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## **Chapter 03 - The Chemical Level of Organization**

### **Multiple Choice**

1. Which of the following statements best describes elements?
- Anything that occupies space and has mass.
  - A substance joined by chemical bonds.
  - All matter in the natural world is composed of one or more of these fundamental substances.
  - Any group of atoms bonded together.
  - A particle that carries a positive charge.

**ANSWER:** c

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.1 Elements and Atoms: The Building Blocks of Matter

**LEARNING OBJECTIVES:** 3.1.1 - Compare and contrast the terms atoms, elements, molecules, and compounds.

2. What does the atomic weight of an atom equal?
- The number of protons in the nucleus of the atom.
  - Roughly equal to the number of protons and neutrons plus a little weight from the electrons.
  - Total number of protons and neutrons times the atomic weight factor.
  - The total weight of protons in the atom.
  - The total weight of neutrons in the atom.

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember [www.TBSM.WS](http://www.TBSM.WS)

**REFERENCES:** 3.1 Elements and Atoms: The Building Blocks of Matter

**LEARNING OBJECTIVES:** 3.1.2 - Describe the charge, mass, and relative location of electrons, protons, and neutrons in an atom.

3. How do you describe the electron valance shell of an atom?
- An atom's outermost electron shell.
  - The sum of all of the atom's electron shells.
  - The innermost electron shell.
  - The average of the electron shells of the atom.
  - The shell that traps all of the electrons in an atom.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.1 Elements and Atoms: The Building Blocks of Matter

**LEARNING OBJECTIVES:** 3.1.6 - Relate the number of electrons in an electron shell to the atom's chemical stability and its ability to form chemical bonds.

4. What distinguishes an isotope from the elemental form?
- Different number of protons.
  - Different number of neutrons.
  - Different number of electrons.
  - Different radiation levels.
  - Different atomic weights.

**ANSWER:** b

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**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.1 Elements and Atoms: The Building Blocks of Matter  
**LEARNING OBJECTIVES:** 3.1.5 - Compare and contrast the terms ion, free radical, isotope, and radioisotopes.

5. What is an ion?
- A positively charged atom.
  - A negatively charged atom.
  - Either a negatively or positively charged atom.
  - An atom without an electrical charge.
  - An atom with both a positive and negative charge at the same time.

**ANSWER:** c

**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.1 Elements and Atoms: The Building Blocks of Matter  
**LEARNING OBJECTIVES:** 3.1.4 - Explain how ions and isotopes are produced by changing the relative number of specific subatomic particles, using one element as an example.

6. How is the atomic number of an atom determined?
- By the number of electrons in the atom.
  - By the number of protons in the atom.
  - By the number of neutrons in the atom.
  - By the measure of the number of daltons.
  - By its radiation level.

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.1 Elements and Atoms: The Building Blocks of Matter  
**LEARNING OBJECTIVES:** 3.1.3 - Distinguish among the terms atomic number, mass number, and atomic weight.

7. What is a positively charged ion called?
- cation
  - anion
  - positron
  - ionize
  - chloride

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.1 Elements and Atoms: The Building Blocks of Matter  
**LEARNING OBJECTIVES:** 3.1.7 - Predict, by examining the properties of an atom, the likelihood that it will ionize or form bonds.

8. What fact most strongly governs the tendency of an atom to participate in a chemical reaction?
- The number of electrons in its valence shell.
  - The number of protons in the nucleus.
  - The total number of electrons.
  - The number of neutrons in the nucleus.
  - The atomic activity value.

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**ANSWER:** a  
**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.1 Elements and Atoms: The Building Blocks of Matter  
**LEARNING OBJECTIVES:** 3.1.7 - Predict, by examining the properties of an atom, the likelihood that it will ionize or form bonds.

9. Which of the following statements best describes an ionic bond?
- a. An ongoing, close association between ions of opposite charges.
  - b. It shares electrons in a mutually stabilizing relationship.
  - c. A bond that is individually weak and easily broken.
  - d. An unbreakable bond between atoms.
  - e. A strong bond between molecules.

**ANSWER:** a  
**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.2 Chemical Bonds  
**LEARNING OBJECTIVES:** 3.2.1 - Explain the mechanism of each type of chemical bond and provide biologically significant examples of each: covalent, ionic, and hydrogen bonds.

10. Which of the following statements best describes a covalent bond?
- a. An ongoing, close association between ions of opposite charge.
  - b. It shares electrons in a mutually stabilizing relationship.
  - c. A bond individually weak and easily broken.
  - d. An unbreakable bond between atoms.
  - e. A strong bond between molecules.

**ANSWER:** b  
**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.2 Chemical Bonds  
**LEARNING OBJECTIVES:** 3.2.1 - Explain the mechanism of each type of chemical bond and provide biologically significant examples of each: covalent, ionic, and hydrogen bonds.

11. Which of the following statements best describes a hydrogen bond?
- a. An ongoing, close association between ions of opposite charge.
  - b. It shares electrons in a mutually stabilizing relationship.
  - c. A bond individually weak and easily broken.
  - d. An unbreakable bond between atoms.
  - e. A strong bond between molecules.

**ANSWER:** c  
**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.2 Chemical Bonds  
**LEARNING OBJECTIVES:** 3.2.1 - Explain the mechanism of each type of chemical bond and provide biologically significant examples of each: covalent, ionic, and hydrogen bonds.

12. Which of the following statements best describes a nonpolar covalent bond?
- a. In a covalent bond, the electrons are shared equally between two atoms.
  - b. In a covalent bond, the electrons are shared unequally between two atoms.
  - c. In a covalent bond, the electrons between two atoms are oriented by their poles.
  - d. In a covalent bond, the electrons between two atoms are eliminated by each other.

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e. In a covalent bond, the electrons between two atoms are expelled from their orbit.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.2 Chemical Bonds

**LEARNING OBJECTIVES:** 3.2.3 - Compare and contrast nonpolar covalent and polar covalent bonds.

13. Which of the following statements best describes the role of hydrogen bonds?

- a. Hydrogen bonds are critical to the functioning of our molecules and cells.
- b. Hydrogen bonds are rarely found in nature.
- c. Hydrogen bonds are resistant to temperature changes and acids.
- d. Hydrogen bonds rarely bond with other atoms.
- e. Hydrogen bonds do not change with environmental factors.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.2 Chemical Bonds

**LEARNING OBJECTIVES:** 3.2.2 - List the following types of bonds in order by relative strength: nonpolar covalent, polar covalent, ionic, and hydrogen bonds.

14. How is metabolism defined?

- a. The sum total of all of the chemical reactions that occur inside the body.
- b. The conversion of food to kinetic energy.
- c. The chemistry of the human brain.
- d. The absorption of liquids by the body.
- e. The speed at which the body can move.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.3 Chemical Reactions

**LEARNING OBJECTIVES:** 3.3.1 - Compare and contrast kinetic and potential energy.

15. Which statement best describes kinetic energy?

- a. The energy produced by the body.
- b. The energy of motion.
- c. Energy not produced in the body.
- d. Energy stored within plants.
- e. The energy source primarily from the sun.

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.3 Chemical Reactions

**LEARNING OBJECTIVES:** 3.3.1 - Compare and contrast kinetic and potential energy.

16. What is always required to complete an endergonic reaction?

- a. sunlight
- b. energy
- c. chemicals
- d. water
- e. hydrogen

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**ANSWER:** b  
**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.3 Chemical Reactions  
**LEARNING OBJECTIVES:** 3.3.2 - Compare and contrast endergonic and exergonic chemical reactions.

17. Which of the following lists describes the three types of chemical reactions?
- a. synthesis, decomposition, and exchange
  - b. external, internal, and holistic
  - c. potential, kinetic, and static
  - d. dormant, active, and aggressive
  - e. slow, medium, and fast

**ANSWER:** a  
**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.3 Chemical Reactions  
**LEARNING OBJECTIVES:** 3.3.3 - Describe and draw examples of the three basic types of chemical reactions.

18. Chemical reactions tend to proceed at a faster rate in which medium?
- a. solids
  - b. liquids
  - c. gases
  - d. space
  - e. the oceans

**ANSWER:** c  
**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.3 Chemical Reactions  
**LEARNING OBJECTIVES:** 3.3.4 - List and explain several factors that influence the rate of reactions.

19. Which statement best describes the function of enzymes?
- a. Enzymes reduce the activation energy required for chemical reactions to proceed.
  - b. Enzymes provide the body with nutrients.
  - c. Enzymes control cellular function.
  - d. Enzymes destroy harmful molecules.
  - e. Enzymes provide energy to the cell.

**ANSWER:** a  
**DIFFICULTY:** Blooms: Remember  
**REFERENCES:** 3.3 Chemical Reactions  
**LEARNING OBJECTIVES:** 3.3.5 - Define enzyme and describe factors that affect enzyme activity.

20. What is the percentage of the composition of water in an average adult body?
- a. 5% to 10%
  - b. 10% to 30%
  - c. 30% to 50%
  - d. 50% to 70%
  - e. 70% to 90%

**ANSWER:** d  
**DIFFICULTY:** Blooms: Remember

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**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.2 - Describe the physiologically important properties of water.

21. What statement best describes a suspension?

- a. A liquid mixture in which a heavier substance is suspended temporarily.
- b. A liquid mixture which is often opaque in solution.
- c. A liquid mixture that is always soluble.
- d. A liquid mixture in which substances are always visible.
- e. A liquid mixture that is always transparent.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.3 - Compare and contrast the terms solution, solute, solvent, colloid suspension, and emulsion.

22. What is a major component for many of the body's lubricating fluids?

- a. white corpuses
- b. blood plasma
- c. water
- d. mucus membranes
- e. molecular soluble

**ANSWER:** c

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.3 - Compare and contrast the terms solution, solute, solvent, colloid suspension, and emulsion.

23. Which statement best describes the nature of salts?

- a. A substance, when dissolved in water dissociates into ions other than  $H^+$  or  $OH^-$ .
- b. A substance, when dissolved in acids breaks apart into inactive ions.
- c. A substance, when dissolved in water becomes an acid.
- d. A substance, when dissolved in water becomes a base.
- e. A substance, when dissolved in a base becomes an acid.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.4 - Define the terms salt, pH, acid, base, and buffer.

24. Which statement best defines an acid?

- a. A substance that releases oxygen ions in solution.
- b. A substance that releases hydrogen ions in solution.
- c. A substance that releases carbon ions in solution.
- d. A substance that releases all ions in solution.
- e. A substance that restricts the release of ions in solution.

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember

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**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.4 - Define the terms salt, pH, acid, base, and buffer.

25. Which statement best defines a base?

- a. A substance that releases oxygen ions in solution.
- b. A substance that releases hydroxyl ions in solution.
- c. A substance that releases carbon ions in solution.
- d. A substance that releases all ions in solution.
- e. A substance that restricts the release of ions in solution.

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.4 - Define the terms salt, pH, acid, base, and buffer.

26. The pH of human blood is normally between which of the following ranges?

- a. From 1.35 to 2.45
- b. From 2.35 to 4.45
- c. From 7.35 to 7.45
- d. From 9.25 to 10.25
- e. From 12.35 to 13.45

**ANSWER:** c

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.5 - State the pH values for acidic, neutral, and alkaline (basic) solutions.

27. How would you describe a buffer?

- a. A solution of weak acid and its conjugate base.
- b. A solution that releases hydroxyl ions.
- c. A solution that releases carbon ions.
- d. A solution that releases all ions.
- e. A solution that restricts the release of ions.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.5 - State the pH values for acidic, neutral, and alkaline (basic) solutions.

28. What effect does a buffer have on body fluids?

- a. Neutralizes small amounts of acids or bases.
- b. Increases the acidity of all body fluids.
- c. Decreases the acidity of all body fluids.
- d. Converts acids and bases to water.
- e. Reduces the cellular effects of all body fluids.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.5 - State the pH values for acidic, neutral, and alkaline (basic) solutions.

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29. What statement best describes an organic compound?
- a. A substance that does not contain carbon or hydrogen.
  - b. A substance primarily composed of water.
  - c. A substance that contains both carbon and hydrogen.
  - d. A substance that contains mostly oxygen.
  - e. All substances that contain carbon and oxygen.

**ANSWER:** c

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.1 - Compare and contrast organic and inorganic compounds and give examples of each.

30. What are groupings of carbon and hydrogen called?
- a. carbolic groupings
  - b. hydroxides
  - c. hydrocarbons
  - d. carbide groupings
  - e. water-based groupings

**ANSWER:** c

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.1 - Compare and contrast organic and inorganic compounds and give examples of each.

31. What statement best describes an inorganic compound?
- a. A substance that does not contain carbon or hydrogen.
  - b. A substance primarily composed of water.
  - c. A substance that contains both carbon and hydrogen.
  - d. A substance that contains mostly oxygen.
  - e. All substances that contain carbon and oxygen.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.4 Inorganic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.4.1 - Compare and contrast organic and inorganic compounds and give examples of each.

32. What statement best describes why there is an abundance of organic compounds?
- a. They are required for all living organisms.
  - b. They evolved with human evolution.
  - c. Carbon atoms have four electrons in their valence shell.
  - d. Carbon atoms accept and donate electrons.
  - e. Carbon is abundant in the earth's crust.

**ANSWER:** c

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.5 Organic Compounds Essential to Human Functioning



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**LEARNING OBJECTIVES:** 3.5.1 - Define the term organic molecule.

33. What is the term to describe any large molecule?

- a. A super molecule
- b. An extended molecule
- c. A macromolecule
- d. A compound molecule
- e. A composite molecule

**ANSWER:** c

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.5 Organic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.5.1 - Define the term organic molecule.

34. What are the individual units of organic molecules called?

- a. polymers
- b. monomers
- c. macromolecules
- d. atoms
- e. ions

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.5 Organic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.5.2 - Explain the relationship between monomers and polymers.

35. Which of the following statements best describes an hydrolysis reaction?

- a. A molecule of water disrupts a compound, breaking its bonds.
- b. The reaction always results in the absorption of water.
- c. One reactant gives up an atom of oxygen and the other reactant gives up a carbon group.
- d. One reactant is water and the other reactant is an oxygen molecule.
- e. The reaction always results in the synthesis of carbon compounds.

**ANSWER:** a

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.5 Organic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.5.3 - Define and provide examples of dehydration synthesis and hydrolysis reactions.

36. Which of the following is correct about fatty acid chains?

- a. Fatty acid chains are composed of multiple inorganic molecules.
- b. Fatty acids are long chains of carbon and hydrogen molecules.
- c. Fatty acids chains are composed of heavy metals that are stored in adipocytes.
- d. Fatty acids are primarily made of water molecules.
- e. Fatty acid chains are composed of several oxygen isotopes.

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.5 Organic Compounds Essential to Human Functioning

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**LEARNING OBJECTIVES:** 3.5.3 - Define and provide examples of dehydration synthesis and hydrolysis reactions.

37. Which of the following statements best describes a dehydration synthesis reaction?
- The reaction always results in the absorption of water.
  - One reactant gives up an atom of oxygen and another reactant gives up a carbon group.
  - One reactant is always water and the other reactant an oxygen molecule.
  - The reaction always results in the synthesis of carbon compounds.
  - A covalent bond that joins two monomers is broken.

**ANSWER:** e

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.5 Organic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.5.3 - Define and provide examples of dehydration synthesis and hydrolysis reactions.

38. What elements are carbohydrates composed of?
- carbon and oxygen
  - carbon, hydrogen, and oxygen
  - carbon and water
  - hydrogen, oxygen, and sucrose
  - carbon and sucrose

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.5 Organic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.5.4 - Compare and contrast the general molecular structure of carbohydrates, proteins, lipids, and nucleic acids using chemical formulas.

39. What characteristic do all lipids share?
- All lipids are radioactive.
  - All lipids are hydrophobic.
  - All lipids dissolve in water.
  - All lipids contain nitrogen.
  - All lipids contain heavy metals.

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember

**REFERENCES:** 3.5 Organic Compounds Essential to Human Functioning

**LEARNING OBJECTIVES:** 3.5.4 - Compare and contrast the general molecular structure of carbohydrates, proteins, lipids, and nucleic acids using chemical formulas.

40. What do the five monosaccharides (glucose, fructose, galactose, ribose, and deoxyribose) have in common?
- They are not found in plants or animals.
  - These molecules are all hydrocarbon rings.
  - These molecules are sourced from the earth's crust.
  - They all are destroyed by sunlight.
  - They are major causes of cancer.

**ANSWER:** b

**DIFFICULTY:** Blooms: Remember