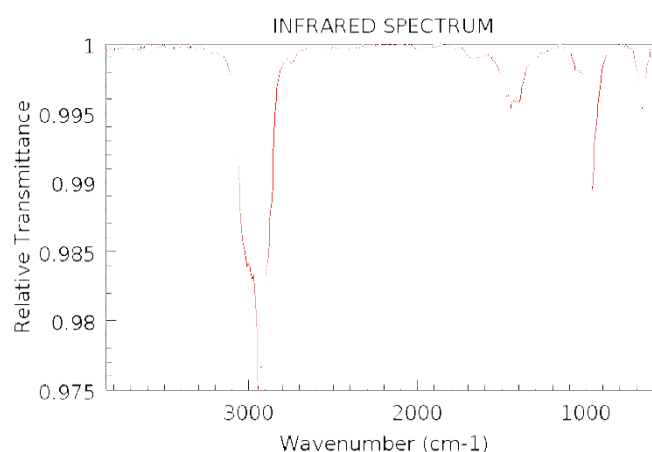
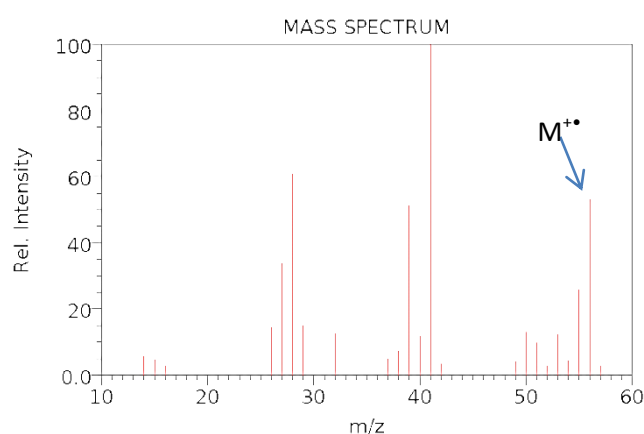
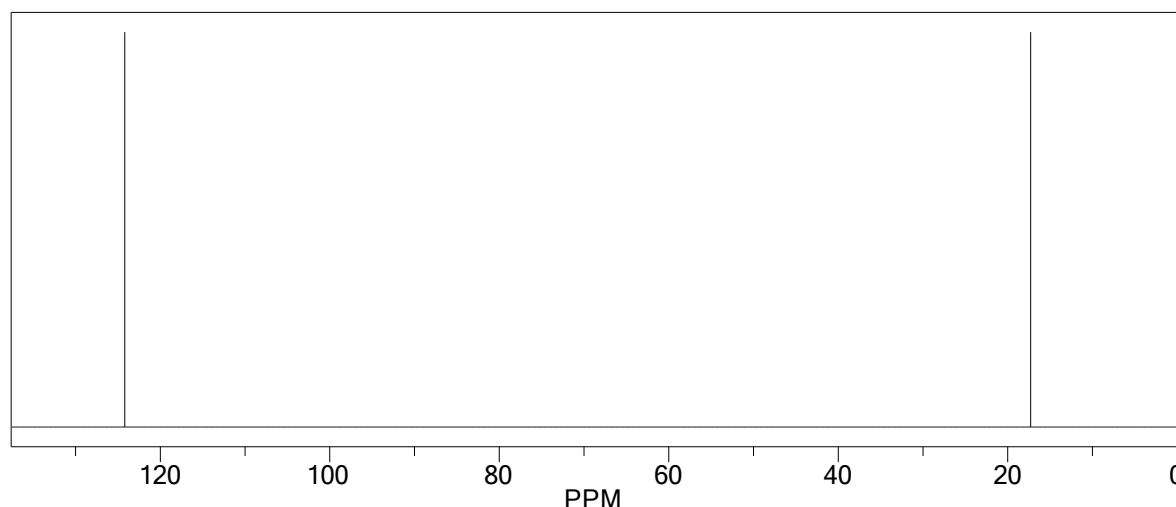


Below are the spectra-data for Compound F



The mass spectrum indicates the molar mass of the molecule is 56.

The IR shows a peak approximately  $\sim 1600 \text{ cm}^{-1}$  indicating a possible C=C bond

$^{13}\text{C}$  NMR spectrum also support the present of C=C

However, since there is only one C=C signal in the  $^{13}\text{C}$  NMR it means the C=C is in the middle of a symmetrical molecule.

Ethene will only give one signal in  $^{13}\text{C}$  NMR

Propene is not symmetrical

Butene has three structural isomer, 2-methyl prop-1-ene, But-1-ene and But-2-ene and both have a molecular formula  $\text{C}_4\text{H}_8$  which has a molecular mass of 56

2-methyl prop-1-ene has 3 carbon environments

But-1-ene has 4 carbon environments

But-2-ene has 2 carbon environments

However, from the data, we cannot determine is it a cis or trans isomer