Note: Guidelines were changed from 5000 characters to 2-pages

Project Summary: I will support [redacted] to complete a project which explores the chemistry of metal-organic frameworks (MOFs), a new highly porous class of materials with applications in molecular storage and separation. Specifically, [redacted] will examine the incorporation of a new organic component into the framework using a technique known as ball-milling. The incorporation of this new component is known as "post-synthetic exchange"(PSE). This is an exciting project since to date no one has demonstrated PSE via ball-milling. Instead, the current method is one which involves solvents, while ball-milling can be done dry in the solid phase. Her main goal will be to explore the influence of milling energy on the extent of exchange. This is a continuation of an ongoing project which requires additional data collection, so the methods are well established. As such, I feel it makes a good project for a BURST student. A past student gathered preliminary data which suggests that energy impacts exchange level, with increasing energy leading to increased exchange up to a threshold energy, beyond which the material is structurally damaged. We need to repeat this work to see if this finding is robust. In addition, we gathered data that suggests that the starting properties, specifically the level of defects present in MOF, seem to influence the exchange amount. Defect levels can be controlled by varying the synthesis conditions. A second student, [redacted] , is also applying to the BURST program for a similar project, but the two will be exploring different starting MOFs: one with defects ([redacted]) and one without defects ([redacted]).

Scholar support: [redacted] plans to become a physicians assistant after graduating, so I will work with her to develop an individual development plan (IDP) which will help her achieve this goal. We will incorporate the timeline for PA school applications, and discuss strategies to reducing her workload around the time of application. We will discuss the GRE (or MCAT —varies by school) and how to prepare. I also have served on the HSSEC committee at USD and have some familiarity with the process, such that I can help [redacted] through the internal process as well. [redacted] has mentioned that her commitment to pursuing PA school may prevent her from continuing research in the fall, so I've assigned to a slightly shorter project (starting from defect-free MOF, which we have as a starting material—no synthesis required) to afford a greater likelihood her work will come to fruition after 10 weeks. I will encourage & support her to present a talk at Creative Collaborations (or fall equivalent if one is available) in order to hone her research presentation skills. I will also work with her to search for PA schools that would be a potential fit. In addition, though I currently do not have any senior students in my lab, I plan to pair up [redacted] and [redacted] as a strategy for success. I understand that they are friends, and they are both sophomores. I think they will work well together and be on somewhat parallel research trajectories (a bit offset in time) such that sharing results, working on data analysis, and dealing with the nuances of instrumentation will be easier with another knowledgeable student in the lab.

Logistics: I will begin by training [redacted] to collect SEM & EDX data on our defect-free UiO-66 supply. I will train her to use additional instrumentation as outlined in the timeline. I will also introduce [redacted] to the lab electronic lab notebook (ELN) in LabArchives (introduced in general chemistry), and show her how to enter her research data each day and week of research. We will have weekly group meetings which will take on several forms: sharing research results and seeking feedback and questions from the group, sharing related

findings from the literature, and introducing new instrumentation (function, capabilities and limitations) as we are a measurement-intensive research group. At the first research meeting we will discuss goals for each project (since they are related it will be good for everyone to be familiar with these goals), and expectations for the group. I will go over ELN best practices, and also how to read and present a research paper. I will introduce X-ray photoelectron spectroscopy (our main instrument) in week 2 as a guide to introducing the theory behind an instrument and in preparation for training, which everyone will receive. [redacted] will present something every week starting the second week. I will provide feedback on the research updates on best practices when presenting data, as they will become more detailed as more data is gathered. [redacted] 's last 2 presentations will be 20-minute research talks: a "practice" talk, and a more polished talk after receiving feedback. This will help prepare her to discuss her research experience during PA school interviews. We will also have at least 2 planned fun outings and participate in the annual bocce competition!