



# Dental Admission Test (DAT)

## Acknowledgements

### Dental Admission Test (DAT) Organic Chemistry Test Constructors

Jay Wackerly, PhD	Central College, Pella, IA
Michael Wentzel, PhD	Augsburg University, Minneapolis, MN
Shakena West, PhD	Wingate University, Wingate, NC
Sarah Zingales, PhD	University of St. Joseph, West Hartford, CT

### Council on Dental Education and Licensure (CDEL), Dental Admission Testing Committee (DATC)

Kathleen Boesze-Battaglia, PhD	University of Pennsylvania, Philadelphia, PA
Juliette Daniels, EdD	University of Detroit Mercy, Detroit, MI
Janet Guthmiller, DDS, PhD	University of Nebraska, Lincoln, NE
Carrie Hanson, RDH, MA, EdD	Johnson County Community College, Overland Park, KS
Craig Hirschberg, DDS	Rutgers, Newark, NJ
Julie Marshall, DDS, MS	University of Nebraska Medical Center, Lincoln, NE
Maureen McAndrew, DDS	New York University College of Dentistry, New York, NY
Paul Shadid, DDS	Shadid Dental Studio, Oklahoma City, OK
Cheryline Pezzullo, DDS	New York University College of Dentistry, New York, NY

### Department of Testing Services (DTS) Staff

Matthew Grady, PhD	Director, Development
Michael Matyasik, MS	Senior Manager, Test Development
Michelle Singleton, PhD	Assessment Specialist, Meeting Facilitation
Lindsey Streamer, PhD	Research Analyst, Surveys
David Waldschmidt, PhD	Senior Director, Testing Services



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## Organic Chemistry Readiness Surveys: Establishing the Content Domain and Test Specifications for the Organic Chemistry Section of the Dental Admission Test (2021)

### Background

In 2021, at the direction of the American Dental Association's (ADA's) Council on Dental Education and Licensure (CDEL), the ADA's Department of Testing Services (DTS) initiated activities to update and establish the content domain and test specifications for the organic chemistry section of the Dental Admission Test (DAT). This effort relied heavily on the expertise of organic chemistry subject matter experts serving on the DAT Organic Chemistry Test Construction Team (TCT), working closely with DTS staff to specify relevant content areas for possible inclusion in the organic chemistry test section. Three surveys were conducted to inform the organic chemistry section updates. Survey data collection took place during the fall of 2021. Findings were reviewed and interpreted by the Organic Chemistry TCT, DTS staff, and CDEL's Dental Admission Testing Committee (DATC), with final review and approval of proposed changes by CDEL occurring in June of 2024. Revisions to the DAT are expected to be implemented in 2026. This document summarizes information concerning the implementation of the surveys and the overall findings of this effort.

### Approach

Three **Organic Chemistry Readiness** surveys were developed to identify core knowledge in organic chemistry that first-year U.S. dental students must know when entering dental school, in order to be adequately prepared to benefit from further training. "Core knowledge" refers to required knowledge that establishes readiness for dental school training. Incoming dental students who possess the knowledge prerequisites are ready to face the challenges associated with their first year in dental school, while those who lack the required knowledge are unlikely to be successful unless they revisit and learn the fundamentals. Updates to the DAT organic chemistry section should therefore reflect current organic chemistry core knowledge requirements in order to effectively assess students' readiness for dental school training.

The surveys targeted three distinct populations: pre-health organic chemistry instructors, faculty who teach first-year dental students, and current dental students. It was reasoned that insights from each of these groups would allow the Organic Chemistry TCT to compare information that dental schools require first-year dental students to know with information that pre-dental programs teach candidates. Survey results could then be used to identify areas of commonality and discrepancy between pre-dental instruction, dental school requirements, and the DAT organic chemistry content outline.

## Survey of Pre-Health Organic Chemistry Instructors

Recruitment & Sample

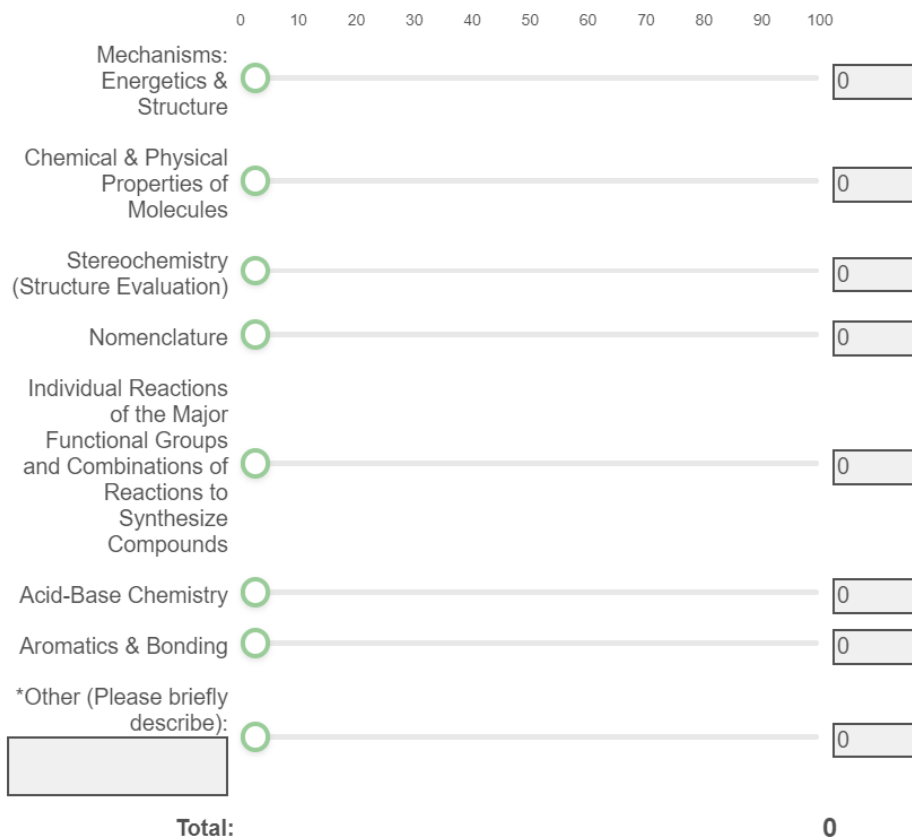
Survey invitations were emailed to health professions advisors at colleges and universities in the United States, via the National Association of Advisors for the Health Professions (NAAHP) listserv. Email recipients were told that participation in the survey would help inform admission decisions and the development of examinations measuring knowledge of important topics and concepts in organic chemistry. The sample consisted of 44 responses from 40 unique universities distributed across the United States. Data were analyzed at the university level. A majority of respondents were professors, with an average of 14.5 years of experience as introductory/organic chemistry instructors. Most held a Ph.D. in organic chemistry.

Survey Items

Respondents were asked to indicate the percentage of course time allocated to various organic chemistry topics, first focusing on main organic chemistry topics, and then focusing on the subtopics associated with each main topic. As respondents indicated time allocations, the survey automatically totaled the percentages so that the total time allocation did not exceed 100%. Afterwards, respondents were given an opportunity to list any topics or subtopics they thought should be removed from or added to the organic chemistry section of the DAT, in open-ended responses.

*Example:*

Please indicate the percentage of the *Introductory Organic Chemistry Sequence* at your school that is allocated to each main organic chemistry topic below.







## Survey Results

### Survey of Pre-Health Organic Chemistry Instructors

Table 1 presents the mean percentage of time pre-health organic chemistry instructors report allocating to each organic chemistry main topic and subtopic area. Topics are listed based on mean scores (descending order). If mean scores are equal, topics are listed alphabetically.

Table 1. Time Allocations (Survey of Pre-Health Organic Chemistry Instructors)

Individual Reactions of the Major Functional Groups and Combinations of Reactions to Synthesize Compounds (M=28.0%)	Substitution/Elimination (general, one-step, multi-step) (M=23.5%) Aldehyde/Ketone (general, one-step, multi-step) (M=20.4%) Carboxylic Acids & Derivatives (general, one-step, multi-step) (M=19.6%) Alkene/Alkyne (general, one-step, multi-step) (M=19.1%) Aromatic (general, one-step, multi-step) (M=15.4%)
Mechanisms: Energetics & Structure (M=20.6%)	Substitution Mechanisms (M=34.5%) Addition (M=28.7%) Elimination (M=25.5%) Free Radical (M=8.7%)
Chemical & Physical Properties of Molecules (M=13.0%)	Spectroscopy (1H NMR, 13C NMR, Infrared, Multi-Spectra) (M=47.8%) Structure (Polarity, Intermolecular Forces (Solubility, Melting/Boiling Point, etc.)) (M=26.6%) Laboratory Theory & Techniques (TLC Separations, etc.) (M=25.6%)
Stereochemistry (Structure Evaluation) (M=11.3%)	Conformations (M=3.2%) Isomer Relationships (M=3.0%) Chirality (M=2.8%)
Aromatics & Bonding (M=9.3%)	Resonance (M=29.4%) Concept of Aromaticity (M=21.6%) Atomic/Molecular Orbitals (M=19.1%) Hybridization (M=17.7%) Bond Angles/Lengths (M=11.0%)
Acid-Base Chemistry (M=9.1%)	Ranking Acidity/Basicity (structure analysis, pH/pKa data analysis) (M=53.0%) Prediction of Products & Equilibria (M=45.8%)
Nomenclature (M=7.6%)	Functional Groups in Molecules (M=51.8%) IUPAC Rules (M=45.7%)

## Survey of Faculty who Teach First-Year Dental Students

Table 2 presents the mean importance ratings for each main topic and subtopic area, as indicated by faculty who teach first-year dental students. Topics are listed based on mean scores (descending order). If mean scores are equal, topics are listed alphabetically.

Table 2. Topic Importance Ratings (Survey of Faculty who Teach First-Year Dental Students)

Acid-Base Chemistry (M=4.1)	Ranking Acidity/Basicity (structure analysis, pH/pKa data analysis) (M=3.8) Prediction of Products & Equilibria (M=3.1)
Chemical & Physical Properties of Molecules (M=3.5)	Structure (Polarity, Intermolecular Forces (Solubility, Melting/Boiling Point, etc.)) (M=3.6) Laboratory Theory & Techniques (TLC Separations, etc.) (M=2.7) Spectroscopy (1H NMR, 13C NMR, Infrared, Multi-Spectra) (M=2.4)
Nomenclature (M=3.5)	Functional Groups in Molecules (M=3.9) IUPAC Rules (M=2.3)
Mechanisms: Energetics & Structure (M=3.4)	Free Radical (M=3.3) Substitution Mechanisms (M=3.0) Addition (M=2.8) Elimination (M=2.8)
Individual Reactions of the Major Functional Groups and Combinations of Reactions to Synthesize Compounds (M=3.1)	Carboxylic Acids & Derivatives (general, one-step, multi-step) (M=3.3) Aldehyde/Ketone (general, one-step, multi-step) (M=3.1) Substitution/Elimination (general, one-step, multi-step) (M=2.9) Alkene/Alkyne (general, one-step, multi-step) (M=2.8) Aromatic (general, one-step, multi-step) (M=2.7)
Aromatics & Bonding (M=3.0)	Concept of Aromaticity (M=2.7) Hybridization (M=2.5) Resonance (M=2.5) Atomic/Molecular Orbitals (M=2.3) Bond Angles/Lengths (M=2.1)
Stereochemistry (Structure Evaluation) (M=2.9)	Conformations (M=3.2) Isomer Relationships (M=3.0) Chirality (M=2.8)

Survey of Current Dental Students

Table 3 presents the mean importance ratings for each main topic area, as indicated by current dental students. Topics are listed based on mean scores (descending order). If mean scores are equal, topics are listed alphabetically.

Table 2. Topic Importance Ratings (Survey of Current Dental Students)

Acid-Base Chemistry (M=3.3)
Chemical & Physical Properties of Molecules (M=3.1)
Aromatics & Bonding (M=2.4)
Nomenclature (M=2.3)
Individual Reactions of the Major Functional Groups and Combinations of Reactions to Synthesize Compounds (M=2.2)
Mechanisms: Energetics & Structure (M=2.2)
Stereochemistry (Structure Evaluation) (M=2.0)





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## Revisions to DAT Organic Chemistry Test Specifications

Survey findings were reviewed and interpreted by the Organic Chemistry TCT, DTS staff and CDEL's Dental Admission Testing Committee (DATC). Based on the findings, changes to the organic chemistry test specifications of the DAT were recommended and approved by CDEL. Changes to the organic chemistry test specifications will be shared with communities of interest prior to their implementation, which is expected to occur in 2026.