Problem Set 3 – Aromatic Systems

1. Which of the following structures represent aromatic systems?
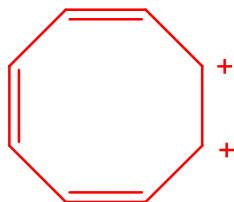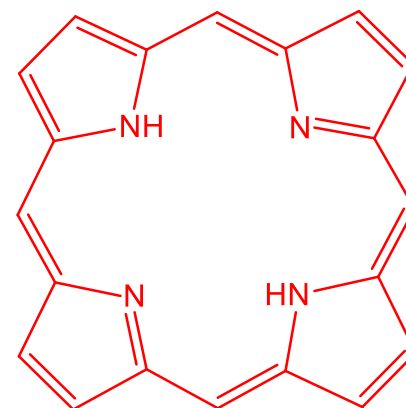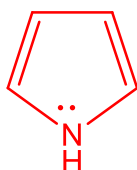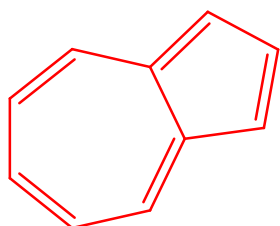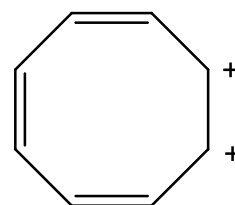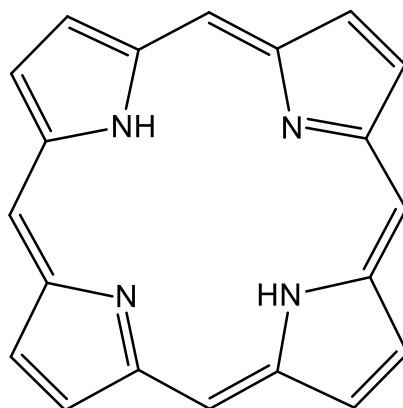
2. Sondheimer synthesized a series of conjugated cyclic polyalkenes which are known as [n]-annulenes where n indicates the size of the ring.
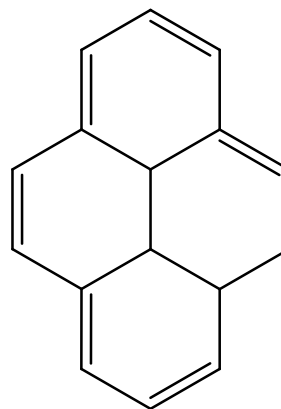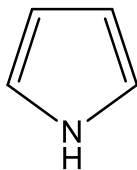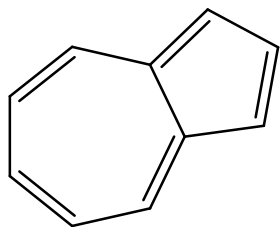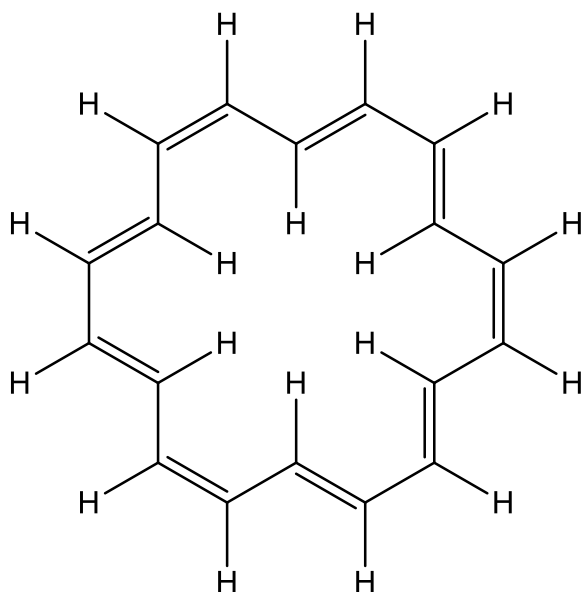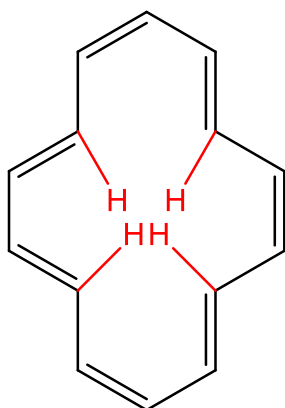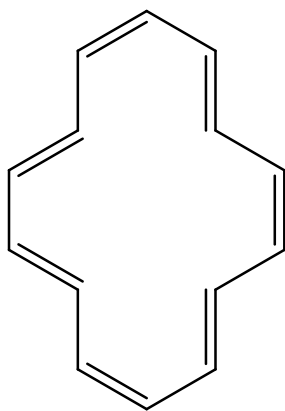
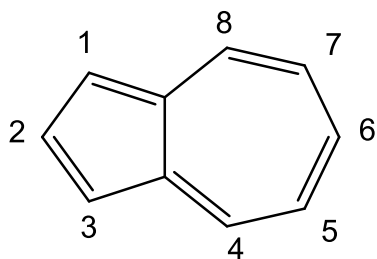   a. [18]-annulene, shown below, is aromatic. Explain.

[18]-annulene is cyclic and planar with 18 π electrons delocalized over the whole ring. 18 is a Hückel number.

b. [14]-annulene is not aromatic. It reacts with bromine at ambiant temperature. Explain.

3. Azulene is readily attacked by electrophiles at C-1 and by nucleophiles at C-4.

a. Azulene, is aromatic. Justify.

   The molecule is planar, cyclic with 10 π electrons delocalized.

b. One resonance structure of the cation formed by attack at carbon-1 is shown below. Justify electrophilic attack at this carbon.
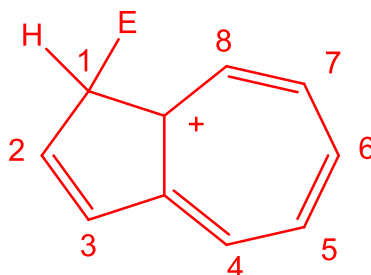
   The seven-membered ring is aromatic.

c. One resonance structure of the anion formed by attack at carbon-4 is shown below. Justify nucleophilic attack at this carbon.
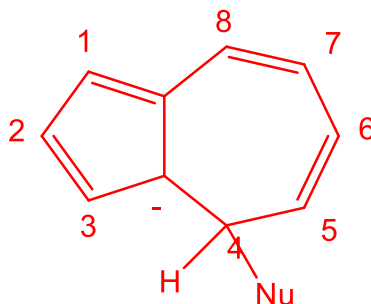
The five-membered ring is aromatic.