

2. What chemical agent would be most effective in each of the following situations?
 - a. A puncture wound acquired while gardening.
 - b. For presurgical scrubbing.
 - c. To sterilize packaged bandages.
 - d. To prevent the growth of molds in liquid cosmetics.
3. Compare and contrast sterilization and sanitation.
4. Discuss the advantages and disadvantages associated with each of the following physical methods of control.
 - a. Osmotic pressure
 - b. Desiccation
 - c. Refrigeration
 - d. Filtration
5. Discuss the advantages and disadvantages of UV light as a method to control microbial growth.

ANSWERS

Matching

- I. 1. g 2. b 3. d 4. e 5. c 6. f 7. i
- II. 1. c 2. b 3. e 4. d 5. f
- III. 1. i 2. b 3. d 4. d 5. e 6. f 7. g 8. j 9. a 10. c
- IV. 1. a 2. e 3. d 4. b 5. c 6. d
- V. 1. d 2. c 3. b 4. e 5. a
- VI. 1. a 2. b 3. c 4. e 5. d 6. f

Fill in the Blanks

1. nonionizing 2. singlet 3. X rays, gamma rays, high-energy electrons 4. 70%
5. glutaraldehyde 6. -stat 7. under pressure (as in an autoclave) 8. autoclaves
9. carbon dioxide 10. fungi, such as molds and yeasts

Critical Thinking

1. a. Autoclaving at 121°C, 15 psi for 15 minutes will kill all organisms and their endospores.
b. The milk should be sterilized by ultra-high-temperature (UHT) treatment.
c. Vaccines are heat-sensitive and must be filter-sterilized.
d. Most media can be safely autoclaved. Heat-sensitive media can be filter-sterilized.
2. a. An oxidizing agent such as hydrogen peroxide would be a good choice. Oxidizing agents are especially effective against anaerobic bacteria.
b. Chlorhexidine is useful for surgical scrubbing because it is bactericidal against both gram-positive and gram-negative organisms.
c. Ethylene oxide would be appropriate because it is 100% effective and can penetrate the wrapping material covering the bandage.
d. The addition of a compound such as methylparaben would inhibit mold growth.
3. *Sterilization* refers to the destruction or the removal of *all* microbial life, including endospores. There are many ways to achieve sterilization, including the use of heat, chemical agents, or filtration. *Sanitation* is the *reduction* of pathogens on inanimate objects (such as eating utensils) to “safe” levels. This may be achieved by mechanical cleaning or with chemical agents.
4. a. The use of high concentrations of salt or sugar creates a hypertonic environment that results in the osmotic loss of water from microbial cells. The advantage is that this is a simple way to preserve meat and fruit. Applications include jams and jellies. Disadvantages are that molds may grow on foods prepared this way and that it isn’t a practical way to preserve many foods.
b. Desiccation involves drying food (for example, meat and fruit). The lack of water retards the growth and reproduction of microbes. The advantage is that it is an easy way to preserve some foods. The disadvantages are that many microorganisms are able to survive desiccation for long periods of time and are revived upon the addition of moisture. Applications are beef jerky and sun-dried tomatoes.
c. Refrigeration is a simple and relatively effective way to retard the spoilage of food. Although many bacteria can survive and even reproduce at refrigerator temperatures, the rate of chemical reactions is slowed.
d. Filtration is the passage of gas or liquid through a screenlike material with pores small enough to retain microbes. There are many applications of filtration, such as sterilizing heat-sensitive materials. It is difficult to filter-sterilize viscous materials such as some media.
5. Nonionizing radiation (for example, UV light) damages the DNA of exposed cells and is used to control microbes in air and to sterilize vaccines, serums, and toxins. A serious disadvantage of nonionizing radiation is that because of its relatively low energy content, it penetrates poorly. Organisms protected by practically anything are not affected.