Bioengineering Day Poster Addendum (ABET questions)

1. List two to four **Desired Needs** of your project that led to your final design objectives.
   Answer in two to four bullet points or concepts within a sentence or two.
   - The emission of carbon dioxide in the atmosphere is the major contributor of global warming.
   - The rising need of solution to reverse the climate crisis before it severely endangers all life on earth.
   - Lack of cost-effective and scalable in-vivo carbon sequestration process to sequester atmospheric carbon dioxide.

2. List the major **Constraints** on your design/project
   a) Safety/Regulatory Affairs: The project requires members to work with various chemical and biological hazards. All members were required to use PPE and learn aseptic techniques.
   b) Risks: The project utilizes an engineering synthetic organism, so possible effects of exposure to natural ecosystem is not extensively studied.
   c) Global Impact: Global impact requires the project to be scalable, but large-scale production might be limited by cost and sequestration efficiency.
   d) Manufacturability: Minimal cell is extremely fragile and the required SP4 media is expensive.
   e) Quality Control/Marketability: Cost becomes a problem when scaling up. Sequestration efficiency of cell cultures might vary.

3. List the major **Engineering Standards** on your design/project
   a) **ASTM WK84273** - New Practice for Design, Production, and Deployment of Genetically Engineered Microorganisms.
   b) ISO 20688-2:2024 - Biotechnology regulations for the production and quality control of synthesized gene fragments, genes, and genomes.
   c) ISO 5058-1:2021 - Biotechnology - Genome editing

4. Explain **Ethical, Environmental, or Societal concerns** for practical applications of your project.
   - Ethical: The use of synthetic, genetically modified cells may pose risk in the environment
   - Environmental: The carbon sequestration pathway used produces an oxalate by-product which can be toxic at certain concentration.
   - Societal: The success of the project will greatly help in slowing down the rapid increase in global warming.

5. Describe **Active Teamwork** and **Leadership** in your design group
   a) **collaboration** and inclusion of diverse opinions? All members are required to attend weekly team meeting where the group collectively decide on the direction of the project.
   b) **delegation** of leadership on subprojects? Each member leads a subproject. We alternate doing the task or split the workload when necessary.
   c) establishing and reaching **goals and deadlines**? Goals and deadlines are discussed and decided on during weekly meeting with the PI
   d) received or given **constructive feedback**? Discussed during the weekly meeting after each experiment.

6. What were the most significant motivating factors that led you to
   a) acquire **new knowledge:** Interest in wet lab and interest in minimal cells
   b) be **self-initiating:** to continue the great work the past senior design groups worked on
   c) **persist** against challenges and setbacks: Kind guidance of our mentor and PI

7. What are your most **innovative and/or entrepreneurial ideas** for this project

Experiment and implement changes in the GC-MS setting and protocol despite not knowing how to use the GC-MS before working on the project. Creating a tracker for reagents and cell inventory.