As the very existence of our universe is based on molecules, understanding molecular functions is at the crux of most major innovations in science. The perfect blend of Chemical Engineering, Material Science, Bio-Engineering, Electrical Engineering, and Mechanical Engineering, Molecular Engineering is an ever growing and ever progressing field that holds answers to issues as diverse as cancer and information security. As I have learnt the structure of atoms and molecules in both physics and chemistry, I have realized the obvious interconnection between different streams of science culminating in the larger objective of deploying and achieving technological expertise. I strongly believe that the field of Molecular Engineering possesses omnipotent features that can transform our lives to an unimaginable state, and I wish to pursue a career in this field starting with a rewarding postgraduate program from your University.

In order to enhance my understanding of chemical and physical systems and to manipulate these systems via a molecular design approach, I decided to pursue my undergraduate studies in Molecular Chemistry. During this period, I learnt about the chemical basis of molecular structures through my courses on Physical Chemistry, Organic Chemistry, and Biochemistry. One of the important applications of this stream is in Pharmacology, and I understood several drug mechanisms and their modes of action on the human body.

As my main objective for pursuing Molecular Chemistry was to understand and identify the molecular basis of medicines for various conditions, I decided to undertake my final year undergraduate project on the Phytochemical Basis of the Plant *Terminala arjuana* (Arjun). In this project, I investigated the antioxidant properties and presence of pharmacologically active chemical compounds, and performed proximate analysis of the plant. I began by extracting the plant material using the cold extraction process, and used the methanolic and aqueous extract of the plant for phytochemical screening. My analysis through complementary tests such as reducing power assay, total antioxidant determination, total phenolic content, nitric oxide scavenging, total flavonoid content, and reduction of ferric ion by ortho-phenanthroline reagent revealed the presence of phytoconstituents such as alkaloids, reducing sugar, saponins, glycosides, and tannins, and moderate nitric oxide scavenging activity. My observations and deductions from my experimental results revealed the presence of significant antioxidant activity in the plant extract, and this material could serve as a potential antioxidant in the future. While performing my experiments, there were several breakdowns when I realized the true nature of intense scientific research and challenges faced at every step of the way in pursuit of a medicinal drug. I acquired extensive technical knowledge of experimental systems and setups, and understood how to plan and prioritize my research tasks to ensure successful completion within the stipulated deadline.

My undergraduate research project introduced me to the challenging and exciting world of drug research, and in order to acquire research experience in an industrial setup I decided to undertake a certificate training course. Here, I learnt both theoretical and practical aspects of industrial boilers, pumps and compressors, heat exchangers, industrial water treatment, measurement and control of process parameters, urea fertilization production plant, HPLC, and atomic spectral method. These are important techniques used in several experimental procedures and I was able to acquire hands-on experience in these methodologies and equipment.

Eventually, I was fortunate enough to attend an internship at a renowned pharmaceutical company in Bangladesh, where I observed the work ethics and projects carried out in various

departments such as Production, Quality Assurance, Engineering, and Warehouse. In particular, I learnt about the HVAC system, breakdown and preventative maintenance of machinery and equipment, current Good Manufacturing Practices (cGMP), and regulatory activities relating to pharmaceutical manufacturing. Hence, in contrast to the technical knowledge acquired during my undergraduate project, my internships offered me a commercial and an industrial management standpoint of research projects.

After completing my undergraduate studies, I wanted to obtain a holistic experience in the field of Molecular Engineering, and so I started working at PRAN-RFL, which is a polymer-based plastic manufacturing company. I worked in the Research and Development department and my roles included quality control and research of breakdown in a damaged product including its troubleshooting. As I eventually got promoted to the post of Assistant Manager, I had acquired in-depth knowledge of several industrial processes such as injection molding machine operation, processing of plastic materials, quality check and selection of moulds, observation of process parameters, and co-ordination with sourcing. Apart from these, I was also responsible for updating the Maintenance Logbook, installation and standardization of new equipment, procurement of optimal conditions for production unit, and preserving batch samples for future use. In addition to the immense technical and equipment-related knowledge I acquired at this company, I was also able to work on my personality and leadership skills, and my managerial position helped me become an organized capable person with good time management and communication strategies.

My undergraduate project in Pharmacology has enabled me to acquire knowledge and skills of how the science of pharmacy is applied in the real world, and the exposure attained through the project has helped me become a disciplined and dedicated contributor to a professional team. Having lost my mother to cancer, I feel that it is my moral responsibility to pursue research in determining a better cure for malignant tumors. A postgraduate education in Molecular Engineering will help me fulfill my long-term goal which is to prevent deaths arising due to cancer. It will also help me pursue a career in research and gradually become a leading researcher in a renowned pharmaceutical corporation.

I am especially keen to pursue my postgraduate education in Molecular Engineering at your University because I have done considerable research on the works being carried out by your Molecular Engineering department, and I have high regards for the faculty members at your premises. The research articles regularly published from your institution are groundbreaking, and I am excited to belong to a skilled team of researchers working towards the common goal of promoting health in the world. I am confident that being guided by exceptionally talented professors at your University will help me gain expert knowledge in the subject and will help me acquire a broader perspective of the field in order to fulfill my future goals.

Given my personal stake in finding a cure for cancer, I intend to achieve mastery over the subject through your structured and rewarding postgraduate program.