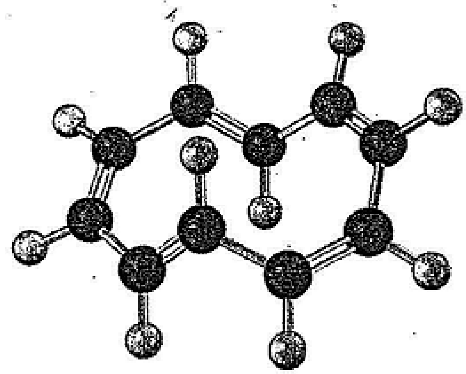
Problem 15.5

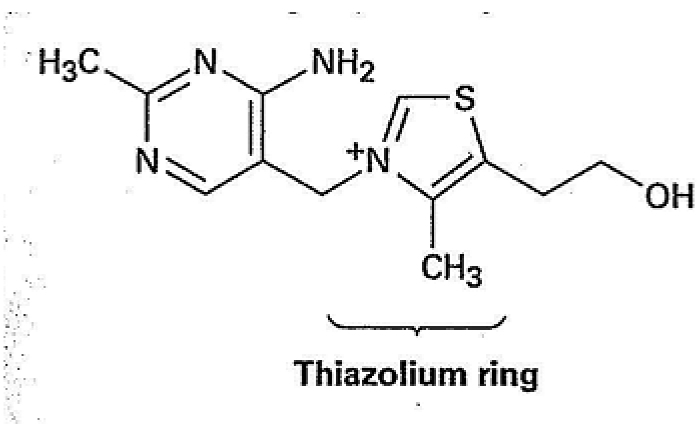
To be aromatic, a molecule must have $4n + 2$ π electrons and must have cyclic conjugation. 1,3,5,7,9-Cyclodecapentaene fulfills one of these criteria but not the other and has resisted all attempts at synthesis. Explain.



1,3,5,7,9-Cyclopentaene

Problem 15.10

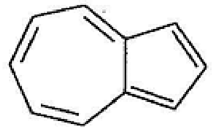
Thiamin, or Vitamin B1 contains a positively charged five-membered nitrogen-sulfur heterocycle called a *thiazolium* ring. Explain why the thiazolium ring is aromatic.



Thiamin

Problem 15.11

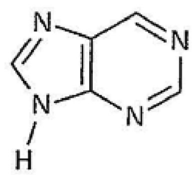
Azulene, a beautiful blue hydrocarbon, is an isomer of naphthalene. Is azulene aromatic? Draw a second resonance form of azulene in addition to that shown.



Azulene

Problem 15.12

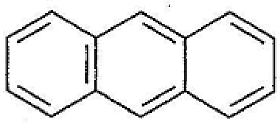
How many electrons does each of the four nitrogen atoms in purine contribute to the aromatic π system?



Purine

Problem 15.25

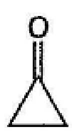
Anthracene has four resonance structures, one of which is shown. Draw the other three.

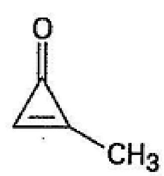


Anthracene

Problem 15.31

Cyclopropanone is highly reactive because of its large amount of angle strain, but methylcyclopropenone, although even more strained than cyclopropanone, is nevertheless quite stable and can even be distilled. Explain, taking the polarity of the carbonyl group into account.

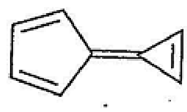




Cyclopropanone **Methylcyclopropenone**

Problem 15.35

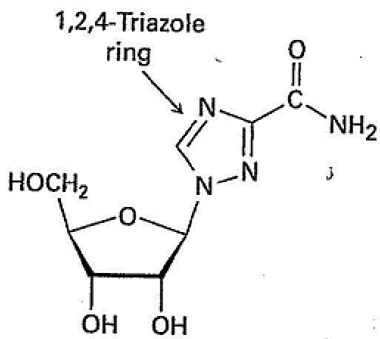
Calicene, like azulene (Problem 15.17), has an unusually large dipole moment for a hydrocarbon. Explain, using resonance structures.



Calicene

Problem 15.38

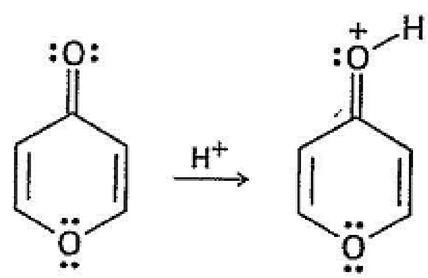
Ribavirin, an antiviral agent used against hepatitis C and viral pneumonia, contains a 1,2,4-triazole ring. Why is the ring aromatic?



Ribavirin

Problem 15.42

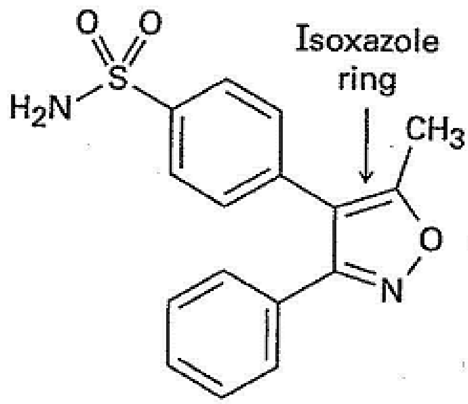
On reaction with acid, 4-pyrone is protonated on the carbonyl-group oxygen to give a stable cationic product. Using resonance structures and the Hückel $4n + 2$ rule, explain why the protonated product is so stable.



4-Pyrone

Problem 15.43

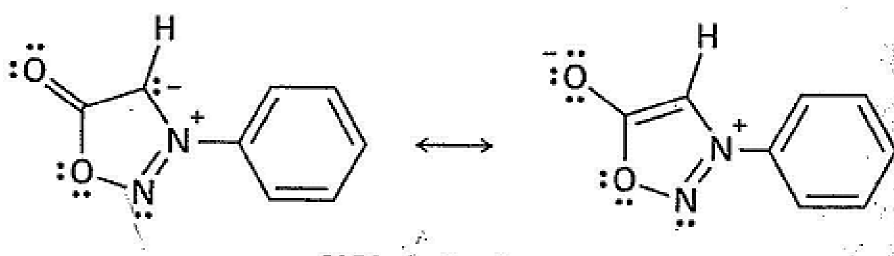
Bextra, a COX-2 inhibitor used in the treatment of arthritis, contains an isoxazole ring. Why is the ring aromatic?



Bextra

Problem 15.44

N-Phenylsydnone, so-named because it was first studied at the University of Sydney, Australia, behaves like a typical aromatic molecule. Explain, using the Hückel $4n + 2$ rule.



***N*-Phenylsydnone**