2016 Che3460 – Assignment #1: Textbook Figure
Due on Feb. 2nd at midnight
Upload here: 159.203.103.114/gallery/56a3bc5486e2c32b571a4142

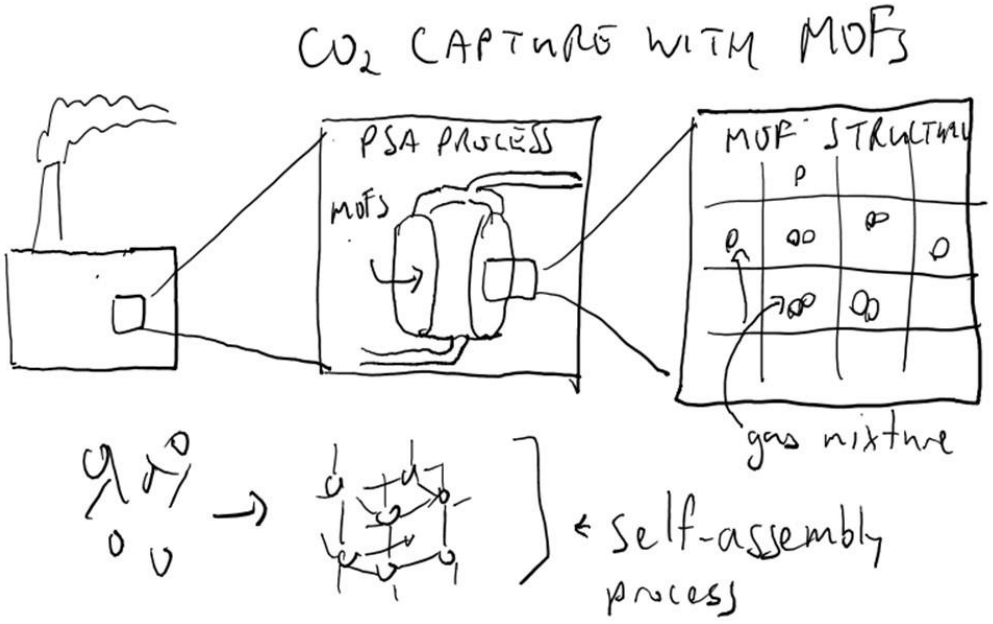
For this assignment, you are asked to make a diagram describing part of your chosen scientific grant proposal. For each proposal, you are given a brief written description and a very rough sketch (imagine that your boss/advisor ran into your office, briefly described a diagram you needed to make, and then quickly drew a rough sketch of what he had in mind before leaving and getting on a plane).

The diagram must be exactly 800x600 pixels, and may contain words as well as images. There is no caption associated with this diagram, so all text must be part of the diagram itself.

Proposal #1:

"I need a diagram that gives an overview of how MOFs are used to capture CO_2 in a coal power plant. Look up a typical CO_2 capture process and just replace whatever they use now with MOFs. Make sure it's clear that we're proposing a pressure-swing adsorption (PSA) process. Capture the essential details but don't clutter it with unrelated processes/details (e.g., the SO2 and mercury scrubbers). Show where the CO_2 capture unit is located in the whole plant (google a plant schematic). Show where the MOFs are located in the CO_2 capture unit. Also show a unit cell of a typical MOF. Finally, explain very briefly how MOFs self-assemble, and show a sub-diagram of MOFs self-assembling in solution. Explain in words whatever is not very clear in the images alone."

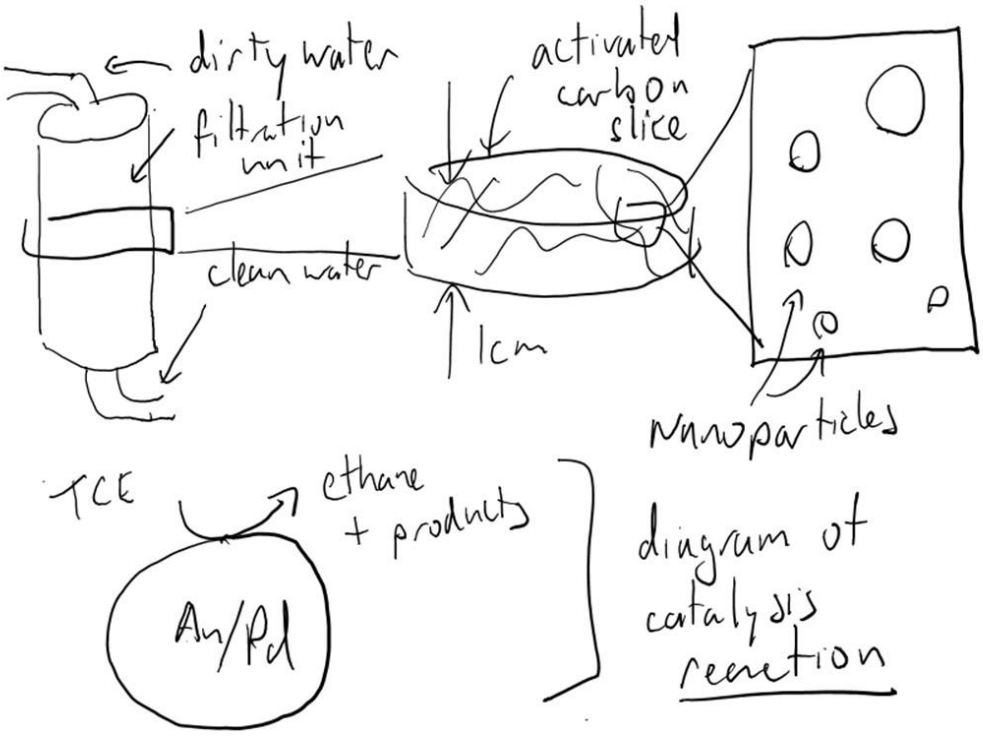
Whiteboard sketch:



Proposal #2:

"I need a diagram that gives an overview of how our catalyst works to remove TCE from water. Show a bimetallic Pd/Au nanoparticle catalyzing the conversion of TCE to ethane, including the adsorption, reaction, and desorption steps. Also show a basic schematic of a water filtration tank, where the filter unit has slices of activated carbon filters supporting the nanoparticles. This schematic needs to depict three three different scales: the water filtration unit (with reasonable dimensions, it will probably be about the size of a human), the activated carbon slice (about 1 cm thick), and the nanoscale (~1-5 um) where nanoparticles are distributed randomly on the support. Explain in words whatever is not very clear in the images alone."

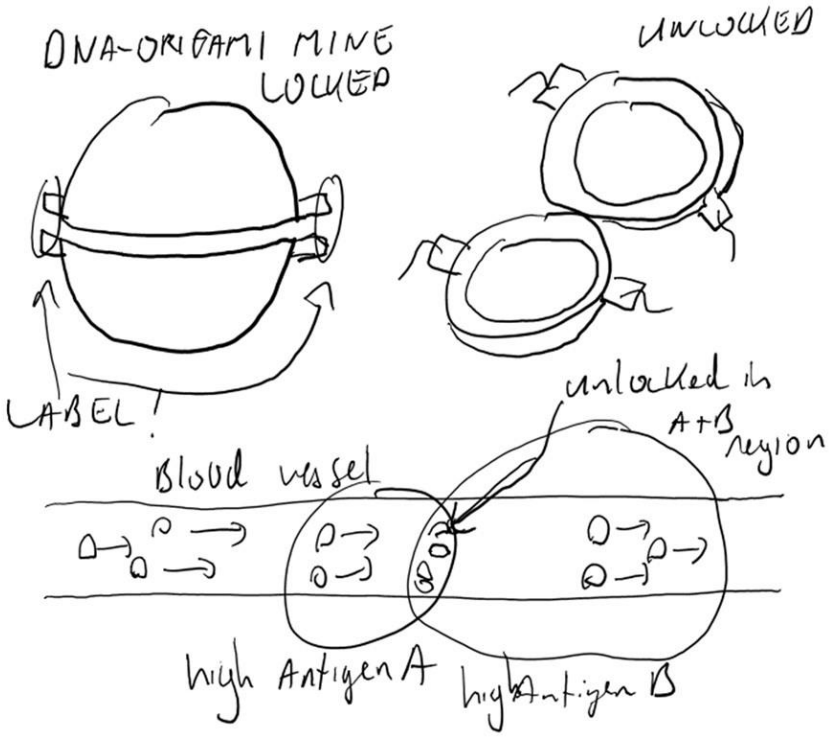
Whiteboard sketch:



Proposal #3:

"I need a detailed diagram of one of our DNA-origami mines, in its locked and unlocked state. Let's assume this one has 2 locks, that each require a different antigen to open. Also show some of these mines floating in a blood vessel (along with some platelets), showing how the mines unlock when they reach a region with a certain antigen concentration – you don't need to draw the specific antigens – just make sure it's clear that the mines open when the antigen concentration of antigen A and antigen B are both high, and that they don't open when the concentration of either one is too low. Explain in words whatever is not very clear in the images alone."

Whiteboard sketch:



Proposal #4:

"I need a diagram that shows what a complete gas sensor device might look like assuming all of the research works out, kind of like a mock-up of a finished product. We want the entire device to be something you could hold in your hand. Show how gas mixture enters and leaves the device, and where in the device the actual sensor array would be situated (and its approximate dimensions). Then 'zoom in' and show the sensor array, and then zoom in more to show a single surface acoustic wave sensor (and describe its various parts). Finally, show a gas molecule (or several) adsorbing on the surface and thus changing the surface mass. Explain in words whatever is not very clear in the images alone."

Whiteboard sketch: