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| **MicroAssessment number (Question#)** | **Question** | **Answer** |
| 1.1 (1) | Give two reasons why it took so long to disprove spontaneous  generation. | (1) Heat resistant spores were present in some broths, and (2) some stoppers (corks) used to seal flasks were not effective. |
| 1.1 (2) | What experiment disproved the notion that a “vital force” in air  was responsible for spontaneous generation? | Pasteur’s experiment showing that sterile medium in swan necked flasks open to the air would remain sterile indefinitely if they were not tipped. |
| 1.1 (3) | What conclusions could Tyndall reach on the properties of  the agent that entered the broth from hay? | They were not killed by heating and they were not visible to the naked eye. |
| 1.2 (4) | Describe two microbial activities essential to life and three that  make our lives more comfortable. | Essential activities—(1) Conversion of nitrogen of the air into a form that is useable by plants and animals, and (2) replenishment of O2 in the atmosphere by photosynthetic microorganisms. Non-essential activities—(1) Synthesis of many products used in every day life (amino acids, vitamins, etc), (2) involvement in food and beverage production, and (3) degradation of environmental pollutants |
| 1.2 (5) | Describe three reasons why some diseases re-emerge. | Diseases re-emerge because: (1) Reduction of vaccination against certain diseases, (2) diseases under control by antimicrobial medications become resistant to the medications, and (3) the aging population is more susceptible to infectious diseases |
| 1.2 (6) | Why would it seem logical, even inevitable, that at least some  bacteria would attack the human body and cause disease? | The human body is an ecological location that provides many of the requirements that bacteria require to grow. Organisms that have the ability to invade our cells or damage our tissues have access to additional nutrients. |
| 1.3 (7) | Name one feature that distinguishes members of the Bacteria  from the Archaea. | Bacteria contain the unusual compound peptidoglycan in their cell wall whereas the Archea do not. |
| 1.3 (8) | List two features that distinguish prokaryotes from eukaryotes. | (1) Prokaryotes have no true nucleus; eukaryotes do, and (2) prokaryotes rarely, if ever have membrane bounded internal structures |
| 1.3 (9) | The binomial system of classification uses both a genus and a  species name. Why are two names used? | The genus name identifies a group of organisms that share features in common. The species name separates organisms in the genus into individuals that differ in their individual properties from all other organisms in the genus. To identify a specific organism requires both names |
| 1.4 (10) | Describe the chemical composition of viruses, viroids, and prions. | Viruses consist of a protein coat surrounding either DNA or RNA; viroids consist of only RNA; and prions consist of only protein |
| 1.4 (11) | Which of the non-living members of the microbial world seems to  be the least threat to human health? | Viroids have not been shown to cause any human disease and prions are responsible rarely for diseases in humans. |
| 1.5 (12) | Place in order with respect to typical size (arrange from smallest  to largest) bacteria, eukaryotic cells, and viruses. | Viruses, bacteria, eukaryotic cells |
| 1.5 (13) | What factor limits the size of free-living cells? | Free living organisms must have the necessary equipment to sustain life, including all of the required macromolecules. They must be large enough to contain these macromolecules. |
| **Chapter 2** |  |  |
| 2.1 (#1) | Why are electrons not considered in determining the mass number of an element? | They are too light to contribute to the atomic mass |
| 2.1 (#2) | What is the “octet rule” and its biologically important exception? | Atoms of biological importance contain a maximum of 8 electrons in their outer shell to achieve maximum stability.The exception is the H atom which has only a single shell which is filled with a maximum of 2 electrons. |
| 2.1 (#3) | Why is the energy level of an electron higher the farther it is from the nucleus? | The further from the nucleus, the less attraction from the protons in the nucleus |
| 2.2 (#4) | Compare the relative strengths of covalent, hydrogen, and ionic bonds. | Covalent bonds are the strongest; hydrogen and ionic bonds are far weaker in an aqueous solution,. In a solid compound, ionic bonds are strong. |
| 2.2 (#5) | Which type of bond requires an enzyme to break it? | Covalent bond |
| 2.2 (#6) | Which type of bond requires an enzyme to break it? | The loss of a negative charge gives the uncharged atom a positive charge. The proton in the nucleus gives the atom the positive charge. |
| 2.3 (#7) | Why is water a polar molecule? Give two examples of why this property is important in microbiology. | Because the oxygen atom has a greater attraction for electrons than does the hydrogen atom. Because of this polarity, water is an excellent solvent and liquid water is denser than ice, so ice floats. |
| 2.3 (#8) | Name the four important classes of large molecules in cells. | Nucleic acids, proteins, polysaccharides and lipids |
| 2.3 (#9) | In pure water, what must be done to decrease the OH- concentration? To decrease the H+ concentration? | Add an acidic material ( H+ ) to decrease the OH- concentration. Add a base ( OH- ) to decrease the H+ concentration. |
| 2.4 (#10) | What type of bond joins amino acids to form proteins? | Peptide bond which is a covalent bond |
| 2.4 (#11) | Describe five roles of proteins. | Acidic and basic amino acids. |
| 2.4 (#12) | What elements must all amino acids contain? What element will only some amino acids contain? | All amino acids contain C,H,O,N; some amino acids contain S |
| 2.5 (#13) | Distinguish between structural isomers and stereoisomers. | A structural isomer contains the same atoms in the same concentrations but they are arranged differently in the molecule. A stereoisomer is a mirror image of another molecule resulting from the C atom being joined to four different atoms |
| 2.5 (#14) | What is the general name given to a single sugar? How can single sugars differ from another? | Monosaccharide. Monosaccharides can differ from one another in the number of atoms they contain, the arrangement of the atoms, what functional groups they contain, whether they are in a ring or linear form, and the relative position oft he –OH group joined to the number 1 carbon atom ( alpha or beta form ). |
| 2.5 (#15) | How can you distinguish sucrose and lactose from a protein molecule by identifying the elements in the molecules? | The two sugars do not contain any N atoms whereas the protein molecule does. |
| 2.6 (#16) | How do the nucleotides of DNA differ from those of RNA? | DNA contains thymine whereas RNA contains uracil. |
| 2.6 (#17) | How does the structure of DNA differ from that of RNA? | DNA is a long double stranded helix in which the two strands are held together by many hydrogen bonds. RNA is a much shorter single stranded molecule with little, if any hydrogen bonding. |
| 2.6 (#18) | If the DNA molecule were placed in boiling water, how would the molecule change? | The molecule would denature into single strands because of the breakage of the hydrogen bonds holding the two strands together. |
| 2.7 (#19) | What are the main functions of lipids in cells? | They prevent the entrance into the cell and the exit out of the cell of hydrophilic molecules. As a small molecule, water can enter and exit. |
| 2.7 (#20) | What features in the chemical composition of phospholipids make them ideal components of the cytoplasmic membrane? | The two layers of phospholipids give the membrane different properties. The outer hydrophilic layers are in contact with the aqueous region of the outside environment and the internal contents of the cell. The opposing layers of fatty acids face inward and prevent water soluble molecules from entering or exiting. |
| 2.7 (#21) | How could you determine if a solid compound were a lipid or a carbohydrate based on its solubility properties? | A lipid is insoluble in water whereas a carbohydrate is soluble. |
| **Chapter 3** |  |  |
| 3.1 (#1) | Why must oil be used to obtain the best resolution with a 100× lens? | Oil displaces the air, so that the light does not refract as it travels to the lens. |
| 3.1 (#2) | What are some drawbacks of electron microscopes? | They are expensive and bulky, and specimen preparation is time consuming and difficult. |
| 3.1 (#3) | If an object being viewed under the phase-contrast microscope has the same refractive index as the background material, how would it appear? | It would be difficult to see because the phase contrast microscope amplifies differences in the refractive index. |
| 3.2 (#4) | What are the functions of a primary stain and a counterstain? | The primary stain dyes all cells, and the counterstain dyes the cells that were rendered colorless by the decolorizing agent. |
| 3.2 (#5) | Describe one error in the staining procedure that would result in a Gram-positive bacterium appearing pink. | Overdecolorizing is the most common error, and it would result in a Gram-positive bacterium appearing pink. Forgetting the primary stain would give the same result. |
| 3.2 (#6) | What color would a Gram-negative bacterium be in an acid-fast stain? | Blue. All cells other than acid-fast ones are blue. |
| 3.3 (#7) | What shape are Escherichia coli cells? | Rods |
| 3.3 (#8) | What determines whether a group of dividing cells will form chains or clusters? | Some cells stick together following division, and the number of planes in which the cells divide determines the groupings. |
| 3.4 (#9) | Explain the fluid mosaic model. | The lipid bilayer is a liquid, so proteins can move around in the membrane. |
| 3.4 (#10) | Name three molecules that pass freely through the lipid bilayer. | Gases, small hydrophobic molecules, and water |
| 3.4 (#11) | Why do the protons ejected by the electron transport system stay close to the membrane, rather than float away? | The hydroxyl ions, which are negatively charged, attract the positively charged protons. |
| 3.5 (#12) | Why do the protons ejected by the electron transport system stay close to the membrane, rather than float away? | Prokaryotes typically grow in very dilute environments, so transport systems that expend energy must be used to move substances into the cell (up the concentration gradient) |
| 3.5 (#13) | Why would a cell need to secrete proteins? | Cells secrete proteins to break down extracellular macromolecules so that the components subunits can then be brought into the cell. Cells also need to secrete proteins to make extracellular structures such as flagella. |
| 3.5 (#14) | Can you argue that group translocation is a form of active transport? | Yes. A high-energy phosphate bond is expended to bring the substance into the cell. |
| 3.6 (#15) | What is the significance of lipid A? | It is the part of the LPS molecule that is recognized by our host defenses; when large amounts accumulate (such as in a bloodstream infection), the response by the defense system itself can be deadly. |
| 3.6 (#16) | How does the action of penicillin differ from that of lysozyme? | 16. Penicillin interferes with the synthesis of peptidoglycan (prevents the cross-linking from occurring), whereas lysozyme breaks bonds that connect the NAG and NAM subunits |