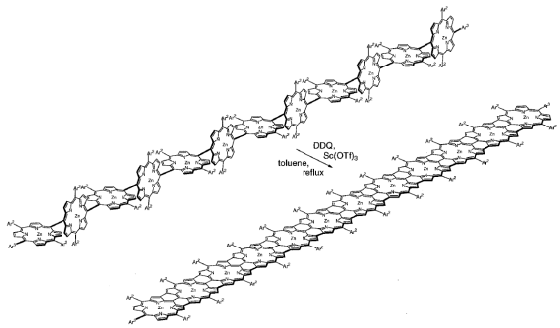
Core Course 2002
Homework Part II, Problem Set 1

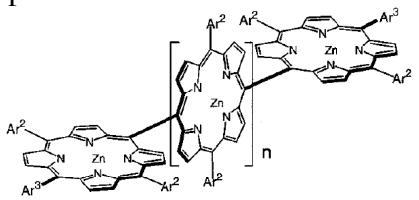
In a recent issue of Science, investigators reported the synthesis and characterization of fused porphyrin systems, as illustrated here.



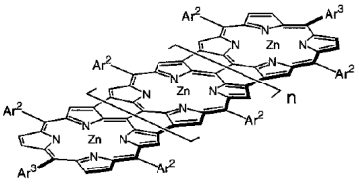
Scheme 2.

www.sciencemag.org SCIENCE VOL 293 6 JULY 2001

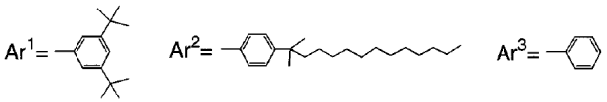
To be more complete, they characterized a series of constructs of varying lengths and measured their absorption properties. Absorption spectra are shown below:



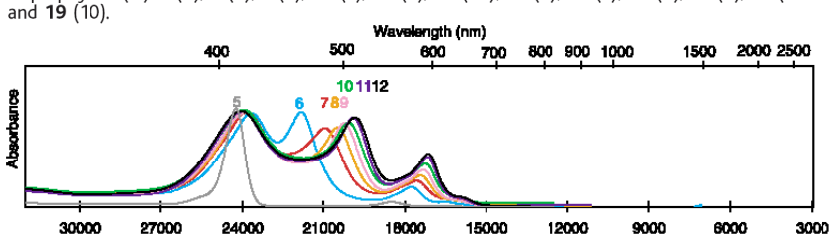
7–12

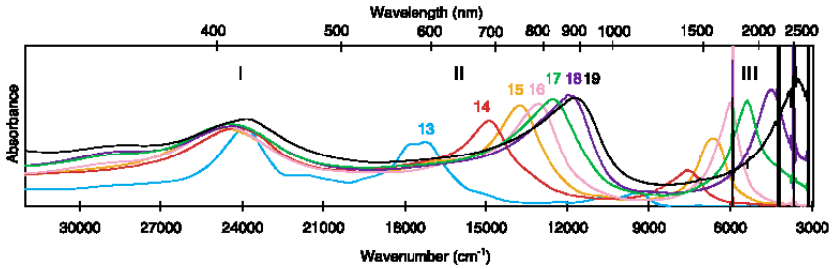


14–19



Scheme 1. **1**, M = Cu, $R^1 = R^2 = Ar^1$; **3**, M = Zn, $R^1 = R^2 = Ar^1$; **6**, M = Zn, $R^1 = Ar^2$, $R^2 = Ar^3$; **2**, M = Cu, $R^1 = R^2 = Ar^1$; **4**, M = Zn, $R^1 = R^2 = Ar^1$; **13**, M = Zn, $R^1 = Ar^2$, $R^2 = Ar^3$. Number of porphyrins (*N*): **7** (1), **8** (2), **9** (3), **10** (4), **11** (6), **12** (10); **14** (1), **15** (2), **16** (3), **17** (4), **18** (6), and **19** (10).





1. Assuming that the largest fused system (19) is a one dimensional particle in a box, with box size 100 Å, calculate the energy (in cm^{-1}) of the predicted lowest energy electronic transition.

2. Assuming that the largest fused system (19) is a TWO dimensional particle in a box, with well size 100 Å x 7 Å, calculate the energy (in cm^{-1}) of the predicted lowest energy electronic transition.

3. Why measure spectra of constructs 7-12? Explain their spectra.