ORIGINAL WORK

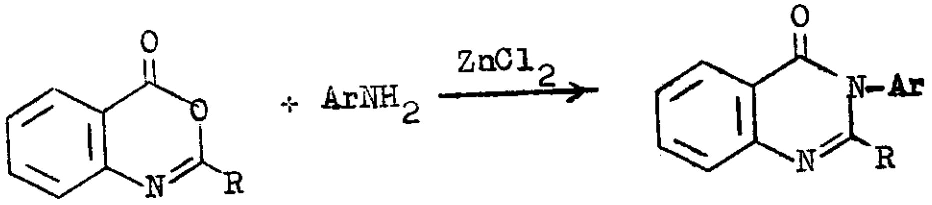
The results obtained from ring opening reactions of 2-isopropyl-3,1,4-benzoxazone, will be discussed in the following sequence :

1- Aminolysis.
2- Hydrazinolysis.
3- Ammonolysis.
4- Friedel-Crafts reaction.
5- Action of Gringard reagents.
6- Action of sodium azide.
7- Action of phosphorus pentasulphide.
8- Aminolysis of the resulting thione.
9- Action of Grignard reagent upon the thione.

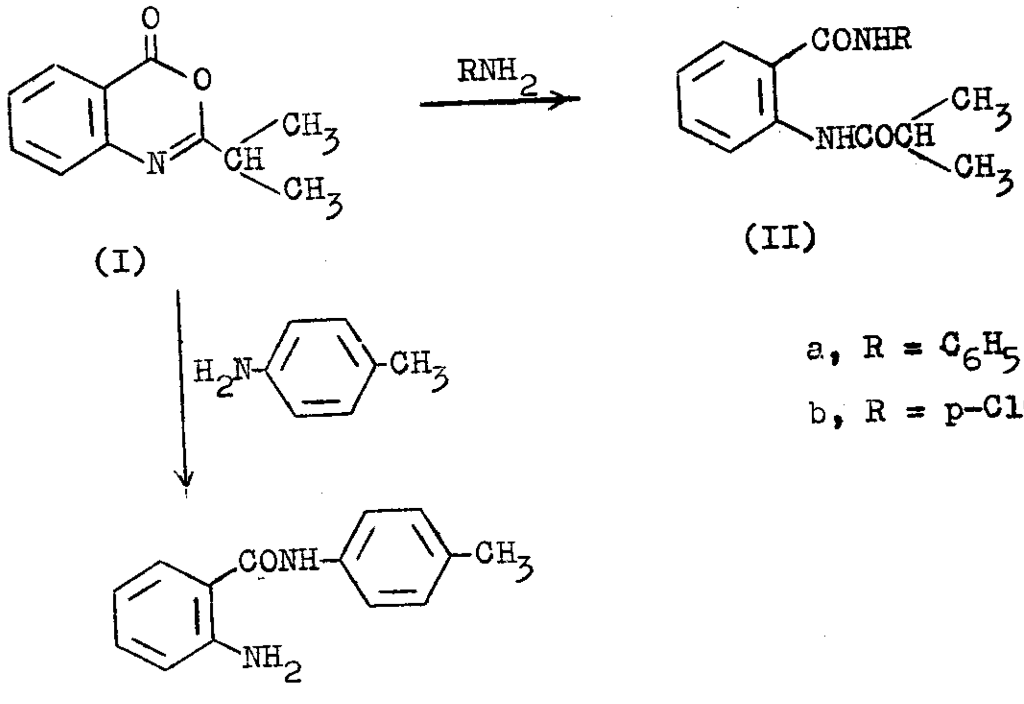
Ring Opening Reactions of 2-Isopropyl-3,1,4-Benzoxazone :

(I) Aminolysis :

It was previously stated[89,90,91] that primary amines react with 2-substituted-3,1,4-benzoxazones in the presence of anhydrous zinc chloride to give 2,3-disubstituted-4-quinazolones.



The present investigation deals with aminolysis of 2-isopropyl-3,1,4-benzoxazone (I) with primary aromatic amines namely (aniline, p-chloroaniline) to give the corresponding 2-(arylcarbamoyl) isobutroylanilides (IIa and b). And with p-toluidine yielded 2-[p-tolylcarbamoyl]-aniline (III) with elimination of isobutroyl group.



(I)

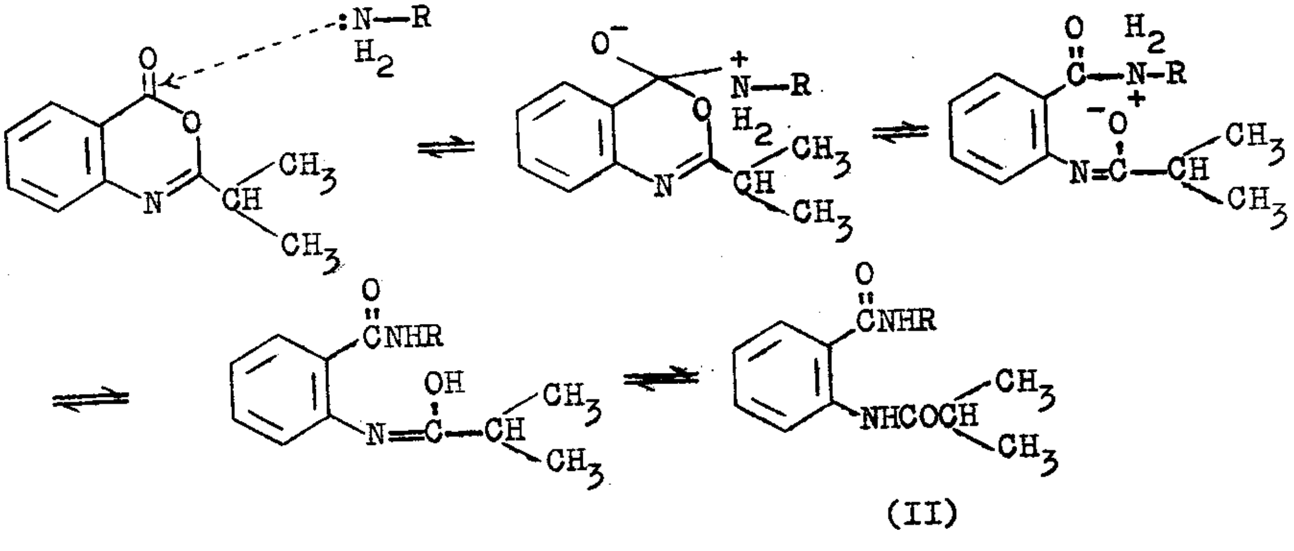
(II)

(III)

a, R = C_6H_5

b, R = p-ClC_6H_4

The reaction possibly takes place according to the scheme I.



(II)

(Scheme 1)

The structure of II was confirmed from :

(i) Analytical data.

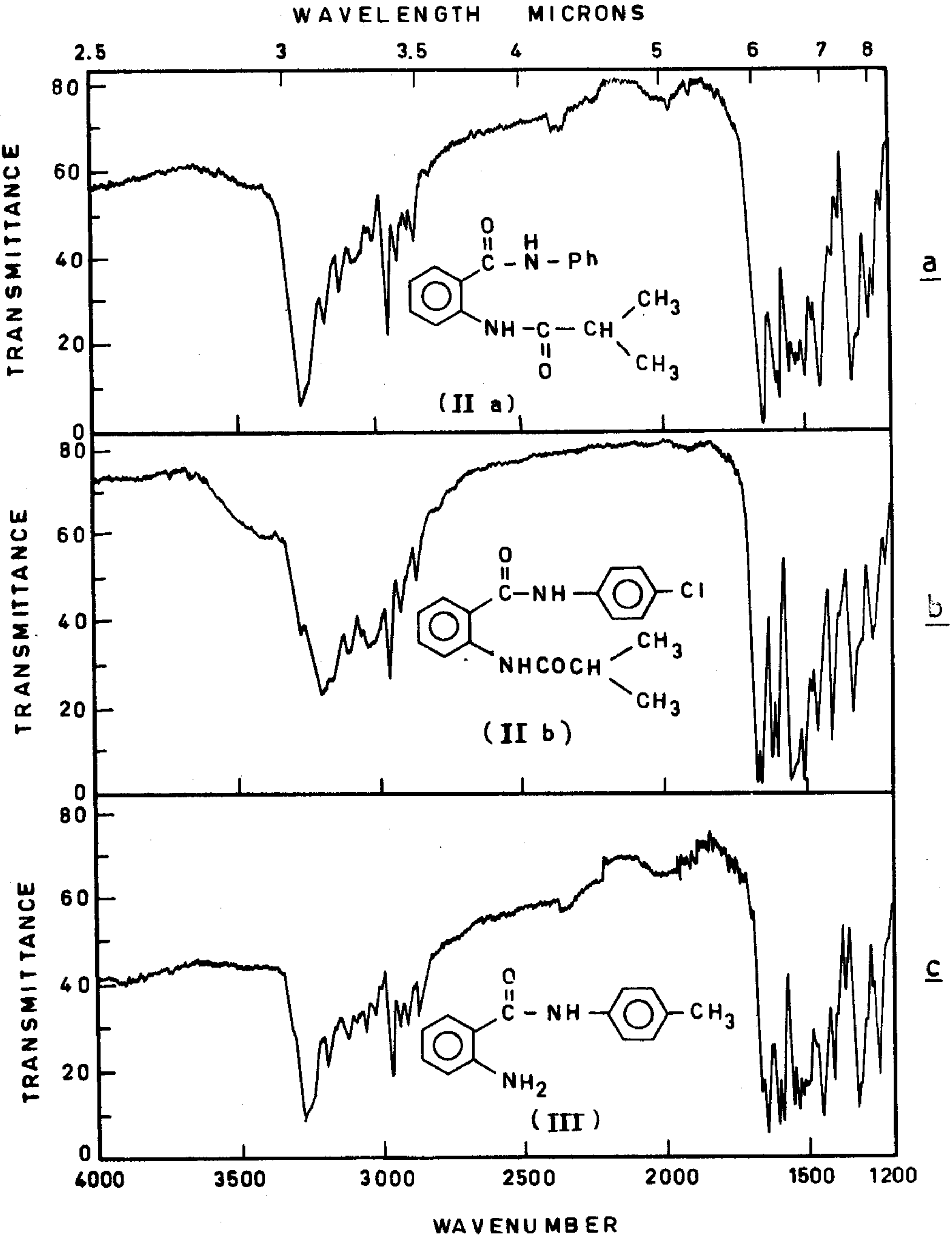
(ii) Infrared spectral data for (II) show two bands at 1670 cm^{-1} and 1650 cm^{-1} for two amide carbonyls, ν_{NH} in the region of 3300 cm^{-1} and 3200 cm^{-1} and other two bands at 2970 cm^{-1} and 2870 cm^{-1} attributable to stretching frequencies of methyl group and CH (tertiary) (cf. Fig. 1a and b for IIa and b).

The proposed structure III was confirmed from infrared spectrum which shows a well defined band at 1660 cm^{-1} due to $\nu_{C=O}$ two bands at (3300 cm^{-1} and 3180 cm^{-1}) attributable for ν_{NH} of primary amine and amide respectively (cf. Fig. 1c for III).

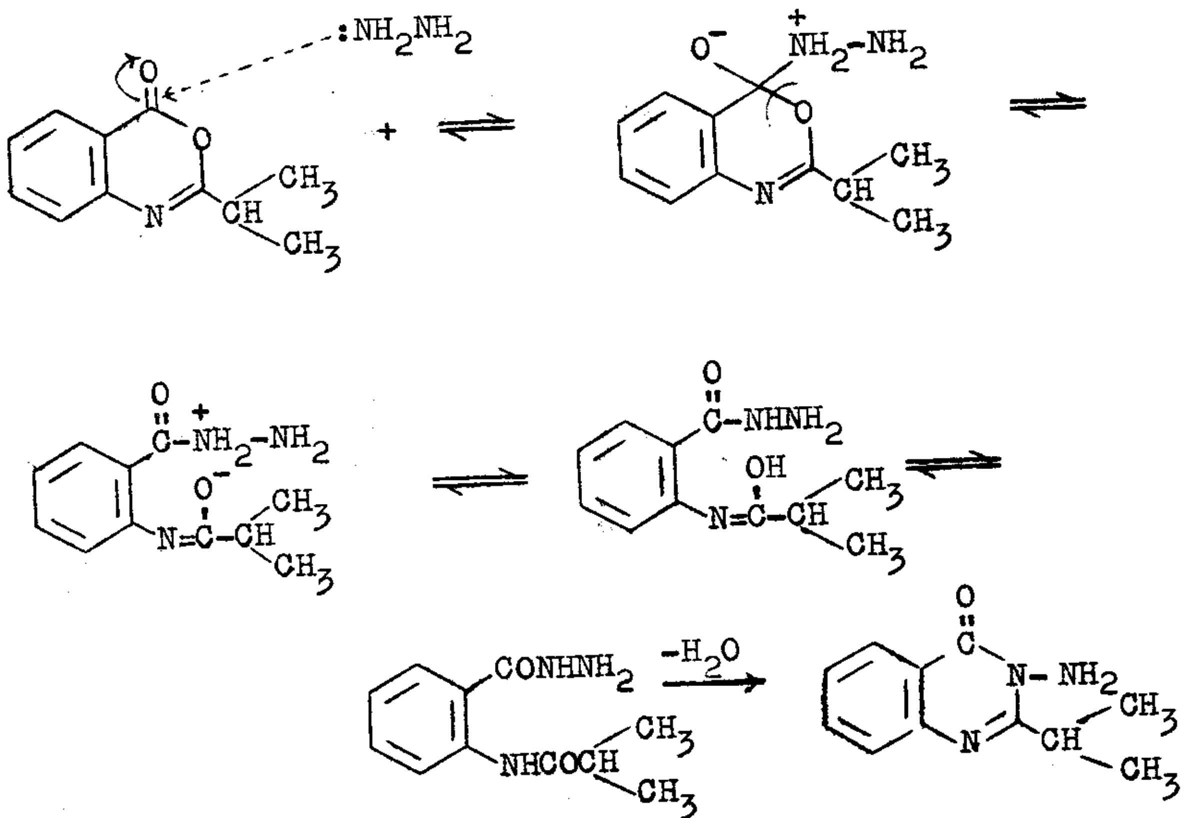
(II) <u>Hydrazinolysis</u> :

Recently[91,92], it was shown that the reaction of 3,1,4-benzoxazones with hydrazine hydrate affects fission of the hetero-cyclic ring.

In the present investigation, it was found that 2-isopropyl-3,1,4-benzoxazone (I) reacts with hydrazine hydrate in refluxing alcohol to give 3-amino-2-isopropyl quinazolinone (IV). The reaction possibly takes place according to the following scheme.


WAVELENGTH MICRONS
2.5
3
3.5
4
5
6
7
8
TRANSMITTANCE
80
60
40
20
0
(II a)
a
(II b)
b
(III)
c
4000
3500
3000
2500
2000
1500
1200
WAVENUMBER

F i g . 1



(IV)

(Scheme 2)

The structure of (IV) was proved from

(i) I.r. spectrum which shows $\nu_{C=O}$ of quinazolone at 1680 cm^{-1}, $\nu_{C=N}$ (cyclic) at 1640 cm^{-1}, and ν_{NH} at (3500-3200 br) (cf. Fig. 2a for IV).

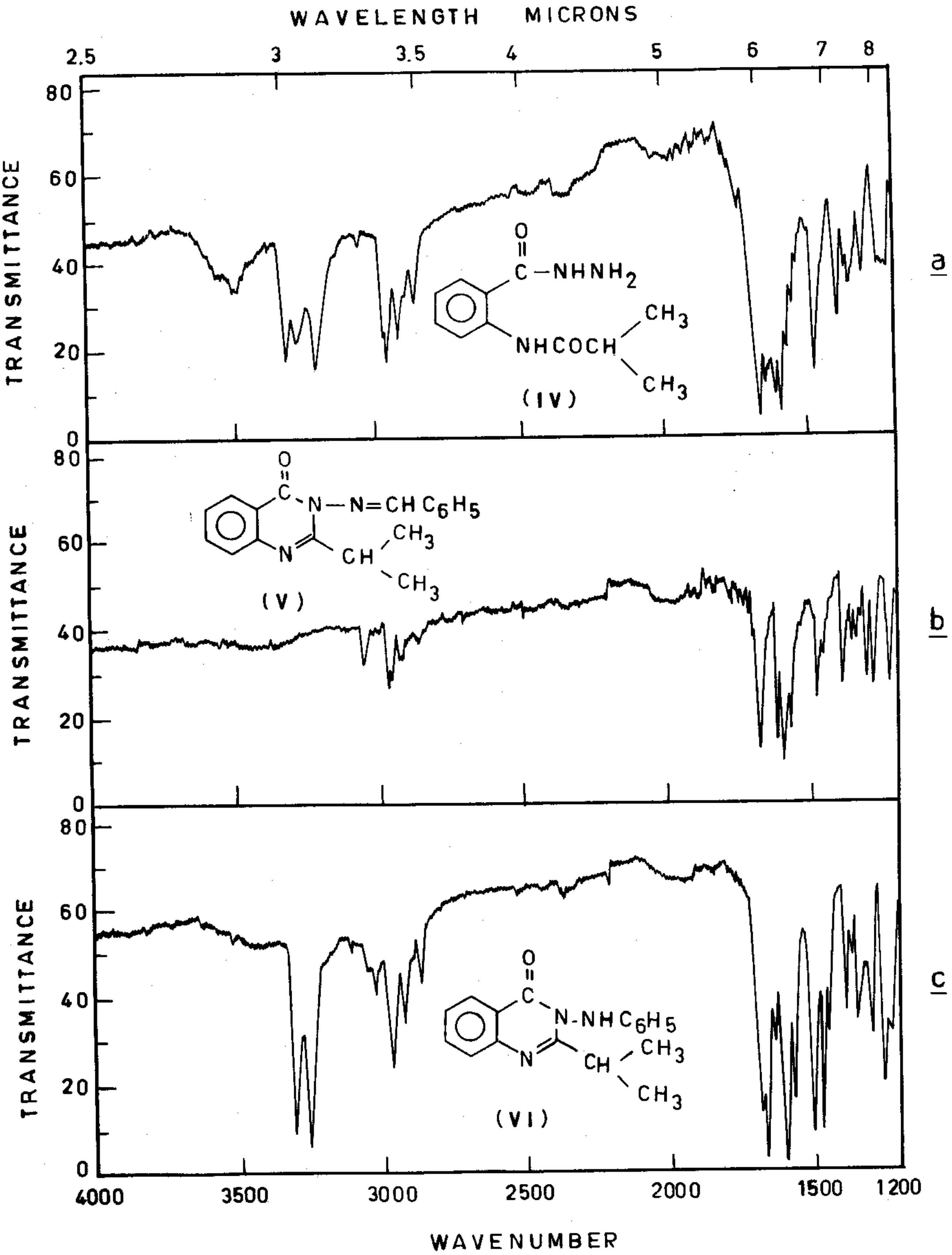
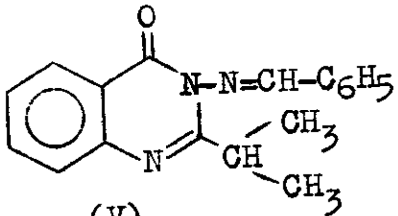

WAVELENGTH MICRONS
2.5
3
3.5
4
5
6
7
8
TRANSMITTANCE
80
60
40
20
0
a
O
C
NHNH2
NHCOCH
CH3
CH3
(IV)
b
O
C
N
N=CHC6H5
N
CH
CH3
CH3
(V)
c
O
C
N-NHC6H5
N
CH
CH3
CH3
(VI)
4000
3500
3000
2500
2000
1500
1200
WAVENUMBER

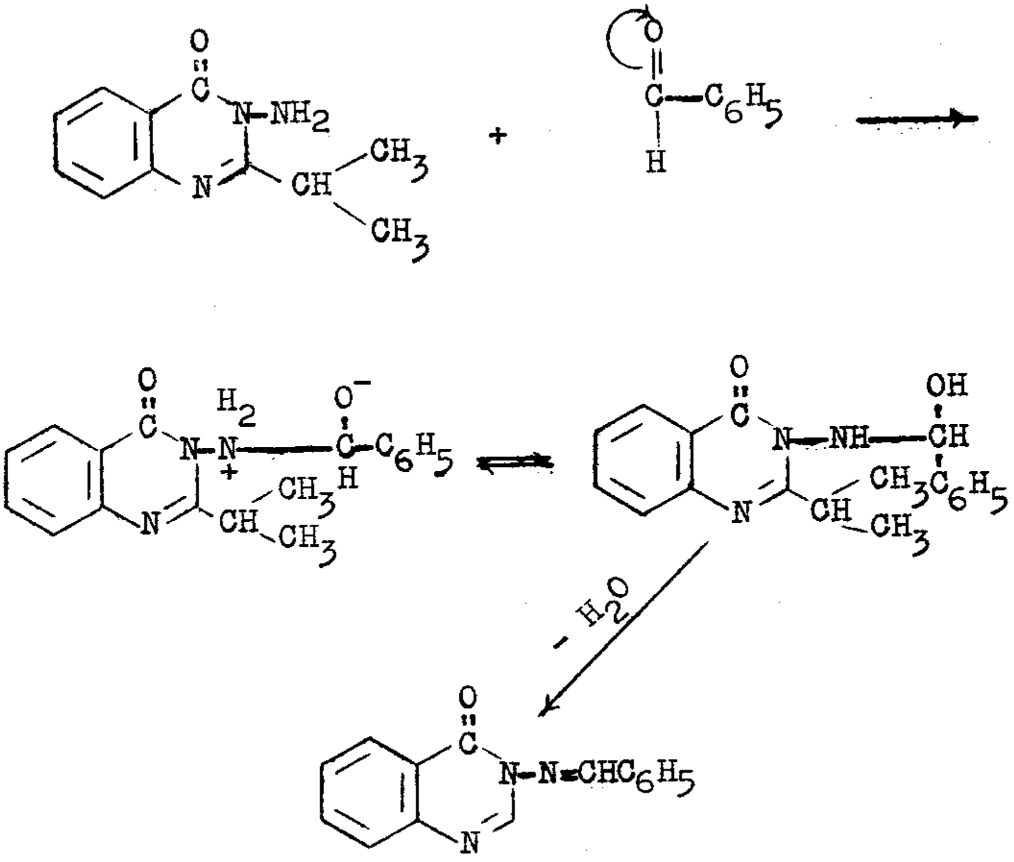
Fig. 2

(ii) Chemically: via the condensation of (IV) with benzaldehyde to give 3-(benzylidene amino)-2-isopropyl-4(3H)-quinazolinone (V).



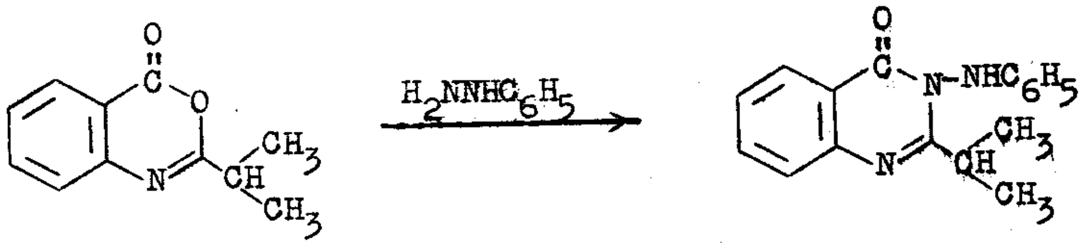
(V)

Structure (V) was proved from i.r. spectrum which shows $\nu_{C=O}$ at (1690 cm^{-1}) and other two bands at 1680 cm^{-1} and 1670 cm^{-1} due to the stretching frequency of two types of (C=N) also shows no ν_{NH} (cf. Fig. 2b). The reaction possibly takes place according to the following scheme:



Scheme 3

Also hydrazinolysis of (I) with phenyl hydrazine gives 2-isopropyl-3-(anilino)-4(3*H*)-quinazolinone (VI).



(I)

(VI)

The structure of (VI) was proved from

(i) Correct analytical data.

(ii) i.r. spectrum shows $\nu_{C=O}$ at (1670 cm^{-1}), $\nu_{C=N}$ at 1640 cm^{-1} and ν_{NH} at 3310 cm^{-1} (cf. Fig. 2c for VI).

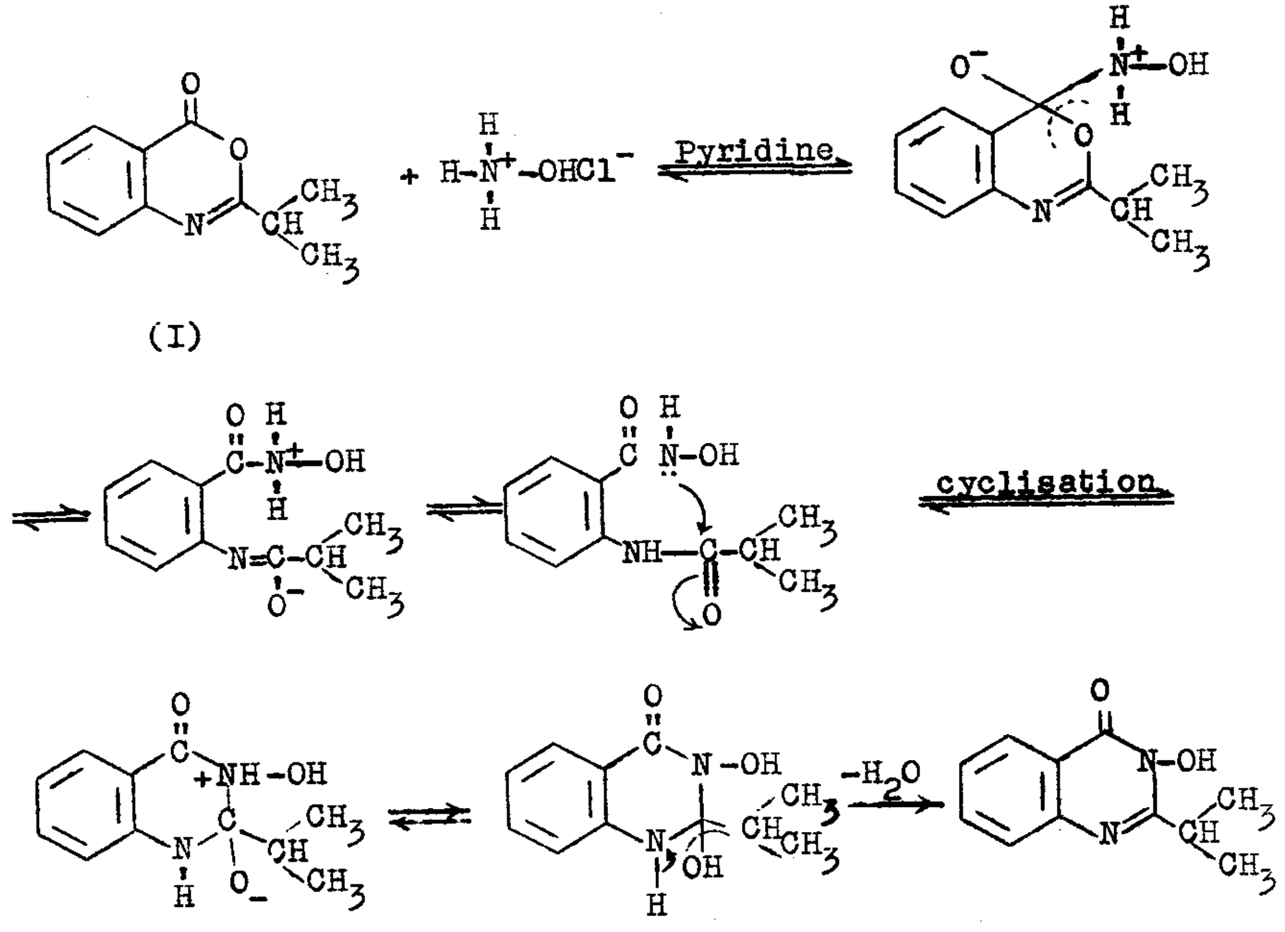
(III) Base-catalysed ring opening with hydroxylamine hydrochloride.

Recently Sammour *et al.*[93] reported that 2-cyclohexyl-3,1,4-benzoxazone reacts with hydroxylamine hydrochloride in refluxing pyridine to give 2-cyclohexyl-3-hydroxyl-4-quinazolone.

In the present investigation the author introduces isopropyl group in position 2 of benzoxazone to see the effect of branched chain on the mode of ring opening.

2-Isopropyl-3,1,4-benzoxazone (I) reacts with hydroxyl amine hydrochloride in refluxing pyridine to give 3-hydroxy-2-isopropyl-4(3H)-quinazolinone (VII).

The reaction takes place according to the following scheme :



(Scheme 4)

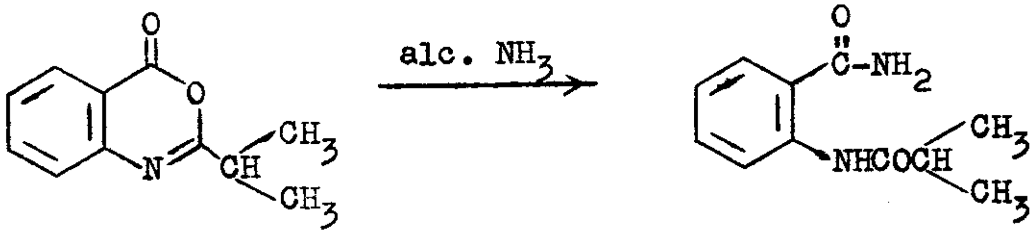
The structure of (VII) was confirmed from :

(i) Analytical data.

(ii) i.r. Spectrum for(VII) shows $\nu_{C=O}$ at 1680 cm^{-1}, $\nu_{C=N}$ at 1620 cm^{-1} and ν_{OH} at 3100 cm^{-1} (chelated) (cf. Fig. 3).

(IV) <u>Ammonolysis</u> :

2-Isopropyl-3,1,4-benzoxazone (I) reacts with alcoholic ammonia to give N-isobutroylanthranilamide (VIII), and the reaction takes place via a mechanism similar to that proposed for aminolysis



(VIII)

The structure of (VIII) was confirmed from :

(i) Analytical data.

(ii) i.r. Spectrum which reveals ν_{NH} bands at (3360 cm^{-1} and 3220 cm^{-1}), and two bands for two $\nu_{C=O's}$ of amide (1680 cm^{-1} and 1640 cm^{-1}) (cf. Fig. 4a).

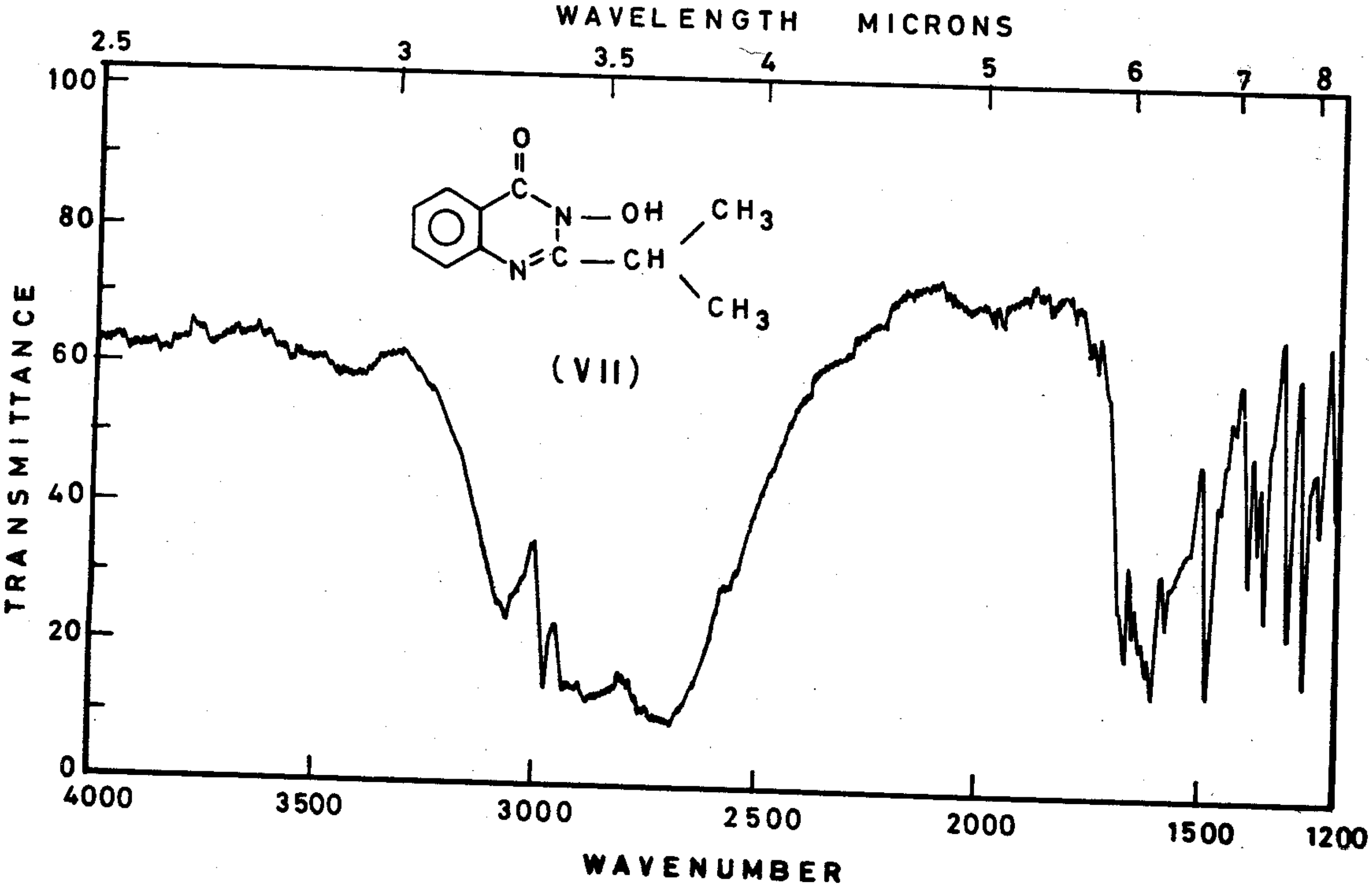

WAVELENGTH MICRONS
2.5
3
3.5
4
5
6
7
8
100
80
60
40
20
0
TRANSMITTANCE
4000
3500
3000
2500
2000
1500
1200
WAVENUMBER
(VII)

Fig. 3

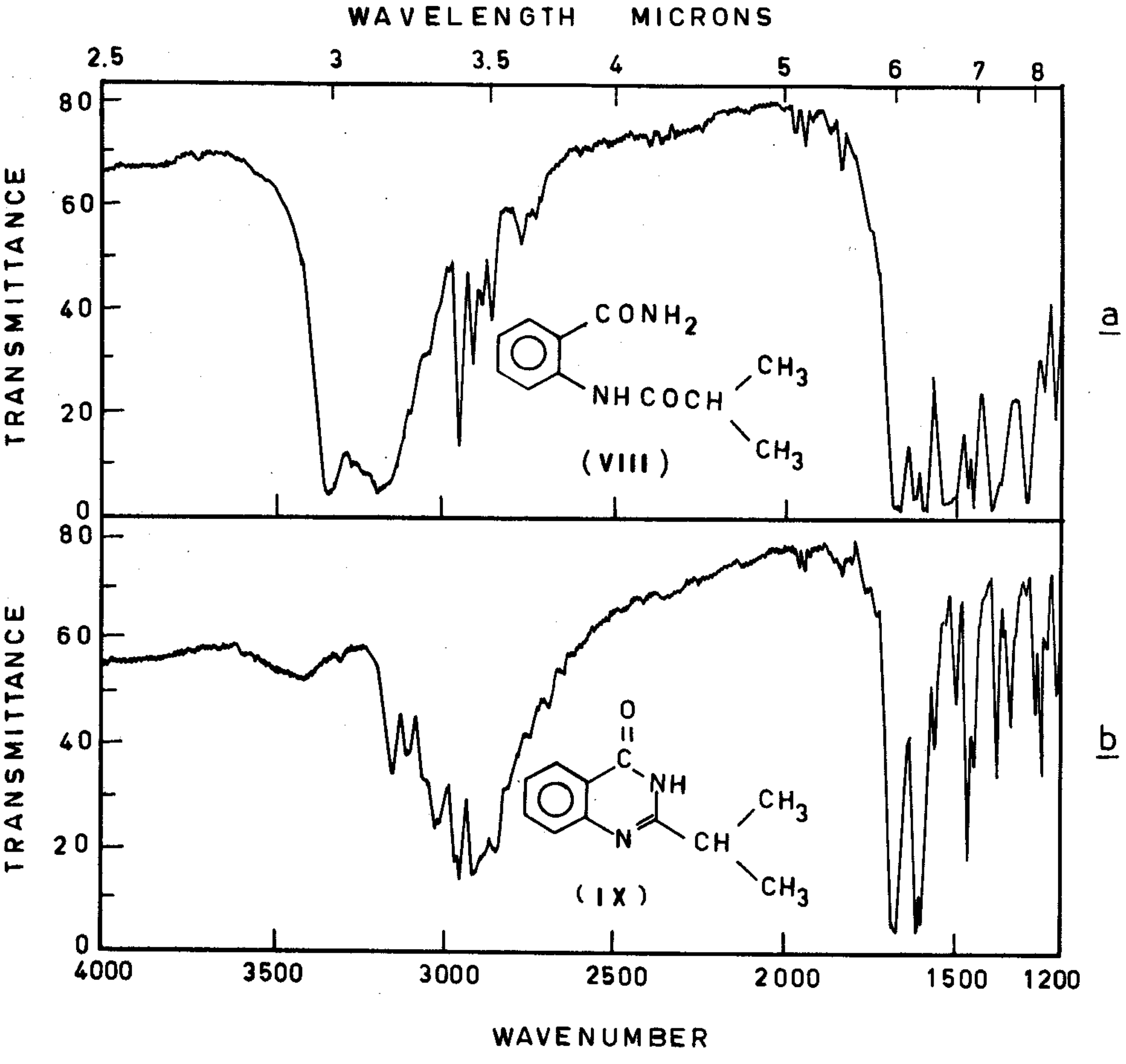
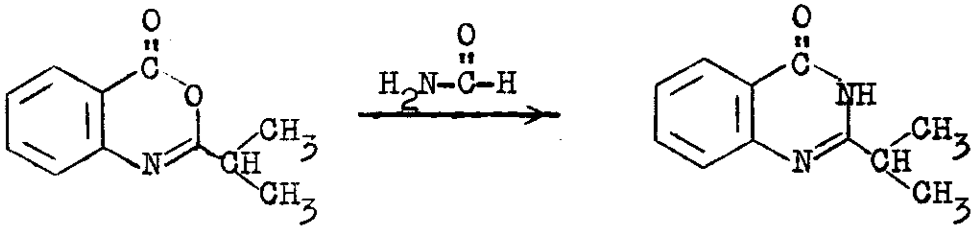

WAVELENGTH MICRONS
2.5
3
3.5
4
5
6
7
8
TRANSMITTANCE
80
60
40
20
0
CONH2
NHCOCH
CH3
CH3
(VIII)
a
TRANSMITTANCE
80
60
40
20
0
O
C
NH
N
CH
CH3
CH3
(IX)
b
4000
3500
3000
2500
2000
1500
1200
WAVENUMBER

Fig. 4

Trials for cyclisation of (VIII) was failed and no 2-isopropyl-4-quinazolone (IX) could be isolated. However the latter could be obtained from the reaction of 2-isopropyl-3,1,4-benzoxazone with formamide.



(I) (IX)

Infrared spectrum of (IX) shows ν_{OH} at 3450 cm^{-1} (basin peak) ν_{NH} at 3160 cm^{-1}, $\nu_{C=O}$ at 1690 cm^{-1} and two bands for $\nu_{C=N}$ at 1630 cm^{-1} and 1620 cm^{-1} (cf. Fig. 4b).

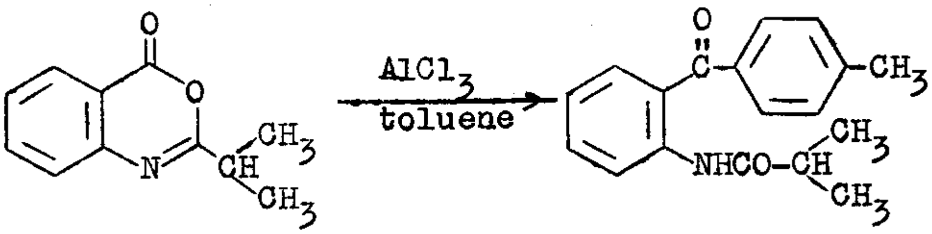
The above infrared data reveal that 2-isopropyl-4-quinazolone (IX) actually exists in a lactam-lactim tautomeric equilibrium (IXa and b).

(IXa) (IXb)

(V) Friedel-Crafts reaction with 2-isopropyl-3,1,4-benzoxazone

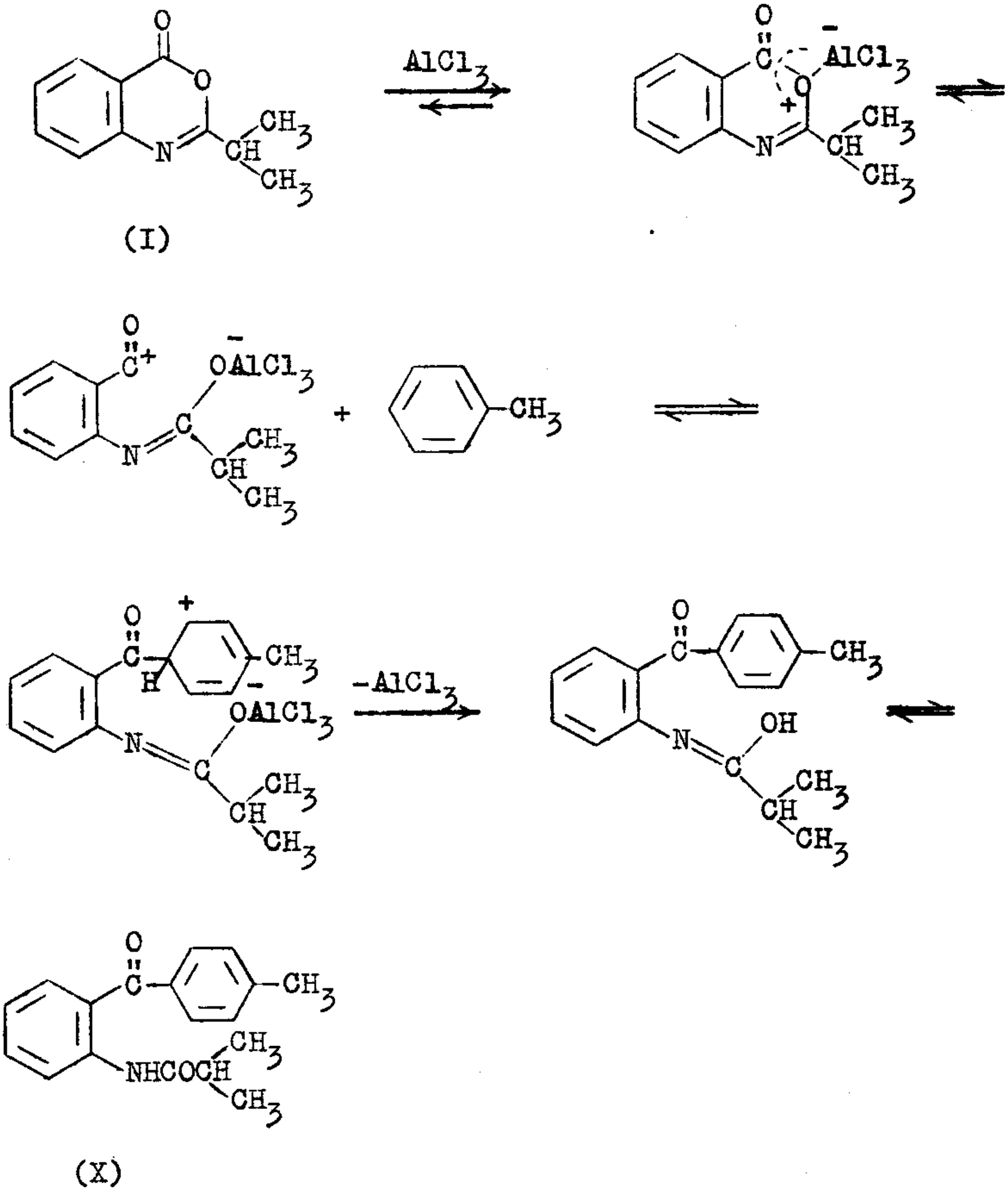
In this investigation the author tried to investigate the behaviour of 4-benzoxazone ring towards Friedel-Crafts reaction.

2-Isopropyl-3,1,4-benzoxazone (I) reacts with aluminium chloride in toluene under the condition of Friedel-Crafts reaction to give 2-isobutroylamido-4'-methyl-benzophenone (X).



(X)

The reaction proceeds via the following (scheme 5).



(Scheme 5)

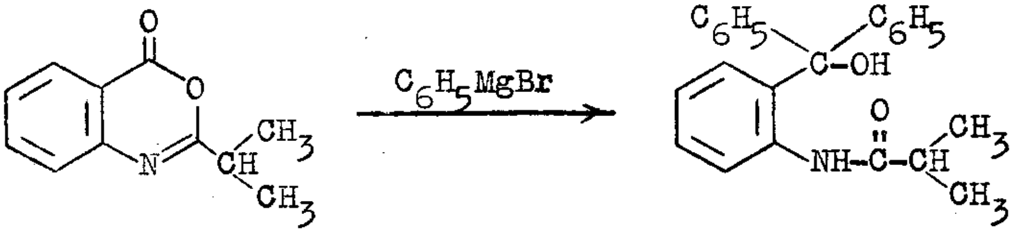
The structure of (X) was confirmed from:

(i) Analytical data.

(ii) i.r Spectrum which shows $\nu_{C=O}$ at 1660 cm^{-1}, and ν_{NH} at 3300 cm^{-1} (cf. Fig. 5).

(VI) Action of Grignard Reagents on 2-isopropyl-3,1,4-benzoxazone.

2-Isopropyl-3,1,4-benzoxazone (I) reacts with phenylmagnesium bromide[91] to give o-isobutramido-carbinol (XI).



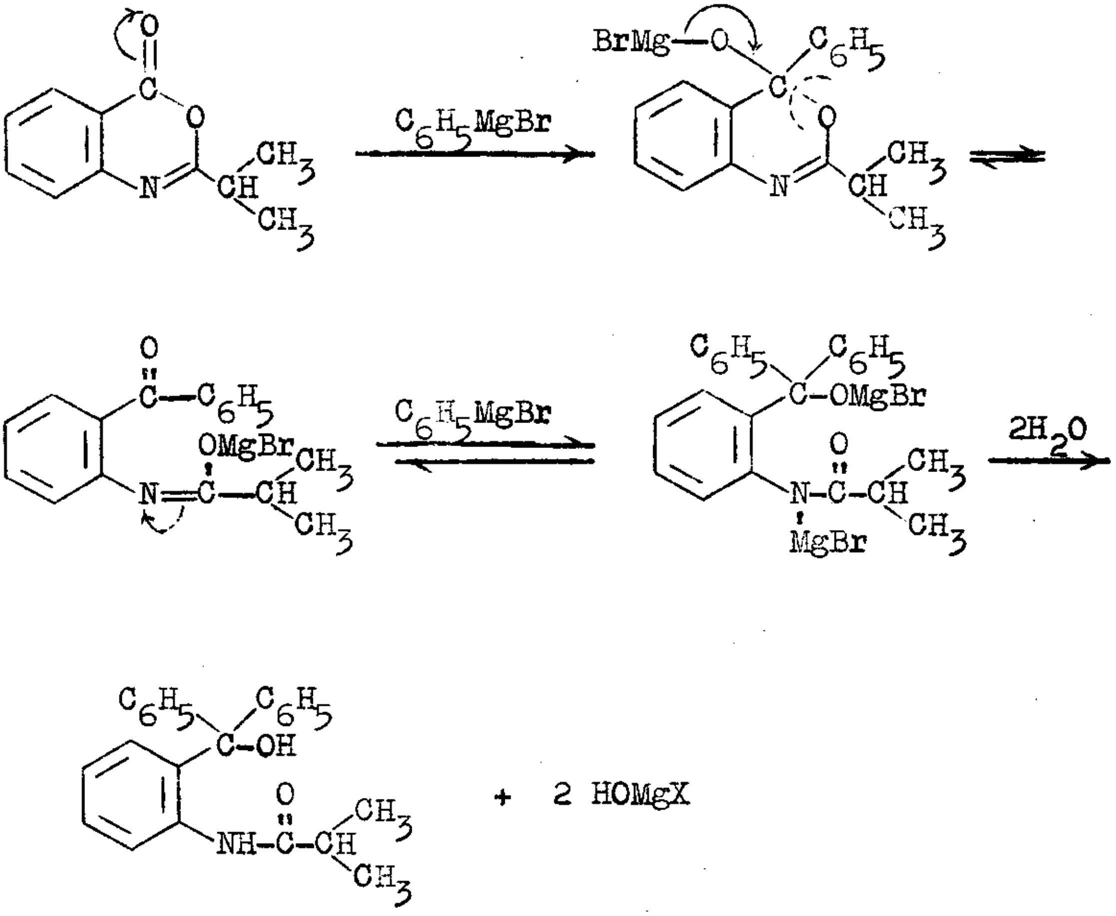
(I) (XI)

The structure of (XI) was confirmed from

(i) Analytical data

(ii) Infrared spectrum of (XI) shows $\nu_{C=O}$ (1680 cm^{-1}), and ν_{NH} at (3060 cm^{-1}) and ν_{OH} at (3380 cm^{-1}) (cf. Fig. 6a).

The reaction takes place according to the following scheme:



(XI)

(Scheme 6)

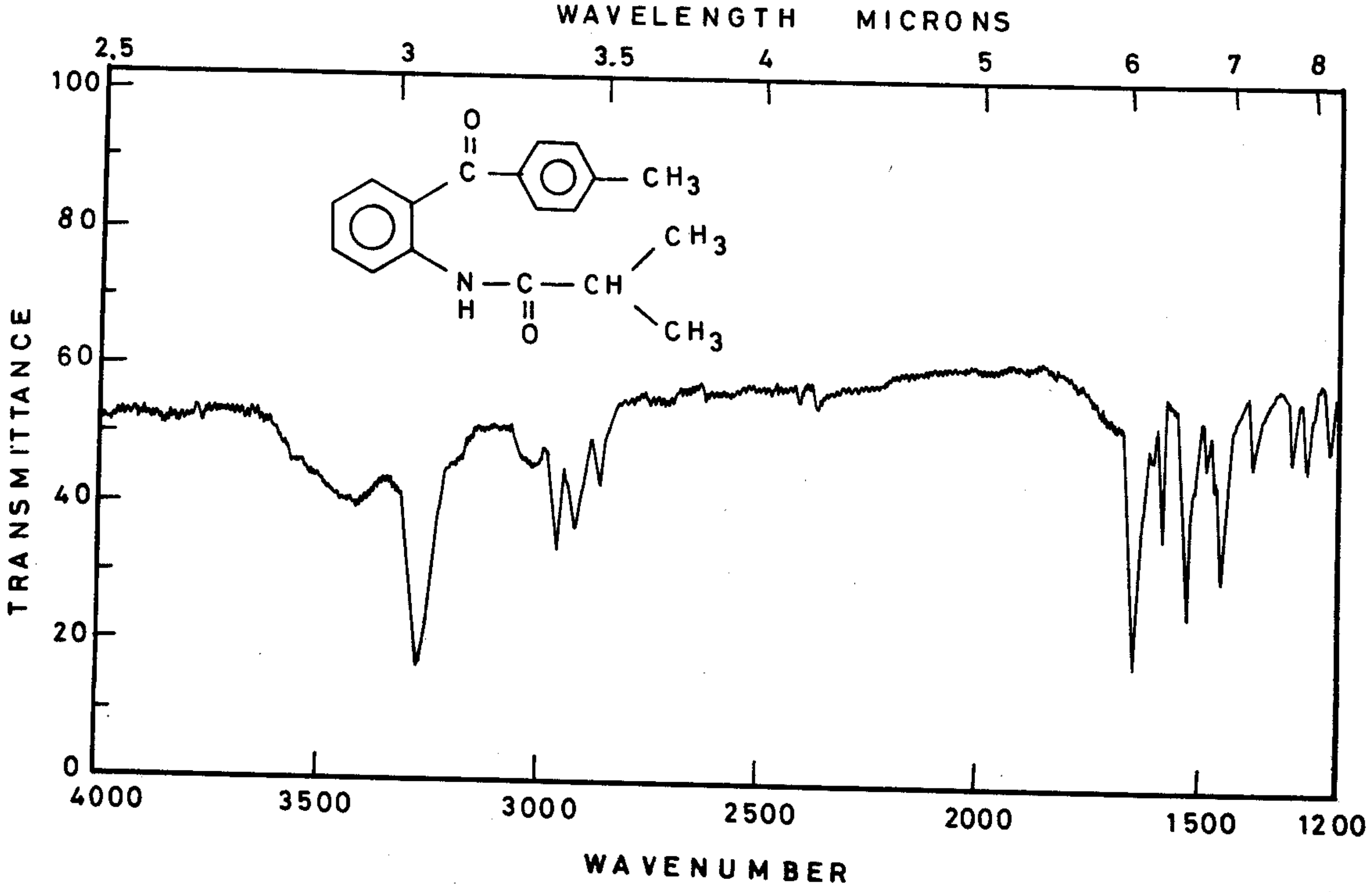

WAVELENGTH MICRONS
2.5
3
3.5
4
5
6
7
8
100
80
60
40
20
0
TRANSMITTANCE
4000
3500
3000
2500
2000
1500
1200
WAVENUMBER
O
C
CH3
N
H
C
O
CH
CH3
CH3

Fig. 5

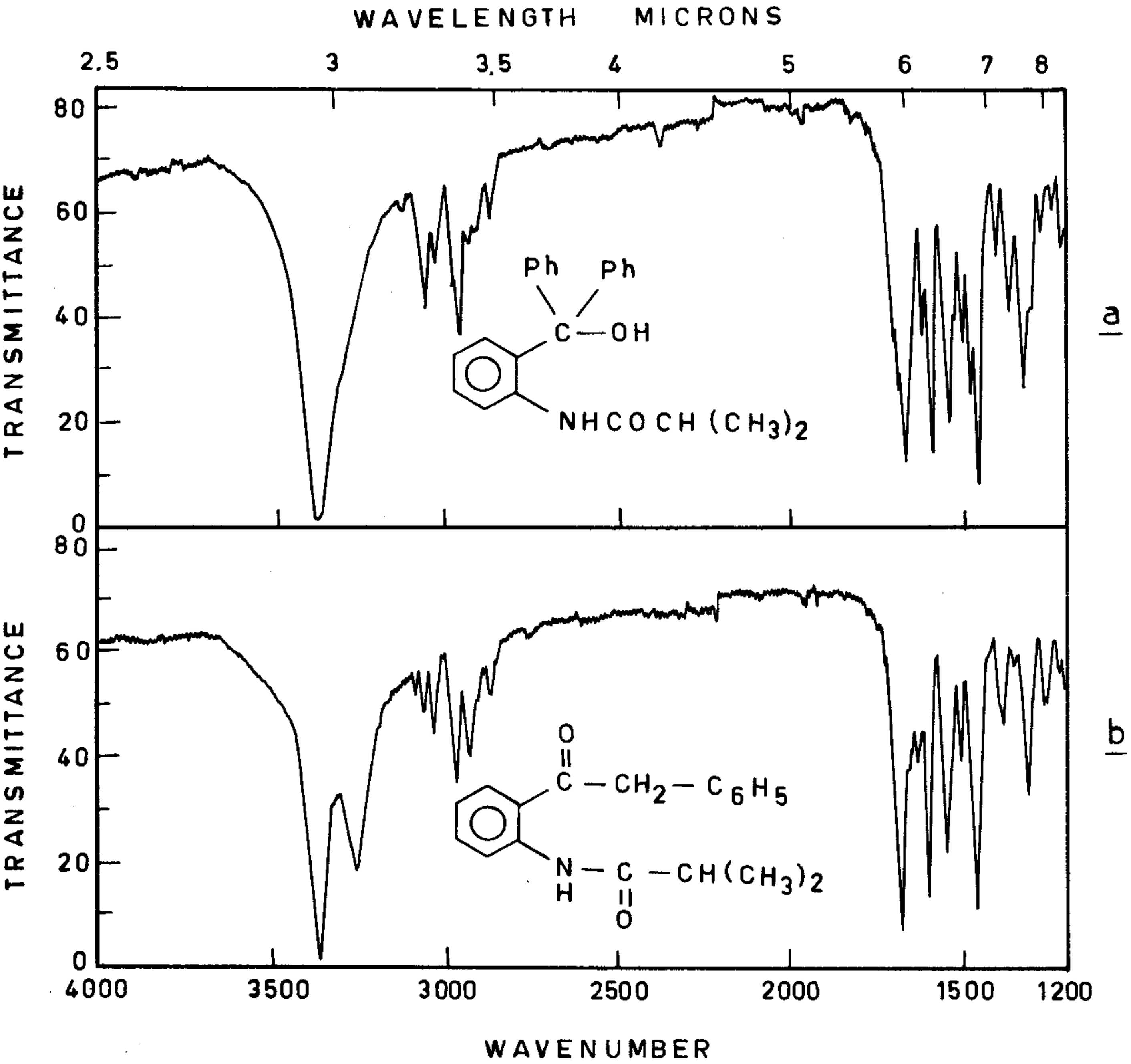

WAVELENGTH MICRONS
2.5
3
3.5
4
5
6
7
8
TRANSMITTANCE
80
60
40
20
0
Ph
Ph
C — OH
NHCOCH(CH3)2
a
TRANSMITTANCE
80
60
40
20
0
O
C — CH2 — C6H5
N — C — CH(CH3)2
H
O
b
4000
3500
3000
2500
2000
1500
1200
WAVENUMBER

Fig. 6