Problem 33: Polymers

Figure 1. The Golden Larnax from the Tomb of the Greek king Philippos of Macedonia, discovered by the late Prof. M. Andronikos of the University of Thessaloniki, in Vergina, a place in Northern Greece close to Thessaloniki. Its cover depicts the 16-rayed star, emblem of the Macedonian Dynasty (Thessaloniki Archeological Museum)

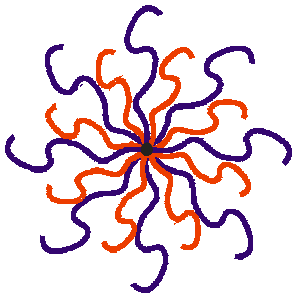
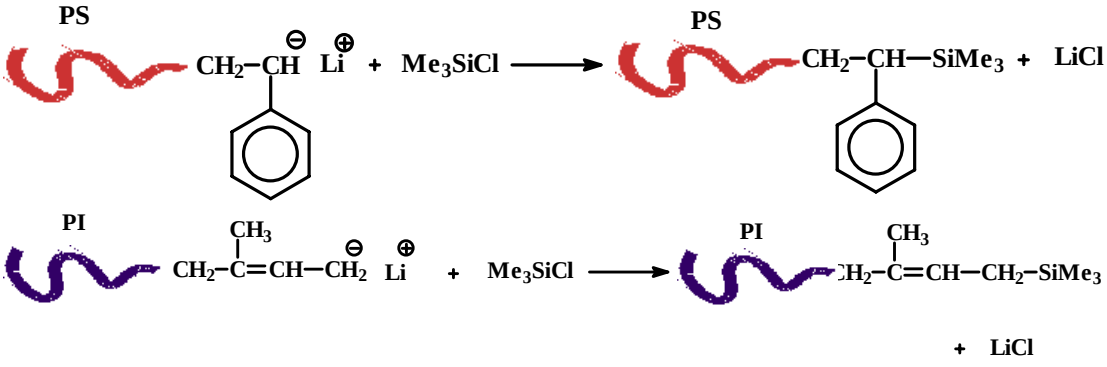
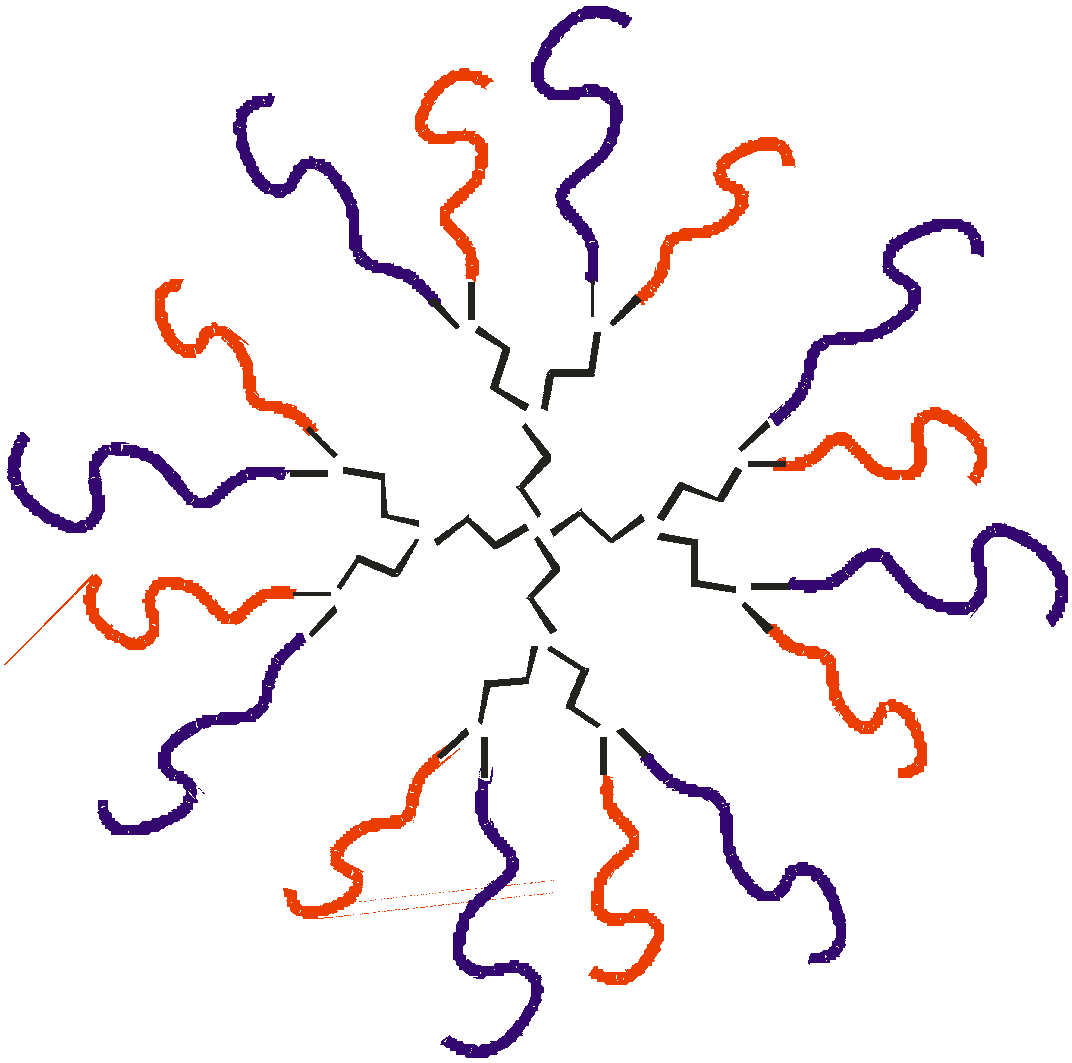


Figure 2. Vergina Star Copolymer: The similarity to the 16-rayed star emblem of the Macedonian Dynasty is obvious

1. The dimensions of the Larnax are 40.9 x 34.1 x 17.0 cm, and the molecular mass of the Vergina star copolymer is 1.0×10^6. If the copolymer density is 0.98 g cm^{-3}, how many Vergina star copolymer molecules are needed in order to fill the Larnax?

2. By using the reactions and the chemical structure of the Vergina star copolymer given below, propose a reaction scheme for the synthesis of the star:



where PS is polystyrene and PI is polyisoprene.