AFML-TR-69-235
PART I

CHARACTERIZATION OF VERY PAUCI-DISPERSE SYSTEMS WITH STRONG INTERACTION BY EQUILIBRIUM SEDIMENTATION

PART I. DETERMINATION OF MOLECULAR WEIGHTS AND PARTIAL EVALUATION OF INTERACTION MATRIX

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FOREWORD

This report was prepared by the Polymer Branch of the Nonmetallic Materials Division. The work was initiated under Project 7342, "Fundamental Research on Macromolecular Materials and Lubrication Phenomena," Task No. 734203, "Fundamental Principles Determining the Behavior of Macromolecules." The work was administered under the direction of the Air Force Materials Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, with Dr. M. T. Gehatia acting as project scientist.

The report covers research conducted from January 1968 to April 1969. The manuscript was released by the author in May 1969 for publication as a technical report.

This technical report has been reviewed and is approved.

William E. Gibbs

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ABSTRACT

As part of a series of investigations of the fundamental properties of certain aromatic-heterocyclic polymers, a study has been done on the equilibrium sedimentation of samples of poly (2,2'-m-phenylene-5,5'-bibenzimidazole) in dimethylacetamide. Although these samples were obtained by fractional precipitation techniques from a whole polymer, it was found that their behavior was best described by assuming some samples to be composed of at least two major sub-fractions. In addition, this analysis required that each sub-fraction have a relatively strong interaction with itself and other sub-fractions. Because each sample consisted of a small number of major fractions a method was developed based upon considerations from pauci-disperse systems to characterize molecular weights and polymer-polymer interaction terms. This report details the development of this method. The concentration of these samples is represented by:

$$c \approx \sum_{n=1}^{N} g_n \exp \left[h_n \omega^2 x - R_{nk} c + (R_{nk} - R_{nn}) c_n \right],$$

where c is concentration; x = square of the distance from the center of rotation; h_n a constant proportional to molecular weight of fraction n; R_{nk}, R_{nn} are interaction coefficients and ω is the angular velocity.

The distribution of this Abstract is unlimited.

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ILLUSTRATIONS (CONT)

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LIST OF SYMBOLS

r = the distance from the center of rotation

r_m = the distance from the center of rotation to the meniscus

r_b = the distance from the center of rotation to the bottom of the cell

$x = r^2$

$m = r_m^2$

$b = r_b^2$

r_o = the distance from the center of rotation to the initial boundary in a velocity experiment

s = sedimentation constant

D = diffusion constant

ω = angular velocity

$\beta = h\omega^2$

t = time

T = absolute temperature in °K

R = universal gas constant, or interaction parameter in general

ρ = density of solution

ρ_o = density of solvent

V = partial specific volume of polymer in solution

c = concentration in g of polymer per g of solution

$c^\bullet$ = initial concentration

$H = 2RT/(1-V\rho)$

M = molecular weight

$h = M/H$

g = a constant defined for θ-temperature where, $g = c\, e^{-h\omega^2 x}$

LIST OF SYMBOLS (CONT)

c_n
c^*_n
M_n
h_n
g_n
} the above defined quantities corresponding to fraction n.

R_{nk} = interaction parameter appearing in an expression for c_n, and caused by c_k

SECTION I

INTRODUCTION

Aromatic-heterocyclic polymers are a class of interesting materials that are currently being developed due to their resistance to high temperature. Relatively little has been done toward determining many of the fundamental parameters that govern the physical behavior of these chains. This report covers one phase of an investigation of the dilute solution properties of one of the earlier, high molecular weight aromatic-heterocycles, poly (2,2'-m-phenylene-5,5'-bibenzimidazole) (PBI), dissolved in a good solvent dimethylacetamide (DMAC). Specifically this report concerns equilibrium sedimentation measurements on samples of this polymer in an effort to define molecular weight, and polymer-polymer interaction parameters.

Preliminary measurements on these samples suggested that each sample consists of a relatively small number of rather discrete molecular weight ranges. In addition, it was suspected that relatively strong interactions could exist between various species. Therefore, early consideration was given to describing this situation by applying a method developed from study of paucidisperse systems.

This is discussed in the next section.

SECTION II

THEORY

A MONODISPERSE SYSTEM WITH INTERACTION

Consider a monodisperse polymer with significant concentration dependence. If higher than first order terms can be neglected, the concentration achieved in equilibrium-sedimentation can be expressed by the following equation:

$$c = ge^{h\omega^2 c - Rc} \tag{1}$$

The relationship expressed by Equation 1 and especially the interaction parameter R were discussed by Fujita (Reference 1), Casassa (Reference 2), Gehatia and Wiff (Reference 3), and others.

By differentiating Equation 1 with respect to x one obtains:

$$\frac{dc}{dx} = \left(h\omega^2 - R\frac{dc}{dx}\right) c \tag{2}$$

which leads to the following working formulas:

$$c^{-1}\frac{dc}{dx} = h\omega^2 - R\frac{dc}{dx} \tag{3}$$

$$c^{-1} = h\omega^2 \left(\frac{dc}{dx}\right)^{-1} - R \tag{4}$$

A plot of $c^{-1}\frac{dc}{dx}$ vs. $\frac{dc}{dx}$, according to Equation 3, should give a straight line with a slope equal to (-R). Similarly, according to Equation 4, a plot of c^{-1} vs. $\left(\frac{dc}{dx}\right)^{-1}$ gives a slope equal to $h\omega^2$, which is a quantity proportional to the molecular weight (References 3 and 4).

By knowing $h\omega^2$ and R one can evaluate the constant g from Equation 1 and thereby fully characterize the system under consideration.

SYSTEM OF TWO DISTINCT INTERACTING FRACTIONS

Consider a solution of polymer comprised of two interacting fractions (1 and 2). The concentration can be expressed as:

$$c = c_1 + c_2 \tag{5}$$

where:

$$c_1 = g_1 e^{h_1 \omega^2 x - R_{1,1} c_1 - R_{1,2} c_2} \tag{6}$$

and:

$$c_2 = g_2 e^{h_2 \omega^2 x - R_{2,1} c_1 - R_{2,2} c_2} \tag{7}$$

It has been assumed that in a certain region ($m \leq x \leq x^*$) the fraction 1 prevails, e.g., that $c_1 \approx c$ and $c_2 << c_1$. Since $c_1 = c - c_2$ the exponent in Equation 6 can be modified:

$$-R_{1,1} c_1 - R_{1,2} c_2 = -R_{1,1} c - (R_{1,2} - R_{1,1}) c_2 \tag{8}$$

and Equation 5 can be approximated by the formula:

$$c \approx g_1 e^{h_1 \omega^2 x - R_{1,1} c} \left[1 - (R_{1,2} - R_{1,1}) c_2 \right] + c_2 \tag{9}$$

Denote:

$$g_1 e^{h_1 \omega^2 x - R_{1,1} c} = G_1 \tag{10}$$

and:

$$R_{1,2} - R_{1,1} = K_m \tag{11}$$

Equation 9 will now lead to the following expression for c_2:

$$\frac{c - G_1}{1 - K_m G_1} \approx c_2 \tag{12}$$

The approximation is justified if the quantity $K_m c_2 << 1$, e.g., if, for a certain $x > x^*$, c_2 is not negligible in comparison to be c, but is still small enough to make the following transformation valid:

$$e^{-K_m c_2} \approx 1 - K_m c_2 \tag{13}$$

For a known value of K_m one can evaluate the c_2 curve in a region in which $K_m c_2 << 1$. According to Fujita (Reference 1),

$$R_{1,2} = M_1 f_{1,2} \tag{14}$$

and:

$$R_{2,1} = M_2 f_{2,1} \tag{15}$$

where f_{12} and f_{21} are the cross coefficients of interaction and:

$$f_{1,2} = f_{2,1} \tag{16}$$

Using this assumption of a symmetric interaction one obtains:

$$R_{2,1} = R_{1,2}\left(\frac{M_2}{M_1}\right) = R_{1,2}\left(\frac{h_2\omega^2}{h_1\omega^2}\right) \tag{17}$$

By inserting this expression for $R_{2,1}$ into Equation 7 one obtains the following formula:

$$\ln c_2 = \ln g_2 - \frac{h_2\omega^2}{h_1\omega^2} R_{1,2}c + \left[\frac{h_2\omega^2}{h_1\omega^2} R_{1,2} - R_{2,2}\right] c_2 \tag{18}$$

Equation 18 is an expression for c_2 with three unknown parameters; $\ln g_2$, $(h_1\omega^2/h_2\omega^2) R_{1,2} = a$, and $\left[(h_2\omega^2/h_1\omega^2) R_{1,2} - R_{2,2}\right] = b$

For a large number of c values one can determine the parameters in Equation 18 as well as the total error of the system. In this calculation a measure of the error was taken as:

$$\Delta_m^2 = \sum_i \delta_{m,i}^2 \quad , \tag{19}$$

where:

$$\delta_{m,i} = \ln (c_2)_{m,i} - \ln (g_2)_m + a_m (c)_i + b_m (c_2)_{m,i} \tag{20}$$

One must remember that such a treatment was originally suggested for the case when K_m is a known quantity. In a real case such a value is not known, a priori. However, the following procedure can be applied. A set of values can be assumed for K_m and accordingly Δ^2_m can be evaluated. The "best fit," e.g.,

the minimum of a plot Δ^2_m vs. K_m, gives an acceptable value for K_m. In such a case the values of K_m as well as other parameters, are determined. These parameters finally lead to evaluation of the following constants: M_1, M_2, g_1, g_2, $R_{1,1}$, $R_{1,2}$, $R_{2,1}$, and $R_{2,2}$, which fully describe the system comprised of two interacting fractions (Figures 16 and 17).

The search for appropriate K_m values can be accomplished by use of a high speed computer. In case of a few fractions one can find more than one distinct K_m value, i.e., $\{K_{m,n}\}$; with the corresponding set M_n, g_n, R_{1n}, R_{ni}, and R_{nn}. If there are too many fractions in the system $K_{m,n}$ values cannot be distinguished by searching, and "noise" is created.

In case of two fractions, and if all parameters of the transcendental equation, Equation 7, are known, c_2 can be precisely evaluated for all values of x without need of an approximation.

SECTION III

EXPERIMENTAL

Bulk PBI was dissolved in DMAC and fractionated with hexane. The fractions were purified in the following manner. Each sample was redissolved in DMAC, precipitated and washed with methyl ethyl ketone (MEK), filtered and washed again with MEK. The process of washing was continued; however, MEK was replaced by mixtures of MEK-MEOH with successively decreasing amounts of MEK. The polymer was further washed with pure methanol and replaced by mixtures of MEOH-ether with successively decreasing amounts of MEOH. Finally, the remaining polymer was washed with ether and dried under vaccum (this method of purification and fractionation was suggested by T. E. Helminiak).

A set of sedimentation equilibrium experiments was carried out with four samples of PBI in DMAC at 40°C. An aluminum, 12mm, 4°, single sector cell containing the solution and another similar cell with DMAC were inserted into a J-rotor. The resulting Schlieren curves appeared, therefore, with a base line in addition to the sedimentation curve (Figures 2-8).

Each sample was measured at different rotor speeds. It required about 14-17 days to achieve the first equilibrium. If the speed was decreased the next equilibrium could be achieved within 7-10 days. However, it took only a few days to achieve equilibrium when the speed was increased rather than decreased. This surprising behavior, which contradicts theoretical considerations and expectations, has not yet been explained. In several cases no equilibrium was achieved as the speed was lowered and the Schlieren curve dissipated.

The quantity $\frac{dc}{dn}$ has been determined from auxiliary velocity runs carried out with a synthetic boundary cell.

Finally the plates were enlarged and the coordinates $\frac{dn}{dr}$ and Δr were measured.

SECTION IV

COMPUTATION

The experimental data was analyzed by applying Equations 3 and 4. (Figures 2-16 and Tables I-XI). As one can readily see no linear plots have been obtained. Therefore, the samples under consideration are not homogenous. On the other hand, one can also observe that these plots clearly show a straight line in a zone close to the meniscus ($m \leq x \leq x^*$, where x^* is a special value different for each sample and speed). Only sample three led to a straight line over all values of x.

Such a peculiarity of the plot can be explained by assuming the existence of a distinct low molecular weight fraction. This, as well as other considerations, suggests that there exists a very pauci-disperse system, i.e., that each sample is comprised of a few fractions (as a matter of fact, 2, 3, or 4 fractions). In addition, the low molecular weight fraction is very distinct in a certain zone near the meniscus, $c_{total} \approx c_1$ and $c_{n \neq 1} << c_1$.

The results of applying a method based upon these considerations to the four samples is summarized in Table XII. An equilibrium sedimentation experiment was made at each speed indicated. The first fraction parameters (g_1, M_1, and $R_{1,1}$) were evaluated by the procedure outlined above. The other parameters (g_m, M_m, R_{mm}, and R_{1m}) were determined by finding minima as indicated in Figure 22. All minima corresponding to fractions within a sample are indicated in Table XII.

SECTION V

DISCUSSION OF RESULTS

The computation just described cannot be considered as completed. In the case of four fractions:

$$c_n = g_n \exp (h_n \omega^2 - R_{n1} c_1 - R_{n2} c_2 - R_{n3} c_3 - R_{n4} c_4) \qquad (21)$$

each curve can be evaluated within a zone, where $K_m c_m \ll 1$, and the corresponding parameters can be determined within such a zone.

However, an assumption has been made, according to Fujita (Reference 1), that:

$$\frac{R_{nk}}{M_n} = \frac{R_{kn}}{M_k} \qquad (22)$$

which is not readily apparent (Reference 2). Without using the relationship described in Equation 22, the cross-coefficients R_{kn} $(k \neq 1)$ cannot be easily evaluated.

The parameters $h_1 \omega^2$ and $R_{1,1}$ were determined from the linear portion of original plots. However, such an evaluation may introduce a numerical error which exceeds the tolerances required by the $K_{m,n}$, $\Delta_{m,n}$ analysis. Therefore, a variance in the values of $h_1 \omega^2$ and $R_{1,1}$ has to be taken into account to better fit the system.

Finally, the analysis has been performed by comparing the lowest fraction of a given sample with the other fractions in the sample. The results of applying this analysis to four samples is given in Table XII. Samples 1, 2, and 4 show that they are composed of about four sub-fractions. These sub-fractions have molecular weights of approximately 1,500; 30,000; 60,000; and 120,000. One sample, namely number 3, appears to have a very narrow distribution. Its weight average molecular weight is about 4,500.

It is also significant that the diagonal elements (R_{mm}) of the "interaction" matrix were all found to be negative. Only values for R_{1m} are given in Table XII, since no proper method was applied to determine the off-diagonal elements R_{nk} for $n \neq 1$.

It has been suggested that some of the molecular weights indicated (Table XII) by this experimental analysis are higher than would be expected from condensation polymerization. Therefore, further investigations must be initiated for better examination of the system. Also, additional work will be required to more fully evaluate the validity of this method and to make necessary modifications to include in the calculation of all R_{nk} parameters.

SECTION VI

COMPUTER PROGRAM

COMPUTER SYMBOL IDENTIFICATION

Following is a list of symbols used in the computer program. Where possible the symbols are identified with the previously derived theory. One must remember that the computer program was written only for the case of two major distinct molecular weight components.

RECØRD - Used as "flag" for subroutine calling order.

PNAME1 and PNAME2 - Identification of experiment.

NMAX - Number of data points read into machine.

CO - Initial concentration of experimental solution.

R1 - First radial value. The distance from the center of rotation in the meniscus.

DLR - Incremented value for radial distances. Radial distance to the bottom of cell is given by R1 + (NMAX-1)*DLR.

R(I) - Array of radial values

X(I) - Array R(I)**2

CR(I) - Array containing experimentally measured ordinates from Schlieren Curves. Once these are read they are multiplied by SCALE to obtain the true $^{dc}/dr$ values.

CX(I) - Array $(^{1}/2r)$ $(^{dc}/dr)$

C(I) - Array of concentrations obtained from $\int_{m}^{x} \frac{dc}{dx}\, dx = c - c_m$. Then use is made of the equation $\int_{m}^{b} cdx = c^{\circ}(b-m)$ to calculate c_m, the concentration at the meniscus.

ZLC(I) - Array ln (C(I))

CXØVX(I) - Array (dc/dx)/C

XCX(I) - Array $(dc/dx)^{-1}$

XC(I) - Array (C^{-1})

NMAX1 - First point at which c_2 is small but must be considered.

NMAX2 - Highest point at which c_2 is small but not zero.

DLK - $R_{1,1} + R_{1,2}$

DKMAX - Maximum value of DLK.

XDLK - Increment value for DLK.

G(I) - Array $\left\{ g_1 e^{h_1 \omega^2 x} - R_{11} c \right\}$

H1ØMSQ - $h_1 \omega^2$

R11 - $R_{1,1}$

G1 - g_1

Y(I,J) - Array containing three consecutive sets of values (three successive DLK values) for YN(I).

YN(I) - (C(I) - G(I))/(1-DLK*G(I))

U(I) - Array (X - $(R_{12}/h_1 \omega^2)$*c)

IY(I,J) - Array containing the values of NMAX1 and NMAX2 corresponding to the array Y(I,J).

Z(I) - Array ln C_2(I)

R22 - $R_{2,2}$

R12 - $R_{1,2}$ = DLK - $R_{1,1}$

G2 - g_2

H20MSQ - $h_2 \omega^2$

XLNG2 - ln (g_2)

XN - Number of data points sampled (NMAX2-NMAX1 + 1)

$$\text{DELTA} = \frac{1}{XN} \sum_{i=NMAX1}^{NMAX2} \left\{ \ln c_2(x_i) - \left[\ln g_2 + h_2 \omega^2 \left(x_i - \frac{R_{1,2}}{h_1 \omega^2} c(x_i) \right) + \frac{R_{1,2}}{h_1 \omega^2} - R_{2,2} c_2(x_i) \right] \right\}^2$$

The flow of computer data is shown in Figure 1.

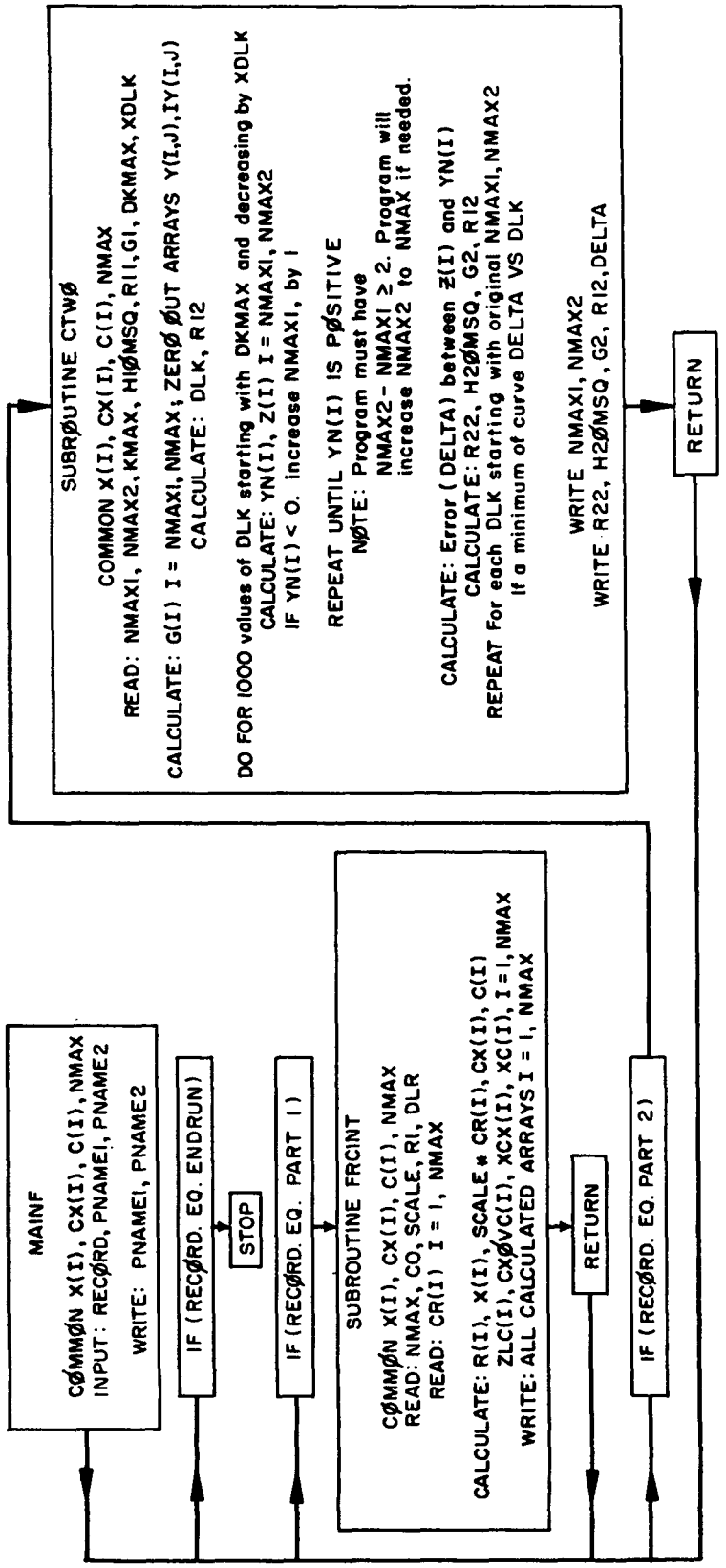

Figure 1. Computer Data Flow Diagram

COMPUTER PRINTOUT

```
$IBFTC MAINF   DECK
       COMMON X,CX,C,NMAX
C      DIMENSIONS FOR COMMON
       DIMENSION X(100),CX(100),C(100)
       DATA P1,P2,P3/6HPART 1,6HENDRUN,6H
       DATA P4/6HPART 2/
     1 READ(5,101) RECORD,PNAME1,PNAME2
   101 FORMAT(A6,4X,2A6)
       IF(RECORD - P1) 2,10,2
     2 IF(RECORD - P2) 3,89,3
     3 IF(RECORD - P4) 4,11,4
     4 IF(RECORD - P3) 99,1,99
    10 WRITE(6,1000)
  1000 FORMAT(1H1/1HA)
       WRITE(6,2000) PNAME1,PNAME2
  2000 FORMAT(1H ,50X,25HIDENTIFICATION NUMBER IS ,2A6)
       CALL FRCINT
       WRITE(6,1001)
  1001 FORMAT(1HA/1HA)
       GO TO 1
    11 WRITE(6,1000)
       WRITE(6,2000) PNAME1,PNAME2
       CALL CTWO
       WRITE(6,1001)
       GO TO 1
    99 WRITE(6,3000) RECORD
  3000 FORMAT(1H ,36HWHAT DO WE DO WITH THE CARD LABELED ,A6)
       GO TO 1
    89 WRITE(6,1000)
       WRITE(6,7000)
  7000 FORMAT(8(11H END OF RUN,3X)/1H1)
       STOP
       END
```

COMPUTER PRINTOUT (CONT)

```
$IBFTC FRCIN   DECK
       SUBROUTINE FRCINT
       COMMON X,CX,C,NMAX
C      DIMENSIONS FOR COMMON
       DIMENSION X(100),CX(100),C(100)
       DIMENSION CR(100),R(100),ZLC(100),CXOVC(100),XCX(100),XC(100)
       READ(5,101) NMAX,CO,SCALE,R1,DLR
  101 FORMAT(I3,1P2E11.4,0PF10.5,0PF10.6)
  100 FORMAT(A6)
       READ(5,102) (CR(I),I = 1,NMAX)
  102 FORMAT(16F5.0)
       DO 1 I = 1,NMAX
       R(I) = R1 + FLOAT(I-1)*DLR
       X(I) = R(I)**2
       CR(I) = SCALE*CR(I)
       CX(I) = CR(I)/(2.*R(I))
     1 CONTINUE
       A = 0.
       COEF = 0.
       DO 2 I = 1,NMAX
       IF(I.EQ.1) GO TO 2
       DLX = X(I) - X(I-1)
       AVGCX = (CX(I)+CX(I-1))/2.
       COEF = COEF + DLX*AVGCX
       AC = (COEF + C(I-1))/2.
       A = A + DLX*AC
     2 C(I) = COEF
       DIFBM = X(NMAX) - X(1)
       CM = (DIFBM*CO - A)/DIFBM
       WRITE(6,2000) CO,DIFBM,CM
 2000 FORMAT(1H ,33HTHE CONCENTRATION FOR THIS RUN = ,E11.4/43H DIFFEREN
     1CE BTWN SOS OF BTM AND MENISCUS = ,E15.8/21H CONC. AT MENISCUS = ,
     2E11.4////)
       DO 3 I = 1,NMAX
       C(I) = C(I) + CM
       ZLC(I) = 0.
       IF(C(I).LE.0.) GO TO 3
       ZLC(I) = ALOG(C(I))
       CXOVC(I) = CX(I)/C(I)
       XCX(I) = 1./CX(I)
       XC(I) = 1./C(I)
     3 CONTINUE
       WRITE(6,2001)
 2001 FORMAT(1H ,1X,1HI,9X,1HR,11X,1HX,11X,2HCR,10X,2HCX,10X,1HC,9X,5HLN
     1(C),7X,4HCX/C,8X,4H1/CX,8X,3H1/C//)
       DO 4 I = 1,NMAX
     4 WRITE(6,2002) I,R(I),X(I),CR(I),CX(I),C(I),ZLC(I),CXOVC(I),XCX(I),
     1XC(I)
 2002 FORMAT(1H ,I2,5X,9(1PE11.4,1X))
       RETURN
       END
```

COMPUTER PRINTOUT (CONT)

```
$IBFTC CTAU     DECK
       SUBROUTINE CTWO
       COMMON X,CX,C,NMAX
C      DIMENSIONS FOR COMMON
       DIMENSION X(100),CX(100),C(100)
       DIMENSION G(100),YN(100),U(100),Z(100)
       READ(5,100) NMAX1,NMAX2,KMAX,H1OMSQ,R11,G1,DKMAX,XDLK
  100  FORMAT(3I3,3E10.3,F15.8,F10.6)
       DO 1 I = NMAX1,NMAX
       A1 = H1OMSQ*X(I) - R11*C(I)
       A2 = EXP(A1)
     1 G(I) = G1*A2
       DO 2 K = 1,KMAX
       K1 = NMAX1
       K2 = NMAX2
       DLK = DKMAX + XDLK*FLOAT(K-1)
       WRITE(6,1001) DLK
 1001  FORMAT(1H ,80X,5HKN = ,F10.5)
       R12 = R11 - DLK
    98 CONTINUE
       WRITE(6,2000) NMAX1,NMAX2
 2000  FORMAT(1H ,8HNMAX1 = ,I2,9H NMAX2 = ,I2)
       DO 3 I = NMAX1,NMAX2
       A1 = C(I) - G(I)
       A2 = 1. + DLK*G(I)
       YN(I) = A1/A2
       IF(I.EQ.NMAX1) GO TO 20
       GO TO 21
    20 A3 = X(I) - R12*C(I)/H1OMSQ
       XN1 = A3 - 1.
    21 CONTINUE
       U(I) = X(I) - (R12*C(I)/H1OMSQ) - XN1
       XXN = 1.
       IF(YN(I).LT.0.1E-05) GO TO 99
       IF(I.EQ.NMAX1) GO TO 22
       GO TO 23
    22 A3 = ALOG(YN(I))
       XN2 = ABS(A3) - 1.
    23 CONTINUE
       Z(I) = ALOG(YN(I)) + XN2
     3 CONTINUE
       A1 = 0.
       A2 = 0.
       A3 = 0.
       A4 = 0.
       A5 = 0.
       A6 = 0.
       A7 = 0.
       A8 = 0.
       XN = FLOAT(NMAX2 - NMAX1 + 1)
       DO 4 I = NMAX1,NMAX2
       A1 = A1 + 0.1*U(I)
       A2 = A2 + (0.1*U(I))**2
       A3 = A3 + 100.*YN(I)
```

COMPUTER PRINTOUT (CONT)

```
      A4 = A4 + (100.*YN(I))**2
      A5 = A5 + Z(I)
      A6 = A6 + 10.*U(I)*YN(I)
      A7 = A7 + 0.1*U(I)*Z(I)
    4 A8 = A8 + 100.*YN(I)*Z(I)
      B1 = A2*A4 - A6*A6
      B2 = A1*A4 - A3*A6
      B3 = A2*A3 - A1*A6
      DENOM = XN*B1 - A1*B2 - A3*B3
      ANUM = A5*B1 - A7*B2 - A8*B3
      B1 = A7*A4 - A8*A6
      B2 = A5*A4 - A3*A8
      B3 = A3*A7 - A5*A6
      BNUM = XN*B1 - A1*B2 - A3*B3
      B1 = A7*A6 - A2*A8
      B2 = A5*A6 - A1*A8
      B3 = A1*A7 - A5*A2
      CNUM = XN*B1 - A1*B2 - A3*B3
      H2OMSQ = 0.1*(BNUM/DENOM)
      B = 100.*(CNUM/DENOM)
      R22 = B + R12*H2OMSQ/H1OMSQ
      XK = CNUM/DENOM
      XLNG2 = XK - XN1*H2OMSQ - XN2
      WRITE(6,3001) DENOM,ANUM,BNUM,CNUM,R22,H2OMSQ,XLNG2
3001 FORMAT(1H ,7(1X,E15.8,1X))
      IF(ABS(XLNG2).GT.88.) GO TO 40
      G2 = EXP(XLNG2)
      GO TO 41
   40 G2 = 0.
   41 CONTINUE
      COEF = 0.
      DO 5 I = NMAX1,NMAX2
      B1 = XK
      B2 = H2OMSQ*U(I)
      B3 = B*YN(I)
    5 COEF = COEF + (Z(I)-B1-B2+B3)**2
      DELTA = COEF/XN
      IF(H2OMSQ.LT.0.) GO TO 32
      WRITE(6,1000) K,R12,G2,H2OMSQ,R22,DELTA
1000 FORMAT(1H ,5X,I2,7H R12 = ,1PE10.3,6H G2 = ,1PE10.3,10H H2OMSQ = ,
     11PE10.3,7H R22 = ,1PE10.3,9H DELTA = ,1PE10.3/)
   32 CONTINUE
      NMAX1 = K1
      NMAX2 = K2
      GO TO 2
   99 CONTINUE
      NMAX1 = NMAX1 + 1
      IF((NMAX2-NMAX1).GT.2) GO TO 97
      NMAX2 = NMAX2 + 1
      IF(NMAX2.EQ.NMAX) GO TO 88
   97 GO TO 98
    2 CONTINUE
   88 RETURN
      END
```

SECTION VII

REFERENCES

1. H. Fujita, "Mathematical Theory of Sedimentation Analysis," Academic Press, New York, 1962.

2. E. F. Casassa, "Sedimentation Equilibrium in Multicomponent Solutions," (Private Communication).

3. M. Gehatia and D. R. Wiff, AFML-TR-67-121, Part II.

4. M. Gehatia, AFML-TR-67-121, Part I.

TABLE I

EXPERIMENTAL DATA FOR SAMPLE 1 AT ROTOR SPEED 10,589 RPM
(See Figure 2a)

Identification Number is Sample 1 10,589 RPM

THE CONCENTRATION FOR THIS RUN = 0.1394E-00
DIFFERENCE BTWN SQS OF BTM AND MENISCUS = 0.93875737E 01
CONC. AT MENISCUS = 0.1084E-00

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.5295E 00	4.2634E 01	3.8547E-02	2.9519E-03	1.0837E-01	-2.2222E 00	2.7237E-02	3.3878E 02	9.2272E 00
2	6.5413E 00	4.2798E 01	3.9562E-02	3.0240E-03	1.0883E-01	-2.2179E 00	2.7785E-02	3.3069E 02	9.1882E 00
3	6.5531E 00	4.2943E 01	4.0576E-02	3.0960E-03	1.0931E-01	-2.2136E 00	2.8324E-02	3.2300E 02	9.1486E 00
4	6.5648E 00	4.3097E 01	4.1692E-02	3.1754E-03	1.0979E-01	-2.2092E 00	2.8922E-02	3.1492E 02	9.1082E 00
5	6.5766E 00	4.3252E 01	4.2808E-02	3.2545E-03	1.1029E-01	-2.2047E 00	2.9509E-02	3.0726E 02	9.0671E 00
6	6.5884E 00	4.3427E 01	4.3924E-02	3.3334E-03	1.1080E-01	-2.2000E 00	3.0085E-02	2.9999E 02	9.0253E 00
7	6.6002E 00	4.3562E 01	4.5445E-02	3.4427E-03	1.1133E-01	-2.1953E 00	3.0925E-02	2.9047E 02	8.9826E 00
8	6.6119E 00	4.3719E 01	4.6965E-02	3.5440E-03	1.1187E-01	-2.1904E 00	3.1680E-02	2.8217E 02	8.9390E 00
9	6.6237E 00	4.3874E 01	4.8691E-02	3.6755E-03	1.1243E-01	-2.1854E 00	3.2691E-02	2.7207E 02	8.8942E 00
10	6.6355E 00	4.4030E 01	5.0213E-02	3.7836E-03	1.1301E-01	-2.1802E 00	3.3479E-02	2.6430E 02	8.8484E 00
11	6.6473E 00	4.4186E 01	5.1937E-02	3.9067E-03	1.1362E-01	-2.1749E 00	3.4385E-02	2.5597E 02	8.8016E 00
12	6.6591E 00	4.4343E 01	5.3865E-02	4.0445E-03	1.1424E-01	-2.1695E 00	3.5403E-02	2.4725E 02	8.7536E 00
13	6.6708E 00	4.4500E 01	5.5933E-02	4.1894E-03	1.1489E-01	-2.1638E 00	3.6466E-02	2.3870E 02	8.7043E 00
14	6.6826E 00	4.4657E 01	5.8024E-02	4.3414E-03	1.1556E-01	-2.1580E 00	3.7569E-02	2.3034E 02	8.6538E 00
15	6.6944E 00	4.4815E 01	6.0357E-02	4.5080E-03	1.1625E-01	-2.1520E 00	3.8777E-02	2.2183E 02	8.6019E 00
16	6.7062E 00	4.4973E 01	6.2690E-02	4.6740E-03	1.1698E-01	-2.1458E 00	3.9957E-02	2.1395E 02	8.5486E 00
17	6.7179E 00	4.5131E 01	6.5023E-02	4.8395E-03	1.1773E-01	-2.1394E 00	4.1107E-02	2.0663E 02	8.4940E 00
18	6.7297E 00	4.5289E 01	6.7660E-02	5.0270E-03	1.1851E-01	-2.1327E 00	4.2418E-02	1.9893E 02	8.4380E 00
19	6.7415E 00	4.5449E 01	7.0399E-02	5.2213E-03	1.1932E-01	-2.1259E 00	4.3757E-02	1.9152E 02	8.3805E 00
20	6.7533E 00	4.5607E 01	7.3037E-02	5.4075E-03	1.2017E-01	-2.1189E 00	4.4999E-02	1.8493E 02	8.3216E 00
21	6.7651E 00	4.5766E 01	7.6080E-02	5.6230E-03	1.2105E-01	-2.1116E 00	4.6453E-02	1.7784E 02	8.2612E 00
22	6.7768E 00	4.5925E 01	7.9122E-02	5.8303E-03	1.2196E-01	-2.1041E 00	4.7805E-02	1.7152E 02	8.1993E 00
23	6.7886E 00	4.6085E 01	8.2166E-02	6.0518E-03	1.2291E-01	-2.0963E 00	4.9237E-02	1.6524E 02	8.1360E 00
24	6.8004E 00	4.6245E 01	8.5210E-02	6.2650E-03	1.2390E-01	-2.0883E 00	5.0567E-02	1.5962E 02	8.0713E 00
25	6.8122E 00	4.6406E 01	8.8861E-02	6.5223E-03	1.2492E-01	-2.0801E 00	5.2211E-02	1.5332E 02	8.0051E 00
26	6.8239E 00	4.6566E 01	9.2312E-02	6.7637E-03	1.2599E-01	-2.0716E 00	5.3685E-02	1.4785E 02	7.9373E 00
27	6.8357E 00	4.6727E 01	9.6267E-02	7.0414E-03	1.2710E-01	-2.0628E 00	5.5401E-02	1.4202E 02	7.8679E 00
28	6.8475E 00	4.6888E 01	1.0022E-01	7.3182E-03	1.2826E-01	-2.0537E 00	5.7060E-02	1.3665E 02	7.7969E 00
29	6.8593E 00	4.7050E 01	1.0408E-01	7.5866E-03	1.2946E-01	-2.0444E 00	5.8603E-02	1.3181E 02	7.7245E 00
30	6.8711E 00	4.7211E 01	1.0834E-01	7.8936E-03	1.3071E-01	-2.0348E 00	6.0314E-02	1.2685E 02	7.6506E 00
31	6.8829E 00	4.7373E 01	1.1260E-01	8.1796E-03	1.3201E-01	-2.0249E 00	6.1962E-02	1.2225E 02	7.5752E 00
32	6.8946E 00	4.7536E 01	1.1686E-01	8.4746E-03	1.3336E-01	-2.0147E 00	6.3546E-02	1.1800E 02	7.4984E 00
33	6.9064E 00	4.7698E 01	1.2142E-01	8.7907E-03	1.3476E-01	-2.0042E 00	6.5230E-02	1.1376E 02	7.4203E 00
34	6.9182E 00	4.7861E 01	1.2599E-01	9.1056E-03	1.3622E-01	-1.9935E 00	6.6844E-02	1.0982E 02	7.3410E 00
35	6.9300E 00	4.8024E 01	1.3086E-01	9.4415E-03	1.3773E-01	-1.9824E 00	6.8548E-02	1.0592E 02	7.2603E 00
36	6.9417E 00	4.8188E 01	1.3613E-01	9.8054E-03	1.3931E-01	-1.9711E 00	7.0387E-02	1.0198E 02	7.1784E 00
37	6.9535E 00	4.8351E 01	1.4022E-01	1.0212E-02	1.4094E-01	-1.9594E 00	7.2453E-02	9.7926E 01	7.0950E 00
38	6.9653E 00	4.8515E 01	1.4730E-01	1.0617E-02	1.4265E-01	-1.9473E 00	7.4425E-02	9.4189E 01	7.0101E 00
39	6.9771E 00	4.8679E 01	1.5388E-01	1.1028E-02	1.4443E-01	-1.9350E 00	7.6355E-02	9.0679E 01	6.9238E 00
40	6.9889E 00	4.8844E 01	1.5957E-01	1.1416E-02	1.4628E-01	-1.9223E 00	7.8043E-02	8.7599E 01	6.8364E 00
41	7.0006E 00	4.9009E 01	1.6738E-01	1.1954E-02	1.4820E-01	-1.9092E 00	8.0664E-02	8.3651E 01	6.7476E 00
42	7.0124E 00	4.9174E 01	1.7488E-01	1.2470E-02	1.5022E-01	-1.8957E 00	8.3011E-02	8.0196E 01	6.6571E 00
43	7.0242E 00	4.9339E 01	1.8259E-01	1.2997E-02	1.5232E-01	-1.8818E 00	8.5329E-02	7.6938E 01	6.5651E 00
44	7.0360E 00	4.9505E 01	1.9031E-01	1.3567E-02	1.5452E-01	-1.8674E 00	8.7799E-02	7.3710E 01	6.4716E 00
45	7.0477E 00	4.9671E 01	1.9984E-01	1.4177E-02	1.5682E-01	-1.8526E 00	9.0405E-02	7.0535E 01	6.3767E 00
46	7.0595E 00	4.9837E 01	2.0997E-01	1.4800E-02	1.5923E-01	-1.8374E 00	9.2950E-02	6.7566E 01	6.2803E 00
47	7.0713E 00	5.0003E 01	2.1911E-01	1.5493E-02	1.6175E-01	-1.8217E 00	9.5783E-02	6.4545E 01	6.1824E 00
48	7.0831E 00	5.0170E 01	2.2976E-01	1.6219E-02	1.6439E-01	-1.8055E 00	9.8660E-02	6.1656E 01	6.0830E 00
49	7.0948E 00	5.0337E 01	2.4143E-01	1.7014E-02	1.6717E-01	-1.7888E 00	1.0178E-01	5.8774E 01	5.9820E 00

TABLE I (CONT)

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
50	7.1066E 00	5.0504E 01	2.5360E-01	1.7843E-02	1.7008E-01	-1.7715E 00	1.0490E-01	5.6046E 01	5.8795E 00
51	7.1184E 00	5.0672E 01	2.6374E-01	1.8526E-02	1.7313E-01	-1.7537E 00	1.0700E-01	5.3980E 01	5.7760E 00
52	7.1302E 00	5.0839E 01	2.7997E-01	1.9633E-02	1.7633E-01	-1.7354E 00	1.1134E-01	5.0934E 01	5.6711E 00
53	7.1420E 00	5.1008E 01	2.9519E-01	2.0666E-02	1.7972E-01	-1.7164E 00	1.1499E-01	4.8389E 01	5.5642E 00
54	7.1537E 00	5.1176E 01	3.1954E-01	2.2334E-02	1.8334E-01	-1.6964E 00	1.2182E-01	4.4776E 01	5.4544E 00
55	7.1655E 00	5.1345E 01	3.4997E-01	2.4420E-02	1.8728E-01	-1.6751E 00	1.3039E-01	4.0950E 01	5.3396E 00
56	7.1773E 00	5.1513E 01	3.8547E-01	2.6854E-02	1.9161E-01	-1.6523E 00	1.4015E-01	3.7239E 01	5.2189E 00
57	7.1891E 00	5.1683E 01	4.5648E-01	3.1748E-02	1.9657E-01	-1.6267E 00	1.6151E-01	3.1498E 01	5.0872E 00
58	7.2008E 00	5.1852E 01	5.4270E-01	3.7683E-02	2.0245E-01	-1.5972E 00	1.8613E-01	2.6537E 01	4.9394E 00
59	7.2126E 00	5.2022E 01	8.3891E-01	5.8156E-02	2.1059E-01	-1.5578E 00	2.7616E-01	1.7195E 01	4.7486E 00

TABLE II

EXPERIMENTAL DATA FOR SAMPLE 1 AT ROTOR SPEED 8,766 RPM
(See Figure 2b)

Identification Number is Sample 1 8,766 RPM

THE CONCENTRATION FOR THIS RUN = 0.1394E-00
DIFFERENCE BTWN SOS OF BTM AND MENISCUS = 0.93875737E 01
CONC. AT MENISCUS = 0.1152E-00

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.52955E 00	4.2634E 01	3.2461E-02	2.4857E-03	1.1523E-01	-2.1608E 00	2.1572E-02	4.0230E 02	8.6783E 00
2	6.5413E 00	4.2738E 01	3.3475E-02	2.5588E-03	1.1562E-01	-2.1575E 00	2.2131E-02	3.9081E 02	8.6492E 00
3	6.5531E 00	4.2943E 01	3.4490E-02	2.6316E-03	1.1602E-01	-2.1540E 00	2.2682E-02	3.8000E 02	8.6193E 00
4	6.5648E 00	4.3097E 01	3.5504E-02	2.7041E-03	1.1643E-01	-2.1505E 00	2.3225E-02	3.6981E 02	8.5888E 00
5	6.5766E 00	4.3252E 01	3.6518E-02	2.7764E-03	1.1685E-01	-2.1468E 00	2.3759E-02	3.6018E 02	8.5576E 00
6	6.5884E 00	4.3407E 01	3.7533E-02	2.8484E-03	1.1729E-01	-2.1431E 00	2.4285E-02	3.5107E 02	8.5258E 00
7	6.6002E 00	4.3562E 01	3.8547E-02	2.9202E-03	1.1774E-01	-2.1393E 00	2.4802E-02	3.4245E 02	8.4934E 00
8	6.6119E 00	4.3718E 01	3.9866E-02	3.0147E-03	1.1820E-01	-2.1354E 00	2.5505E-02	3.3171E 02	8.4602E 00
9	6.6237E 00	4.3874E 01	4.1083E-02	3.1012E-03	1.1868E-01	-2.1313E 00	2.6132E-02	3.2245E 02	8.4262E 00
10	6.6355E 00	4.4030E 01	4.2605E-02	3.2104E-03	1.1917E-01	-2.1272E 00	2.6939E-02	3.1149E 02	8.3914E 00
11	6.6473E 00	4.4186E 01	4.3924E-02	3.3039E-03	1.1968E-01	-2.1229E 00	2.7606E-02	3.0268E 02	8.3556E 00
12	6.6591E 00	4.4343E 01	4.5649E-02	3.4275E-03	1.2021E-01	-2.1185E 00	2.8513E-02	2.9176E 02	8.3190E 00
13	6.6708E 00	4.4500E 01	4.7372E-02	3.5507E-03	1.2075E-01	-2.1140E 00	2.9404E-02	2.8163E 02	8.2812E 00
14	6.6826E 00	4.4657E 01	4.8793E-02	3.6507E-03	1.2132E-01	-2.1093E 00	3.0091E-02	2.7392E 02	8.2426E 00
15	6.6944E 00	4.4815E 01	5.0720E-02	3.7882E-03	1.2191E-01	-2.1045E 00	3.1075E-02	2.6397E 02	8.2030E 00
16	6.7062E 00	4.4973E 01	5.2343E-02	3.9026E-03	1.2251E-01	-2.0995E 00	3.1854E-02	2.5624E 02	8.1623E 00
17	6.7179E 00	4.5131E 01	5.4372E-02	4.0468E-03	1.2314E-01	-2.0944E 00	3.2862E-02	2.4711E 02	8.1207E 00
18	6.7297E 00	4.5289E 01	5.6502E-02	4.1979E-03	1.2380E-01	-2.0891E 00	3.3910E-02	2.3821E 02	8.0778E 00
19	6.7415E 00	4.5448E 01	5.8632E-02	4.3486E-03	1.2447E-01	-2.0837E 00	3.4936E-02	2.2996E 02	8.0338E 00
20	6.7533E 00	4.5607E 01	6.0661E-02	4.4912E-03	1.2518E-01	-2.0780E 00	3.5879E-02	2.2266E 02	7.9888E 00
21	6.7651E 00	4.5766E 01	6.2791E-02	4.6409E-03	1.2590E-01	-2.0722E 00	3.6861E-02	2.1548E 02	7.9426E 00
22	6.7768E 00	4.5926E 01	6.4922E-02	4.7900E-03	1.2666E-01	-2.0663E 00	3.7819E-02	2.0877E 02	7.8955E 00
23	6.7886E 00	4.6085E 01	6.6950E-02	4.9311E-03	1.2743E-01	-2.0602E 00	3.8696E-02	2.0280E 02	7.8473E 00
24	6.8004E 00	4.6245E 01	6.9182E-02	5.0866E-03	1.2823E-01	-2.0539E 00	3.9667E-02	1.9659E 02	7.7983E 00
25	6.8122E 00	4.6406E 01	7.1820E-02	5.2714E-03	1.2906E-01	-2.0474E 00	4.0843E-02	1.8970E 02	7.7481E 00
26	6.8239E 00	4.6566E 01	7.4051E-02	5.4258E-03	1.2992E-01	-2.0408E 00	4.1762E-02	1.8430E 02	7.6969E 00
27	6.8357E 00	4.6727E 01	7.6587E-02	5.6020E-03	1.3081E-01	-2.0340E 00	4.2825E-02	1.7851E 02	7.6447E 00
28	6.8476E 00	4.6888E 01	7.9123E-02	5.7775E-03	1.3173E-01	-2.0270E 00	4.3860E-02	1.7308E 02	7.5915E 00
29	6.8593E 00	4.7050E 01	8.1964E-02	5.9746E-03	1.3268E-01	-2.0198E 00	4.5032E-02	1.6737E 02	7.5372E 00
30	6.8711E 00	4.7211E 01	8.4702E-02	6.1637E-03	1.3366E-01	-2.0125E 00	4.6116E-02	1.6224E 02	7.4818E 00
31	6.8828E 00	4.7373E 01	8.7543E-02	6.3595E-03	1.3467E-01	-2.0049E 00	4.7222E-02	1.5725E 02	7.4255E 00
32	6.8946E 00	4.7536E 01	9.0383E-02	6.5546E-03	1.3572E-01	-1.9972E 00	4.8295E-02	1.5256E 02	7.3682E 00
33	6.9064E 00	4.7699E 01	9.3832E-02	6.7931E-03	1.3680E-01	-1.9892E 00	4.9656E-02	1.4721E 02	7.3097E 00
34	6.9182E 00	4.7861E 01	9.6977E-02	7.0088E-03	1.3793E-01	-1.9810E 00	5.0815E-02	1.4268E 02	7.2502E 00
35	6.9300E 00	4.8024E 01	1.0043E-01	7.2459E-03	1.3909E-01	-1.9726E 00	5.2094E-02	1.3801E 02	7.1896E 00
36	6.9417E 00	4.8188E 01	1.0387E-01	7.4819E-03	1.4029E-01	-1.9640E 00	5.3330E-02	1.3366E 02	7.1279E 00
37	6.9535E 00	4.8351E 01	1.0753E-01	7.7318E-03	1.4154E-01	-1.9552E 00	5.4627E-02	1.2934E 02	7.0652E 00
38	6.9653E 00	4.8515E 01	1.1139E-01	7.9954E-03	1.4283E-01	-1.9461E 00	5.5980E-02	1.2507E 02	7.0015E 00
39	6.9771E 00	4.8679E 01	1.1534E-01	8.2655E-03	1.4416E-01	-1.9368E 00	5.7334E-02	1.2099E 02	6.9366E 00
40	6.9889E 00	4.8844E 01	1.1919E-01	8.5273E-03	1.4554E-01	-1.9273E 00	5.8589E-02	1.1727E 02	6.8708E 00
41	7.0006E 00	4.9009E 01	1.2345E-01	8.9173E-03	1.4697E-01	-1.9175E 00	5.9993E-02	1.1341E 02	6.8040E 00
42	7.0124E 00	4.9174E 01	1.2771E-01	9.1062E-03	1.4845E-01	-1.9075E 00	6.1341E-02	1.0981E 02	6.7362E 00
43	7.0242E 00	4.9339E 01	1.3197E-01	9.3942E-03	1.4998E-01	-1.8972E 00	6.2636E-02	1.0645E 02	6.6675E 00
44	7.0360E 00	4.9505E 01	1.3694E-01	9.7317E-03	1.5156E-01	-1.8867E 00	6.4209E-02	1.0276E 02	6.5979E 00
45	7.0477E 00	4.9671E 01	1.4202E-01	1.0075E-02	1.5321E-01	-1.8760E 00	6.5763E-02	9.9253E 01	6.5271E 00
46	7.0595E 00	4.9837E 01	1.4709E-01	1.0418E-02	1.5491E-01	-1.8649E 00	6.7250E-02	9.5990E 01	6.4554E 00
47	7.0713E 00	5.0003E 01	1.5226E-01	1.0766E-02	1.5667E-01	-1.8536E 00	6.8718E-02	9.2884E 01	6.3827E 00
48	7.0831E 00	5.0170E 01	1.5825E-01	1.1171E-02	1.5850E-01	-1.8420E 00	7.0478E-02	8.9519E 01	6.3091E 00
49	7.0949E 00	5.0337E 01	1.6423E-01	1.1581E-02	1.6040E-01	-1.8301E 00	7.2201E-02	8.6347E 01	6.2344E 00

TABLE II (CONT)

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
50	7.1066E 00	5.0504E 01	1.7093E-01	1.2026E-02	1.6237E-01	-1.8178E 00	7.4062E-02	8.3154E 01	6.1586E 00
51	7.1184E 00	5.0672E 01	1.7853E-01	1.2540E-02	1.6443E-01	-1.8053E 00	7.6264E-02	7.9743E 01	6.0815E 00
52	7.1302E 00	5.0839E 01	1.8746E-01	1.3146E-02	1.6659E-01	-1.7922E 00	7.8911E-02	7.6071E 01	6.0028E 00
53	7.1420E 00	5.1008E 01	1.9791E-01	1.3855E-02	1.6886E-01	-1.7787E 00	8.2054E-02	7.2174E 01	5.9222E 00
54	7.1537E 00	5.1176E 01	2.1211E-01	1.4825E-02	1.7127E-01	-1.7645E 00	8.6559E-02	6.7453E 01	5.8387E 00
55	7.1655E 00	5.1345E 01	2.2824E-01	1.5926E-02	1.7387E-01	-1.7495E 00	9.1601E-02	6.2789E 01	5.7516E 00
56	7.1773E 00	5.1513E 01	2.4853E-01	1.7313E-02	1.7667E-01	-1.7335E 00	9.7997E-02	5.7758E 01	5.6602E 00
57	7.1891E 00	5.1683E 01	2.8708E-01	1.9966E-02	1.7983E-01	-1.7158E 00	1.1103E-01	5.0085E 01	5.5609E 00
58	7.2008E 00	5.1852E 01	3.7228E-01	2.5850E-02	1.8371E-01	-1.6944E 00	1.4071E-01	3.8685E 01	5.4434E 00
59	7.2126E 00	5.2022E 01	5.3256E-01	3.6919E-02	1.8904E-01	-1.6658E 00	1.9530E-01	2.7087E 01	5.2900E 00

TABLE III

EXPERIMENTAL DATA FOR SAMPLE 1 AT ROTOR SPEED 7,447 RPM
(See Figure 2c)

Identification Number is Sample 1 7,447 RPM

THE CONCENTRATION FOR THIS RUN = 0.1394E-00
DIFFERENCE BTWN SQS OF BTM AND MENISCUS = 0.93875737E 01
CONC. AT MENISCUS = 0.1200E-00

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.5295E 00	4.2634E 01	3.6518E-02	2.7964E-03	1.2000E-01	-2.1203E 00	2.3304E-02	3.5760E 02	8.3336E 00
2	6.5413E 00	4.2788E 01	3.6924E-02	2.8224E-03	1.2043E-01	-2.1167E 00	2.3436E-02	3.5431E 02	8.3037E 00
3	6.5531E 00	4.2943E 01	3.7331E-02	2.8560E-03	1.2087E-01	-2.1131E 00	2.3630E-02	3.5014E 02	8.2736E 00
4	6.5648E 00	4.3097E 01	3.7737E-02	2.8818E-03	1.2131E-01	-2.1094E 00	2.3756E-02	3.4700E 02	8.2434E 00
5	6.5766E 00	4.3252E 01	3.8547E-02	2.9306E-03	1.2176E-01	-2.1057E 00	2.4069E-02	3.4122E 02	8.2129E 00
6	6.5884E 00	4.3407E 01	3.9054E-02	2.9639E-03	1.2222E-01	-2.1020E 00	2.4251E-02	3.3740E 02	8.1822E 00
7	6.6002E 00	4.3562E 01	3.9562E-02	2.9970E-03	1.2268E-01	-2.0982E 00	2.4430E-02	3.3367E 02	8.1513E 00
8	6.6119E 00	4.3718E 01	4.0373E-02	3.0530E-03	1.2315E-01	-2.0943E 00	2.4791E-02	3.2754E 02	8.1202E 00
9	6.6237E 00	4.3874E 01	4.1083E-02	3.1012E-03	1.2363E-01	-2.0905E 00	2.5085E-02	3.2245E 02	8.0886E 00
10	6.6355E 00	4.4030E 01	4.1692E-02	3.1416E-03	1.2412E-01	-2.0865E 00	2.5311E-02	3.1831E 02	8.0569E 00
11	6.6473E 00	4.4186E 01	4.2605E-02	3.2047E-03	1.2461E-01	-2.0825E 00	2.5717E-02	3.1204E 02	8.0248E 00
12	6.6591E 00	4.4343E 01	4.3518E-02	3.2676E-03	1.2512E-01	-2.0785E 00	2.6115E-02	3.0604E 02	7.9923E 00
13	6.6709E 00	4.4500E 01	4.4431E-02	3.3302E-03	1.2564E-01	-2.0743E 00	2.6506E-02	3.0028E 02	7.9593E 00
14	6.6826E 00	4.4657E 01	4.5141E-02	3.3775E-03	1.2617E-01	-2.0702E 00	2.6770E-02	2.9608E 02	7.9260E 00
15	6.6944E 00	4.4815E 01	4.5952E-02	3.4322E-03	1.2670E-01	-2.0659E 00	2.7088E-02	2.9136E 02	7.8925E 00
16	6.7062E 00	4.4973E 01	4.6764E-02	3.4866E-03	1.2725E-01	-2.0616E 00	2.7400E-02	2.8681E 02	7.8586E 00
17	6.7179E 00	4.5131E 01	4.7778E-02	3.5560E-03	1.2781E-01	-2.0572E 00	2.7824E-02	2.8121E 02	7.8244E 00
18	6.7297E 00	4.5289E 01	4.8691E-02	3.6176E-03	1.2837E-01	-2.0528E 00	2.8180E-02	2.7642E 02	7.7897E 00
19	6.7415E 00	4.5448E 01	4.9706E-02	3.6865E-03	1.2895E-01	-2.0483E 00	2.8588E-02	2.7126E 02	7.7547E 00
20	6.7533E 00	4.5607E 01	5.0720E-02	3.7552E-03	1.2954E-01	-2.0437E 00	2.8988E-02	2.6630E 02	7.7193E 00
21	6.7651E 00	4.5766E 01	5.1734E-02	3.8236E-03	1.3015E-01	-2.0391E 00	2.9379E-02	2.6153E 02	7.6836E 00
22	6.7769E 00	4.5926E 01	5.2749E-02	3.8918E-03	1.3076E-01	-2.0344E 00	2.9763E-02	2.5695E 02	7.6474E 00
23	6.7886E 00	4.6085E 01	5.3763E-02	3.9598E-03	1.3139E-01	-2.0296E 00	3.0138E-02	2.5254E 02	7.6109E 00
24	6.8004E 00	4.6245E 01	5.4879E-02	4.0350E-03	1.3203E-01	-2.0247E 00	3.0561E-02	2.4783E 02	7.5740E 00
25	6.8122E 00	4.6406E 01	5.5995E-02	4.1099E-03	1.3268E-01	-2.0198E 00	3.0975E-02	2.4331E 02	7.5367E 00
26	6.8239E 00	4.6566E 01	5.7111E-02	4.1846E-03	1.3335E-01	-2.0148E 00	3.1381E-02	2.3897E 02	7.4991E 00
27	6.8357E 00	4.6727E 01	5.8429E-02	4.2738E-03	1.3403E-01	-2.0097E 00	3.1887E-02	2.3398E 02	7.4610E 00
28	6.8475E 00	4.6888E 01	5.9748E-02	4.3628E-03	1.3473E-01	-2.0045E 00	3.2383E-02	2.2921E 02	7.4225E 00
29	6.8593E 00	4.7050E 01	6.0864E-02	4.4366E-03	1.3544E-01	-1.9993E 00	3.2758E-02	2.2540E 02	7.3836E 00
30	6.8711E 00	4.7211E 01	6.2386E-02	4.5397E-03	1.3616E-01	-1.9939E 00	3.3341E-02	2.2028E 02	7.3442E 00
31	6.8828E 00	4.7373E 01	6.3907E-02	4.6425E-03	1.3691E-01	-1.9885E 00	3.3910E-02	2.1540E 02	7.3043E 00
32	6.8946E 00	4.7536E 01	6.5124E-02	4.7228E-03	1.3767E-01	-1.9829E 00	3.4307E-02	2.1174E 02	7.2640E 00
33	6.9064E 00	4.7698E 01	6.6950E-02	4.8470E-03	1.3844E-01	-1.9773E 00	3.5011E-02	2.0631E 02	7.2232E 00
34	6.9182E 00	4.7861E 01	6.8575E-02	4.9634E-03	1.3924E-01	-1.9715E 00	3.5646E-02	2.0148E 02	7.1817E 00
35	6.9300E 00	4.8024E 01	7.0602E-02	5.0940E-03	1.4006E-01	-1.9657E 00	3.6370E-02	1.9631E 02	7.1397E 00
36	6.9417E 00	4.8188E 01	7.2530E-02	5.2242E-03	1.4090E-01	-1.9597E 00	3.7076E-02	1.9142E 02	7.0970E 00
37	6.9535E 00	4.8351E 01	7.4660E-02	5.3685E-03	1.4177E-01	-1.9535E 00	3.7867E-02	1.8627E 02	7.0536E 00
38	6.9653E 00	4.8515E 01	7.7094E-02	5.5342E-03	1.4267E-01	-1.9473E 00	3.8791E-02	1.8069E 02	7.0094E 00
39	6.9771E 00	4.8679E 01	7.9225E-02	5.6775E-03	1.4359E-01	-1.9408E 00	3.9541E-02	1.7613E 02	6.9645E 00
40	6.9889E 00	4.8844E 01	8.1962E-02	5.8566E-03	1.4453E-01	-1.9342E 00	4.0521E-02	1.7075E 02	6.9188E 00
41	7.0006E 00	4.9009E 01	8.4500E-02	6.0351E-03	1.4551E-01	-1.9275E 00	4.1475E-02	1.6570E 02	6.8722E 00
42	7.0124E 00	4.9174E 01	8.7239E-02	6.2203E-03	1.4653E-01	-1.9206E 00	4.2452E-02	1.6076E 02	6.8247E 00
43	7.0242E 00	4.9339E 01	8.9774E-02	6.3994E-03	1.4757E-01	-1.9135E 00	4.3305E-02	1.5649E 02	6.7765E 00
44	7.0360E 00	4.9505E 01	9.2513E-02	6.5743E-03	1.4864E-01	-1.9062E 00	4.4229E-02	1.5211E 02	6.7276E 00
45	7.0477E 00	4.9671E 01	9.5354E-02	6.7648E-03	1.4975E-01	-1.8988E 00	4.5175E-02	1.4782E 02	6.6779E 00
46	7.0595E 00	4.9837E 01	9.8397E-02	6.9691E-03	1.5089E-01	-1.8912E 00	4.6187E-02	1.4349E 02	6.6274E 00
47	7.0713E 00	5.0003E 01	1.0185E-01	7.2014E-03	1.5207E-01	-1.8834E 00	4.7356E-02	1.3886E 02	6.5760E 00
48	7.0831E 00	5.0170E 01	1.0555E-01	7.4472E-03	1.5329E-01	-1.8754E 00	4.8583E-02	1.3428E 02	6.5236E 00
49	7.0948E 00	5.0337E 01	1.0956E-01	7.7209E-03	1.5456E-01	-1.8672E 00	4.9955E-02	1.2952E 02	6.4702E 00

TABLE III (CONT)

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
50	7.1066E 00	5.0504E 01	1.1361E-01	7.9934E-03	1.5587E-01	-1.8587E 00	5.1283E-02	1.2510E 02	6.4156E 00
51	7.1184E 00	5.0672E 01	1.1950E-01	8.3935E-03	1.5724E-01	-1.8500E 00	5.3379E-02	1.1914E 02	6.3596E 00
52	7.1302E 00	5.0839E 01	1.2528E-01	8.7851E-03	1.5868E-01	-1.8408E 00	5.5362E-02	1.1383E 02	6.3018E 00
53	7.1420E 00	5.1008E 01	1.3238E-01	9.2677E-03	1.6020E-01	-1.8313E 00	5.7850E-02	1.0790E 02	6.2421E 00
54	7.1537E 00	5.1176E 01	1.4100E-01	9.8551E-03	1.6181E-01	-1.8213E 00	6.0905E-02	1.0147E 02	6.1800E 00
55	7.1655E 00	5.1345E 01	1.5216E-01	1.0618E-02	1.6354E-01	-1.8107E 00	6.4924E-02	9.4184E 01	6.1148E 00
56	7.1773E 00	5.1513E 01	1.6738E-01	1.1560E-02	1.6542E-01	-1.7993E 00	7.0488E-02	8.5762E 01	6.0452E 00
57	7.1891E 00	5.1683E 01	1.9071E-01	1.3264E-02	1.6753E-01	-1.7866E 00	7.9173E-02	7.5394E 01	5.9692E 00
58	7.2008E 00	5.1852E 01	2.2317E-01	1.5496E-02	1.6997E-01	-1.7722E 00	9.1171E-02	6.4533E 01	5.8836E 00
59	7.2126E 00	5.2022E 01	2.8403E-01	1.9690E-02	1.7295E-01	-1.7547E 00	1.1385E-01	5.0787E 01	5.7820E 00

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TABLE IV

EXPERIMENTAL DATA FOR SAMPLE 2 AT ROTOR SPEED 17,250 RPM
(See Figure 3a)

Identification Number is Sample 2 17,250 RPM

THE CONCENTRATION FOR THIS RUN = 0.6737E-01
DIFFERENCE BTWN SOS OF BTM AND MENISCUS = 0.12556299E 02
CONC. AT MENISCUS = 0.2446E-01

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.2624E 00	3.9218E 01	9.9452E-04	7.9404E-05	2.4463E-02	-3.7106E 00	3.2459E-03	1.2594E 04	4.0879E 01
2	6.2800E 00	3.9438E 01	2.9836E-03	2.3754E-04	2.4498E-02	-3.7092E 00	9.6966E-03	4.2097E 03	4.0820E 01
3	6.2976E 00	3.9660E 01	4.9726E-03	3.9480E-04	2.4568E-02	-3.7063E 00	1.6070E-02	2.5329E 03	4.0704E 01
4	6.3152E 00	3.9882E 01	6.9616E-03	5.5118E-04	2.4673E-02	-3.7021E 00	2.2340E-02	1.8143E 03	4.0531E 01
5	6.3328E 00	4.0105E 01	8.9507E-03	7.0669E-04	2.4813E-02	-3.6964E 00	2.8481E-02	1.4150E 03	4.0302E 01
6	6.3504E 00	4.0328E 01	1.0940E-02	8.6134E-04	2.4988E-02	-3.6894E 00	3.4471E-02	1.1610E 03	4.0020E 01
7	6.3680E 00	4.0552E 01	1.2929E-02	1.0151E-03	2.5198E-02	-3.6810E 00	4.0287E-02	9.8509E 02	3.9686E 01
8	6.3856E 00	4.0776E 01	1.4918E-02	1.1681E-03	2.5443E-02	-3.6713E 00	4.5910E-02	8.5611E 02	3.9304E 01
9	6.4032E 00	4.1001E 01	1.6907E-02	1.3202E-03	2.5723E-02	-3.6604E 00	5.1323E-02	7.5747E 02	3.8876E 01
10	6.4208E 00	4.1227E 01	1.9890E-02	1.5489E-03	2.6047E-02	-3.6479E 00	5.9466E-02	6.4562E 02	3.8392E 01
11	6.4384E 00	4.1454E 01	2.1879E-02	1.6991E-03	2.6414E-02	-3.6338E 00	6.4326E-02	5.8854E 02	3.7858E 01
12	6.4560E 00	4.1681E 01	2.3868E-02	1.8485E-03	2.6817E-02	-3.6187E 00	6.8931E-02	5.4097E 02	3.7290E 01
13	6.4736E 00	4.1908E 01	2.5858E-02	1.9971E-03	2.7255E-02	-3.6025E 00	7.3277E-02	5.0072E 02	3.6691E 01
14	6.4912E 00	4.2136E 01	2.7847E-02	2.1449E-03	2.7727E-02	-3.5853E 00	7.7358E-02	4.6622E 02	3.6065E 01
15	6.5088E 00	4.2365E 01	2.9836E-02	2.2919E-03	2.8235E-02	-3.5672E 00	8.1173E-02	4.3631E 02	3.5417E 01
16	6.5265E 00	4.2595E 01	3.1825E-02	2.4381E-03	2.8778E-02	-3.5482E 00	8.4722E-02	4.1015E 02	3.4749E 01
17	6.5441E 00	4.2825E 01	3.3814E-02	2.5835E-03	2.9356E-02	-3.5283E 00	8.8009E-02	3.8707E 02	3.4065E 01
18	6.5617E 00	4.3055E 01	3.5803E-02	2.7282E-03	2.9968E-02	-3.5076E 00	9.1035E-02	3.6655E 02	3.3369E 01
19	6.5793E 00	4.3287E 01	3.7792E-02	2.8720E-03	3.0616E-02	-3.4862E 00	9.3808E-02	3.4819E 02	3.2663E 01
20	6.5969E 00	4.3519E 01	3.9781E-02	3.0151E-03	3.1299E-02	-3.4642E 00	9.6333E-02	3.3166E 02	3.1950E 01
21	6.6145E 00	4.3751E 01	4.2764E-02	3.2326E-03	3.2025E-02	-3.4412E 00	1.0094E-01	3.0935E 02	3.1225E 01
22	6.6321E 00	4.3985E 01	4.5748E-02	3.4490E-03	3.2804E-02	-3.4172E 00	1.0514E-01	2.8994E 02	3.0484E 01
23	6.6497E 00	4.4218E 01	4.9726E-02	3.7390E-03	3.3645E-02	-3.3919E 00	1.1113E-01	2.6745E 02	2.9722E 01
24	6.6673E 00	4.4453E 01	5.4699E-02	4.1020E-03	3.4564E-02	-3.3649E 00	1.1868E-01	2.4378E 02	2.8932E 01
25	6.6849E 00	4.4688E 01	6.1660E-02	4.6119E-03	3.5588E-02	-3.3357E 00	1.2959E-01	2.1683E 02	2.8099E 01
26	6.7025E 00	4.4924E 01	6.8622E-02	5.1191E-03	3.6735E-02	-3.3040E 00	1.3935E-01	1.9535E 02	2.7222E 01
27	6.7201E 00	4.5160E 01	7.4589E-02	5.5497E-03	3.7995E-02	-3.2703E 00	1.4606E-01	1.8019E 02	2.6319E 01
28	6.7377E 00	4.5397E 01	8.1551E-02	6.0518E-03	3.9369E-02	-3.2348E 00	1.5372E-01	1.6524E 02	2.5400E 01
29	6.7553E 00	4.5634E 01	8.8512E-02	6.5513E-03	4.0866E-02	-3.1975E 00	1.6031E-01	1.5264E 02	2.4470E 01
30	6.7729E 00	4.5872E 01	9.8457E-02	7.2685E-03	4.2512E-02	-3.1580E 00	1.7098E-01	1.3758E 02	2.3523E 01
31	6.7905E 00	4.6111E 01	1.0940E-01	8.0551E-03	4.4341E-02	-3.1158E 00	1.8166E-01	1.2414E 02	2.2552E 01
32	6.8081E 00	4.6351E 01	1.2034E-01	8.8377E-03	4.6363E-02	-3.0713E 00	1.9062E-01	1.1315E 02	2.1569E 01
33	6.8257E 00	4.6591E 01	1.3327E-01	9.7620E-03	4.8595E-02	-3.0242E 00	2.0088E-01	1.0244E 02	2.0578E 01
34	6.8433E 00	4.6831E 01	1.4818E-01	1.0827E-02	5.1072E-02	-2.9745E 00	2.1199E-01	9.2363E 01	1.9580E 01
35	6.8609E 00	4.7072E 01	1.6410E-01	1.1959E-02	5.3821E-02	-2.9221E 00	2.2219E-01	8.3621E 01	1.8580E 01
36	6.8785E 00	4.7314E 01	1.8399E-01	1.3374E-02	5.6884E-02	-2.8667E 00	2.3511E-01	7.4772E 01	1.7579E 01
37	6.8961E 00	4.7557E 01	2.0288E-01	1.4710E-02	6.0289E-02	-2.8086E 00	2.4399E-01	6.7982E 01	1.6587E 01
38	6.9137E 00	4.7800E 01	2.2675E-01	1.6399E-02	6.4071E-02	-2.7478E 00	2.5594E-01	6.0981E 01	1.5608E 01
39	6.9314E 00	4.8044E 01	2.5460E-01	1.8366E-02	6.8307E-02	-2.6837E 00	2.6887E-01	5.4450E 01	1.4640E 01
40	6.9490E 00	4.8288E 01	2.7946E-01	2.0108E-02	7.3008E-02	-2.6172E 00	2.7542E-01	4.9731E 01	1.3697E 01
41	6.9666E 00	4.8533E 01	3.1228E-01	2.2413E-02	7.8216E-02	-2.5483E 00	2.8655E-01	4.4617E 01	1.2785E 01
42	6.9842E 00	4.8779E 01	3.5305E-01	2.5275E-02	8.4072E-02	-2.4761E 00	3.0064E-01	3.9564E 01	1.1895E 01
43	7.0018E 00	4.9025E 01	3.9880E-01	2.8479E-02	9.0689E-02	-2.4003E 00	3.1403E-01	3.5114E 01	1.1027E 01
44	7.0194E 00	4.9272E 01	4.5350E-01	3.2304E-02	9.8191E-02	-2.3208E 00	3.2899E-01	3.0956E 01	1.0184E 01
45	7.0370E 00	4.9519E 01	5.1616E-01	3.6675E-02	1.0672E-01	-2.2375E 00	3.4364E-01	2.7267E 01	9.3699E 00
46	7.0546E 00	4.9767E 01	5.9970E-01	4.2504E-02	1.1655E-01	-2.1495E 00	3.6470E-01	2.3527E 01	8.5803E 00
47	7.0722E 00	5.0016E 01	6.9716E-01	4.9289E-02	1.2796E-01	-2.0560E 00	3.8519E-01	2.0289E 01	7.8150E 00
48	7.0898E 00	5.0265E 01	8.0059E-01	5.6461E-02	1.4114E-01	-1.9580E 00	4.0003E-01	1.7711E 01	7.0851E 00
49	7.1074E 00	5.0515E 01	9.6270E-01	6.7725E-02	1.5666E-01	-1.8537E 00	4.3230E-01	1.4766E 01	6.3832E 00

TABLE IV (CONT)

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
50	7.1250E 00	5.0768E 01	1.1517E 00	8.0818E-02	1.7527E-01	-1.7414E 00	4.6111E-01	1.2373E 01	5.7055E 00
51	7.1426E 00	5.1017E 01	1.4649E 00	1.0255E-01	1.9830E-01	-1.6180E 00	5.1715E-01	9.7515E 00	5.0430E 00
52	7.1602E 00	5.1269E 01	1.7931E 00	1.2521E-01	2.2697E-01	-1.4829E 00	5.5168E-01	7.9863E 00	4.4059E 00
53	7.1778E 00	5.1521E 01	2.1114E 00	1.4708E-01	2.6133E-01	-1.3420E 00	5.6279E-01	6.7992E 00	3.8265E 00
54	7.1954E 00	5.1774E 01	2.4336E 00	1.6911E-01	3.0134E-01	-1.1995E 00	5.6119E-01	5.9134E 00	3.3186E 00

TABLE V

EXPERIMENTAL DATA FOR SAMPLE 2 AT ROTOR SPEED 10,589 RPM
(See Figure 4)

Identification Number is Sample 2 10,589 RPM

THE CONCENTRATION FOR THIS RUN = 0.6737E-01
DIFFERENCE BTWN SQS OF RTM AND MENISCUS = 0.12693140E 02
CONC. AT MENISCUS = 0.3524E-01

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.2645E 00	3.9244E 01	1.7955E-02	1.4331E-03	3.5236E-02	-3.3457E 00	4.0671E-02	6.9780E 02	2.8380E 01
2	6.2881E 00	3.9540E 01	1.9172E-02	1.5245E-03	3.5673E-02	-3.3334E 00	4.2735E-02	6.5596E 02	2.8032E 01
3	6.3116E 00	3.9836E 01	2.0592E-02	1.6313E-03	3.6141E-02	-3.3203E 00	4.5137E-02	6.1301E 02	2.7669E 01
4	6.3352E 00	4.0134E 01	2.2114E-02	1.7453E-03	3.6644E-02	-3.3065E 00	4.7629E-02	5.7296E 02	2.7289E 01
5	6.3587E 00	4.0433E 01	2.3737E-02	1.8665E-03	3.7184E-02	-3.2919E 00	5.0195E-02	5.3577E 02	2.6893E 01
6	6.3823E 00	4.0733E 01	2.5553E-02	2.0026E-03	3.7765E-02	-3.2764E 00	5.3029E-02	4.9934E 02	2.6480E 01
7	6.4058E 00	4.1035E 01	2.7490E-02	2.1457E-03	3.8390E-02	-3.2600E 00	5.5893E-02	4.6604E 02	2.6049E 01
8	6.4294E 00	4.1337E 01	2.9620E-02	2.3035E-03	3.9062E-02	-3.2426E 00	5.8970E-02	4.3412E 02	2.5600E 01
9	6.4529E 00	4.1641E 01	3.1954E-02	2.4759E-03	3.9788E-02	-3.2242E 00	6.2228E-02	4.0389E 02	2.5133E 01
10	6.4765E 00	4.1945E 01	3.4490E-02	2.6627E-03	4.0570E-02	-3.2047E 00	6.5631E-02	3.7556E 02	2.4649E 01
11	6.5001E 00	4.2251E 01	3.7127E-02	2.8559E-03	4.1414E-02	-3.1841E 00	6.8960E-02	3.5015E 02	2.4147E 01
12	6.5236E 00	4.2558E 01	3.9967E-02	3.0633E-03	4.2322E-02	-3.1625E 00	7.2381E-02	3.2645E 02	2.3629E 01
13	6.5472E 00	4.2865E 01	4.3011E-02	3.2847E-03	4.3299E-02	-3.1396E 00	7.5860E-02	3.0444E 02	2.3095E 01
14	6.5707E 00	4.3174E 01	4.6257E-02	3.5199E-03	4.4350E-02	-3.1156E 00	7.9366E-02	2.8410E 02	2.2548E 01
15	6.5943E 00	4.3485E 01	4.9706E-02	3.7688E-03	4.5480E-02	-3.0905E 00	8.2867E-02	2.6533E 02	2.1988E 01
16	6.6178E 00	4.3796E 01	5.3213E-02	3.2649E-03	4.6575E-02	-3.0667E 00	7.0100E-02	3.0629E 02	2.1471E 01
17	6.6414E 00	4.4108E 01	5.7314E-02	4.3149E-03	4.7759E-02	-3.0416E 00	9.0348E-02	2.3176E 02	2.0939E 01
18	6.6650E 00	4.4422E 01	6.1978E-02	4.6421E-03	4.9162E-02	-3.0126E 00	9.4423E-02	2.1542E 02	2.0341E 01
19	6.6885E 00	4.4736E 01	6.6748E-02	4.9897E-03	5.0677E-02	-2.9823E 00	9.8461E-02	2.0041E 02	1.9733E 01
20	6.7121E 00	4.5052E 01	7.2225E-02	5.3803E-03	5.2314E-02	-2.9505E 00	1.0285E-01	1.8586E 02	1.9115E 01
21	6.7356E 00	4.5369E 01	7.8312E-02	5.8132E-03	5.4087E-02	-2.9172E 00	1.0748E-01	1.7202E 02	1.8489E 01
22	6.7592E 00	4.5686E 01	8.4905E-02	6.2807E-03	5.6009E-02	-2.8822E 00	1.1214E-01	1.5922E 02	1.7854E 01
23	6.7827E 00	4.6005E 01	9.2209E-02	6.7973E-03	5.8095E-02	-2.8457E 00	1.1700E-01	1.4712E 02	1.7213E 01
24	6.8063E 00	4.6326E 01	1.0032E-01	7.3700E-03	6.0362E-02	-2.8074E 00	1.2210E-01	1.3569E 02	1.6567E 01
25	6.8298E 00	4.6647E 01	1.0915E-01	7.9906E-03	6.2829E-02	-2.7673E 00	1.2718E-01	1.2515E 02	1.5916E 01
26	6.8534E 00	4.6969E 01	1.1868E-01	8.6588E-03	6.5513E-02	-2.7255E 00	1.3217E-01	1.1549E 02	1.5264E 01
27	6.8770E 00	4.7293E 01	1.2913E-01	9.3888E-03	6.8431E-02	-2.6819E 00	1.3720E-01	1.0651E 02	1.4613E 01
28	6.9005E 00	4.7617E 01	1.4060E-01	1.0187E-02	7.1608E-02	-2.6365E 00	1.4227E-01	9.8161E 01	1.3965E 01
29	6.9241E 00	4.7943E 01	1.5378E-01	1.1105E-02	7.5075E-02	-2.5893E 00	1.4792E-01	9.0050E 01	1.3320E 01
30	6.9476E 00	4.8269E 01	1.6768E-01	1.2067E-02	7.8861E-02	-2.5401E 00	1.5302E-01	8.2867E 01	1.2681E 01
31	6.9712E 00	4.8597E 01	1.8290E-01	1.3118E-02	8.2990E-02	-2.4890E 00	1.5807E-01	7.6231E 01	1.2050E 01
32	6.9947E 00	4.8926E 01	1.9963E-01	1.4270E-02	8.7495E-02	-2.4362E 00	1.6310E-01	7.0076E 01	1.1429E 01
33	7.0183E 00	4.9256E 01	2.1798E-01	1.5465E-02	9.2402E-02	-2.3816E 00	1.6737E-01	6.4660E 01	1.0822E 01
34	7.0418E 00	4.9588E 01	2.3737E-01	1.6854E-02	9.7755E-02	-2.3253E 00	1.7241E-01	5.9332E 01	1.0230E 01
35	7.0654E 00	4.9920E 01	2.6070E-01	1.8449E-02	1.0362E-01	-2.2670E 00	1.7805E-01	5.4203E 01	9.6506E 00
36	7.0890E 00	5.0253E 01	2.8708E-01	2.0248E-02	1.1007E-01	-2.2066E 00	1.8395E-01	4.9387E 01	9.0850E 00
37	7.1125E 00	5.0588E 01	3.1751E-01	2.2320E-02	1.1719E-01	-2.1439E 00	1.9046E-01	4.4802E 01	8.5330E 00
38	7.1361E 00	5.0924E 01	3.5207E-01	2.5019E-02	1.2514E-01	-2.0784E 00	1.9993E-01	3.9970E 01	7.9913E 00
39	7.1596E 00	5.1260E 01	4.1083E-01	2.8691E-02	1.3418E-01	-2.0086E 00	2.1382E-01	3.4854E 01	7.4527E 00
40	7.1832E 00	5.1598E 01	4.9706E-01	3.4599E-02	1.4487E-01	-1.9319E 00	2.3882E-01	2.8903E 01	6.9027E 00
41	7.2067E 00	5.1937E 01	7.2022E-01	4.9969E-02	1.5920E-01	-1.8376E 00	3.1387E-01	2.0012E 01	6.2813E 00

TABLE VI

EXPERIMENTAL DATA FOR SAMPLE 2 AT ROTOR SPEED 7,447 RPM
(See Figure 3b)

Identification Number is Sample 2 7,447 RPM

THE CONCENTRATION FOR THIS RUN = 0.6737E-01
DIFFERENCE BTWN SOS OF BTM AND MENISCUS = 0.12556299E 02
CONC. AT MENISCUS = 0.4797E-01

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.2624E 00	3.9218E 01	2.0885E-02	1.6675E-03	4.7967E-02	-3.0373E 00	3.4763E-02	5.9971E 02	2.0848E 01
2	6.2800E 00	3.9438E 01	2.1879E-02	1.7420E-03	4.8343E-02	-3.0294E 00	3.6034E-02	5.7406E 02	2.0686E 01
3	6.2976E 00	3.9660E 01	2.1879E-02	1.7371E-03	4.8728E-02	-3.0215E 00	3.5649E-02	5.7566E 02	2.0522E 01
4	6.3152E 00	3.9882E 01	2.2874E-02	1.8110E-03	4.9122E-02	-3.0134E 00	3.6868E-02	5.5217E 02	2.0357E 01
5	6.3328E 00	4.0105E 01	2.3868E-02	1.8845E-03	4.9533E-02	-3.0051E 00	3.8045E-02	5.3064E 02	2.0188E 01
6	6.3504E 00	4.0328E 01	2.4863E-02	1.9576E-03	4.9962E-02	-2.9965E 00	3.9181E-02	5.1083E 02	2.0015E 01
7	6.3680E 00	4.0552E 01	2.5858E-02	2.0303E-03	5.0409E-02	-2.9876E 00	4.0276E-02	4.9255E 02	1.9838E 01
8	6.3856E 00	4.0776E 01	2.6852E-02	2.1025E-03	5.0873E-02	-2.9784E 00	4.1329E-02	4.7562E 02	1.9657E 01
9	6.4032E 00	4.1001E 01	2.7847E-02	2.1744E-03	5.1354E-02	-2.9690E 00	4.2341E-02	4.5989E 02	1.9473E 01
10	6.4208E 00	4.1227E 01	2.8841E-02	2.2459E-03	5.1853E-02	-2.9593E 00	4.3313E-02	4.4526E 02	1.9285E 01
11	6.4384E 00	4.1454E 01	2.9836E-02	2.3170E-03	5.2370E-02	-2.9494E 00	4.4243E-02	4.3159E 02	1.9095E 01
12	6.4560E 00	4.1681E 01	3.0830E-02	2.3877E-03	5.2904E-02	-2.9393E 00	4.5133E-02	4.1881E 02	1.8902E 01
13	6.4736E 00	4.1908E 01	3.1825E-02	2.4580E-03	5.3455E-02	-2.9289E 00	4.5983E-02	4.0683E 02	1.8707E 01
14	6.4913E 00	4.2136E 01	3.2819E-02	2.5280E-03	5.4024E-02	-2.9183E 00	4.6793E-02	3.9558E 02	1.8510E 01
15	6.5089E 00	4.2365E 01	3.3814E-02	2.5975E-03	5.4611E-02	-2.9075E 00	4.7564E-02	3.8498E 02	1.8311E 01
16	6.5265E 00	4.2595E 01	3.4808E-02	2.6667E-03	5.5215E-02	-2.8965E 00	4.8297E-02	3.7500E 02	1.8111E 01
17	6.5441E 00	4.2825E 01	3.5803E-02	2.7355E-03	5.5836E-02	-2.8853E 00	4.8992E-02	3.6556E 02	1.7910E 01
18	6.5617E 00	4.3055E 01	3.6797E-02	2.8040E-03	5.6475E-02	-2.8740E 00	4.9649E-02	3.5664E 02	1.7707E 01
19	6.5793E 00	4.3287E 01	3.7792E-02	2.8720E-03	5.7132E-02	-2.8624E 00	5.0270E-02	3.4819E 02	1.7503E 01
20	6.5969E 00	4.3519E 01	3.8786E-02	2.9397E-03	5.7806E-02	-2.8507E 00	5.0856E-02	3.4017E 02	1.7299E 01
21	6.6145E 00	4.3751E 01	3.9781E-02	3.0071E-03	5.8497E-02	-2.8388E 00	5.1406E-02	3.3255E 02	1.7095E 01
22	6.6321E 00	4.3985E 01	4.0775E-02	3.0741E-03	5.9206E-02	-2.8267E 00	5.1922E-02	3.2530E 02	1.6890E 01
23	6.6497E 00	4.4218E 01	4.1770E-02	3.1407E-03	5.9933E-02	-2.8145E 00	5.2404E-02	3.1840E 02	1.6685E 01
24	6.6673E 00	4.4453E 01	4.2764E-02	3.2070E-03	6.0680E-02	-2.8020E 00	5.2853E-02	3.1182E 02	1.6478E 01
25	6.6849E 00	4.4688E 01	4.3759E-02	3.2730E-03	6.1447E-02	-2.7893E 00	5.3270E-02	3.0553E 02	1.6270E 01
26	6.7025E 00	4.4924E 01	4.4753E-02	3.3386E-03	6.2235E-02	-2.7764E 00	5.3656E-02	2.9951E 02	1.6061E 01
27	6.7201E 00	4.5160E 01	4.5748E-02	3.4038E-03	6.3045E-02	-2.7634E 00	5.4013E-02	2.9374E 02	1.5851E 01
28	6.7377E 00	4.5397E 01	4.6742E-02	3.4687E-03	6.3877E-02	-2.7502E 00	5.4342E-02	2.8821E 02	1.5641E 01
29	6.7553E 00	4.5634E 01	4.7737E-02	3.5332E-03	6.4732E-02	-2.7367E 00	5.4644E-02	2.8290E 02	1.5430E 01
30	6.7729E 00	4.5872E 01	4.8731E-02	3.5973E-03	6.5611E-02	-2.7230E 00	5.4919E-02	2.7780E 02	1.5218E 01
31	6.7905E 00	4.6111E 01	4.9726E-02	3.6611E-03	6.6513E-02	-2.7090E 00	5.5169E-02	2.7290E 02	1.5006E 01
32	6.8081E 00	4.6351E 01	5.0720E-02	3.7245E-03	6.7440E-02	-2.6948E 00	5.5394E-02	2.6818E 02	1.4793E 01
33	6.8257E 00	4.6591E 01	5.1715E-02	3.7875E-03	6.8392E-02	-2.6804E 00	5.5595E-02	2.6364E 02	1.4579E 01
34	6.8433E 00	4.6831E 01	5.2709E-02	3.8501E-03	6.9370E-02	-2.6657E 00	5.5773E-02	2.5926E 02	1.4365E 01
35	6.8609E 00	4.7072E 01	5.3704E-02	3.9124E-03	7.0375E-02	-2.6508E 00	5.5929E-02	2.5504E 02	1.4151E 01
36	6.8785E 00	4.7314E 01	5.4698E-02	3.9743E-03	7.1407E-02	-2.6356E 00	5.6064E-02	2.5097E 02	1.3936E 01
37	6.8961E 00	4.7557E 01	5.5693E-02	4.0358E-03	7.2468E-02	-2.6202E 00	5.6180E-02	2.4703E 02	1.3720E 01
38	6.9137E 00	4.7800E 01	5.6687E-02	4.0969E-03	7.3558E-02	-2.6045E 00	5.6278E-02	2.4322E 02	1.3505E 01
39	6.9314E 00	4.8044E 01	5.7682E-02	4.1577E-03	7.4678E-02	-2.5886E 00	5.6359E-02	2.3953E 02	1.3289E 01
40	6.9490E 00	4.8288E 01	5.8676E-02	4.2180E-03	7.5829E-02	-2.5724E 00	5.6424E-02	2.3595E 02	1.3072E 01
41	6.9666E 00	4.8533E 01	5.9671E-02	4.2780E-03	7.7012E-02	-2.5561E 00	5.6474E-02	2.3247E 02	1.2856E 01
42	6.9842E 00	4.8779E 01	6.0665E-02	4.3376E-03	7.8228E-02	-2.5396E 00	5.6510E-02	2.2910E 02	1.2639E 01
43	7.0018E 00	4.9025E 01	6.1660E-02	4.3968E-03	7.9478E-02	-2.5230E 00	5.6532E-02	2.2582E 02	1.2422E 01
44	7.0194E 00	4.9272E 01	6.2654E-02	4.4556E-03	8.0763E-02	-2.5062E 00	5.6542E-02	2.2263E 02	1.2205E 01
45	7.0370E 00	4.9519E 01	6.3649E-02	4.5141E-03	8.2084E-02	-2.4893E 00	5.6540E-02	2.1952E 02	1.1988E 01
46	7.0546E 00	4.9767E 01	6.4643E-02	4.5722E-03	8.3441E-02	-2.4722E 00	5.6527E-02	2.1649E 02	1.1771E 01
47	7.0722E 00	5.0016E 01	6.5638E-02	4.6299E-03	8.4836E-02	-2.4550E 00	5.6504E-02	2.1353E 02	1.1554E 01
48	7.0898E 00	5.0265E 01	6.6632E-02	4.6872E-03	8.6270E-02	-2.4377E 00	5.6471E-02	2.1064E 02	1.1337E 01
49	7.1074E 00	5.0515E 01	6.7627E-02	4.7442E-03	8.7744E-02	-2.4202E 00	5.6429E-02	2.0781E 02	1.1121E 01

TABLE VI (CONT)

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
50	7.1250E 00	5.0766E 01	1.1735E-01	8.2353E-03	9.1901E-02	-2.3870E 00	8.9611E-02	1.2143E 02	1.0881E 01
51	7.1426E 00	5.1017E 01	1.2730E-01	8.9112E-03	9.4054E-02	-2.3639E 00	9.4746E-02	1.1222E 02	1.0632E 01
52	7.1602E 00	5.1269E 01	1.4520E-01	1.0139E-02	9.6452E-02	-2.3387E 00	1.0512E-01	9.8625E 01	1.0368E 01
53	7.1778E 00	5.1521E 01	1.7802E-01	1.2401E-02	9.9297E-02	-2.3096E 00	1.2488E-01	8.0641E 01	1.0071E 01
54	7.1954E 00	5.1774E 01	2.5559E-01	1.7761E-02	1.0311E-01	-2.2719E 00	1.7225E-01	5.6304E 01	9.6981E 00

TABLE VII

EXPERIMENTAL DATA FOR SAMPLE 3 AT ROTOR SPEED 10,589 RPM
(See Figure 5)

Identification Number is Sample 3 10,589 RPM

THE CONCENTRATION FOR THIS RUN = 0.1146E-00
DIFFERENCE BTWN SQS OF BTM AND MENISCUS = 0.12987963E 02
CONC. AT MENISCUS = 0.6796E-01

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.2486E 00	3.9045E 01	4.9353E-02	3.9491E-03	6.7960E-02	-2.6888E 00	5.8109E-02	2.5322E 02	1.4715E 01
2	6.2778E 00	3.9411E 01	5.0360E-02	4.0109E-03	6.9418E-02	-2.6676E 00	5.7780E-02	2.4932E 02	1.4406E 01
3	6.3071E 00	3.9779E 01	5.2374E-02	4.1520E-03	7.0919E-02	-2.6462E 00	5.8546E-02	2.4085E 02	1.4101E 01
4	6.3363E 00	4.0149E 01	5.3382E-02	4.2124E-03	7.2465E-02	-2.6246E 00	5.8129E-02	2.3740E 02	1.3800E 01
5	6.3655E 00	4.0520E 01	5.5396E-02	4.3512E-03	7.4055E-02	-2.6029E 00	5.8757E-02	2.2982E 02	1.3503E 01
6	6.3948E 00	4.0893E 01	5.7410E-02	4.4888E-03	7.5704E-02	-2.5809E 00	5.9294E-02	2.2277E 02	1.3209E 01
7	6.4240E 00	4.1268E 01	5.8418E-02	4.5468E-03	7.7398E-02	-2.5588E 00	5.8746E-02	2.1993E 02	1.2920E 01
8	6.4533E 00	4.1644E 01	6.0432E-02	4.6823E-03	7.9135E-02	-2.5366E 00	5.9169E-02	2.1357E 02	1.2637E 01
9	6.4825E 00	4.2023E 01	6.1439E-02	4.7389E-03	8.0916E-02	-2.5143E 00	5.8565E-02	2.1102E 02	1.2358E 01
10	6.5117E 00	4.2403E 01	6.3454E-02	4.8723E-03	8.2742E-02	-2.4920E 00	5.8885E-02	2.0524E 02	1.2086E 01
11	6.5410E 00	4.2784E 01	6.7492E-02	5.1584E-03	8.4656E-02	-2.4692E 00	6.0934E-02	1.9386E 02	1.1813E 01
12	6.5702E 00	4.3167E 01	7.2518E-02	5.5187E-03	8.6702E-02	-2.4453E 00	6.3652E-02	1.8120E 02	1.1534E 01
13	6.5994E 00	4.3553E 01	7.7554E-02	5.8758E-03	8.8896E-02	-2.4203E 00	6.6098E-02	1.7019E 02	1.1249E 01
14	6.6287E 00	4.3939E 01	8.2590E-02	6.2298E-03	9.1237E-02	-2.3943E 00	6.8282E-02	1.6052E 02	1.0961E 01
15	6.6579E 00	4.4328E 01	9.0648E-02	6.8075E-03	9.3769E-02	-2.3669E 00	7.2599E-02	1.4690E 02	1.0665E 01
16	6.6871E 00	4.4718E 01	9.7699E-02	7.3049E-03	9.6522E-02	-2.3380E 00	7.5682E-02	1.3689E 02	1.0360E 01
17	6.7164E 00	4.5110E 01	1.0374E-01	7.7230E-03	9.9466E-02	-2.3079E 00	7.7645E-02	1.2948E 02	1.0054E 01
18	6.7456E 00	4.5503E 01	1.1079E-01	8.2122E-03	1.0260E-01	-2.2769E 00	8.0039E-02	1.2177E 02	9.7464E 00
19	6.7748E 00	4.5899E 01	1.1986E-01	8.8457E-03	1.0597E-01	-2.2446E 00	8.3471E-02	1.1305E 02	9.4363E 00
20	6.8041E 00	4.6296E 01	1.2892E-01	9.4738E-03	1.0961E-01	-2.2108E 00	8.6432E-02	1.0555E 02	9.1233E 00
21	6.8333E 00	4.6694E 01	1.3799E-01	1.0097E-02	1.1351E-01	-2.1759E 00	8.8948E-02	9.9043E 01	8.8097E 00
22	6.8626E 00	4.7095E 01	1.4806E-01	1.0787E-02	1.1769E-01	-2.1397E 00	9.1658E-02	9.2701E 01	8.4967E 00
23	6.8918E 00	4.7497E 01	1.5813E-01	1.1472E-02	1.2217E-01	-2.1024E 00	9.3907E-02	8.7166E 01	8.1855E 00
24	6.9210E 00	4.7901E 01	1.7022E-01	1.2297E-02	1.2697E-01	-2.0638E 00	9.6852E-02	8.1320E 01	7.8760E 00
25	6.9503E 00	4.8306E 01	1.8331E-01	1.3187E-02	1.3213E-01	-2.0239E 00	9.9802E-02	7.5831E 01	7.5680E 00
26	6.9795E 00	4.8713E 01	2.0043E-01	1.4359E-02	1.3774E-01	-1.9824E 00	1.0424E-01	6.9644E 01	7.2598E 00
27	7.0087E 00	4.9122E 01	2.2158E-01	1.5808E-02	1.4391E-01	-1.9386E 00	1.0984E-01	6.3260E 01	6.9487E 00
28	7.0380E 00	4.9533E 01	2.4475E-01	1.7388E-02	1.5073E-01	-1.8923E 00	1.1536E-01	5.7512E 01	6.6344E 00
29	7.0672E 00	4.9945E 01	2.7497E-01	1.9454E-02	1.5832E-01	-1.8431E 00	1.2287E-01	5.1404E 01	6.3161E 00
30	7.0964E 00	5.0360E 01	3.1425E-01	2.2141E-02	1.6694E-01	-1.7901E 00	1.3263E-01	4.5165E 01	5.9903E 00
31	7.1257E 00	5.0775E 01	3.6662E-01	2.5725E-02	1.7689E-01	-1.7322E 00	1.4543E-01	3.8872E 01	5.6533E 00
32	7.1549E 00	5.1193E 01	4.4820E-01	3.1321E-02	1.8880E-01	-1.6671E 00	1.6590E-01	3.1927E 01	5.2967E 00
33	7.1842E 00	5.1612E 01	6.7482E-01	4.6066E-02	2.0521E-01	-1.5837E 00	2.2887E-01	2.1292E 01	4.8731E 00
34	7.2134E 00	5.2033E 01	1.0072E 00	6.9815E-02	2.2978E-01	-1.4706E 00	3.0383E-01	1.4324E 01	4.3519E 00

TABLE VIII

EXPERIMENTAL DATA FOR SAMPLE 3 AT ROTOR SPEED 8,766 RPM
(See Figure 6a)

Identification Number is Sample 3 8,766 RPM

THE CONCENTRATION FOR THIS RUN = 0.1146E-00
DIFFERENCE BTWN SQS OF BTM AND MENISCUS = 0.12829269E 02
CONC. AT MENISCUS = 0.8063E-01

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.2468E 00	3.9023E 01	4.1590E-02	3.3289E-03	8.0627E-02	-2.5179E 00	4.1288E-02	3.0040E 02	1.2403E 01
2	6.2645E 00	3.9244E 01	4.2300E-02	3.3762E-03	8.1368E-02	-2.5088E 00	4.1493E-02	2.9619E 02	1.2290E 01
3	6.2821E 00	3.9465E 01	4.3213E-02	3.4394E-03	8.2123E-02	-2.4995E 00	4.1881E-02	2.9075E 02	1.2177E 01
4	6.2998E 00	3.9687E 01	4.4126E-02	3.5022E-03	8.2895E-02	-2.4902E 00	4.2249E-02	2.8553E 02	1.2063E 01
5	6.3175E 00	3.9910E 01	4.5039E-02	3.5647E-03	8.3683E-02	-2.4807E 00	4.2597E-02	2.8053E 02	1.1950E 01
6	6.3351E 00	4.0134E 01	4.6054E-02	3.6348E-03	8.4487E-02	-2.4712E 00	4.3022E-02	2.7512E 02	1.1836E 01
7	6.3528E 00	4.0358E 01	4.7068E-02	3.7045E-03	8.5310E-02	-2.4615E 00	4.3424E-02	2.6994E 02	1.1722E 01
8	6.3705E 00	4.0583E 01	4.8083E-02	3.7739E-03	8.6150E-02	-2.4517E 00	4.3806E-02	2.6498E 02	1.1608E 01
9	6.3881E 00	4.0808E 01	4.9198E-02	3.8508E-03	8.7010E-02	-2.4417E 00	4.4257E-02	2.5969E 02	1.1493E 01
10	6.4058E 00	4.1034E 01	5.0314E-02	3.9272E-03	8.7889E-02	-2.4317E 00	4.4684E-02	2.5463E 02	1.1378E 01
11	6.4235E 00	4.1261E 01	5.1532E-02	4.0112E-03	8.8788E-02	-2.4215E 00	4.5177E-02	2.4930E 02	1.1263E 01
12	6.4411E 00	4.1488E 01	5.2749E-02	4.0947E-03	8.9709E-02	-2.4112E 00	4.5644E-02	2.4422E 02	1.1147E 01
13	6.4588E 00	4.1716E 01	5.3966E-02	4.1777E-03	9.0652E-02	-2.4007E 00	4.6085E-02	2.3937E 02	1.1031E 01
14	6.4765E 00	4.1945E 01	5.5285E-02	4.2681E-03	9.1617E-02	-2.3901E 00	4.6587E-02	2.3429E 02	1.0915E 01
15	6.4941E 00	4.2174E 01	5.6604E-02	4.3580E-03	9.2606E-02	-2.3794E 00	4.7060E-02	2.2946E 02	1.0798E 01
16	6.5118E 00	4.2404E 01	5.8024E-02	4.4553E-03	9.3618E-02	-2.3685E 00	4.7590E-02	2.2445E 02	1.0682E 01
17	6.5295E 00	4.2634E 01	5.9444E-02	4.5520E-03	9.4656E-02	-2.3575E 00	4.8090E-02	2.1969E 02	1.0565E 01
18	6.5471E 00	4.2865E 01	6.0864E-02	4.6481E-03	9.5718E-02	-2.3463E 00	4.8561E-02	2.1514E 02	1.0447E 01
19	6.5648E 00	4.3097E 01	6.2386E-02	4.7515E-03	9.6807E-02	-2.3350E 00	4.9082E-02	2.1046E 02	1.0330E 01
20	6.5825E 00	4.3329E 01	6.3907E-02	4.8543E-03	9.7923E-02	-2.3236E 00	4.9573E-02	2.0600E 02	1.0212E 01
21	6.6001E 00	4.3562E 01	6.5530E-02	4.9643E-03	9.9066E-02	-2.3120E 00	5.0111E-02	2.0144E 02	1.0094E 01
22	6.6178E 00	4.3795E 01	6.7153E-02	5.0737E-03	1.0024E-01	-2.3002E 00	5.0616E-02	1.9710E 02	9.9762E 00
23	6.6355E 00	4.4030E 01	6.8878E-02	5.1901E-03	1.0144E-01	-2.2883E 00	5.1165E-02	1.9267E 02	9.8581E 00
24	6.6531E 00	4.4264E 01	7.0602E-02	5.3059E-03	1.0267E-01	-2.2762E 00	5.1679E-02	1.8847E 02	9.7398E 00
25	6.6708E 00	4.4500E 01	7.2428E-02	5.4287E-03	1.0394E-01	-2.2640E 00	5.2232E-02	1.8420E 02	9.6214E 00
26	6.6885E 00	4.4736E 01	7.4254E-02	5.5509E-03	1.0523E-01	-2.2516E 00	5.2750E-02	1.8015E 02	9.5029E 00
27	6.7061E 00	4.4972E 01	7.6181E-02	5.6800E-03	1.0656E-01	-2.2390E 00	5.3303E-02	1.7606E 02	9.3844E 00
28	6.7238E 00	4.5210E 01	7.8210E-02	5.8159E-03	1.0792E-01	-2.2263E 00	5.3889E-02	1.7194E 02	9.2658E 00
29	6.7415E 00	4.5447E 01	8.0340E-02	5.9587E-03	1.0932E-01	-2.2134E 00	5.4505E-02	1.6782E 02	9.1471E 00
30	6.7591E 00	4.5686E 01	8.2572E-02	6.1082E-03	1.1076E-01	-2.2004E 00	5.5146E-02	1.6371E 02	9.0283E 00
31	6.7768E 00	4.5925E 01	8.5007E-02	6.2719E-03	1.1224E-01	-2.1871E 00	5.5877E-02	1.5944E 02	8.9092E 00
32	6.7945E 00	4.6165E 01	8.7543E-02	6.4422E-03	1.1377E-01	-2.1736E 00	5.6626E-02	1.5523E 02	8.7898E 00
33	6.8121E 00	4.6405E 01	9.0282E-02	6.6265E-03	1.1534E-01	-2.1599E 00	5.7453E-02	1.5091E 02	8.6701E 00
34	6.8298E 00	4.6646E 01	9.3122E-02	6.8173E-03	1.1696E-01	-2.1459E 00	5.8288E-02	1.4669E 02	8.5500E 00
35	6.8475E 00	4.6888E 01	9.6165E-02	7.0219E-03	1.1863E-01	-2.1317E 00	5.9192E-02	1.4241E 02	8.4295E 00
36	6.8651E 00	4.7130E 01	9.9310E-02	7.2329E-03	1.2036E-01	-2.1173E 00	6.0095E-02	1.3826E 02	8.3086E 00
37	6.8828E 00	4.7373E 01	1.0276E-01	7.4649E-03	1.2214E-01	-2.1026E 00	6.1116E-02	1.3396E 02	8.1872E 00
38	6.9005E 00	4.7617E 01	1.0641E-01	7.7104E-03	1.2399E-01	-2.0876E 00	6.2186E-02	1.2970E 02	8.0652E 00
39	6.9181E 00	4.7861E 01	1.1037E-01	7.9766E-03	1.2590E-01	-2.0722E 00	6.3354E-02	1.2537E 02	7.9425E 00
40	6.9358E 00	4.8105E 01	1.1463E-01	8.2534E-03	1.2789E-01	-2.0566E 00	6.4612E-02	1.2102E 02	7.8191E 00
41	6.9535E 00	4.8351E 01	1.1929E-01	8.5780E-03	1.2996E-01	-2.0405E 00	6.6005E-02	1.1658E 02	7.6948E 00
42	6.9711E 00	4.8597E 01	1.2437E-01	8.9200E-03	1.3211E-01	-2.0241E 00	6.7519E-02	1.1211E 02	7.5694E 00
43	6.9888E 00	4.8844E 01	1.2994E-01	9.2966E-03	1.3436E-01	-2.0073E 00	6.9193E-02	1.0757E 02	7.4428E 00
44	7.0065E 00	4.9091E 01	1.3603E-01	9.7075E-03	1.3671E-01	-1.9899E 00	7.1010E-02	1.0301E 02	7.3149E 00
45	7.0241E 00	4.9339E 01	1.4293E-01	1.0174E-02	1.3917E-01	-1.9721E 00	7.3105E-02	9.8289E 01	7.1854E 00
46	7.0418E 00	4.9587E 01	1.5054E-01	1.0689E-02	1.4176E-01	-1.9536E 00	7.5399E-02	9.3556E 01	7.0540E 00
47	7.0595E 00	4.9836E 01	1.5926E-01	1.1280E-02	1.4450E-01	-1.9345E 00	7.8062E-02	8.8653E 01	6.9204E 00
48	7.0771E 00	5.0086E 01	1.6940E-01	1.1968E-02	1.4740E-01	-1.9146E 00	8.1196E-02	8.3553E 01	6.7841E 00
49	7.0948E 00	5.0336E 01	1.8361E-01	1.2939E-02	1.5052E-01	-1.8937E 00	8.5965E-02	7.7283E 01	6.6436E 00

TABLE VIII (CONT)

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
50	7.1125E 00	5.0587E 01	2.0085E-01	1.4120E-02	1.5392E-01	-1.8713E 00	9.1735E-02	7.0823E 01	6.4970E 00
51	7.1301E 00	5.0839E 01	2.2114E-01	1.5507E-02	1.5764E-01	-1.8474E 00	9.8369E-02	6.4486E 01	6.3434E 00
52	7.1478E 00	5.1091E 01	2.4346E-01	1.7030E-02	1.6175E-01	-1.8217E 00	1.0529E-01	5.8720E 01	6.1825E 00
53	7.1655E 00	5.1344E 01	2.8403E-01	1.9819E-02	1.6641E-01	-1.7933E 00	1.1910E-01	5.0455E 01	6.0094E 00
54	7.1832E 00	5.1598E 01	3.3475E-01	2.3301E-02	1.7187E-01	-1.7610E 00	1.3557E-01	4.2916E 01	5.8183E 00
55	7.2008E 00	5.1852E 01	4.3619E-01	3.0288E-02	1.7868E-01	-1.7221E 00	1.6951E-01	3.3017E 01	5.5965E 00

TABLE IX

EXPERIMENTAL DATA FOR SAMPLE 3 AT ROTOR SPEED 7,447 RPM
(See Figure 6b)

Identification Number is Sample 3 7,447 RPM

THE CONCENTRATION FOR THIS RUN = 0.1146E-00
DIFFERENCE BTWN SQS OF BTM AND MENISCUS = 0.12829269E 02
CONC. AT MENISCUS = 0.8673E-01

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.2468E 00	3.9023E 01	3.8547E-02	3.0854E-03	8.6728E-02	-2.4450E 00	3.5575E-02	3.2411E 02	1.1530E 01
2	6.2645E 00	3.9244E 01	3.8750E-02	3.0928E-03	8.7410E-02	-2.4371E 00	3.5383E-02	3.2333E 02	1.1440E 01
3	6.2821E 00	3.9465E 01	3.8952E-02	3.1084E-03	8.8098E-02	-2.4293E 00	3.5283E-02	3.2171E 02	1.1351E 01
4	6.2998E 00	3.9687E 01	3.9460E-02	3.1319E-03	8.8791E-02	-2.4215E 00	3.5272E-02	3.1930E 02	1.1262E 01
5	6.3175E 00	3.9910E 01	3.9866E-02	3.1552E-03	8.9492E-02	-2.4136E 00	3.5257E-02	3.1694E 02	1.1174E 01
6	6.3351E 00	4.0134E 01	4.0373E-02	3.1864E-03	9.0201E-02	-2.4057E 00	3.5326E-02	3.1383E 02	1.1086E 01
7	6.3528E 00	4.0358E 01	4.0880E-02	3.2175E-03	9.0919E-02	-2.3978E 00	3.5389E-02	3.1080E 02	1.0999E 01
8	6.3705E 00	4.0583E 01	4.1388E-02	3.2484E-03	9.1645E-02	-2.3898E 00	3.5445E-02	3.0784E 02	1.0912E 01
9	6.3881E 00	4.0808E 01	4.1996E-02	3.2870E-03	9.2382E-02	-2.3818E 00	3.5581E-02	3.0422E 02	1.0825E 01
10	6.4058E 00	4.1034E 01	4.2605E-02	3.3255E-03	9.3129E-02	-2.3738E 00	3.5708E-02	3.0071E 02	1.0738E 01
11	6.4235E 00	4.1261E 01	4.3315E-02	3.3716E-03	9.3888E-02	-2.3657E 00	3.5911E-02	2.9659E 02	1.0651E 01
12	6.4411E 00	4.1488E 01	4.4025E-02	3.4175E-03	9.4660E-02	-2.3575E 00	3.6103E-02	2.9261E 02	1.0564E 01
13	6.4588E 00	4.1716E 01	4.4836E-02	3.4710E-03	9.5445E-02	-2.3492E 00	3.6366E-02	2.8810E 02	1.0477E 01
14	6.4765E 00	4.1945E 01	4.5648E-02	3.5241E-03	9.6244E-02	-2.3409E 00	3.6617E-02	2.8376E 02	1.0390E 01
15	6.4941E 00	4.2174E 01	4.6460E-02	3.5770E-03	9.7057E-02	-2.3325E 00	3.6855E-02	2.7956E 02	1.0303E 01
16	6.5118E 00	4.2404E 01	4.7372E-02	3.6374E-03	9.7886E-02	-2.3239E 00	3.7160E-02	2.7492E 02	1.0216E 01
17	6.5295E 00	4.2634E 01	4.8285E-02	3.6975E-03	9.8731E-02	-2.3154E 00	3.7450E-02	2.7045E 02	1.0129E 01
18	6.5471E 00	4.2865E 01	4.9300E-02	3.7650E-03	9.9593E-02	-2.3067E 00	3.7804E-02	2.6560E 02	1.0041E 01
19	6.5648E 00	4.3097E 01	5.0416E-02	3.8398E-03	1.0047E-01	-2.2979E 00	3.8217E-02	2.6043E 02	9.9528E 00
20	6.5825E 00	4.3329E 01	5.1633E-02	3.9220E-03	1.0138E-01	-2.2889E 00	3.8688E-02	2.5497E 02	9.8643E 00
21	6.6001E 00	4.3562E 01	5.2850E-02	4.0037E-03	1.0230E-01	-2.2799E 00	3.9138E-02	2.4977E 02	9.7753E 00
22	6.6178E 00	4.3795E 01	5.4068E-02	4.0850E-03	1.0324E-01	-2.2707E 00	3.9567E-02	2.4480E 02	9.6859E 00
23	6.6355E 00	4.4030E 01	5.5386E-02	4.1735E-03	1.0421E-01	-2.2613E 00	4.0049E-02	2.3961E 02	9.5960E 00
24	6.6531E 00	4.4264E 01	5.6806E-02	4.2691E-03	1.0520E-01	-2.2519E 00	4.0581E-02	2.3424E 02	9.5056E 00
25	6.6708E 00	4.4500E 01	5.8227E-02	4.3643E-03	1.0622E-01	-2.2423E 00	4.1088E-02	2.2913E 02	9.4147E 00
26	6.6885E 00	4.4736E 01	5.9748E-02	4.4665E-03	1.0726E-01	-2.2325E 00	4.1642E-02	2.2389E 02	9.3232E 00
27	6.7061E 00	4.4972E 01	6.1371E-02	4.5757E-03	1.0833E-01	-2.2226E 00	4.2239E-02	2.1854E 02	9.2311E 00
28	6.7238E 00	4.5210E 01	6.3096E-02	4.6920E-03	1.0943E-01	-2.2125E 00	4.2877E-02	2.1313E 02	9.1384E 00
29	6.7415E 00	4.5447E 01	6.4820E-02	4.8076E-03	1.1056E-01	-2.2022E 00	4.3484E-02	2.0801E 02	9.0450E 00
30	6.7591E 00	4.5686E 01	6.6646E-02	4.9301E-03	1.1172E-01	-2.1918E 00	4.4129E-02	2.0284E 02	8.9510E 00
31	6.7768E 00	4.5925E 01	6.8573E-02	5.0594E-03	1.1291E-01	-2.1811E 00	4.4808E-02	1.9765E 02	8.8563E 00
32	6.7945E 00	4.6165E 01	7.0602E-02	5.1956E-03	1.1414E-01	-2.1703E 00	4.5518E-02	1.9247E 02	8.7609E 00
33	6.8121E 00	4.6405E 01	7.2732E-02	5.3384E-03	1.1541E-01	-2.1593E 00	4.6256E-02	1.8732E 02	8.6648E 00
34	6.8298E 00	4.6646E 01	7.4964E-02	5.4880E-03	1.1671E-01	-2.1480E 00	4.7021E-02	1.8222E 02	8.5679E 00
35	6.8475E 00	4.6888E 01	7.7297E-02	5.6442E-03	1.1806E-01	-2.1366E 00	4.7808E-02	1.7717E 02	8.4703E 00
36	6.8651E 00	4.7130E 01	7.9833E-02	5.8144E-03	1.1945E-01	-2.1249E 00	4.8678E-02	1.7199E 02	8.3719E 00
37	6.8828E 00	4.7373E 01	8.2572E-02	5.9984E-03	1.2088E-01	-2.1129E 00	4.9622E-02	1.6671E 02	8.2725E 00
38	6.9005E 00	4.7617E 01	8.5514E-02	6.1962E-03	1.2237E-01	-2.1007E 00	5.0637E-02	1.6139E 02	8.1722E 00
39	6.9181E 00	4.7861E 01	8.8659E-02	6.4077E-03	1.2391E-01	-2.0882E 00	5.1714E-02	1.5606E 02	8.0707E 00
40	6.9358E 00	4.8105E 01	9.2108E-02	6.6400E-03	1.2550E-01	-2.0754E 00	5.2908E-02	1.5060E 02	7.9680E 00
41	6.9535E 00	4.8351E 01	9.5759E-02	6.8857E-03	1.2716E-01	-2.0623E 00	5.4149E-02	1.4523E 02	7.8640E 00
42	6.9711E 00	4.8597E 01	9.9716E-02	7.1520E-03	1.2889E-01	-2.0488E 00	5.5490E-02	1.3982E 02	7.7587E 00
43	6.9888E 00	4.8844E 01	1.0398E-01	7.4387E-03	1.3069E-01	-2.0349E 00	5.6920E-02	1.3443E 02	7.6519E 00
44	7.0065E 00	4.9091E 01	1.0854E-01	7.7457E-03	1.3256E-01	-2.0207E 00	5.8430E-02	1.2910E 02	7.5435E 00
45	7.0241E 00	4.9339E 01	1.1361E-01	8.0873E-03	1.3453E-01	-2.0060E 00	6.0117E-02	1.2365E 02	7.4335E 00
46	7.0418E 00	4.9587E 01	1.1909E-01	8.4560E-03	1.3658E-01	-1.9908E 00	6.1911E-02	1.1826E 02	7.3216E 00
47	7.0595E 00	4.9836E 01	1.2518E-01	8.8659E-03	1.3874E-01	-1.9752E 00	6.3903E-02	1.1279E 02	7.2077E 00
48	7.0771E 00	5.0086E 01	1.3207E-01	9.3311E-03	1.4101E-01	-1.9589E 00	6.6172E-02	1.0717E 02	7.0916E 00
49	7.0948E 00	5.0336E 01	1.4019E-01	9.8798E-03	1.4342E-01	-1.9420E 00	6.8888E-02	1.0122E 02	6.9727E 00

TABLE IX (CONT)

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
50	7.1125E 00	5.0587E 01	1.5013E-01	1.0554E-02	1.4598E-01	-1.9243E 00	7.2297E-02	9.4750E 01	6.8502E 00
51	7.1301E 00	5.0839E 01	1.6332E-01	1.1453E-02	1.4875E-01	-1.9055E 00	7.6992E-02	8.7316E 01	6.7227E 00
52	7.1478E 00	5.1091E 01	1.8259E-01	1.2773E-02	1.5181E-01	-1.8852E 00	8.4138E-02	7.8293E 01	6.5874E 00
53	7.1655E 00	5.1344E 01	2.1302E-01	1.4865E-02	1.5530E-01	-1.8624E 00	9.5715E-02	6.7274E 01	6.4391E 00
54	7.1832E 00	5.1598E 01	2.5360E-01	1.7652E-02	1.5942E-01	-1.8362E 00	1.1073E-01	5.6649E 01	6.2727E 00
55	7.2008E 00	5.1852E 01	3.6518E-01	2.5357E-02	1.6489E-01	-1.8025E 00	1.5379E-01	3.9437E 01	6.0648E 00

TABLE X

EXPERIMENTAL DATA FOR SAMPLE 4 AT ROTOR SPEED 13,410 RPM
(See Figure 7)

Identification Number is Sample 4 13,410 RPM

THE CONCENTRATION FOR THIS RUN = 0.1098E-00
DIFFERENCE BTWN SQS OF BTM AND MENISCUS = 0.14738286E 02
CONC. AT MENISCUS = 0.7052E-01

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.1025E 00	3.7241E 01	1.0245E-02	8.3945E-04	7.0518E-02	-2.6519E 00	1.1904E-02	1.1913E 03	1.4181E 01
2	6.1261E 00	3.7529E 01	1.2984E-02	1.0598E-03	7.0792E-02	-2.6480E 00	1.4970E-02	9.4361E 02	1.4126E 01
3	6.1496E 00	3.7818E 01	1.5013E-02	1.2207E-03	7.1121E-02	-2.6434E 00	1.7163E-02	8.1923E 02	1.4060E 01
4	6.1732E 00	3.8108E 01	1.7245E-02	1.3968E-03	7.1501E-02	-2.6380E 00	1.9535E-02	7.1595E 02	1.3986E 01
5	6.1967E 00	3.8399E 01	1.9375E-02	1.5633E-03	7.1933E-02	-2.6320E 00	2.1733E-02	6.3966E 02	1.3902E 01
6	6.2203E 00	3.8692E 01	2.1607E-02	1.7368E-03	7.2415E-02	-2.6253E 00	2.3984E-02	5.7577E 02	1.3809E 01
7	6.2438E 00	3.8985E 01	2.3940E-02	1.9171E-03	7.2952E-02	-2.6180E 00	2.6279E-02	5.2163E 02	1.3708E 01
8	6.2674E 00	3.9280E 01	2.6374E-02	2.1041E-03	7.3544E-02	-2.6099E 00	2.8610E-02	4.7526E 02	1.3597E 01
9	6.2909E 00	3.9576E 01	2.8403E-02	2.2575E-03	7.4189E-02	-2.6011E 00	3.0428E-02	4.4297E 02	1.3479E 01
10	6.3145E 00	3.9873E 01	3.0838E-02	2.4418E-03	7.4887E-02	-2.5918E 00	3.2607E-02	4.0953E 02	1.3353E 01
11	6.3381E 00	4.0171E 01	3.3475E-02	2.6408E-03	7.5644E-02	-2.5817E 00	3.4911E-02	3.7867E 02	1.3220E 01
12	6.3616E 00	4.0470E 01	3.6011E-02	2.8303E-03	7.6463E-02	-2.5710E 00	3.7016E-02	3.5331E 02	1.3078E 01
13	6.3852E 00	4.0770E 01	3.8547E-02	3.0185E-03	7.7341E-02	-2.5595E 00	3.9028E-02	3.3129E 02	1.2930E 01
14	6.4087E 00	4.1072E 01	4.0880E-02	3.1894E-03	7.8276E-02	-2.5475E 00	4.0746E-02	3.1354E 02	1.2775E 01
15	6.4323E 00	4.1374E 01	4.3721E-02	3.3985E-03	7.9273E-02	-2.5349E 00	4.2871E-02	2.9424E 02	1.2615E 01
16	6.4558E 00	4.1678E 01	4.6662E-02	3.6140E-03	8.0337E-02	-2.5215E 00	4.4985E-02	2.7670E 02	1.2448E 01
17	6.4794E 00	4.1983E 01	4.9198E-02	3.7965E-03	8.1466E-02	-2.5076E 00	4.6603E-02	2.6340E 02	1.2275E 01
18	6.5030E 00	4.2288E 01	5.2242E-02	4.0168E-03	8.2661E-02	-2.4930E 00	4.8593E-02	2.4896E 02	1.2098E 01
19	6.5265E 00	4.2595E 01	5.5589E-02	4.2587E-03	8.3931E-02	-2.4778E 00	5.0741E-02	2.3481E 02	1.1915E 01
20	6.5501E 00	4.2903E 01	5.8835E-02	4.4912E-03	8.5278E-02	-2.4618E 00	5.2665E-02	2.2266E 02	1.1726E 01
21	6.5736E 00	4.3212E 01	6.1980E-02	4.7143E-03	8.6701E-02	-2.4453E 00	5.4374E-02	2.1212E 02	1.1534E 01
22	6.5972E 00	4.3523E 01	6.5429E-02	4.9588E-03	8.8202E-02	-2.4281E 00	5.6222E-02	2.0166E 02	1.1338E 01
23	6.6207E 00	4.3834E 01	6.9182E-02	5.2247E-03	8.9787E-02	-2.4103E 00	5.8189E-02	1.9140E 02	1.1137E 01
24	6.6443E 00	4.4147E 01	7.3240E-02	5.5115E-03	9.1465E-02	-2.3918E 00	6.0258E-02	1.8144E 02	1.0933E 01
25	6.6678E 00	4.4460E 01	7.7602E-02	5.8191E-03	9.3241E-02	-2.3726E 00	6.2409E-02	1.7185E 02	1.0725E 01
26	6.6914E 00	4.4775E 01	8.2166E-02	6.1397E-03	9.5123E-02	-2.3526E 00	6.4545E-02	1.6287E 02	1.0513E 01
27	6.7150E 00	4.5091E 01	8.7238E-02	6.4958E-03	9.7118E-02	-2.3318E 00	6.6886E-02	1.5394E 02	1.0297E 01
28	6.7385E 00	4.5408E 01	9.2412E-02	6.9570E-03	9.9234E-02	-2.3103E 00	6.9099E-02	1.4584E 02	1.0077E 01
29	6.7621E 00	4.5726E 01	9.8397E-02	7.2756E-03	1.0148E-01	-2.2879E 00	7.1695E-02	1.3744E 02	9.8541E 00
30	6.7856E 00	4.6045E 01	1.0479E-01	7.7213E-03	1.0387E-01	-2.2646E 00	7.4333E-02	1.2951E 02	9.6271E 00
31	6.8092E 00	4.6365E 01	1.1158E-01	8.1936E-03	1.0642E-01	-2.2403E 00	7.6992E-02	1.2205E 02	9.3965E 00
32	6.8327E 00	4.6686E 01	1.1970E-01	8.7592E-03	1.0915E-01	-2.2151E 00	8.0252E-02	1.1417E 02	9.1620E 00
33	6.8563E 00	4.7009E 01	1.2802E-01	9.3358E-03	1.1206E-01	-2.1887E 00	8.3308E-02	1.0712E 02	8.9235E 00
34	6.8798E 00	4.7332E 01	1.3776E-01	1.0012E-02	1.1519E-01	-2.1611E 00	8.6910E-02	9.9885E 01	8.6810E 00
35	6.9034E 00	4.7657E 01	1.4810E-01	1.0727E-02	1.1856E-01	-2.1323E 00	9.0475E-02	9.3225E 01	8.4345E 00
36	6.9270E 00	4.7983E 01	1.5957E-01	1.1518E-02	1.2218E-01	-2.1022E 00	9.4265E-02	8.6823E 01	8.1844E 00
37	6.9505E 00	4.8310E 01	1.7296E-01	1.2442E-02	1.2610E-01	-2.0707E 00	9.8667E-02	8.0374E 01	7.9302E 00
38	6.9741E 00	4.8638E 01	1.8848E-01	1.3513E-02	1.3036E-01	-2.0375E 00	1.0366E-01	7.4005E 01	7.6713E 00
39	6.9976E 00	4.8967E 01	2.0846E-01	1.4895E-02	1.3503E-01	-2.0022E 00	1.1031E-01	6.7137E 01	7.4057E 00
40	7.0212E 00	4.9297E 01	2.3433E-01	1.6687E-02	1.4025E-01	-1.9644E 00	1.1898E-01	5.9927E 01	7.1303E 00
41	7.0447E 00	4.9628E 01	2.8910E-01	2.0519E-02	1.4641E-01	-1.9213E 00	1.4015E-01	4.8735E 01	6.8301E 00
42	7.0683E 00	4.9961E 01	3.3780E-01	2.3895E-02	1.5379E-01	-1.8722E 00	1.5537E-01	4.1850E 01	6.5023E 00
43	7.0919E 00	5.0294E 01	4.2909E-01	3.0252E-02	1.6282E-01	-1.8151E 00	1.8580E-01	3.3055E 01	6.1416E 00
44	7.1154E 00	5.0629E 01	5.2749E-01	3.7067E-02	1.7409E-01	-1.7482E 00	2.1292E-01	2.6978E 01	5.7442E 00
45	7.1390E 00	5.0965E 01	6.8979E-01	4.8312E-02	1.8842E-01	-1.6691E 00	2.5640E-01	2.0699E 01	5.3072E 00
46	7.1625E 00	5.1302E 01	1.0651E 00	7.4354E-02	2.0908E-01	-1.5650E 00	3.5562E-01	1.3449E 01	4.7828E 00
47	7.1861E 00	5.1640E 01	1.9274E 00	1.3410E-01	2.4431E-01	-1.4093E 00	5.4890E-01	7.4569E 00	4.0931E 00
48	7.2096E 00	5.1979E 01	2.7490E 00	1.9065E-01	2.9938E-01	-1.2061E 00	6.3682E-01	5.2452E 00	3.3403E 00

TABLE XI

EXPERIMENTAL DATA FOR SAMPLE 4 AT ROTOR SPEED 10,589 RPM
(See Figure 8)

Identification Number is Sample 4 10,589 RPM

THE CONCENTRATION FOR THIS RUN = 0.1098E-00
DIFFERENCE BTWN SQS OF BTM AND MENISCUS = 0.14800723E 02
CONC. AT MENISCUS = 0.7316E-01

I	R	X	CR	CX	C	LN(C)	CX/C	1/CX	1/C
1	6.1057E 00	3.7280E 01	2.4082E-02	1.9721E-03	7.3156E-02	-2.6152E 00	2.6957E-02	5.0708E 02	1.3669E 01
2	6.1349E 00	3.7637E 01	2.5742E-02	2.0980E-03	7.3884E-02	-2.6053E 00	2.8396E-02	4.7664E 02	1.3535E 01
3	6.1642E 00	3.7997E 01	2.7403E-02	2.2228E-03	7.4661E-02	-2.5948E 00	2.9772E-02	4.4989E 02	1.3394E 01
4	6.1934E 00	3.8358E 01	3.0725E-02	2.4804E-03	7.5510E-02	-2.5835E 00	3.2849E-02	4.0315E 02	1.3243E 01
5	6.2226E 00	3.8721E 01	3.2386E-02	2.6022E-03	7.6433E-02	-2.5713E 00	3.4046E-02	3.8428E 02	1.3083E 01
6	6.2519E 00	3.9086E 01	3.4046E-02	2.7229E-03	7.7404E-02	-2.5587E 00	3.5178E-02	3.6726E 02	1.2919E 01
7	6.2811E 00	3.9452E 01	3.6538E-02	2.9085E-03	7.8436E-02	-2.5455E 00	3.7082E-02	3.4382E 02	1.2749E 01
8	6.3104E 00	3.9821E 01	3.9859E-02	3.1582E-03	7.9552E-02	-2.5313E 00	3.9700E-02	3.1663E 02	1.2570E 01
9	6.3396E 00	4.0190E 01	4.1520E-02	3.2747E-03	8.0742E-02	-2.5165E 00	4.0557E-02	3.0538E 02	1.2385E 01
10	6.3688E 00	4.0562E 01	4.2350E-02	3.3248E-03	8.1968E-02	-2.5014E 00	4.0562E-02	3.0077E 02	1.2200E 01
11	6.3981E 00	4.0935E 01	4.4011E-02	3.4394E-03	8.3230E-02	-2.4861E 00	4.1324E-02	2.9075E 02	1.2015E 01
12	6.4273E 00	4.1310E 01	4.6502E-02	3.6176E-03	8.4553E-02	-2.4704E 00	4.2784E-02	2.7643E 02	1.1827E 01
13	6.4565E 00	4.1687E 01	4.8994E-02	3.7941E-03	8.5949E-02	-2.4540E 00	4.4144E-02	2.6357E 02	1.1635E 01
14	6.4858E 00	4.2065E 01	5.0654E-02	3.9050E-03	8.7406E-02	-2.4372E 00	4.4677E-02	2.5608E 02	1.1441E 01
15	6.5150E 00	4.2445E 01	5.3146E-02	4.0787E-03	8.8923E-02	-2.4200E 00	4.5868E-02	2.4518E 02	1.1246E 01
16	6.5442E 00	4.2827E 01	5.6467E-02	4.3143E-03	9.0525E-02	-2.4021E 00	4.7658E-02	2.3179E 02	1.1047E 01
17	6.5735E 00	4.3211E 01	5.8128E-02	4.4214E-03	9.2200E-02	-2.3838E 00	4.7954E-02	2.2617E 02	1.0846E 01
18	6.6027E 00	4.3596E 01	5.9789E-02	4.5276E-03	9.3924E-02	-2.3653E 00	4.8205E-02	2.2087E 02	1.0647E 01
19	6.6319E 00	4.3983E 01	6.2280E-02	4.6955E-03	9.5708E-02	-2.3464E 00	4.9060E-02	2.1297E 02	1.0448E 01
20	6.6612E 00	4.4371E 01	6.4771E-02	4.8618E-03	9.7566E-02	-2.3272E 00	4.9831E-02	2.0568E 02	1.0250E 01
21	6.6904E 00	4.4762E 01	6.7262E-02	5.0268E-03	9.9496E-02	-2.3076E 00	5.0523E-02	1.9893E 02	1.0051E 01
22	6.7197E 00	4.5154E 01	6.8923E-02	5.1285E-03	1.0149E-01	-2.2878E 00	5.0534E-02	1.9499E 02	9.8535E 00
23	6.7489E 00	4.5548E 01	7.3075E-02	5.4139E-03	1.0356E-01	-2.2676E 00	5.2277E-02	1.8471E 02	9.6561E 00
24	6.7781E 00	4.5943E 01	7.7227E-02	5.6968E-03	1.0576E-01	-2.2466E 00	5.3866E-02	1.7554E 02	9.4555E 00
25	6.8074E 00	4.6340E 01	8.3040E-02	6.0993E-03	1.0810E-01	-2.2247E 00	5.6422E-02	1.6395E 02	9.2506E 00
26	6.8366E 00	4.6739E 01	8.9683E-02	6.5590E-03	1.1063E-01	-2.2016E 00	5.9290E-02	1.5246E 02	9.0394E 00
27	6.8658E 00	4.7140E 01	9.7987E-02	7.1359E-03	1.1337E-01	-2.1771E 00	6.2943E-02	1.4014E 02	8.8207E 00
28	6.8951E 00	4.7542E 01	1.0878E-01	7.8884E-03	1.1639E-01	-2.1508E 00	6.7775E-02	1.2677E 02	8.5917E 00
29	6.9243E 00	4.7946E 01	1.2207E-01	8.8145E-03	1.1977E-01	-2.1222E 00	7.3598E-02	1.1345E 02	8.3496E 00
30	6.9535E 00	4.8352E 01	1.3702E-01	9.8522E-03	1.2355E-01	-2.0911E 00	7.9741E-02	1.0150E 02	8.0937E 00
31	6.9828E 00	4.8759E 01	1.5612E-01	1.1179E-02	1.2784E-01	-2.0570E 00	8.7444E-02	8.9457E 01	7.8225E 00
32	7.0120E 00	4.9168E 01	1.8186E-01	1.2968E-02	1.3278E-01	-2.0191E 00	9.7664E-02	7.7115E 01	7.5314E 00
33	7.0413E 00	4.9579E 01	2.1590E-01	1.5331E-02	1.3859E-01	-1.9762E 00	1.1062E-01	6.5226E 01	7.2155E 00
34	7.0705E 00	4.9992E 01	2.7403E-01	1.9379E-02	1.4575E-01	-1.9259E 00	1.3296E-01	5.1603E 01	6.8610E 00
35	7.0997E 00	5.0406E 01	3.2801E-01	2.3100E-02	1.5455E-01	-1.8672E 00	1.4947E-01	4.3290E 01	6.4704E 00
36	7.1290E 00	5.0822E 01	4.3181E-01	3.0285E-02	1.6565E-01	-1.7979E 00	1.8282E-01	3.3019E 01	6.0367E 00
37	7.1582E 00	5.1240E 01	6.9754E-01	4.8723E-02	1.8215E-01	-1.7029E 00	2.6748E-01	2.0524E 01	5.4899E 00
38	7.1874E 00	5.1659E 01	1.1460E 00	7.9719E-02	2.0909E-01	-1.5650E 00	3.8127E-01	1.2544E 01	4.7827E 00
39	7.2167E 00	5.2080E 01	1.5030E 00	1.0414E-01	2.4780E-01	-1.3951E 00	4.2024E-01	9.6029E 00	4.0355E 00

TABLE XII

FINAL RESULTS OF THE ELEVEN EXPERIMENTS REPORTED

SAMPLE	ROTOR SPEED (RPM)	$M_1 \times 10^{-3}$	g_1	$-R_{11}$	$M_m \times 10^{-3}$	g_m	$-R_{mm}$	$+R_{1m}$
1	10,589	1.4	3.393×10^{-2}	6.16	28.9	2.135×10^{-7}	134	0.83
					50.2	1.715×10^{-10}	165	0.79
					97.7	9.757×10^{-17}	89	0.78
1	8,766	1.4	4.015×10^{-2}	6.24	30.1	1.022×10^{-5}	386	2.04
					38.6	8.520×10^{-6}	325	1.97
					67.4	1.427×10^{-6}	208	1.86
					82.6	4.047×10^{-7}	166	1.81
					105.5	5.114×10^{-8}	110	1.77
					112.9	2.545×10^{-8}	95	1.76
1	7,477	1.7	4.430×10^{-2}	5.90	29.6	1.413×10^{-4}	241	1.43
					59.3	1.301×10^{-5}	217	1.40
					131.3	6.394×10^{-8}	127	1.36
2	17,250	1.6	3.520×10^{-3}	20.0	5.2	8.288×10^{-5}	75	1.87
					43.8	1.187×10^{-20}	186	4.37
					116.3	6.127×10^{-48}	255	1.29
2	10,589	1.6	1.050×10^{-2}	20.0	44.5	1.381×10^{-7}	122	6.04
					58.6	1.222×10^{-8}	45	5.89
					62.1	6.474×10^{-9}	27	5.86
					66.6	2.874×10^{-9}	6	5.82
2	7,447	3.3	1.503×10^{-2}	13.2	32.7	5.616×10^{-5}	215	4.66
					114.3	2.545×10^{-8}	86	4.49
3	10,589	4.4	1.125×10^{-2}	5.3				
3	8,766	4.7	1.966×10^{-2}	4.7	No other significant components found for this fraction.			
3	7,447	4.2	2.740×10^{-2}	5.5				
4	13,410	1.6	1.901×10^{-2}	7.0	6.2	1.729×10^{-4}	164	2.11
					10.7	2.003×10^{-5}	160	2.12
					139.3	1.580×10^{-31}	117	2.32
4	10,589	1.6	2.422×10^{-2}	8.3	3.2	3.352×10^{-3}	136	6.02
					9.8	2.337×10^{-3}	38	0.92
					44.6	1.525×10^{-6}	373	3.85
					123.1	1.190×10^{-10}	1,558	5.41

The subscript m(m = 2,3,...) indicates other fractions found.

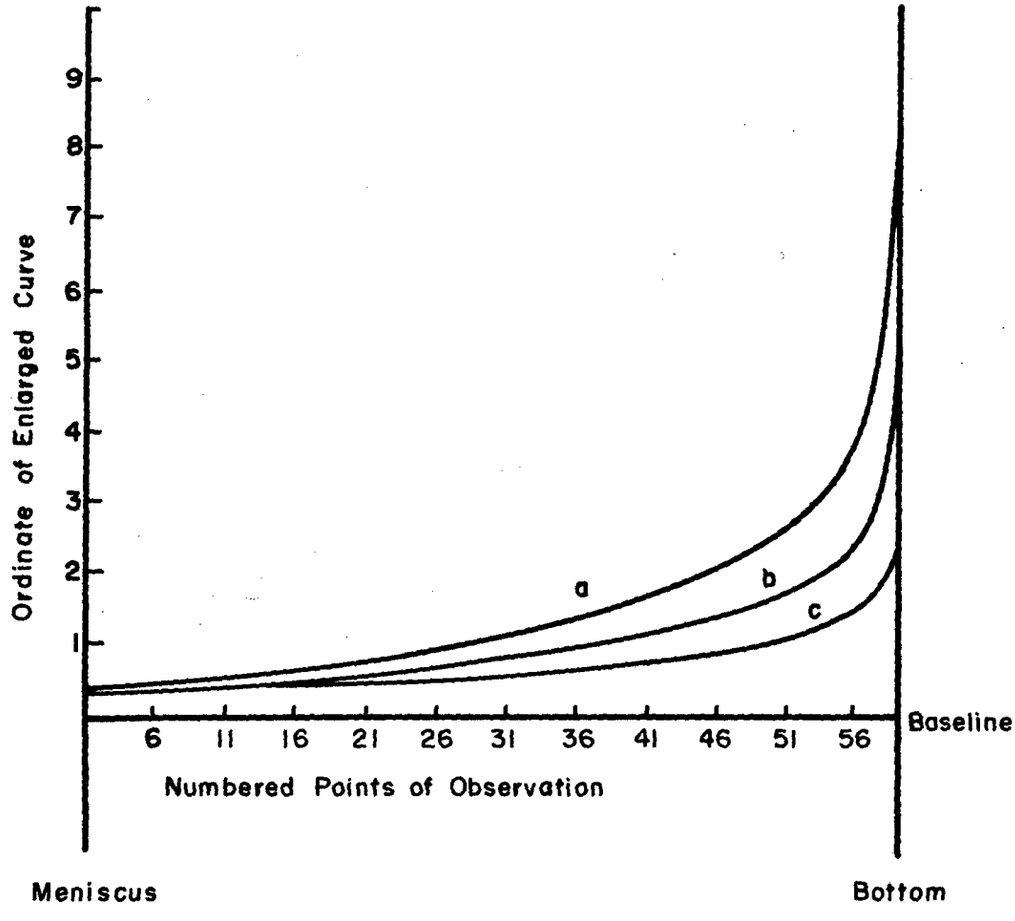

Figure 2. Schlieren Curves for Sample 1 at Rotor Speeds: a) 10,589 RPM; b) 8,766 RPM; and c) 7,447 RPM

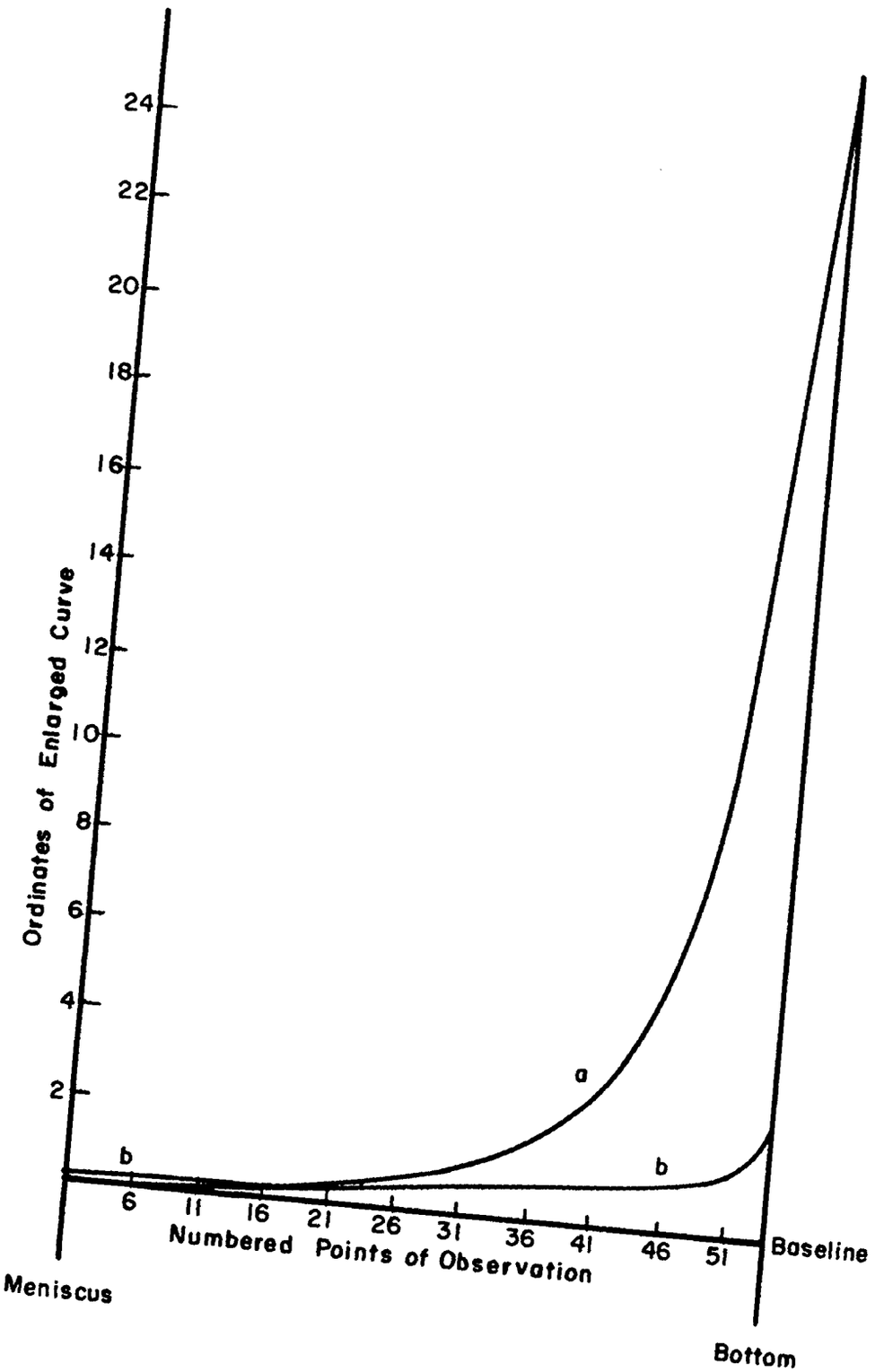

Figure 3. Schlieren Curve for Sample 2 at Rotor Speeds: a) 17,250 RPM; and b) 7,447 RPM

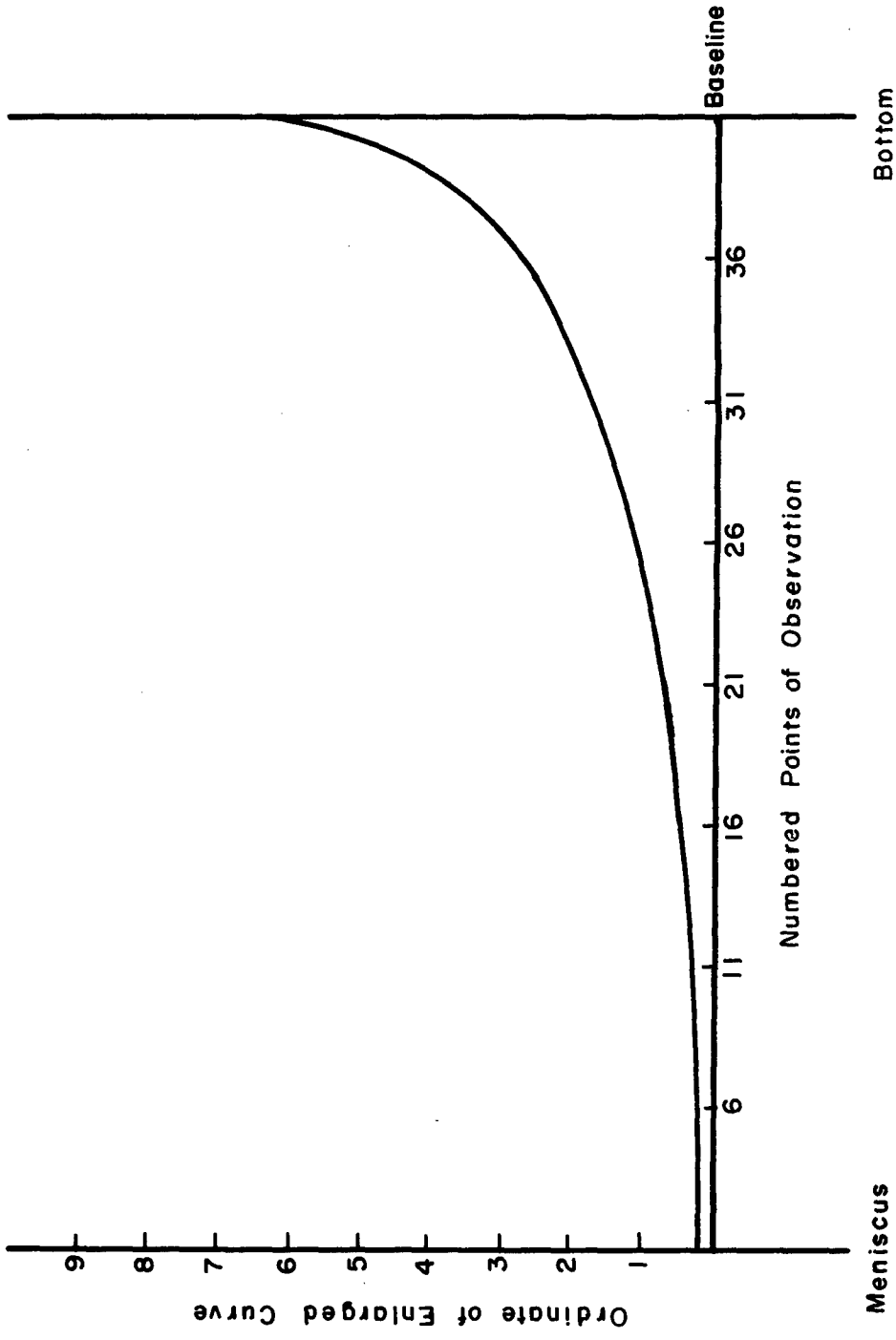

Figure 4. Schlieren Curve for Sample 2 at Rotor Speed 10,589 RPM

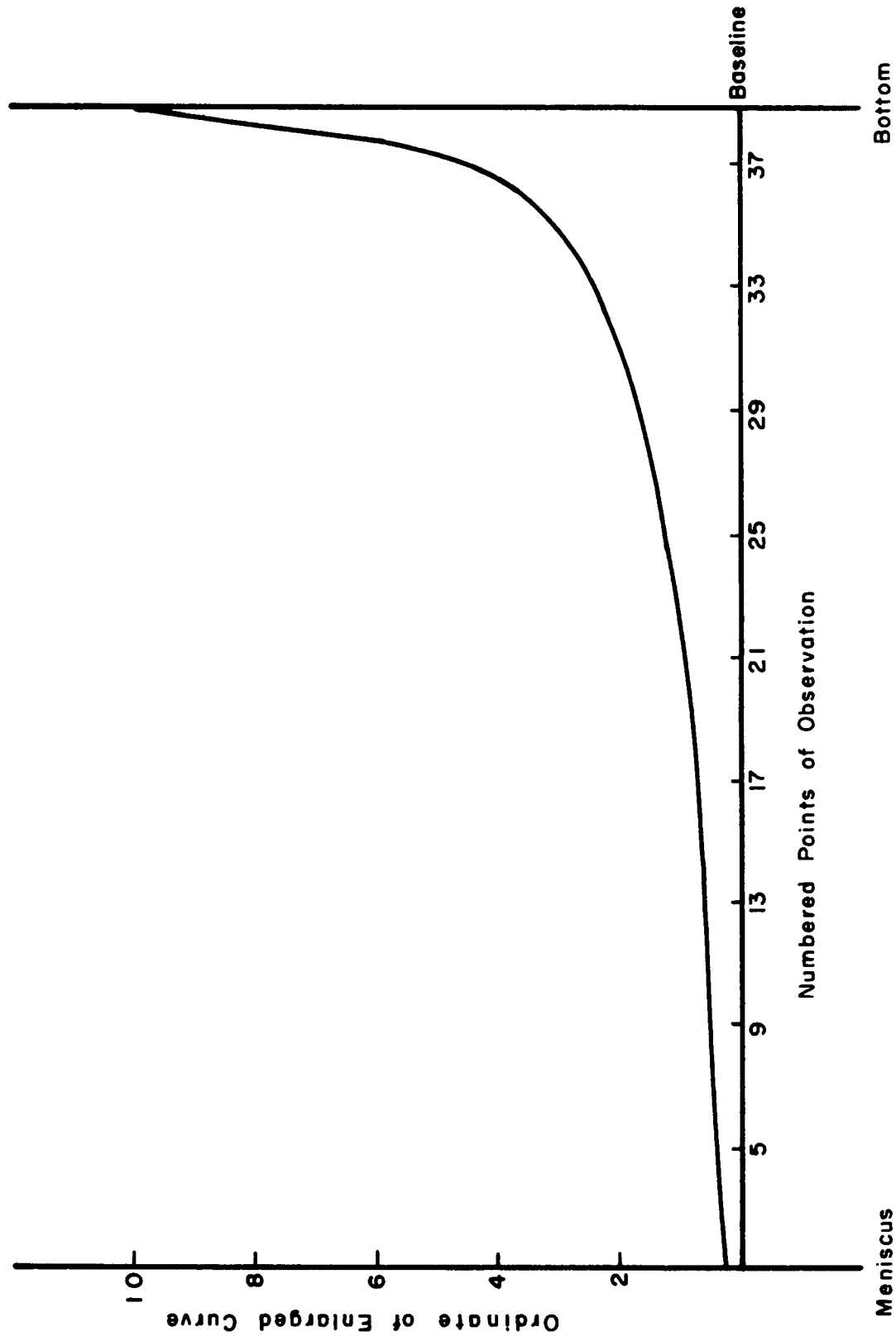

Figure 5. Schlieren Curve for Sample 3 at Rotor Speed 10,589 RPM

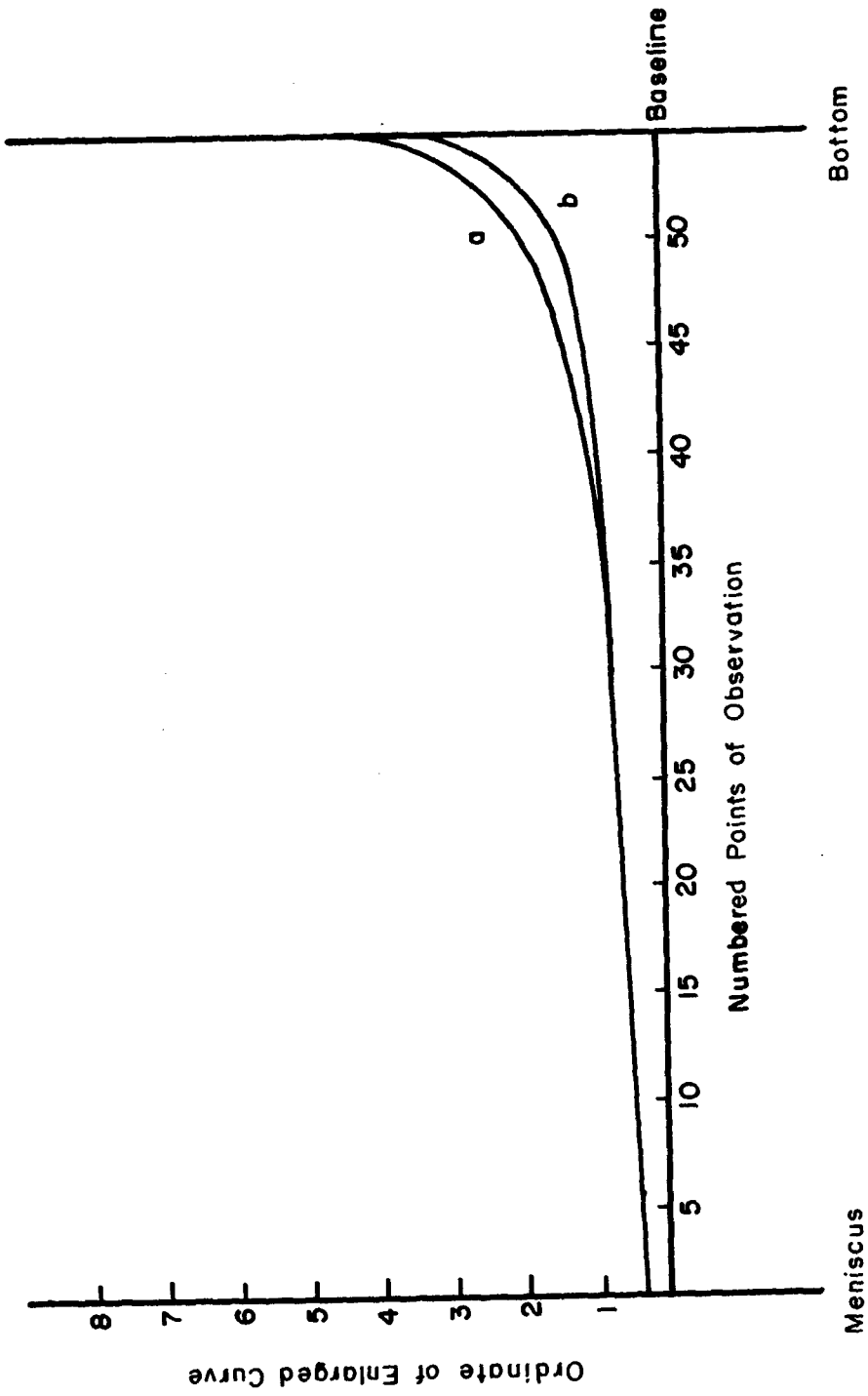

Figure 6. Schlieren Curve for Sample 3 at Rotor Speeds: a) 8,766 RPM; and b) 7,447 RPM

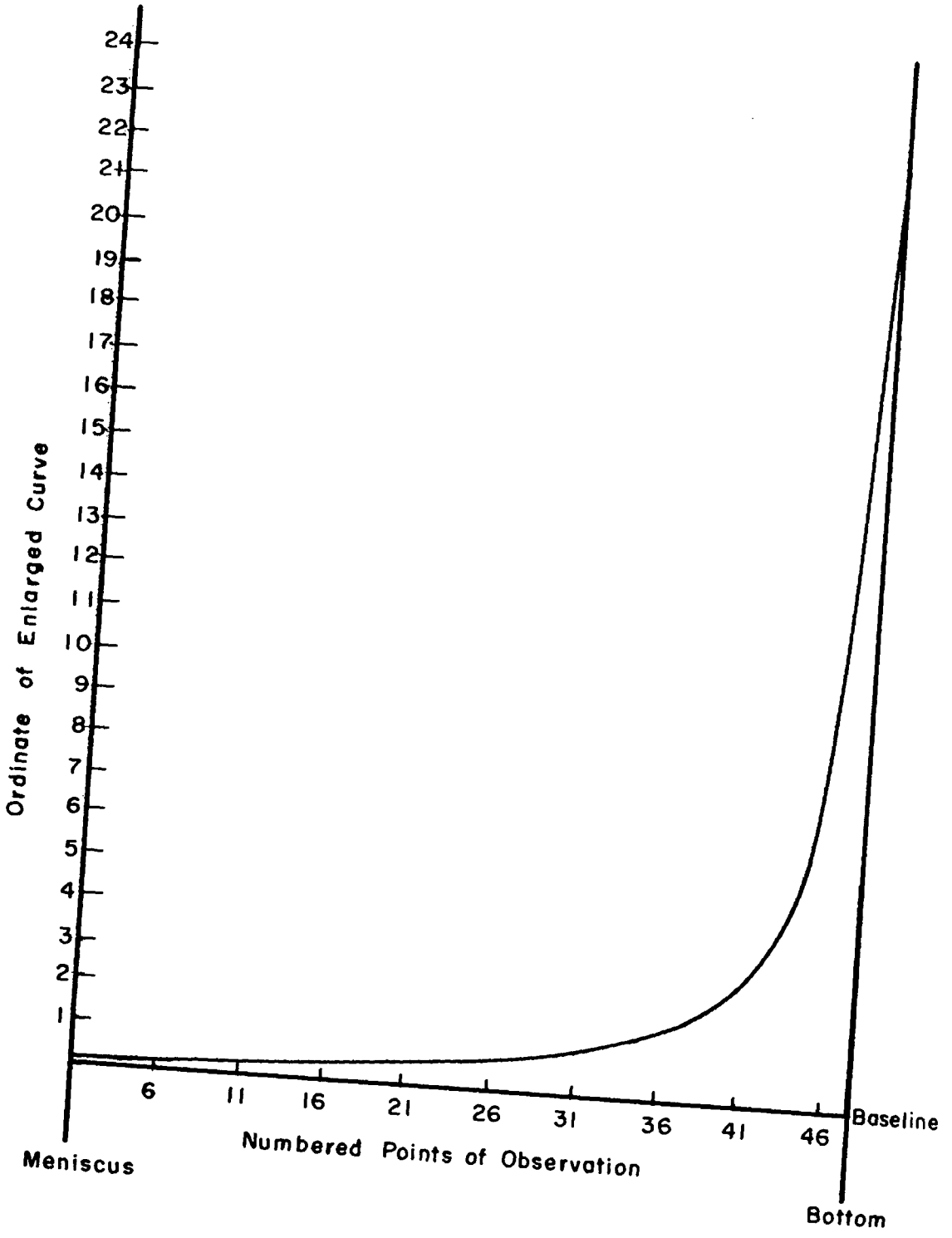

Figure 7. Schlieren Curve for Sample 4 at Rotor Speed 13,410 RPM

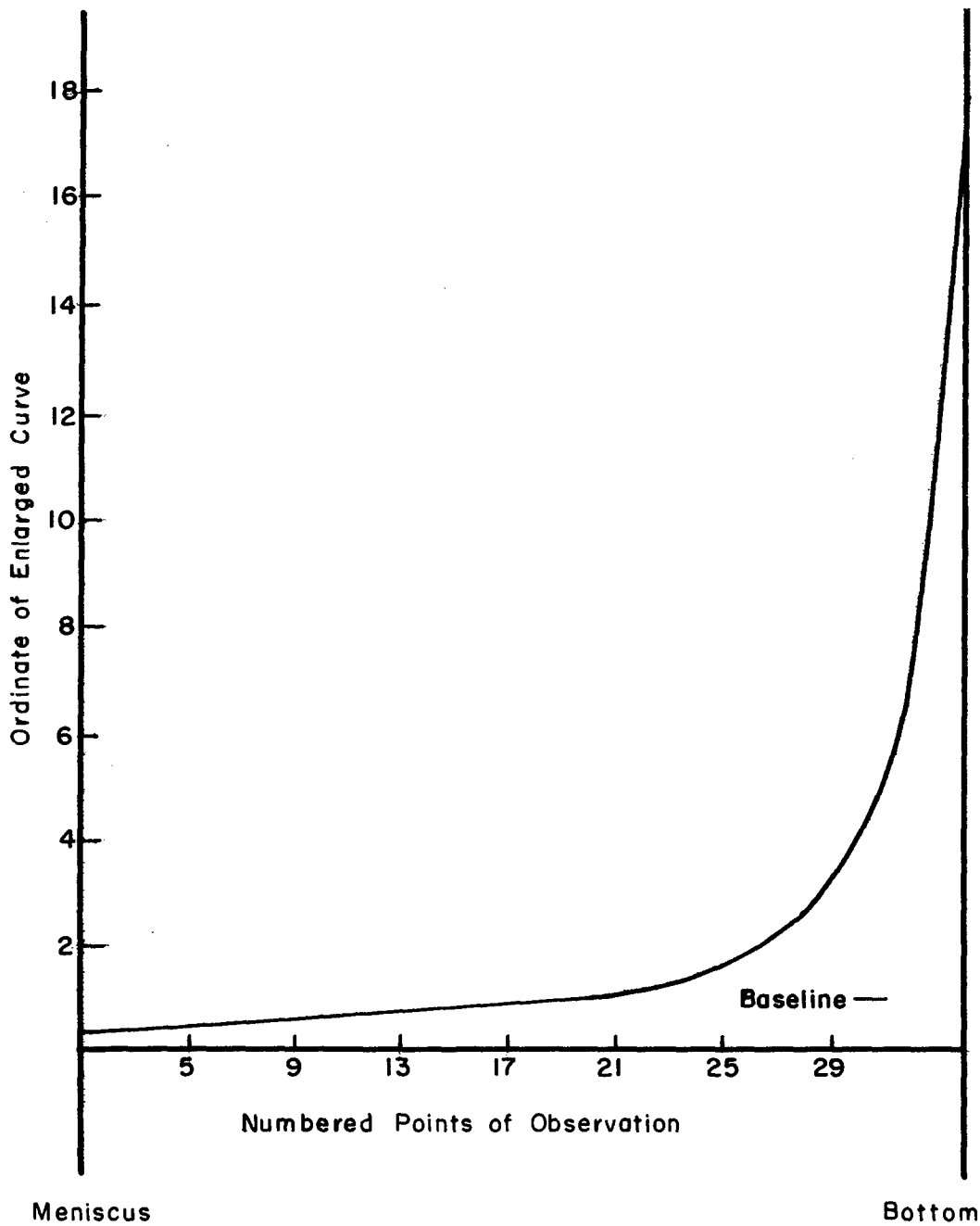

Figure 8. Schlieren Curve for Sample 4 at Rotor Speed 10,589 RPM

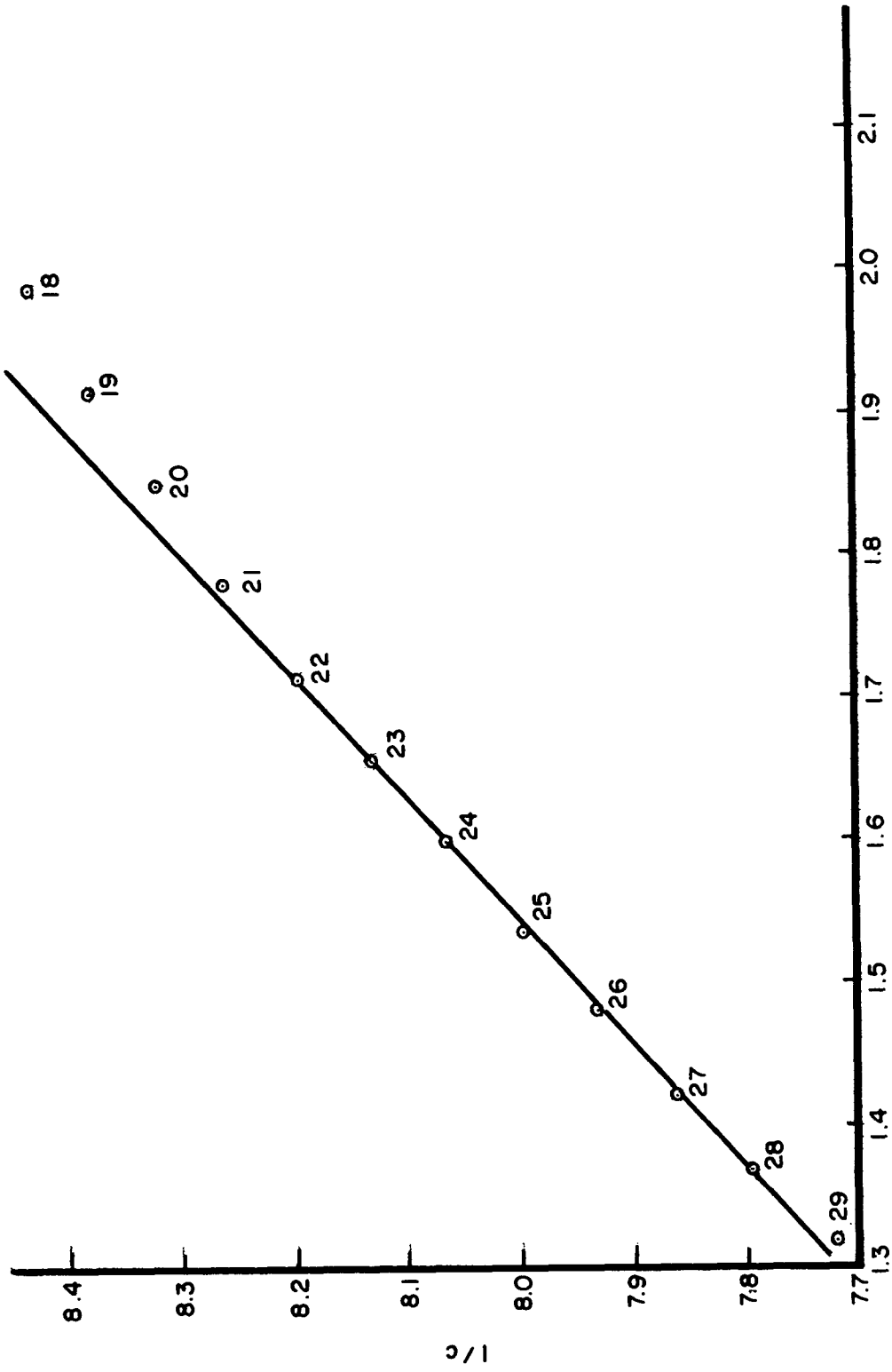

Figure 9. Equilibrium Sedimentation for Sample 1 at 10,589 RPM Showing Slope Equal to $h;\omega^2$

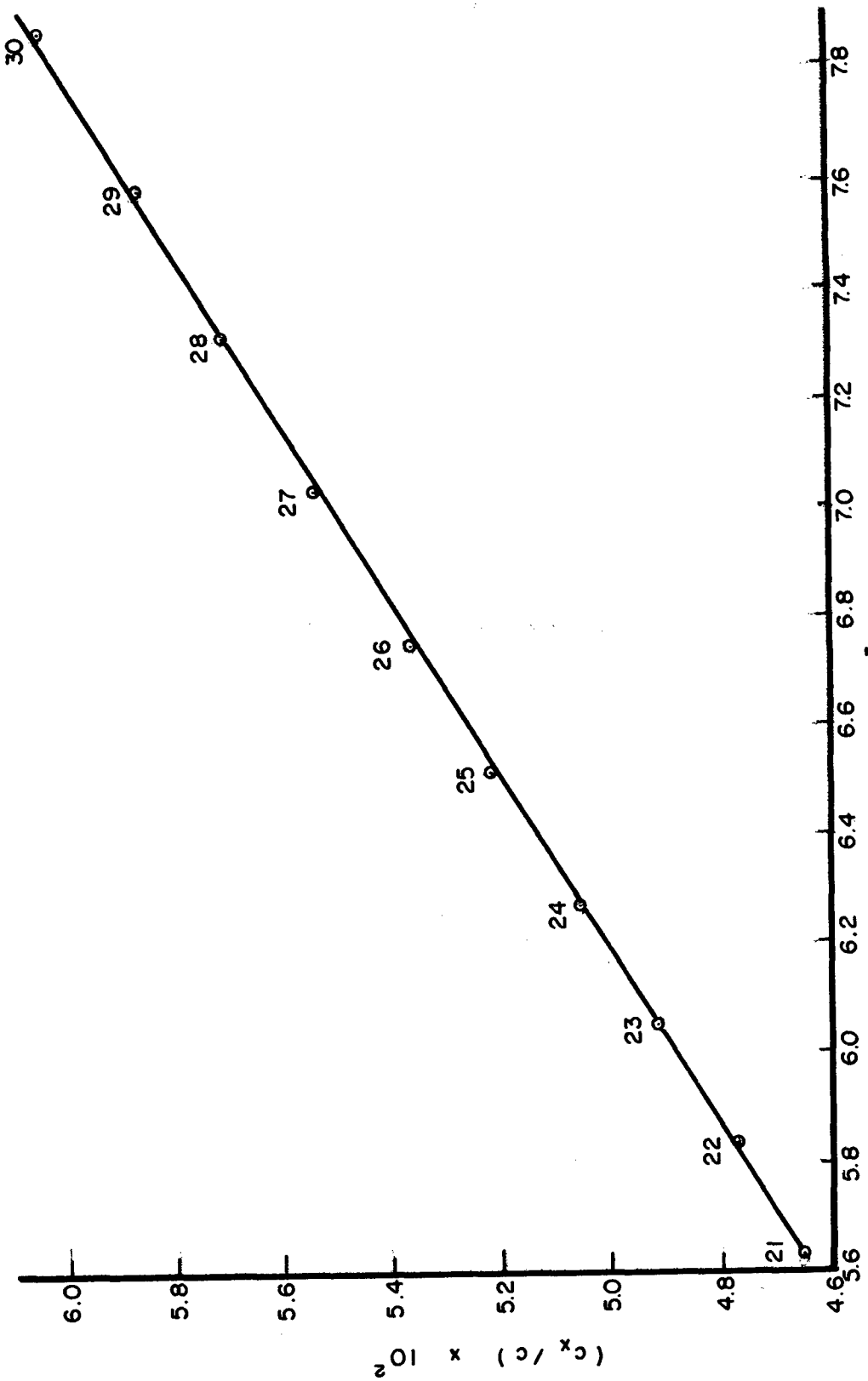

Figure 10. Equilibrium Sedimentation for Sample 1 at 10,589 RPM Showing Slope Equal to $-R_{1,1}$

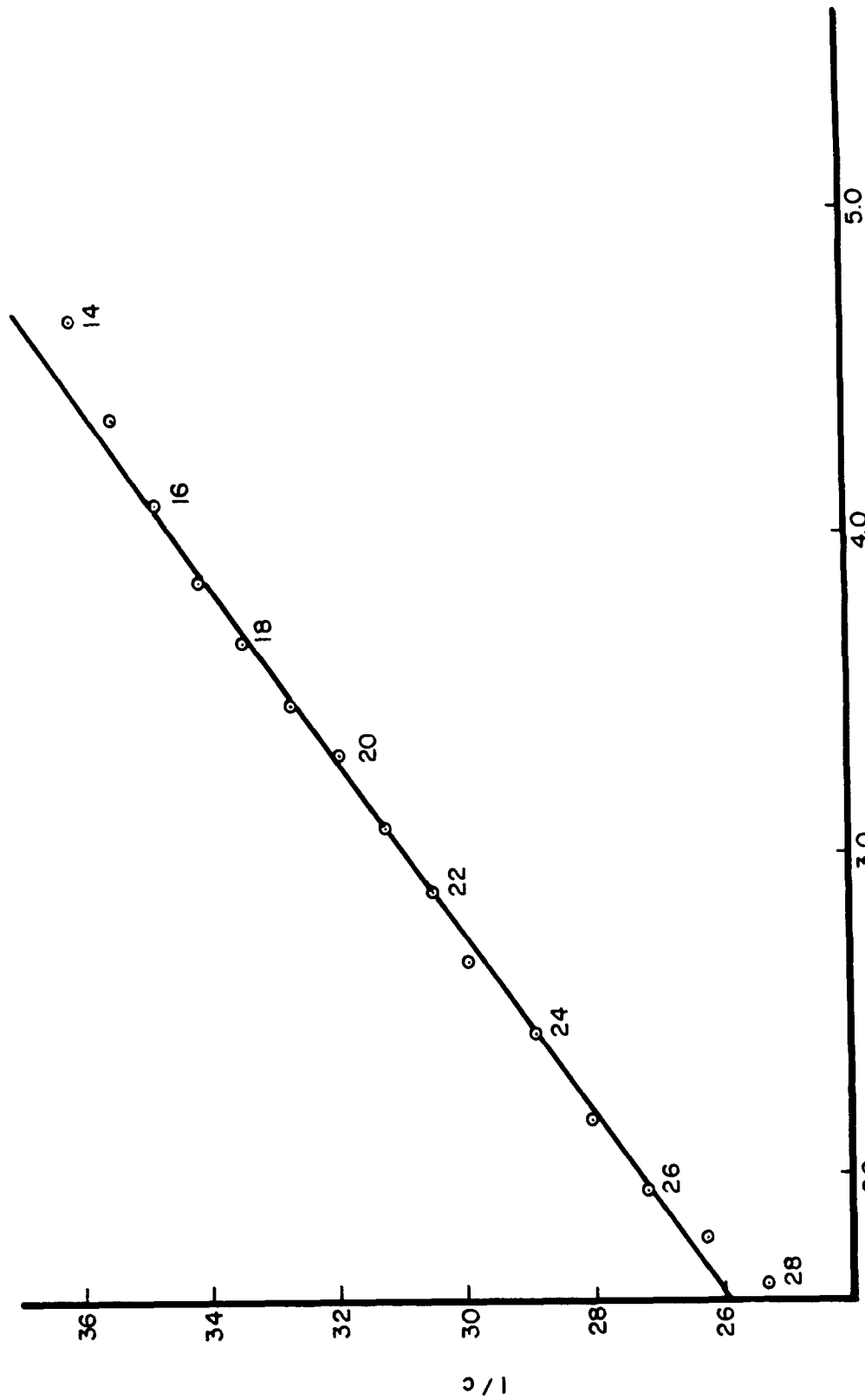

Figure 11. Equilibrium Sedimentation for Sample 2 at 17,250 RPM Showing Slope Equal to h, ω^2

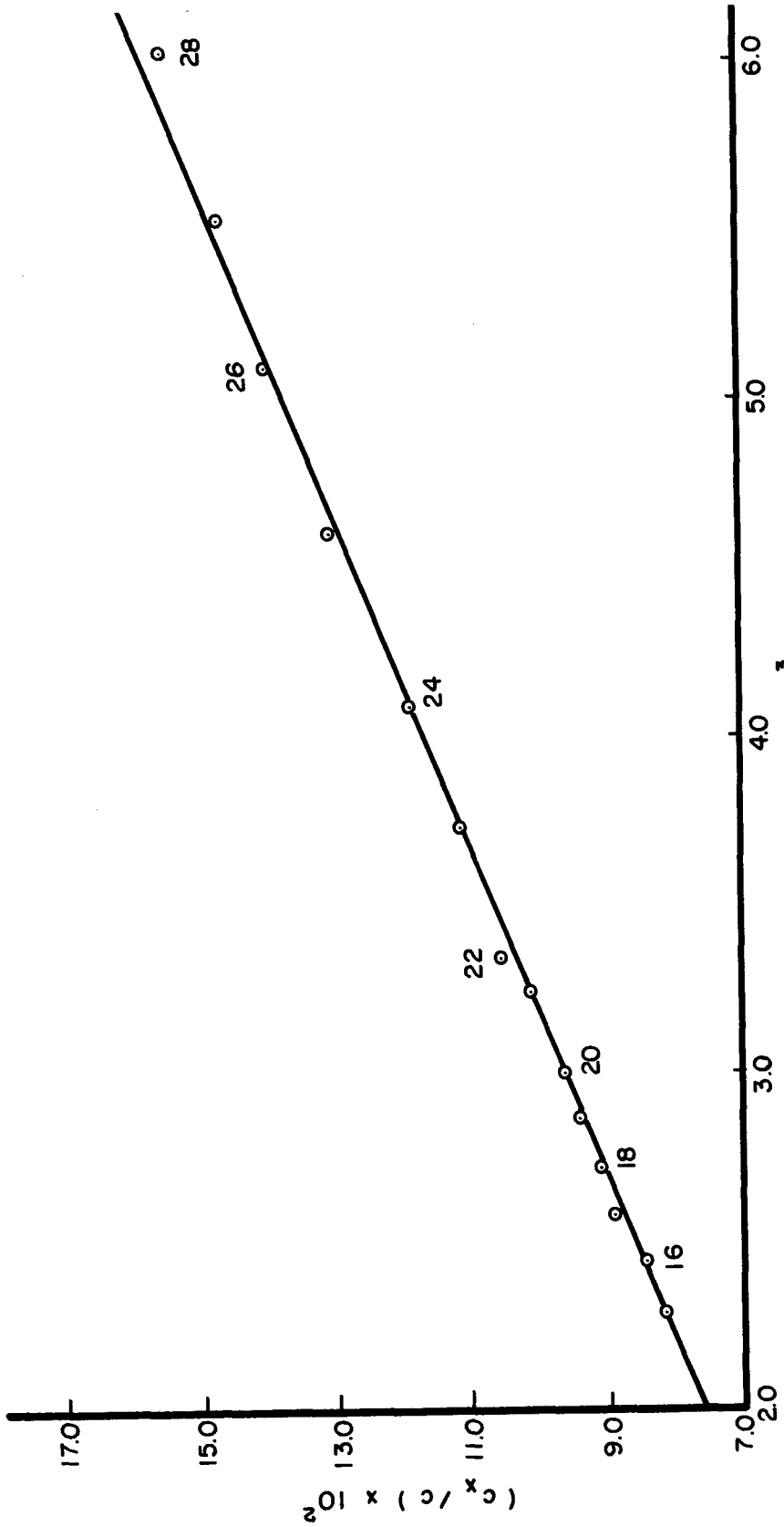

Figure 12. Equilibrium Sedimentation for Sample 2 at 17,250 RPM Showing Equal to $-R_{1,1}$

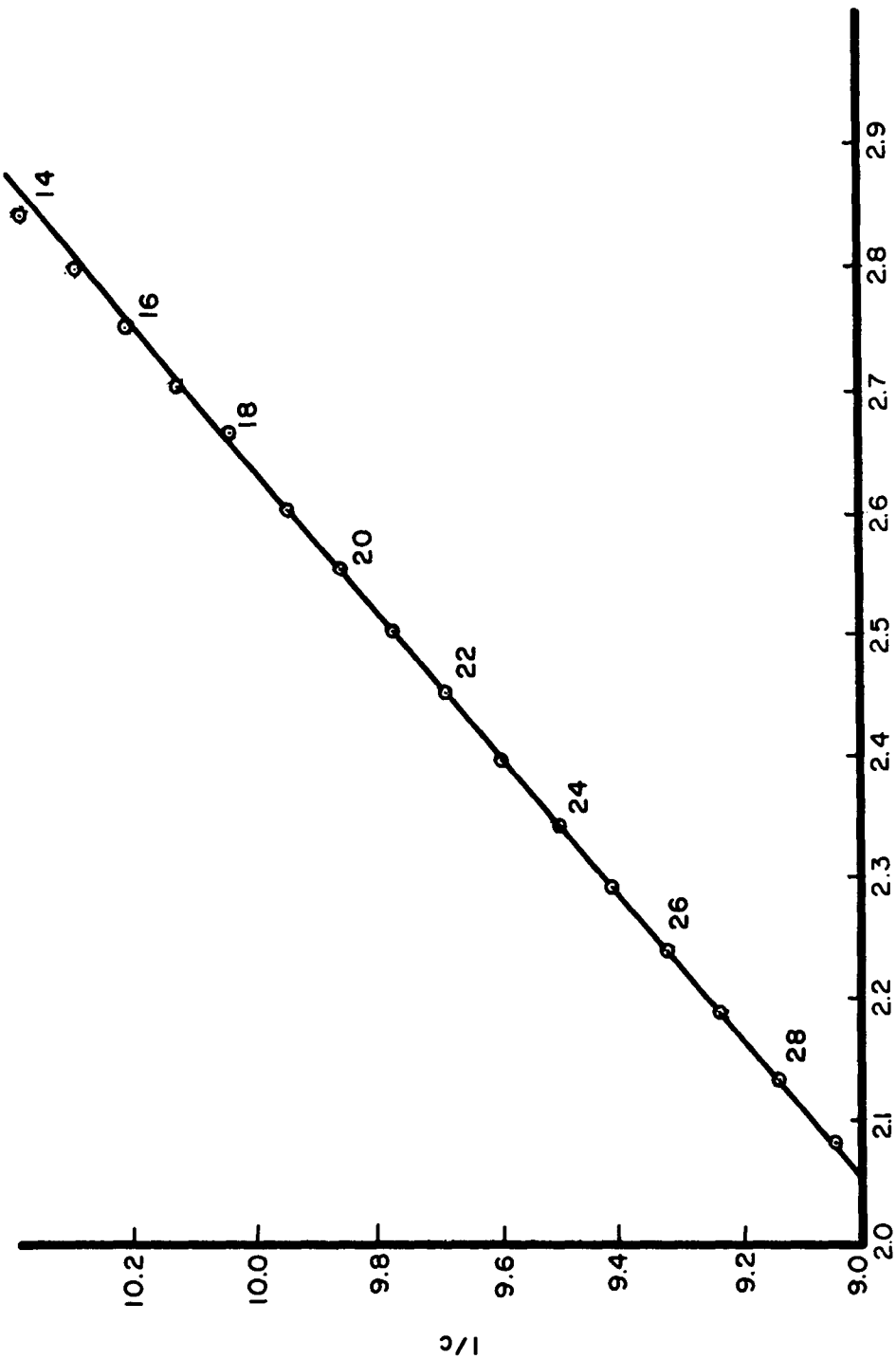

Figure 13. Equilibrium Sedimentation for Sample 3 at 7,447 RPM Showing Slope Equal to h, ω^2

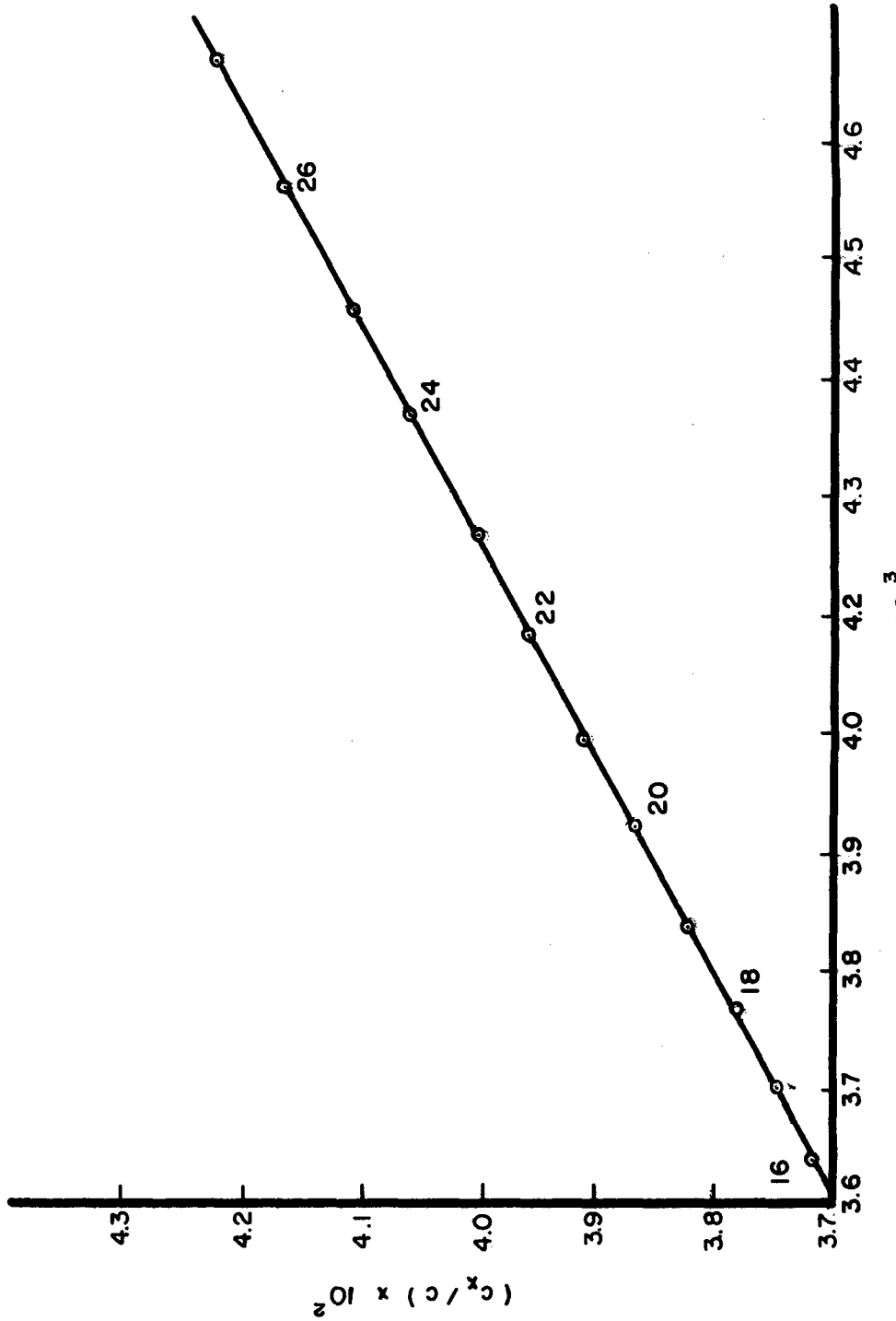

Figure 14. Equilibrium Sedimentation for Sample 3 at 7,447 RPM Showing Slope Equal to $-R_{1,1}$

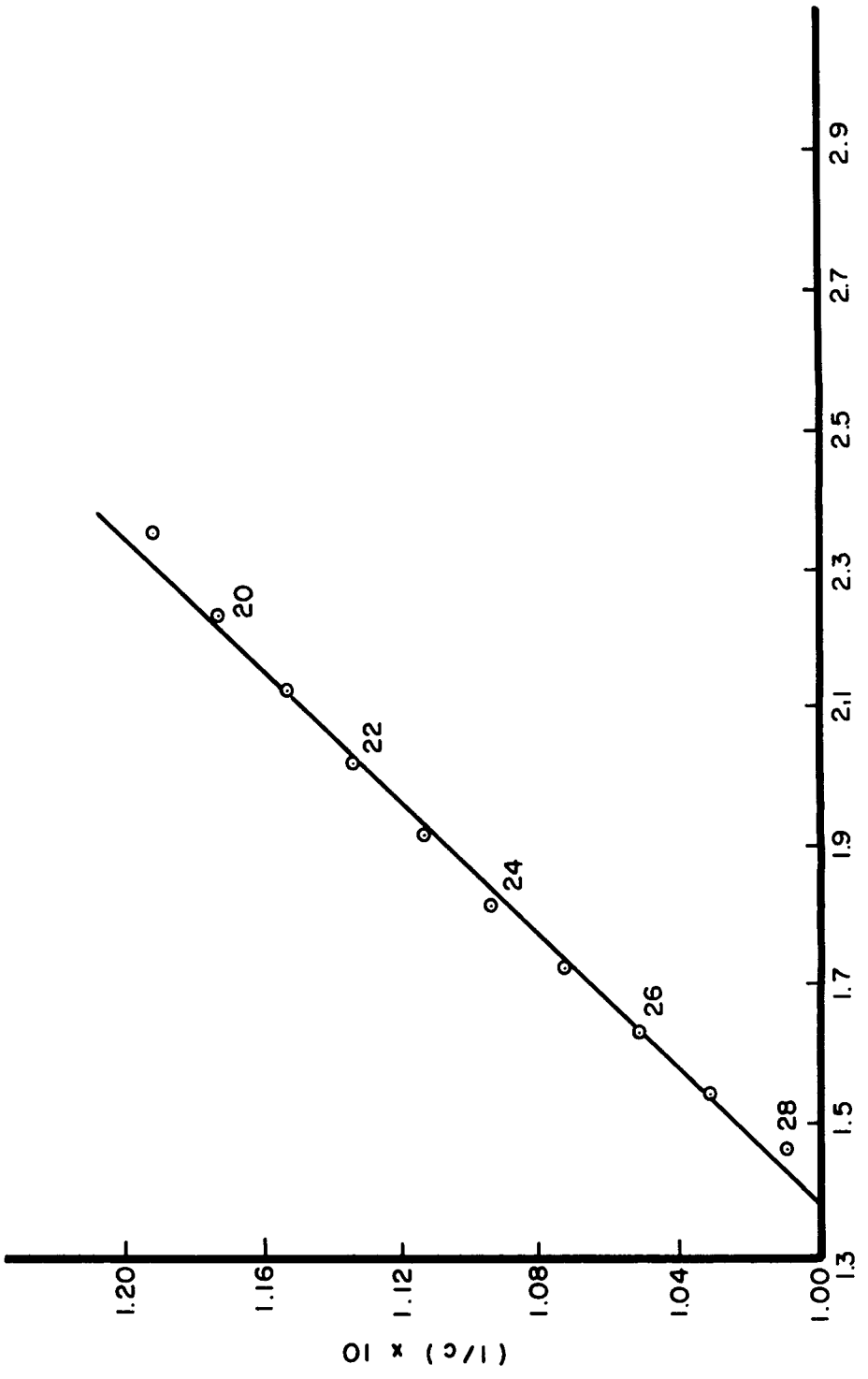

Figure 15. Equilibrium Sedimentation for Sample 4 at 13,410 RPM Showing Slope Equal to h, ω^2

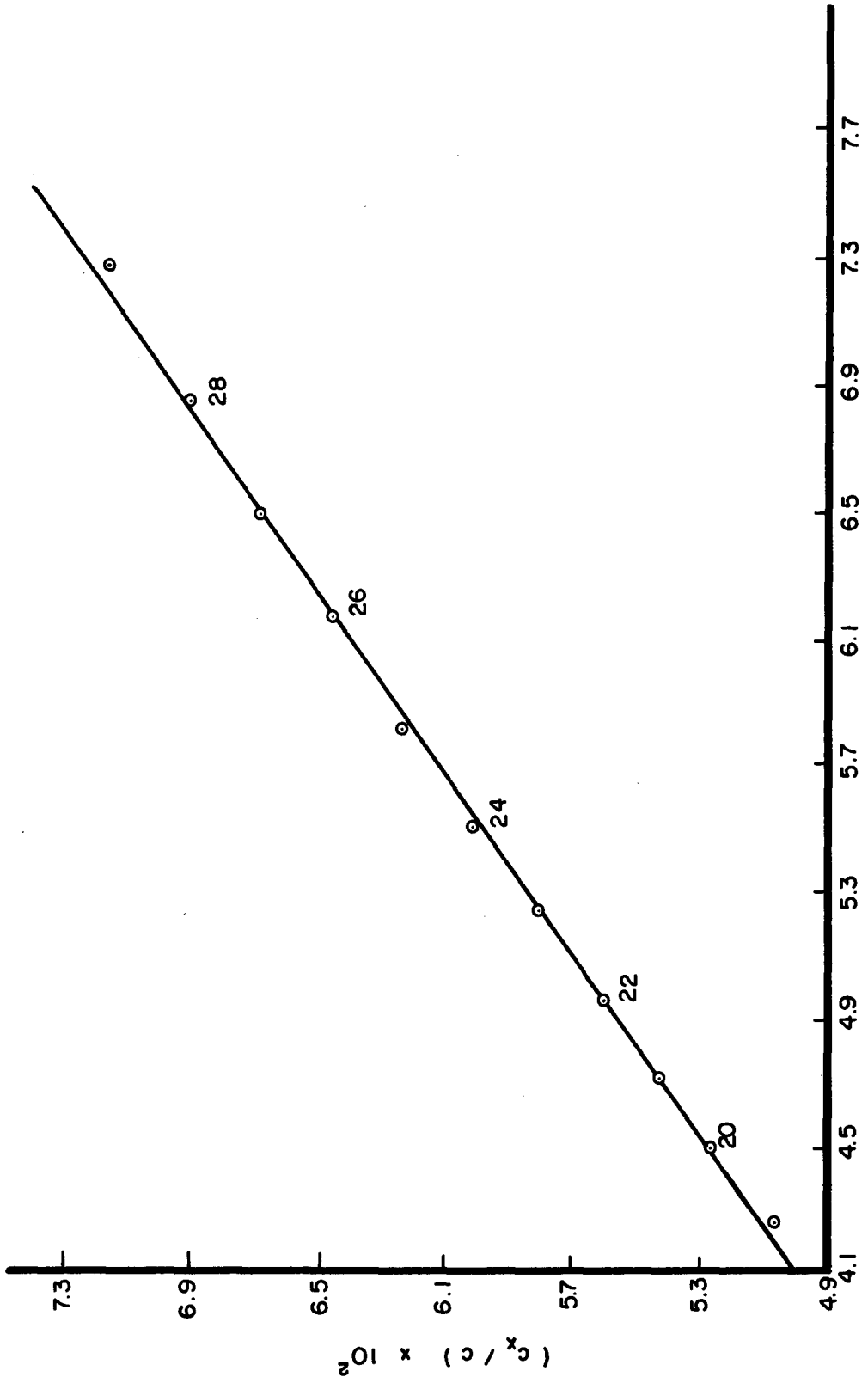

Figure 16. Equilibrium Sedimentation for Sample 4 at 13,410 RPM Showing Slope Equal to $-R_{1,1}$

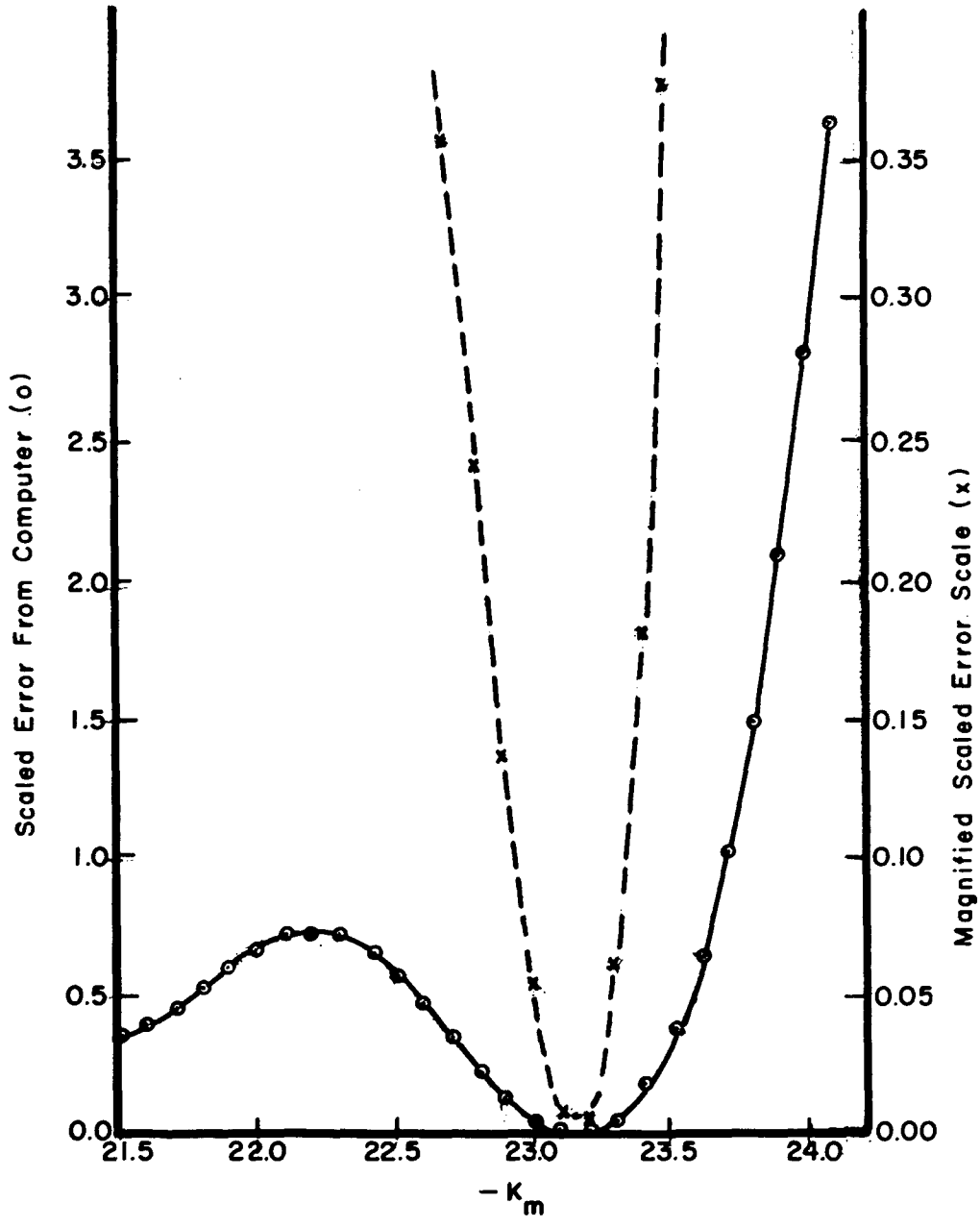

Figure 17. Error Δ_m^2 Vs. $(-K_m)$ for Sample 2 at 17,250 RPM, Indicating a Minimum at $K_m = 23.16$

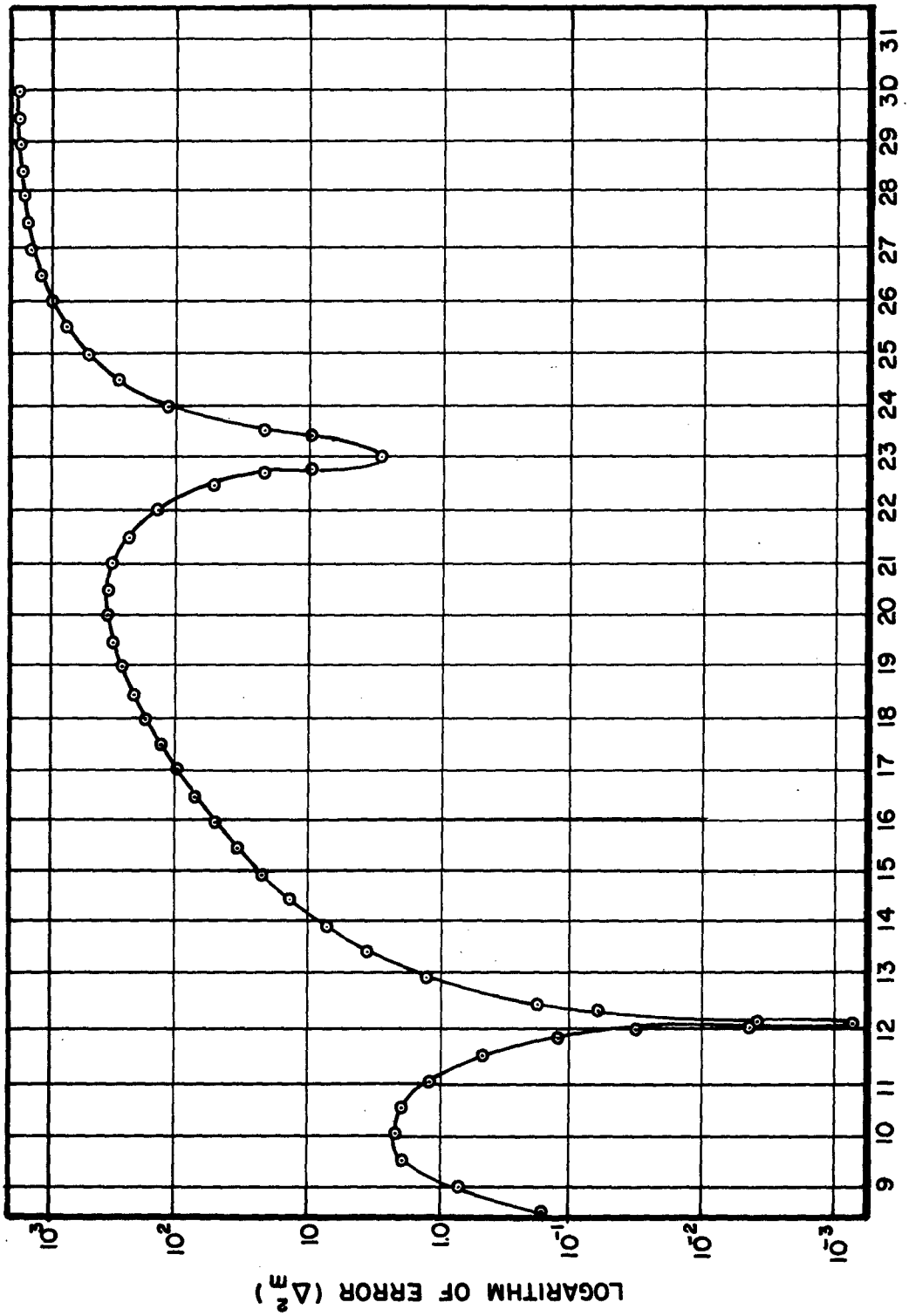

Figure 18. Example of How More Than One Fraction is Predicted (Each Minimum Corresponds to a Value K_m, and, Therefore, a Definite Fraction)

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13. ABSTRACT

Samples of dilute solutions of poly-2,2' (m-phenylene -5,5' bibenzimidazole) (PBI) in DMAC have been subjected to equilibrium sedimentation at 40°C. Each sample was composed of a very few distinct fractions, between 1 and 4. Since sedimentation of PBI in DMAC is characterized by strong concentration dependence, an appropriate computational method has been developed based on the formula:

$$c \approx \sum_{n=1}^{N} g_n \exp\left[h_n \omega^2 x - R_{nk} c + (R_{nk} - R_{nn}) c_n \right],$$

This method led to determination of molecular weights and other parameters characterizing fractions which appeared in each sample.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
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Equilibrium Sedimentation						
Polydispersity						
PBI						
Concentration Dependence						
Theory						