**Essay 1:**

*Describe your educational preparation. Discuss classes taken, techniques learned, and any pertinent extracurricular activities.*

It only took one semester in college for me to realize that I was interested in a lot more than just astronomy. I added physics and math majors as well, and was soon diving head-first into the field of astrophysics.

So far, the physics classes I have taken have built a very solid educational foundation. Having taken thermodynamics, electrodynamics and magnetism, classical mechanics, quantum mechanics, and optics, I have been exposed to a wide range in physics topics. I have also taken as many upper-level math courses as I can to augment the physics courses, including linear algebra, complex analysis, four semesters of calculus, ordinary differential equations, and partial differential equations. So far I have been able to take two general astronomy courses as well as a stellar astrophysics course, and I am excited to take more courses next year. Finally, I took a Python course, which has been a great help for doing astronomy research. While I have learned many helpful scientific techniques in these courses, they have also given me more general skills including time management and troubleshooting.

This year I was happy to be named the president of the IU Astronomy Club. Helping with community outreach events and planning meetings for the members, many of whom are not actually studying a hard science, has helped teach me to communicate scientific information to people not involved in the field. Being in charge of the Astronomy Club as well as being a part of other clubs has been a great way to learn how to balance a rigorous academic load with fun extracurricular activities.

Of course, it would be dishonest to imply that all of this came easily. I have experienced plenty of struggles along the way, especially as the level of my classes increased with my interest in them. I have had to put much more time and energy into learning the material for my courses, but have found it highly rewarding work.

**Essay 2:**

*Describe a challenge you have faced (i.e., a difficult class, a research problem, etc) and what steps you took to overcome the challenge.*

Since sophomore year of high school, I have struggled with anxiety. Unfortunately, much of it revolved around school and academics. As school became more difficult and competitive, I experienced more anxiety, which made studying and working harder. I struggled to focus on homework assignments and stay engaged on tests. I also felt like I had a lot of pressure to perform at a high level, and therefore my self-worth became reliant on exceptional grades and academic performance.

Despite these challenges, I was hesitant to seek help for various reasons. I was unsatisfied with myself if I did not get perfect grades, and did not realize how destructive that mindset was for my mental health. At the time I also felt like I was not able to be emotionally vulnerable due to the stigma surrounding men opening up about mental health. However, after a year of college and more pressure from my close friends, I finally acknowledged that I needed help and took the first steps towards improvement.

Last school year I started talking to counselors to find ways of keeping the anxiety under control. This was an important first step as it allowed me to acknowledge and openly discuss the issue, something I had not done before. However, it did not completely stop the problems I was having, and I started medication to help mitigate the effects of anxiety. I have also made efforts to unlearn the harmful standards I set for myself and to cultivate a healthier self-image not based just on academics.

Although I still have bad days here and there, I have learned how to keep my anxiety under control more effectively. In doing so, I have not only learned a lot about myself, but I have also reignited my passion for school. All of the introspection and effort I put into reshaping my view of academia has led to a greater appreciation of the field of astronomy and what I want to achieve in it.

**Essay 3:**

*Why are you interested in completing an REU? What excites you about KU?*

One of the most important skills to develop if I want to continue in the field of astronomical research is effective communication. If you are not able to communicate the results of your study, then your work becomes less effective as a whole. Having the opportunity to participate in an REU would allow me to develop great communication skills by working with other students and professors on projects as well as possibly presenting the results in a professional setting. Being accepted into an REU would also allow me to experience research with another astronomy department. I think that getting to see how other departments and professors operate and research is an invaluable experience as more diversity will allow me to become a better astronomer in the future.

I would be very excited to have the opportunity to research under the supervision of a professor previously unfamiliar to me. Exposing myself to new and diverse perspectives would help to expand my knowledge and refine the areas of research that I am already familiar with. Working one on one with an expert in the field, like a professor, would be a great learning experience for me because I hope to one day be a professor myself.

Getting to work at The University of Kansas would be a great experience for many reasons. From galactic research to extrasolar planets, there is a wide range of topics that I would have the opportunity to learn about. I think working in a department that has research both in physics and astronomy would be a great experience as well because I am interested in astronomy research based more so in physics and less so in pure observation and data collection. Finally, the Kansas program would be a great opportunity to meet new friends in the field and enjoy the Summer in Lawrence. Gaining research experience is valuable, but having fun while doing it makes it that much better!

**Essay 4:**

*What area(s) of physics and astronomy excite you the most? (This does not need to be an area that our REU supports.) Describe why this area interests you, some of the open research questions associated with this area, and some of the current findings.*

As I have had the chance to take more math and physics classes, and get better at programming, I have found myself wanting to dive deeper into theoretical and model-based astrophysics. I have always thought that working with larger scale projects, such as galactic evolution or cosmology, would be very interesting. In particular, I think researching dark matter would align with my interests.

I have always had a particular interest in dark matter because I find the total mystery of it compelling. The fact that such a large portion of the mass in our universe is unknown to us puts into perspective how much we still have to learn. It is also a relatively new field, which is exciting for a hopeful astronomer like myself as the contribution I could be able to make would be more impactful. Additionally, the prospect of becoming part of a global effort towards a deeper understanding of this puzzling subject is very exciting, and would be a great way to meet and work with others who share my passion.

As of now, it seems like research into the field has left us with more questions than answers. On one hand, researchers are unsure what dark matter is composed of. Although scientists have been able to eliminate larger objects such as brown dwarves, there are still several possibilities. Its gravitational influence also seems to be a bit mysterious, and many models have been developed to work out how it fits in with our current understanding of gravity. Understanding more about dark matter could give us valuable insight on the early stages of the universe, which is relevant to many fields of physics. Projects like the James Webb Space Telescope are a great way of obtaining more information about how dark matter has shaped the cosmos. Getting the opportunity to work on developing more models and simulations of dark matter would be a very exciting experience.