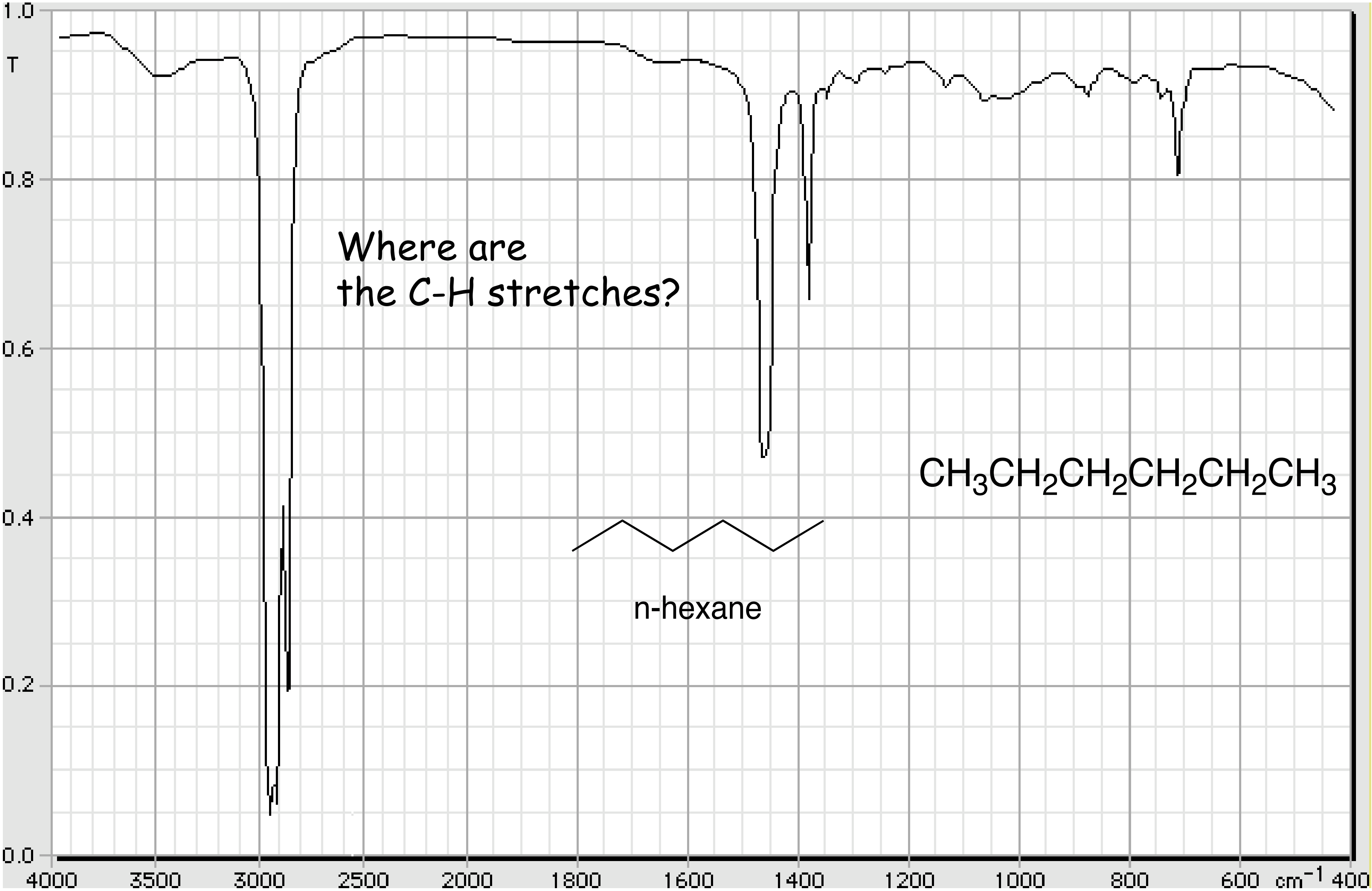
The following are the IR spectra that appear in IR Tutor. List of correlations for the IR. As an exercise for you should go through each structure and try to make sense out of the IR bands between 2.8 μ (3700 cm^{-1})-6 μ (1620 cm^{-1}). Questions on exam 3 will test if you have learned how to go from a structure to a spectrum or from the spectrum to the structure.

Some Important and Characteristic Infrared Absorption Frequencies and Wavelengths for Some Common Stretching Motions

Atom Group	Typical of	Frequency (cm^{-1})	Wavelength (μ)
O-H (free)	Alcohols (dilute)	3550-3650 cm^{-1}	2.8 μ
O-H (H bonded)	Alcohols (concentrated) Carboxylic acids	3200-3400 cm^{-1}	3.0 μ
$C\equiv C-H$	Acetylene (CH)	3300 cm^{-1}	3.0 μ
$C=C-H$	Benzene (CH), Ethylene (CH)	3010-3100 cm^{-1}	3.3 μ
$C-C-H$	Ethane (CH)	2950-3000 cm^{-1}	3.5 μ
$C\equiv C$	Acetylene	2100-2260 cm^{-1}	4.5 μ
$C\equiv N$	Nitriles	2000-2300 cm^{-1}	4.5 μ
$C=O$	Carbonyl	1650-1750 cm^{-1}	5.5- 6.0 μ
$C=C$	Alkene	1620-1680 cm^{-1}	6.0 μ
$C-C$	Alkane	600-1500 cm^{-1}	6.7-17 μ
$C-O$	Alcohols, Ethers	1000-1300 cm^{-1}	10-7.7 μ

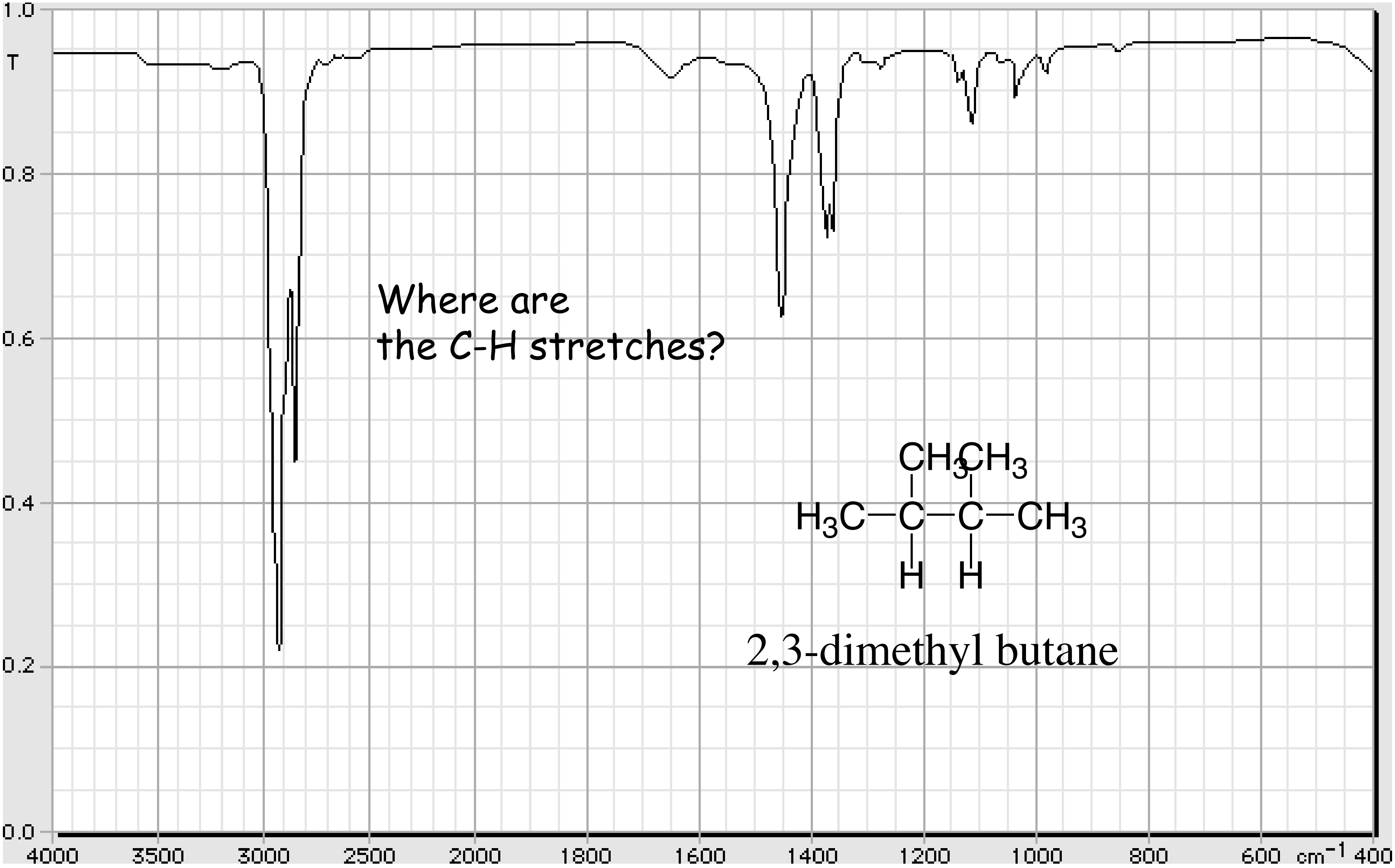
In general we will only be using the data in an IR spectrum for stretching vibrations which have energies higher than 1620 cm^{-1}. Although the bands at lower energy are known and assigned, the region below 1620 cm^{-1} is very congested with single bond stretches of two heavy atoms (see C-C and C-O in table) and C-H bends and are beyond the scope of what we want to do.



Where are
the C-H stretches?

n-hexane

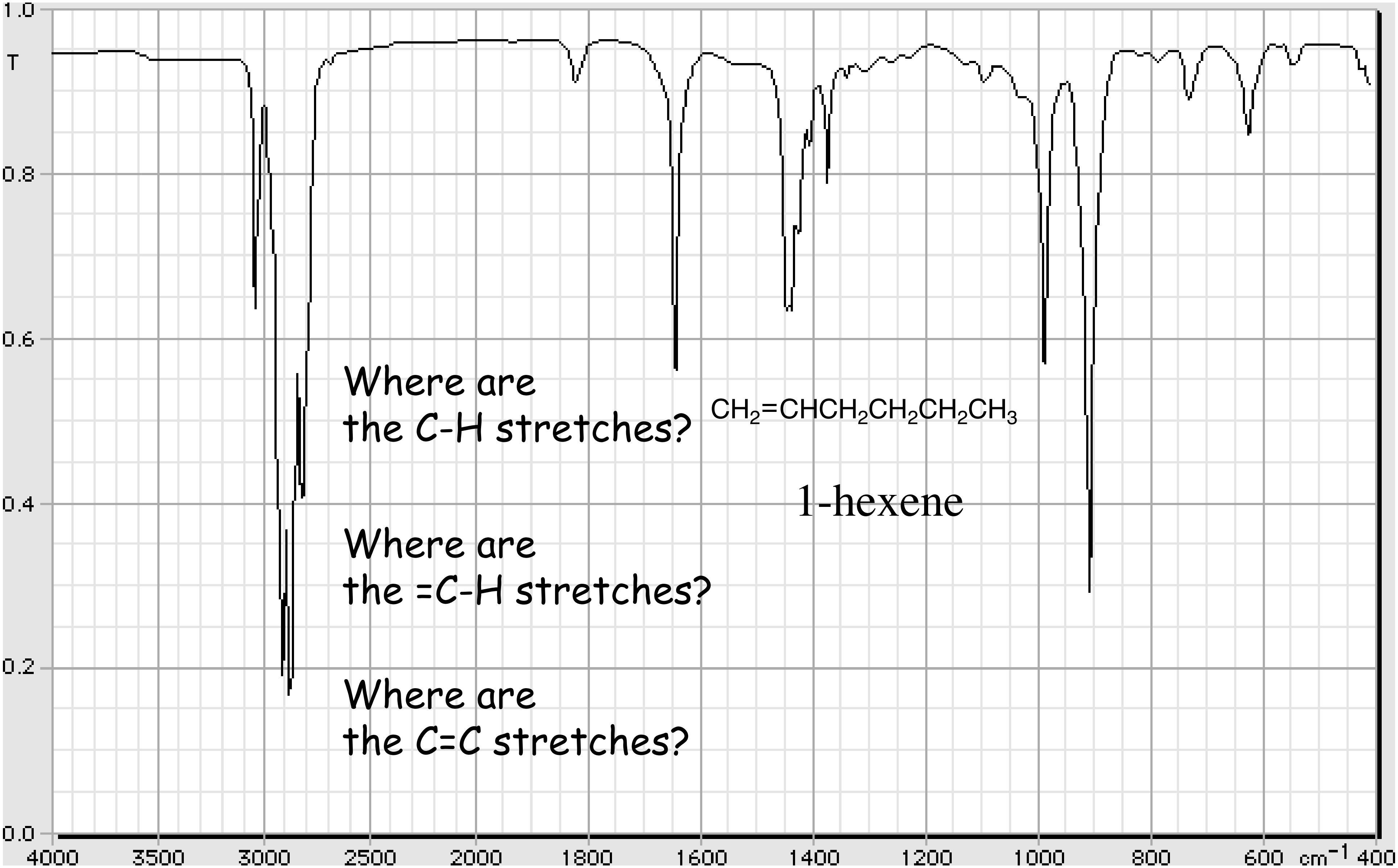
$CH_3CH_2CH_2CH_2CH_2CH_3$



Where are
the C-H stretches?

$H_3C-CH(CH_3)-CH(CH_3)-CH_3$

2,3-dimethyl butane



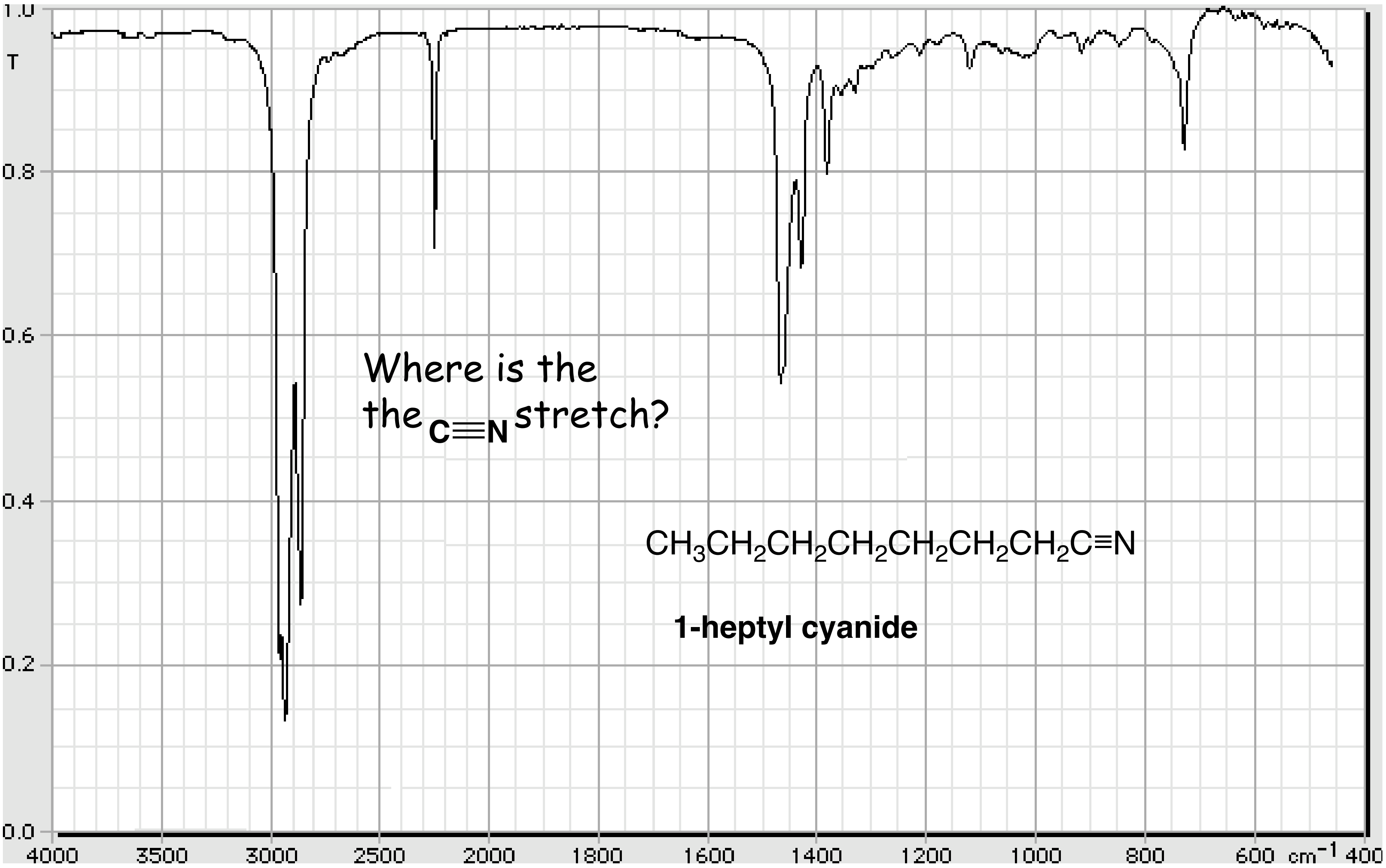
Where are
the C-H stretches?

Where are
the =C-H stretches?

Where are
the C=C stretches?

$CH_2{=}CHCH_2CH_2CH_2CH_3$

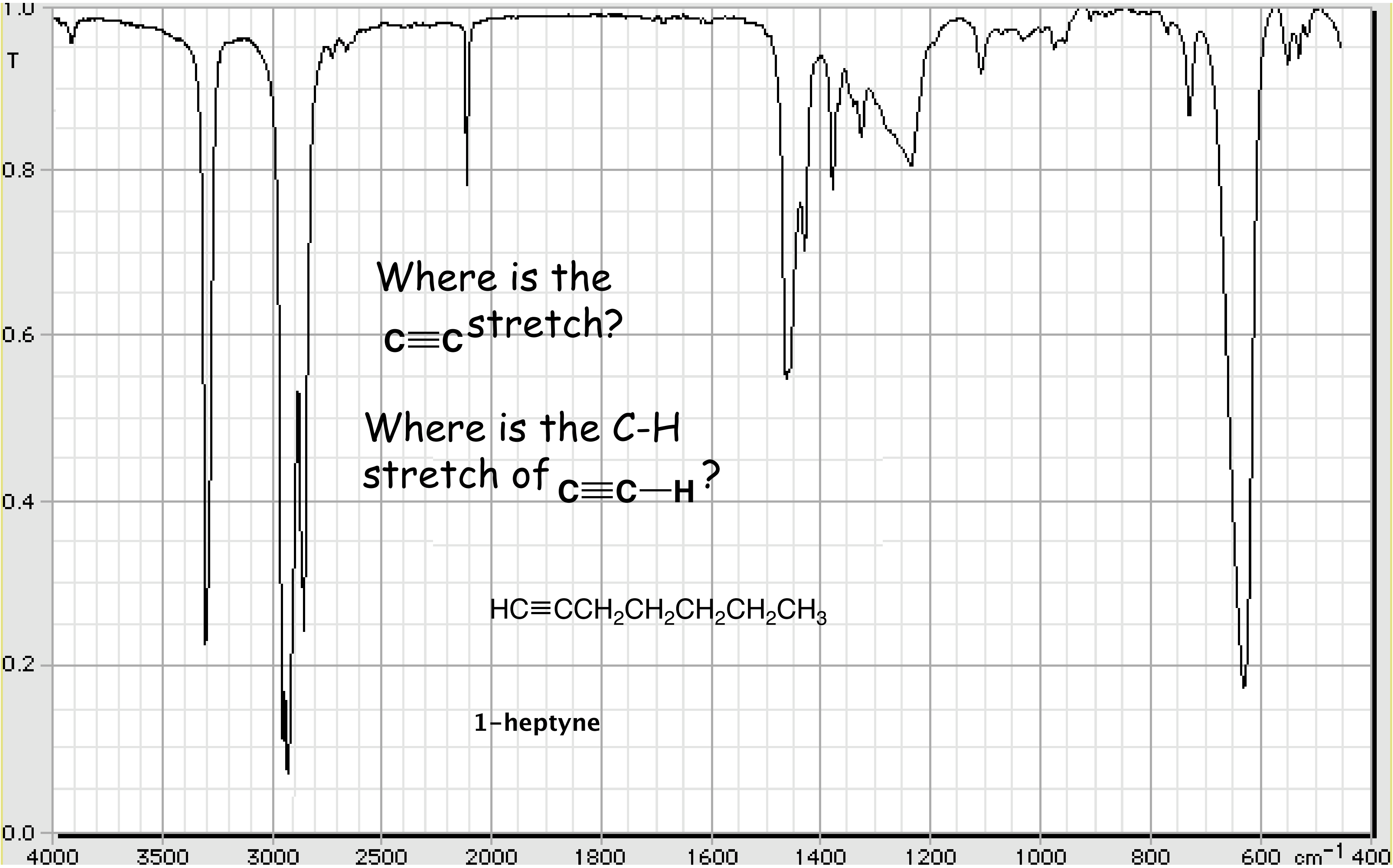
1-hexene



Where is the the $C\equiv N$ stretch?

$CH_3CH_2CH_2CH_2CH_2CH_2CH_2C\equiv N$

1-heptyl cyanide

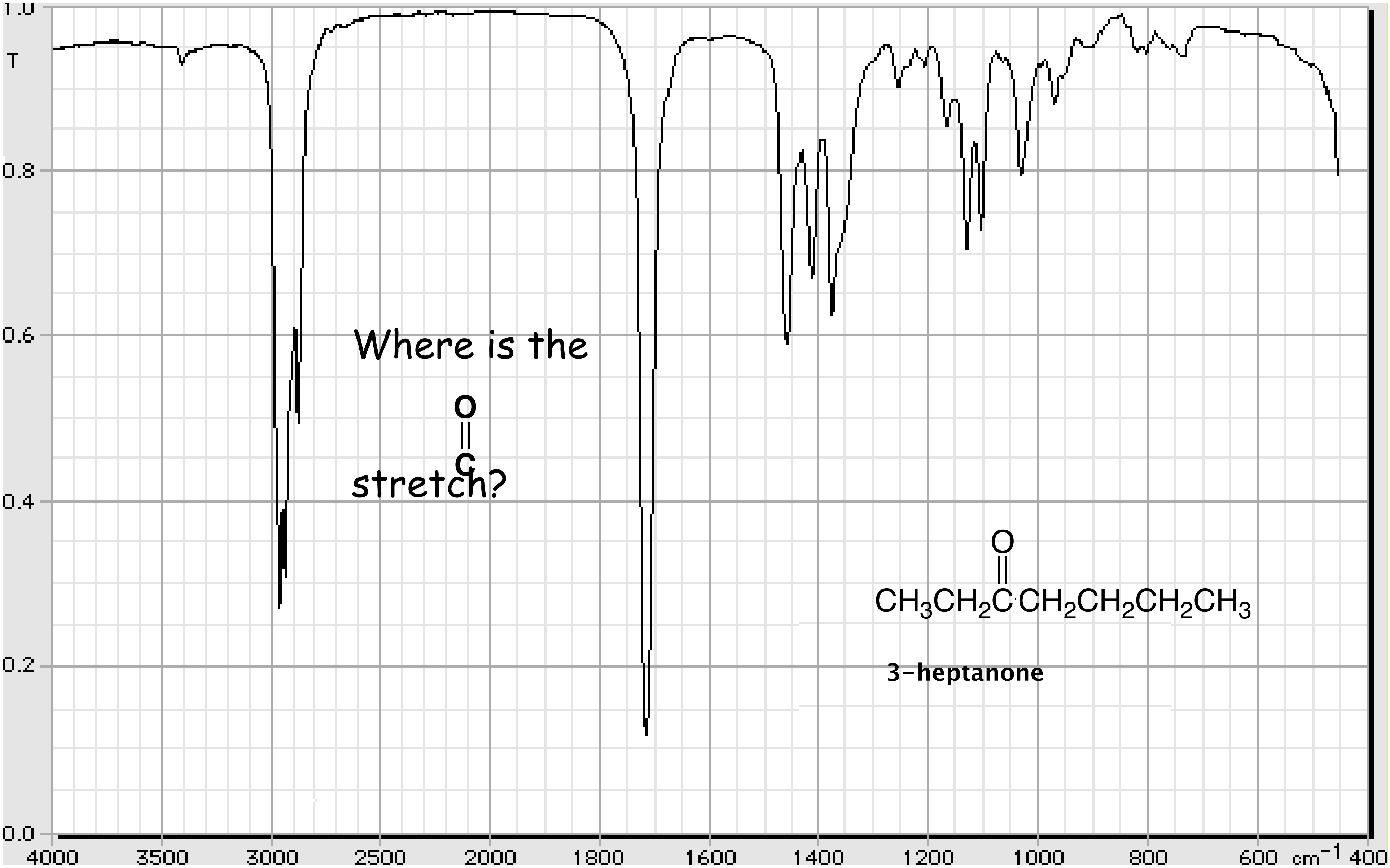


Where is the $C\equiv C$ stretch?

Where is the C-H stretch of $C\equiv C-H$?

$HC\equiv CCH_2CH_2CH_2CH_2CH_3$

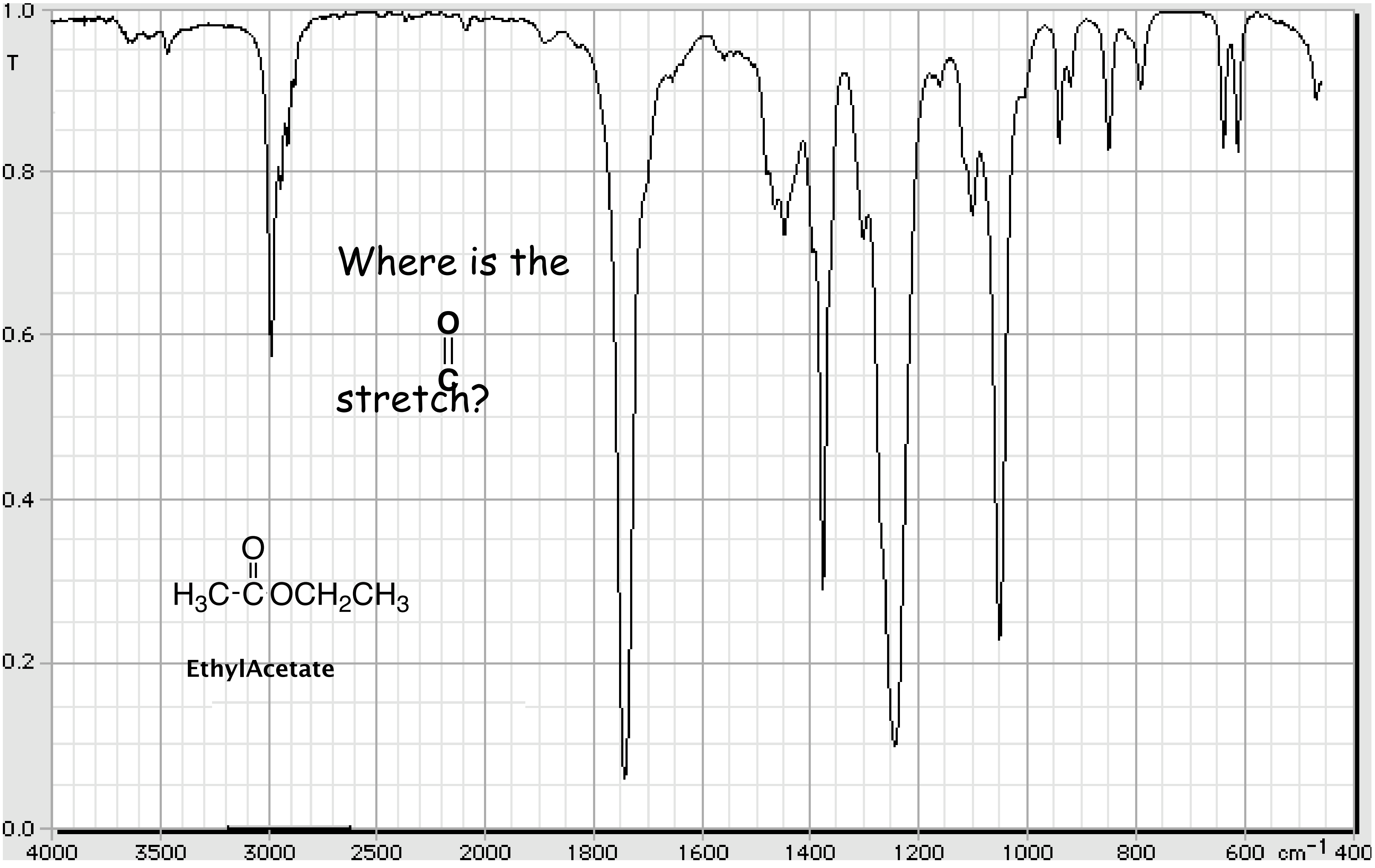
1-heptyne



Where is the $\overset{O}{\overset{\|}{C}}$ stretch?

$CH_3CH_2\overset{O}{\overset{\|}{C}}CH_2CH_2CH_2CH_3$

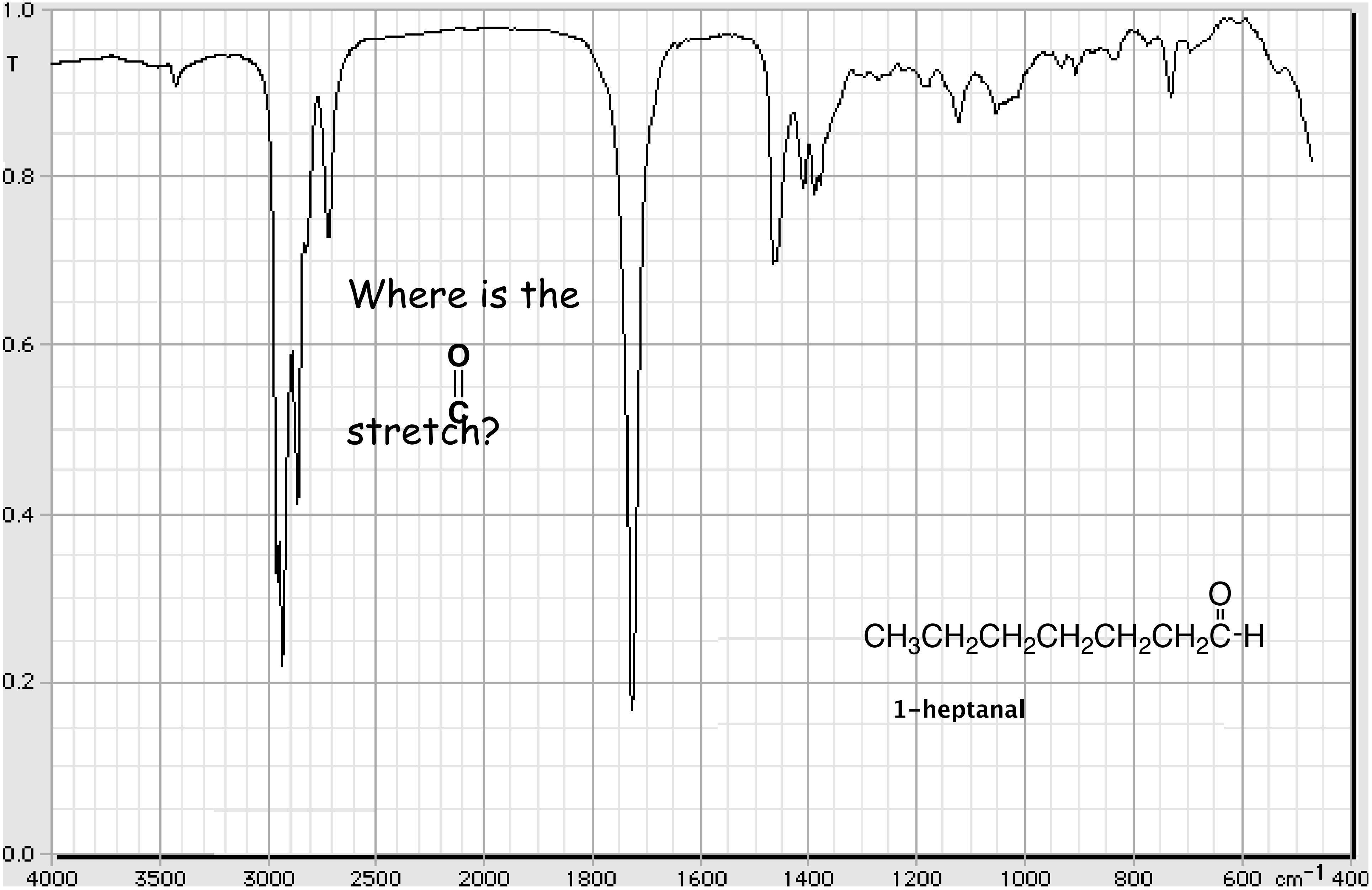
3-heptanone



Where is the $\overset{\text{O}}{\overset{\|}{\text{C}}}$ stretch?

$H_3C\text{-}\overset{\overset{O}{\|}}{C}OCH_2CH_3$

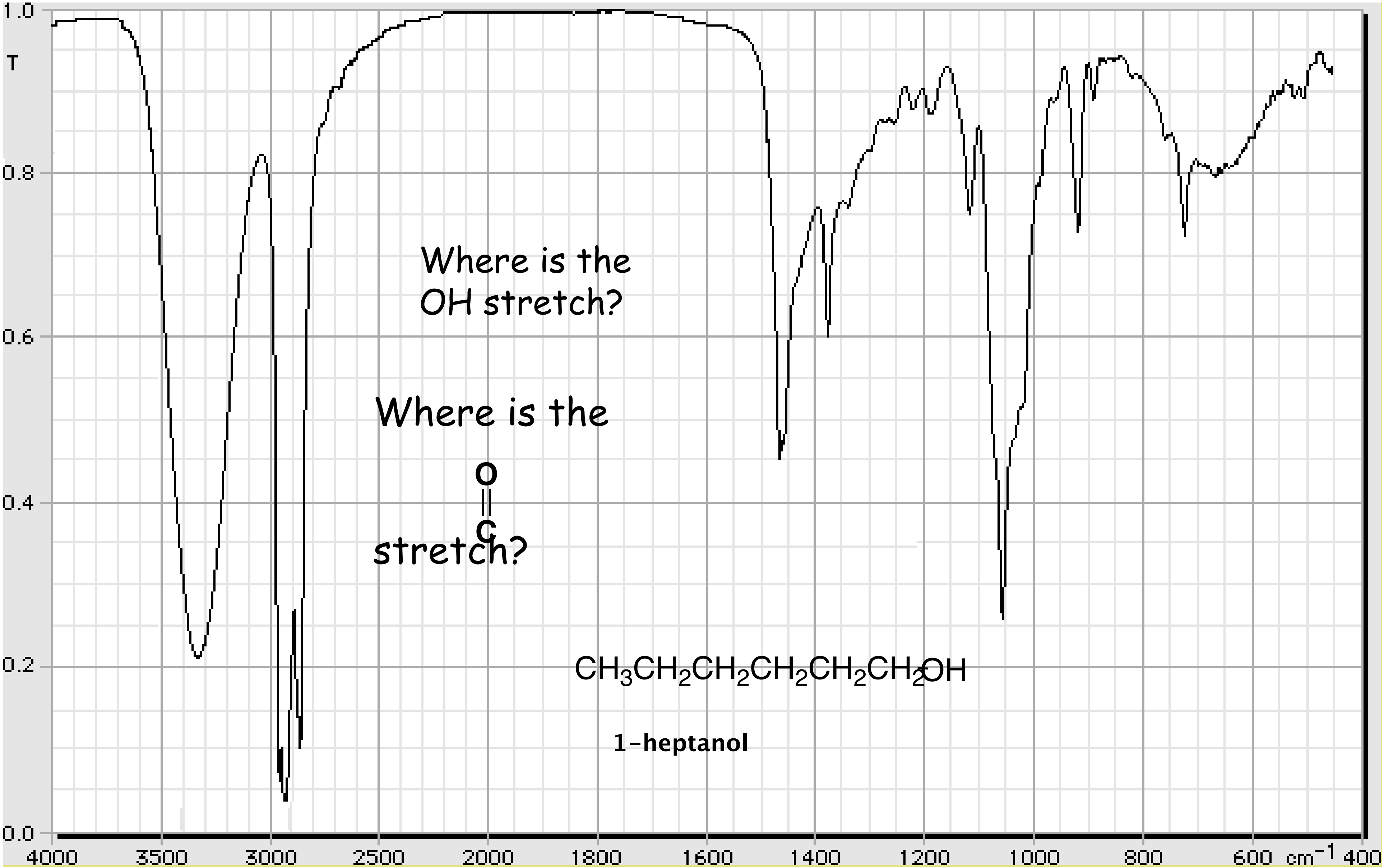
EthylAcetate



Where is the $\overset{O}{\overset{\|}{C}}$ stretch?

$CH_3CH_2CH_2CH_2CH_2CH_2\overset{O}{\overset{\|}{C}}\text{-}H$

1-heptanal

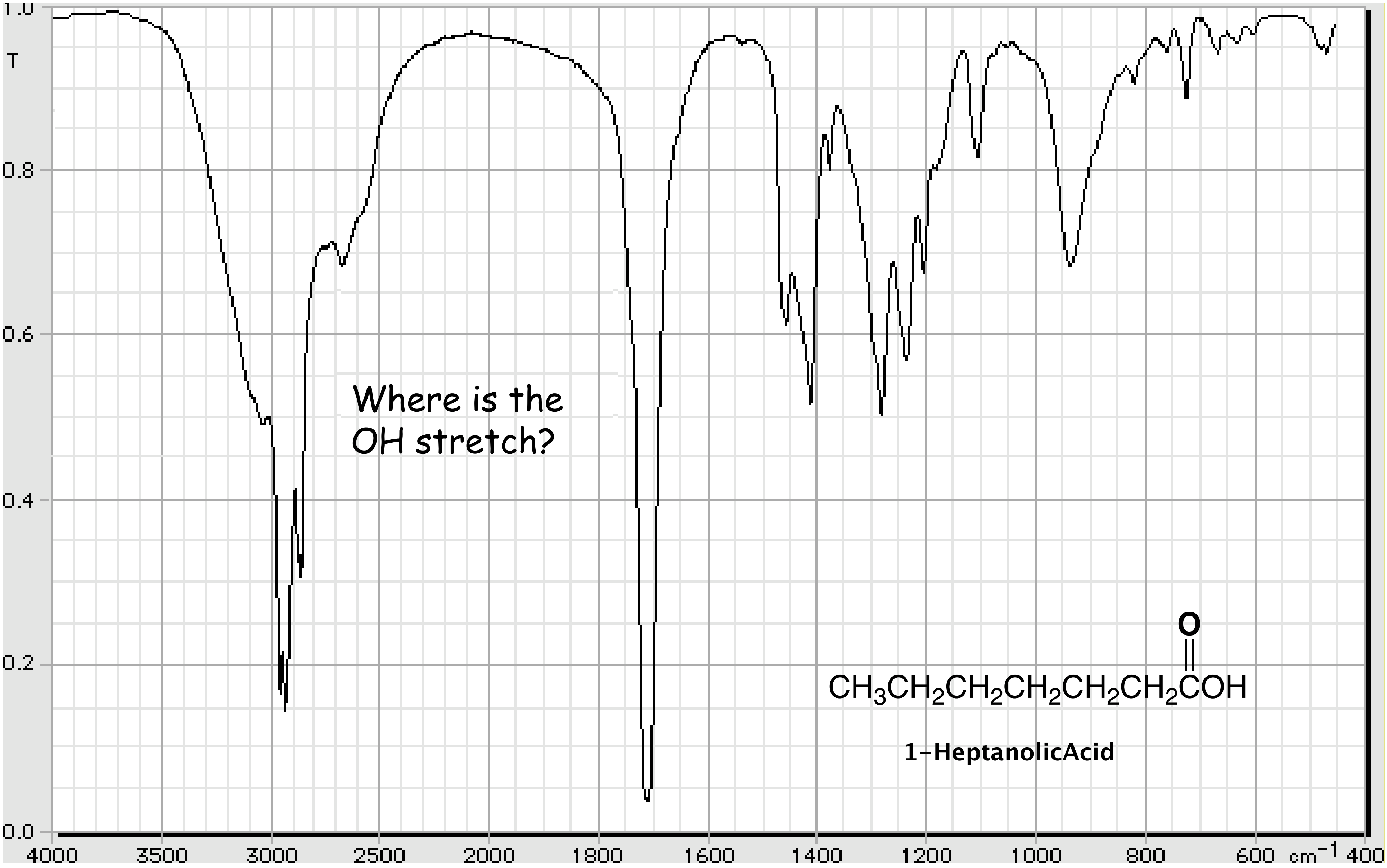


Where is the OH stretch?

Where is the $\overset{O}{\overset{\|}{C}}$ stretch?

$CH_3CH_2CH_2CH_2CH_2CH_2OH$

1-heptanol



Where is the OH stretch?

$CH_3CH_2CH_2CH_2CH_2CH_2\overset{\overset{\displaystyle O}{\|}}{C}OH$

1-HeptanolicAcid