol; fatty acids

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04e Discuss the types and functions of lipids.*
*Section: 02.04*
*Topic: Organic compounds*

55. _____ are major components of cell membranes, and are said to be _____.

A. Triglycerides; hydrophobic
B. Steroids; hydrophilic
C. Bile acids; fat-soluble
D. Eicosanoids; water-soluble
**E.** Phospholipids; amphiphilic

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04e Discuss the types and functions of lipids.*
*Section: 02.04*
*Topic: Organic compounds*

56. Which of these molecules is hydrophobic?

A. Glucose
**B.** Cholesterol
C. Amino acid
D. Protein
E. Disaccharide

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04e Discuss the types and functions of lipids.*
*Section: 02.04*
*Topic: Organic compounds*

57. Proteins perform all of the following functions *except* _____.

A. catalyze metabolic reactions
B. give structural strength to cells and tissues
C. produce muscular and other forms of movement
D. regulate transport of solutes into and out of cells
**E.** store hereditary information

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04e Discuss physiological and structural roles in the human body of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04f Discuss protein structure and function.*
*Section: 02.04*
*Topic: Organic compounds*

58. A drastic conformational change in a protein in response to extreme heat or pH is called _____.

A. contamination
**B.** denaturation
C. saturation
D. sedimentation
E. deconformation

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04f Discuss protein structure and function.*
*Section: 02.04*
*Topic: Organic compounds*

59. Proteins are _____ built from _____ different amino acids.

A. monomers; 10
B. molecules; 10
**C.** polymers; 20
D. macromolecules; 40
E. peptides:25

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04f Discuss protein structure and function.*
*Section: 02.04*

*Topic: Organic compounds*

60. The folding and coiling of a protein into a globular shape is the _____ structure of the protein.

A. primary
B. secondary
**C.** tertiary
D. quaternary
E. denatured

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04f Discuss protein structure and function.*
*Section: 02.04*
*Topic: Organic compounds*

61. An enzyme is substrate-specific because of the shape of its _____.

**A.** active site
B. receptor
C. secondary structure
D. terminal amino acid
E. alpha chain

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04g Explain how enzymes function.*
*Section: 02.04*
*Topic: Organic compounds*

62. _____ is the substrate of _____.

A. Glucose; lactose
B. Lactase; glucose
**C.** Lactose; lactase
D. Galactose; lactose
E. Sucrase; sucrose

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04g Explain how enzymes function.*
*Section: 02.04*
*Topic: Organic compounds*

63. All enzymes are _____.

A. cofactors
**B.** proteins
C. lipids
D. carbohydrates
E. nucleic acids

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04g Explain how enzymes function.*
*Section: 02.04*
*Topic: Organic compounds*

64. Nucleic acids are _____ of _____.

A. monomers; monosaccharides
B. monomers; ATP
**C.** polymers; nucleotides
D. polymers; cAMP
E. polymers; DNA

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04j Identify the principal types of nucleic acids.*
*Section: 02.04*
*Topic: Nucleic acids: DNA and RNA*
*Topic: Organic compounds*

65. ATP_____ endergonic and exergonic reactions.

A. opposes
B. decomposes
C. reduces
**D.** links
E. dehydrates

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C05.01 Describe the generalized reversible reaction for release of energy from ATP and explain the role of ATP in the cell.*
*HAPS Topic: Module C05 Energy transfer using ATP.*
*Learning Outcome: 02.04h Describe the structure, production, and function of ATP.*
*Section: 02.04*
*Topic: Energy transfer using ATP*
*Topic: Organic compounds*

66. Minerals are found in all of the following *except* _____.

A. bones and teeth
**B.** vitamins
C. thyroid hormone
D. electrolytes

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: O01.01e List the important dietary minerals and describe the major uses of each mineral in the body.*
*HAPS Topic: Module O01 Nutrition.*
*Learning Outcome: 02.01c State the functions of minerals in the body.*
*Section: 02.01*
*Topic: Atoms and molecules*

67. An atom with 12 electrons, 13 neutrons, and 11 protons is a(n) _____.

A. anion
B. cation
C. free radical
D. isotope
**E.** both an anion and an isotope
F. both an anion and a free radical

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01e Distinguish between ions, electrolytes, and free radicals.*
*Section: 02.01*
*Topic: Atoms and molecules*

68. The concentration of a solution may be expressed by all of the following *except* _____.

A. weight per volume
B. percentage
C. molarity
**D.** pH

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02.02e Discuss some ways in which the concentration of a solution can be expressed, and the kinds of information we can derive from the different units of measure.*
*Section: 02.02*
*Topic: Inorganic compounds and solutions*

69. The vibration of an ear drum is an example of _____ energy.

**A.** kinetic
B. potential
C. elastic
D. radiant

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C05.01 Describe the generalized reversible reaction for release of energy from ATP and explain the role of ATP in the cell.*
*HAPS Topic: Module C05 Energy transfer using ATP.*
*Learning Outcome: 02.03a Define energy and work, and describe some types of energy.*
*Section: 02.03*
*Topic: Atoms and molecules*

70. In the following reaction, what is(are) the product(s)? $CO_2 + H_2O$ ---> $H_2CO_3$

**A.** $H_2CO_3$
B. $CO_2$ and $H_2O$
C. $CO_2$ and $H_2CO_3$
D. $H_2O$ and $H_2CO_3$

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.03b Understand how chemical reactions are symbolized by chemical equations.*
*Section: 02.03*
*Topic: Atoms and molecules*

71. Which of the following will increase the rate of a chemical reaction?

**A.** An increase in reactant concentration
B. An increase in product concentration
C. A decreased temperature
D. Enzyme inhibition

*Accessibility: Keyboard Navigation*
*Blooms Level: 3. Apply*
*Gradable: automatic*
*HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.03d Identify the factors that govern the speed and direction of a reaction.*
*Section: 02.03*
*Topic: Atoms and molecules*

72. Carbon is very versatile in forming bonds with other atoms because it has _____ valence electrons.

**A.** four
B. two
C. eight
D. six

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.01 Define the term organic molecule.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04a Explain why carbon is especially well suited to serve as the structural foundation of many biological molecules.*
*Section: 02.04*
*Topic: Chemical bonding*
*Topic: Organic compounds*

73. Amylase is a digestive enzyme that breaks starches down into sugars through _____ reactions.

**A.** hydrolysis
B. dehydration synthesis
C. anabolic
D. endergonic

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04c Discuss the relevance of polymers to biology and explain how they are formed and broken by dehydration synthesis and hydrolysis.*
*Section: 02.04*
*Topic: Organic compounds*

74. Which of the following is ***not*** a nucleotide?

**A.** RNA
B. GTP
C. ATP
D. cAMP

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04j Identify the principal types of nucleic acids.*
*Section: 02.04*
*Topic: Organic compounds*

75. Metabolism is the sum of _____ and _____.

A. inhalation; exhalation
B. growth; differentiation
**C.** anabolism; catabolism
D. positive; negative feedback
E. responsiveness; movement

*Accessibility: Keyboard Navigation*
*Blooms Level: 1. Remember*
*Gradable: automatic*
*HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.*
*HAPS Topic: Module O02 Introduction to metabolism.*
*Learning Outcome: 02.03e Define metabolism and its two subdivisions.*
*Section: 02.03*
*Topic: Energy transfer using ATP*

## True / False Questions

76. A molecule that is oxidized gains electrons and energy.

**FALSE**

*Accessibility: Keyboard Navigation*
*Blooms Level: 2. Understand*
*Gradable: automatic*
*HAPS Objective: O02.05 Describe the processes of oxidation, reduction, decarboxylation, and phosphorylation.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.03f Define oxidation and reduction, and relate these to changes in the energy content of a molecule.*
*Section: 02.03*
*Topic: Atoms and molecules*