

Chapter 02 - The Chemistry of Biology

Chapter 02
The Chemistry of Biology

Multiple Choice Questions

1. Anything that occupies space and has mass is called
- A. atomic.
 - B. living.
 - C. matter.**
 - D. energy.
 - E. space.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

2. The electrons of an atom are
- A. always equal to the number of neutrons in an atom.
 - B. found in the nucleus.
 - C. used to determine atomic number.
 - D. positively charged.
 - E. moving in pathways called orbitals.**

ASM Objective: 03.01 Bacteria and Archaea exhibit extensive, and often unique, metabolic diversity (e.g., nitrogen fixation, methane production, anoxygenic photosynthesis).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

3. The electrons of an atom are
- A. always equal to the number of protons.
 - B. used to determine the atomic weight.
 - C. carrying a positive charge.
 - D. used to determine the atomic number.
 - E. always in full orbitals.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

4. All of the following pertain to the atom Carbon-14 except
- A. has 6 protons.
 - B. has 6 electrons.
 - C. has 14 neutrons.
 - D. is an isotope of Carbon.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

5. The subatomic particles that surround the nucleus are the
- A. electrons.
 - B. protons.
 - C. neutrons.
 - D. protons and neutrons.
 - E. protons and electrons.

Chapter 02 - The Chemistry of Biology

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

6. What is the maximum number of electrons in the second energy shell of an atom?

A. 2

B. 4

C. 8

D. 18

E. 32

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

7. What is the maximum number of electrons in the first energy shell of an atom?

A. 2

B. 4

C. 8

D. 18

E. 32

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

8. Protons and neutrons that make up the atom's central core, which is referred to as its

A. valence number.

B. isotope.

C. nucleus.

D. center of gravity.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

9. The valence number is the

A. number of protons.

B. number of neutrons.

C. atomic weight.

D. number of inner most electrons.

E. number of outer most electrons.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

10. Two or more atoms bonded together are called a/an

A. ion.

B. isotope.

C. element.

D. electrolyte.

E. molecule.

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ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

11. What would be the valence number of electrons in the sulfur (S) atom?

A. 2

B. 6

C. 8

D. 16

E. 32

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

12. Polar molecules are composed of covalently bonded

A. identical atoms.

B. carbon atoms.

C. ions.

D. atoms of different electronegativity.

E. atoms of identical electronegativity.

ASM Objective: 03.04 The growth of microorganisms can be controlled by physical, chemical, mechanical, or biological means.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

13. Polar molecules

- A. have an equal charge distribution.
- B. have an unequal charge distribution.**
- C. are insoluble in water.
- D. always contain carbon.
- E. always involve oxygen.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Topic: Basic Chemistry

14. Covalent bonds

- A. result from losing electrons.
- B. are always polar.
- C. are always nonpolar.
- D. result from sharing electrons.**
- E. result from gaining electrons.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

15. Cations are

- A. charged subatomic particles.
- B. atoms that have gained electrons.
- C. atoms that have gained neutrons.
- D.** capable of forming ionic bonds with anions.
- E. atoms without protons.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

16. A reaction where an electron is lost is called

- A.** oxidation.
- B. reduction.
- C. ionization.
- D. decomposition.
- E. dissolution.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

17. An atom has gained an electron. It has been

- A. oxidized.
- B. reduced.**
- C. ionized.
- D. deionized.
- E. neutralized.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

18. Ionic bonds

- A. result from sharing electrons.
- B. result from transferring electrons.**
- C. result from like charge attraction.
- D. are the weakest chemical bonds.
- E. always involve carbon.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

19. Hydrogen bonds

- A. result from attractive forces between molecules with polar covalent bonds.
- B. result from attractive forces between molecules with polar ionic bonds.
- C. result from attractive forces between molecules with nonpolar covalent bonds.
- D. result from attractive forces between molecules with nonpolar ionic bonds.
- E. are the strongest bonds between molecules.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

20. Atoms that gain or lose electrons become charged particles called

- A. cations.
- B. anions.
- C. ions.
- D. isotopes.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

21. Substances that release ions when dissolved in water and conduct electricity are

- A. covalent.
- B. nonpolar.
- C. electrons.
- D. electrolytes.
- E. solvents.

Chapter 02 - The Chemistry of Biology

ASM Objective: 03.04 The growth of microorganisms can be controlled by physical, chemical, mechanical, or biological means.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

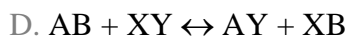
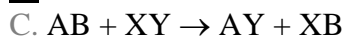
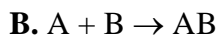
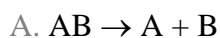
Learning Outcome: 02.02 List and define four types of chemical bonds.

Learning Outcome: 02.03 Differentiate between a solute and a solvent.

Section Number: 02.01

Topic: Basic Chemistry

22. Which of the following represents a synthesis reaction?



ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

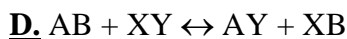
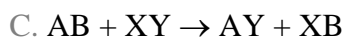
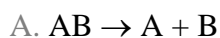
Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

23. Which of the following represents a reversible reaction?



ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

24. The important solvent associated with living things is

- A. carbon dioxide.
- B. sodium chloride.
- C. ethyl alcohol.
- D. benzene.
- E.** water.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.03 Differentiate between a solute and a solvent.

Section Number: 02.01

Topic: Basic Chemistry

25. A capillary tube is used to acquire a small blood sample for CBC (complete blood count) analysis. Suction is not required to transfer the blood from the fingertip prick to the tube in part due to:

- A. ionic bonding between the water molecules.
- B. cohesive forces between the glass particles of the tube and the water molecules.
- C. covalent bonding between the water molecules.
- D.** adhesive forces between the water molecules and the glass particles of the tube.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.03 Differentiate between a solute and a solvent.

Section Number: 02.01

Topic: Basic Chemistry

26. Ionic compounds

- A. are hydrophobic.
- B. are hydrophilic.**
- C. are acidic in solution.
- D. are basic in solution.
- E. always form salts in solution.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

27. A solution is composed of one or more substances called _____ that are uniformly dispersed in a dissolving medium called a _____.

- A. solvents; solute
- B. solutes; solvent**
- C. neither solvents, solute nor solutes; solvent
- D. both solvents, solute and solutes; solvent

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.03 Differentiate between a solute and a solvent.

Section Number: 02.01

Topic: Basic Chemistry

28. Which term or phrase does not belong in this list of characteristics describing acids?

- A. lactic acid
- B. vinegar
- C. hydrogen ion donor
- D.** pH 8
- E. acidic

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.04 Provide a brief definition of pH.

Section Number: 02.01

Topic: Basic Chemistry

29. Compared to a solution of pH 9, a solution of pH 7:

- A. is more basic.
- B. has no OH^- ions.
- C.** has more H^+ ions.
- D. has a higher pH.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.04 Provide a brief definition of pH.

Section Number: 02.01

Topic: Basic Chemistry

30. Burning coal produces sulfur dioxide in the atmosphere. When combined with precipitation that falls into bodies of water, this leads to:

- A. an increase in pH level of the water.
- B. a greater concentration of OH^- ions in the water.
- C.** a decrease in the pH level of the water.
- D. no change in the pH level of the water.

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ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.04 Provide a brief definition of pH.

Section Number: 02.01

Topic: Basic Chemistry

31. Compared to a solution of pH 9, a solution of pH 7 is:

- A. 2 times more acidic.
- B. 20 times more acidic.
- C. 20 times more basic.
- D.** 100 times more acidic.
- E. 100 times more basic.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.04 Provide a brief definition of pH.

Section Number: 02.01

Topic: Basic Chemistry

32. Which of the following functional groups is mismatched to the organic compound in which it is typically contained?

- A.** phosphate - carbohydrates
- B. sulfhydryl - proteins
- C. amino - proteins
- D. hydroxyl - alcohols
- E. carboxyl - fatty acids

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

33. Organic chemicals always have a basic framework of the element _____ bonded to other atoms.

- A. carbon
- B. nitrogen
- C. oxygen
- D. hydrogen
- E. phosphorous

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.02

Topic: Biochemistry

34. Most biochemical macromolecules are polymers, which are chains of

- A. hydrophobic molecules.
- B. electrolytic molecules.
- C. repeating monomers.
- D. repeating carbohydrates.
- E. hydrogen bonds.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

35. All of the following are monosaccharides except

- A. glucose.
- B. glycogen.**
- C. fructose.
- D. ribose.
- E. deoxyribose.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

36. Which of the following would have glycosidic bonds?

- A. triglycerides
- B. monosaccharides
- C. polypeptides
- D. polysaccharides**
- E. ATP

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

37. All of the following are polysaccharides except

- A. dextran in some bacterial slime layers.
- B. agar used to make solid culture media.
- C. a cell's glycocalyx.
- D. cellulose in certain cell walls.
- E. sterols in cell membranes.**

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.05 Name the four main families of biochemicals.

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

38. $C_6H_{12}O_6 + C_6H_{12}O_6 \rightarrow C_{12}H_{22}O_{11} + H_2O$ represents

- A. the formation of a peptide bond.
- B. a decomposition reaction.
- C. a denaturation reaction.
- D. the formation of a polysaccharide.
- E. a dehydration synthesis.**

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.02

Topic: Biochemistry

39. Starch is the primary storage food for all of the following except

- A. green plants.
- B. algae.
- C. animals.**
- D. some fungi.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

40. Select the statement that most accurately reflects the process of plant material digestion in humans:

- A. it is a very efficient process the produces very little undigested material in feces.
- B. it is a process that is dependent upon enzyme (cellulase) production by gut microbiota.**
- C. it requires the action of enzymes called kinases.
- D. it is linked to the digestion of glycogen.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

41. All of the following are lipids except

- A. cholesterol.
- B. starch.**
- C. phospholipid.
- D. wax.
- E. triglyceride.

Chapter 02 - The Chemistry of Biology

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

42. What part of a phospholipid comprise the hydrophobic tails?

- A.** fatty acids
- B. glycerol
- C. phosphate
- D. alcohol
- E. hydroxyl.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Chapter 02 - The Chemistry of Biology

Topic: Biochemistry

43. A fat is called _____ if all carbons of the fatty acid chain are single-bonded to 2 other carbons and 2 hydrogens.

- A. unsaturated
- B. polyunsaturated
- C. monounsaturated
- D.** saturated

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

44. The lipid group that serves as energy storage molecules is the

- A. prostaglandins.
- B. waxes.
- C. phospholipids.
- D. steroids.
- E.** triglycerides.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

45. The lipid group that is the major component of cell membranes is the

- A. prostaglandins.
- B. waxes.
- C. phospholipids.**
- D. steroids.
- E. triglycerides.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

46. The building blocks of an enzyme are

- A. nucleotides.
- B. glycerol and fatty acids.
- C. monosaccharides.
- D. phosphate, glycerol, and fatty acids.
- E. amino acids.**

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

47. An amino acid contains all of the following except a/n

- A. amino group.
- B. carboxyl group.
- C. variable R group.
- D. α carbon.
- E. phosphate.**

Chapter 02 - The Chemistry of Biology

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

48. Which is not true about enzymes?

- A. found in all cells
- B. are catalysts
- C. participate in the cell's chemical reactions
- D. can be denaturated by heat and other agents
- E.** have high-energy bonds between phosphates

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.07 Differentiate among primary, secondary, tertiary, and quaternary levels of protein structure.

Section Number: 02.02

Topic: Biochemistry

49. What type of bonds are formed by dehydration synthesis between adjacent amino acids?

- A. glycosilic
- B. ester
- C.** peptide
- D. disulfide
- E. phosphate

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

Chapter 02 - The Chemistry of Biology

50. The alpha (α) helix is a type of _____ protein structure.

- A. primary
- B. secondary**
- C. tertiary
- D. quaternary

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.07 Differentiate among primary, secondary, tertiary, and quaternary levels of protein structure.

Section Number: 02.02

Topic: Biochemistry

51. One nucleotide contains one

- A. phosphate.
- B. pentose sugar.
- C. nitrogen base.
- D. All of the choices are correct.**

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Learning Outcome: 02.08 List the three components of nucleotides.

Section Number: 02.02

Topic: Biochemistry

52. Which pertains to DNA but not to RNA?

- A. contains ribose
- B. contains adenine
- C. contains thymine**
- D. contains uracil
- E. contains nucleotides

ASM Objective: 04.02 Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

ASM Topic: Module 03 Metabolic Pathways

Chapter 02 - The Chemistry of Biology

ASM Topic: Module 04 Information Flow

Blooms Level: 1. Remember

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Learning Outcome: 02.09 Name the nitrogen bases of DNA and of RNA.

Section Number: 02.02

Topic: Biochemistry

53. ATP is best described as

- A. an enzyme.
- B. a double helix.
- C. an electron carrier.
- D.** the energy molecule of cells.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.10 List the three components of ATP.

Section Number: 02.02

Topic: Biochemistry

54. A student forgot to label a beaker containing a DNA solution and a beaker containing a glucose solution. If chemical analysis was performed to identify the contents of each beaker, which of the following would be found in the beaker of DNA but not in the beaker with glucose?

- A. amino acids
- B. hydrogen and oxygen atoms
- C.** nitrogen and phosphorus
- D. fatty acids
- E. carbon atoms

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.05 Name the four main families of biochemicals.

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Learning Outcome: 02.09 Name the nitrogen bases of DNA and of RNA.

Section Number: 02.02

Topic: Biochemistry

55. Purines and pyrimidines are components in the building block units of all

- A. nucleic acids.
- B. carbohydrates.
- C. polysaccharides.
- D. amino acids.
- E. enzymes.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Learning Outcome: 02.08 List the three components of nucleotides.

Section Number: 02.02

Topic: Biochemistry

56. Which of the following is not a pyrimidine?

- A. uracil
- B. adenine
- C. thymine
- D. cytosine

ASM Objective: 04.02 Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

ASM Topic: Module 04 Information Flow

Blooms Level: 1. Remember

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Learning Outcome: 02.09 Name the nitrogen bases of DNA and of RNA.

Learning Outcome: 02.10 List the three components of ATP.

Section Number: 02.02

Topic: Biochemistry

57. During protein synthesis, _____ RNA is made to be a copy of a gene from the DNA that will be translated into protein.

- A. transfer
- B. messenger**
- C. ribosomal
- D. small subunit

ASM Objective: 04.02 Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

ASM Topic: Module 04 Information Flow

Blooms Level: 1. Remember

Learning Outcome: 02.09 Name the nitrogen bases of DNA and of RNA.

Section Number: 02.02

Topic: Biochemistry

58. Characteristics shared by all cells include

- A. a membrane serving as a cell boundary.
- B. the possession of genetic information.
- C. the presence of cellular fluid.
- D. All of the choices are correct.**

ASM Objective: 02.04 While microscopic eukaryotes (for example, fungi, protozoa, and algae) carry out some of the same processes as bacteria, many of the cellular properties are fundamentally different.

ASM Topic: Module 02 Structure and Function

Blooms Level: 1. Remember

Learning Outcome: 02.11 Recall three characteristics common to all cells.

Section Number: 02.02

Topic: Biochemistry

59. Microscopic analysis of a cell reveals the presence of ribosomes. Based upon this information alone, it can be determined that:

- A. it is a bacterial cell.
- B. it is an archaeal cell.
- C. it is a eukaryotic cell.
- D. it is either a bacterial or archaeal cell.
- E. further information is needed to determine if it is either a bacterial, archaeal, or eukaryotic cell.**

ASM Objective: 02.04 While microscopic eukaryotes (for example, fungi, protozoa, and algae) carry out some of the same processes as bacteria, many of the cellular properties are fundamentally different.

ASM Topic: Module 02 Structure and Function

Blooms Level: 1. Remember

Learning Outcome: 02.11 Recall three characteristics common to all cells.

Section Number: 02.02

Topic: Biochemistry

60. An example of an amphipathic molecule found in living cells is

- A. glucose.
- B. phospholipid.**
- C. protein.
- D. nucleic acids.
- E. ATP.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

61. The purine ____ always binds with the pyrimidine ____ within both DNA and RNA.

- A.** guanine; cytosine
- B. cytosine; guanine
- C. adenine; guanine
- D. thymine; guanine

ASM Objective: 04.02 Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

ASM Topic: Module 04 Information Flow

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

True / False Questions

62. Electrons that participate in chemical bonding are typically located closest to the nucleus.

FALSE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.01 Explain the relationship between atoms and elements.

Section Number: 02.01

Section Number: 02.02

Topic: Basic Chemistry

63. Water molecules are nonpolar molecules.

FALSE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Section Number: 02.02

Topic: Basic Chemistry

Topic: Biochemistry

64. Polar molecules have more reactivity compared to nonpolar molecules.

TRUE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

65. A covalent bond is formed between an anion and a cation.

FALSE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.02 List and define four types of chemical bonds.

Section Number: 02.01

Topic: Basic Chemistry

66. The concentration of a solution expresses the amount of solvent present.

FALSE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.03 Differentiate between a solute and a solvent.

Section Number: 02.01

Topic: Basic Chemistry

67. If solution A has a lower pH compared to solution B, then solution A is more acidic than solution B.

TRUE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic

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abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 05 Systems

Blooms Level: 2. Understand

Learning Outcome: 02.04 Provide a brief definition of pH.

Section Number: 02.01

Topic: Basic Chemistry

68. The only part of an amino acid that differs from other amino acids is its R group.

TRUE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.05 Name the four main families of biochemicals.

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

69. All proteins are enzymes.

FALSE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 2. Understand

Learning Outcome: 02.05 Name the four main families of biochemicals.

Learning Outcome: 02.07 Differentiate among primary, secondary, tertiary, and quaternary levels of protein structure.

Section Number: 02.02

Topic: Biochemistry

70. The most important outcome of polypeptide intrachain bonding and folding is the unique shape of the protein.

TRUE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 1. Remember

Learning Outcome: 02.07 Differentiate among primary, secondary, tertiary, and quaternary levels of protein structure.

Section Number: 02.02

Topic: Biochemistry

71. Nucleic acids have primary, secondary, tertiary, and quaternary levels of organization.

FALSE

ASM Objective: 04.02 Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

ASM Topic: Module 04 Information Flow

Blooms Level: 3. Apply

Learning Outcome: 02.08 List the three components of nucleotides.

Learning Outcome: 02.09 Name the nitrogen bases of DNA and of RNA.

Section Number: 02.02

Topic: Biochemistry

72. A new organism was identified that contained arsenic in place of phosphate in its DNA double helix structure. Based upon this information alone, it can be determined that this change will greatly alter the information encoded by this genetic material.

FALSE

ASM Objective: 04.02 Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

ASM Topic: Module 04 Information Flow

Blooms Level: 3. Apply

Learning Outcome: 02.08 List the three components of nucleotides.

Learning Outcome: 02.09 Name the nitrogen bases of DNA and of RNA.

Section Number: 02.02

Topic: Biochemistry

73. Viruses are not considered living organisms because they lack cellular structure and require a host cell for life cycle completion.

FALSE

ASM Objective: 04.02 Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

ASM Objective: 04.04 The synthesis of viral genetic material and proteins is dependent on host cells.

ASM Topic: Module 04 Information Flow

Blooms Level: 3. Apply

Learning Outcome: 02.11 Recall three characteristics common to all cells.

Section Number: 02.02

Topic: Biochemistry

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Multiple Choice Questions

74. In what way would life be different if the element carbon was absent?

- A. There would be no organic compounds.
- B. There would be no inorganic compounds.
- C. Life would not exist in any shape or form.
- D. The concept of pH would not exist.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 3. Apply

Learning Outcome: 02.05 Name the four main families of biochemicals.

Section Number: 02.02

Topic: Biochemistry

75. In a later chapter, you will study the staining of bacteria. In the Gram stain, alcohol is used as a decolorizer. What chemical component of the cell does alcohol affect?

- A. protein
- B. carbohydrate
- C. lipid
- D. electrolytes

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).

ASM Topic: Module 03 Metabolic Pathways

Blooms Level: 3. Apply

Learning Outcome: 02.05 Name the four main families of biochemicals.

Learning Outcome: 02.06 Provide examples of cell components made from each of the families of biochemicals.

Section Number: 02.02

Topic: Biochemistry