29 The structure of benzene – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)
delocalised	

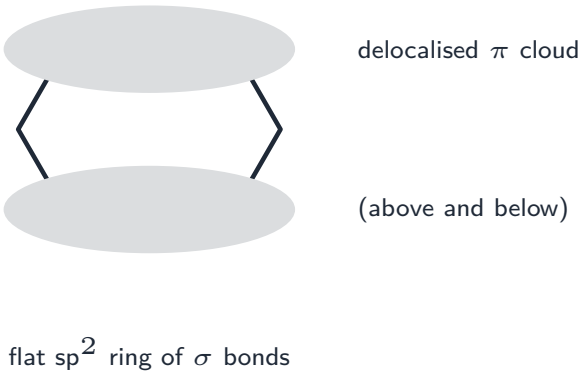
Recall

Benzene is unusually stable. Its structure – a ring of shared electrons – explains why.

New ideas

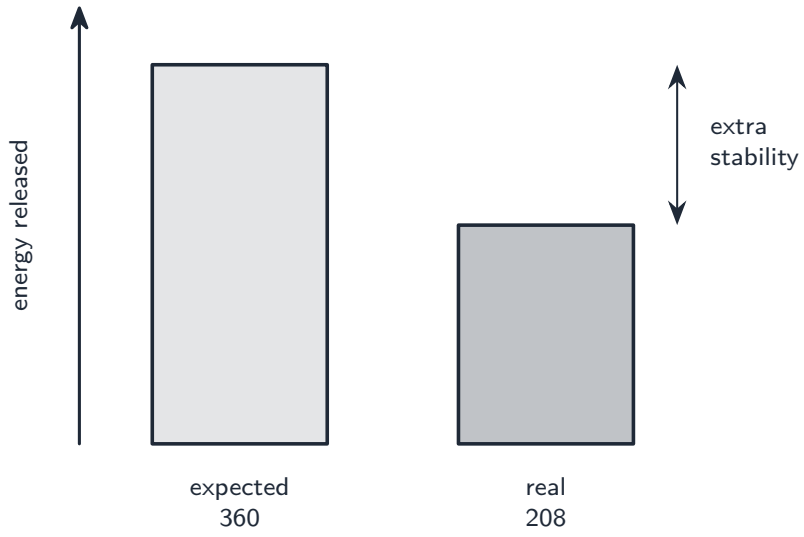
Read these first, then do the Practice.

1 The bonding



Each carbon makes a flat ring of **sigma bonds** (σ bonds). The leftover p orbitals overlap all the way round into one **delocalised pi-bond** (π) cloud, so all six C–C bonds are equal and the ring is very stable.

■ 2 The evidence



Hydrogenating benzene releases far *less* energy than a model of three separate double bonds predicts (208 vs 360 kJ mol^{-1}) – proof that benzene is extra stable.

Watch out: all six C–C bonds in benzene are *equal* (between a single and a double bond) because the π electrons are delocalised over the whole ring – it is *not* alternating single/double (Kekulé) bonds.

Practice

Try these in order.

29.6 What shape is the benzene molecule? [1]

29.7 What kind of bond system do the p orbitals make? [1]

29.8 Because the electrons are shared evenly, what is true of the six C–C bonds? [1]

29.9 Does real benzene release more or less hydrogenation energy than the model predicts? [1]

29.10 What does that smaller energy show about benzene? [1]

29.11 Challenge. Hydrogenating benzene releases about 208 kJ mol^{-1}, but a model of three separate C=C bonds predicts about 360 kJ mol^{-1}. Explain what this difference shows. [2]