

Year 1 – Foundations of Scientific Thinking and Research Identity

Year 1 establishes the core scientific literacy essential for biomedical studies, while cultivating an early identity as a future healthcare professional. A central theme is building a conceptual understanding of biology and chemistry as the basis of human health. This theme weaves through General Biology I & II with Labs (BIOL 110/L and BIOL 120/L) and General Chemistry I & II with Labs (CHEM 110/L and CHEM 120/L), introducing principles of molecular structures, cellular function, and chemical reactivity.

Parallel to the science coursework, students develop crucial communication skills through Multimodal and Collaborative Writing (ENGL 110/120) and Interpersonal Communication in the Age of AI (COMM 110). Courses like Medical Terminology (COLL 110) introduce professional language early, supporting both clinical fluency and scientific discourse.

Quantitative literacy begins its scaffold with Calculus (MATH 130) and Applied Biostatistics (MATH 121), preparing students for data interpretation and the analytic demands of biomedical research and MCAT-style problem-solving.

A defining feature of Year 1 is the integration of research identity, primarily through the ISLaND Project, where students explore ecological relationships and molecular biology in local ecosystems. Engagement in the East West Health Fair connects scientific study to community health, reinforcing healthcare's societal dimension.

Horizontally, Year 1 bridges sciences, communication, and community engagement. Vertically, it lays the essential groundwork for the more specialized biomedical sciences in Year 2 and beyond.

Year 2 – Systems Physiology, Molecular Foundations, and Physical Principles

Year 2 deepens the scaffold with the theme of systems-level understanding of human biology, driven by Systemic Physiology I & II (BIOL 221/L and BIOL 222). These courses link molecular knowledge to organ-level function, creating critical pathways for future clinical reasoning.

Simultaneously, Organic Chemistry I & II with Labs (CHEM 210/L and CHEM 220/L) continue building the molecular framework, focusing on reaction mechanisms, stereochemistry, and functional group transformations essential for understanding biochemical processes and drug interactions.

Physics I & II with Labs (PHYS 210/L and PHYS 220/L) contribute another layer to horizontal integration, demonstrating how physical principles underlie physiological processes such as hemodynamics, respiration, and neural signaling. This ensures students can analyze biological phenomena with quantitative rigor.

The Genetics and Genomics (BIOL 230) course introduces students to inheritance patterns, gene regulation, and molecular diagnostics, setting the stage for more advanced molecular and clinical coursework.

Horizontally, Year 2 reinforces the interconnectedness of chemistry, physics, and biological systems. Vertically, it propels students toward the molecular depth and clinical applications characteristic of Years 3 and 4.

Year 3 – Molecular Complexity, Translational Applications, and Research Development

Year 3 advances students into biomedical complexity and translational thinking, merging molecular insights with disease mechanisms and early therapeutic concepts.

A central theme is molecular underpinnings of disease, developed in the Fall through Microbiology with Lab (BIOL 310/L), Advanced Cell and Molecular Biology (BIOL 420), Biochemistry (CHEM 310), and Neuroscience (BIOL 410). These courses interconnect molecular structures, biochemical pathways, and cellular dysfunctions that manifest as clinical diseases. For example, biochemical pathways studied in Biochemistry become relevant in understanding microbial metabolism in Microbiology or neurotransmitter signaling in Neuroscience.

In the Spring semester, Medicinal Biochemistry emerges as a crucial bridge between molecular biology and clinical pharmacology. Here, students explore structure-activity relationships, drug design principles, and biochemical mechanisms of therapeutic agents. This course vertically builds on Organic Chemistry and Biochemistry, preparing students for the clinical decision-making processes addressed in Year 4's pharmacology and case-based medicine.

Research development remains a prominent theme, with students engaged in quantitative and qualitative research methods and analysis, where they transition from designing research questions to executing and analyzing independent scholarly projects. These experiences prepare them for the Honors Thesis in Year 4, while also cultivating skills essential for evidence-based medicine and scientific communication.

Horizontally, Year 3 blends content across biological scales, from molecular interactions to systemic diseases. Vertically, it bridges students' scientific expertise to the clinical reasoning they will refine in Year 4.

Year 4 – Clinical Integration, Professional Identity, and Capstone Scholarship

Year 4 of the BSDMD curriculum is the culmination of a scaffolded educational journey, where students bring together the scientific, clinical, and research competencies built over the preceding three years into a cohesive, professional identity.

A central theme of Year 4 is clinical integration and decision-making. Students shift from understanding molecular and systemic mechanisms to applying that knowledge in clinical contexts. Building on molecular foundations from biochemistry, genetics, and medicinal biochemistry, they now explore how therapeutic interventions are chosen, tailored, and managed in patient care. They engage deeply with clinical reasoning, analyzing real-world cases, and practicing the diagnostic logic they began developing in earlier coursework. This transition from scientific knowledge to clinical thinking represents a vertical scaffold from fundamental sciences to practical application—a key preparation for medical and dental school.

Another crucial theme is synthesis of biomedical disciplines into a unified understanding of disease and treatment. Where earlier years emphasized distinct subjects like microbiology, physiology, or pharmacology, Year 4 focuses on connecting these areas. Students see how disruptions in molecular pathways translate into clinical symptoms, how genetics informs personalized medicine, and how pharmacologic strategies are crafted based on both molecular targets and patient-specific factors. This holistic integration echoes the interdisciplinary demands of professional healthcare practice.

Independent research and scholarly inquiry become defining features of Year 4. Having developed collaborative skills in the ISLaND Project and faculty-guided research experiences in COLL 320, students now transition to independent research with the completion of an Honors Thesis. Here, they design, execute, and defend original research projects, demonstrating not only technical competence but also the intellectual independence and critical thinking essential for future physician-scientists and clinician-researchers. This research experience represents the pinnacle of the vertical scaffold that began in Year 1, highlighting how the program fosters investigative curiosity and scholarly rigor throughout.

Finally, Year 4 is characterized by a deepening sense of professional identity and leadership. Building on communication skills, ethics discussions, and collaborative experiences from earlier years, students refine their understanding of what it means to be a healthcare professional. They cultivate leadership qualities, prepare for patient-centered communication, and reflect on the humanistic and ethical dimensions of healthcare delivery. These competencies ensure that graduates are not just scientifically and clinically

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capable but also ready to contribute meaningfully to the communities and professions they will serve.

Horizontally, Year 4 weaves together knowledge from diverse biomedical fields into cohesive clinical reasoning and evidence-based practice. Vertically, it represents the final stage of transformation from learners of science into emerging healthcare professionals who are scientifically grounded, clinically prepared, research engaged, and ethically driven.