

# Infrared (IR) Spectroscopy

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from chapter(s) \_\_\_\_\_ in the recommended text

## A. Introduction

## B. Origin Of IR Absorbance

less

lower

accumulated after multiple scans

dipole

unsymmetrical

greater

faster

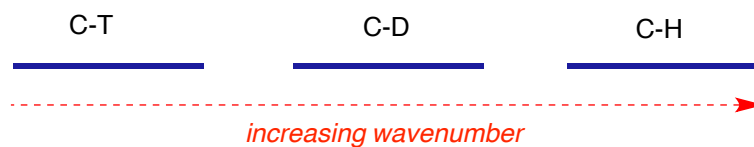
higher

cm<sup>-1</sup>.

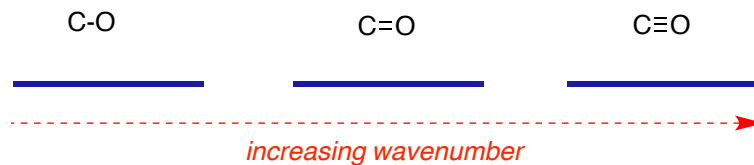
slower

lower wavenumber.

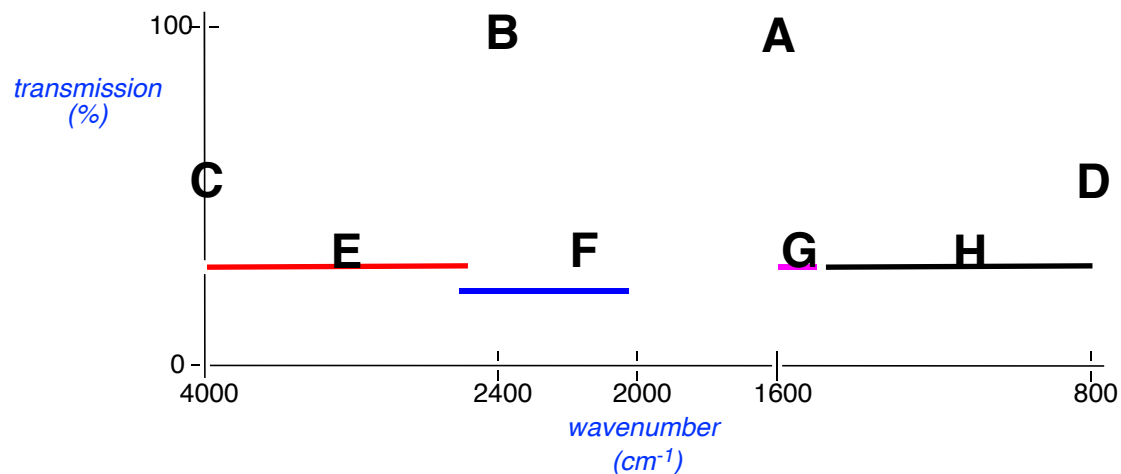
write C-H, C-D, and C-T  
above the appropriate lines



write  
C≡O    C-O    C=O  
above the appropriate lines



are  
inversely  
the same  
expanded below 2000 relative to the 4000 – 2000 cm<sup>-1</sup>.  
can



3000 cm<sup>-1</sup>

3300 cm<sup>-1</sup>

3500 cm<sup>-1</sup>

1600 - 1500 cm<sup>-1</sup>

1900 – 1500 cm<sup>-1</sup>.

1640 cm<sup>-1</sup> and absorb much less

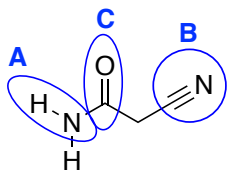
lower

1550 & 1350 cm<sup>-1</sup>.

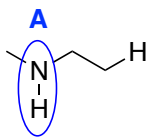
1030 – 1080 cm<sup>-1</sup>.

the fingerprint region

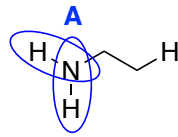
## C. Functional Group Assignments



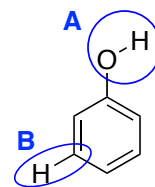
A 3300; B 2300; C 1690  $\text{cm}^{-1}$



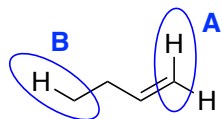
A 3300  $\text{cm}^{-1}$



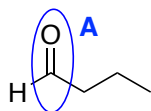
A 3300 and 3250  $\text{cm}^{-1}$



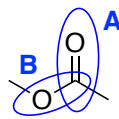
A 3400; B 3050  $\text{cm}^{-1}$



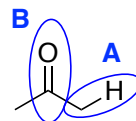
A 3050; B 2950  $\text{cm}^{-1}$



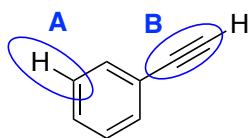
A 1730  $\text{cm}^{-1}$



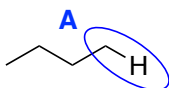
A 1735; B 1250  $\text{cm}^{-1}$



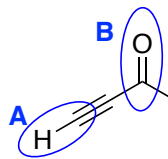
A 2950; B 1715  $\text{cm}^{-1}$



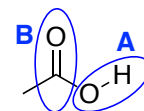
A 3050; B 2100  $\text{cm}^{-1}$



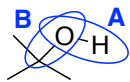
A 2950  $\text{cm}^{-1}$



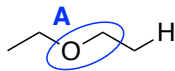
A 3300; B 1680  $\text{cm}^{-1}$



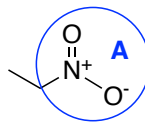
A 2900 (br); B 1690  $\text{cm}^{-1}$



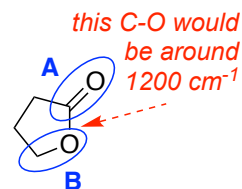
A 3400 (br); B 1100  $\text{cm}^{-1}$



A 1100  $\text{cm}^{-1}$

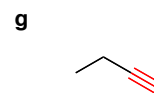
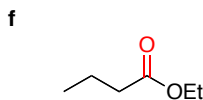
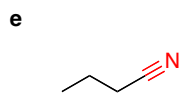
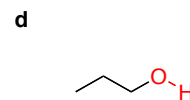
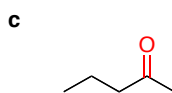
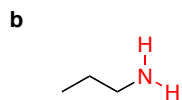


A 1560 and 1380  $\text{cm}^{-1}$

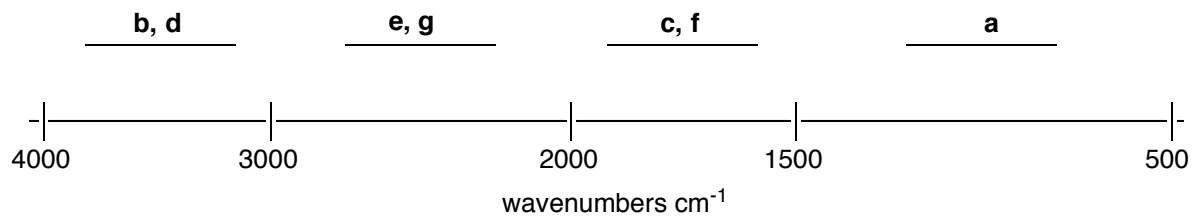


A 1770; B 1100  $\text{cm}^{-1}$

a "the "fingerprint region"



put letters  
on these lines  
to indicate  
the functional  
groups that  
absorb here



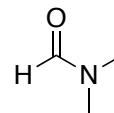
## D. Assigning Structures From Spectra



*acetone*



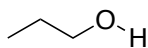
*acetonitrile*



*DMF*



*DMSO*



*n-propyl alcohol*



*pyridine*

is acetone .

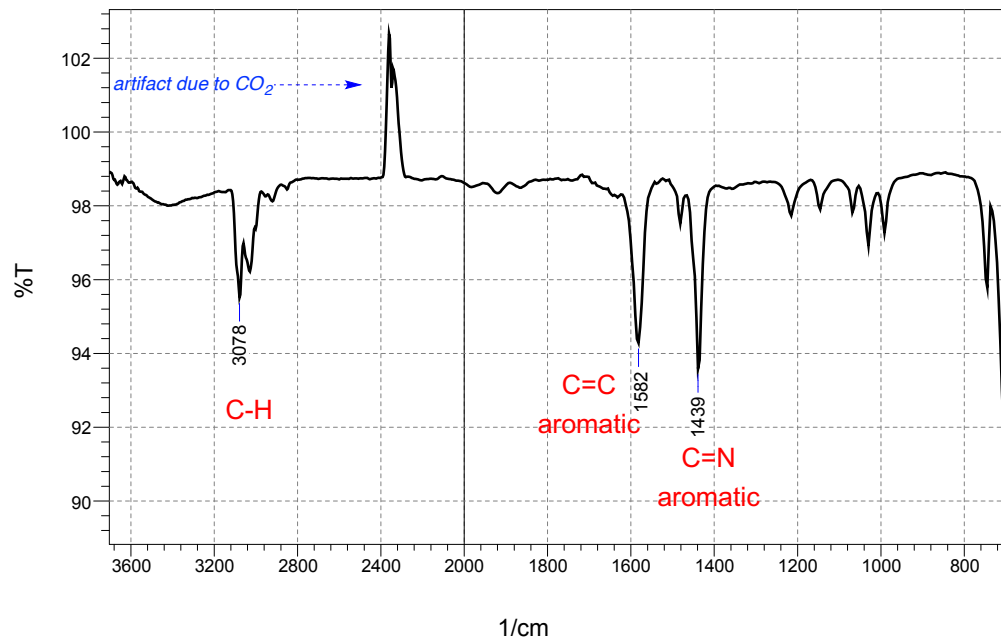
a C-H bond.

a C=O bond.

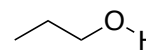
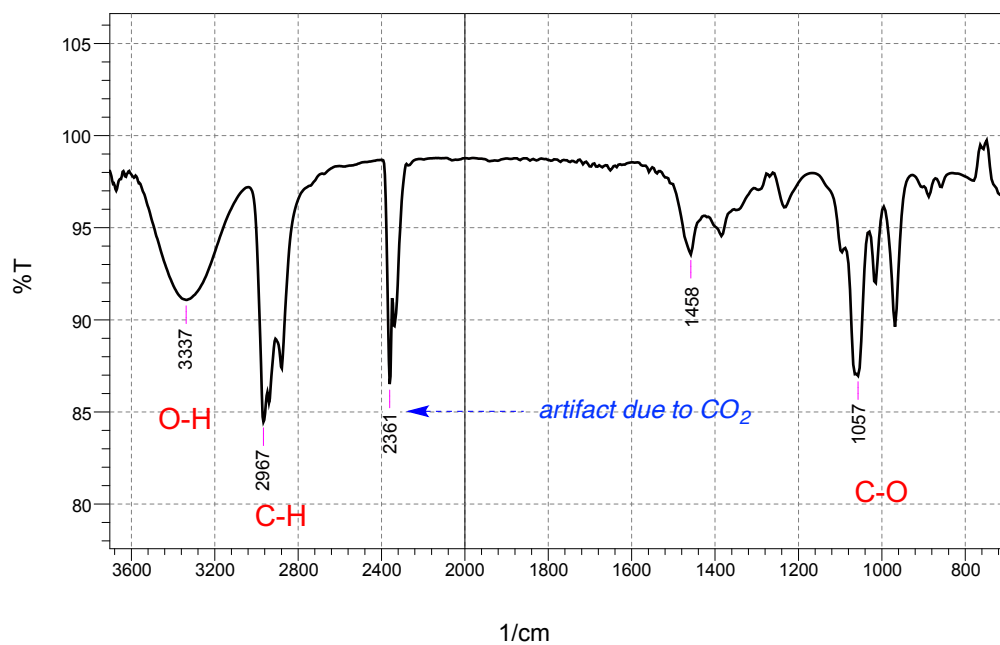
is acetonitrile .

a C-H bond.

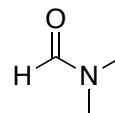
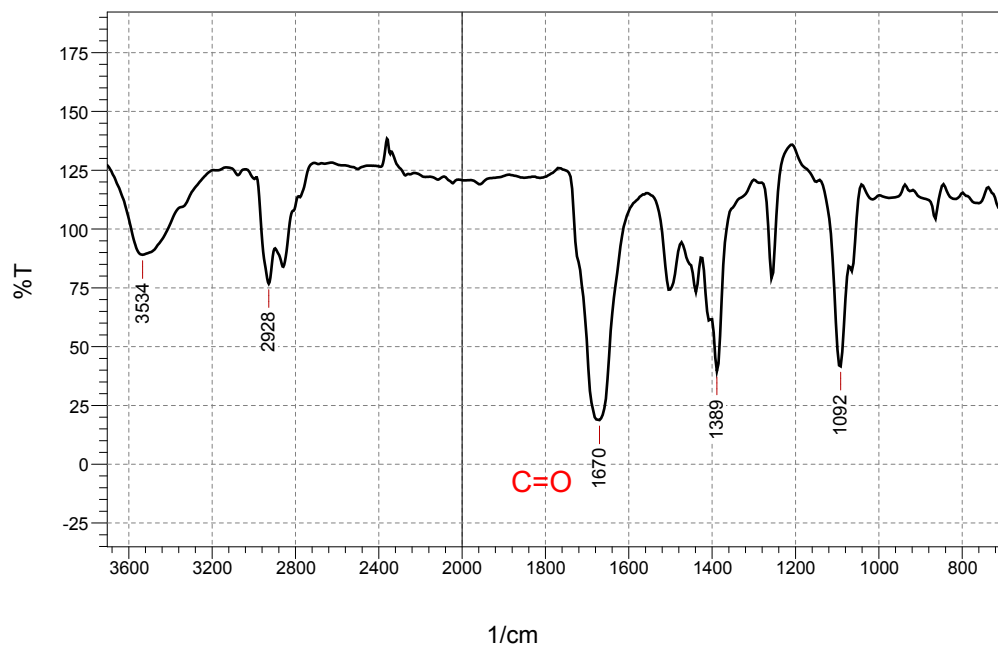
a C≡N bond.



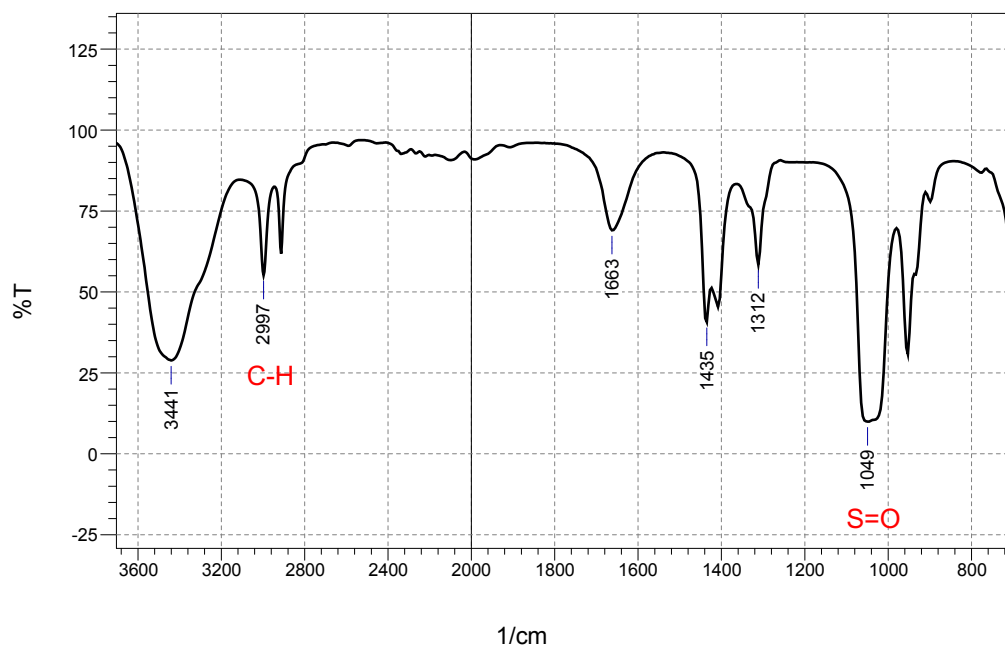
draw structure and attribute numbered IR stretches to particular bonds



draw structure and attribute numbered IR stretches to particular bonds

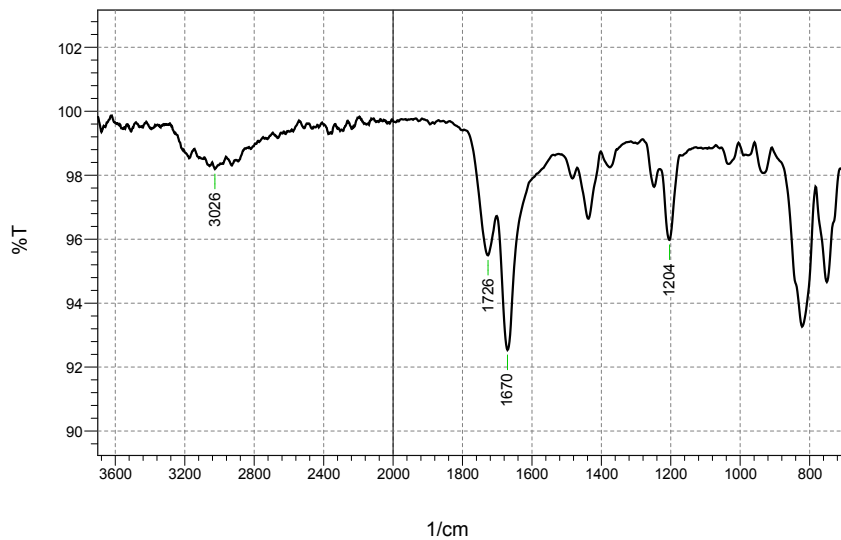


*draw structure and attribute numbered IR stretches to particular bonds*



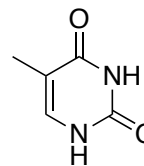
*draw structure and attribute numbered IR stretches to particular bonds*



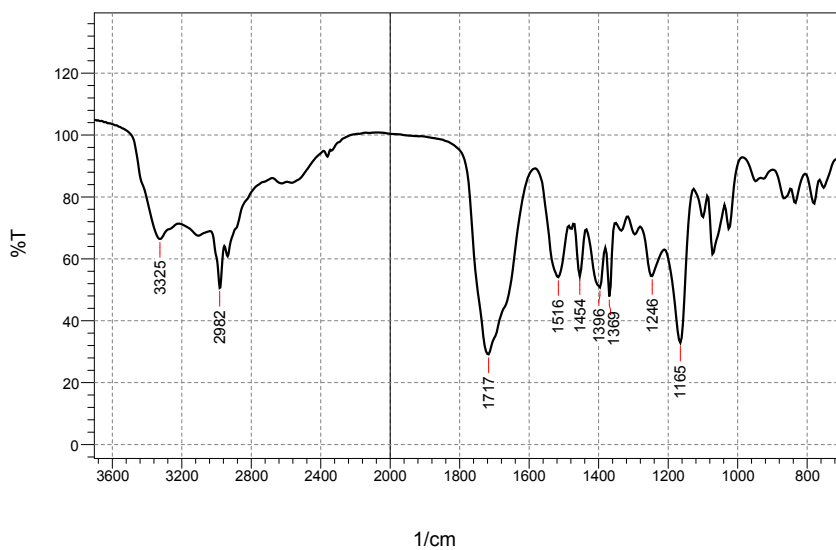


thymine

*compound name*

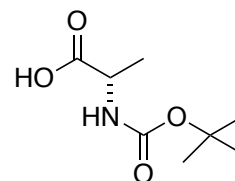


*compound structure*

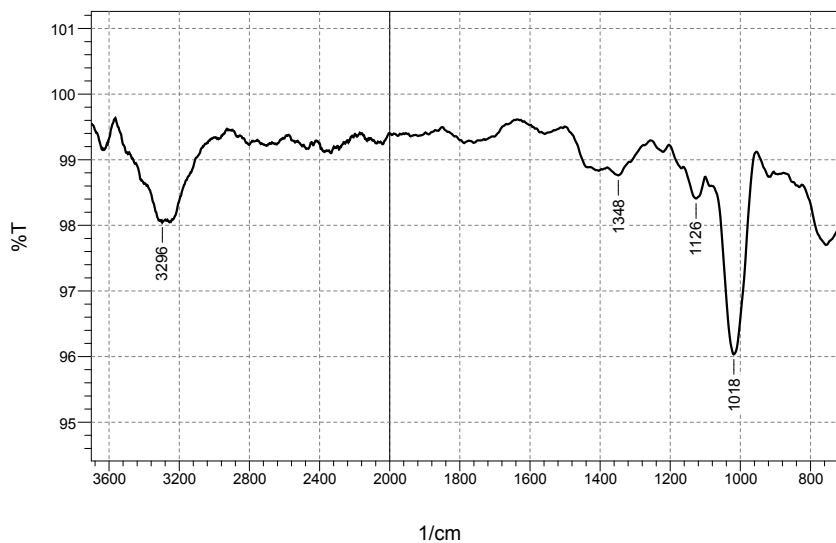


Boc-Ala

*compound name*

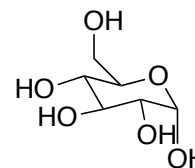


*compound structure*



glucose

*compound name*



*compound structure*

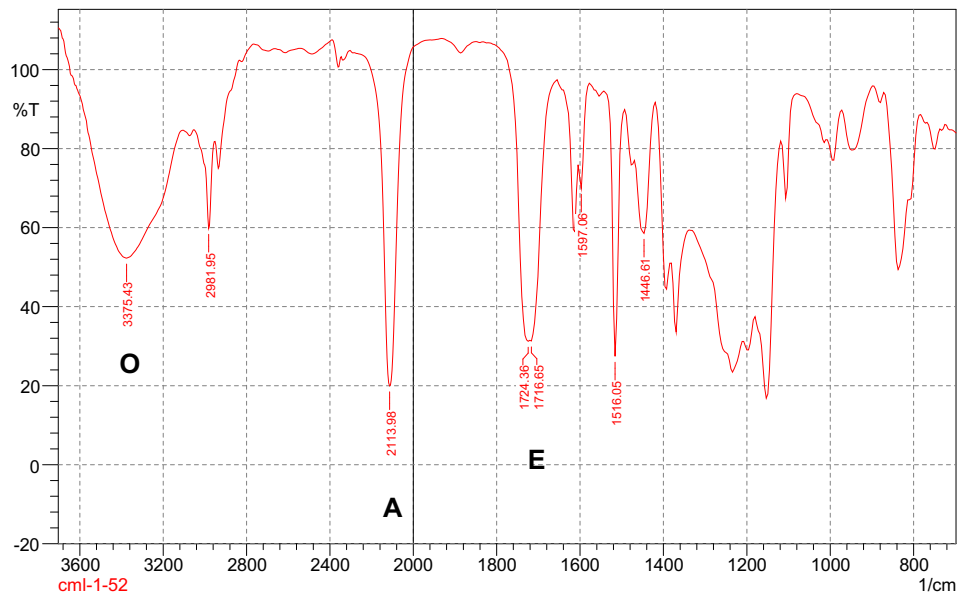
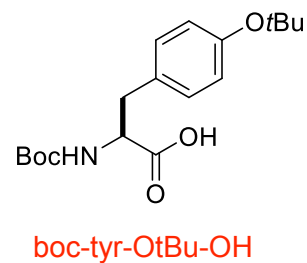
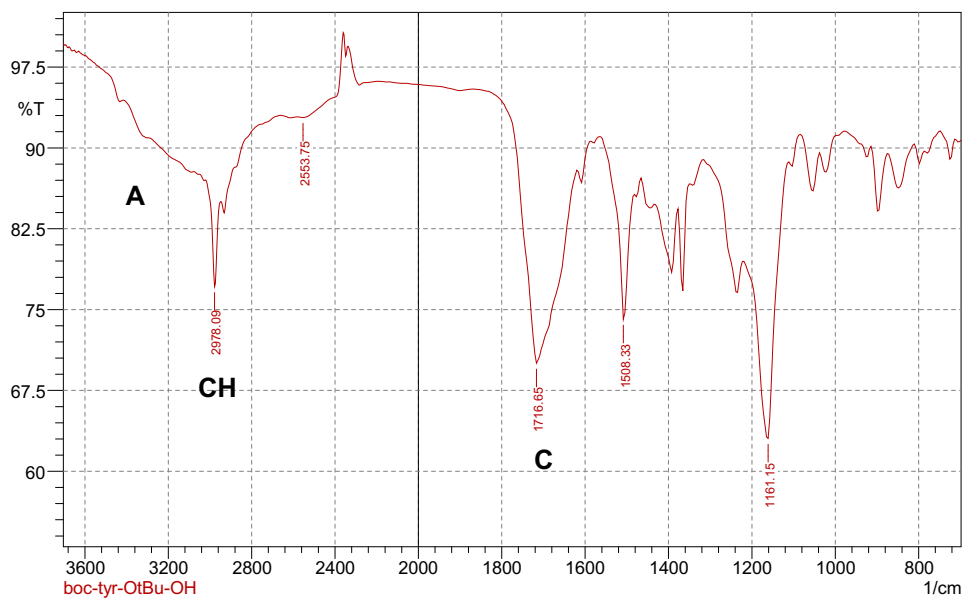


plate).



The following is an FT-IR of compound “cml-1-52-sm”. Write **A** on the absorbances corresponding to the amine N-H stretches, **C** on that for the CO stretches, and **CH** for the C-H stretches (taken as a thin film on a NaCl plate).

