**Literature Discussion of “A Synthetic Cavity Assembles Through Self-Complementary Hydrogen Bonds”**

Rene Wyler, Javier de Mendoza, and Julius Rebek Jr. *Angewandte Chemie Int. Ed. Engl.* **1993**, *32* (12), 1699-1701.

And **“Encapsulation of Methane and Other Small Molecules in a Self-Assembling Superstructure”**

N. Branda, R. Wyler, J. Rebek Jr. *Science* **1994** *263*, 1267-1268.

For the following questions, the notation **1**·**1** denotes the dimer of compound **1** and the notation [**1**·**1** & “guest”] refers to a small molecule guest encapsulated by (inside) host **1**·**1**.

Questions relating to the *Angewandte Chemie* article:

1. List two examples of biological molecules that can assemble into larger structures via weak intermolecular forces.

2. Figure 1 and Figure 3 show how two *C*-shaped molecular subunits of compound **1** (Figure 2) can assemble for form a structure analogous to a tennis ball. The necessary *C*-shape of **1** is derived from the durene tetrabromide (**3**) portion of the molecule.

a) Draw the conformation of durene tetrabromide (**3**) that would lead to this *C* shape.

b) Draw the alternate conformation of 3 that is *S*-shaped.

3. Diphenylglyoluril **2** is synthesized from benzil and 2 equivalents of what compound? Note that this reaction is not described in detail in the article but the answer may be generated using retrosynthetic analysis.



4. Draw a curved arrow mechanism to describe the reaction of diphenylglycoluril **2** and 1,2-bis(chloromethyl)-4,5-dimethylbenzene (**4**) to form compound **5**. What common organic reaction mechanism appears in this transformation?

5. Draw a figure that explains how DMSO disrupts the hydrogen bonding of dimer **1**·**1**.

6. What would be a likely reason that the authors used diphenylglycoluril (**2**) rather than glycoluril (**2** with hydrogens in place of the phenyl groups)in the synthesis of **1**?



7. List the three techniques used by the authors to establish that **1**·**1** was formed in solution. Briefly describe how each technique provided evidence.

Questions relating to the *Science* article:

8. Describe the ways in which the *Science* article builds upon the work in the *Angewandte Chemie* article.

9. Write the reaction that corresponds to the value of *K*inc discussed in the article for

[**1**·**1** & CH4]. Write *K*inc in terms of reactants and products. Why does *K*inc have units of *M-1*?

10. Explain why S is negative for the encapsulation of CH4 by **1**·**1**.

11. If S is negative for encapsulation of CH4 by **1**·**1**, H must be negative. Briefly explain why.

12. Refer to Figure 3. How did the authors use the plot to obtain the H values in Table 1?

13. Refer to Table 1. Why is *K*inc for [**1**·**1** & CHCl3] nearly four orders of magnitude smaller than *K*inc for [**1**·**1** & CH4]?

14. Refer to Table 1. What percentage of the interior volume of host **1**·**1** was filled by CH4?