

Organic Chemistry | (7th Edition)

Chapter 10, Problem 56P

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Step-by-step solution

Step 1 of 45

(a) Given compound is:



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Step 2 of 45

So, let us mark the carbons as a group:



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Step 3 of 45

Here, the number of signals we will get from proton decoupled, ^{13}C spectra is: 2.

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three protons (CH_3), two protons (CH_2) and one proton (CH)'.

Here we will get the spectrums individually.

(1) Spectrum will show one signal for (CH)

(2) Spectrum will show one signal for (CH_2)

[Comment](#)

Step 4 of 45

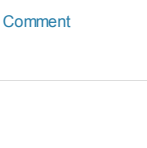
(b) Given molecule is:



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Step 5 of 45

Let us mark the carbons as a group:



[Comment](#)

Step 6 of 45

Here, the number of signals we will get from proton decoupled, ^{13}C spectra is: 2.

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three proton (CH_3), two proton (CH_2) and one proton (CH)'.

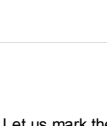
Here we will get the spectrums individually.

(1) Spectrum will show one signal for (CH_2)

[Comment](#)

Step 7 of 45

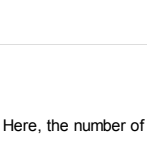
(c) Given molecule is:



[Comment](#)

Step 8 of 45

Let us mark the carbons as a group:



[Comment](#)

Step 9 of 45

Here, the number of signals we will get from proton decoupled, ^{13}C spectra is: 2.

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three protons (CH_3), two proton (CH_2) and one proton (CH)'.

Here we will get the spectrums individually.

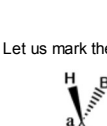
(1) Spectrum will show one signal for (CH)

(2) Spectrum will show one signal for (CH_2)

[Comment](#)

Step 10 of 45

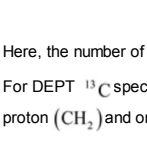
(d) Given molecule is:



[Comment](#)

Step 11 of 45

Let us mark the carbons as a group:



[Comment](#)

Step 12 of 45

Here, the number of signals we will get from proton decoupled, ^{13}C spectra is: 2.

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three proton (CH_3), two proton (CH_2) and one proton (CH)'.

Here we will get the spectrums individually.

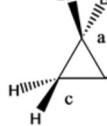
(1) Spectrum will show one signal for (CH)

(2) Spectrum will show one signal for (CH_2)

[Comment](#)

Step 13 of 45

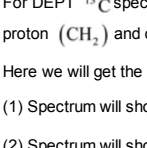
(e) Given molecule is:



[Comment](#)

Step 14 of 45

Let us mark the carbons as a group:



[Comment](#)

Step 15 of 45

Here, the number of signals we will get from proton decoupled, ^{13}C spectra is: 3

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three proton (CH_3), two proton (CH_2) and one proton (CH)'.

Here we will get the spectrums individually.

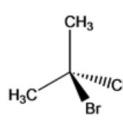
(1) Spectrum will show one signal for (CH)

(2) Spectrum will show one signal for (CH_2)

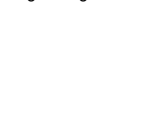
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Step 16 of 45

(a) Given isomers:



A



B



C

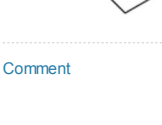
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Step 17 of 45

Consider A:

(i) Number of signals:

Let us draw the hashed-wedged diagram of the molecule A:



[Comment](#)

Step 18 of 45

Let us draw the mirror bisecting the molecule, we get one half is the mirror image of another half.



[Comment](#)

Step 19 of 45

So, let us mark the equivalent carbons as a group:



[Comment](#)

Step 20 of 45

So, the number of signals we will get in ^{13}C NMR: 4.

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three proton (CH_3), two proton (CH_2) and one proton (CH)'.

Here we will get the spectrums individually.

(1) Spectrum will show two signals for (CH_3)

(2) Spectrum will show one signal for (CH_2)

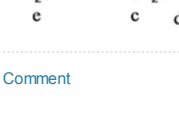
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Step 21 of 45

Consider B:

(i) Number of signals:

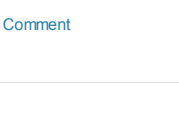
Let us draw the hashed-wedged diagram of the molecule B:



[Comment](#)

Step 22 of 45

Let us draw the mirror bisecting the molecule, we get one half is not the mirror image of another half. So, let us mark the equivalent carbons as a group:



[Comment](#)

Step 23 of 45

So, the number of signals we will get in ^{13}C NMR: 5

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three protons (CH_3), two proton (CH_2) and one proton (CH)'.

Here we will get the spectrums individually.

(1) Spectrum will show two signals for (CH_3)

(2) Spectrum will show two signals for (CH_2)

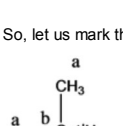
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Step 24 of 45

Consider C:

(i) Number of signals:

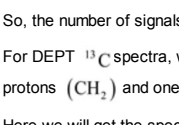
Let us draw the hashed-wedged diagram of the molecule:



[Comment](#)

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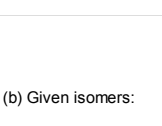
Let us draw the mirror bisecting the molecule, we get one half is the mirror image of another half.



[Comment](#)

Step 26 of 45

So, let us mark the equivalent carbons as a group:



[Comment](#)

Step 27 of 45

So, the number of signals we will get in ^{13}C NMR: 4.

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three protons (CH_3), two protons (CH_2) and one proton (CH)'.

Here we will get the spectrums individually.

(1) Spectrum will show one signal for (CH)

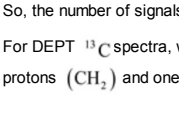
(2) Spectrum will show two signals for (CH_2)

(3) Spectrum will show one signal for (CH_3)

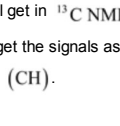
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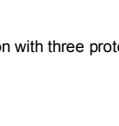
(b) Given isomers:



D



E



F

[Comment](#)

Step 29 of 45

Consider D:

(i) Number of signals:

This molecule is nonequivalent, so, the carbons are also nonequivalent.

So, let us mark the equivalent carbons as a group:

[Comment](#)

Step 30 of 45

So, the number of signals we will get in ^{13}C NMR: 4.

For DEPT ^{13}C spectra, we will get the signals as 'one carbon with three protons (CH_3), two protons (CH_2) and one proton (CH)'.

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