

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: DHYG 301 Department: Dental Hygiene

Course Title: Dental Materials Semester: Spring Year: 1999

Objectives/Competencies

Course Objective	Competencies
<p>1. Identify and describe physical and biological conditions that must be considered when using a material in dentistry.</p> <p>Explain and define the general physical and chemical properties of dental materials.</p> <p>Describe and explain the uses, composition, important properties and characteristics, as well as the effects of technique variations, on the properties of the materials listed within the course schedule of content.</p> <p>List and describe recommended uses and procedures of the various materials associated with laboratory techniques.</p> <p>Describe and explain the structures and properties of matter in relation to their physical and mechanical status.</p> <p>List and describe techniques for the construction of</p>	<p>1. Explain the functions and duties of the American Dental Association (ADA) Council on Dental Materials and Devices.</p> <p>2. Explain the importance of the American Dental Association Specification and Acceptance Programs and how they function.</p> <p>3. Explain why it is necessary for you to understand the dental materials that you will come in contact with in the dental environment.</p>

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<p>removable partial and complete dentures as well as crowns and inlays.</p> <p>2. Identify and describe the physical and biological conditions that must be considered when using a material in dentistry.</p>	<ol style="list-style-type: none"> 1. List and briefly describe the four classes of materials utilized in dentistry. 2. List and describe the physical considerations making demands on dental materials. 3. List and describe the important biological properties and tell why each is necessary. 4. Compare the microleakage of new amalgam restorations with that of older ones. 5. Define the term interface. 6. Define percolation. 7. Explain how temperature changes affect materials in the oral cavity. 8. Define galvanism and explain how it is lessened in some cases. 9. List and explain the different classification of restorative materials and give an example of each. 10. Differentiate between inlays and onlays. 11. Define the term solid. 12. Define and give examples of: <ol style="list-style-type: none"> a. adhesion b. cohesion 13. Explain the importance of adhesion in dentistry. 14. Explain what is meant by viscosity. 15. Define wetting and describe the factors that influence it. 16. Define film thickness and its importance in density.

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	<p>17.Explain what is meant by surface tension.</p> <p>18.Explain what is meant by the term force in dentistry.</p> <p>19.Define stress and strain and relate them to each other.</p> <p>20.Describe the three types of stress and strain and give examples of each.</p> <p>21.Interpret a stress-strain curve.</p> <p>22.Define and explain the importance of:</p> <ul style="list-style-type: none"> a.elasticity b.elastic limit c.Hooke’s Law d.proportional limit e.yield point f.ultimate strength g.fracture strength <p>23.Define Young’s Modulus and explain how it is affected by deformation.</p> <p>24.Explain the importance of a high modulus of elasticity in dental restorative materials.</p> <p>25.Compare ductility and malleability.</p> <p>26.Differentiate between flow and creep.</p> <p>27.Define hardness and describe the methods for measuring it.</p> <p>28.Define distortion and relaxation and explain how they are related.</p> <p>29.Define rheology.</p> <p>30.Describe thermal conductivity and thermal expansion; explain their importance in choosing materials for restorations and appliances.</p>

Course Objective	Competencies
<p>3. Understand and value the gypsum product as it is utilized in the dental office and dental laboratory.</p>	<p>31. Explain how color influences the choice of a dental material.</p> <p>32. Define hue, value, and chroma.</p> <p>33. Define metamerism and explain how its effects may be avoided in a dental office.</p> <p>34. Identify the characteristics of the ideal dental material.</p> <p>1. Describe the physical and chemical properties of dental gypsum products.</p> <p>2. Give the chemical composition of gypsum.</p> <p>3. Name the major constituents of plaster, stone and improved stone.</p> <p>4. Describe the essential difference between the powders of plaster, stone and improved stone.</p> <p>5. Explain how this fundamental difference between the powders is related to the manufacturing process.</p> <p>6. Describe the chemical changes that occur during the manufacturing and setting reaction of the gypsum product.</p> <p>7. Define exothermic reaction.</p> <p>8. Define water/powder ratio and give the W/P ratios for plaster, stone and improved stone.</p> <p>9. Describe the reaction that occurs when water is mixed with the gypsum product.</p> <p>10. Explain how changes in the W/P ratio affect the gypsum cast.</p> <p>11. Define gauging water and explain its function.</p> <p>12. Explain the term initial setting time as it is applied to</p>

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	<p>gypsum products; briefly describe how it is measured; and indicate its practical significance.</p> <p>13. Describe a method for measuring the final setting time.</p> <p>14. List and explain the factors influencing setting time.</p> <p>15. Describe how the setting rate is adjusted by the manufacturer.</p> <p>16. Explain how setting expansion can be controlled.</p> <p>17. List the materials that will lengthen and shorten the setting time.</p> <p>18. Describe what happens to a gypsum product with regard to setting expansion.</p> <p>19. Explain what is meant by hygroscopic expansion.</p> <p>20. List the ways that strength is determined in the gypsum product and what each entails.</p> <p>21. Describe how the strength of the gypsum product is affected by the W/P ratio.</p> <p>22. Differentiate between wet and dry strength.</p> <p>23. Explain how the final gypsum product obtains its strength and rigidity.</p> <p>24. Describe the effect(s) of adding extra water or powder after beginning to mix the gypsum product.</p> <p>25. State the infection control protocol when handling gypsum models.</p> <p>26. Classify gypsum materials according to their use in dentistry.</p> <p>27. Compare impression plaster, model plaster, and dental stone.</p> <p>28. Differentiate between the five classes of stone.</p>

Course Objective	Competencies
<p>6. Understand and value the various dental impression materials utilized in the dental office.</p>	<ol style="list-style-type: none"> 8. List the components of the applicable dental waxes. 9. Relate how each wax type is prepared (if applicable). 10. Explain what is meant by the term investment. 11. List the important properties of inlay wax. 12. State the ADA specifications for the applicable dental wax. 13. Accurately take an occlusal bite registration. 14. Box a maxillary or mandibular impression utilizing boxing wax. 15. Recognize the various dental waxes. 16. Utilize utility wax on a stock tray. 17. Utilize occlusal indicator wax to detect areas of premature contact. <ol style="list-style-type: none"> 1. Classify impression materials according to their uses in dentistry. 2. Identify two methods of classifying impression materials. 3. Differentiate between the terms reversible and irreversible. 4. Classify each material according to the chart as to whether each material is nonelastic, aqueous elastomeric, or non-aqueous elastomeric impression material. 5. Define the term undercut. 6. List the uses of dental compound. 7. List the ingredients of the dental compound and where applicable, state the function. 8. Briefly explain the setting reaction of the compound material.

Course Objective	Competencies
<p>7.Prepare, take and evaluate the ZOE bite registration to a laboratory competency.</p>	<ul style="list-style-type: none"> 9.List the uses of the ZOE. 10.Identify the components of the ZOE product and their function. 11.Explain how the setting time of the ZOE product is influenced. 12.Describe the mixing techniques of the paste system and the power/liquid system. 13.List the uses for the following ZOE products. <ul style="list-style-type: none"> a.ZOE impression paste b.bite registration paste c.surgical dressings 14.List the advantages and disadvantages of using this paste over others for the purpose of registering bite relationships. 1.Prepare a tray set-up for ZOE bite registration paste. 2.Mix a ZOE bite registration paste. 3.Accurately take a ZOE bite registration. 4.Rinse and store the ZOE bite registration material following OSHA guidelines. 5.List the uses of eugenol and non-eugenol periodontal pastes. 6.List the components of the non-eugenol periodontal pastes. 7.Explain what is meant by the term dew point. 8.List the mixing and setting times for the eugenol and non-eugenol dressings. 9.Briefly describe the placement of the periodontal dressing.

Course Objective	Competencies
<p>8.Mix a periodontal paste to laboratory competency.</p>	<p>10.Describe the controversy associated with the placement of periodontal dressings.</p> <ol style="list-style-type: none"> 1.Prepare a tray set-up for the P/L and the paste periodontal dressings. 2.Mix the eugenol and non-eugenol periodontal pastes. 3.Prepare a periodontal dressing for placement. 4.State the composition of the hydrocolloid impression materials. 5.Explain the term colloid. 6.List and explain why each ingredient in the irreversible hydrocolloid impression material is essential. 7.Explain how the reversible hydrocolloid material differs from the irreversible type. 8.Compare the advantages and disadvantages of the hydrocolloid impression materials. 9.List the ways that difficulties are avoided when utilizing the irreversible hydrocolloid impression material. 10.List the applications in dentistry of the reversible and irreversible hydrocolloid impression material.
<p>9.Take and evaluate the irreversible impression material to a clinical competency.</p>	<ol style="list-style-type: none"> 1.Describe the method for using irreversible hydrocolloid impression materials. 2.Briefly describe the method for preparing the reversible hydrocolloid impression material. 3.List the factors affecting the setting time of the irreversible hydrocolloid impression material. 4.Explain the importance of pouring the impression

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	<p>immediately in the gypsum product.</p> <ol style="list-style-type: none"> 5.Explain the significance of wrapping the impression in a moist towel. 6.Prepare a tray set-up for the irreversible hydrocolloid impression material. 7.List the materials necessary for a tray set-up for the reversible impression material. 8.Accurately prepare to take an irreversible hydrocolloid impression. 9.Prepare a patient for this procedure. 10.Describe the relationship of the oral cavity to an impression tray of proper size and shape. 11.Select a property sized impression tray for a given patient or model. 12.Describe the techniques to help alleviate patient gagging and discomfort. 13.Properly fill the impression trays with the hydrocolloid impression material. 14.Insert and remove the maxillary and mandibular impression trays with minimal discomfort to the patient. 15.Clean and store the reversible hydrocolloid impression material following OSHA guidelines. 16.Identify the different types of elastomeric impression materials and list their applications in dentistry. 17.List the components of the various elastomeric impression materials and state why each ingredient is utilized (if applicable). 18.Differentiate between the elastomeric impression

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<p>10.Prepare, mix and evaluate elastomeric materials to laboratory competency.</p>	<p>materials given with regard to: a.elastic recovery b.flow c.flexibility d.dimensiona shrinkage e.tear resistance f.by-products g.pouring limits</p> <p>19.List the mixing and setting times for the given elastomeric impression materials.</p> <p>20.Describe the manipulative techniques for the given elastomeric impression materials.</p> <p>21.Explain how high temperatures and humidity affect the setting times of the elastomeric impression materials.</p> <p>22.Name the accelerators and retarders that are used to alter the setting times of the elastomeric impression materials.</p> <p>23.Define curing.</p> <p>24.Define vulcanization.</p> <p>25.Explain how streaks in the final product will affect the accuracy of the elastomeric impression material.</p> <p>26.Describe the tray that is best utilized with elastomeric impression materials.</p> <p>27.Explain how the elastomeric material is maintained in the impression tray.</p> <p>1.Prepare a tray set-up for the elastomeric impression material.</p> <p>2.Accurately mix the given elastomeric impression material.</p>

Course Objective	Competencies
<p>11. Understand and value the various dental cements as they are utilized in the dental setting.</p>	<ol style="list-style-type: none"> 1. List the general uses of cements in dentistry. 2. Identify the various types of cements utilized in the dental office. 3. Describe the compatibility of each cement with the dental tissues. 4. List the major advantages and disadvantages of each dental cement. 5. Describe the effects of the P/L ratios, water and saliva on each cement's strength. 6. Explain how the mixing and setting times of each cement may be altered. 7. List the mixing times of the major dental cements. 8. List the uses of the various dental cements. 9. Name the major constituents of the noted dental cements and, if applicable, explain their specific function(s). 10. Define the term buffering agent. 11. Explain what is meant by the term hygroscopic. 12. Explain how moisture affects the setting time of the given cements. 13. Explain why some cements need to be mixed over a large area of the glass slab; identify the affected cement. 14. Compare Type I and II ZPC. 15. Describe the ways of controlling the water content of the ZPC liquid. 16. Describe and compare the mixing techniques for preparing ZPC as a luting agent. 17. List the ways of controlling the setting time of ZPC by:

Course Objective	Competencies
	<p>a.the glass slab temperature b.the P/L ratio</p> <p>18.Relate the importance of ADA specification #8. 19.Describe the mixing technique of ZPC. 20.Compare silicophosphate cement with that of other phosphate cements. 21.Describe the mixing technique of silicophosphate cement. 22.Explain how the setting time of polycarboxylate cement may be controlled by the manufacturer and by the dental personnel. 23.Compare the acidity of polycarboxylate cement to that of ZOE. 24.Explain why the initial acidic nature of polycarboxylate cement produces minimal irritation to the dental pulp. 25.Compare the solubility of polycarboxylate cement to that of ZPC. 26.Describe the mixing technique of polycarboxylate cement. 27.Describe the effect air has on the polycarboxylate cement liquid and how this will affect the cement's setting time. 28.Explain why a clean, dry surface facilitates the polycarboxylate cement's adhesion to the tooth structure. 29.Explain why a clean, dry surface facilitates the polycarboxylate cement's adhesion to the tooth structure. 30.List the uses of ZOE. 31.Name the ways that ZOE is supplied in the dental office. 32.Explain how the working time of ZOE may be altered. 33.List the three items that control the setting time of ZOE cement.</p>

Course Objective	Competencies
<p>12. Prepare mix and evaluate the various dental cements to laboratory competency.</p>	<p>34. Briefly explain what effect ZOE has on pulpal tissues. 35. Describe the mixing technique for ZOE. 36. List the uses of reinforced ZOE in the dental setting. 37. Describe the mixing technique for reinforced ZOE. 38. List the uses of EBA cement. 39. Describe the mixing technique for EBA cement. 40. List the uses of glass ionomer cement. 41. Explain the ways in which a premature contact with moisture may be avoided when placing a glass ionomer cement. 42. Describe the manipulation of glass ionomer cement. 43. List the uses of the resin cement. 44. Describe the available systems that may be purchased for this particular cement. 45. Briefly explain how one can minimize polymerization shrinkage with this cement. 46. Explain how this cement affects pulpal tissue. 47. Relate the importance of silicate cement in dentistry. 48. Identify the major use of silicate cement. 49. Identify the major components of silicate cement.</p> <p>1. Prepare a tray set-up for each of the covered cements. 2. Demonstrate the desired consistencies of a luting agent, a base, and a temporary restoration. 3. Care for each cement's powder and liquid. 4. Accurately mix the appropriate cements as specified. 5. Mix the various cements according to the manufacturer's directions.</p>

Course Objective	Competencies
<p>13. Understand and value cavity varnishes and bases as they are utilized in the dental setting.</p>	<ol style="list-style-type: none"> 6. Clean the appropriate armamentarium when the mixing procedure is completed. 7. Explain what is meant by the frozen slab technique. 8. List the advantages and disadvantages of changing the temperature of the glass slab. 9. Identify which cements have leachable fluoride and why this ingredient is beneficial to the consumer. 1. List the uses of cavity varnishes. 2. Explain what is meant by the term semipermeable. 3. Explain how varnishes aid in preventing leakage around a restoration. 4. State the reasons why varnishes are utilized over moisture sensitive restorations. 5. List the components of a varnish. 6. Explain the mode of action of a cavity varnish. 7. Describe the manipulation of a varnish. 8. Explain why several layers of varnish are preferred over one thick layer. 9. Explain when it is necessary to remove excess varnish from the tooth structure. 10. List the two properties that make varnishes an advantageous material to utilize in the dental setting. 11. List the uses of bases. 12. Explain why bases are utilized under acidic restorations. 13. Explain how bases affect the dentinal tubules. 14. Describe what effect bases have on the pulp. 15. List the type of barriers that a base sets up against irritants

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<p>14. Prepare and mix the bases and liners to a laboratory competency.</p> <p>Understand and value the use of synthetic resins.</p>	<p>and marginal leakage.</p> <p>16. List the components of bases.</p> <p>17. Explain why some bases cannot be utilized with resin restorations.</p> <p>18. State the pH of the various bases.</p> <p>19. Explain how bases affect the dentinal tubules.</p> <p>20. Explain why the thickness of a base is a factor for ensuring adequate insulation.</p> <p>21. Describe the manipulation of a liner.</p> <p>1. List the uses of restorative resins in dentistry.</p> <p>2. List the types of restorative resins.</p> <p>3. Explain why ZOE and varnishes are contraindicated with acrylic polymers.</p> <p>4. Briefly describe the various insertion methods associated with given acrylic restorations.</p> <p>5. List the components of the composite resin.</p> <p>6. Describe the mixing and insertion methods for the composite resin materials.</p> <p>7. List the advantages and disadvantages of the various composite resins.</p> <p>8. Identify the teeth that may exhibit wear with a composite resin.</p> <p>9. Define acid etching and state its advantages and disadvantages.</p> <p>10. Define bonding and state its advantages.</p> <p>11. List the means of polymerization of the acrylic and composite restorations.</p>

Course Objective	Competencies
<p>15. Prepare and construct a custom made tray to laboratory competency.</p>	<p>12. Differentiate between the given composite materials. 13. Briefly describe how eroded areas may be “restored” in the dental office. 14. Explain what is meant by beveling Class V cavity preparations. 15. Differentiate between direct and indirect inlay systems. 16. Describe the basic technique for applying a dental sealant. 17. List the major component of a commercial pit and fissure sealant. 18. Explain when a resin facing is indicated. 19. Briefly explain the application of a resin veneer. 20. List the uses of a custom tray material. 21. Briefly describe the construction of a custom made acrylic tray.</p> <p>1. Prepare a tray set-up for a composite filling material. 2. Identify the instruments utilized with the composite material. 3. Mix a composite material. 4. Prepare and utilize the precision vacuum adapter and/or pro-cure light. 5. Construct a maxillary or mandibular custom made acrylic tray utilizing the precision vacuum adapter and/or pro-cure light. 6. List the function of the acrylic bur. 7. Identify the use of the bench lathe. 8. Smooth and polish the custom made tray.</p>

Course Objective	Competencies
<p>16. Understand and value the use of synthetic resins in the dental setting.</p>	<ol style="list-style-type: none"> 1. List the uses of synthetic resins in dentistry. 2. Differentiate between thermoplastic and thermoset resins. 3. Briefly describe the molding process of a denture. 4. Explain the function of an inhibitor. 5. Identify the two methods of curing the denture. 6. Differentiate between relines and rebases. 7. Differentiate between a complete denture, an immediate denture, an overdenture, and an implant denture. 8. List the advantages and disadvantages of an immediate denture. 9. List the four criteria when considering an overdenture for a dental patient. 10. Identify the advantages of an overdenture. 11. Name the indications for an overdenture. 12. List the parts of a complete full denture. 13. List the parts of a removable partial denture. 14. List the parts of a fixed partial appliance. 15. Identify the basic home care instruction for the denture patient. 16. Describe what an obturator is and explain its importance in dentistry. 17. Briefly and accurately describe the following: <ol style="list-style-type: none"> a. localized inflammation b. generalized inflammation c. ulcerative lesions d. papillary hyperplasia e. denture hyperplasia f. leukoplakia

Course Objective	Competencies
<p>17. Understand and value the use of dental implants.</p>	<p>g.angular cheilosis</p> <ol style="list-style-type: none"> 1. Identify the basic types of dental implants and further describe when each type would be utilized. 2. List the evaluation criteria for patient selection. 3. Briefly describe the sequence of events during surgical phases I and II. 4. List the options available for fully edentulous patients considering implants. 5. Recognize and list the symptoms of an implant failure. 6. Discuss the importance of recall and maintenance visits for the implant patient. 7. Discuss the controversy of probing a dental implant. 8. Identify the types of bacteria found in and around a dental implant. 9. List the home care products recommended to dental implant patients. 10. Identify the dental implant scaling instruments utilized by the dental hygienist.
<p>18. Understand and value the use of dental porcelain in the dental setting.</p>	<ol style="list-style-type: none"> 1. List the uses of porcelain in dentistry. 2. Name the manner in which porcelains are classified. 3. Briefly describe the construction of a dental porcelain crown. 4. Identify the effects of firing and glazing. 5. List and identify the parts of a two and three unit bridge. 6. Name the general properties of dental porcelain. 7. Briefly describe the care that needs to be given by the

Course Objective	Competencies
<p>19. Understand and value the use of dental amalgam.</p>	<p>dental hygienist when scaling and polishing a dental porcelain material.</p> <ol style="list-style-type: none"> 1. Identify the uses of amalgam in the oral cavity. 2. List the components of the amalgam alloy, including their percentages. 3. Define the following terms: <ol style="list-style-type: none"> a. alloy b. amalgam c. trituration d. amalgamation e. condensation 4. Briefly describe the setting reaction that occurs during the hardening process of amalgam mass. 5. List the amalgam failures seen most often in the oral cavity and state the reasons why they occur. 6. Explain how excessive expansion and contraction affect the pulp and the restoration. 7. List the two items that govern strength and explain how they will affect the amalgam mass. 8. Explain how the creep value affects marginal integrity. 9. Explain what is meant by the Eames technique. 10. Explain how mercury exposure hazards may be avoided in the dental office. 11. List the two biological effects of mercury toxicity and include their symptoms. 12. List the routes of mercury absorption and how they occur. 13. Name the most common causes of amalgam failures.

Course Objective	Competencies
	<p>14.Relate the average trituration times for the given amalgam materials.</p> <p>15.Describe the appearance and effects of:</p> <ul style="list-style-type: none">a.overtriturationb.undertriturationc.normal trituration <p>16.List the advantages of utilizing mechanical amalgamators.</p> <p>17.Identify the various amalgamators.</p> <p>18.Briefly relate the mixing technique of the amalgam mass.</p> <p>19.Relate how hardened amalgam affects future mixes.</p> <p>20.Explain the purpose and advantage of mulling the amalgam mass.</p> <p>21.Explain the importance of condensing the amalgam mass immediately after trituration.</p> <p>22.Explain the importance of carving, burnishing and polishing the amalgam restoration.</p> <p>23.Explain the post-operative instructions for a patient with a new amalgam restoration.</p> <p>24.State the function of a squeeze cloth.</p> <p>25.Explain how moisture affects the amalgam mass.</p> <p>26.Discuss the differences in the various alloy types and state their advantages and disadvantages.</p> <p>27.Differentiate between tarnish and corrosion.</p> <p>28.Identify the ways of making a restoration more resistant to corrosion.</p> <p>1.Prepare a tray set-up for the amalgam mass.</p> <p>2.Correctly dispense the amalgam materials.</p>

Course Objective	Competencies
<p>20. Prepare, mix, and condense the amalgam to a laboratory competency.</p>	<ol style="list-style-type: none"> 3. Properly utilize the laboratory amalgamators. 4. Accurately triturate the amalgam mass. 5. Relate the mixing times for the single and double spill premeasured amalgam capsules and for the alloy/liquid mercury amalgams. 6. Operate and identify the amalgam carrier. 7. Identify the amalgam condense and carving instruments. 8. Utilize the proper technique in handling the alloy, mercury, and the amalgam mass. 9. Care for the amalgam instruments. 10. Relate the process of cleansing the liquid mercury. 11. Properly dispense of the amalgam contents.
<p>21. Understand and value the use of gold and other precious metals in the dental setting.</p>	<ol style="list-style-type: none"> 1. List the uses of gold alloys. 2. Name the two types of gold alloys. 3. Further classify the types of gold alloys. 4. Identify the components of the classified gold alloys. 5. List the general uses of each classification type. 6. State the function of each of the gold alloy components. 7. Differentiate between a wrought gold alloy and a casting gold alloy. 8. Explain how dental gold is rated. 9. Calculate the percentage of dental gold from a given amount based on a jeweler's rate. 10. List the three non-gold alloys commonly used in dentistry today. 11. List the major use for each of these alloys. 12. Define soldering.

Course Objective	Competencies
<p>22. Understand and value the abrasive and polishing materials utilized in the dental setting.</p>	<p>13. Identify the components of a soldering agent. 14. List the uses of a gold foil. 15. Name the types and forms of gold foil. 16. Define the following: a. annealing b. welding c. pickling d. quenching</p> <p>1. Differentiate between abrasion and polishing. 2. List the requirements necessary to make a material abrasive. 3. List the four abrading factors and describe their effects. 4. List and describe the function of the more common abrading materials utilized by the dental hygienist. 5. Name the vehicles for polishing and abrading. 6. Differentiate between the various types of burs. 7. Relate why diamonds are used with a water spray or with the washed field technique. 8. Explain what is meant by a noble metal. 9. Describe the conditions which would necessitate utilizing an abrasive strip on proximal tooth surfaces. 10. Categorize the miscellaneous abrasive materials according to their ability to polish: a. tooth surfaces b. gold c. chromium cobalt d. resins</p>

Course Objective	Competencies
	e.porcelain 11.Explain why it is important to consider each patient as an individual when recommending a toothpaste.