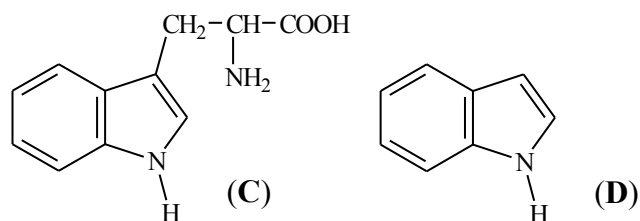


Marks
3

- The side-chain of the amino acid tryptophan (**C**) is a substituted derivative of the heterocycle indole (**D**). Explain with the aid of diagrams whether you would expect indole to have aromatic stability or not. Would you expect the nitrogen atom of indole to be basic? Give reasons for your answer.

**Indole is aromatic:**

- It is a fused ring system with all rings co-planar
- All atoms in the rings are sp^2 hybridised with p-orbitals perpendicular to the ring
- It has 10 π electrons, which obeys the $(4n + 2)$ rule with $n = 2$ required for aromaticity. These 10 electrons comes from 4 C=C ($2 e^-$ each) plus the lone pair from the nitrogen.

Indole is not basic as the "lone pair" on the nitrogen is part of the aromatic π system and thus not free to react.