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Dental Materials II: Final Exam (version 11) April, 2009

1. Increased humidity and temperature alters the setting behavior of calcium hydroxide and zinc oxide eugenol cements in which manner?

- Lengthen the setting time Б)
- c) Have no effect

2. IRM (Intermediate Restorative Material) has a higher strength than an unmodified, conventional zinc oxide-eugenol cements due to::

- a) incorporation of amalgam filings;
- b) incorporation of polyacrylic acid:
- c) incorporation of resin monomers and polymerization initiators-accelerators;
- d) incorporation of pre-polymerized synthetic polymer particles; / mothy methodistic polymer to e) incorporation of a fluoride glass filler.

One of the foremost advantages of polycarboxylate cements is:

- Very high compressive strengths
- Minimal effect on the pulp/Good biocompatibility
- Dual curing mechanism
- d) Short working time
- Zero solubility e)
- 4. The major ingredients of a dental porcelain are:
 - a)) Quartz, feldspar, and clay (kaolin)
 - b) Barium glass and Bis-Gma
 - c) Calcium alumino-silicate glass & polyacrylic acid
 - d) Alumina and zirconia
 - e) Platinum, palladium, and silver

5. True or False: Polyacid modified composite resins (Compomers) share many of the same components as resin-modified glass ionomers (RMGIs); except the presence of which substance in sufficient qualities to begin an immediate, acid-base glass ionomer reaction?

- a) ethanol
- b) tartaric acid
- c) acetone
- d) borax
- e) water

6. Resin modified glass - ionomer (RMGI) cements are different than conventional glass ionomer (CGI) cements in the following aspects:

- a) RMGI's do not form a calcium and aluminum polysalt matrix;
- b) RMGI's do not contain water;
- C) RMGI's have early water resistance (solubility) and do not require a coating or varnish;
- d) RMGI's have significantly higher compressive and tensile strength compared to CGIs;
- e) none of the above.

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7. True or false: Glass ionomer cement displays adhesive behavior to tooth structure.

a) True (b) false

- 8. A conventional, two component, paste-paste calcium hydroxide cements sets due to the reaction of calcium hydroxide AND:
 - a) phosphoric acid;
 - b) salicyclate ester;
 - c) eugenol;
 - d) polyacrylic acid;
 - e) benzoyl peroxide.

9. In considering the adherence of porcelain veneering to cast metal substructures; a critical element in adequate bonding of the ceramic material to metal is:

a) formation of the hybrid zone;

b) formation of an interprismatic zone;

c) formation of a mixed oxide layer containing metal and porcelain oxides;

- d) formation of an oxide-free layer;
- e) none of the above.

10. Critical to the selection of a particular veneering porcelain for a PFM metal substructure:

a) s the selection of a porcelain with a CTE (coefficient of thermal expansion) slightly lower to that of the metal;

- b) Is the selection of a porcelain with a CTE (coefficient of thermal expansion) much lower than that of the metal;
- c) Is the selection of a porcelain with a CTE (coefficient of thermal expansion) much higher than that of the metal;
- d) is the selection of a porcelain with a CTE (coefficient of thermal expansion) slightly higher to that of the metal;
- e) none of the above
- 11. The chemical reaction, in a <u>heat-cured</u>, processed, PMMA-based denture base is thermodynamically an exothermic (heat producing) reaction. True or false?

12. According to Powers and Sagaguchi, the minimum acceptable compressive strength for a waterbased luting cement under the ADA and ISO (ISO 9917) standards is?:

a) 10 MPa
b) 30 MPA
c) 100 MPa
d) 70 MPa
e) None of the above

13. True or False; Dental ceramics are classified by their crystalline phase (degree of crystalline content); but not their fusion temperature.



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14. Failure in the development (or breakdown in the process) of osseointegration is characterized by:

a) a direct structural and functional connection to ordered living bone;

- b) contact predominantly with fibrous soft tissue and fibroblasts;
- c) an organized structure of living bone with the ability to support a load-carrying implant;
- d) a dynamic interface which matures within time;
- e) occurs with high predictability, at the stable oxide interface of titanium.

15. A critical advantage of titanium alloy over commercially pure (CP) titanium in the fabrication and use in endosseous, root form, dental implants, is:

- a) formation of a more biocompatible oxide layer for titanium alloy (Ti-6AI-4V) as compared to commercially pure (CP) titanium;
- (b) titanium alloy (Ti-6AI-4V) is significantly stronger than commercial pure (CP) titanium;
 - c) there more types of titanium alloy (Ti-6AI-4V) than commercial pure (CP) titanium;
- d) titanium alloy (Ti-6AI-4V) has a longer history of clinical use than commercial pure (CP) titanium;
- e) none of the above.
- 16. True or false: <u>Osteoconductive</u> materials do not induce the differentiation of new bone forming cells, but rather act as a scaffold for new bone formation.



17. True or false: <u>Osteoinductive</u> materials induce in-situ new bone formation via the conversion of mesenchymal cells preferentially to bone progenitor cells.



- 18. The range of diameters of titanium and titanium-alloy endosseous dental implants is (are):
 - (a)) 1.8 to approximately 7.0 millimeters in diameter;
 - b) 4.0 millimeters to approximately 5 to 5.5 millimeters in diameter;
 - c) 5 to approximately 8.0 millimeters in diameter (wide-body implants);
 - d) 0.5 to 7.0 millimeters in diameter
 - e) None of the above
- 19. Nylon 6,6 and Polystyrene are examples of which class of denture base material:
 - a) Heat-cured acrylic resin denture base material
 - b) Auto-cured acrylic resin denture base material
 - <u>c</u>) Dimethacrylate light-activated denture base material
 - d) Thermoplastic, injection-mold denture base material
 - e) None of the above
- 20. With respect to methyl methacrylate monomer content, which of the following denture-base materials has little or none:
 - a) Heat-cured denture base resin;
 - b) Heat-cured, rubber reinforced denture base resin;
 - c) Light-activated denture base resin;
 - d) Auto-cured denture base resin;
 - e) Heat-cured, fiber reinforced denture base resin

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- 21. Resin modified glass ionomers (RGMIs) display what type of dimensional change behavior when subjected to an aqueous environment over relatively long periods of time?
 - a) Little or no dimensional change over time
 - (b) Expansion or increased dimensional change
 - c) A negative dimensional change (shrinkage)
 - d) A significant reduction in compressive strength
- 22. The types of curing modes used in polymer-based cements include:
 - a) visible light polymerization (light-curing)
 - b) chemical-mediated, self-curing polymerization
 - c) dual-curing mechanisms (light and self-curing)
 - (d) All of the above
 - e) None of the above

23. True or false: The chemical compounds 4-META and phosphonates as adhesion promoters that promotes bonding to tooth structure in self-adhesive resin cements.

)true b) false

24. The oxide layer in an osseointegrated titanium implant:

a) is in immediate contact with a thin amorphous proteoglycan layer and continues to grow over time;

- b) remains stable in thickness over time;
- c) decreases in thickness over time;
- d) transforms to a silicon dioxide layer;
- e) none of the above.
- 25. Osseous crestal changes (at the level of the implant coronal threads) considered within normal limits are:
 - a) 1.0 millimeter marginal bone loss per year after the first year of function;
 - b) 2.0 to 4.0 millimeters marginal bone loss per year after the first year of function;
 - c) 0.1 to 0.2 millimeters marginal bone loss per year after the first year of function;
 - d) 0.5 millimters marginal bone loss per year after the first year of function;
 - e) None of the above.

26. In two stage implant surgery:

- a) At stage one, the dental implant is placed, a healing screw is inserted in the fixture, and the implant fixture plus healing screw are buried beneath the mucosa flap for a specific time period;
- b) At stage one, the dental implant is placed and a healing abutment is attached to the implant fixture through the sutured mucosa for a specific time period;
- c) At stage one, the dental implant is placed and a temporary abutment is attached via an abutment screw to support a cemented temporary in light occlusal loading;
- d) None of the above.

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27. In considering the classification of various bone graft materials; demineralized, freeze-dried, particulate bone would be classified as:

- a a xenograft
- c. an alloplastic material
- d. an autograft
- e. none of the above

28. In densely-sintered zirconia substructures, the tetragonal to monoclinic phase transformation which occurs as a micro-crack extends is termed:

- a. Transformation toughening
- b. Inversion formation
- c. Strain hardening
- d. Cold welding
- e. None of the above

29. Aromatic amines serve what role in polymeric dental materials:

- a. the polymerization initiator
- b.) the polymerization accelerator
- c. the polymerization terminator
- d. a plasticizer
- e. a cross-linking agent

30. During polymerization of UDMA (Urethane Dimethacrylate) in a light-activated, single-component, denture-base system (Triad[™] resin); which of the following is split to form two free radicals?

- a-) camphorquinone
- b- an organic amine
- c- ethylene glycol dimethacrylate
- d- benzoyl peroxide

31. Which of the following describes visibly the FIRST stage in the setting and polymerization of powder/liquid heat-cured poly (methyl methacrylate) denture base material?

- a- dough-like
- b- runny
- c-) sandy
- d- hard
- e- rubbery

32. Which of the following polymers are formed by addition polymerization?

- a- polycarbonate b- Nylon 6,6
- both PMMA and urethane dimethacryate/ bis- 611A
- d- both PMMA and Nylon 6,6
- e- both Nylon 6,6 and urethane dimethacrylate

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- 33. In a sintered, stacked dental porcelain; the layer almost always applied immediately after the opaque layer is the:
 - a) glaze
 - b)_enamel
 - C dentin
 - d) opalescent enamel
 - e) none of the above

34. The precise term that defines the thermal process in which porcelain (or ceramic) particles undergo fusion to form a continuous mass of higher density.

a) Baking
a) Casting
b) Curing
c) Polymerizing
d) Sintering

35. The approximate volumetric shrinkage of a heat-cured denture acrylic denture base material (powder plus monomer liquid) is:

b) 60 % c) 6% d) 21% e) 2% f) Less than 1% shrinkage

36. The initiator molecule of a heat-cured and chemically-cured denture acrylic denture base systems is:

- b) Camphoquinone (CQ)
- c) Benzoyl Peroxide
- d) LC Amine
- e) Methyl methacrylate monomer
- f) 4-META
- 37. An advantage of rubber-reinforced denture base materials, as compared to conventional heat-cured acrylic, would be:
 - b) increased surface hardness (increased Knoop hardness)
 - c) increased flexural strength
 - d higher or improved impact strength
 - e) no methyl methacrylate monomer
 - f) improved denture base retention compared to other denture base materials

38. Acrylic chairside soft denture liners have which noteworthy property when used as a soft reline material?

a. do not bond well to the hard acrylic denture base, thus allowing easy removal;

b. maintain their resilience over extended periods of time;

c. have high peel strength to hard acrylic denture bases, without the need of a separate bonding agent;

- d. do not absorb stains or odors;
- e. care must be exercised with use of denture cleansers; damage can readily occur.

39. How is the Glass Transition Temperature (Tg) of acrylic polymer-based soft liners modified by the addition to plasticizers to the polymer matrix?

- (a-) decreases the Tg
- b- increases the Tg
- c- has no effect on the glass transition temperature
- d- eliminates the glass transition temperature of the material; material is temperature insensitive

40. In comparing late (months-years) versus early (days-weeks) failures in porcelain-ceramic restorations, which statement below accurately summarizes the usual respective location of the initiation of such defects:

- a- early failures usually occur within the bulk of veneering porcelain, late failures usually occur at or near the porcelain-metal interface;
- b-) early failures usually occur at or near the porcelain-metal interface, late failures usually occur within the bulk of veneering porcelain;
- c- both failure modes usually occur within the bulk of veneering porcelain;
- d- both failure modes usually occur at or near the porcelain-metal interface;
- e- none of the above.

41. Processing of conventional, flasked, pressure-packed acrylic denture base materials at an elevated temperatures above 74 degrees C., for the entire curing cycle, could result in:

a- ')increased porosity:

- b- reduced porosity;
- c- color change in the denture polymer;
- d- longer curing cycles;
- e- none of the above.

42. Select the proper ranking of materials, based on flexural strength and fracture toughness, from highest to lowest:

- a- high-leucite pressable ceramic>machined, sintered high-density zirconia>machined, sintered, high-density alumina
 b- machined sintered high-density alumina>machined sintered high density rises high leucite pressable ceramic>machined sintered high-density alumina>machined sintered high-density alumina>
 - machined, sintered high-density alumina>machined, sintered high density zirconia>high-leucite pressable ceramic
 -) machined, sintered high-density zirconia>machined, sintered high-density alumina>high-leucite pressable high-leucite pressable ceramic>machined, machined, sintered high-density alumina>machined, sintered high-density zirconia
- e- machined, sintered high-density alumina>high-leucite pressable ceramic>machined, sintered high-density zirconia

43. According to Powers & Sakaguchi, the maximum film thickness (ANSI/ADA Specification No. 96) for a dental, water based, luting cement (i.e. glass ionomer, zinc phosphate, and zinc polycarboxylate) is:

a- 70 microns

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- b- 10 microns
- c- 50 microns
- d-) 25 microns
- e- 100 microns

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44. In terms of polymer classification type, Cross-linked PMMA polymer is to Nylon 6,6 polymer as ______ is to ______.

a- thermoplastic, thermoset b-thermoset, thermoplastic c- condensation, ring-opening d- thermo-electric, thermo-magnetic e- thermoelastic, thermorigid

45. Conventional (water-based, acid-base) Polycarboxylate Cements and Glass Ionomer Cements share which of the following components in their compositions:

- a- phosphoric acid
- b- a reactive, calcium fluoroaluminosilicate glass
- c-) polyacrylic acid
- d- a salicylate ester
- e- methyl methacrylate

46. Titanium dental implants, like bioactive glasses, form a chemical bond to bone as part of the osseointegration process. True or false?

a- true b- false

47. Powers and Sagaguchi (and Dr. Jefferies) indicate which of the following materials can be used as a pulp-capping agent:

- a-) calcium hydroxide & MTA (Mineral trioxide Aggregate)
- b- glass ionomer
- c- poly carboxylate
- d- resin-modified glass ionomer (RMGI)
- e- all of the above

48. As the coefficient of thermal expansion (CTE) of a crown or bridge substructure material <u>decreases</u> (i.e. going from a casting metal to high density, sintered zirconia), how would one would expect the leucite content of a properly designed veneering porcelain to vary?

a- the leucite content of the veneering porcelain would increase;

- b the leucite content of the veneering porcelain would decrease;
- c- the leucite content of the veneering porcelain would not vary;
- d- leucite is not a component of veneering porcelain.

49. Increasing the amount of leucite in a feldspathic porcelain (as would be the case for a heat-pressed ceramic material) would affect the physical properties in what manner?

a-) increases the flexural strength

- b- decrease the flexural strength
- c- no change in flexural strength
- d- reduce the CTE of the ceramic
- e- Quadrupal the fracture toughness of the ceramic

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50. Titanium dental implants demonstrate which of the following interactions with soft tissue (epithelium) and connective tissue:

a- presence of hemi-desmosome like structures connecting epithelium to the titanium surface

- b- presence of connective tissue insertion into the implant interface
- c- presence of a Sharpey's fiber attachment into the implant interface;
- d- all of the above
- e- none of the above

51. A bone graft material (Bioplant-HTR) consists of a spherical porous particles of poly hydroxyethyl - methacrylate (Poly-HEMA) coated with calcium hydroxide. In terms of the classification of hard tissue grafting materials, Bioplant_HTR would be classified as an:

- a- autograft
- b- xenograft
- c- allograft
- (d-) alloplast
- e- none of the above

52. The melting temperature of an alloy used as a sub-structure for a ceramic-metal restoration should be at least 100 degrees C. higher than the ceramic.

a. true b. false

53. In comparing Gold-Platinum-Palladium (Au-Pt-Pd) to Gold-Palladium (Au-Pd) ceramic-metal alloys, Au-Pd alloys are:

- a. Are white, not yellow, in color;
- b. Are stronger, stiffer, and harder than Au-Pt-Pd alloys;
- c. Have a lower casting temperature (Au-Pd is lower than Au-Pt-Pd)
- d.a and b
- e. a and c

54. Gallium is added to many of the high-noble and noble alloys for ceramic-metal restorations for the purpose of:

- a. Increasing the casting temperature;
- b. Forming surface oxides for porcelain bonding;
- c. Acts as a grain refiner;
- d. Reducing-controlling the casting/fusion temperature;
- e. none of the above.

55. The role of chromium in both Nickel-Chromium (Ni-Cr) & Cobalt-Chromium (Co-Cr) base metal ceramic-metal alloys is:

a.)to provide tarnish and corrosion resistance;

- b. to lower the coefficient of thermal expansion;
- c. to create a yellow color for the alloy;
- d. to block the inherent greening effect of these alloys on porcelain;
- e. none of the above.

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56. The primary role of indium in high-noble and noble ceramic-metal casting alloys is:

a. Increase the strength and toughness of these alloys;

- Dromation of a surface oxide layer to facilitate bonding of porcelain;
 - c. increases the casting temperature;
 - d. reduces the casting temperature;
 - e. acts as a grain refiner.

57. The process of infiltrating a molten glass into a partially sintered ceramic (alumina/zirconia) porous sub-structure is termed:

a. casting; b. stacking; c. slip-cast technique; d. heat-pressing; e. machining.

58. Both leucite and lithium disilicate can be used as a crystalline phase in heat-pressed all-ceramics.



59. Which of the following dental ceramic materials can be acid etched with hydrofluoric acid to achieve direct adhesive bonding of an all-ceramic restoration to tooth structure using a resin cement?

a leucite-containing, glassy matrix, dental porcelain;

- b. a dense, machined and sintered, yttrium-stabilized zirconia core material;
- c. a dense, condensed/machined and sintered, alumina core material;
- d. all of the above;
- e. none of the above.

60. The initial firing of both the dentin and enamel portions of the "stacked" dental porcelain layers is called or termed the:

a. glazing or glaze bake b. opaque bake c. first bake d biscuit or bisque bake e. none of the above

61. The basic method(s) of toughening dental ceramics are:

- a. crystalline reinforcement
- b. rapid cooling
- c. transformation toughening
- d. a and b
- e)a and c