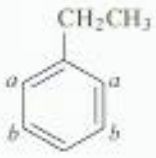


11

As only six signals are observed for Compound **11**, there must be some equivalence in the compound.

The NMR data show that there is only one CH_3 group, so the aromatic ring in Compound **11** must be monosubstituted.

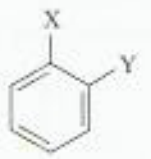
Aromatic carbon atoms bearing the same letter in the structure in the margin are equivalent, so the six observed NMR signals are explained.

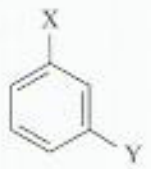
Compound **12**	q at 16 p.p.m.	CH_3	aliphatic
	q at 24 p.p.m.	CH_3	aliphatic
	t at 29 p.p.m.	CH_2	aliphatic
	d at 34 p.p.m.	CH	aliphatic
	d at 127 p.p.m.	CH	aromatic
	d at 128 p.p.m.	CH	aromatic
	s at 142 p.p.m.	C	aromatic
	s at 145 p.p.m.	C	aromatic

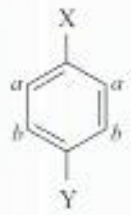
As only eight signals are observed for Compound **12**, there must be some equivalence in the compound.

At this point, you may simply reconcile the NMR data with one possible structure suggested by your knowledge of Friedel–Crafts chemistry.

The presence of two singlets in the aromatic region indicates disubstitution in Compound **12** (once again, carbon atoms bearing the same letter in the *para*-disubstituted compound are equivalent). The following possibilities must be considered, and the number of signals that they would generate in the aromatic region of the ^{13}C NMR spectrum:







number of signals in the aromatic region of the NMR spectrum	six	six	four

Four aromatic signals are observed in the NMR spectrum of Compound **12**; hence it must be 1,4-disubstituted.

As there is an ethyl group present in Compound **11**, the only possible structure for Compound **12** is

12

This fits the expected behaviour in the Friedel–Crafts alkylation reaction.