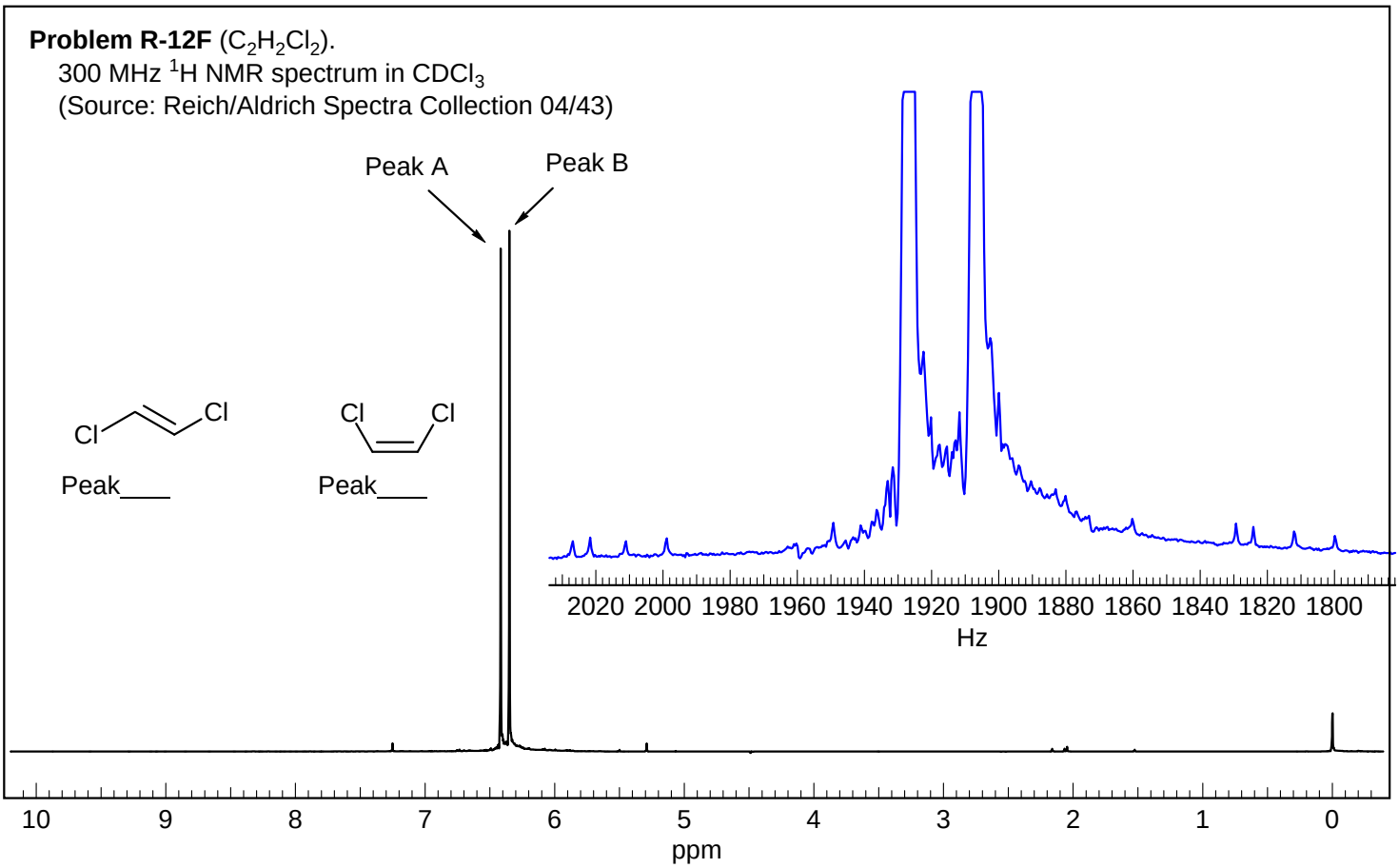
Problem R-12F. Below is the 300 MHz ^{1}H NMR spectrum of a nearly 1:1 mixture of the *E* and *Z* isomers of 1,2-dichloroethylene. Also shown is a vertical and horizontal expansion.

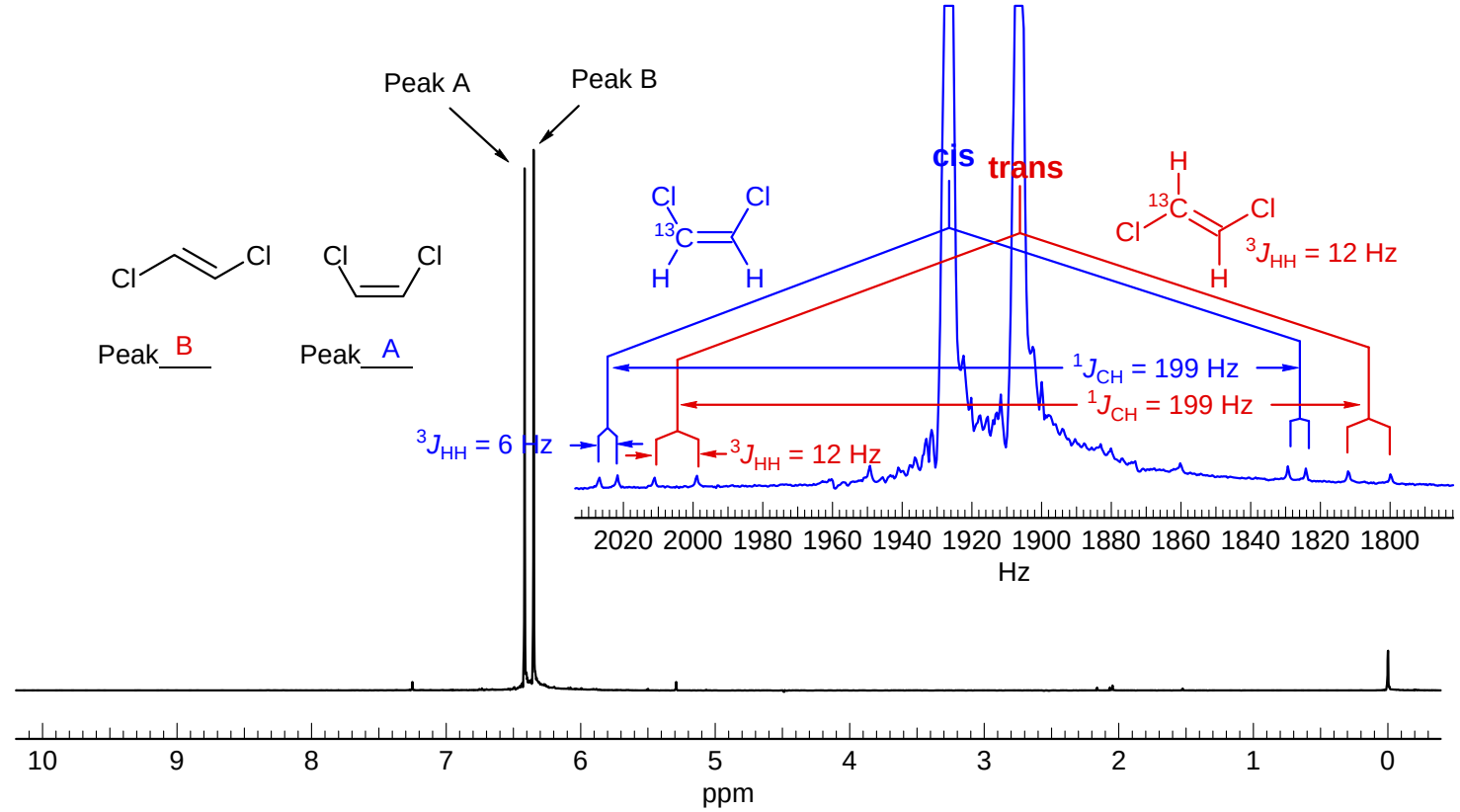


Indicate which peak (A or B) is cis and which is trans 1,2-dichloroethylene. Summarize all chemical shift and/or coupling information you obtained from the spectrum.

10

Problem R-12F. Below is the 300 MHz ^{1}H NMR spectrum of a nearly 1:1 mixture of the *E* and *Z* isomers of 1,2-dichloroethylene. Also shown is a vertical and horizontal expansion.

Problem R-12F ($C_2H_2Cl_2$).
300 MHz ^{1}H NMR spectrum in $CDCl_3$
(Source: Reich/ASV 04/43)



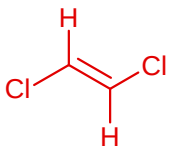
3

Indicate which peak (A or B) is cis and which is trans 1,2-dichloroethylene. Summarize all chemical shift and/or coupling information you obtained from the spectrum.

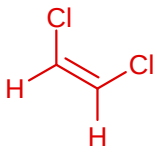
The cis and trans 3-bond J_{HH} can be measured directly from the ^{13}C satellites of each peak - the one at δ 6.42 has a coupling of 6 Hz, thus cis isomer, the one at δ 6.35 has J_{HH} = 12 Hz, so trans isomer

7

2 pts J_{CH}
3 pts J_{HH}
2 pts reasoning



5.25
gem-Cl 1.08
t-Cl 0.13
Calc: 6.46



5.25
gem-Cl 1.08
c-Cl 0.18
Calc: 6.51

NOTE: The ^{13}C peaks are only 0.5 ppm apart, so also not suitable making a stereochemical assgnment