Dental Materials (Advanced)

Year 2 — Bachelor of Dental Surgery

Reference and Resource List — Chapters 1 to 15

Supporting the MCQ, SBA, SAQ and flashcard question bank

BM Education FZE

Disclaimer

Questions in this bank were generated with the assistance of artificial intelligence and reviewed against the references listed. They are provided for educational revision only, are not a substitute for prescribed textbooks, clinical guidelines or supervised clinical training, and no warranty is given as to their accuracy or completeness.

References are presented in Vancouver style. Part 1 lists the core sources that apply across the whole subject; Part 2 lists, for each chapter, the relevant sections of those core texts together with the additional references specific to that chapter.

PART 1 — CORE REFERENCES (ALL CHAPTERS)

1.1 Principal dental materials textbooks

1. Shen C, Rawls HR, Esquivel-Upshaw JF, editors. Phillips' Science of Dental Materials. 13th ed. St Louis: Elsevier; 2021.
2. Pfeifer CS, Ferracane JL, Sakaguchi RL, editors. Craig's Restorative Dental Materials. 15th ed. St Louis: Elsevier; 2025.
3. van Noort R, Barbour ME. Introduction to Dental Materials. 5th ed. Edinburgh: Elsevier; 2023.
4. McCabe JF, Walls AWG. Applied Dental Materials. 9th ed. Oxford: Blackwell Publishing; 2008.
5. Manappallil JJ. Basic Dental Materials. 5th ed. New Delhi: Jaypee Brothers Medical Publishers; 2026.
6. Powers JM, Wataha JC. Dental Materials: Foundations and Applications. 11th ed. St Louis: Elsevier; 2017.
7. Bonsor SJ, Pearson GJ. A Clinical Guide to Applied Dental Materials. Edinburgh: Churchill Livingstone Elsevier; 2013.
8. O'Brien WJ, editor. Dental Materials and Their Selection. 4th ed. Hanover Park (IL): Quintessence Publishing; 2008.
9. Ferracane JL. Materials in Dentistry: Principles and Applications. 2nd ed. Philadelphia: Lippincott Williams & Wilkins; 2001.

1.2 Supporting materials science and oral biology

10. Darvell BW. Materials Science for Dentistry. 10th ed. Cambridge: Woodhead Publishing; 2018.
11. Nanci A. Ten Cate's Oral Histology: Development, Structure, and Function. 10th ed. St Louis: Elsevier; 2024.
12. Berkovitz BKB, Holland GR, Moxham BJ. Oral Anatomy, Histology and Embryology. 5th ed. Edinburgh: Elsevier; 2017.

1.3 Clinical correlation: operative, endodontic and prosthodontic texts

13. Banerjee A, Watson TF. Pickard's Guide to Minimally Invasive Operative Dentistry. 10th ed. Oxford: Oxford University Press; 2015.
14. Hargreaves KM, Berman LH, editors. Cohen's Pathways of the Pulp. 12th ed. St Louis: Elsevier; 2020.
15. Rosenstiel SF, Land MF, Fujimoto J, editors. Contemporary Fixed Prosthodontics. 5th ed. St Louis: Elsevier Mosby; 2016.
16. Shillingburg HT Jr, Sather DA, Wilson EL, Cain JR, Mitchell DL, Blanco LJ, et al. Fundamentals of Fixed Prosthodontics. 4th ed. Chicago: Quintessence Publishing; 2012.
17. Zarb GA, Hobkirk JA, Eckert SE, Jacob RF, editors. Prosthodontic Treatment for Edentulous Patients: Complete Dentures and Implant-Supported Prostheses. 13th ed. St Louis: Elsevier Mosby; 2013.

1.4 Standards and specifications

18. International Organization for Standardization. ISO 1942 Dentistry — Vocabulary. Geneva: ISO. Available from: https://www.iso.org
19. International Organization for Standardization. ISO 10993-1 Biological evaluation of medical devices — Part 1: Evaluation and testing within a risk management process. Geneva: ISO. Available from: https://www.iso.org
20. International Organization for Standardization. ISO 7405 Dentistry — Evaluation of biocompatibility of medical devices used in dentistry. Geneva: ISO. Available from: https://www.iso.org
21. International Organization for Standardization. ISO 4049 Dentistry — Polymer-based restorative materials. Geneva: ISO. Available from: https://www.iso.org
22. International Organization for Standardization. ISO 9917-1 Dentistry — Water-based cements — Part 1: Powder/liquid acid-base cements; and ISO 9917-2 Part 2: Resin-modified cements. Geneva: ISO. Available from: https://www.iso.org
23. International Organization for Standardization. ISO 4823 Dentistry — Elastomeric impression and bite registration materials. Geneva: ISO. Available from: https://www.iso.org
24. International Organization for Standardization. ISO 6873 Dentistry — Gypsum products. Geneva: ISO. Available from: https://www.iso.org
25. International Organization for Standardization. ISO 24234 Dentistry — Dental amalgam. Geneva: ISO. Available from: https://www.iso.org
26. International Organization for Standardization. ISO 22674 Dentistry — Metallic materials for fixed and removable restorations and appliances. Geneva: ISO. Available from: https://www.iso.org
27. International Organization for Standardization. ISO 20795-1 Dentistry — Base polymers — Part 1: Denture base polymers. Geneva: ISO. Available from: https://www.iso.org
28. International Organization for Standardization. ISO 6872 Dentistry — Ceramic materials. Geneva: ISO. Available from: https://www.iso.org
29. American Dental Association. ANSI/ADA standards for dental materials, instruments and equipment. Chicago: ADA. Available from: https://www.ada.org

1.5 Guidelines, regulatory and safety sources

30. United Nations Environment Programme. Minamata Convention on Mercury: text and annexes. Geneva: UNEP. Available from: https://www.mercuryconvention.org
31. European Parliament and Council. Regulation (EU) 2024/1849 amending Regulation (EU) 2017/852 on mercury as regards dental amalgam and other mercury-added products subject to export, import and manufacturing restrictions. Official Journal of the European Union; 2024. Available from: https://eur-lex.europa.eu
32. Scientific Committee on Emerging and Newly Identified Health Risks. The safety of dental amalgam and alternative dental restoration materials for patients and users. Luxembourg: European Commission; 2015. Available from: https://health.ec.europa.eu

33. World Health Organization. Future use of materials for dental restoration. Geneva: WHO; 2011. Available from: https://www.who.int

34. FDI World Dental Federation. Policy statements on dental restorative materials and the phase-down of dental amalgam. Geneva: FDI. Available from: https://www.fdiworlddental.org

35. Health and Safety Executive. EH40/2005 Workplace exposure limits. 4th ed. Norwich: HSE Books. Available from: https://www.hse.gov.uk

36. Health and Safety Executive. Control of Substances Hazardous to Health Regulations 2002: approved code of practice and guidance (L5). 6th ed. Norwich: HSE Books. Available from: https://www.hse.gov.uk

37. Scottish Dental Clinical Effectiveness Programme. Decontamination into practice: dental clinical guidance. Dundee: SDCEP. Available from: https://www.sdcep.org.uk

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39. General Dental Council. Preparing for practice: dental team learning outcomes for registration. London: GDC; 2015. Available from: https://www.gdc-uk.org

40. Dental Council of India. Bachelor of Dental Surgery (BDS) Course Regulations, 2007 (as amended). New Delhi: DCI.

1.6 Key journals for currency

Dental Materials · Dental Materials Journal · Journal of Dental Research · Journal of Dentistry · Journal of Prosthetic Dentistry · Journal of Adhesive Dentistry · Operative Dentistry · Clinical Oral Investigations · Journal of the American Dental Association · British Dental Journal · European Journal of Oral Sciences · International Journal of Prosthodontics · Journal of Oral Rehabilitation

PART 2 — CHAPTER-SPECIFIC REFERENCES

Chapter 1 — Introduction to Dental Materials

1.1 Classification of dental materials · 1.2 Requirements of an ideal dental material · 1.3 Standards and testing

Core texts: [1] Ch. 1 (Overview of Preventive and Restorative Materials) · [2] Introductory chapters on the scope and selection of dental materials · [3] Introductory chapter and the chapter on the requirements of dental materials · [5] Section 1 (Structure and Properties of Dental Materials), introductory chapters · [10] Chs. on the classification of materials · [18]–[29] Standards cited by material class

Additional

- Bayne SC, Ferracane JL, Marshall GW, Marshall SJ, van Noort R. The evolution of dental materials over the past century: silver and gold to tooth color and beyond. J Dent Res. 2019;98(3):257–65.
- Schmalz G, Galler KM. Biocompatibility of biomaterials — lessons learned and considerations for the design of novel materials. Dent Mater. 2017;33(4):382–93.
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- Bayne SC. Correlation of clinical performance with in vitro tests of restorative dental materials that use polymer-based matrices. Dent Mater. 2012;28(1):52–71.
- Wataha JC. Predicting clinical biological responses to dental materials. Dent Mater. 2012;28(1):23–40.
- American Dental Association Council on Scientific Affairs. Acceptance programme guidelines and the role of standards in dental product evaluation. Chicago: ADA. Available from: https://www.ada.org

Chapter 2 — Basic Material Science: Core Properties and Testing

2.1 Structure of matter · 2.2 Mechanical properties · 2.3 Physical properties · 2.4 Rheology · 2.5 Adhesion and bonding · 2.6 Biocompatibility

Core texts: [1] Chs. 2–4 (Structure of Matter and Principles of Adhesion; Chemical and Physical Properties of Solids; Mechanical Properties of Solids) and Ch. 17 (Biocompatibility) · [2] Chs. on the structure of matter, physical and mechanical properties, and adhesion · [3] Chs. 1–2 on the physical and mechanical properties of materials · [10] Chs. on bonding, deformation, fracture and rheology · [19], [20]

Mechanical behaviour and testing

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Optical properties and colour

- Johnston WM. Color measurement in dentistry. J Dent. 2009;37 Suppl 1:e2–6.
- Paravina RD, Ghinea R, Herrera LJ, Bona AD, Igiel C, Linninger M, et al. Color difference thresholds in dentistry. J Esthet Restor Dent. 2015;27 Suppl 1:S1–9.

Adhesion, surfaces and biocompatibility

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Chapter 3 — Impression Materials

3.1 Classification · 3.2 Hydrocolloids · 3.3 Elastomeric impression materials · 3.4 Impression compound · 3.5 Impression plaster · 3.6 Tray materials and adhesives

Core texts: [1] Ch. 13 (Auxiliary Materials) · [2] Ch. on impression materials · [3] Chs. on impression materials and hydrocolloids · [5] Section on impression materials · [23] for elastomeric impression specifications

Additional

- Punj A, Bompolaki D, Garaicoa J. Dental impression materials and techniques. Dent Clin North Am. 2017;61(4):779–96.
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Chapter 4 — Gypsum Products and Model Materials

4.1 Classification (Types I–V) · 4.2 Setting reaction · 4.3 Manipulation and properties · 4.4 Investments and refractory materials

Core texts: [1] Ch. 13 (Auxiliary Materials) and Ch. 14 (Casting Investments and Casting Procedures) · [2] Ch. on gypsum products and casts · [3] Ch. on gypsum products · [4] Ch. on model and die materials · [24] for gypsum specifications

Additional

- Michalakis KX, Asar NV, Kapsampeli V, Magkavali-Trikka P, Pissiotis AL, Hirayama H. Delayed linear dimensional changes of five high-strength gypsum products used for the fabrication of definitive casts. J Prosthet Dent. 2012;108(3):189–95.
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- International Organization for Standardization. ISO 15912 Dentistry — Casting and baseplate investments and refractory die materials. Geneva: ISO. Available from: https://www.iso.org

Chapter 5 — Waxes and Pattern Materials

5.1 Classification of waxes · 5.2 Properties and manipulation · 5.3 Uses

Core texts: [1] Ch. 13 (Auxiliary Materials) and Ch. 14 (Casting Investments and Casting Procedures) · [2] Ch. on waxes and pattern materials · [3] Ch. on dental waxes · [4] Ch. on waxes · [5] Section on auxiliary and laboratory materials

Additional

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- International Organization for Standardization. ISO 15854 Dentistry — Casting and baseplate waxes. Geneva: ISO. Available from: https://www.iso.org

Chapter 6 — Direct Restorative Materials: Dental Amalgam

6.1 Composition and types · 6.2 Setting reaction · 6.3 Manipulation · 6.4 Properties · 6.5 Clinical considerations

Core texts: [1] Ch. 8 (Dental Amalgams) · [2] Ch. on amalgam · [3] Ch. on dental amalgam · [4] Ch. on dental amalgam · [5] Section on direct restorative materials · [25] for amalgam specifications · [30]–[32] for mercury regulation and safety

Composition, setting and clinical behaviour

- Mahler DB. The high-copper dental amalgam alloys. J Dent Res. 1997;76(1):537–41.
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Mercury safety, waste and regulation

- Rathore M, Singh A, Pant VA. The dental amalgam toxicity fear: a myth or actuality. Toxicol Int. 2012;19(2):81–8.

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Chapter 7 — Direct Restorative Materials: Resin Composites

7.1 Composition · 7.2 Classification · 7.3 Polymerization and shrinkage · 7.4 Properties and clinical handling · 7.5 Composite failures

Core texts: [1] Ch. 5 (Resin-Based Composites) · [2] Chs. on resin composites and polymerization · [3] Ch. on resin composites · [4] Ch. on resin-based filling materials · [5] Section on direct restorative materials · [21] for polymer-based restorative specifications

Composition, classification and cure

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Shrinkage stress and clinical performance

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Chapter 8 — Adhesive Dentistry and Bonding Systems

8.1 Enamel bonding · 8.2 Dentin bonding · 8.3 Liners and bases · 8.4 Bonding to different substrates

Core texts: [1] Ch. 2 (Principles of Adhesion) and Ch. 6 (Bonding Mechanism and Bonding Agents) · [2] Ch. on principles of adhesion and adhesives · [3] Chs. on adhesion and dentine bonding agents · [4] Ch. on adhesive restorative materials · [13] Chs. on pulp protection and minimally invasive management · [14] Chs. on pulpal response to restorative procedures

Foundations of adhesion

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Contemporary adhesive systems

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Liners, bases and pulp protection

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Chapter 9 — Glass Ionomer Cements and Related Materials

9.1 Types and composition · 9.2 Setting reaction · 9.3 Properties · 9.4 Indications

Core texts: [1] Ch. 7 (Cements) · [2] Ch. on glass ionomer and resin-modified glass ionomer materials · [3] Ch. on glass ionomer cements · [4] Ch. on glass ionomer cements · [5] Section on restorative and luting materials · [22] for water-based cement specifications

Chemistry and properties

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Clinical use and atraumatic restorative treatment

- Frencken JE, Leal SC, Navarro MF. Twenty-five-year atraumatic restorative treatment (ART) approach: a comprehensive overview. Clin Oral Investig. 2012;16(5):1337–46.
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Chapter 10 — Dental Cements: Luting, Bases, Liners and Temporary

10.1 Classification by purpose · 10.2 Common dental cements · 10.3 Properties to compare across cements

Core texts: [1] Ch. 7 (Cements) · [2] Chs. on cements and materials for adhesion and luting · [3] Chs. on cements and liners · [4] Ch. on dental cements · [15], [16] Chs. on luting agents for fixed prostheses · [22]

Luting agents

- Hill EE. Dental cements for definitive luting: a review and practical clinical considerations. Dent Clin North Am. 2007;51(3):643–58.
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Bases, liners and pulpal response

- Weiner R. Liners and bases in general dentistry. Aust Dent J. 2011;56 Suppl 1:11–22.
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Chapter 11 — Metals and Alloys in Dentistry

11.1 Metals: structure and properties · 11.2 Types of alloys · 11.3 Casting alloys · 11.4 Soldering and welding

Core texts: [1] Ch. 9 (Metals) and Ch. 14 (Casting Investments and Casting Procedures) · [2] Chs. on metals and casting · [3] Chs. on the structure of metals and dental casting alloys · [4] Chs. on metals and alloys · [15], [16] Chs. on alloy selection in fixed prosthodontics · [26]

Alloy classes and selection

- Wataha JC. Alloys for prosthodontic restorations. J Prosthet Dent. 2002;87(4):351–63.
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Corrosion, biocompatibility and joining

- Setcos JC, Babaei-Mahani A, Silvio LD, Mjör IA, Wilson NH. The safety of nickel containing dental alloys. Dent Mater. 2006;22(12):1163–8.
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- American Dental Association Council on Scientific Affairs. Titanium applications in dentistry. J Am Dent Assoc. 2003;134(3):347–9.
- International Organization for Standardization. ISO 9693 Dentistry — Compatibility testing for metal-ceramic and ceramic-ceramic systems. Geneva: ISO. Available from: https://www.iso.org

Chapter 12 — Acrylic Resins and Denture Base Materials

12.1 PMMA chemistry and types · 12.2 Processing · 12.3 Properties and failures · 12.4 Soft liners and tissue conditioners

Core texts: [1] Ch. 11 (Prosthetic Polymers and Resins) · [2] Ch. on polymers and denture base materials · [3] Chs. on denture base resins and polymers · [4] Ch. on denture base polymers · [17] Chs. on denture fabrication and relining · [27]

PMMA chemistry, processing and properties

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- Jorge JH, Giampaolo ET, Machado AL, Vergani CE. Cytotoxicity of denture base acrylic resins: a literature review. J Prosthet Dent. 2003;90(2):190–3.

Soft liners and tissue conditioners

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Chapter 13 — Elastomers, Soft Materials and Temporary Restorative Materials

13.1 Temporary restorative materials · 13.2 Soft denture liners

Core texts: [1] Ch. 7 (Cements) and Ch. 11 (Prosthetic Polymers and Resins) · [2] Chs. on temporary materials and polymers · [3] Chs. on temporary restorative materials and resilient liners · [14] Chs. on temporization and coronal seal · [15] Chs. on provisional restorations

Temporary restorative materials and coronal seal

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Chapter 14 — Ceramics and Aesthetic Materials

14.1 Dental ceramics overview · 14.2 Uses · 14.3 Glazing and bonding

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Chapter 15 — Clinical Failures, Selection and Safety

15.1 Material selection principles · 15.2 Common reasons for failure · 15.3 Safety and waste

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