DNTLJS05

UNIVERSITY OF GREATER MANCHESTER

QUEENS DENTAL SCIENCES CENTRE

BSc (HONS) DENTAL TECHNOLOGY

SEMESTER TWO EXAMINATION 2024/2025

INTRODUCTORY DENTAL BIOMATERIALS SCIENCE

MODULE NO: DNT4105

Date: Wednesday 14 May 2025 **Time: 10.00 am – 12.00 noon**

INSTRUCTIONS TO CANDIDATES:

PART 1
Answer ALL 40 multiple choice questions.

PART 2
Answer ALL 6 questions in this section.

Marks for parts of questions are shown in brackets.

There are a total of 100 marks available.

The pass mark is 40.

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PART 1 Multiple Choice

1. **Why do dental alloys have melting ranges?**

   a. To allow for expansion
   b. They don't have melting ranges as alloys have melting points
   c. The different metals in the alloy have melting points when combined form ranges.
   d. To enable ceramics to be added to the metal.

2. **Which of the following materials has the greatest compressive strength?**

   a. Acrylic Resin
   b. Lithium Disilicate
   c. Composite
   d. Feldspathic Porcelain

3. **Metal oxides are used in dental ceramics for…**

   a. Strength
   b. Pigmentation
   c. Bonding agents
   d. Initiation

4. **Which of the following metals found in dental alloys adds strength?**

   a. Zinc
   b. Ruthenium
   c. Palladium
   d. Gold

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5. Galvanism occurs in the mouth when …

a. Dissimilar metals are in contact.

b. Patient has a dry mouth.

c. Similar metals are in contact with each other.

d. Dissimilar metals are in contact in the presence of an electrolyte.

6. Soft lining materials are prone to harden over time because …

a. The unbound plasticiser diffuses out into the oral cavity

b. The patient causes the hardening by creating excessive masticatory load

c. The resilient acrylic absorbs oral fluids that attack the plasticiser

d. The manufacturer needs to maintain a commercial need for the resilient material

7. Fusing porcelain to metal requires a surface preparation to increase….

a. Translucency

b. Non chemical attraction between materials

c. Sharp, angled surfaces

d. Micro mechanical retention

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8. **Base metal alloys may contain elements that are toxic or known to cause allergic reactions in some patients, which of the following is known to cause irritation?**

   a. Gold
   b. Nickel
   c. Cobalt
   d. Chromium

9. **For an implant alloy what would be the most important consideration?**

   a. Ductility
   b. Biocompatibility
   c. Strength
   d. Cost

10. **A material is categorised as being brittle when its elongation value is below?**

   a. 20%
   b. 10%
   c. 5%
   d. 15%

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11. Which one of the following biomaterials can be used during a lost wax technique?

a. Polymethylmethacrylate
b. Poly Ethyl Ethyl Ketone
c. Composite
d. Zirconia Oxide

12. Cold cure resins are weaker than heat cure resins by approximately

a. 10%
b. 20%
c. 30%
d. 40%

13. Which one of the following materials wear at the same rate as natural dentition to opposing dentition?

a. Ceramic
b. Alloy
c. Composite
d. Acrylic

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14. Feldspathic Dental Ceramics have complex mechanical properties. Which of the following terms is associated with this material?

a. Flexible
b. High tensile strength
c. High flexural strength
d. High compressive strength

15. Ceramic surfaces are glazed to …

a. Seal surface porosity
b. Give the restoration shape
c. Improve heat conductivity
d. Increase strength

16. Quartz is used in ceramics for?

a. Strength
b. The formation of a glass matrix
c. Its opaque properties
d. Elongation

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17. Which of the following methods provides the best chemical bond with metal alloys and ceramics?

a. Oxidisation of the alloy
b. Roughened surface to alloy substrate
c. Coefficient of thermal expansion control
d. Adhesives

18. The method by which heat is transferred through a material is called?

a. Thermal insulation
b. Thermal compensation
c. Thermal osmosis
d. Thermal conductivity

19. Which of the following is not a biomaterial?

a. Lithium Disilicate
b. Zirconia Oxide
c. Calcium Sulphate Dihydrate
d. Metal Alloys

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20. Aesthetic composite materials are made up of …

a. ceramics and polymers.
b. alloys and ceramics.
c. ceramics and zirconia.
d. polymers and alloys.

21. When milling Zirconia the restoration are oversized. Why?

a. To make the material more flexible.
b. To increase the translucency of the material.
c. To allow the material to contract to correct dimensions during sintering.
d. To allow for expansion of the material during sintering.

22. Stainless steel wires used in orthodontics are made from?

a. 20/10 austenitic stainless steel
b. 18/10 austenitic stainless steel
c. 18/8 austenitic stainless steel
d. 19/8 austenitic stainless steel

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23. Implant surfaces are designed to encourage

a. Bacterial colonies

b. Osseo-integration

c. Stronger jaw bones

d. Cement bonding

24. Why is Iridium is used in precious gold alloys?

a. Grain refiner.

b. Biocompatibility.

c. Bonding mechanism.

d. Corrosion resistance

25. Which of the following acrylics has the potential to retain the most residual monomer?

a. Heat Cured PMMA

b. Light Cured PMMA

c. Cold Cured PMMA

d. Milled PMMA

26. Which of the following biomaterials has the highest strength values?

a. Lithium Disilicate

b. Gypsum

c. Composite

d. Zirconia Oxide

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27. Which of the following is affected by temperature change in the oral cavity?

a. Dimensional stability

b. Colour

c. Translucency

d. Grain structure

28. Which of the following types of gold alloy is the most brittle?

a. 1

b. 2

c. 3

d. 4

29. When a patient presents deep undercuts, clasps used for retention should ideally be constructed using –

a. cast gold alloy

b. wrought wire

c. cobalt chromium

d. ceramics

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30. Gold is used in alloys to produce high levels of biocompatibility.

a. True?

b False?

31. Zinc is included in a dental alloy as a?

a. Scavenger metal

b. Grain refiner

c. Bonding element

d. Metal that raises the melting range

32. Which material would be chemically least affected by the oral environment?

a. Silver Palladium

b. Cobalt Chrome

c. Zirconia Oxide

d. Silver solder

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33. When selecting a denture base alloy what in your opinion would be the most important property?

a. **Colour**
b. **Corrosion resistance**
c. **Flexibility**
d. **Tensile strength**

34. Which metal is considered the most ductile from the list below?

a. **Ag**
b. **Cu**
c. **Au**
d. **Co**

35. Which one of the following alloys is most suited to the oral environment?

a. **Silver palladium**
b. **Cobalt Chromium**
c. **Stainless Steel**
d. **Titanium**

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36. As a metal cools it changes state from a liquid to a solid. This is initiated by …

a. Formation of stable nucleus

b. Grains

c. Inhibitor

d. Metallic grains forming until the metal is at room temperature

37. Which type of porosity could be caused by under-packing acrylic resins during flasking?

a. Gaseous porosity

b. Contraction porosity

c. Granular porosity

d. Expansion porosity

38. Which of the following statements relates to the term glass transition?

a. A temperature at which a material can be moulded

b. Colour stable

c. Grain structure

d. A material with high translucency

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39. Which of the following is an 'ideal' requirement of a dental biomaterial?

a. Dimensionally unstable

b. Porous

c. Biocompatible

d. Brittle

40. Monomer boils at what temperature?

a. 100.1°c
b. 100.2°c
c. 100.3°c
d. 100.4°c

END OF PART ONE

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PART 2 – Answer all question

41. What are the common constituents present in the dental acrylics and why are they present in the material?

Up to 12 Marks

42. a) Describe ceramic sintering and the effects on the dimensions of a ceramic restoration.

(9 Marks)

b) What are the methods of compaction?

(4 Marks)

Total 13 Marks

43. Name three materials commonly used to form a supportive framework for traditional porcelain techniques.

3 Marks

44. What are the properties associated with dental alloys?

8 Marks

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45. Name 5 different types of dental polymer manufacturing and state one use for each material

10 Marks

46. a) Identify the materials that have been used in the image below.

(2 Marks)

b) What fixed restorative options are available to improve this patient's smile?

(6 Marks)

c) Select one type of restorative solution and justify in terms of material properties and why you believe this is the best option.

(6 Marks)

Total 14 Marks

END OF QUESTIONS