Chapter 01: Introduction to Dental Materials

MULTIPLE CHOICE

1. Until 1970, which of the following groups of dental auxiliaries were allowed to perform intraoral functions in all states?
   1. Dental hygienists
   2. Registered dental assistants
   3. Certified dental assistants
   4. On-the-job trained dental assistants
   a. 1, 2, 3, 4
   b. 1, 2, 3
   c. 1, 2
   d. 1

   ANS: D
   Until 1970, only the dental hygienist was allowed to perform intraoral functions in all states. Although laws vary from state to state, virtually every state has modified, updated, and made changes to state restrictions to allow for the performance of intraoral procedures by all allied oral health care practitioners.

   REF: p. 1 TOP: The Role of the Dental Auxiliary in the Use of Dental Materials

2. Silver paste was first mentioned as a restorative material for teeth by the:
   a. Chinese.
   b. Greeks.
   c. Romans.
   d. French.

   ANS: A
   Silver paste was first mentioned as a restorative material for teeth by the Chinese in 659 AD. More than 1000 years later, in 1800, it was produced in France from "shavings from silver cut from coins mixed with enough mercury to form a sloppy paste." Health problems arising from the high mercury content of this early amalgam prompted the American Society of Dental Surgeons to pass a resolution in 1846 stating that amalgam should not be used under any circumstances.

   REF: p. 3 TOP: The Historical Development of Dental Materials

3. What was the "Amalgam War" fought over?
   a. Mining rights in states in the Western region of the United States
   b. The price of silver in relation to tin and zinc
   c. The value and safety of silver dental amalgam
   d. Patent issues between France and England

   ANS: C
   The "Amalgam War" was fought over the value and safety of silver dental amalgam. It did not end until 1895, when G.V. Black developed an acceptable amalgam formula.

   REF: p. 3 TOP: The Historical Development of Dental Materials

4. Which of the following restorative techniques was first introduced in 1955?
   a. Cast gold inlays
   b. Cohesive gold foil
   c. Acid-etch technique
   d. Synthetic resins for denture bases

   ANS: C
   The acid-etch technique was introduced in 1955. Cohesive gold foil, which could be condensed directly into the cavity preparation, was introduced in 1855. In 1907, Dr. William Taggart demonstrated a casting method to produce gold inlays. Synthetic resins were introduced in 1932; these resins soon replaced rubber as the denture base of choice. Around this time, synthetic resins also became a popular tooth-colored alternative, and, together with the introduction of the acid-etch technique, they have evolved into composite resin, one of the most popular restorative materials.

   REF: p. 3 TOP: The Historical Development of Dental Materials

5. What is Dr. Frederick McKay credited with?
   a. Developing an acceptable formula for silver dental amalgam
   b. Noting dental fluorosis in Colorado Springs
   c. Demonstrating a casting method to produce gold inlays
   d. The introduction of dental cements

   ANS: B
   Dr. Frederick McKay is credited with noting dental fluorosis in Colorado Springs in 1901. Together with G.V. Black, he determined that drinking water was the factor. These caries-free but mottled teeth prompted Dr. McKay to suggest changes in the water supply, leading to the first community water fluoridation programs in 1945.

   REF: p. 3 TOP: The Historical Development of Dental Materials

6. Since 2005, the American Dental Association (ADA) Seal of Acceptance is awarded to _____ products.
   a. both professional and consumer
   b. professional but not consumer
   c. consumer but not professional
   d. neither professional nor consumer

   ANS: C
   Since 2005, the American Dental Association (ADA) Seal of Acceptance is awarded to consumer but not professional products. Although strictly a voluntary program, more than 1300 consumer dental products carry the Seal of Acceptance. Most common among these are toothpaste, toothbrushes, mouth rinses, floss and other interdental cleaners, sugar-free chewing gum, and denture adherents and cleansers.

   REF: p. 4 TOP: The Agencies Responsible for Standards (American Dental Association)

7. Dental materials considered devices, as well as over-the-counter products sold to the public, are subject to control and regulation of the _____ Center for Devices and Radiological Health.
   a. Food and Drug Administration

b. Drug Enforcement Administration
c. Centers for Disease Control and Prevention
d. Department of Human and Health Services

ANS: B
Dental materials considered devices, as well as over-the-counter products sold to the public, are subject to control and regulation of the Food and Drug Administration Center for Devices and Radiological Health. The original Food and Drug Act of 1906 did not include provisions to ensure medical and dental device safety or claims. In 1976, the Medical Device Amendment was signed to give the Food and Drug Administration regulatory authority over medical and dental devices, which are now classified and regulated according to their degree of risk to the public.

REF: p. 5
TOP: The Agencies Responsible for Standards (U.S. Food and Drug Administration)

8. Which of the following represents the standards used to develop specifications and testing on an international level?
a. World Health Organization (WHO)
b. Food and Drug Administration (FDA)
c. American Dental Association (ADA)
d. International Standards Organization (ISO)

ANS: D
The International Dental Federation and the International Standards Organization (ISO) represent the standards used to develop specifications and testing on an international level. These standards are developed through the ISO's technical committee for dentistry (ISO TC 106).

REF: p. 5 TOP: The Agencies Responsible for Standards (International Agencies)

9. Which of the following statements is true concerning the American Dental Association (ADA) Seal?
a. All dental products qualify for the Seal.
b. It helps consumers make informed decisions about the safety and efficiency of products.
c. The ADA Seal is usually awarded for the life of the product.
d. Once a product has been accepted, it does not need to be reevaluated if its composition changes.

ANS: B
Consumers and dentists rely on the ADA Seal to assist them in making informed decisions regarding a product's safety and efficiency. Not all dental products qualify for the Seal. The ADA Seal is usually awarded for a period of 5 years, at which time the product is reevaluated. Products that have been previously accepted are also reevaluated anytime their composition changes.

REF: p. 5 TOP: The Agencies Responsible for Standards (American Dental Association)

10. Who does the delivery of dental materials most often fall to?
a. The dentist

b. The dental hygienist
c. The dental assistant
d. The dental laboratory technician

ANS: C
The dental assistant is most directly responsible for the delivery of dental materials within specific guidelines outlined by the dental manufacturer.

REF: p. 1 TOP: The Role of the Dental Auxiliary in the Use of Dental Materials

11. Which of the following is not a classification of dental materials?
a. Preventive
b. Biological
c. Restorative
d. Therapeutic

ANS: B
Dental materials are classified as preventive, restorative, and therapeutic materials.

REF: p. 2 TOP: The Role of the Dental Auxiliary in the Use of Dental Materials

12. What is the best resource for choosing which dental material to use?
a. Reading professional journals
b. Meeting with manufacturers' representatives
c. Discussing which materials colleagues use
d. All of the above are good resources.

ANS: D
Professional journals, dental materials manufacturers and manufacturers' representatives, Internet links, and other resources can provide invaluable information.

REF: p. 2 TOP: The Role of the Dental Auxiliary in the Use of Dental Materials

13. The first acceptable amalgam formula was developed by _____ in 1895.
a. G.V. Black
b. Pierre Fuchard
c. Dr. Frederick McKay
d. Dr. William Taggart

ANS: A
The "Amalgam War" ended in 1895, when G.V. Black developed an acceptable amalgam formula.

REF: p. 3 TOP: The Historical Development of Dental Materials

14. What is today's approach to dental care referred to as?
a. Individualized care
b. Comprehensive care
c. Science-based dentistry
d. Evidence-based dentistry

ANS: B

The ADA defines evidence-based dentistry as an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence related to the patient's oral medical history with the dentist's clinical expertise and the patient's treatment needs and preferences.

REF: p. 2 TOP: Evidence-Based Dentistry

15. In history, the earliest recorded mention of restorative dentistry occurs when?
    a. 2500 BC
    b. 600 BC
    c. 1200 AD
    d. 1700 AD

    ANS: B
    Much is found in the literature about treatment options, including remedies of potions and prayer, but no evidence of restorative dentistry exists until around 600 BC to 300 BC.

    REF: p. 2 TOP: The Historical Development of Dental Materials

16. According to the earliest historical mention, in which location was fluoride first used?
    a. China
    b. Prussia
    c. England
    d. Colorado Springs

    ANS: C
    Preventive dentistry had an early beginning, with fluoride first introduced in 1874 and dispensed in England at that time for the prevention of caries.

    REF: p. 3 TOP: The Historical Development of Dental Materials

MATCHING

Match the items with the correct description below.

a. Food and Drug Administration
b. American Dental Association
c. International Standards Organization

1. Seal of Acceptance
2. Regulation over dental devices
3. Standards to develop specifications on an international level

1. ANS: B REF: p. 4
   TOP: The Agencies Responsible for Standards (American Dental Association)
2. ANS: A REF: p. 5
   TOP: The Agencies Responsible for Standards (U.S. Food and Drug Administration)
3. ANS: C REF: p. 5
   TOP: The Agencies Responsible for Standards (International Agencies)

SHORT ANSWER

1. What would be the four characteristics of the perfect dental material?

   ANS:
   The perfect dental material would be biocompatible, bond permanently to tooth structure, be esthetic with the tooth/tissue structures, and repair or regenerate missing tissues.

   REF: p. 2 TOP: The Role of the Dental Auxiliary in the Use of Dental Materials

Chapter 02: Oral Environment and Patient Considerations

MULTIPLE CHOICE

1. Some dental materials may be therapeutic in small quantities or if in contact with tissues for a short period of time. Dental materials may be irritating or toxic with longer or larger doses.
   a. Both statements are true.
   b. Both statements are false.
   c. The first statement is true, and the second statement is false.
   d. The first statement is false, and the second statement is true.

   ANS: A
   Some dental materials may be therapeutic in small quantities or if in contact with tissues for a short period of time but also may be irritating or toxic with longer or larger doses. Topical fluoride is of great benefit when used according to manufacturers' directions but can be irritating to soft tissues and can even excessively etch enamel if used improperly.

   REF: p. 9 TOP: Biocompatibility

2. Normal masticatory forces on the occlusal surfaces of molar teeth can increase to as much as _____ pounds per square inch on a cusp tip.
   a. 280
   b. 1000
   c. 10,000
   d. 28,000

   ANS: D
   Normal masticatory forces on the occlusal surfaces of molar teeth can increase to as much as 28,000 pounds per square inch on a cusp tip. Normal masticatory forces on the occlusal surfaces of molar teeth average 90 to 200 pounds. Masticatory forces decrease in incisor areas and can increase during bruxing or clenching.

   REF: p. 10 TOP: Force and Stress

3. _____ force is applied when two surfaces slide against each other in opposite directions.
   a. Compressive
   b. Shearing
   c. Tensile
   d. Axial

   ANS: B
   Shearing force is applied when two surfaces slide against each other or in a twisting or rotating motion. An incisor used for cutting is an example of shearing forces.

   REF: p. 10 TOP: Force and Stress

4. Stress is the amount of force exerted from within an object, and _____ is the amount of change that the force has produced.
   a. strain
   b. tension

c. compression
d. chemical bonding

ANS: C
Stress is the amount of force exerted from within an object, and strain is the amount of change that the force has produced. The normal process of chewing rarely involves only one type of stress; these combinations of stresses form complex stress combinations.

REF: p. 11 TOP: Force and Stress

5. Which of the following materials has the highest ultimate compressive strength (lbs/in^2)?
a. Acrylic
b. Porcelain
c. Amalgam
d. Composite resins

ANS: C
Amalgam has the highest ultimate compressive strength (45,000 to 64,000 lbs/in^2), followed by composite resins (30,000 to 60,000 lbs/in^2), porcelain (21,000 lbs/in^2), and acrylic (11,000 lbs/in^2). Amalgam and composite resins more closely replicate enamel in compressive strength, but porcelain falls short. Porcelain is more likely to fracture under compressive stresses.

REF: p. 11
TOP: Table 2-1: Ultimate Compressive and Tensile Strengths of Tooth and Restorative Structures

6. Which of the following statements is correct about fatigue failure?
a. It is not a factor for restorative dental materials.
b. It is not dependent on conditions in the oral cavity.
c. It occurs as the result of a large, single-force application.
d. It occurs as the result of microscopic flaws that grow over time.

ANS: B
Fatigue failure occurs as the result of microscopic flaws that grow over time. Failures rarely occur in a single-force application; rather, they occur when stress is frequently repeated. A metal wire will eventually break when bent repeatedly. Restorative materials are subject to repeated fatigue testing for all forces. Conditions of the oral cavity such as humidity and temperature and pH fluctuations may also increase fatigue failure.

REF: p. 11 TOP: Force and Stress

7. The normal resting pH of saliva ranges from 6.2 to _____, which is neutral.
a. 1
b. 6.6
c. 7
d. 14

ANS: C
The normal resting pH of saliva ranges from 6.2 to 7, which is neutral. It can fluctuate higher or lower by several points during the course of a day. Many materials that would be compatible in a neutral environment will not be compatible in an acidic one.

REF: p. 11 TOP: Moisture and Acid Levels

8. The staining of resins and acrylics from repeated exposure to coffee, tea, and other dyed beverages is due to:
   a. compressive forces.
   b. water sorption.
   c. galvanism.
   d. tarnish.

   ANS: B
   The staining of resins and acrylics from repeated exposure to coffee, tea, and other dyed beverages is due to water sorption. Water sorption is the ability to absorb moisture. Dentures, when placed in a glass of water, will take up the liquid and become slightly larger. Some acrylics will absorb both odors and tastes from foods.

   REF: p. 11 TOP: Moisture and Acid Levels

9. Which of the following dental restorative materials is particularly susceptible to corrosion?
   a. Acrylic
   b. Dental porcelain
   c. Dental amalgam
   d. Composite resin

   ANS: C
   Dental amalgam is particularly susceptible to corrosion, causing marginal breakdown and discoloration of tooth structures. In newer, high-copper amalgams, this may not be as critical to their longevity.

   REF: pp. 11-12 TOP: Moisture and Acid Levels

10. Which of the following has been suggested to delay formation of surface tarnish on dental amalgams?
    a. Incremental addition
    b. Polishing
    c. Use of non–copper-containing dental amalgam
    d. Undercondensation

    ANS: B
    Polishing of amalgams to produce a smooth surface has been recommended to help delay the process of surface tarnish. Surface tarnish, discoloration due to oxidation of the metal's surface, can accelerate in crevices between a tooth and restoration and on rough surfaces.

    REF: p. 12 TOP: Moisture and Acid Levels

11. Which of the following is true of galvanism?
    a. It is an electrical current transmitted between two similar metals.
    b. It is observed in patients with composite resin but not silver amalgam restorations.
    c. Galvanic stimulation will decrease with time as oxides form on the surface of the metal.
    d. The salts of the saliva inhibit the movement of electrical current from one type of metal to another.

ANS: C
Galvanic stimulation will decrease with time as oxides form on the surface of the metal. Galvanism is an electrical current transmitted between two dissimilar metals. An environment containing moisture, acidity, and dissimilar metals makes the generation of electrical current possible. The salts of the saliva facilitate the movement of electrical current from one type of metal to another. The current may result in stimulation to the pulp, called *galvanic shock.*

REF: p. 12 TOP: Galvanism

12. What could excessive expansion of a restorative material result in?
    a. Corrosion
    b. Galvanism
    c. Fracture of cusps
    d. Leakage of fluid and bacteria into the gaps

ANS: C
Excessive expansion of a restorative material may result in fracture of cusps. Excessive contraction may result in leakage of fluid and bacteria into the open gaps, resulting in sensitivity. Expansion and contraction are measured using the coefficient of thermal expansion, the measurement of change in volume or length in relationship to change in temperature.

REF: p. 12 TOP: Temperature

13. What is percolation?
    a. The rate at which heat flows through a material
    b. A form of chemical rather than mechanical retention
    c. Something that helps seal the interface between tooth and restorative material
    d. Something that allows the ingress of bacteria and oral fluids and may lead to recurrent caries, staining, and pulpal irritation

ANS: D
Percolation allows the ingress of bacteria and oral fluids and may lead to recurrent caries, staining, and pulpal irritation. Percolation is the repeated shrinkage and expansion of the restoration during ingestion of cold and hot fluids, producing the opening and closing of a gap between the restoration and the tooth surface.

REF: p. 12 TOP: Temperature

14. Which of the following is the best thermal conductor?
    a. Gold
    b. Dentin
    c. Enamel
    d. Ceramic

ANS: A
Gold is one of the best thermal conductors; nonmetals such as ceramics, resins, cements, enamel, and dentin are poor conductors. Poor conductors can be used as insulators; dentin is a natural insulator.

REF: p. 12 TOP: Temperature