

CHEM322/362 Test Thursday 12 May 2005

NAME: (Print clearly)

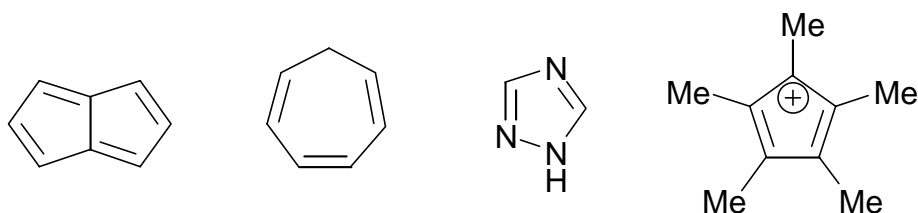
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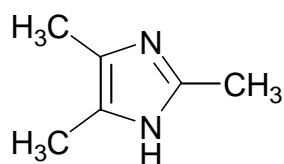
Answer all eleven questions.

Total marks: 50 Time allowed: 50 minutes

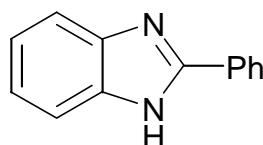
- (1) [4 marks] List the criteria that an organic molecule must possess in order to be aromatic.
- (2) [4 marks] For each of the structures shown below indicate whether it would be aromatic, antiaromatic or non-aromatic.



- (3) [5 marks] Describe, in words, the structure of C_{60} .
- (4) [4 marks] The chemistry of C_{60} has been classified into the following three areas: intercalation compounds, exohedral compounds and endohedral compounds. Explain what these terms mean.
- (5) [4 marks] Pyridine is sometimes described as π -deficient. What does this mean?
- (6) [6 marks] Imidazoles are most commonly prepared by reaction of a 1,3-binucleophile with a 1,2-bielectrophile, whereas benzimidazoles are usually made from 1,4-binucleophiles and 1,1-bielectrophiles. Show how these procedures could be used to prepare the two derivatives shown below.



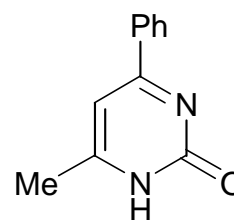
2,4,5-trimethylimidazole



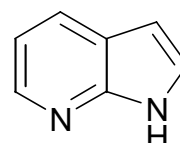
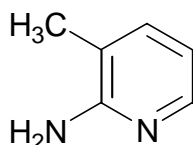
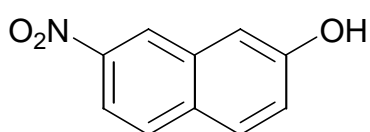
2-phenylbenzimidazole

- (7) [2 marks] Explain why 2,4,5-trimethylimidazole (above) shows only two signals for the three methyl groups in its NMR spectra.

(8) [5 marks] Suggest a method of synthesis for the molecule shown below and draw three other tautomers for this compound.



(9) [3 marks] Indicate (with an arrow) where you would expect each the following compounds to undergo electrophilic substitution.



(10) [5 marks] List the most commonly employed reaction types used for the formation of bonds in the construction of heterocyclic compounds.

(11) [8 marks] Predict the structures of the heterocyclic products of the following reactions:

