Practice Set C

1. Suppose you want to capture a specific DNA sequence out a collection of 25 sequences in a test tube.

a) What approach would you take to isolate the sequence?

b) What simple test would you do to know that you have bound and isolated the sequence?

c) What variables could you use to test for less than perfect matches?

d) What would be the consequence of having AT rich versus GC rich sequences?

2. You have the idea to enhance bone material $Ca_3(PO4)_2$ at the site of a bone injury. You know that natural proteins in the bone act to template the crystal structure of these materials. You decide to make some synthetic peptides to increase bone deposition at a particular location.

a) What types of amino acid sequences would you expect to see for these proteins?

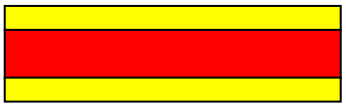
d) Design a self-assembled monolayer system to practice templating bone.

c) Consider ways to deliver your synthetic peptide to a bone location that requires healing.

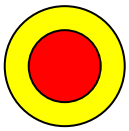
3. Propose a mechanism for aligning a carbon nanotube between two gold electrodes using any biological molecules. You don't have to synthesize the electrodes and you can order them in any size and spacing you need.

4. You are working for NASA and a Mars rock is brought in that under inspection with a scanning electron microscope contains 2 micrometer spherical objects that are thought to be a life form. Using typical bacterial growth media you are able to get the spheres to reproduce. Devise a set of experiments to see what biological materials are responsible for carrying the genetic information. Think about the "transforming principle" experiments.

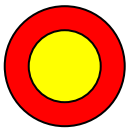
5. Design a system that would allow you to self-assemble and template an inorganic material above and below an organic layer. Yellow is inorganic, red is organic



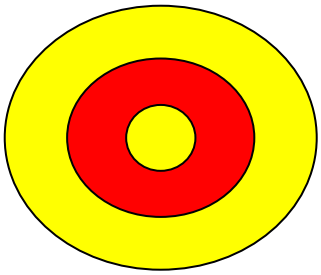
6. Design an experiment to self-assemble in inorganic sphere with an organic interior.



7. Design an experiment to assemble an organic outer layer with an interior inorganic material.



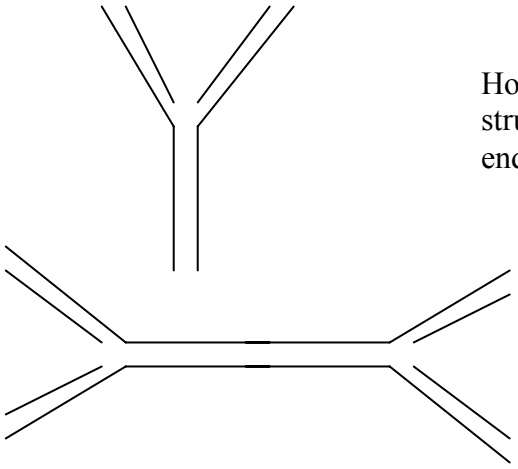
8.Design an experiment to assemble a sphere with an inorganic exterior an organic middle and an inorganic interior.



8. Design a material that could encapsulate a DNA molecule of interest and target it to be delivered to a tumor cell.

9. Give an example of a 5 amino acid peptide that could only bind one gold particle. Give an example of a 5 amino acid peptide that could bind two gold particles.

10.



How would you design the follow structures out of DNA, label the ends