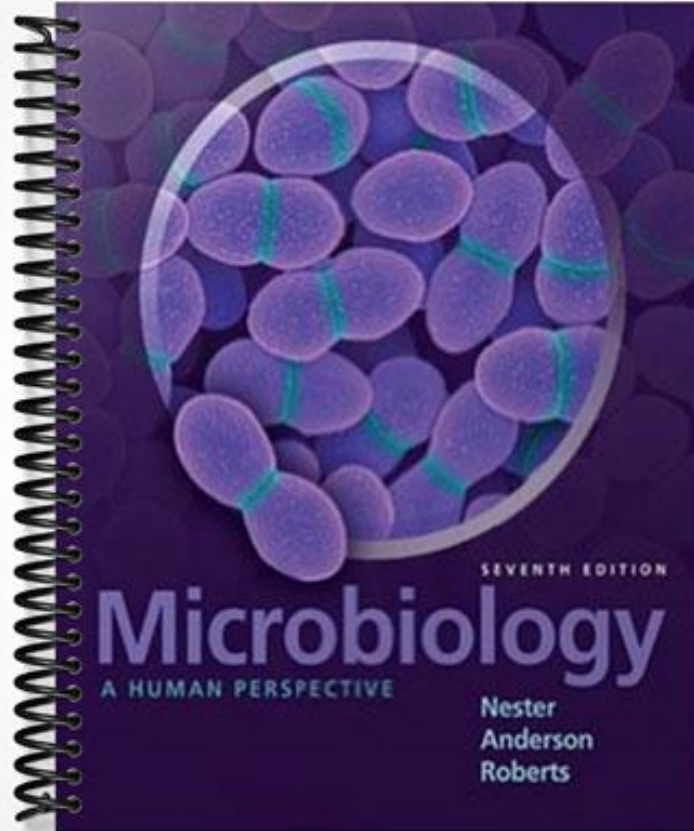


SOLUTIONS MANUAL



SEVENTH EDITION

Microbiology

A HUMAN PERSPECTIVE

Nester
Anderson
Roberts

Chapter # and Question type	Question	Answer
Chapter 1 Short answer #1.	How did Louis Pasteur help disprove spontaneous generation?	Pasteur demonstrated that swan necked flasks containing sterile growth medium would remain sterile indefinitely if the bend in the flask did not come in contact with the medium.
Chapter 1 Short answer #2.	Give three reasons why life could not exist without the activities of microorganisms.	<ul style="list-style-type: none"> • Nitrogen would not be available in a form that humans and plants could use. • The supply of oxygen would be depleted after about 20 years if microorganisms were not available to replenish it. • A wide variety of materials would pile up if microorganisms were not present to degrade them.
Chapter 1 Short answer #3.	List five beneficial applications of bacteria.	<ul style="list-style-type: none"> • Their role in food and beverage production • Role in pollutant degradation • Synthesis of commercially valuable products • Their importance in synthesizing medically important products, following genetic modification • Their importance as model organisms for the study of universal biological processes
Chapter 1 Short answer #4.	State three reasons why there is a resurgence of infectious diseases today.	<ul style="list-style-type: none"> • Aging population is more susceptible to disease • Organisms controlled by antimicrobial medications have become resistant to the medications • Children are not being routinely vaccinated against many diseases
Chapter 1 Short answer #5.	Name the prokaryotic groups in the microbial world.	<i>Bacteria</i> and <i>Archaea</i>

Chapter 1 Short answer #6.	Name one location where you could isolate members of the Archaea.	The hot springs of Yellowstone National Park
Chapter 1 Short answer #7.	How might you distinguish a prokaryotic cell from a eukaryotic cell?	The prokaryotic cell does not have a nucleus whereas the eukaryotic cell does.
Chapter 1 Short answer #8.	In the designation <i>Escherichia coli</i> B, what is the genus? What is the species? What is the strain?	<i>Escherichia</i> is the genus; <i>coli</i> is the species and <i>B</i> is the strain.
Chapter 1 Short answer #9.	Why are viruses not microorganisms?	. Viruses do not have all of the machinery necessary to live and so they must use that of a host cell in order to replicate.
Chapter 1 Short answer #10.	Name three non-living groups in the microbial world and describe their major properties.	<ul style="list-style-type: none"> • Viruses contain a protein coat and either DNA or RNA. They are obligate intracellular parasites of all forms of life. • Viroids contain only a short RNA molecule. They cause serious plant diseases Prions consist only of protein that is a misfolded version of normal cellular protein found in the brain of animals. They are resistant to the commonly used sterilizing procedures that kill viruses and bacteria. They are responsible for fatal neurological diseases
Chapter 1 Multiple Choice #1	The property of endospores that led to confusion in the experiments on spontaneous generation is their a) small size. b) ability to pass through cork stoppers. c) heat resistance. d) presence in all infusions. e) presence on cotton plugs.	. (C)
Chapter 1 Multiple Choice #2	The “Golden Age of Microbiology” was the time when a) microorganisms were first used to make bread. b) microorganisms were first used to make cheese.	. (C)

	<p>c) most pathogenic bacteria were identified.</p> <p>d) a vaccine against influenza was developed.</p> <p>e) antibiotics became available.</p>	
Chapter 1 Multiple Choice #3	<p>Microorganisms play a role in</p> <p>a) disease. b) biodegradation. c) cheese production.</p> <p>d) nitrogen recycling. e) all of the above.</p>	(E)
Chapter 1 Multiple Choice #4	<p>Which disease was once thought to be due to stress but is now known to be caused by a bacterium?</p> <p>a) smallpox b) peptic ulcers c) AIDS</p> <p>d) plague e) influenza</p>	. (B)
Chapter 1 Multiple Choice #5	<p>The prokaryotic members of the microbial world include</p> <p>1. algae. 2. fungi. 3. prions. 4. bacteria. 5. archaea.</p> <p>a) 1, 2 b) 2, 3 c) 3, 4 d) 4, 5 e) 1, 5</p>	(D)
Chapter 1 Multiple Choice #6	<p>The Archaea</p> <p>1. are microscopic.</p> <p>2. are commonly found in extreme environments.</p> <p>3. contain peptidoglycan.</p> <p>4. contain mitochondria.</p> <p>5. are most commonly found in the soil.</p> <p>a) 1, 2 b) 2, 3 c) 3, 4 d) 4, 5 e) 1, 5</p>	(A)
Chapter 1 Multiple Choice #7	<p>Prokaryotes typically do not have</p> <p>a) cell walls. b) flagella. c) a nuclear membrane.</p> <p>d) specific shapes. e) genetic information.</p>	. (C)
Chapter 1 Multiple Choice #8	<p>Nucleoids are associated with</p> <p>1. genetic information. 2. prokaryotes.</p> <p>3. eukaryotes. 4. viruses. 5. prions.</p> <p>a) 1, 2 b) 2, 3 c) 3, 4 d) 4, 5 e) 1, 5</p>	. (A)
Chapter 1 Multiple Choice # 9	<p>Viruses</p> <p>1. contain both protein and nucleic acid.</p>	(A)

	<p>2. infect all domains of life. 3. can grow in the absence of living cells. 4. are generally the same size as prokaryotes. 5. always kill the cells they infect. a) 1, 2 b) 2, 3 c) 3, 4 d) 4, 5 e) 1, 5</p>	
Chapter 1 Multiple Choice #10	<p>Antony van Leeuwenhoek could not have observed a) roundworms. b) Escherichia coli. c) yeasts. d) viruses.</p>	(D)
Chapter 1 Applications #1	<p>The American Society for Microbiology is preparing a “Microbe-Free” banquet to emphasize the importance of microorganisms in the diet. What foods could not be on the menu?</p>	<p>. Nothing would be available to eat. Microorganisms are needed for crop production, so vegetables or fruits would not be available to eat. Cattle, chickens, pigs and other animals need microorganisms to assist with the digestion of food. They would be undernourished and not provide quality meat or products adequate for human consumption. Do not look for fish or any other lake or ocean products because these ecosystems are needed for their survival. Milk and alcoholic beverages would be off the menu. Any beverage prepared with water would be unsafe to consume. Water is cleaned and treated to be disease-free with microorganisms.</p>
Chapter 1 Applications #2	<p>If you were asked to nominate one of the individuals mentioned in this chapter for the Nobel Prize, who would it be? Make a statement supporting your choice.</p>	Any answer that is supported.
Chapter 1 Critical Thinking #1	<p>A microbiologist obtained two pure biological samples: one of a virus, and the other of a viroid. Unfortunately, the labels had been lost. The microbiologist felt she could distinguish the two by analyzing for the presence or absence of a single molecule.</p>	Test for proteins.

	What molecule would she search for and why?	
Chapter 1 Critical Thinking #2	Why is the bacterium that causes anthrax such an effective agent of bioterrorism?	Spores, in general, are an effective agent of bioterrorism because they are environmentally tough, “invisible” and can be readily delivered through the air, all of which enables them to potentially infect large numbers of people easily.
Chapter 2		
Chapter 2 Short Answer #1	Differentiate between an atom, a molecule, and a compound.	An atom is the basic unit of all matter. A molecule is composed of two or more atoms joined through chemical bonds. A compound consists of molecules of two or more different elements.
Chapter 2 Short Answer #2	Why is water a good solvent?	Because of its polar nature, water can form hydrogen bonds with all all polar molecules thereby preventing the association of the atoms comprising the molecules.
Chapter 2 Short Answer #3	Which solution is more acidic, one with a pH of 4 or a pH of 5? What is the concentration of H ⁺ ions in each? The concentration of OH ⁻ ions?	A pH of 4 is more acidic. A solution of 4 has a H ⁺ concentration of 10 ⁻⁴ and a 10 ⁻¹⁰ OH ⁻ concentration. A solution with a pH of 5 has a H ⁺ concentration of 10 ⁻⁵ and an OH ⁻ concentration of 10 ⁻⁹ .
Chapter 2 Short Answer #4	Name the subunits of proteins, polysaccharides, and nucleic acids.	Subunits of proteins are amino acids; subunits of polysaccharides are monosaccharides; subunits of nucleic acids are nucleotides
Chapter 2 Short Answer #5	Give an example of dehydration synthesis. Give an example of a hydrolysis reaction. How are these reactions related?	Dehydration synthesis is involved in the joining together of two amino acids with the loss of water in the chemical reaction. Hydrolysis is involved in the splitting part of the two amino acids with the addition of H ⁺ to one amino acid and OH ⁻ to the other. Dehydration synthesis is the reverse of hydrolysis.
Chapter 2 Short Answer #6	List four functions of proteins.	Catalyse enzymatic reactions Move the cell Serve as components of certain cell

		structures Turn genes off and on
Chapter 2 Short Answer #7	What are the four levels of protein structure, and what is the distinguishing feature of each?	<p>Primary structure—The sequence of amino acids comprising the protein</p> <p>Secondary structure—The three--dimensional shape of localized regions</p> <p>Tertiary structure---The three—dimensional shape of the entire molecule</p> <p>Quarternary structure—The three-dimensional shape of a protein molecule consisting of more than one polypeptide chain.</p>
Chapter 2 Short Answer #8	How do the two types of nucleic acids differ from one another in (a) composition, (b) size, and (c) function?	<p>(a) DNA contains deoxyribose; RNA contains ribose.</p> <p>(b) DNA is much longer than RNA</p> <p>(c) DNA codes for all of the genetic information of the cell. RNA is involved in decoding the information in DNA.</p>
Chapter 2 Short Answer #9	What are the two major groups of lipids? Give an example of each group. What feature is common to all lipids?	<p>Simple and compound</p> <p>Fats are simple lipids; phospholipids are compound.</p> <p>All lipids are insoluble in water.</p>
Chapter 2 Short Answer #10	What features do all lipids share?	All lipids are heterogeneous in their chemical composition and insoluble in water but soluble in organic solvents.
Chapter 2 Multiple Choice #1	Choose the list that goes from the lightest to the heaviest: a) proton, atom, molecule, compound, electron. b) atom, proton, compound, molecule, electron. c) electron, proton, atom, molecule, compound. d) atom, electron, proton,	C

	<p>molecule, compound. e) proton, atom, electron, molecule, compound.</p>	
Chapter 2 Multiple Choice #2	<p>The strongest chemical bonds between two atoms in solution are</p> <p>a) covalent. b) ionic. c) hydrogen bonds. d) hydrophobic interactions.</p>	. A
Chapter 2 Multiple Choice #3	<p>Dehydration synthesis is involved in the synthesis of all of the following except</p> <p>a) DNA. b) proteins. c) polysaccharides. d) lipids. e) monosaccharides.</p>	. E
Chapter 2 Multiple Choice #4	<p>The primary structure of a protein relates to its</p> <p>a) sequence of amino acids. b) length. c) shape. d) solubility. e) bonds between amino acids.</p>	A
Chapter 2 Multiple Choice #5	<p>Pure water has all of the following properties except</p> <p>a) polarity. b) ability to dissolve lipids. c) pH of 7. d) covalent joining of its atoms. e) ability to form hydrogen bonds.</p>	. B
Chapter 2 Multiple Choice #6	<p>The macromolecules that are composed of carbon, hydrogen, and oxygen in an approximate ratio of 1:2:1 are</p> <p>a) proteins. b) lipids. c) polysaccharides. d) DNA. e) RNA.</p>	. C
Chapter 2 Multiple Choice #7	<p>In proteins, α helices and β pleated structures are associated with the</p> <p>a) primary structure. b)</p>	. B

	<p>secondary structure.</p> <p>c) tertiary structure. d) quaternary structure. e) multiprotein complexes.</p>	
Chapter 2 Multiple Choice #8	<p>Complementarity plays a major role in the structure of</p> <p>a) proteins. b) lipids. c) polysaccharides. d) DNA. e) RNA.</p>	D
Chapter 2 Multiple Choice #9	<p>A bilayer is associated with</p> <p>a) proteins. b) DNA. c) RNA. d) complex polysaccharides. e) phospholipids.</p>	D.
Chapter 2 Multiple Choice #10	<p>Isomers are associated with</p> <p>1. carbohydrates. 2. amino acids. 3. nucleotides. 4. RNA. 5. fatty acids. a) 1, 2 b) 2, 3 c) 3, 4 d) 4, 5 e) 1, 5</p>	. A
Chapter 2 Applications #1	<p>A group of prokaryotes known as thermophiles thrive at high temperatures that would normally destroy other organisms. Yet these thermophiles cannot survive well at the lower temperatures normally found on the earth. Propose an explanation for this observation.</p>	<p>The enzymes can function well at the high temperatures but function poorly at the lower temperatures.</p>
Chapter 2 Applications #2	<p>Microorganisms use hydrogen bonds to attach to surfaces. Many of the cells lose hold of the surface because of the weak nature of these bonds. Contrast the benefits and disadvantages of using covalent bonds as a means of attaching to surfaces.</p>	<p>The weak hydrogen bonds allow the organisms to detach and reattach very quickly and so the organisms can respond very quickly to changing conditions in the environment. Further, very little energy is required to attach and detach from surfaces.</p>
Chapter 2 Critical Thinking #1	<p>What properties of the carbon atom make it ideal as the key atom for all molecules in organisms?</p>	<p>Carbon is the major building block of all matter because it can form four covalent bonds with other atoms including carbon atoms. Since these bonds can be single, double or triple bonds, with a variety of elements, a wide variety of different molecules can be formed. The bonds can be polar or non polar so a wide variety of molecules with different weak</p>

		bonding properties can be formed.															
Chapter 2 Critical Thinking #2	<p>A biologist determined the amounts of several amino acids in two separate samples of pure protein. The data are shown here: Amino Acid</p> <table> <tr> <td>Leucine</td> <td>Alanine</td> <td>Histidine</td> <td>Cysteine</td> <td>Glycine</td> </tr> <tr> <td>Protein A 7%</td> <td>12%</td> <td>4%</td> <td>2%</td> <td>5%</td> </tr> <tr> <td>Protein B 7%</td> <td>12%</td> <td>4%</td> <td>2%</td> <td>5%</td> </tr> </table> <p>The scientist concluded that protein A and protein B were the same protein. Do you agree with this conclusion? Justify your answer.</p>	Leucine	Alanine	Histidine	Cysteine	Glycine	Protein A 7%	12%	4%	2%	5%	Protein B 7%	12%	4%	2%	5%	No. The amino acids might be arranged differently so the two proteins would be quite different and have different properties.
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Chapter 2 Critical Thinking #3	<p>This table indicates the freezing and boiling points of several molecules: Molecule</p> <table> <tr> <td>Freezing Point (°C)</td> <td>Boiling Point (°C)</td> </tr> <tr> <td>Water 0</td> <td>100</td> </tr> <tr> <td>Carbon tetrachloride (CCl₄) – 23</td> <td>77</td> </tr> <tr> <td>Methane (CH₄) – 182</td> <td>– 164</td> </tr> </table> <p>Carbon tetrachloride and methane are non-polar molecules. How does the polarity and non-polarity of these molecules explain why the freezing and boiling points for methane and carbon tetrachloride are so much lower than those for water?</p>	Freezing Point (°C)	Boiling Point (°C)	Water 0	100	Carbon tetrachloride (CCl ₄) – 23	77	Methane (CH ₄) – 182	– 164	<p>Because of the hydrogen bonding between water molecules, much energy is required in the form of heat to break the bonds and convert the liquid into a gas. If there is no hydrogen bonding between molecules, less energy (a lower temperature) is required. Further, as the temperature drops, weak hydrogen bonds between water molecules are broken less frequently until a crystalline structure (ice) is formed in which hydrogen bonding between molecules is most stable. Molecules that can not form hydrogen bonds between molecules must reach lower temperatures to achieve stability between molecules and form a crystalline structure.</p>							
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