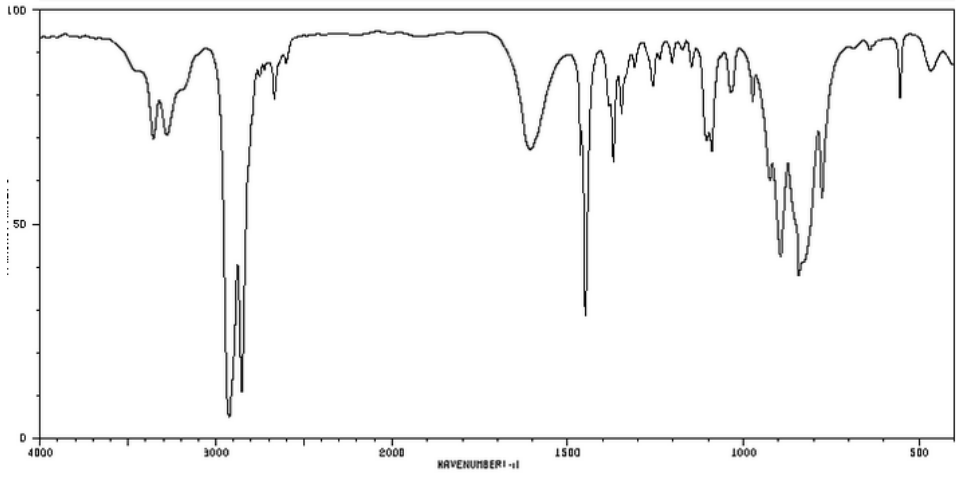
Answer the following questions:-

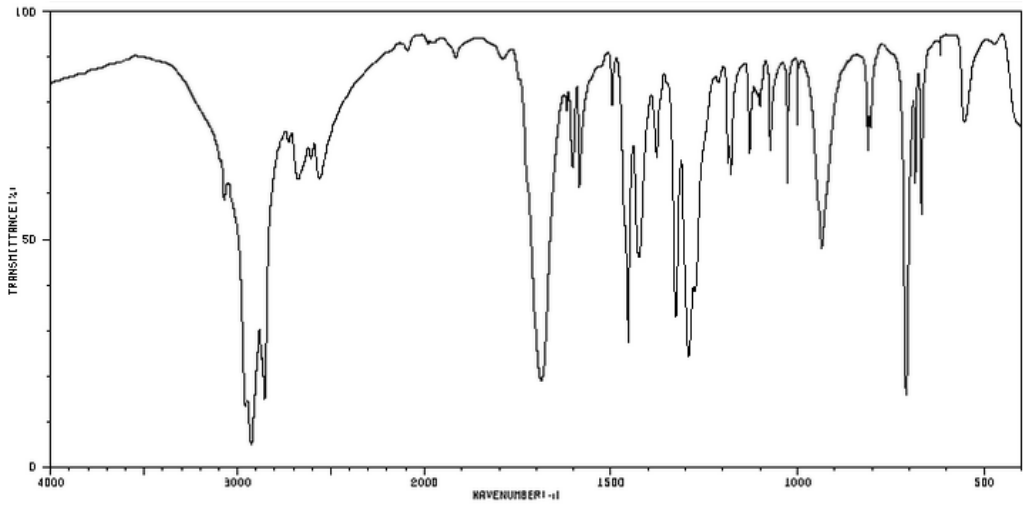
1) Each of the following IR spectra is associated with one of the compounds below, identify the compound associated with each spectrum and mark the functional groups for each

Benzaldehyde, benzoic acid, Cyclohexylamine, Acetophenone, Naphthalene, Cyclohexanone, 1-Hexyne.

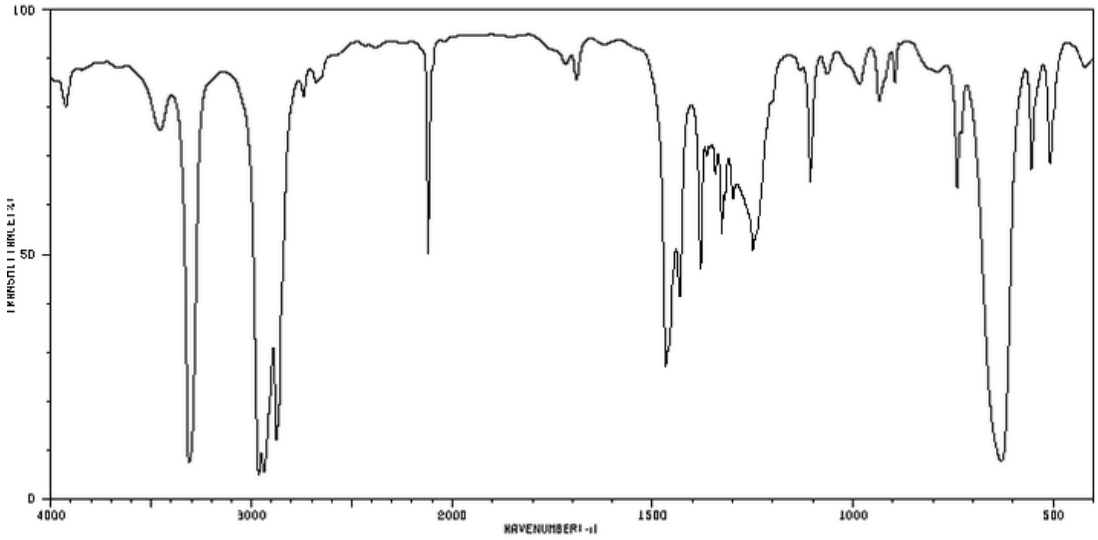
Spectrum A……



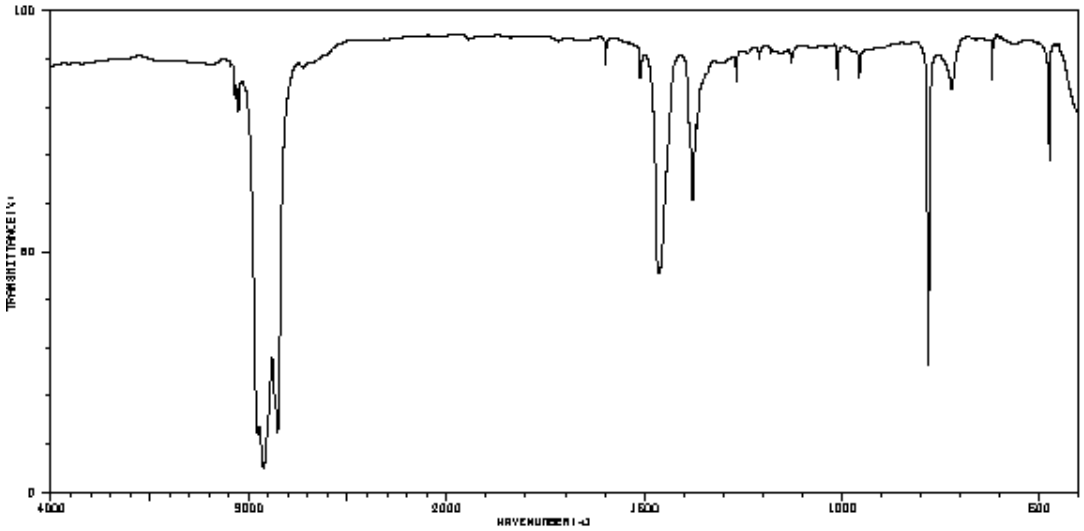
Spectrum B……



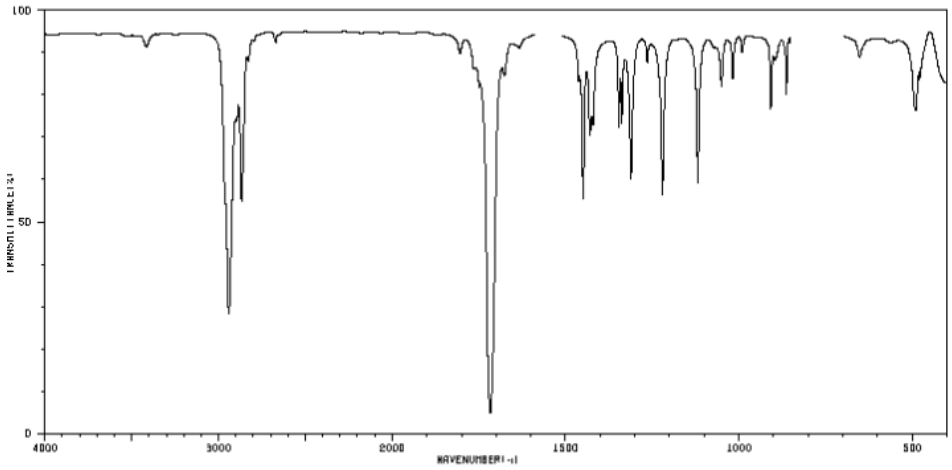
Spectrum C……



Spectrum D……

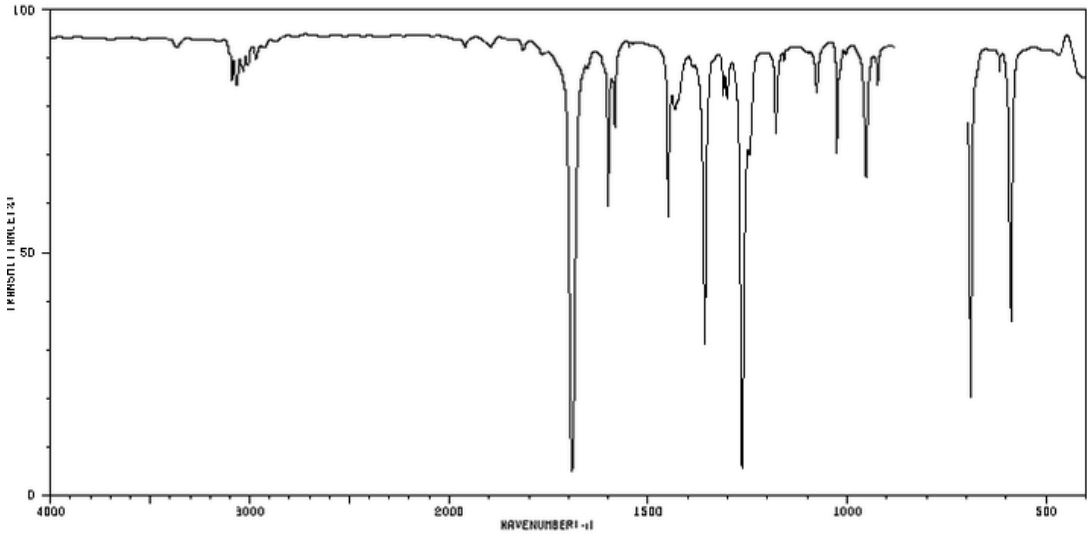


Spectrum E……

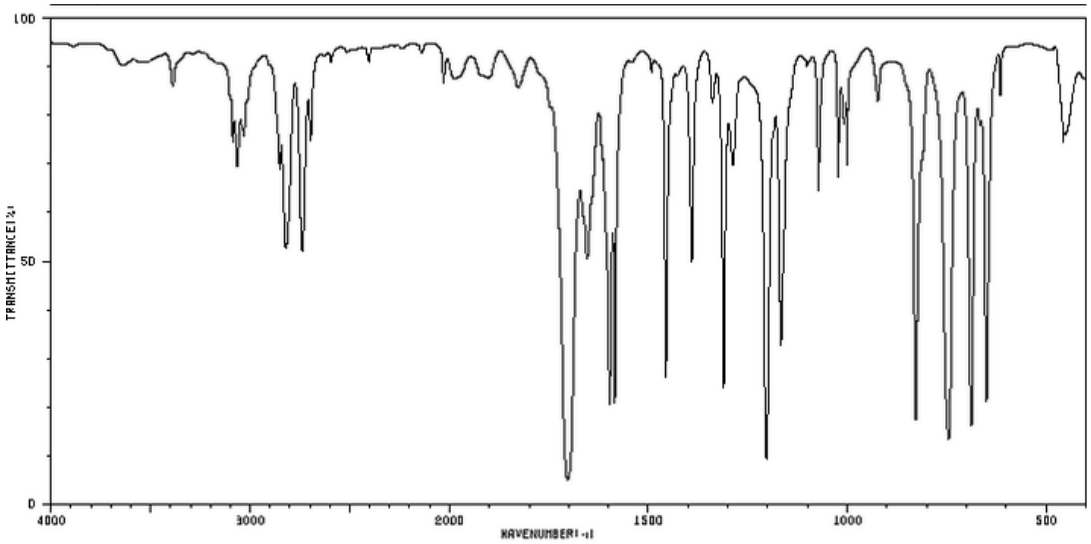


Spectrum

F……



Spectrum G……


100
50
0
TRANSMITTANCE[%]
4000
3000
2000
1500
1000
500
WAVENUMBER[-1]

2) Circle the correct answer in each of the following:

1) Which compound would be expected to show intense IR absorption at 3300 cm-1?

A) Butane B) 1-Butyne C) 2-Butyne D) 1-Butene

2) Which compound would be expected to show intense IR absorption at 3100 cm-1?

A) Butane B) 1-Butyne C) 2-Butyne D) 1-Butene

3) Which compound would be expected to show intense IR absorption at 2820, 2710 and 1705 cm-1?

A) $CH_3COCH_2CH_3$ B) 3-Buten-2-one C) $PhCOCH_3$ D) PhCHO

4) Which compound would be expected to show intense IR absorption at 3300 cm-1?

A) Pentane B) 1-Pentyne C) 2-Pentyne D) 1-Pentene

5) Which compound would be expected to show intense IR absorption at 2250 cm-1?

A) $(CH_3)_2CHCN$ B) $CH_3CH_2CH_2CO_2H$ C) $CH_3CH_2CH_2CONH_2$ D) $(CH_3)_2CHCH_2OH$

6) The infrared spectrum was obtained from a compound and showed absorptions at 2100 cm^{-1}, 1700 cm^{-1}, and 1200 cm^{-1}. Identify the compound.

A) CH_3COOCH_3 B) C_6H_5COOH C) $CH_2=CHCH_2OH$ D) $CH\equiv CCH_2CO_2CH_3$

7) In infrared spectroscopy which frequency range is known as the fingerprint region?

a) 400 - 1400cm^{-1} **b)** 1400 - 900cm^{-1} **c)** 900 - 600cm^{-1} **d)** 600 - 250cm^{-1}

3) Indicate if the following statements are true (√) or false (X)

1) The IR of two similar ketones have similar functional group band and similar fingerprint region ( ).

2) A more polar bond will have a stronger absorption than a less polar bond ( )

3) Trimethyl amines have no band in the region 3200-3500 cm^{-1} ( ).

4) The carbon-carbon bond of ethane will not observe an IR stretching vibration ( )

5) Internal alkynes show a sharp, weak band at about 3300 cm^{-1} corresponding to the C-H stretch. ( ).

6) 3-Hexyne shows a sharp, weak band at about 3300 cm^{-1} corresponding to the C-H stretch. ( ).

7) IR spectra can be obtained regardless of the physical state of a sample ( )

8) Ethylene lacks a peak in its IR spectrum for C=C stretching ( )

9) Tertiary amines have no band at 3200-3500 cm-1 ( ).

10) 1-Hexyne shows a sharp, weak band at about 3300 cm^{-1} corresponding to the C-H stretch. ( ).

11) If a bond is non-polar due to symmetry, IR light will not be absorbed ( ).

12) The IR of 2-Hexanone and 3- Hexanone have similar functional group band and different fingerprint region ( ).

13) 1-Amino butane exhibit one NH stretching band ( ).

4) How could IR spectroscopy be used to distinguish between the following pair of compounds?

i) 1-Pentanol and 2-pentene

ii) 1-Butyne and 1-Butene

iii) $(CH_3)_2CHCN$ and $CH_3CH_2CH_2CO_2H$

iv) PhCHO and $CH_3CH_2CH_2OH$

v) $CH_3OCH_2CH_3$ and $CH_3CH_2CH_2OH$

vi) 2-Butanone and 3-buten-2-ol