

1. When heated at 1150 degrees C., the main raw ingredient of classical high-fusing porcelain, feldspar, forms which components?  
 C a. molten glass & silicon nitride b. molten glass & zirconium oxide c. molten glass & leucite d. leucite & zinc oxide e. leucite & lithium oxide
2. A lithium disilicate pressable ceramic material (Empress II – eMax), compared to a high leucite pressable ceramic (Empress I), has which of the following characteristics?  
 A a. greater strength; b. lower strength; c. can not be etched with hydrofluoric acid; d) a & b e) a & c
3. In terms of flexural strength (also termed fast fracture strength or rupture strength), rank the follow materials in their proper order, strongest to weakest:  
 B Materials: Alumina - Densely sintered (A); Feldspathic (stack – powder/liquid) Porcelain (FP); High Concentration Leucite – Pressable (HL-P); Slip-Cast/Glass-Alumina (SC-GA); Zirconia-Densely Sintered (ZDP)  
 a) A>FP>HL-P>SC-GA>ZDP b) ZDP>A>SC-GA>HL-P>FP c) HL-P>ZDP>SC-GA>A>FP d) SC-GA>A>Z>HL-P>FP e) A>ZDP>SC-GA>FP>HL-P
4. Integral to the success of the development of ceramo-metal restorations was:  
 A a. use of leucite containing glass ceramics; b. placement of bead retention on the metal substructure; c. application of slip-cast processing; d. use of high-gold alloys; e. none of these answers
5. Stress frozen in a material that is independent of an applied force is termed:  
 C a. tensile stress; b. flexural strength; c. residual compressive strength; d. fatigue stress; e. diametrical tensile stress
6. This naturally occurring, aluminum-containing silicate mineral (most abundant on earth) is a precursor material for dental porcelains:  
 B a. kaolin; b. feldspar; c. limestone; d. gypsum e. quartz
7. Which metallic element is utilized to improve "castability" in Gold-Palladium and Gold-Palladium-Silver high noble alloys for ceramo-metal restorations?  
 E a. tin b. indium c. copper d. rhenium e. ruthenium
8. True or False: Polycrystalline ceramic materials contain an abundant glassy matrix.  
 B a) true b) false
9. Although iridium is often used as a grain refiner for high noble, all gold restorative alloys, which of the following metallic elements serves this purpose in Gold-Palladium and Gold-Palladium-Silver high noble alloys for ceramo-metal restorations?  
 E a. gallium b. indium b. zinc d. zirconium e. rhenium
10. Zirconia and alumina are correctly termed or classified as: *zirconium oxide, aluminum oxide*  
 B a. white metal; b. an oxide c. an amorphous material d. a polymer; e. none of the above
11. True or false: The first firing of the porcelain is termed a "glaze" bake.  
 B a.) True b. False
12. Porcelain enamels, which contain a vitreous, glass-like structure, have the following properties:  
 D a. tough and have a definite melting point; b. highly opaque and lack a definite melting point; c. highly opaque and brittle; d. brittle and lack a definite melting point; e. tough and lack a definite melting point.
13. According to the Powers text and your review notes, the contact or wetting angle of ceramic on a gold alloy surface is about \_\_\_\_\_.  
 D a.  $\leq 150$  degrees b.  $\leq 120$  degrees c.  $\leq 100$  degrees d.  $\leq 60$  degrees e. none of these answers
14. Which process accelerates the formation of the oxide layer on a metal acceptable for ceramo-metal applications?  
 D a. application of an LED light for 30 seconds; b. application of a KCl gel c. application of a nail varnish; d. heating the metal framework e) none of the above
15. The progression from glassy to polycrystalline ceramic materials parallels what general trends in term of strength and translucency/opacity?  
 E a. opaque to translucent/strength increases; b. translucent to opaque/strength decreases; c. opaque to translucent/strength decreases; d. no change in translucency-opacity/increase in strength; e. translucent to opaque/strength increases
16. Densely sintered alumina and zirconia substructures (frameworks) have a lower coefficient of thermal expansion (CTE) than metal-based substructures. You have been asked to formulate a compatible and stable veneering porcelain which will bond well to these polyceramic substructures. You start out with a stack porcelain formula which contains enough leucite to make it compatible with high palladium (78%) metal alloy. Indicate below how you will adjust the amount of leucite in this new porcelain specifically for densely sintered alumina or zirconia substructures??  
 B a. you will increase the amount of leucite; b. you will reduce the leucite; c. you will keep the leucite content the same
17. The coefficient of thermal expansion (CTE) for the metal substructure of a porcelain fused to metal restoration, ideally, should be \_\_\_\_\_ than the CTE of the overlying porcelain ceramic.  
 A a. slightly higher b. slightly lower c. significantly higher d. significantly lower e. roughly equal
18. As described in question 17 above; under optimal matching of the CTEs of the metal substrate to overlying porcelain in a porcelain-fused-to-metal restoration, the porcelain ceramic is subjected, under cooling after the firing cycle, to \_\_\_\_\_ stresses.  
 A a. slight compressive b. slight tensile c. slight flexural d. slight torsional e. none of the answers listed
19. Aside from compositional differences, which statement regarding a comparison of Co-Cr to Ni-Cr ceramo-metal alloys is true?  
 D a. their densities and casting temperatures are significantly different; b. one of them is classified as a noble alloy; c. Ni-Cr alloys are stronger and harder than Co-Cr alloys; d. Co-Cr alloys are stronger and harder than Ni-Cr alloys.
20. Which class of dental cements is well know for its difficulty of removal of excess cement, especially after this cement has fully set?  
 A a. resin cement; b. zinc phosphate; c. polycarboxylate; d. glass ionomer e. zinc oxide eugenol

21. IRM (Intermediate Restorative Material) has a higher strength than an unmodified, conventional zinc oxide-eugenol cements due to incorporation of:
- a. amalgam filings b. polyacrylic acid c. resin monomers ☒ d. pre-polymerized synthetic polymer particles e. a fluoride glass filler.
22. One of the foremost advantages of polycarboxylate cement is:
- a. high compressive strengths ☒ b. Minimal effect on the pulp/Good biocompatibility c. Dual curing mechanism d. Zero solubility
23. Which cement has the basic components of polyacrylic acid-water solution and zinc oxide powder?
- a. glass ionomer b. zinc phosphate ☒ c. polycarboxylate d. resin cement e. zinc oxide eugenol
24. Which of the following cements is classified as a "phenolate" based cement? *calcium hydroxide*
- a. glass ionomer b. zinc phosphate ☒ c. zinc oxide eugenol d. resin cement e. polycarboxylate cement
25. 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 quantities to begin an immediate, acid-base glass ionomer reaction?
- a. ethanol b. tartaric acid c. acetone d. borax ☒ e. water
26. 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 have early water resistance (solubility) and do not require a coating or varnish; c. RMGI's do not contain water; d. RMGI's have significantly higher compressive and tensile strength compared to CGIs; e. RMGI's do not release fluoride
27. True or false: Glass ionomer cement displays adhesive behavior to tooth structure.
- ☒ a. True b. false
28. A conventional, two component, paste-paste calcium hydroxide cements sets due to the reaction of calcium hydroxide AND:
- a. phosphoric acid; ☒ b. salicylate ester; c. eugenol; d. polyacrylic acid; e. benzoyl peroxide.
29. According to Powers and Sagaguchi, the minimum acceptable compressive strength for a water-based 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
30. You have a substitute dental assistant working with you when you cement some high-leucite, pressable (Empress I) all ceramic anterior crowns. You use several cements in your practice, depending on the type of restoration being cemented. The assistant mixes a material that previously was provided as a powder-liquid, but now comes as a paste-paste that is also mixed on a mixing pad. You do not pay any attention to her dispensing or mixing the cement. Two weeks after cementation, the patient returns to the practice with the chief complaint of vertical fractures in the ceramic on the facial surfaces of three out of four crowns. Which cement type did the substitute dental assistant, most likely, incorrectly select, mix and dispense into the all-ceramic crowns?
- a. resin-cement b. glass ionomer cement ☒ c. resin modified glass ionomer d. zinc phosphate e. polycarboxylate cement
31. Failure rates (annual - per year average) due to cracking, chipping or failure of porcelain on ceramo-metal or porcelain-fused-to-metal (PFM) restorations was cited in lecture to be on the order of \_\_\_\_\_ per year.
- ☒ a. 0.05 to 0.9% b. 1.5 to 2 % c. 2 to 5% d. 5 to 7% e. 0.001 to 0.009
32. Like glass ionomers, the chemical compounds 4-META and methylacrylate-containing phosphonates serve as adhesive monomers that promotes bonding to tooth structure in self-adhesive resin cements by forming an ionic bond in tooth structure to \_\_\_\_\_.
- a. phosphate ☒ b. collagen c. calcium d. water e. none of the answers listed *HA*
33. Conventional (water-based, acid-base) Polycarboxylate 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
34. Powers and Sagaguchi (and Dr. Jefferies) indicate which of the following materials can be used as a pulp-capping agent:
- a. glass ionomer ☒ b. calcium hydroxide & MTA (Mineral trioxide Aggregate) c. poly carboxylate
- d. resin-modified glass ionomer (RMGI) e. all of the above
35. According to Powers & Sakaguchi, what is the maximum film thickness (ANSI/ADA Specification No. 96) for a dental, water-based luting cement?
- ☒ a. 25 microns b. 40 microns c. 50 microns d. 10 microns e. 75 microns
36. Which component of dental cements has been demonstrated, over long-term clinical use, to have an "obtundent" effect on the tooth?
- a. phosphoric acid b. polyacrylic acid c. urethane dimethylacrylate d. tartaric acid ☒ e. eugenol
37. In terms of polymer classification type, Nylon 6,6 polymer is to Cross-linked PMMA polymer as \_\_\_\_\_ is to \_\_\_\_\_.
- ☒ a. thermoplastic, thermoset b. thermoset, thermoplastic c. condensation, ring-opening d. thermoelastic, thermorigid e. none listed
38. 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.
39. The initiator molecule of heat-cured and chemically-cured denture acrylic denture base systems is:
- a. Camphoquinone (CQ) ☒ b. Benzoyl Peroxide c. Light Curing Amine d. Methyl methacrylate monomer e. 4-META
40. An advantage of rubber-reinforced denture base materials, as compared to conventional heat-cured acrylic, would be:
- a. increased surface hardness (increased Knoop hardness); b. increased flexural strength; ☒ c. higher or improved impact strength;
- d. no methyl methacrylate monomer; e. improved denture base retention compared to other denture base materials
41. 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.
42. How is the Glass Transition Temperature (Tg) of acrylic polymer-based soft liners modified by the addition of plasticizers to the polymer matrix?
- ☒ a. decreases the Tg b. increases the Tg c. no effect on the glass transition temperature
- d. eliminates the glass transition temperature of the material; e. material is temperature insensitive

43. Phthalates (such as dibutyl phthalate) serve what predominant 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

44. During polymerization of the UDMA (Urethane Dimethacrylate) oligomer 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 e. Bis-GMA

45. Which of the following clinical stage descriptions for the polymerization of powder/liquid cold-cured poly (methyl methacrylate) is the THIRD stage?

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

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

- a. polycarbonate b. Nylon 6,6 **c. both PMMA and urethane dimethacrylate** d. both PMMA and Nylon 6,6 e. both Nylon 6,6 and urethane dimethacrylate

47. At room temperature, polymerized poly(methyl acrylate) is a \_\_\_\_\_ and polymerized poly(methyl methacrylate) is a \_\_\_\_\_:

- a. plastic, rubber **b. rubber, plastic** c. rubber, gel d. plastic, plastic e. None of these answers

48. 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-polymerized denture base resin; e. Heat-cured, fiber reinforced denture base resin

49. 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.

50. 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-6Al-4V) as compared to commercially pure (CP) titanium; **b. titanium alloy (Ti-6Al-4V) is significantly stronger than commercial pure (CP) titanium**; c. there more types of titanium alloy (Ti-6Al-4V) than commercial pure (CP) titanium; d. titanium alloy (Ti-6Al-4V) has a longer history of clinical use than commercial pure (CP) titanium; e. none of the above.

51. True or false: Osteoconductive materials do not induce the differentiation of new bone forming cells, but rather act as a scaffold for new bone formation.

- a. True** b. False

52. True or false: Osteoinductive materials induce in-situ new bone formation via the conversion of mesenchymal cells preferentially to bone progenitor cells.

- a. True** b. False

53. 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**

54. Between the oxide layer of the Titanium implant and living bone is a \_\_\_\_\_ layer.

- a. lipid b. connective tissue **c. proteoglycan** d. muscle cell e. none of these answers

55. Tri-calcium phosphate is a synthetic bone replacement material which would best be classified as a \_\_\_\_\_ material.

- a. xenograft b. allograft **c. alloplastic** d. autograft e. none of the listed answers

56. Titanium implants can demonstrate a \_\_\_\_\_ like structure connecting the oral gingival epithelium to the implant surface.

- a. proteinous b. acellular c. irregular **d. hemi-desmosome** e. connective tissue

57. As specifically mentioned in Powers and Sakaguchi: How does the modulus (stiffness) of titanium compare to that of natural bone?

- a. titanium much higher (10-fold higher); **b. titanium significantly higher (5-fold higher)**; c. virtually equal; d. titanium much lower (10-fold lower); e. titanium significantly lower (5-fold lower)

58. In the third year of function of a single tooth dental implant replacing tooth number 5, a radiographic examination indicates a severe area of radiolucency along the mesial surface of the bone contacting side of the implant and an adjacent area of vertical bone loss of about 1 mm within the last year. The implant also displays a mobility of 1 mm, which was not previously evident. True or false: this implant meets the minimum success criteria for dental implants?

- a. True **b. False**

59. Freeze-dried, demineralized particulate bone (DFDBA), which is derived from human organ donation after death, is best classified as:

- a. an autograft; **b. an allograft** c. an alloplastic material d. a xenograft e. none of these answers

60. True or false: The oxide layer on the titanium implant, when osseointegrated, changes in dimension or thickness during the life of the implant.

- a. True** b. False