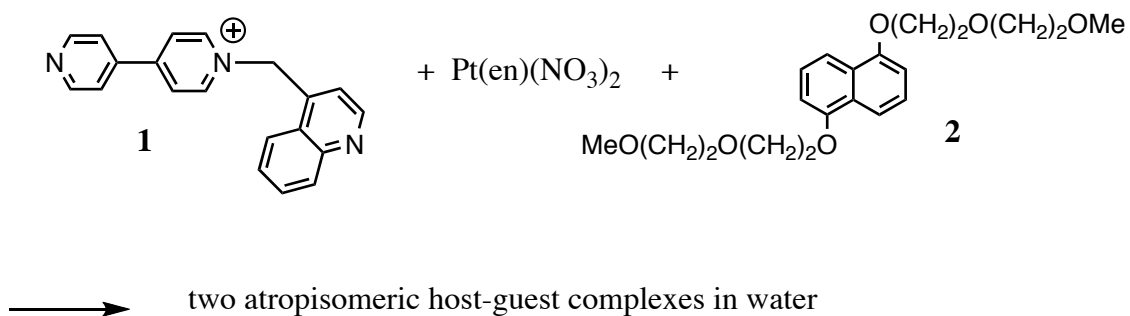
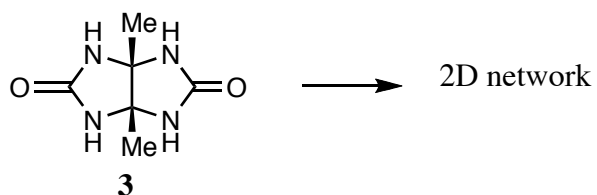


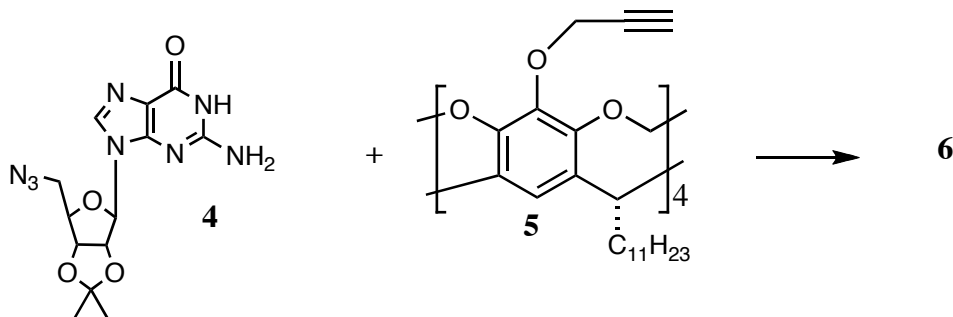
**Problem 1:** Compound **1**, together with  $\text{Pd(en)(NO}_3)_2$  (en = ethylenediamine), forms two atropisomeric receptors that bind guest **2** in water. a) Propose a structure for the formed host-guest complexes. b) Describe the host-guest binding interactions in the complexes. c) Propose why one complex is more stable than the other (10 pts).



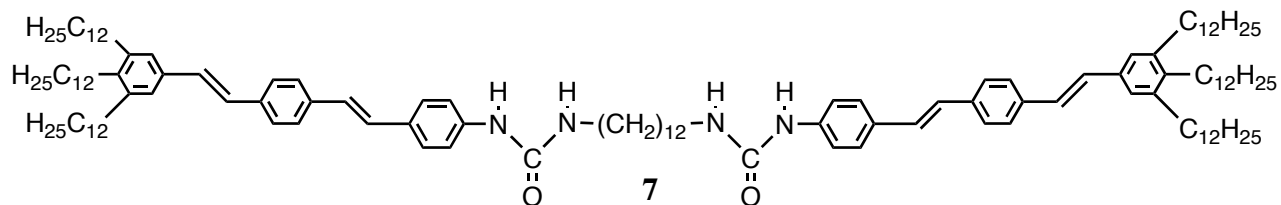
**Problem 2: A)** Propose a two-dimensional (2D) H-bonded network that glycoluril **3** can form in the crystal, forming H-bonds with all its donor and acceptor sites (4 pts).



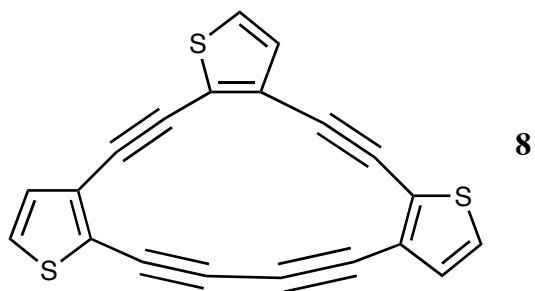
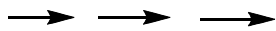
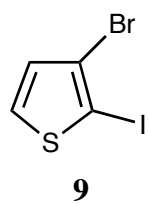
**B)** Nucleoside **4** (4 equiv.) and resorcin[4]arene cavitand **5** (1 equiv.) react to give a system **6**, in which the resorcin[4]arene platform stabilizes the intramolecular self-assembly of the four nucleobases on top. a) Show schematically product **6** and propose the key reaction conditions. b) Show the assembly (in  $\text{CHCl}_3$ ) of the four nucleobases atop the platform, indicating all H-bonds in the assembly (show only the assembly and a vector to the platform which needs not to be drawn. c) Which nucleobase (name) is it? (6 pts).



**Problem 3:** Compound **7** forms a stable one-dimensional, ribbon-type surpramolecular polymer by self-association. This self-association encompasses all parts of the molecule. a) Show how molecules of **7** interact with each other, indicating the various intermolecular bonding forces (it is sufficient to show three interacting molecules). b) Propose a multi-step synthesis of **7** starting from benzene derivatives and using  $\text{OCN}-(\text{CH}_2)_{12}-\text{NCO}$  (several routes are possible; show the main reagents and conditions). (20 pts).



**Problem 4:** Suggest a synthesis of **8** starting from thiophene **9**. Show reagents and key reaction conditions (10 points).



**Problem 5:** Suggest a synthesis of **10** (indicate reagents and pertinent reaction conditions) starting from resorcinol ether **11** and using **12** (among other intermediates known to you) (10 points).

