# Infrared (IR) Spectroscopy

from chapter(s) _____ in the recommended text

## A. Introduction

## B. Origin Of IR Absorbance

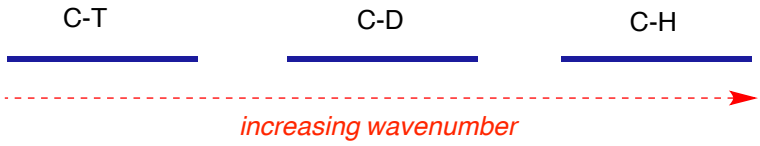
*less*
*lower*

*accumulated after multiple scans*

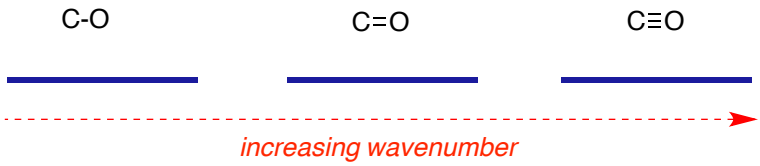
*dipole*
*unsymmetrical*
*greater*
*faster*
*higher*
*cm$^{-1}$*.

*slower*
*lower* wavenumber.

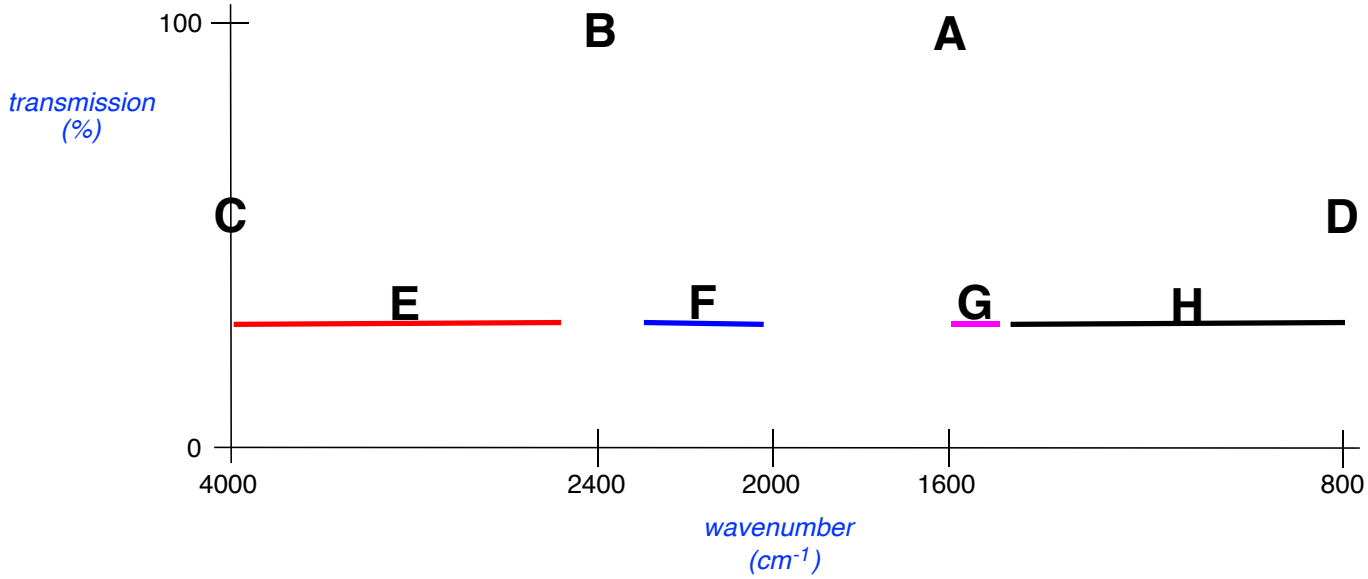
write C-H, C-D, and C-T
above the appropriate lines




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



*are*
*inversely*
*the same*
*expanded below 2000 relative to the 4000 – 2000 cm$^{-1}$*.




*3000* cm$^{-1}$
*3300* cm$^{-1}$
*3500* cm$^{-1}$

*1600 - 1500* cm$^{-1}$
*1900 – 1500* cm$^{-1}$.

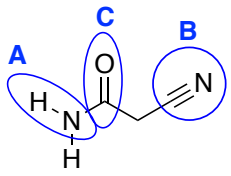
*1640* cm$^{-1}$ and absorb much *less*
*lower*

*1550 & 1350* cm$^{-1}$.

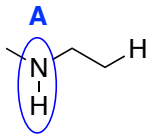
*1030 – 1080* cm$^{-1}$.

the ___fingerprint____ region

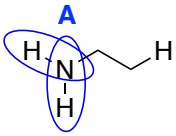
## C. Functional Group Assignments



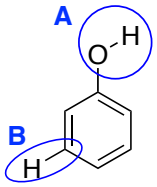

**A** 3300; **B** 2300; **C** 1690 $cm^{-1}$



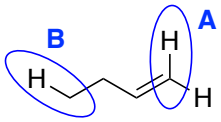

**A** 3300 $cm^{-1}$



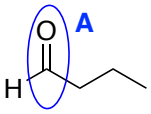

**A** 3300 and 3250 $cm^{-1}$



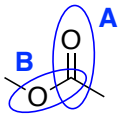

**A** 3400; **B** 3050 $cm^{-1}$



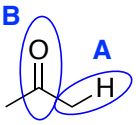

**A** 3050; **B** 2950 $cm^{-1}$



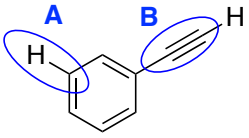

**A** 1730 $cm^{-1}$



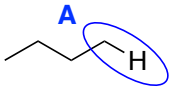

**A** 1735; **B** 1250 $cm^{-1}$



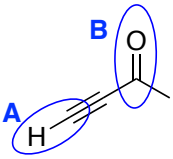

**A** 2950; **B** 1715 $cm^{-1}$



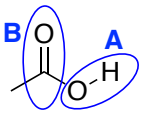

**A** 3050; **B** 2100 $cm^{-1}$



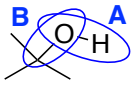

**A** 2950 $cm^{-1}$



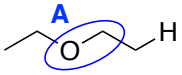

**A** 3300; **B** 1680 $cm^{-1}$



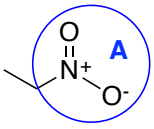

**A** 2900 (br); **B** 1690 $cm^{-1}$



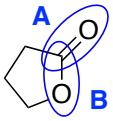

**A** 3400 (br); **B** 1100 $cm^{-1}$




**A** 1100 $cm^{-1}$



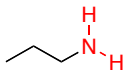

**A** 1560 and 1380 $cm^{-1}$



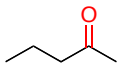

**A** 1770; **B** 1100 $cm^{-1}$

**a** "the "fingerprint region"

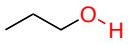
**b**



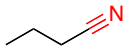

**c**



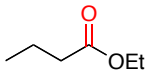

**d**




**e**

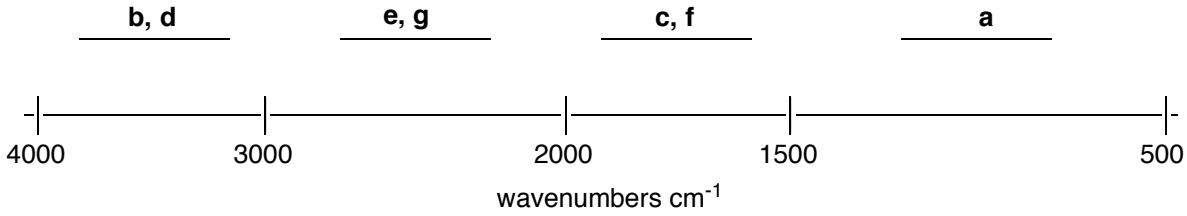



**f**




**g**

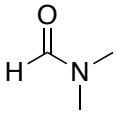
**put letters on these lines to indicate the functional groups that absorb here**



## D. Assigning Structures From Spectra

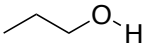
*acetone*

*acetonitrile*



*DMF*

*DMSO*



*n-propyl alcohol*

*pyridine*

is _____acetone_____ .

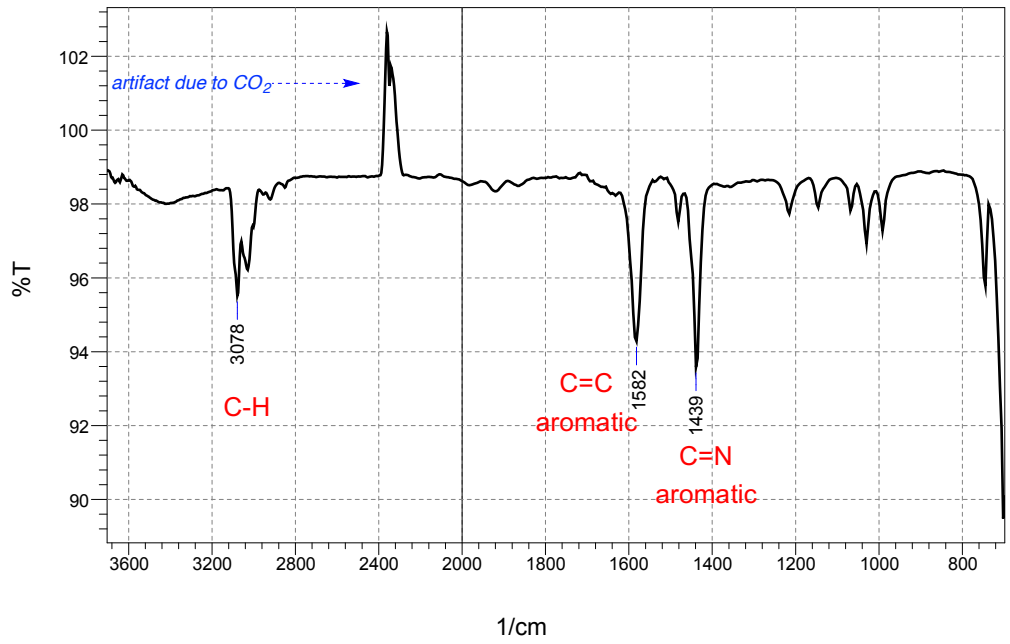
a _____C-H___ bond.

a _____C=O_____ bond.

is _____acetonitrile_____ .

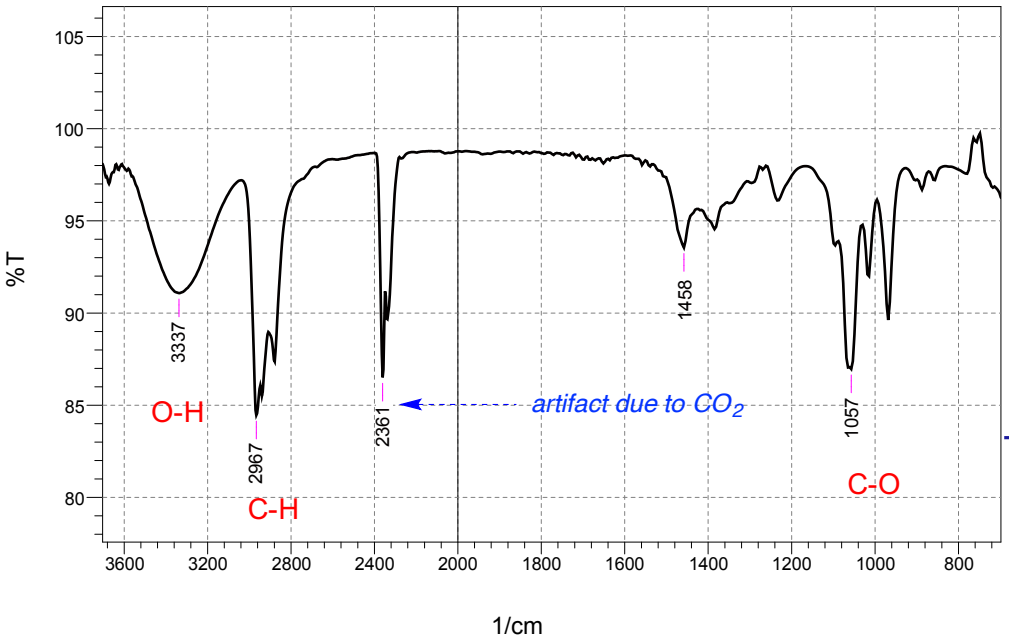
a _____C-H____ bond.

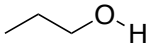
a _____C≡N_____ bond.



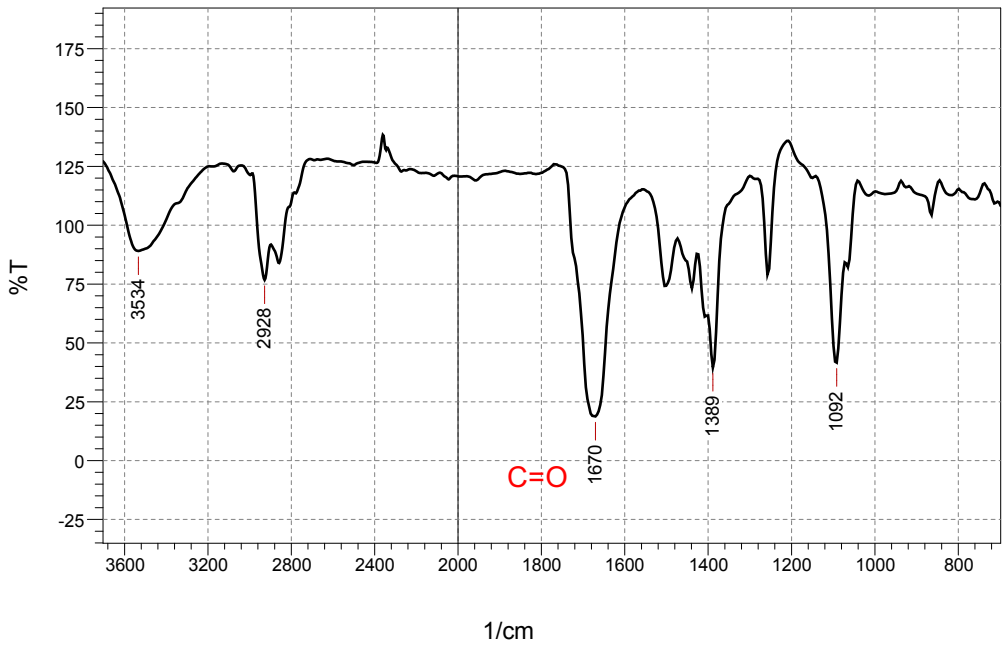


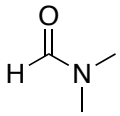
*draw structure and attribute numbered IR stretches to particular bonds*



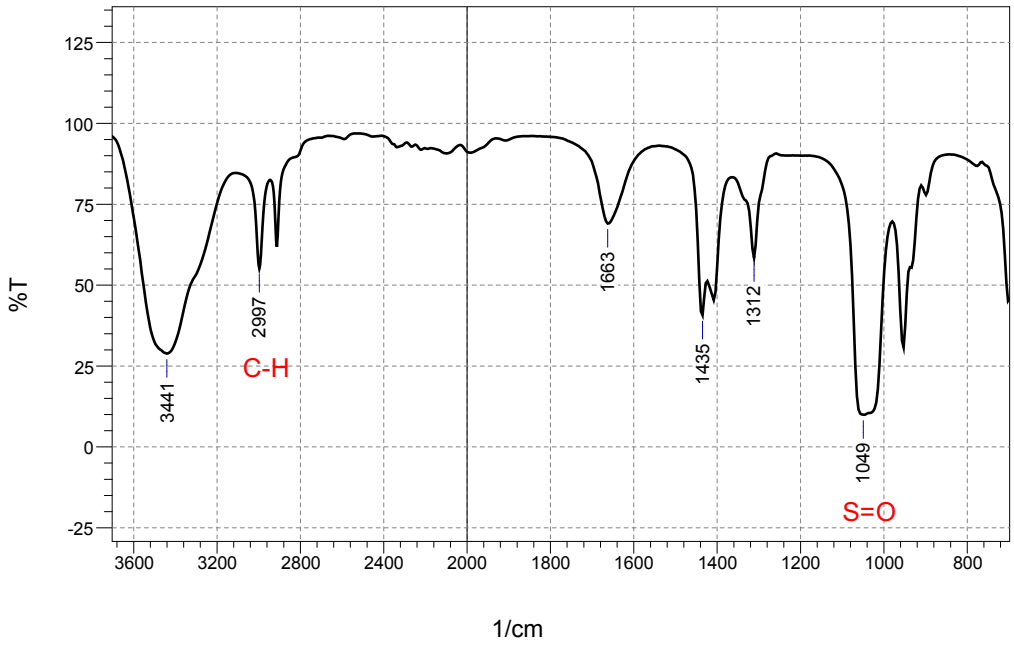




*draw structure and attribute numbered IR stretches to particular bonds*



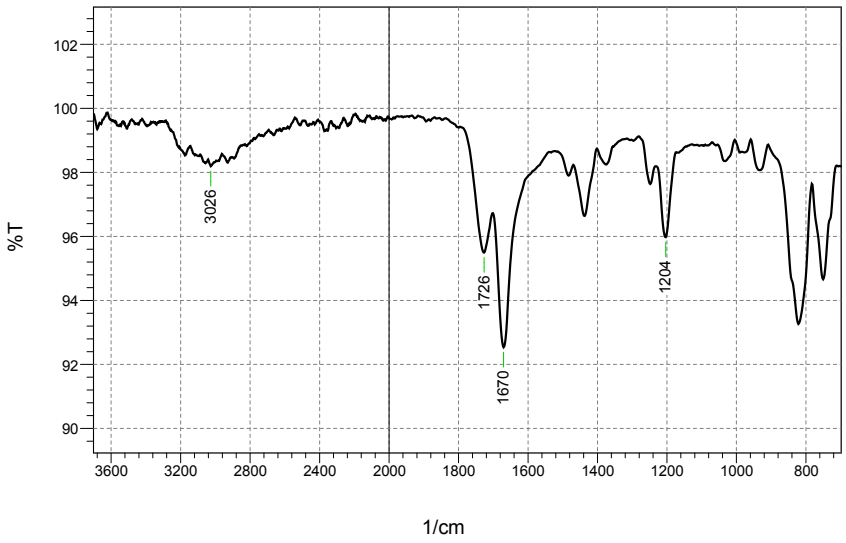




*draw structure and attribute numbered IR stretches to particular bonds*



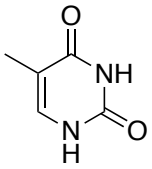


*draw structure and attribute numbered IR stretches to particular bonds*

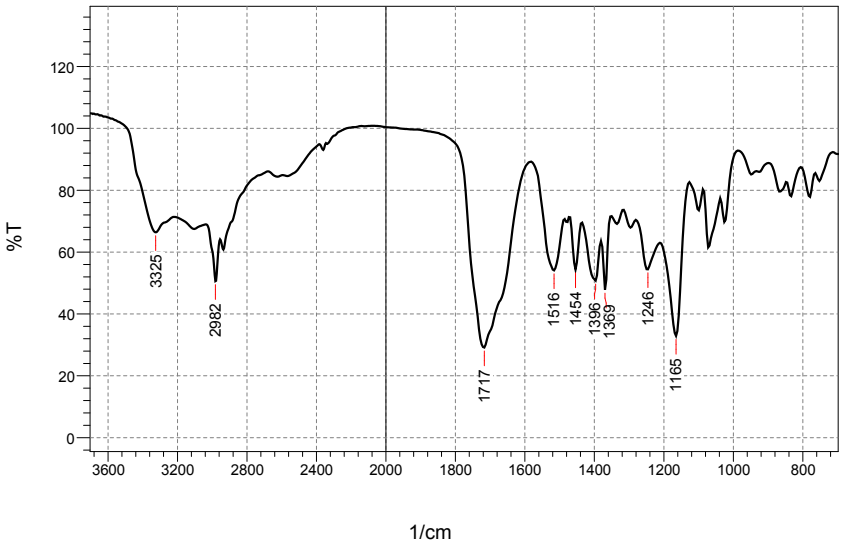



thymine

*compound name*

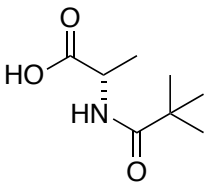


*compound structure*

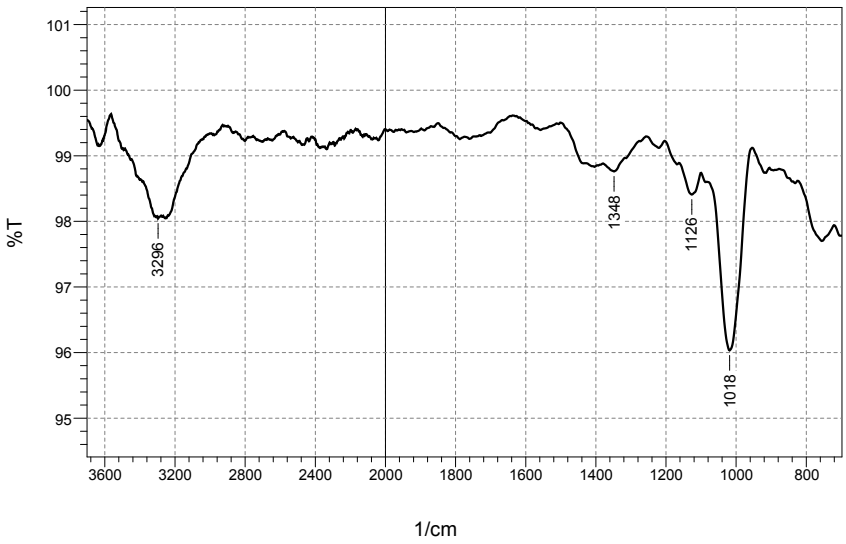



Boc-Ala

*compound name*

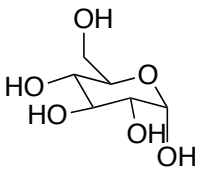


*compound structure*




glucose

*compound name*



*compound structure*

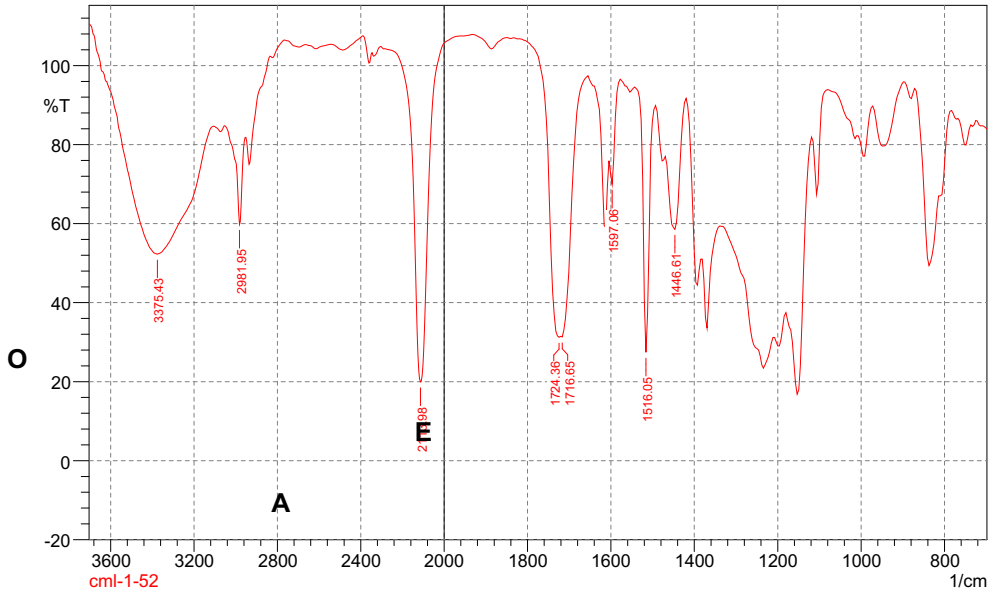
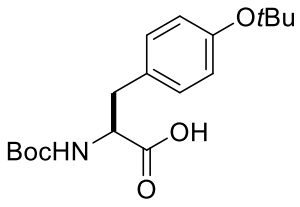
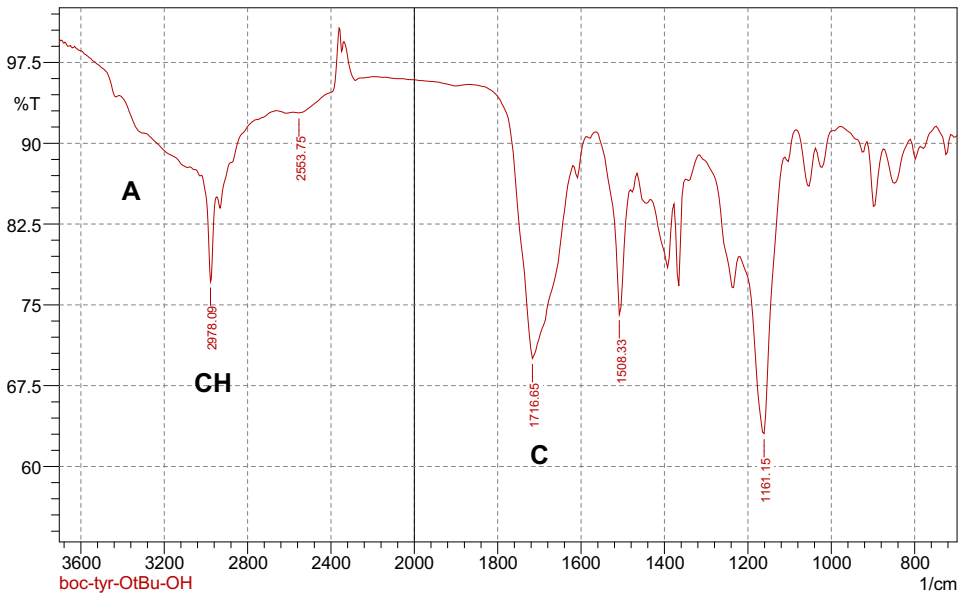


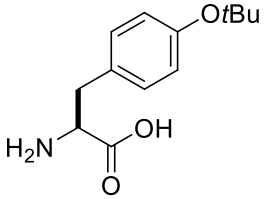

plate).



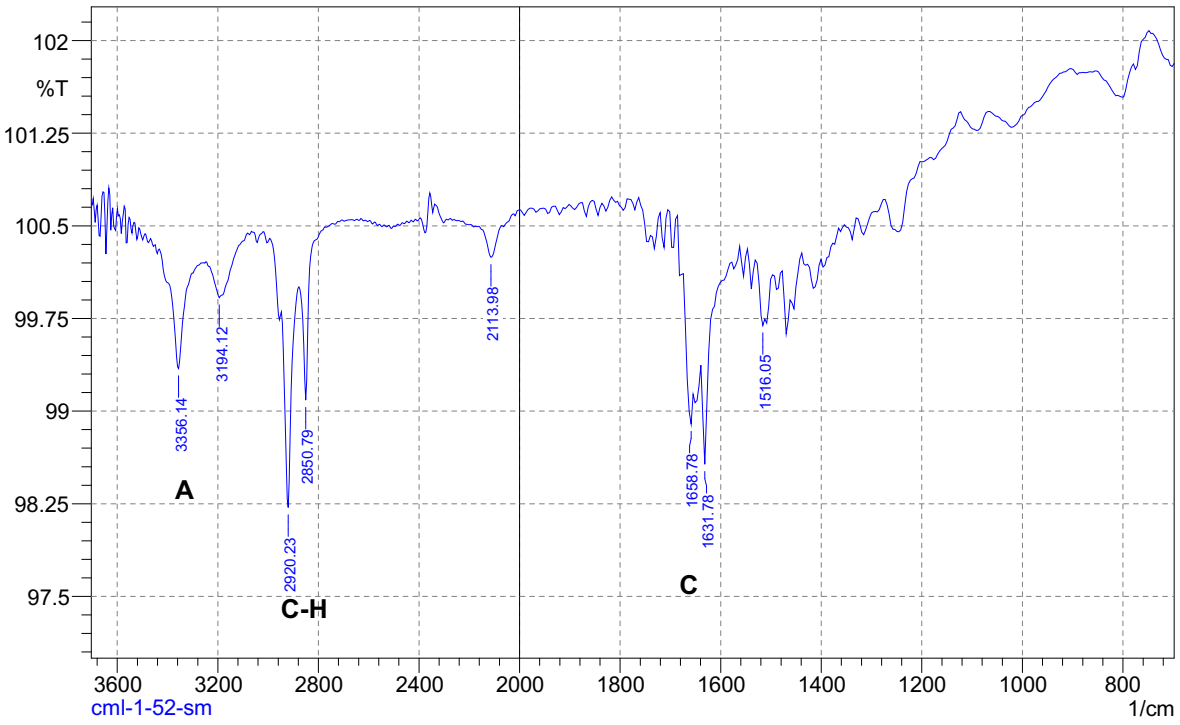

boc-tyr-OtBu-OH




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).




**cml-1-52-sm**


102
%T
101.25
100.5
99.75
99
98.25
97.5
3356.14
3194.12
2920.23
2850.79
2113.98
1658.78
1631.78
1516.05
A
C-H
C
3600
3200
2800
2400
2000
1800
1600
1400
1200
1000
800
cml-1-52-sm
1/cm