

Handbook on Dental Materials

Theory-Viva Voce, Multiple Choice Questions, Spotters, Model Answers and Practical Exercises

With 48 Colour Plates of Spotter Materials

Salient features:

- A unique work blending of theory, *viva voce*, MCQs and practical spotters in question-answer form for quick reference.
- Brief answers to all questions on materials and techniques used in dental clinics.
- Useful for all the candidates appearing in any undergraduate, postgraduate, PG entrance, or competitive examination in dental sciences.
- About 900 MCQs and 100 spotters with color plates and tables
- Solved numerical problems to understand the properties.
- Model answers to University question papers.

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Hyderabad | Nagpur | Patna | Pune | Vijayawada

ISBN: 978-93-86310-86-6



Handbook on
Dental Materials

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Jayaprakash
Nandish



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V Shama Bhat
Jayaprakash K
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for
Undergraduate and
Postgraduate Students
as well as
PG Dental Entrance
Examinations



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ISBN: 978-93-86310-86-6

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First Edition: 2017

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Published by Satish Kumar Jain and produced by Varun Jain for

CBS Publishers & Distributors Pvt Ltd

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Printed at: Rashtriya Printers, Dilshad Garden, Delhi, India

Foreword

It is truly a great privilege and honour to write the foreword for the third consecutive time for my beloved teacher, Prof V Shama Bhat's invaluable attempt in preparing *Handbook on Dental Materials*. The earlier textbook prepared by him, "Science of Dental Materials and Clinical Applications" has no match in our country. It is very fact that, this has been followed and referred extensively in almost all dental schools in this country and abroad, itself speaks volumes about its quality, usefulness and popularity. The third edition, now under print has been revised to keep abreast with the recent developments.

The Science of Dental Materials has become so exhaustive, students in the first and second years of BDS courses, find it extremely difficult to assimilate and reproduce in their examinations. With the vast teaching experience, Prof Bhat, has clearly understood the students' difficulties in facing the theory, viva voce and practical examinations.

To simplify the whole process, he has made an in-depth study of every aspect of the evaluation systems, and with the assistance of his experienced faculty members, BT Nandish and Jayaprakash K (MSc, in Dental Materials with PhD), has provided valuable solutions and answers to all the queries in this subject.

His commitment to this material science (since 1976), is witnessed by visiting the department and its unique museum of materials and models used in dentistry. Inspired by this, Jayaprakash K has contributed another part, large collections of "Skulls and teeth of many domestic animals", which again, is a very unique in our country and elsewhere. We are truly indebted to these invaluable contributions.

I congratulate Prof V Shama Bhat and his supporting staff for these wonderful works which will immensely benefit the students' fraternity and dental profession. I pray Almighty, to shower all His blessings to bestow, Sir (who is very active even at this age of 83 years) with long life and good health for much more contributions in future to the cause of science of dental materials.

BH SRIPATHI RAO MDS

Dean/Principal

Yenepoya Dental College

Mangalore, Karnataka, India

(Former Executive Council Member of DCI

Former Vice-Chancellor, Yenepoya University, Mangalore,
Karnataka)

Preface

Science of materials used in dentistry is a very rapidly advancing composite subject intermeshed by the interaction between the basic science subjects (physics, chemistry, biology) and engineering technologies (polymer resins, metallurgy, ceramics, composites) with the biological sciences (physiology, anatomy, pathology, microbiology, biochemistry). The present scientist–dental clinicians have to select the best materials for the particular clinical situations and apply the highest clinical skills, with the deep knowledge of this very fast developing science. The technicians should have thorough knowledge of metallurgy, ceramics, auxiliary materials, sophisticated pieces of equipment and technologies for selection of best materials and fabrication techniques to avail the desired best properties.

It is said that there is no any dental treatment without using any dental materials in the clinical practices. The importance of the thorough knowledge of this basic science foundation cannot be overstressed. The recent knowledge explosion in the basic sciences, technologies and their clinical applications, has given more responsibilities to the clinicians and technicians. In view of these the Dental Council of India has given the due importance and recently extended the duration of teaching of this subject for two years.

The main objective of the examinations is to evaluate the actual depth of the knowledge of the basic sciences and its applications of the principles acquired during the first two years, which can be later applied scientifically to the treatments in various clinical situations.

The present method of evaluation is, through, theory (long essays, short essays, brief answers, multiple choice questions, and viva voce) and practicals (along with details of answering spotter and questions in memory level).

It is observed, that various types of questions framed such as long essays of about 20 min, short essays of about 10 min, brief answers of about 5 min, durations and also the viva voce methods have their own limitations and are not adequate to assess the actual depth of the knowledge. Candidates are at a loss to plan the extent of information expected within the depth time limit. Recent trend of evaluation of the depth of knowledge of theory, which almost all universities have introduced, is to give more weightages to the multiple choice questions and viva voce examinations. It is quite difficult to answer the viva questions asked at random by the examiners. The spotter and tests, i.e. writing the identifications, compositions, properties and applications of the materials used, as a part of the practical skill tests, actually is a very novel idea which is now followed by all universities.

The Section A contains MCQs, planned for answering the theory and viva voce examination questions, for testing the knowledge in the memory, differentiating and logical levels by using the key answers. In many questions, the three-all correct answers, refer to all the information desired. Much attention is given to provide briefly vast information along with ready reference tables of compositions, properties, etc.

The Section B is focused on the spotter and answers as well as the theory and viva voce examinations. Vast information are provided briefly in nut shell (or capsules!), along with, tables of compositions and properties for quick and ready references. The color plates provided is an additional advantage.

The Section C contains model answers to two university examination question papers. This gives the idea of the contents required to answer the different types of questions within the time limitations—long essays, short essays and brief answers.

The last section comprises a collection of large number of color plates of recent spotter materials for recollection and identifications.

However, there is a lacuna and not much materials and literatures are available in these areas. In view of this, to assist the students and even the faculties, this unique work has been prepared. In addition, model answers to two different University question papers are also provided for the students

to practice, planning and answering them in the limited time, by those authors deeply involved in handling this subject (since 1976), as well as writing popular textbooks, "Science of Dental Materials and Clinical Applications", and "Complete solutions to Dental Materials".

**V Shama Bhat
Jayaprakash K
BT Nandish**

Acknowledgments

The idea of writing this was initiated by Mr Jayaprakash K, Lecturer in DM by collecting large number of color plates and questions for spotters and discussed regarding the details. It took nearly six months to do this work. Dr. BT Nandish Associate Professor, his valuable contributions for preparing this work. Mrs Sowmya Rao, Lecturer, recently joined our department, took active part in this project.

Our thanks are due to our beloved Principal Dr BH Sripathi Rao, Yenepoya Dental College, who has given us continuous support and encouragements, without which we could not have succeeded in any of our endeavors, and development of this department, with the unique museum of materials used in dentistry, and preparing this work.

Our respected Chancellor, Y Abdulla Kunny is always a source of inspirations to all our above adventures, preparing a "Textbook on "Science of Dental Materials and Clinical Applications 3rd Edition (CBS Publishers, 2006)," "Complete Solutions for Dental Materials" questions and answers to many Indian University Question Papers (Jaypee Publishers—2014), this work, as well as developing unique museum of "dental materials, skulls and teeth of animals". We are very much thankful to Dr M Vijayakumar, Vice-Chancellor, Dr CV Raghuvver, Registrar, Dr BT Nandish, Controller of Examinations of our Yenepoya University and all our colleagues for their encouragements.

We sincerely thank Mr SK Jain Managing Director, Mr YN Arjun, Senior Vice President—Publishing, Editorial and Publicity, CBS Publishers & Distributors for readily accepting the manuscripts and bringing out this beautifully planned book in the shortest time possible.

**V Shama Bhat
Jayaprakash K
BT Nandish**

Contents

<i>Foreword</i>	v
<i>Preface</i>	vii
<i>Practical Curriculum in Dental Materials</i>	xvii

Section A

1

Theory, MCQs and Answers

1. Orientation to dental sciences	1
2. Properties of dental materials and some solved numerical problems	4
3. Impression materials	13
4. Gypsum products (auxiliary materials)	21
5. Dental polymer resins	23
6. Prosthetic applications of polymer resins	25
7. Biocompatibility aspects of dental materials	33
8. Restorative dental materials cements	35
9. Composite restorative resins	48
10. Bonding of restorations	52
11. Direct filling gold	55
12. Silver amalgam restorative materials	57
13. Dental ceramics	65
14. Dental waxes (auxiliary materials)	73

15. Casting investments (auxiliary materials)	75
16. Solidifications of metals and alloys (metallurgy)	78
17. Dental casting alloys	83
18. Casting procedure and defects	92
19. Wrought alloys	97
20. Carbon-steels and stainless steels	99
21. Materials used in orthodontia	102
22. Brazing—soldering and welding	106
23. Tarnish and corrosion	110
24. Dental implants	112
25. Cutting, abrasion and finishing mechanisms, and tools	114
Answers to MCQs chapterwise	123

Section B

2

Theory–Viva Voce and Spotters

1. Gypsum products (cast and die—auxiliary materials)	129
2. Impression materials (auxiliary materials)	133
3. Denture fabrication materials	147
4. Restorative materials and cements	151
5. Composite restorative resins	168
6. Silver amalgam alloys	172
7. Auxiliary materials, waxes, investments in casting	176
8. Investment materials	180
9. Metallurgy: Casting alloys and techniques	184
10. Wrought alloys used in orthodontia	189

11. Soldering, brazing and welding	192
12. Dental ceramics and metal ceramics	194
13. Dental implant materials	199
14. Mechanics of cutting, abrasion, and polishing tools	200
15. Comparison of human, acrylic and porcelain and composite resin teeth	206

Section C

3

Theory Model Answers for University Examinations

Yenepoya University (Nov. 2015)	207
Rajiv Gandhi University of Health Sciences (Dec. 2015)	226

Colour plates with references for practical-spotters
and dental materials practicals end of the text

Practical Curriculum in Dental Materials

Sl. No.	Practical Exercises for First Year
1.	Study of setting action of gypsum products (dental plaster and stone and die stones). Determinations of gloss-disappearance time, initial and final setting times with respect to various water/powder ratios, accelerators, retarders and mixing times using Gilmore needles and Vicat penetrometers. Preparations of regular shaped plaster models trimming and polishing.
2.	Manipulation of impression compound and preparing casts: a. Impression of edentulous die, and regular cast metal dies. b. Preliminary impression of finger with impression compound.
3.	ZnOE impression pastes—mixing and recording secondary impression of the same finger. Preparing finger-cast-duplicate with model or stone plaster.
4.	Manipulation of alginate impression materials: a. Using a cardboard spacer, prepare special tray with impression compound for the metal die, and prepare perforated special tray. b. Record alginate impression of same die. Cover it with wet cotton and prepare the stone cast. c. Recording impression of acrylic partially dentulous die using with alginate and perforated tray and preparing its cast.

5. *Demonstrations:* Manipulation of two consistency elastomers; preliminary impression or tray, secondary, etc. impression techniques, special trays, rubber adhesives, die stone casts.
6. Mixing of heat or cold cure acrylic denture base resin powders with MMA liquids, studying various stages of mixing and dough times.
7. Manipulation of modelling wax and preparation of rectangular block of size $4.0 \times 1.2 \times 1.0$ cm, finishing and polishing of the wax block.
8. *Acrylization:* Wax block is invested, in dental flask and dewaxed. Seperating medium is applied. Heat cure clear acrylic dough is prepared, packed with one or two trial closures, bench-cured for 30 min, cured at 70°C for 8 hr, bench-cooled and recovered. Excess is removed, abraded with 60 and 100 grit sand papers. Polished with pumice and French chalk slurries.

Practical Excercises for Second Year

9. *Manipulation of dental cements:* Selection, proportioning and mixing for luting or base consistencies.
 - a. Zinc oxide eugenol cements
 - b. Zinc phosphate cements
 - c. Zinc polycarboxylate cements
 - d. Glass ionomer cement (types I and II).
10. *Demonstrations:* Main instruments, applications of cavity varnishes and liner, cement bases, cement restorations on class 1, 2, 3, 4, 5 tooth cavity models. Luting cements consintencies and cementations.
11. Manipulation of dental amalgam restorative material:
 - Main instruments for mixing mortar and pestles, squeez cloth, amalgam and plastic carriers, round and rectangular condensers, carvers (diamond,

demonstrations, Hollenback's and Wartz's), round and T burnishers, and polishing agents.

- Alloy selection criteria.
- Mercury/alloy ratios, proportioning methods.
- Trituration methods, mulling and squeezing.
- Homogeneous and optimum condensation.
- Carving, burnishing and finishing.

12. *Demonstrations:* Dental alloy casting procedures: Indirect wax patterns. Spruing methods, casting ring with liners, investing and divesting methods, wax burn out, methods of melting of alloys, casting machines of different types, casting, cooling, de-vesting, finishing and casting defects.

13. *Demonstrations:* Fabrication steps of metal ceramic restoration.

14. *Demonstrations:* Fabrication of active and reactive (passive) orthodontic appliances.