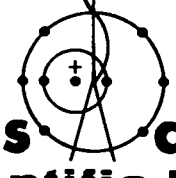
LA-4823

c.3

Numerical Solution of the Boltzmann Equation for Energy Distributions of Electrons with Inelastic Scattering on Molecules

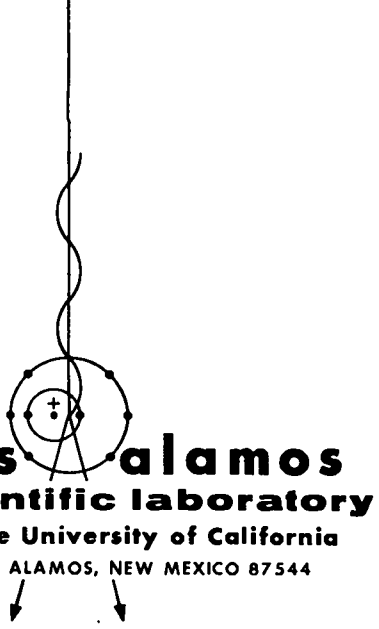


los alamos
scientific laboratory
of the University of California
LOS ALAMOS, NEW MEXICO 87544

UNITED STATES
ATOMIC ENERGY COMMISSION
CONTRACT W-7405-ENG. 36

Printed in the United States of America. Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy $3.00; Microfiche $0.95

LA-4823
UC-34
ISSUED: May 1972.



Numerical Solution of the Boltzmann Equation for Energy Distributions of Electrons with Inelastic Scattering on Molecules

by

J. H. Hancock
R. C. Jones
C. B. Mills

NUMERICAL SOLUTION OF THE BOLTZMANN EQUATION FOR ENERGY DISTRIBUTIONS OF ELECTRONS WITH INELASTIC SCATTERING ON MOLECULES

by

J. H. Hancock, R. C. Jones, and C. B. Mills

ABSTRACT

A new integration of the second-order Boltzmann equation for electron energy conservation in a gaseous electronic plasma, with large inelastic scattering cross sections, has been accomplished. The procedure was to solve a system of numerical equations approximating the differential equation by using the tridiagonal matrix form resulting from a first-order expansion of the terms of the equation in energy space. The results of the integration showed excellent self-consistency in energy balance, and gave significantly different excitation rate integrals from previous solutions. A FORTRAN computer code for the CDC 6600 is appended to the report.

I. INTRODUCTION

The solution of the Boltzmann equation for electron energy distribution in a gaseous medium, with electric gradient and high inelastic scattering cross section, has been a fundamental problem in the field of gaseous electronics. In recent years a first integral of the second-order linear differential equation has been solved numerically. Apparent errors in the energy conservation tests of this solution suggest that a numerical integration of the second-order equation should be attempted directly.

II. THE BOLTZMANN TRANSPORT EQUATION

We wish to find approximate solutions to the equation[1]

$$\frac{E^2}{3}\frac{d}{du}\left(\frac{u}{NQ_m}\frac{df}{du}\right) + \frac{2m}{M}\frac{d}{du}\left(u^2 NQ_m f\right) + \frac{2mkT}{Me}\frac{d}{du}\left(u^2 NQ_m \frac{df}{du}\right)$$

$$+ \sum_j \left(u + u_j\right) f\left(u + u_j\right) NQ_j\left(u + u_j\right) - uf(u)\, N \sum_j Q_j(u)$$

$$+ \sum_j \left(u - u_j\right) f\left(u - u_j\right) NQ_{-j}\left(u - u_j\right) - uf(n)\, N \sum_j Q_{-j}(u) = 0. \qquad (1)$$

Also, we have

$$\begin{cases} \left(u - u_j\right) Q_{-j}\left(u - u_j\right) = \alpha_j\, uQ_j(u) \\ u\, Q_{-j}(u) = \alpha_j\left(u + u_j\right) Q_j\left(u + u_j\right), \end{cases}$$

where

$$\alpha_j = \exp\left[-\frac{e}{kT} u_j\right]. \qquad (2)$$

Substituting Eq. (2) into Eq. (1), replacing u by x, and letting

$$p_1(x) = \frac{E^2}{3}\frac{x}{NQ_m(x)} + \frac{2mkT}{Me} x^2 NQ_m(x)$$

and

$$p_2(x) = \frac{2m}{M} x^2 NQ_m(x),$$

we get

$$\frac{d}{dx}\left[p_1(x)\, f'(x) + p_2(x)\, f(x)\right] + N \sum_{j=1}^{J} \left\{\left(x + u_j\right) Q_j\left(x + u_j\right) f\left(x + u_j\right) - \left[xQ_j(x) + \alpha_j\left(x + u_j\right) Q_j\left(x + u_j\right)\right] f(x) + \alpha_j\, xQ_j(x)\, f\left(x - u_j\right)\right\} = 0. \qquad (3)$$

Now let $0 = x_1 < x_2 < \ldots < x_I$ be a given partition and denote

$$\frac{x_{i-1} + x_i}{2} \text{ by } x_{i-\frac{1}{2}} \text{ and } \frac{x_i + x_{i+1}}{2} \text{ by } x_{i+\frac{1}{2}} .$$

Now we may integrate Eq. (3) from $x_{i-\frac{1}{2}}$ to $x_{i+\frac{1}{2}}$, i = 2, ... , I-1, and obtain I-2 equations.

$$\left[p_1(x)\ f'(x) + p_2(x)\ f(x)\right]\Bigg|_{x_{i-\frac{1}{2}}}^{x_{i+\frac{1}{2}}} + N \sum_{j=1}^{J} \int_{x_{i-\frac{1}{2}}}^{x_{i+\frac{1}{2}}} \Bigg\{ \left(x + u_j\right) Q_j\left(x + u_j\right) f\left(x + u_j\right)$$

$$- \left[xQ_j(x) + \alpha_j\left(x + u_j\right) Q_j\left(x + u_j\right)\right] f(x) + \alpha_j\ xQ_j(x)\ f\left(x - u_j\right) \Bigg\}\, dx = 0 . \qquad (4)$$

Note that no approximations have been used in obtaining Eq. (4). To implement Eq. (4) numerically, we use the following approximations

(a) $$f'\left(x_{i\pm\frac{1}{2}}\right) = \frac{f_{i\pm1} - f_i}{x_{i\pm1} - x_i} ,$$

(b) $$f\left(x_{i\pm\frac{1}{2}}\right) = \frac{f_{i\pm1} + f_i}{2} ,$$

(c) $$\int_{x_{i-\frac{1}{2}}}^{x_{i+\frac{1}{2}}} \Phi(x)\, dx = \left(x_{i+\frac{1}{2}} - x_{i-\frac{1}{2}}\right) \Phi\left(x_i\right) ,$$

and

(d) $$f\left(x_i \pm u_j\right) = \left(f\ x_{i_{j\pm}}\right) , \qquad (5)$$

where $x_{i_{j\pm}}$ is the smallest (largest) mesh point $\geqslant$ ($\leqslant$) $x_i \pm u_j$. If no such mesh point exists, the term is discarded.

Substituting Eq. (5) into Eq. (4), we obtain the I-2 approximate equations.

$$a_{i,i-1}\, f_{i-1} + a_{ii}\, f_i + a_{i,i+1}\, f_{i+1}$$

$$+\sum_{j=1}^{J}\left(b_{i_{j-}}\right)\left(f_{i_{j-}}\right) + \sum_{j=1}^{J}\left(b_{i_{j+}}\right)\left(f_{i_{j+}}\right) = 0 \ ,$$

where

$$a_{i,i-1} = \frac{p_1\left(x_{i-\frac{1}{2}}\right)}{x_i - x_{i-1}} - \frac{p_2\left(x_{i-\frac{1}{2}}\right)}{2} \ ,$$

$$a_{ii} = \frac{p_1\left(x_{i+\frac{1}{2}}\right)}{x_{i+1} - x_i} + \frac{p_1\left(x_{i-\frac{1}{2}}\right)}{x_i - x_{i-1}} + \tfrac{1}{2}\left[p_2\left(x_{i+\frac{1}{2}}\right) - p_2\left(x_{i-\frac{1}{2}}\right)\right]$$

$$- N\left(x_{i+\frac{1}{2}} - x_{i-\frac{1}{2}}\right)\sum_{j=1}^{J}\left[x_i\, Q_j\left(x_i\right) + \alpha_j\left(x_i + u_j\right) Q_j\left(x_i + u_j\right)\right] \ ,$$

$$a_{i,i+1} = \frac{p_1\left(x_{i+\frac{1}{2}}\right)}{x_{i+1} - x_i} + \frac{p_2\left(x_{i+\frac{1}{2}}\right)}{2} \ ,$$

$$b_{i_{j-}} = N\left(x_{i+\frac{1}{2}} - x_{i-\frac{1}{2}}\right)\alpha_j\, x_i Q_j\left(x_i\right) \ ,$$

and

$$b_{i_{j+}} = N\left(x_{i+\frac{1}{2}} - x_{i-\frac{1}{2}}\right)\left(x_i + u_j\right)\, Q_j\left(x_i + u_j\right) \ . \qquad (6)$$

These I-2 equations may be augmented by two boundary conditions, therefore we use

$$f_1 = 1$$

and

$$f_I = 0.* \qquad (7)$$

* This boundary condition is not strictly correct; however, the numerical process is insensitive to this value.

Now Eqs. (6) and (7) may be written in matrix form as

$$(A + B)f = C \quad , \tag{8}$$

where rows 2 through I-1 of A and B are defined by Eq. (6) and rows 1 and I are from Eq. (7).

Then

$$C = \begin{pmatrix} 1 \\ 0 \\ \cdot \\ \cdot \\ \cdot \\ 0 \end{pmatrix} .$$

Because A and B are usually very large matrices, we do not attempt a direct solution of the linear system of Eq. (8), but use the following iteration

$$A\, f^{n+1} = C - Bf^{n} \quad , \tag{9}$$

where

$f^{0} = e^{-ax}$ for a suitable input constant a.

III. REMARKS ON NUMERICAL PROCEDURE

The LU decomposition of A need be done only once, which is simple because A is tridiagonal. An iterative step consists of the calculation of C-Bf, back substitution, and the convergence test. Only the nonzero elements of A and B are stored and involved in the calculation. The convergence test is of the following form.

Let ε_1, ε_2 be given. Let i^* be the first index such that

$$\frac{\left| f_{i^*}^{n+1} - f_{i^*}^{n} \right|}{\mathrm{MAX}\left\{ \left| f_{i^*}^{n+1} \right|, \left| f_{i^*}^{n} \right| \right\}} \geqslant \varepsilon_1$$

if $i^* = I$ or $\left| f_{i^*} \right| < \varepsilon_2$ convergence is assumed.

The iterative process is fast, requiring about 10% of the time necessary for the initial calculation of A and B. Therefore, the best hope for reducing calculation time is to reduce the size of the matrices by (1) increasing mesh size, or (2) by decreasing x_I.

Variable mesh is built into the program, but there is no evidence that a nonuniform mesh is valuable. It may be that effective use of a nonuniform mesh requires modification of the approximations in Eq. (5).

IV. FINAL CALCULATIONS

1. Replace $x_1, \ldots, x_I$ by $z_1, \ldots, z_I$ where $z_i = \frac{ex_1}{kT}$.

2. Replace $f_1, \ldots, f_I$ by $\Phi_1, \ldots, \Phi_I$ such that

$$\int_{z_1}^{z_I} z^{\frac{1}{2}} \Phi(z)\, dz = 1 \quad .$$

The quadrature, here and elsewhere, is done by Simpson's method for unequally spaced points.

3. Calculate

$$\mu = \frac{-\, e(2/kTm)^{\frac{1}{2}}}{3N} \int_{z_1}^{z_I} \frac{z\Phi'(z)}{Q_m(z)}\, dz$$

and

$$D/\mu = \frac{(2kT/m)^{\frac{1}{2}}}{3N\mu} \int_{z_1}^{z_I} \frac{z\Phi(z)}{Q_m(z)}\, dz \quad .$$

Remarks

To approximate $\Phi'(z)$, we use the identity $f' = f(\ell n f)'$ and approximate $d\, \ell n\, \Phi_i$ by $\ell n \left(\Phi_{i+1}/\Phi_{i-1}\right)$.

4. Replace $z_1, \ldots, z_I$ by $\varepsilon_1, \ldots, \varepsilon_I$ where $\varepsilon_i = kTz_i$.

Replace $\Phi_1, \ldots, \Phi_I$ by $g_1, \ldots, g_I$ where $g_i = \Phi_i/(kT)^{3/2}$.

5. Calculate

$$\frac{\nu_{0j}}{N} = 10^{16}\left(\frac{2}{m}\right)^{\frac{1}{2}} \int_{\varepsilon_1}^{\varepsilon_I} g(\varepsilon) \left[\varepsilon Q_j(\varepsilon) - \alpha_j\left(\varepsilon + u_j\right) Q_j\left(\varepsilon + u_j\right)\right] d\varepsilon \quad .$$

6. Calculate the left-hand side of energy balance equation = $eE^2\mu.^2$

7. Calculate the right-hand side of the energy balance equation

$$= e^{3/2}\, N\left(\frac{2}{m}\right)^{\frac{1}{2}} \left\{ \frac{2m}{M} \int_{\varepsilon_1}^{\varepsilon_I} \varepsilon^2\, Q_m(\varepsilon) \left[g(\varepsilon) + kT\, g'(\varepsilon) \right] d\varepsilon \right.$$

$$\left. + e \sum_{j=1}^{J} u_j \int_{\varepsilon_1}^{\varepsilon_I} g(\varepsilon) \left[\varepsilon\, Q_j(\varepsilon) - \alpha_j\left(\varepsilon + u_j\right) Q_j\left(\varepsilon + u_j\right)\right] d\varepsilon \right\} \quad .$$

V. COMPUTER PROGRAM AND SAMPLE CALCULATION

The computer program is given in Appendix A. The application of electron energy distribution functions to molecular excitation rate integrals is illustrated in Appendix B.

ACKNOWLEDGMENTS

The numerical procedures evolved from discussions with R. S. Varga, a Visiting Staff Member at LASL, and B. Buzbee, J. R. Sopka, and B. K. Swartz.

REFERENCES

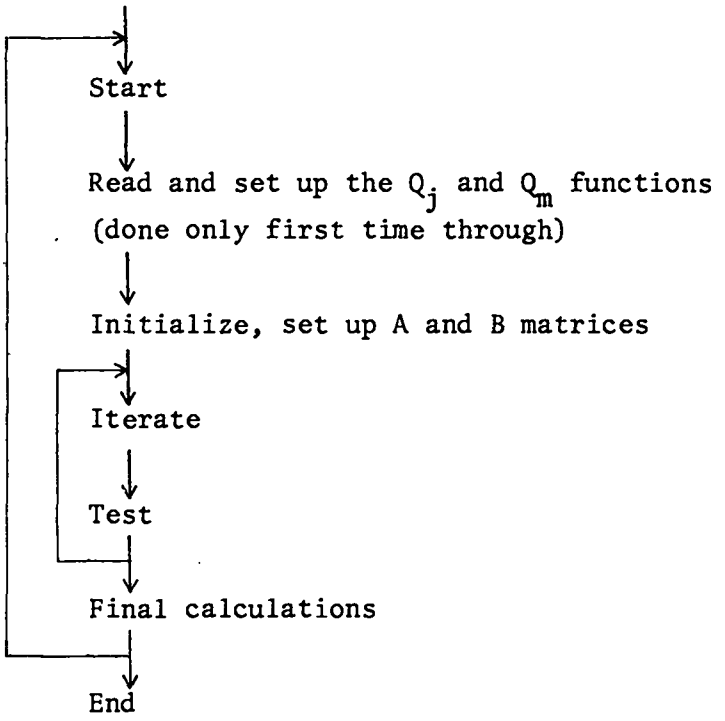
1. L. S. Frost and A. V. Phelps, "Rotational Excitation and Momentum Transfer Cross Sections for Electrons in H_2 and N_2 from Transport Coefficients," Phys. Rev. 127, 1621(1962).

2. A. G. Engelhardt and A. V. Phelps, "Elastic and Inelastic Collision Cross Sections in Hydrogen and Deuterium from Transport Coefficients," Phys. Rev. 131, 2115 (1963).

APPENDIX A

CODE DESCRIPTION

The code is written primarily in FORTRAN for the LASL CDC 7600's and their attendant service routines. It requires 150,000 octal words of core and may use up to approximately 1,440,000 octal words of extended core storage. Input is in the form of cards (plus a magnetic tape if a previous run is being completed), and output is in the form of a listing, punched cards, 35-mm film, and a magnetic tape for an incomplete job to be restarted later. A simplified flow diagram is given here.



The options available as controlling parameters and physical constants for each run are defined by comment cards at the beginning of the code, as is the data deck structure. Up to 4000 mesh points may be specified. A typical run mixing H_2, He, N_2, and CO_2 in the ratio 0, 3, 1, 1 with 961 mesh points took 42 sec to set up, 6 sec to iterate and test 125 times, and 7 sec to do the final calculation.

```
      PROGRAM HANJON(INP,OUT,FILM,FSET3,FSET4,PUN,FSET1=INP)                HAJO  1
                                                                            HAJO  2
      COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,    HAJO  3
     1         XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,           HAJO  4
     2         C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,           HAJO  5
     3         ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,            HAJO  6
     4         TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,        HAJO  7
     5         FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND        HAJO  8
                                                                            HAJO  9
      NAMELIST/PARAM/     BE,  BM,  BN,  BT,    SE, SM,  SK                 HAJO 10
     1 ,                 FH2, FHE, FN2, FCO2                                HAJO 11
                                                                            HAJO 12
      NAMELIST/CONTROL/  CII, EPS, II, IDEGRE, ITMAX, ITPLOT, ITPRNT,       HAJO 13
     1                   IXAXIS, IYAXIS, PICKUP, PWR, SPC, TMAX, X0, XII   HAJO 14
     2 ,                 SUPRES,THRU,FSTOP                                  HAJO 15
                                                                            HAJO 16
                                                                            HAJO 17
                                                                            HAJO 18
C         $PARAM                                                            HAJO 19
                                                                            HAJO 20
C              BE = ELECTRIC FIELD       (DEFAULT = 2670.)                  HAJO 21
C              BM = MOLECULAR MASS        (DEFULAT = CALCULATED)            HAJO 22
C              BN = MOLECULES / CC       (DEFAULT = 2.67   E+19)           HAJO 23
C              BT = GAS TEMPERATURE       (DEFAULT = 293        )           HAJO 24
C              SE = ELECTRONIC CHARGE    (DEFAULT = 1.6    E-12)           HAJO 25
C              SM = ELECTRONIC MASS      (DEFAULT = 9.81   E-28)           HAJO 26
C              SK = BOLTZMAN CONSTANT    (DEFAULT = 1.38   E-16)           HAJO 27
C                                                                           HAJO 28
C              FH2  = MIXING RATIOS, ANY ONE NOT  ... THE 1ST $PARAM CAR    HAJO 29
C              FHE  =    SPECIFIED DEFAULTS TO 0.      SETS THESE FRACTI   HAJO 30
C              FN2  =    IF NONE ARE SPECIFIED,        FOR ALL SUBSEQUEN   HAJO 31
C              FCO2 =    DEFAULT = 1/1/1/1.            RUNS.               HAJO 32
                                                                            HAJO 33
                                                                            HAJO 34
C         $CONTROL                                                          HAJO 35
                                                                            HAJO 36
C              II = NO. OF POINTS                                           HAJO 37
C                   DEFAULT = 481                                           HAJO 38
C              X0 = INITIAL X                                               HAJO 39
C                   DEFAULT= 0.                                             HAJO 40

C              XII = FINAL X(II)                                            HAJO 41
C                   DEFAULT= 10.                                            HAJO 42
C              EPS = CONVERGENCE DELTA                                      HAJO 43
C                   DEFAULT = 1.E-5                                         HAJO 44
C              ITMAX = MAX. NO. ITERATIONS                                  HAJO 45
C                   DEFAULT = 300                                           HAJO 46
C              TMAX = TIME LIMIT, SEC.                                      HAJO 47
C                   DEFAULT = 110.                                          HAJO 48
C              ITPRNT= ITERATION INTERVAL FOR PRINTING X(I), F(I)           HAJO 49
C                   DEFAULT = -1                                            HAJO 50
C              ITPLOT= ITERATION INTERVAL FOR PLOTING X(I), F(I)            HAJO 51
C                   DEFAULT = -1                                            HAJO 52
```

```
C          IXAXIS= +II = LINEAR X SCALE, = - II = LOG X SCALE                HAJO  53
C               DEFAULT = +II                                                HAJO  54
C          IYAXIS= +1  = LINEAR Y SCALE, = - 1  = LOG Y SCALE                HAJO  55
C               DEFAULT = - 1                                                HAJO  56
C          IDEGRE= ORDER OF INTERPOLATION                                    HAJO  57
C               DEFAULT = 1                                                  HAJO  58
C          PWR= EXPONENT FACTOR, F=EXP(- PWR*X)                              HAJO  59
C               DEFAULT= 40.                                                 HAJO  60
C          SPC= VARIABLE MESH FACTOR, 0.LT.SPC.LE.1.                         HAJO  61
C               1. = UNIFORM DELTA X                                         HAJO  62
C               DEFAULT = 1.                                                 HAJO  63
C          CII = FORCED F(II)                                                HAJO  64
C               DEFAULT= 0.                                                  HAJO  65
C          SUPRES =+1., DO NOT PRINT A AND B MATRICES                        HAJO  66
C               DEFAULT = +1.                                                HAJO  67
C          PICKUP = - 1.   NO RESTART AND NO DUMP                            HAJO  68
C                    0.   DUMP ON TIME TO TAPE 3                             HAJO  69
C                   +1.   RESTART FROM TAPE3                                 HAJO  70
C               DEFAULT = - 1.                                               HAJO  71
C          THRU = +1.  PRINT AND PUNCH RESULTS                               HAJO  72
C               DEFAULT = 0.                                                 HAJO  73
C          FSTOP = VALUE OF F FOR CONVERGENCE TEST                           HAJO  74
C               DEFAULT = 0.                                                 HAJO  75
                                                                             HAJO  76
C     MISCELLANEOUS PARAMETERS                                               HAJO  77
                                                                             HAJO  78
C          JJ= NO. OF QJ(X) DATA PAIRS = NO. OF U(X) VALUES                  HAJO  79
C          KK= NO. OF QM(X) VALUES                                           HAJO  80
C          JQ(I)= NO. OF VALUES IN THE ITH QJ TABLE                          HAJO  81

                                                                             HAJO  82
                                                                             HAJO  83
C     DATA DECK SETUP                                                        HAJO  84
                                                                             HAJO  85
C          $PARAM ... (CONSTANTS,MIX FRACTIONS) ... $                        HAJO  86
C          $CONTROL ...(CONTROL PARAMETERS)      ... $                       HAJO  87
C          NAME, FORMAT 8A10                                                 HAJO  88
C          QJ DATA SETS                                                      HAJO  89
C          BLANK CARD                                                        HAJO  90
C          QM DATA SETS                                                      HAJO  91
C          BLANK CARD                                                        HAJO  92
C          $PARAM    ... PARAMETERS FOR 2ND RUN                              HAJO  93
C          $CONTROL                                                          HAJO  94
C          $PARAM    ... PARAMETERS FOR 3RD RUN                              HAJO  95
C          $CONTROL                                                          HAJO  96
C             .                                                              HAJO  97
C             .                                                              HAJO  98
C             .                                                              HAJO  99
C          $PARAM    ... PARAMETERS FOR NTH RUN                              HAJO 100
C          $CONTROL                                                          HAJO 101
                                                                             HAJO 102
                                                                             HAJO 103
C     ECS ARRANGEMENT                                                        HAJO 104
```

```
C              LOCATION      NO. BLKS   LNTH EA.  CONTENTS
C
C              IQM=0            1         400     QM
C              IQJ=400          JJ        400     QJ
C              IQB=(JJ+1)*400   II     2*IIB(I)   B MATRIX


      NNNN=0
  700 CONTINUE
      NNNN=NNNN+1
      IEND=1
      IF(NNNN.GT.1)GO TO 710

      BE=2670.
      BM=4.649E-23
      BN=2.67 E+19

      BT=293.
      SE=1.6  E-12
      SM=9.81 E-28
      SK=1.38 E-16
      FH2=FHE=FN2=FCO2=0.
  710 CONTINUE
      READ(1,PARAM)
      IF(NNNN.GT.1)GO TO 702

      IF(FH2.NE.0..O.FHE.NE.0.)GO TO 701
      IF(FN2.NE.0..O.FCO2.NE.0.)GO TO 701
      FH2=FHE=FN2=FCO2=0.25
      GO TO 703

  701 CONTINUE
      FTOT=FH2+FHE+FN2+FCO2
      FH2=FH2/FTOT
      FHE=FHE/FTOT
      FN2=FN2/FTOT
      FCO2=FCO2/FTOT

  703 CONTINUE
      BM=1.E-24/(FH2/3.3461+FHE/6.6437+FN2/46.498+FCO2/73.049)

      II=481
      EPS=1.E-5
      ITMAX=300
      TMAX=110.
      ITPRNT=-1
      ITPLOT=-1
      IXAXIS=II
      IYAXIS=-1
      IDEGRE=1
```

HAJO 105 HAJO 106 HAJO 107 HAJO 108 HAJO 109 HAJO 110 HAJO 111 HAJO 112 HAJO 113 HAJO 114 HAJO 115 HAJO 116 HAJO 117 HAJO 118 HAJO 119 HAJO 120 HAJO 121 HAJO 122 HAJO 123 HAJO 124 HAJO 125 HAJO 126 HAJO 127 HAJO 128 HAJO 129 HAJO 130 HAJO 131 HAJO 132 HAJO 133 HAJO 134 HAJO 135 HAJO 136 HAJO 137 HAJO 138 HAJO 139 HAJO 140 HAJO 141 HAJO 142 HAJO 143 HAJO 144 HAJO 145 HAJO 146 HAJO 147 HAJO 148 HAJO 149 HAJO 150 HAJO 151 HAJO 152 HAJO 153 HAJO 154 HAJO 155 HAJO 156

```
      PWR=40.                                                          HAJO 157
      SPC=1.                                                           HAJO 158
      X0=0.                                                            HAJO 159
      XII=10.                                                          HAJO 160
      CII=0.                                                           HAJO 161
      PICKUP=-1.                                                       HAJO 162
      SUPRES=1.                                                        HAJO 163

      THRU=0.                                                          HAJO 164
      FSTOP=0.                                                         HAJO 165
                                                                       HAJO 166
  702 CONTINUE                                                         HAJO 167
      READ(1,CONTROL)                                                  HAJO 168
      TTMAX=TMAX                                                       HAJO 169
      IISAV=II                                                         HAJO 170
      IQM=0                                                            HAJO 171
      IQJ=400                                                          HAJO 172
                                                                       HAJO 173
      IF(PICKUP.GT.0.)GO TO 711                                        HAJO 174
                                                                       HAJO 175
      IF(NNNN.LE.1)READ 24,(NAME(I),I=1,8)                             HAJO 176
   24 FORMAT(8A10)                                                     HAJO 177
      GO TO 712                                                        HAJO 178
                                                                       HAJO 179
  711 CALL RESTRT                                                      HAJO 180
      TMAX=TTMAX                                                       HAJO 181
                                                                       HAJO 182
  712 CONTINUE                                                         HAJO 183
      PRINT 6                                                          HAJO 184
    6 FORMAT(1H1)                                                      HAJO 185
      PRINT 25,(NAME(I),I=1,8)                                         HAJO 186
   25 FORMAT(10X,8A10)                                                 HAJO 187
      PRINT 26, NNNN                                                   HAJO 188
   26 FORMAT(/,10X,*RUN NO.*,I3,/)                                     HAJO 189
                                                                       HAJO 190
      PRINT 7, BE,BM,BN,BT,SE,SM,SK,FH2,FHE,FN2,FCO2                   HAJO 191
    7 FORMAT(5X,*INITIAL DATA*,//,10X,*BE = ELECTRIC FIELD =*,1PE12.4, HAJO 192
     1 /,10X,*BM = MOLECULAR MASS =*,E12.4,/,10X,*BN = GAS MOLECULES PER HAJO 193
     2 CC =*,E12.4,/,10X,*BT = GAS TEMPERATURE =*,E12.4,/,10X,*SE = ELECT HAJO 194
     3 RONIC CHARGE =*,E12.4,/,10X,*SM = ELECTRONIC MASS =*,E12.4,/,10X,* HAJO 195
     4 SK = BOLTZMAN CONSTANT =*,E12.4,/,12X,*F H2 =*,E12.4,/,12X,*F HE = HAJO 196
     5 *,E12.4,/,12X,*F N2 =*,E12.4,/,12X,*F CO2 =*,E12.4,////)        HAJO 197
      PRINT 8, EPS,ITMAX,TMAX,ITPRNT,ITPLOT,II,X0,XII,CII,IDEGRE,PWR,SPC HAJO 198
    8 FORMAT(5X,*CONTROL PARAMETERS*,//,10X,*EPS  = CONVERGENCE DEL =*,1 HAJO 199
     1 PE12.4,/,10X,*ITMAX= MAX NO. OF ITERATIONS =*,I4,/,10X,*TMAX = CP HAJO 200
     2 TIME LIMIT ON ITERATION =*,E12.4,/,10X,*ITPRNT = PRINT INTERVAL =* HAJO 201
     3 ,I4,/,10X,*ITPLOT = PLOT INTERVAL =*,I4,/,10X,*II = NO. OF POINTS HAJO 202
     4 =*,I5,/,10X,*X0,XII = X RANGE =*,E12.4,* TO*,E12.4,/,10X,*CII = FO HAJO 203
     5 RCED ENDPOINT =*,E12.4,/,10X,*IDEGRE = INTERPOLATION ORDER =*,I3,/ HAJO 204

     6 , 10X,*PWR, F(X)=EXP(-*,E12.4,* X)*,/,10X,*SPC = SPACING FACTOR =* HAJO 205
     7 ,E12.4)                                                         HAJO 206
                                                                       HAJO 207
```

```
      GO TO (704,708,707)IEND                                          HAJO 208
  708 IEND=-1                                                          HAJO 209
      GO TO 709                                                        HAJO 210
  704 CONTINUE                                                         HAJO 211
      CALL XFSET                                                       HAJO 212
      IF(NNNN.LE.1)CALL QXSET                                          HAJO 213
                                                                       HAJO 214
C        SET UP C MATRIX                                               HAJO 215
C        ONLY THE 1 ST  AND  II TH  ELEMENTS OF C ARE NON-ZERO         HAJO 216
      CONE=1.                                                          HAJO 217
                                                                       HAJO 218
C        SET UP TRI-DIAGONAL MATRIX A                                  HAJO 219
      CALL ASET                                                        HAJO 220
                                                                       HAJO 221
                                                                       HAJO 222
C        SET UP B MATRIX                                               HAJO 223
C             ADD DIAGONAL ELEMENTS TO THE A MATRIX                    HAJO 224
      CALL BSET                                                        HAJO 225
                                                                       HAJO 226
                                                                       HAJO 227
C        DO INITIAL FACTOR OF A MATRIX                                 HAJO 228
      CALL FACTTD(II,A,4000)                                           HAJO 229
                                                                       HAJO 230
                                                                       HAJO 231
      IT=1                                                             HAJO 232
      CALL SECOND(TIME)                                                HAJO 233
      PRINT 713, TIME                                                  HAJO 234
  713 FORMAT(/,10X,*SETUP COMPLETED,*,F10.1,* SECONDS*,//)             HAJO 235
      TCMBF=TSOLTD1=TCNVRG=0.                                          HAJO 236
      CALL SECOND(TIMEL)                                               HAJO 237
                                                                       HAJO 238
    1 CONTINUE                                                         HAJO 239
                                                                       HAJO 240
C        SOLVE FOR COL VECTOR  R = C - B*FI                            HAJO 241
      CALL SECOND(TIME1)                                               HAJO 242
      CALL CMBF                                                        HAJO 243
      CALL SECOND(TIME2)                                               HAJO 244
      TCMBF=TCMBF+TIME2-TIME1                                          HAJO 245
                                                                       HAJO 246
C        SOLVE FOR COL VECTOR  FIP1 = A(INVERSE)*R                     HAJO 247
      CALL SOLTD1(II,A,4000,FIP1,1)                                    HAJO 248
      CALL SECOND(TIME)                                                HAJO 249
      TIME1=TIME                                                       HAJO 250
      TSOLTD1=TSOLTD1+TIME1-TIME2                                      HAJO 251
                                                                       HAJO 252
C        TEST FOR CONVERGENCE                                          HAJO 253
      CALL CNVRG                                                       HAJO 254
      CALL SECOND(TIME2)                                               HAJO 255
      TCNVRG=TCNVRG+TIME2-TIME1                                        HAJO 256
                                                                       HAJO 257
  709 IT=IT+1                                                          HAJO 258
      IF(IEND.GE.0)GO TO 3                                             HAJO 259
```

```
                                                                    HAJO 260
      DO 2 I=1,II                                                   HAJO 261
      FI(I)=FIP1(I)                                                 HAJO 262
 2    CONTINUE                                                      HAJO 263
      GO TO 1                                                       HAJO 264
                                                                    HAJO 265
                                                                    HAJO 266
                                                                    HAJO 267
 3    CONTINUE                                                      HAJO 268
      CALL SECOND(TIME1)                                            HAJO 269
      TLOOP1=TIME1- TIMEL                                           HAJO 270
                                                                    HAJO 271
C          LIST AND PLOT RESULTS                                    HAJO 272
                                                                    HAJO 273
      LIT=IT- 1                                                     HAJO 274
      IT=LIT                                                        HAJO 275
      IF(PICKUP.GE.0..A.IEND.EQ.2)GO TO 705                         HAJO 276
      IF(ITPRNT.GE.0)CALL FPRNT(1)                                  HAJO 277
                                                                    HAJO 278
      IF(ITPLOT.LE.0)GO TO 99                                       HAJO 279
      ENCODE(42,98,TITL)IT,FH2,FHE,FN2,FCO2                         HAJO 280
 98   FORMAT(* X, ITERATION*,I3,*, H2/HE/N2/CO2 *,3(2PF2.0,*/*),F2.0) HAJO 281
      REWIND 4                                                      HAJO 282
      BUFFER OUT(4,1)(FIP1(1),FIP1(4000))                           HAJO 283
 46   IF(UNIT,4)46,47,47,47                                         HAJO 284
 47   CONTINUE                                                      HAJO 285
      IIM1=II- 1                                                    HAJO 286

      DO 48 I=1,IIM1                                                HAJO 287
      FIP1(I)=ALOG10(FIP1(I))                                       HAJO 288
 48   CONTINUE                                                      HAJO 289
      FIP1(II)=FIP1(II- 1)                                          HAJO 290
      CALL PLOJB(X,FIP1,II,1,0,0,0.,10.,10.,NAME,80,TITL,42,        HAJO 291
     1           14HLOG 10 OF FIP1,14)                              HAJO 292
      REWIND 4                                                      HAJO 293
      BUFFER  IN(4,1)(FIP1(1),FIP1(4000))                           HAJO 294
 52   IF(UNIT,4)52,53,53,53                                         HAJO 295
 53   CONTINUE                                                      HAJO 296
                                                                    HAJO 297
 99   CONTINUE                                                      HAJO 298
      IF(IEND.EQ.1)GO TO 700                                        HAJO 299
      CALL SECOND(TIME)                                             HAJO 300
      IF(TIME.GE.TMAX)GO TO 706                                     HAJO 301
 707  CONTINUE                                                      HAJO 302
      CALL SECOND(TIME1)                                            HAJO 303
      CALL INT                                                      HAJO 304
      CALL SECOND(TIME2)                                            HAJO 305
      TINT=TIME2- TIME1                                             HAJO 306
      IF(THRU.GT.0.)CALL SUMARY                                     HAJO 307
      CALL SECOND(TIME1)                                            HAJO 308
      TSUMARY=TIME1- TIME2                                          HAJO 309
      PRINT 7000,  TCMBF,TSOLTD1,TCNVRG,TLOOP1,TINT,TSUMARY         HAJO 310
 7000 FORMAT(//,* TIME DISTRIBUTION*,/,*     CMBF*,F10.1,/,*  SOLTD1*,F10 HAJO 311
```

```
     1 .1,/,*    CNVRG*,F10.1,/,*   LOOP 1*,F10.1,/,*       INT*,F10.1,/,*   S   HAJO 312
     2 UMARY*,F10.1,/)                                                           HAJO 313
                                                                                 HAJO 314
       GO TO 700                                                                 HAJO 315
                                                                                 HAJO 316
 706   IEND=3                                                                    HAJO 317
 705   CALL CDUMP                                                                HAJO 318
       CALL SUMARY                                                               HAJO 319
       END                                                                       HAJO 320
       SUBROUTINE SETUP                                                          HAJO 321
                                                                                 HAJO 322
       COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,        HAJO 323
      1          XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,              HAJO 324
      2          C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,              HAJO 325
      3          ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,               HAJO 326
      4          TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,           HAJO 327

      5          FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND           HAJO 328
                                                                                 HAJO 329
       DIMENSION HDR(20),QJSAV(3,200)                                            HAJO 330
       EQUIVALENCE (QJSAV,A)                                                     HAJO 331
                                                                                 HAJO 332
       EQUIVALENCE (IU,JJ)                                                       HAJO 333
                                                                                 HAJO 334
         ENTRY XFSET                                                             HAJO 335
C      X VALUES AND INITIAL F GUESS                                              HAJO 336
                                                                                 HAJO 337
```

```
      X(1)=0.                                                          HAJO 338
      FI(1)=1.                                                         HAJO 339
      X(II)=XII                                                        HAJO 340
      FI(II)=EXP(-PWR*XII)                                             HAJO 341
      DN=II-1                                                          HAJO 342
      IIM2=II-2                                                        HAJO 343
      IF(SPC.EQ.1.)GO TO 101                                           HAJO 344
                                                                       HAJO 345
      DEL1=(1.-SPC)*XII/(1.-SPC**DN)                                   HAJO 346
      X(II-1)=XII-DEL1                                                 HAJO 347
      FI(II-1)=EXP(-PWR*X(II-1))                                       HAJO 348
      DO 100 I=2,IIM2                                                  HAJO 349
      J=II-I                                                           HAJO 350
      NM1=I-1                                                          HAJO 351
      DX=DEL1*SPC**NM1                                                 HAJO 352
      X(J)=X(J+1)-DX                                                   HAJO 353
      FI(J)=EXP(-PWR*X(J))                                             HAJO 354
100   CONTINUE                                                         HAJO 355
      GO TO 103                                                        HAJO 356
                                                                       HAJO 357
101   CONTINUE                                                         HAJO 358
      DX=XII/DN                                                        HAJO 359
      DO 102 I=2,II                                                    HAJO 360
      X(I)=X(I-1)+DX                                                   HAJO 361
      FI(I)=EXP(-PWR*X(I))                                             HAJO 362
102   CONTINUE                                                         HAJO 363
                                                                       HAJO 364
103   CONTINUE                                                         HAJO 365
                                                                       HAJO 366
      IF(ITPRNT.LE.0)GO TO 708                                         HAJO 367
      PRINT 300,(NAME(I),I=1,8)                                        HAJO 368

300   FORMAT(1H1,10X,*X AND FI INPUT DATA*,//,10X,8A10,///, 4X,*I      HAJO 369
     1   X(I)          FI(I)*,/)                                       HAJO 370
      CALL FPRNT(0)                                                    HAJO 371
3     FORMAT(1X,I4,2(1PE13.4))                                         HAJO 372
708   IF(ITPLOT.LE.0)RETURN                                            HAJO 373
                                                                       HAJO 374
      DO 301 I=1,II                                                    HAJO 375
      A(I)=ALOG10(FI(I))                                               HAJO 376
301   CONTINUE                                                         HAJO 377
      CALL PLOJB(X,A,II,1,0,0,0.,10.,10.,NAME,80,16HX, INITIAL SETUP,16, HAJO 378
     1           12HLOG 10 OF FI,12)                                   HAJO 379
      RETURN                                                           HAJO 380
                                                                       HAJO 381
                                                                       HAJO 382
                                                                       HAJO 383
          ENTRY QXSET                                                  HAJO 384
                                                                       HAJO 385
      LOC=IQJ                                                          HAJO 386
      PRINT 200                                                        HAJO 387
200   FORMAT(1H1,10X,*QJ FUNCTIONS*)                                   HAJO 388
      JJ=1                                                             HAJO 389
```

```
      READ  106,   N,MATL,(HDR(I),I=1,5),U(JJ),(HDR(I),I=7,15)      HAJO 390
106   FORMAT(2I2,5A5,F6.3,9A5)                                      HAJO 391
706   READ 6,(XX(I),I=1,N)                                          HAJO 392
      READ 6,(QX(I),I=1,N)                                          HAJO 393
      DO 710 I=1,3                                                  HAJO 394
710   QJSAV(I,JJ)=HDR(I+12)                                         HAJO 395
      IF(MATL.EQ. 2)FRA=FH2                                         HAJO 396
      IF(MATL.EQ. 4)FRA=FHE                                         HAJO 397
      IF(MATL.EQ.28)FRA=FN2                                         HAJO 398
      IF(MATL.EQ.44)FRA=FCO2                                        HAJO 399
      QT=0.                                                         HAJO 400
      DO 704 I=1,N                                                  HAJO 401
      QX(I)=FRA*QX(I)                                               HAJO 402
704   QT=QT+QX(I)                                                   HAJO 403
      IF(QT.LE.0.)GO TO 705                                         HAJO 404
      FLAG=- 1.                                                     HAJO 405
      K=N- 1                                                        HAJO 406
      L=1                                                           HAJO 407
      M=N                                                           HAJO 408
                                                                    HAJO 409

      DO 89 J=1,K                                                   HAJO 410
      IF(QX(J).GT.0.)FLAG=1.                                        HAJO 411
      IF(FLAG.GT.0.)GO TO 88                                        HAJO 412
      IF((QX(J).EQ.0.).A.(QX(J+1).EQ.0.))L=L+1                      HAJO 413
      GO TO 89                                                      HAJO 414
88    CONTINUE                                                      HAJO 415
      IF((QX(J).EQ.0.).A.(QX(J+1).EQ.0.))M=M- 1                     HAJO 416
89    CONTINUE                                                      HAJO 417
                                                                    HAJO 418
      N=M- L+1                                                      HAJO 419
      JQ(JJ)=N                                                      HAJO 420
                                                                    HAJO 421
      DO 107 NN=1,N                                                 HAJO 422
      N1=NN+L- 1                                                    HAJO 423
      XX(NN)=XX(N1)                                                 HAJO 424
      QX(NN)=QX(N1)*1.E- 16                                         HAJO 425
107   CONTINUE                                                      HAJO 426
                                                                    HAJO 427
      CALL ECWR(XX,LOC,400,IPAR)                                    HAJO 428
      LOC=LOC+400                                                   HAJO 429
                                                                    HAJO 430
      PRINT 109,JJ,N,MATL,(HDR(I),I=1,5),U(JJ),(HDR(I),I=7,15)      HAJO 431
109   FORMAT(1X,*QJ(*,I2,*),  *,2I2,5A5,F10.5,/,5X,9A5)             HAJO 432
      IF(ITPRNT.LE.0)GO TO 707                                      HAJO 433
      DO 1090 I=1,N                                                 HAJO 434
1090  QX(I)=QX(I)*1.E+16                                            HAJO 435
      PRINT 110,(XX(I),QX(I),I=1,N)                                 HAJO 436
110   FORMAT(5X,1PE12.4,E18.4)                                      HAJO 437
      PRINT 703                                                     HAJO 438
707   CONTINUE                                                      HAJO 439
                                                                    HAJO 440
      JJ=JJ+1                                                       HAJO 441
```

```
  705   CONTINUE                                                          HAJO 442
        READ  106,   N,MATL,(HDR(I),I=1,5),U(JJ),(HDR(I),I=7,15)          HAJO 443
        IF(N.NE.0)GO TO 706                                               HAJO 444
        IQB=JJ*400                                                        HAJO 445
        JJ=JJ- 1                                                          HAJO 446
        PUNCH 711, JJ                                                     HAJO 447
  711   FORMAT(I5,* QJ NAMES FOLLOW*)                                     HAJO 448
        PUNCH 712,((QJSAV(I,J),I=1,3),J=1,JJ)                             HAJO 449
  712   FORMAT(16A5)                                                      HAJO 450

                                                                          HAJO 451
        PRINT 400, IU                                                     HAJO 452
  400   FORMAT(1H1,10X,*U INPUT DATA,*,I6,* VALUES*,///,4X,*I      U(I)   HAJO 453
       1 *,/)                                                             HAJO 454
        PRINT 108,(I,U(I),I=1,IU)                                         HAJO 455
  108   FORMAT(1X,I4,1PE13.4)                                             HAJO 456
                                                                          HAJO 457
                                                                          HAJO 458
C         NO. OF QM VALUES                                                HAJO 459
        PRINT 104                                                         HAJO 460
  104   FORMAT(1H1,10X,*QM FUNCTION*,/)                                   HAJO 461
        DO 700 I=1,400                                                    HAJO 462
  700   XX(I)=0.                                                          HAJO 463
        READ  5, KK,MATL,(HDR(I),I=1,19)                                  HAJO 464
  5     FORMAT(2I2,19A4)                                                  HAJO 465
                                                                          HAJO 466
C         X, QM VALUES                                                    HAJO 467
  701   READ 6,(XX(I),I=1,KK)                                             HAJO 468
        READ 6,( A(I),I=1,KK)                                             HAJO 469
  6     FORMAT(10F8.4)                                                    HAJO 470
        PRINT 8, KK,MATL,(HDR(I),I=1,19)                                  HAJO 471
  8     FORMAT( 1X,2I2,19A4)                                              HAJO 472
        IF(MATL.EQ. 2)FRA=FH2                                             HAJO 473
        IF(MATL.EQ. 4)FRA=FHE                                             HAJO 474
        IF(MATL.EQ.28)FRA=FN2                                             HAJO 475
        IF(MATL.EQ.44)FRA=FCO2                                            HAJO 476
        DO 60 I=1,KK                                                      HAJO 477
  60    QX(I)=QX(I)+FRA/(A(I)*1.E- 16)                                    HAJO 478
        KKK=KK                                                            HAJO 479
        READ  5, KK,MATL,(HDR(I),I=1,19)                                  HAJO 480
        IF(KK.NE.0)GO TO 701                                              HAJO 481
        KK=KKK                                                            HAJO 482
        DO 702 I=1,KK                                                     HAJO 483
  702   QX(I)=1./QX(I)                                                    HAJO 484
        NO=400                                                            HAJO 485
        CALL ECWR(XX,IQM,NO,IPAR)                                         HAJO 486
        IF(ITPRNT.LE.0)RETURN                                             HAJO 487
        DO 1040 I=1,KK                                                    HAJO 488
 1040   QX(I)=QX(I)*1.E+16                                                HAJO 489
        PRINT 703                                                         HAJO 490
  703   FORMAT(/)                                                         HAJO 491

        PRINT   3,(I,XX(I),QX(I),I=1,KK)                                  HAJO 492
                                                                          HAJO 493
```

```
      PRINT 709                                                          HAJO 494
709   FORMAT(1H1)                                                        HAJO 495
      RETURN                                                             HAJO 496
      END                                                                HAJO 497
      SUBROUTINE ASET                                                    HAJO 498
                                                                         HAJO 499
      COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB, HAJO 500
     1         XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,        HAJO 501
     2         C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,        HAJO 502
     3         ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,         HAJO 503
     4         TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,     HAJO 504
     5         FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND     HAJO 505
                                                                         HAJO 506
                                                                         HAJO 507
      C1=(BE*BE)/3.                                                      HAJO 508
      C2=(SM+SM)/BM                                                      HAJO 509
      C3=(2.*SM*SK*BT)/(BM*SE)                                           HAJO 510
                                                                         HAJO 511
      A(1,1)=0.                                                          HAJO 512
      A(1,2)=1.                                                          HAJO 513
      A(1,3)=0.                                                          HAJO 514
                                                                         HAJO 515
      DX1=X(2)- X(1)                                                     HAJO 516


      XM=0.5*(X(1)+X(2))                                                 HAJO 517
      CALL CUEMX(XM,CUE)                                                 HAJO 518
      P1XM=(C1*XM)/(BN*CUE*DX1)                                          HAJO 519
      P2XM=C2*XM*XM*BN*CUE                                               HAJO 520
      P3XM=C3*XM*XM*BN*CUE/DX1                                           HAJO 521
      K=II- 1                                                            HAJO 522
                                                                         HAJO 523
      DO 1 I=2,K                                                         HAJO 524
      DX2=X(I+1)- X(I)                                                   HAJO 525
      XP=0.5*(X(I)+X(I+1))                                               HAJO 526
      CALL CUEMX(XP,CUE)                                                 HAJO 527
      P1XP=(C1*XP)/(BN*CUE*DX2)                                          HAJO 528
      P2XP=C2*XP*XP*BN*CUE                                               HAJO 529
      P3XP=C3*XP*XP*BN*CUE/DX2                                           HAJO 530
                                                                         HAJO 531

      A(I,1)=P1XM- 0.5*P2XM+P3XM                                         HAJO 532
      A(I,2)=- P1XP- P1XM+0.5*(P2XP- P2XM)- P3XP- P3XM                   HAJO 533
      A(I,3)=P1XP+0.5*P2XP+P3XP                                          HAJO 534
                                                                         HAJO 535
      P1XM=P1XP                                                          HAJO 536
      P2XM=P2XP                                                          HAJO 537
      P3XM=P3XP                                                          HAJO 538
1     CONTINUE                                                           HAJO 539
                                                                         HAJO 540
                                                                         HAJO 541
                                                                         HAJO 542
      A(II,1)=0.                                                         HAJO 543
```

```
      A(II,2)=1.                                                        HAJO 544
      A(II,3)=0.                                                        HAJO 545
                                                                        HAJO 546
      IF(SUPRES.GT.0.)RETURN                                            HAJO 547
                                                                        HAJO 548
      PRINT 2                                                           HAJO 549
    2 FORMAT(1H1,5X,*A MATRIX, SETUP, W/O B DIAGONAL ELEMENTS*,//)      HAJO 550
      PRINT 3,(I,A(I,1),A(I,2),A(I,3),I=1,II)                          HAJO 551
    3 FORMAT(5X,I10,3(1PE13.4))                                         HAJO 552
                                                                        HAJO 553
                                                                        HAJO 554
      RETURN                                                            HAJO 555
      END                                                               HAJO 556
      SUBROUTINE BSET                                                   HAJO 557
                                                                        HAJO 558
      COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,HAJO 559
     1         XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,       HAJO 560
     2         C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,       HAJO 561
     3         ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,        HAJO 562
     4         TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,    HAJO 563
     5         FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND    HAJO 564
                                                                        HAJO 565
      IF(SUPRES.GT.0.)GO TO 110                                         HAJO 566
      PRINT 11                                                          HAJO 567
   11 FORMAT(1H1,10X,*B MATRIX*,///,*    NO.*,10(11X,*J *    ),/,6X,10(HAJO 568
     1 9X,*B(J)*))                                                      HAJO 569
  110 CONTINUE                                                          HAJO 570
                                                                        HAJO 571
C         1ST ROW                                                       HAJO 572

      DO 1 I=1,201                                                      HAJO 573
      B(I)=0.                                                           HAJO 574
    1 IB(I)=0                                                           HAJO 575
      IB(1)=1                                                           HAJO 576
      IB(2)=1                                                           HAJO 577
                                                                        HAJO 578
      LOC=IQB                                                           HAJO 579
      NO=2                                                              HAJO 580
      IIB(1)=NO                                                         HAJO 581
      CALL ECWR(B,LOC,NO,IPAR)                                          HAJO 582
      LOC=LOC+NO                                                        HAJO 583
      CALL ECWR(IB,LOC,NO,IPAR)                                         HAJO 584
      LOC=LOC+NO                                                        HAJO 585
      IIM1=II-1                                                         HAJO 586
                                                                        HAJO 587
      CALL BPRNT(1)                                                     HAJO 588
                                                                        HAJO 589
C         ROWS 2 THRU II-1                                              HAJO 590
      X1=X(1)                                                           HAJO 591
      XII=X(II)                                                         HAJO 592
      XM=0.5*(X(1)+X(2))                                                HAJO 593
                                                                        HAJO 594
                                                                        HAJO 595
      DO 10 K=2,IIM1                                                    HAJO 596
```

```
      JB=0                                                          HAJO 597
      JIB=1                                                         HAJO 598
      IB(1)=0                                                       HAJO 599
      B(1)=0.                                                       HAJO 600
      XK=X(K)                                                       HAJO 601
      XP=0.5*(X(K)+X(K+1))                                          HAJO 602
                                                                    HAJO 603
C         DIAGONAL ELEMENT                                          HAJO 604
      CALL DCUEJX(XK,CUE)                                           HAJO 605
      A(K,2)=A(K,2)+(XM- XP)*CUE                                    HAJO 606
                                                                    HAJO 607
                                                                    HAJO 608
C         QJ(+N)                                                    HAJO 609
      DO 4 J=1,JJ                                                   HAJO 610
      XKJ=XK+U(J)                                                   HAJO 611
      IF(XKJ.GT.XII)GO TO 5                                         HAJO 612
                                                                    HAJO 613

      DO 2 L=K,II                                                   HAJO 614
      KJ=L                                                          HAJO 615
      IF(X(L).GE.XKJ)GO TO 3                                        HAJO 616
 2    CONTINUE                                                      HAJO 617
      GO TO 5                                                       HAJO 618
                                                                    HAJO 619
 3    CONTINUE                                                      HAJO 620
      CALL CUEJX(XKJ,CUE,J)                                         HAJO 621
      IF(CUE.EQ.0.)GO TO 4                                          HAJO 622
      IF(IB(JIB).EQ.KJ)GO TO 40                                     HAJO 623
                                                                    HAJO 624
      JB=JB+1                                                       HAJO 625
      JIB=JIB+1                                                     HAJO 626
      B(JB)=CUE*(XP- XM)                                            HAJO 627
      IB(JIB)=KJ                                                    HAJO 628
      GO TO 4                                                       HAJO 629
                                                                    HAJO 630
 40   CONTINUE                                                      HAJO 631
      B(JB)=CUE*(XP- XM)+B(JB)                                      HAJO 632
                                                                    HAJO 633
 4    CONTINUE                                                      HAJO 634
                                                                    HAJO 635
 5    CONTINUE                                                      HAJO 636
                                                                    HAJO 637
C         QJ(- N)                                                   HAJO 638
      DO 8 J=1,JJ                                                   HAJO 639
      XKJ=XK- U(J)                                                  HAJO 640
      IF(XKJ.LT.X1)GO TO 9                                          HAJO 641
                                                                    HAJO 642
      KM1=K- 1                                                      HAJO 643
      DO 6 L=1,KM1                                                  HAJO 644
      LL=K- L                                                       HAJO 645
      KJ=LL                                                         HAJO 646
      IF(X(LL).LE.XKJ)GO TO 7                                       HAJO 647
 6    CONTINUE                                                      HAJO 648
```

```
      GO TO 9                                                          HAJO 649
                                                                       HAJO 650
 7    CONTINUE                                                         HAJO 651
      CALL CUEJX(XK ,CUE,- J)                                          HAJO 652
      IF(CUE.EQ.0.)GO TO 8                                             HAJO 653
      IF(IB(JIB).EQ.KJ)GO TO 80                                        HAJO 654

                                                                       HAJO 655
      JB=JB+1                                                          HAJO 656
      JIB=JIB+1                                                        HAJO 657
      B(JB)=CUE*(XP- XM)                                               HAJO 658
      IB(JIB)=KJ                                                       HAJO 659
      GO TO 8                                                          HAJO 660
                                                                       HAJO 661
 80   CONTINUE                                                         HAJO 662
      B(JB)=CUE*(XP- XM)+B(JB)                                         HAJO 663
                                                                       HAJO 664
 8    CONTINUE                                                         HAJO 665
                                                                       HAJO 666
 9    CONTINUE                                                         HAJO 667
      IB(1)=JB                                                         HAJO 668
      NO=JB+1                                                          HAJO 669
      IIB(K)=NO                                                        HAJO 670
      CALL ECWR(B,LOC,NO,IPAR)                                         HAJO 671
      LOC=LOC+NO                                                       HAJO 672
      CALL ECWR(IB,LOC,NO,IPAR)                                        HAJO 673
      LOC=LOC+NO                                                       HAJO 674
                                                                       HAJO 675
      CALL BPRNT(K)                                                    HAJO 676
                                                                       HAJO 677
      XM=XP                                                            HAJO 678
 10   CONTINUE                                                         HAJO 679
                                                                       HAJO 680
C         11th ROW                                                     HAJO 681
      IB(1)=1                                                          HAJO 682
      IB(2)=II                                                         HAJO 683
      B(1)=0.                                                          HAJO 684
      NO=2                                                             HAJO 685
      IIB(II)=NO                                                       HAJO 686
      CALL ECWR(B,LOC,NO,IPAR)                                         HAJO 687
      LOC=LOC+NO                                                       HAJO 688
      CALL ECWR(IB,LOC,NO,IPAR)                                        HAJO 689
                                                                       HAJO 690
      CALL BPRNT(II)                                                   HAJO 691
                                                                       HAJO 692
      IF(SUPRES.GT.0.)RETURN                                           HAJO 693
      PRINT 20                                                         HAJO 694
 20   FORMAT(1H1,5X,*A MATRIX, SETUP, WITH B DIAGONAL ELEMENTS*,//)    HAJO 695

      PRINT23,(I,A(I,1),A(I,2),A(I,3),I=1,II)                         HAJO 696
 23   FORMAT(5X,I10,3(1PE13.4))                                        HAJO 697
      PRINT 14                                                         HAJO 698
 14   FORMAT(1H1)                                                      HAJO 699
                                                                       HAJO 700
```

```
      RETURN                                                            HAJO 701
      END                                                               HAJO 702
      SUBROUTINE CUEX(Z,CUE,N)                                          HAJO 703
                                                                        HAJO 704
      COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,HAJO 705
     1         XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,       HAJO 706
     2         C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,       HAJO 707
     3         ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,        HAJO 708
     4         TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,    HAJO 709
     5         FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND    HAJO 710
                                                                        HAJO 711
      DIMENSION T(20)                                                   HAJO 712
      EQUIVALENCE (T,FIP1)                                              HAJO 713
                                                                        HAJO 714
         ENTRY CUEMX                                                    HAJO 715
      LOC=IQM                                                           HAJO 716
      CALL ECRD(XX,LOC,400,IPAR)                                        HAJO 717
      CUE=AKNINT(Z,KK,IDEGRE,XX,QX,T)                                   HAJO 718
      RETURN                                                            HAJO 719
                                                                        HAJO 720
                                                                        HAJO 721
         ENTRY DCUEJX                                                   HAJO 722
      LOC=IQJ                                                           HAJO 723
                                                                        HAJO 724
1     CUE=0.                                                            HAJO 725
      DO 2 I=1,JJ                                                       HAJO 726
      CALL ECRD(XX,LOC,400,IPAR)                                        HAJO 727
      LOC=LOC+400                                                       HAJO 728
      JQI=JQ(I)                                                         HAJO 729
      IF((Z.LT.XX(1)).O.(Z.GT.XX(JQI)))GO TO 5                          HAJO 730
      ZQP=Z*AKNINT(Z,JQ(I),IDEGRE,XX,QX,T)                              HAJO 731
      GO TO 6                                                           HAJO 732
5     ZQP=0.                                                            HAJO 733
6     CONTINUE                                                          HAJO 734
      ZU=Z+U(I)                                                         HAJO 735
      IF((ZU.LT.XX(1)).O.(ZU.GT.XX(JQI)))GO TO 7                        HAJO 736

      EX=EXP(- (SE*U(I))/(SK*BT))                                       HAJO 737
      ZQM=ZU*EX*AKNINT(ZU,JQ(I),IDEGRE,XX,QX,T)                         HAJO 738
      GO TO 8                                                           HAJO 739
7     ZQM=0.                                                            HAJO 740
8     CONTINUE                                                          HAJO 741
      CUE=CUE+ZQP+ZQM                                                   HAJO 742
2     CONTINUE                                                          HAJO 743
```

```
                                                                      HAJO 744
      CUE=BN*CUE                                                      HAJO 745
      RETURN                                                          HAJO 746
                                                                      HAJO 747
          ENTRY CUEJX                                                 HAJO 748
      K=N-1                                                           HAJO 749
      IF(N.LT.0)K=-N-1                                                HAJO 750
      J=K+1                                                           HAJO 751
      LOC=IQJ+K*400                                                   HAJO 752
      CALL ECRD(XX,LOC,400,IPAR)                                      HAJO 753
      IF(Z.LT.XX(1))GO TO 4                                           HAJO 754
      JQJ=JQ(J)                                                       HAJO 755
      IF(Z.GT.XX(JQJ))GO TO 4                                         HAJO 756
                                                                      HAJO 757
      IF(N.LT.0)GO TO 3                                               HAJO 758
      CUE=Z*BN*AKNINT(Z,JQ(J),IDEGRE,XX,QX,T)                         HAJO 759
      RETURN                                                          HAJO 760
                                                                      HAJO 761
3     EX=EXP(-(SE*U(J))/(SK*BT))                                      HAJO 762
      CUE=Z*BN*EX*AKNINT(Z,JQ(J),IDEGRE,XX,QX,T)                      HAJO 763
      RETURN                                                          HAJO 764
                                                                      HAJO 765
4     CUE=0.                                                          HAJO 766
      RETURN                                                          HAJO 767
                                                                      HAJO 768
      END                                                             HAJO 769
      SUBROUTINE CMBF                                                 HAJO 770
                                                                      HAJO 771
      COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,  HAJO 772
     1         XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,     HAJO 773
     2         C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,     HAJO 774
     3         ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,      HAJO 775
     4         TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,  HAJO 776
     5         FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND  HAJO 777

                                                                      HAJO 778
      DIMENSION D(201)                                                HAJO 779
                                                                      HAJO 780
      EQUIVALENCE (D,IB)                                              HAJO 781
                                                                      HAJO 782
      LOC=IQB                                                         HAJO 783
                                                                      HAJO 784
      DO 3 I=1,II                                                     HAJO 785
      NO=IIB(I)                                                       HAJO 786
      CALL ECRD(B,LOC,NO,IPAR)                                        HAJO 787
      LOC=LOC+NO                                                      HAJO 788
      CALL ECRD(IB,LOC,NO,IPAR)                                       HAJO 789
      LOC=LOC+NO                                                      HAJO 790
      NONZRO=IB(1)                                                    HAJO 791
      IF(NONZRO)5,2,4                                                 HAJO 792
4     CONTINUE                                                        HAJO 793
                                                                      HAJO 794
      DO 1 J=1,NONZRO                                                 HAJO 795
```

```
      L=IB(J+1)                                                          HAJO 796
1     D(J)=FI(L)                                                         HAJO 797
                                                                         HAJO 798
2     CONTINUE                                                           HAJO 799
      FIP1(I)=-DOTPRO(NONZRO,B,1,D,1)                                    HAJO 800
3     CONTINUE                                                           HAJO 801
                                                                         HAJO 802
      FIP1(1)=CONE+FIP1(1)                                               HAJO 803
      FIP1(II)=CII+FIP1(II)                                              HAJO 804
      RETURN                                                             HAJO 805
                                                                         HAJO 806
5     PRINT 6                                                            HAJO 807
6     FORMAT(//,5X,*NEGATIVE IB INDEX*)                                  HAJO 808
      RETURN                                                             HAJO 809
                                                                         HAJO 810
      END                                                                HAJO 811
      SUBROUTINE CNVRG                                                   HAJO 812
                                                                         HAJO 813
      COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB, HAJO 814
     1          XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,       HAJO 815
     2          C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,       HAJO 816
     3          ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,        HAJO 817
     4          TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,    HAJO 818

     5          FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND    HAJO 819
                                                                         HAJO 820
      IEND=-1                                                            HAJO 821
                                                                         HAJO 822
      DO 1 I=1,II                                                        HAJO 823
      III=I                                                              HAJO 824
      FJ=FI(I)                                                           HAJO 825
      FK=FIP1(I)                                                         HAJO 826
      FD=ABS(FJ)                                                         HAJO 827
      IF(ABS(FK).GT.FD)FD=ABS(FK)                                        HAJO 828
      IF(FD.LE.0.)GO TO 1                                                HAJO 829
      IK=I                                                               HAJO 830
      FN=ABS(FK-FJ)                                                      HAJO 831
      TEST=FN/FD                                                         HAJO 832
      IF(TEST.GT.EPS)GO TO 3                                             HAJO 833
1     CONTINUE                                                           HAJO 834
                                                                         HAJO 835
20    CONTINUE                                                           HAJO 836
      CALL SECOND(TIME)                                                  HAJO 837
      PRINT 2, EPS,IT,II,TIME                                            HAJO 838
2     FORMAT(//,2X,*CNVRGNCE CRITERIA OF EPS=*,E13.4,* MET ON ITERATION* HAJO 839
     1 ,I4,*,  II =*,I5,*,*,F10.1,* SECONDS*,/)                          HAJO 840
      IEND=0                                                             HAJO 841
      RETURN                                                             HAJO 842
                                                                         HAJO 843
21    CONTINUE                                                           HAJO 844
      II=III                                                             HAJO 845
      GO TO 20                                                           HAJO 846
                                                                         HAJO 847
3     CONTINUE                                                           HAJO 848
```

```
      IF(FIP1(III).LT.FSTOP)GO TO 21                                    HAJO 849
      IF(IT.GE.ITMAX)GO TO 5                                            HAJO 850
      IF(TIME.GE.TMAX)GO TO 7                                           HAJO 851
      IF(ITPRNT.LE.0)GO TO 44                                           HAJO 852
      PRINT 4,IT,IK                                                     HAJO 853
4     FORMAT(5X,*FAILED TO CONVERGE ON ITERATION*,I4,* AT II=*,I4)      HAJO 854
                                                                        HAJO 855
      I1=1                                                              HAJO 856
      I4=II/4                                                           HAJO 857
      I2=I4+I4                                                          HAJO 858
      I3=I2+I4                                                          HAJO 859

      PRINT 400,I1,I4,I2,I3,II                                          HAJO 860
400   FORMAT(55X,5(*  I=*,I4,4X))                                       HAJO 861
      PRINT 401,FIP1(  1),FIP1( I4),FIP1( I2),FIP1( I3),FIP1( II)       HAJO 862
401   FORMAT(47X,*FIP1(I)=*,5(1PE12.4),/)                               HAJO 863
      IF(MOD(IT,ITPRNT).NE.0)GO TO 44                                   HAJO 864
      CALL FPRNT(1)                                                     HAJO 865
      PRINT 43                                                          HAJO 866
43    FORMAT(1H1)                                                       HAJO 867
44    IF(MOD(IT,ITPLOT).NE.0)RETURN                                     HAJO 868
      IF(ITPLOT.LE.0)RETURN                                             HAJO 869
      ENCODE(42,45,TITL)IT,FH2,FHE,FN2,FCO2                             HAJO 870
45    FORMAT(* X, ITERATION*,I3,*, H2/HE/N2/CO2 *,3(2PF2.0,*/*),F2.0)   HAJO 871
      REWIND 4                                                          HAJO 872
      BUFFER OUT(4,1)(FIP1(1),FIP1(4000))                               HAJO 873
46    IF(UNIT,4)46,47,47,47                                             HAJO 874
47    CONTINUE                                                          HAJO 875
      IIM1=II- 1                                                        HAJO 876
      DO 48 I=1,IIM1                                                    HAJO 877
      FIP1(I)=ALOG10(FIP1(I))                                           HAJO 878
48    CONTINUE                                                          HAJO 879
      FIP1(II)=FIP1(II- 1)                                              HAJO 880
      CALL PLOJB(X,FIP1,II,1,0,0,0.,10.,10.,NAME,80,TITL,42,            HAJO 881
     1           14HLOG 10 OF FIP1,14)                                  HAJO 882
      REWIND 4                                                          HAJO 883
      BUFFER  IN(4,1)(FIP1(1),FIP1(4000))                               HAJO 884
49    IF(UNIT,4)49,50,50,50                                             HAJO 885
50    CONTINUE                                                          HAJO 886
      RETURN                                                            HAJO 887
                                                                        HAJO 888
5     PRINT 6, IT,IK                                                    HAJO 889
6     FORMAT(//,2X,*FAILED TO CONVERGE IN*,I4,* ITERATIONS AT II=*,I4,/) HAJO 890
      IEND=+1                                                           HAJO 891
      RETURN                                                            HAJO 892
                                                                        HAJO 893
7     PRINT 8, TIME,IT                                                  HAJO 894
8     FORMAT(//,2X,*FAILED TO CNVRG IN*,F7.1,* SECONDS AFTER*,I4,* ITERA HAJO 895
     A TIONS*,/)                                                        HAJO 896
      IEND=+2                                                           HAJO 897
      RETURN                                                            HAJO 898
                                                                        HAJO 899
                                                                        HAJO 900

      END                                                               HAJO 901
```

```
      SUBROUTINE PRNT(IROW)                                              HAJO 902
                                                                         HAJO 903
      COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB, HAJO 904
     1         XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,        HAJO 905
     2         C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,        HAJO 906
     3         ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,         HAJO 907
     4         TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,     HAJO 908
     5         FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND     HAJO 909
                                                                         HAJO 910
          ENTRY BPRNT                                                    HAJO 911
      IF(SUPRES.GT.0.)RETURN                                             HAJO 912
      PRINT 120, IB(1)                                                   HAJO 913
  120 FORMAT(/,2H+ ,I4)                                                  HAJO 914
      LIN=IB(1)/10+1                                                     HAJO 915
      IF(MOD(IB(1),10).EQ.0)LIN=LIN- 1                                   HAJO 916
      MB=1                                                               HAJO 917
      M=2                                                                HAJO 918
      N=11                                                               HAJO 919
      NN=IB(1)+1                                                         HAJO 920
      DO 139 I=1,LIN                                                     HAJO 921
      IF(N.GT.NN)N=NN                                                    HAJO 922
      NB=N- 1                                                            HAJO 923
      PRINT 12,(IB(L),L=M,N)                                             HAJO 924
   12 FORMAT(6X,I6,9I13)                                                 HAJO 925
      PRINT 121,IROW                                                     HAJO 926
  121 FORMAT(2H+ ,I4)                                                    HAJO 927
      PRINT 13,( B(L),L=MB,NB)                                           HAJO 928
   13 FORMAT(6X,10(1PE13.4),/)                                           HAJO 929
      M=M+10                                                             HAJO 930
      MB=M- 1                                                            HAJO 931
      N=N+10                                                             HAJO 932
  139 CONTINUE                                                           HAJO 933
      RETURN                                                             HAJO 934
          ENTRY FPRNT                                                    HAJO 935
      NV=II/10+1                                                         HAJO 936
      NL=NV/4                                                            HAJO 937
      IF(NV.GT.(NL*4))NL=NL+1                                            HAJO 938
      IF(IROW.LT.1)GO TO 10                                              HAJO 939
      PRINT 6                                                            HAJO 940
    6 FORMAT(1H1)                                                        HAJO 941

      PRINT 1, IT                                                        HAJO 942
    1 FORMAT(*  RESULTS AFTER ITERATION *,I4,/,4(*          I        X(I) HAJO 943
     1       F(I)*),/)                                                   HAJO 944
   10 CONTINUE                                                           HAJO 945
      NV=NL*10                                                           HAJO 946
      DO 4 M=1,NL                                                        HAJO 947
      I=(M- 1)*10                                                        HAJO 948
      IF(I.LE.0)I=1                                                      HAJO 949
      J=10*(M- 1+NL)                                                     HAJO 950
      K=J+NV                                                             HAJO 951
      L=K+NV                                                             HAJO 952
      IF(IROW.LT.1)GO TO 14                                              HAJO 953
      IF(L.GT.II)GO TO 3                                                 HAJO 954
```

```
      PRINT 2,I,X(I),FIP1(I),J,X(J),FIP1(J),K,X(K),FIP1(K),L,X(L),FIP1(L      HAJO 955
     1 )                                                                      HAJO 956
2     FORMAT(4(1X,I8,1PE12.3,E12.3))                                          HAJO 957
      GO TO 4                                                                 HAJO 958
3     PRINT 2,I,X(I),FIP1(I),J,X(J),FIP1(J),K,X(K),FIP1(K)                   HAJO 959
      GO TO 4                                                                 HAJO 960
14    IF(IROW.LT.0)GO TO 16                                                   HAJO 961
      IF(L.GT.II)GO TO 15                                                     HAJO 962
      PRINT 2,I,X(I),FI(I),J,X(J),FI(J),K,X(K),FI(K),L,X(L),FI(L)            HAJO 963
      GO TO 4                                                                 HAJO 964
15    PRINT 2,I,X(I),FI(I),J,X(J),FI(J),K,X(K),FI(K)                         HAJO 965
      GO TO 4                                                                 HAJO 966
16    IF(L.GT.II)GO TO 17                                                     HAJO 967
      PRINT 2,I,X(I),A(I),J,X(J),A(J),K,X(K),A(K),L,X(L),A(L)                 HAJO 968
      GO TO 4                                                                 HAJO 969
17    PRINT 2,I,X(I),A(I),J,X(J),A(J),K,X(K),A(K)                             HAJO 970
4     CONTINUE                                                                HAJO 971
      RETURN                                                                  HAJO 972
      END                                                                     HAJO 973
      SUBROUTINE INT                                                          HAJO 974
                                                                              HAJO 975
      COMMON    P(4000),G(4000),D(4000),Z( 4402),F(4000),U(200),IQB,          HAJO 976
     1          XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,            HAJO 977
     2          C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,            HAJO 978
     3          ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,             HAJO 979
     4          TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,         HAJO 980
     5          FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND         HAJO 981
                                                                              HAJO 982

      DIMENSION R(4000),GP(1),GM(1)                                           HAJO 983
      EQUIVALENCE (GP,D),(GM,F)                                               HAJO 984
                                                                              HAJO 985
      REAL LHS                                                                HAJO 986
                                                                              HAJO 987
      FA=SE/(SK*BT)                                                           HAJO 988
      REWIND 4                                                                HAJO 989
      BUFFER OUT(4,1)(X(1),X(4000))                                           HAJO 990
9000  IF(UNIT,4)9000,9001,9001,9001                                           HAJO 991
9001  CONTINUE                                                                HAJO 992
      DO 9002 I=1,II                                                          HAJO 993
      R(I)=FA*X(I)                                                            HAJO 994
      X(I)=R(I)                                                               HAJO 995
9002  CONTINUE                                                                HAJO 996
      DO 1 I=1,II                                                             HAJO 997
      G(I)=SQRT(R(I))*F(I)                                                    HAJO 998
1     CONTINUE                                                                HAJO 999
                                                                              HAJO1000
      CALL SIMPUN(R,G,II,1,Z)                                                 HAJO1001
      C=Z(II)                                                                 HAJO1002
                                                                              HAJO1003
      DO 2 I=1,II                                                             HAJO1004
      P(I)=F(I)/C                                                             HAJO1005
      IF(P(I).LE.0.)P(I)=P(I- 1)                                              HAJO1006
      D(I)=ALOG10(P(I))                                                       HAJO1007
```

```
2     CONTINUE                                                          HAJO1008
                                                                        HAJO1009
      PRINT 3, XII,C                                                    HAJO1010
3     FORMAT(1H1,5X,*P=F/C, C=INTEGRAL(0 TO*,F5.1,*) F SQRT(Z) =*,1PE12. HAJO1011
     1 4,//,5X,*     Z              P*,/)                               HAJO1012
      CALL FPRNT(- 1)                                                   HAJO1013
      ENCODE(42, 4,TITL)IT,FH2,FHE,FN2,FCO2                             HAJO1014
4     FORMAT(* X, ITERATION*,I3,*, H2/HE/N2/CO2 *,3(2PF2.0,*/*),F2.0)   HAJO1015
      CALL PLOJB(X,D,II,1,0,0,0.,10.,10.,NAME,80,TITL,42,1HP,1)         HAJO1016
      REWIND 4                                                          HAJO1017
      BUFFER IN (4,1)(X(1),X(4000))                                     HAJO1018
9003  IF(UNIT,4)9003,9004,9004,9004                                     HAJO1019
9004  CONTINUE                                                          HAJO1020
                                                                        HAJO1021
      IIM1=II- 1                                                        HAJO1022
      DO 5 I=2,IIM1                                                     HAJO1023

      CALL CUEMX(X(I),CUE)                                              HAJO1024
      G(I)=R(I)*P(I)*ALOG(P(I+1)/P(I- 1))/(CUE*(R(I+1)- R(I- 1)))       HAJO1025
5     CONTINUE                                                          HAJO1026
                                                                        HAJO1027
      G(1)=0.                                                           HAJO1028
      G(II)=0.                                                          HAJO1029
                                                                        HAJO1030
      CALL SIMPUN(R,G,II,1,Z)                                           HAJO1031
      C=Z(II)                                                           HAJO1032
      E=SE                                                              HAJO1033
      AMU=E*SQRT(2./(SK*BT*SM))/(- 3.*BN) *C                            HAJO1034
                                                                        HAJO1034
      DO 6 I=1,II                                                       HAJO1036
      CALL CUEMX(X(I),CUE)                                              HAJO1037
      G(I)=(R(I)*P(I))/CUE                                              HAJO1038
6     CONTINUE                                                          HAJO1039
                                                                        HAJO1040
      CALL SIMPUN(R,G,II,1,Z)                                           HAJO1041
      C=Z(II)                                                           HAJO1042
      DMU=SQRT(2.*SK*BT/SM)/(3.*BN*AMU) *C                              HAJO1043
                                                                        HAJO1044
      EBN=(BE/BN)*1.E+17                                                HAJO1045
      EMU=BE*AMU                                                        HAJO1046
      OUT(1,NNNN)=EBN                                                   HAJO1047
      OUT(2,NNNN)=EMU                                                   HAJO1048
      OUT(3,NNNN)=DMU                                                   HAJO1049
      OUT(7,NNNN)=DMU*AMU*AMU                                           HAJO1050
      OUT(8,NNNN)=BN*AMU*1.E- 16                                        HAJO1051
                                                                        HAJO1052
                                                                        HAJO1053
      FA=1./(SK*BT)**1.5                                                HAJO1054
      DO 100 I=1,II                                                     HAJO1055
      R(I)=SE*X(I)                                                      HAJO1056
100   P(I)=FA*P(I)                                                      HAJO1057
      FF=SK*BT                                                          HAJO1058
      DO 11 I=2,IIM1                                                    HAJO1059
      CALL CUEMX(X(I),CUE)                                              HAJO1060
```

```
      G(I)=R(I)*R(I)*CUE*(P(I)+FF*ALOG(P(I+1)/P(I-1)))                    HAJO1061
11    CONTINUE                                                           HAJO1062
                                                                         HAJO1063
      G(1)=0.                                                            HAJO1064

      G(II)=0.                                                           HAJO1065
      CALL SIMPUN(R,G,II,1,Z)                                            HAJO1066
      C0=Z(II)                                                           HAJO1067
                                                                         HAJO1068
      SUMA=0.                                                            HAJO1069
      UJCJ=0.                                                            HAJO1070
      REWIND 4                                                           HAJO1071
      BUFFER OUT(4,1)(D(1),D(4000))                                      HAJO1072
9005  IF(UNIT,4)9005,9006,9006,9006                                      HAJO1073
9006  BUFFER OUT(4,1)(F(1),F(4000))                                      HAJO1074
9007  IF(UNIT,4)9007,9008,9008,9008                                      HAJO1075
9008  CONTINUE                                                           HAJO1076
      DO 13 J=1,JJ                                                       HAJO1077
      LOC=IQJ+(J-1)*400                                                  HAJO1078
      CALL ECRD(XX,LOC,400,IPAR)                                         HAJO1079
      JQJ=JQ(J)                                                          HAJO1080
      ALFAJ=EXP(-SE*U(J)/(SK*BT))                                        HAJO1081
                                                                         HAJO1082
      DO 12 I=1,II                                                       HAJO1083
      XK=X(I)                                                            HAJO1084
      XKUJ=XK+U(J)                                                       HAJO1085
      CUE1=AKNINT(XK,JQJ,IDEGRE,XX,QX,Z)                                 HAJO1086
      CUE2=AKNINT(XKUJ,JQJ,IDEGRE,XX,QX,Z)                               HAJO1087
      IF( XK.LT.XX(1).O. XK.GT.XX(JQJ))CUE1=0.                           HAJO1088
      IF(XKUJ.LT.XX(1).O.XKUJ.GT.XX(JQJ))CUE2=0.                         HAJO1089
      GP(I)=P(I)*R(I)*CUE1                                               HAJO1090
      GM(I)=-P(I)*R(I)*U(J)*ALFAJ*CUE2                                   HAJO1091
      G(I)=P(I)*(R(I)*CUE1-ALFAJ*R(I)*U(J)*CUE2)                         HAJO1092
12    CONTINUE                                                           HAJO1093
                                                                         HAJO1094
      CALL SIMPUN(R,GP,II,1,Z)                                           HAJO1095
      VP=SQRT(2./SM)*Z(II)*1.E+16                                        HAJO1096
      CALL SIMPUN(R,GM,II,1,Z)                                           HAJO1097
      VM=SQRT(2./SM)*Z(II)*1.E+16                                        HAJO1098
      CALL SIMPUN(R,G,II,1,Z)                                            HAJO1099
      VN=SQRT(2./SM)*Z(II)*1.E+16                                        HAJO1100
      OUT(J+8,NNNN+15)=VP                                                HAJO1101
      OUT(J+8,NNNN+30)=VM                                                HAJO1102
      OUT(J+8,NNNN)=VN                                                   HAJO1103
      SUMA=SUMA+VN                                                       HAJO1104
      UJCJ=UJCJ+U(J)*Z(II)                                               HAJO1105

13    CONTINUE                                                           HAJO1106
      OUT(6,NNNN)=SUMA                                                   HAJO1107
      REWIND 4                                                           HAJO1108
      BUFFER IN(4,1)(D(1),D(4000))                                       HAJO1109
9009  IF(UNIT,4)9009,9010,9010,9010                                      HAJO1110
9010  BUFFER IN(4,1)(F(1),F(4000))                                       HAJO1111
9011  IF(UNIT,4)9011,9012,9012,9012                                      HAJO1112
```

```
9012  CONTINUE                                                          HAJO1113
                                                                        HAJO1114
      UJCJ=SE*UJCJ                                                      HAJO1115
      RHS=BN*SQRT(2./SM)*(2.*SM*C0/BM+UJCJ)                             HAJO1116
      LHS=SE*BE*BE*AMU                                                  HAJO1117
      OUT(4,NNNN)=LHS*1.E-7                                             HAJO1118
      OUT(5,NNNN)=RHS*1.E-7                                             HAJO1119
      II=IISAV                                                          HAJO1120
      RETURN                                                            HAJO1121
                                                                        HAJO1122
                                                                        HAJO1123
          ENTRY SUMARY                                                  HAJO1124
      PRINT 699                                                         HAJO1125
698   FORMAT(/)                                                         HAJO1126
699   FORMAT(1H1)                                                       HAJO1127
      PRINT 700, FH2,FHE,FN2,FCO2,NNNN                                  HAJO1128
      PUNCH 700, FH2,FHE,FN2,FCO2,NNNN                                  HAJO1129
700   FORMAT(1X,*HANCOCK-JONES CODE MIXING H2/HE/N2/CO2  *,3(2PF2.0,*/*) HAJO1130
     1 ,F2.0,*,*,I3,* RUNS*)                                            HAJO1131
      PRINT 698                                                         HAJO1132
      PRINT 702                                                         HAJO1133
702   FORMAT(* FRACTIONS H2/HE/N2/CO2*)                                 HAJO1134
      PRINT 703, FH2,FHE,FN2,FCO2                                       HAJO1135
      PUNCH 703, FH2,FHE,FN2,FCO2                                       HAJO1136
```

```
703   FORMAT(1P6E13.4)                                                    HAJO1137
      NN1=1 $ NN2=NNNN                                                    HAJO1138
      IF(NN2.GT.6)NN2=6                                                   HAJO1139
704   CONTINUE                                                            HAJO1140
      PRINT 701,(N,N=NN1,NN2)                                             HAJO1141
701   FORMAT(//,* RUN NO.*,6(I3,10X))                                     HAJO1142
      PRINT 698                                                           HAJO1143
      PRINT 705                                                           HAJO1144
705   FORMAT(* E/N VOLT-CM SQ., TOWNSENDS (X E-17)*)                      HAJO1145
      PRINT 703, (OUT(1,N),N=NN1,NN2)                                     HAJO1146

      PUNCH 703, (OUT(1,N),N=NN1,NN2)                                     HAJO1147
      PRINT 706                                                           HAJO1148
706   FORMAT(* DRIFT VELOCITY CM/SEC, E MU*)                              HAJO1149
      PRINT 703, (OUT(2,N),N=NN1,NN2)                                     HAJO1150
      PUNCH 703, (OUT(2,N),N=NN1,NN2)                                     HAJO1151
      PRINT 707                                                           HAJO1152
707   FORMAT(* CHARACTERISTIC ENERGY VOLT, D/MU*)                         HAJO1153
      PRINT 703, (OUT(3,N),N=NN1,NN2)                                     HAJO1154
      PUNCH 703, (OUT(3,N),N=NN1,NN2)                                     HAJO1155
      PRINT 708                                                           HAJO1156
708   FORMAT(* POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LHS*)   HAJO1157
      PRINT 703, (OUT(4,N),N=NN1,NN2)                                     HAJO1158
      PUNCH 703, (OUT(4,N),N=NN1,NN2)                                     HAJO1159
      PRINT 709                                                           HAJO1160
709   FORMAT(* POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS*)    HAJO1161
      PRINT 703, (OUT(5,N),N=NN1,NN2)                                     HAJO1162
      PUNCH 703, (OUT(5,N),N=NN1,NN2)                                     HAJO1163
      PRINT 710                                                           HAJO1164
710   FORMAT(* TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA*)  HAJO1165
      PRINT 703, (OUT(6,N),N=NN1,NN2)                                     HAJO1166
      PUNCH 703, (OUT(6,N),N=NN1,NN2)                                     HAJO1167
      PRINT 711                                                           HAJO1168
711   FORMAT(* DN DIFF CONST X MOL/CC, UNITS 10E16 MOL*)                  HAJO1169
      PRINT 703, (OUT(7,N),N=NN1,NN2)                                     HAJO1170
      PUNCH 703, (OUT(7,N),N=NN1,NN2)                                     HAJO1171
      PRINT 712                                                           HAJO1172
712   FORMAT(* MUN MOBILITY X MOL/CC, UNITS 10E16 MOL*)                   HAJO1173
      PRINT 703, (OUT(8,N),N=NN1,NN2)                                     HAJO1174
      PUNCH 703, (OUT(8,N),N=NN1,NN2)                                     HAJO1175
      PRINT 698                                                           HAJO1176
      PRINT 713, JJ                                                       HAJO1177
      PUNCH 713, JJ                                                       HAJO1178
713   FORMAT(* COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL,  J=*,I3)   HAJO1179
      PRINT 714, (N,N=NN1,NN2)                                            HAJO1180
714   FORMAT(/,* LEVEL          RUN NO.*,I2,4X,5(7X,I2,4X))               HAJO1181
      DO 718 I=1,JJ                                                       HAJO1182
      K=I+8                                                               HAJO1183
      NN3=NN1+15 $ NN4=NN2+15                                             HAJO1184
      NN5=NN1+30 $ NN6=NN2+30                                             HAJO1185
      PRINT 715, I,(OUT(K,N),N=NN3,NN4)                                   HAJO1186
715   FORMAT(/,1X,I3,*   1ST KIND*,1PE13.4,5E13.4)                        HAJO1187

      PRINT 716, (OUT(K,N),N=NN5,NN6)                                     HAJO1188
```

```
716   FORMAT(4X,*   2ND KIND*,1PE13.4,5E13.4)                          HAJO1189
      PUNCH 703, (OUT(K,N),N=NN3,NN4)                                  HAJO1190
      PUNCH 703, (OUT(K,N),N=NN5,NN6)                                  HAJO1191
718   CONTINUE                                                         HAJO1192
      PRINT 699                                                        HAJO1193
      IF(NN2.GE.NNNN)RETURN                                            HAJO1194
      NN1=NN1+6                                                        HAJO1195
      NN2=NN2+6                                                        HAJO1196
      IF(NN2.GT.NNNN)NN2=NNNN                                          HAJO1197
      GO TO 704                                                        HAJO1198
      END                                                              HAJO1199
      SUBROUTINE DUMPIC                                                HAJO1200
                                                                       HAJO1201
      COMMON    A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,  HAJO1202
     1         XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,      HAJO1203
     2         C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,      HAJO1204
     3         ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,       HAJO1205
     4         TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,   HAJO1206
     5         FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND   HAJO1207
                                                                       HAJO1208
      DIMENSION NMLS(8)                                                HAJO1209
      DIMENSION INARY(2)                                               HAJO1210
                                                                       HAJO1211
          ENTRY CDUMP                                                  HAJO1212
      INARY(1)=1                                                       HAJO1213
      INARY(2)=4LTAPE                                                  HAJO1214
      ITAPE=0                                                          HAJO1215
      CALL AFSREL(5LFSET3,INARY,ITAPE,0)                               HAJO1216
      REWIND 3                                                         HAJO1217
                                                                       HAJO1218
      BUFFER OUT(3,1)(A(1),IEND)                                       HAJO1219
1     IF(UNIT,3)1,2,2,2                                                HAJO1220
                                                                       HAJO1221
2     LOC=0 $ JJP1=JJ+1                                                HAJO1222
      DO 4 I=1,JJP1                                                    HAJO1223
      CALL ECRD(B,LOC,400,IPAR)                                        HAJO1224
      BUFFER OUT(3,1)(B(1),B(400))                                     HAJO1225
3     IF(UNIT,3)3,4,4,4                                                HAJO1226
4     LOC=LOC+400                                                      HAJO1227
                                                                       HAJO1228

      DO 7 I=1,II                                                      HAJO1229
      LNTH=2*IIB(I)                                                    HAJO1230
      CALL ECRD(B,LOC,LNTH,IPAR)                                       HAJO1231
      BUFFER OUT(3,1)(B(1),B(LNTH))                                    HAJO1232
5     IF(UNIT,3)5,6,6,6                                                HAJO1233
6     LOC=LOC+LNTH                                                     HAJO1234
7     CONTINUE                                                         HAJO1235
                                                                       HAJO1236
8     READ 9, (NMLS(I),I=1,8)                                          HAJO1237
9     FORMAT(8A10)                                                     HAJO1238
      IF(EOF,1)12,10                                                   HAJO1239
10    BUFFER OUT(3,1)(NMLS(1),NMLS(8))                                 HAJO1240
11    IF(UNIT,3)11,8,8,8                                               HAJO1241
```

```
                                                                      HAJO1242
 12     END FILE 3                                                    HAJO1243
        REWIND 3                                                      HAJO1244
        CALL SECOND(TIME)                                             HAJO1245
        PRINT 13, NNNN,IT,IEND,TIME                                   HAJO1246
 13     FORMAT(////,*       DUMP COMPLETED ON TAPE 3, RUN*,I4,*, AFTER ITER  HAJO1247
     1 ATION*,I5,*,   IEND =*,I2,*,*,F10.1,* SECONDS*)                HAJO1248
        RETURN                                                        HAJO1249
                                                                      HAJO1250
                                                                      HAJO1251
           ENTRY RESTRT                                               HAJO1252
        REWIND 3                                                      HAJO1253
                                                                      HAJO1254
        BUFFER IN(3,1)(A(1),IEND)                                     HAJO1255
 101    IF(UNIT,3)101,102,102,102                                     HAJO1256
                                                                      HAJO1257
 102    LOC=0 $ JJP1=JJ+1                                             HAJO1258
        DO 105 I=1,JJP1                                               HAJO1259
        BUFFER IN(3,1)(B(1),B(400))                                   HAJO1260
 103    IF(UNIT,3)103,104,104,104                                     HAJO1261
 104    CALL ECWR(B,LOC,400,IPAR)                                     HAJO1262
 105    LOC=LOC+400                                                   HAJO1263
                                                                      HAJO1264
        DO 108 I=1,II                                                 HAJO1265
        LNTH=2*IIB(I)                                                 HAJO1266
        BUFFER IN(3,1)(B(1),B(LNTH))                                  HAJO1267
 106    IF(UNIT,3)106,107,107,107                                     HAJO1268
 107    CALL ECWR(B,LOC,LNTH,IPAR)                                    HAJO1269

 108    LOC=LOC+LNTH                                                  HAJO1270
                                                                      HAJO1271
        REWIND 1                                                      HAJO1272
 109    BUFFER IN(3,1)(NMLS(1),NMLS(8))                               HAJO1273
 110    IF(UNIT,3)110,111,112,111                                     HAJO1274
 111    WRITE(1,9)(NMLS(I),I=1,8)                                     HAJO1275
        GO TO 109                                                     HAJO1276
                                                                      HAJO1277
 112    END FILE 1                                                    HAJO1278
        REWIND 1                                                      HAJO1279
        CALL SECOND(TIME)                                             HAJO1280
        PRINT 113, NNNN,IT,IEND,TIME                                  HAJO1281
 113    FORMAT(1H1,*       PICKUP COMPLETED FROM TAPE 3, RUN*,I4,*, AFTER IT  HAJO1282
     1 ERATION*,I5,*,   IEND =*,I2,*,*,F10.1,* SECONDS*)              HAJO1283
        PICKUP=0.                                                     HAJO1284
        RETURN                                                        HAJO1285
                                                                      HAJO1286
        END                                                           HAJO1287
        SUBROUTINE SIMPUN(XX,FX,NX,I,AX)                              HAJO1288
C         QUADRATIC INTEGRATION OVER UNEVENLY SPACED POINTS           HAJO1289
C                                                                     HAJO1290
C         XX IS STRICTLY INCREASING SINGLY DIMENSIONED ARRAY OF ABSCISSAS  HAJO1291
C              AT WHICH THE INTEGRAND WAS EVALUATED                   HAJO1292
C         FX  ARRAY OF INTEGRAND VALUES WHICH WERE EVALUATED AT XX(I),  HAJO1293
C              I=1,2,...,NX                                           HAJO1294
```

```
C       NX NUMBER OF POINTS AT WHICH THE INTEGRAND WAS EVALUATED      HAJO1295
C       L INTEGER WHICH DETERMINES THE DIRECTION OF INTEGRATION       HAJO1296
C            IF L IS NON-NEGATIVE INTEGRATION IS FORWARD              HAJO1297
C            IF L IS NEGATIVE, INTEGRATION IS BACKWARDS               HAJO1298
C            THIS IS SOMETIMES USEFUL FOR FUNCTIONS WHICH ARE SMALL WIT HAJO1299
C            RESPECT TO THE INTEGRAL ON THE LEFT PORTION OF THE INTERVAHAJO1300
C       AX ARRAY WHICH CONTAINS VALUES OF INTEGRAL ON SUBINTERVALS    HAJO1301
C            L .GE. 0   AX(I) CONTAINS APPROX TO INTEGRAL WITH LOWER  HAJO1302
C            LIMIT XX(1) AND UPPER LIMIT XX(I)                        HAJO1303
C           L .LT. 0  AX(I) CONTAINS APPROX TO INTEGRAL WITH LOWER    HAJO1304
C            LIMIT XX(I) AND UPPER LIMIT XX(NX)                       HAJO1305
C                                                                     HAJO1306
      DIMENSION XX(2),FX(2),AX(2)                                     HAJO1307
      IF (I.LT.0) GO TO 30                                            HAJO1308
      AX(1)=0.0                                                       HAJO1309
      DO 10 IX=2,NX,2                                                 HAJO1310

      IXM1=IX- 1                                                      HAJO1311
      IXP1=IX+1                                                       HAJO1312
      D1=XX(IX)- XX(IXM1)                                             HAJO1313
      AX(IX)=AX(IXM1)+D1/2.0*(FX(IX)+FX(IXM1))                        HAJO1314
      IF (NX.EQ.IX) GO TO 20                                          HAJO1315
      D2=XX(IXP1)- XX(IXM1)                                           HAJO1316
      D3=D2/D1                                                        HAJO1317
      A2=D3/6.0*D2**2/(XX(IXP1)- XX(IX))                              HAJO1318
      A3=D2/2.0- A2/D3                                                HAJO1319
   10 AX(IXP1)=AX(IXM1)+(D2- A2- A3)*FX(IXM1)+A2*FX(IX)+A3* FX(IXP1)  HAJO1320
   20 RETURN                                                          HAJO1321
   30 AX(NX)=0.0                                                      HAJO1322
      DO 40 IX=2,NX,2                                                 HAJO1323
      IC=NX+1- IX                                                     HAJO1324
      ICM1=IC- 1                                                      HAJO1325
      ICP1=IC+1                                                       HAJO1326
      D1=XX(ICP1)- XX(IC)                                             HAJO1327
      AX(IC)=AX(ICP1)+D1/2.0*(FX(ICP1)+FX(IC))                        HAJO1328
      IF (NX.EQ.IX) GO TO 20                                          HAJO1329
      D2=XX(ICP1)- XX(ICM1)                                           HAJO1330
      D3=D2/(XX(IC)- XX(ICM1))                                        HAJO1331
      A2=D3/6.0*D2**2/D1                                              HAJO1332
      A3=D2/2.0- A2/D3                                                HAJO1333
   40 AX(ICM1)=AX(ICP1)+(D2- A2- A3)*FX(ICM1)+A2*FX(IC)+ A3*FX(ICP1)  HAJO1334
      RETURN                                                          HAJO1335
          END                                                         HAJO1336
              IDENT  FACTTD                                           HAJO1337
              ENTRY  FACTTD                                           HAJO1338
              ENTRY  SOLTD1                                           HAJO1339
              ENTRY  SOLTDM                                           HAJO1340
              VFD    42/0HFACTTD,18/3                                 HAJO1341
FACTTD        DATA   0                  (N,A,IA)                      HAJO1342
              SA2    B3                 IA                            HAJO1343
              SA5    ONE                                              HAJO1344
              SA1    B2+X2              B(1)                          HAJO1345
              FX6    X5/X1              1./U(1)                       HAJO1346
              SA4    B2+1               A(2)                          HAJO1347
```

```
        SB6     X2              IA                      HAJO1348
        SA2     B1              N                       HAJO1349
        FX7     X6*X4           L(1)                    HAJO1350
        SB7     1                                       HAJO1351

        SA3     A1+B6           C(1)                    HAJO1352
        SB5     X2              N                       HAJO1353
        SA6     A1              1./U(1)                 HAJO1354
FACT    SA1     A1+B7           B(I)                    HAJO1355
        FX0     X7*X3           L(I)*C(I-1)             HAJO1356
        SA4     A4+B7           A(I+1)                  HAJO1357
        FX2     X1-X0           B(I)- L(I)*C(I-1)       HAJO1358
        SA3     A3+B7           C(I)                    HAJO1359
        NX1     X2                                      HAJO1360
        FX6     X5/X1           1./U(I)                 HAJO1361
        SB5     B5-B7                                   HAJO1362
        SA7     A4-B7           L(I)                    HAJO1363
        EQ      B5,B7,SKIP                              HAJO1364
        FX7     X6*X4           L(I+1)                  HAJO1365
SKIP    SA6     A6+B7           1./U(I)                 HAJO1366
        GT      B5,B7,FACT                              HAJO1367
        EQ      FACTTD                                  HAJO1368
ONE     DATA    1.                                      HAJO1369
      VFD       42/0HSOLTD1,18/5                        HAJO1370
SOLTD1  DATA    0               (N,A,IA,Y,LY)           HAJO1371
        SA4     B4              Y(1)                    HAJO1372
        SA5     B5                                      HAJO1373
        BX7     X4              Z(1)                    HAJO1374
        SA1     B1                                      HAJO1375
        SB7     1                                       HAJO1376
        SA2     B2+B7           L(2)                    HAJO1377
        SB5     X5              LY                      HAJO1378
        SB6     X1              N                       HAJO1379
        SA4     A4+B5           Y(2)                    HAJO1380
        SB4     2                                       HAJO1381
FWD1    FX0     X7*X2           L(I)*Z(I-1)             HAJO1382
        SA2     A2+B7           L(I+1)                  HAJO1383
        FX5     X4-X0           Y(I)- L(I)* Z(I-1)      HAJO1384
        SA4     A4+B5           Y(I+1)                  HAJO1385
        NX6     X5              Z(I)                    HAJO1386
        FX1     X6*X2           L(I+1)*Z(I)             HAJO1387
        SA2     A2+B7           L(I+2)                  HAJO1388
        FX3     X4-X1           Y(I+1)- L(I+1)*Z(I)     HAJO1389
        SX0     A4-B5                                   HAJO1390
        SA4     A4+B5           Y(I+2)                  HAJO1391
        NX7     X3              Z(I+1)                  HAJO1392

        SA6     X0              Z(I)                    HAJO1393
        SB6     B6-B4                                   HAJO1394
        SA7     A4-B5           Z(I+1)                  HAJO1395
        GT      B6,B4,FWD1                              HAJO1396
        EQ      B6,B7,ODD                               HAJO1397
        FX0     X7*X2                                   HAJO1398
        SA2     A2+B7           SET A2 TO L(N+1)        HAJO1399
```

```
                FX5     X4-X0                                          HAJO1400
                BX6     X7              Z(N-1)                         HAJO1401
                NX7     X5              Z(N)                           HAJO1402
                SA7     A4              SET A7 TO ADDR( Y(N))          HAJO1403
ODD             SA3     B3              IA                             HAJO1404
                SA1     B1              N                              HAJO1405
                SB2     A2-B7           ADDR( L(N))                    HAJO1406
                SA2     B2+X3           1./U(N)                        HAJO1407
                FX7     X7*X2           X(N)                           HAJO1408
                SB3     X3                                             HAJO1409
                SB6     X1                                             HAJO1410
                SA2     A2-B7           1./U(N-1)                      HAJO1411
                SA3     B3+A2           C(N-1)                         HAJO1412
                SA4     A7-B5           Z(N-1)                         HAJO1413
                SA7     A7                                             HAJO1414
BACK1           FX0     X3*X7           C(I)*X(I+1)                    HAJO1415
                SA3     A3-B7           C(I-1)                         HAJO1416
                FX5     X4-X0           Z(I)- C(I)*X(I+1)              HAJO1417
                SA4     A4-B7           Z(I-1)                         HAJO1418
                NX1     X5                                             HAJO1419
                FX6     X1*X2           X(I)                           HAJO1420
                SA2     A2-B7           U(I-1)                         HAJO1421
                FX0     X3*X6           C(I-1)* X(I)                   HAJO1422
                SA3     A3-B7           C(I-2)                         HAJO1423
                FX5     X4-X0                                          HAJO1424
                SA4     A4-B7                                          HAJO1425
                NX1     X5                                             HAJO1426
                FX7     X1*X2                                          HAJO1427
                SA2     A2-B7                                          HAJO1428
                SB6     B6-B4                                          HAJO1429
                SA6     A7-B5                                          HAJO1430
                SA7     A6-B5                                          HAJO1431
                GT      B6,B4,BACK1                                    HAJO1432
                EQ      B6,B7,SOLTD1                                   HAJO1433

                FX0     X3*X7                                          HAJO1434
                FX5     X4-X0                                          HAJO1435
                NX1     X5                                             HAJO1436
                FX6     X1*X2                                          HAJO1437
                SA6     A7-B5                                          HAJO1438
                EQ      SOLTD1                                         HAJO1439
N               DATA    0                                              HAJO1440
IA              DATA    0                                              HAJO1441
LY              DATA    0                                              HAJO1442
KY              DATA    0                                              HAJO1443
A               DATA    0                                              HAJO1444
Y               DATA    0                                              HAJO1445
LM              DATA    0                                              HAJO1446
M               DATA    0                                              HAJO1447
                VFD     42/0HSOLTDM,18/7                               HAJO1448
SOLTDM          DATA    0               (N,A,IA,Y,LY,KY,M)             HAJO1449
                SA1     B1                                             HAJO1450
                SA2     B3                                             HAJO1451
```

```
          BX6     X1                                                    HAJO1452
          SX7     X2                                                    HAJO1453
          SA6     N                                                     HAJO1454
          SB7     1                                                     HAJO1455
          SA7     A6+B7                                                 HAJO1456
          SX6     B2                                                    HAJO1457
          SX7     B4                                                    HAJO1458
          SA6     A                                                     HAJO1459
          SA7     A6+B7           Y                                     HAJO1460
          SA1     B5                                                    HAJO1461
          SA2     B6                                                    HAJO1462
          BX6     X1                                                    HAJO1463
          SX7     X2                                                    HAJO1464
          SA6     LY                                                    HAJO1465
          SA7     A6+B7           KY                                    HAJO1466
          SA1     M                                                     HAJO1467
          SA2     X1                                                    HAJO1468
          BX6     X2                                                    HAJO1469
          SA6     A1-B7           M                                     HAJO1470
LOOP      RJ      SOLTDI                                                HAJO1471
          SA1     LM                                                    HAJO1472

          SB7     -1                                                    HAJO1473
          SA2     Y                                                     HAJO1474
          SX6     X1+B7                                                 HAJO1475
          SA3     KY                                                    HAJO1476
          ZR      X6,SOLTDM                                             HAJO1477
          IX7     X3+X2                                                 HAJO1478
          SA6     A1              M=M-1                                 HAJO1479
          SA7     A2              Y=Y+KY                                HAJO1480
          SB4     A2                                                    HAJO1481
          SB1     N                                                     HAJO1482
          SB3     B1+B7                                                 HAJO1483
          SB5     B3+B7                                                 HAJO1484
          SA1     A                                                     HAJO1485
          SA2     Y                                                     HAJO1486
          SB2     X1                                                    HAJO1487
          SB4     X2                                                    HAJO1488
          EQ      LOOP                                                  HAJO1489
          END                                                           HAJO1490
      FUNCTION AKNINT(XBAR,N,IM,X,Y,T)                                  HAJO1491
      DIMENSION T(80),X(9),Y(9),MES1(6),MES3(6),MES4(6)                 HAJO1492
      DATA (MES1(I),I=1,6)/48HAKNINT WARNING ORDER OF INTERPOLATION TOO HAJO1493
     1 LARGE /,(MES3(I),I=1,6)/48HAKNINT N LESS THAN 2, YBAR RETURNED AS HAJO1494
     2 Y(1) /,(MES4(I),I=1,6)/48HAKNINT X(I) NOT SEQUENCED PROPERLY     HAJO1495
     3 /                                                                HAJO1496
      DOUBLE PRECISION T                                                HAJO1497
      M = IM                                                            HAJO1498
      IF(M.GE.N)GO TO 100                                               HAJO1499
     9 K=N-1                                                            HAJO1500
      IF(N.LT.2)GO TO 300                                               HAJO1501
      DO 10 I=1,K                                                       HAJO1502
    10 IF(X(I).GE.X(I+1)) GO TO 200                                     HAJO1503
      DO 20 I=1,N                                                       HAJO1504
```

```
      J=I                                                                HAJO1505
 20   IF(XBAR.LE.X(I)) GO TO 11                                          HAJO1506
 11   K = M                                                              HAJO1507
      M = M + 1                                                          HAJO1508
      J = J - M/2                                                        HAJO1509
      J=MAX0 (J,1)                                                       HAJO1510
      J=MIN0 (J,N-K)                                                     HAJO1511
      MEND=J+K                                                           HAJO1512
      DO 12 I=J,MEND                                                     HAJO1513
      KK=I-J+1                                                           HAJO1514
      T(KK) = Y(I)                                                       HAJO1515
 12   T(KK+M) =DBLE(X(I)) - DBLE(XBAR)                                   HAJO1516
      DO 13 I=1,K                                                        HAJO1517
      KK=I+1                                                             HAJO1518
      DO 13 JJ=KK,M                                                      HAJO1519
 13   T(JJ)=(T(I)*T(JJ+M) -T(JJ)*T(I+M))/(DBLE(X(JJ+J-1))-DBLE(X(I+J-1))HAJO1520
     1)                                                                  HAJO1521
      AKNINT=T(M)                                                        HAJO1522
      RETURN                                                             HAJO1523
200   DO 210 I=1,K                                                       HAJO1524
210   IF(X(I).LE.X(I+1)) GO TO 420                                       HAJO1525
      DO 120 I=1,N                                                       HAJO1526
      J=I                                                                HAJO1527
120   IF(XBAR.GE.X(I)) GO TO 11                                          HAJO1528
      GO TO 11                                                           HAJO1529
420   CALL LABRT(4,MES4,4)                                               HAJO1530
      CALL LABRT(1,MES4,4)                                               HAJO1531
300   CALL LABRT(1,MES3,3)                                               HAJO1532
      AKNINT=Y(1)                                                        HAJO1533
      RETURN                                                             HAJO1534

100   CALL LABRT(1,MES1,1)                                               HAJO1535
      M=N-1                                                              HAJO1536
      GO TO 9                                                            HAJO1537
      END                                                                HAJO1538
```

APPENDIX B

SAMPLE CALCULATIONS

The application of electron energy distribution functions to molecular excitation rate integrals is illustrated in this Appendix. The function f(u) is normalized to

$$\int u^{\frac{1}{2}} f(u)du = 1 \quad ,$$

and this f(u) is folded into excitation cross sections developed by Frost and Phelps.[1] The number of molecular excitations per electron per modecule per sec from level i to j is

$$\nu_{ij}/N = \sqrt{\frac{2e}{m}} \int Q_{ij}\, uf(u)du \quad ,$$

where terms were defined above. $Q_{ij}(u)$ values are tabulated below in Table B-I for i = 0 (ground state molecule) to the excited level j with electron energy loss and reaction threshold as shown. The energy balance equation[2] is

$$eEw = (2/m)^{\frac{1}{2}}\, 2m/M \int \varepsilon^2\, NQ_m(\varepsilon) \left[f(\varepsilon) + kT \frac{df(\varepsilon)}{d\varepsilon} \right]$$

$$+ (2/m)^{\frac{1}{2}} \sum_j \varepsilon_j \int \varepsilon f(\varepsilon) \left[NQ_j(\varepsilon) - NQ_{-j}(\varepsilon) \right] d\varepsilon$$

where ε is electron energy.

Values for electron velocity w, characteristic energy D/μ, etc., and excitation rates for each of a number of excited levels are tabulated below in Table B-II as a function of E/N (V-cm^2 x 10^{-17}) for several gas mixtures of He, N_2, and CO_2. Here the mole fractions of the component gases sum to unity (N = 1).

TABLE B-I

ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS

QJ FUNCTIONS

QJ(1), 43 2 LEVEL 1 , ENERGY LOSS = .04300
9. THRESHHOLD = 0.044 , MW = H2 0-2

4.3900E-02	0.
4.7000E-02	1.8500E-20
5.0000E-02	2.7000E-20
5.5000E-02	3.5000E-20
6.0000E-02	4.2000E-20
6.5000E-02	4.8000E-20
7.0000E-02	5.3000E-20
8.0000E-02	6.0000E-20
9.0000E-02	6.8000E-20
1.0000E-01	7.4000E-20
1.1000E-01	7.9000E-20
1.3000E-01	8.9000E-20
1.5000E-01	9.9000E-20
2.0000E-01	1.2000E-19
2.5000E-01	1.3700E-19
3.0000E-01	1.6000E-19
3.5000E-01	1.8500E-19
4.0000E-01	2.1000E-19
4.5000E-01	2.3600E-19
5.0000E-01	2.6300E-19
6.0000E-01	3.2100E-19
7.0000E-01	3.8500E-19
8.0000E-01	4.5200E-19
9.0000E-01	5.2000E-19
1.0000E+00	5.9200E-19
1.2500E+00	7.8100E-19
1.5000E+00	9.6500E-19
2.0000E+00	1.3020E-18
2.4500E+00	1.5660E-18
2.7500E+00	1.6980E-18
3.0000E+00	1.7800E-18
3.2500E+00	1.8140E-18
3.5000E+00	1.8190E-18
3.7500E+00	1.7990E-18
4.0000E+00	1.7700E-18
4.4200E+00	1.6880E-18
5.0000E+00	1.5470E-18
5.5000E+00	1.4550E-18
6.0000E+00	1.3700E-18
6.5000E+00	1.2960E-18
7.0000E+00	1.2370E-18
8.0000E+00	1.1180E-18
1.0000E+01	9.0200E-19

QJ(2), 44 2 LEVEL 2 , ENERGY LOSS = .07200
7. THRESHHOLD = 0.073 , MW = H2 1-3

7.2700E-02	0.
7.5000E-02	1.0000E-20
8.0000E-02	1.7000E-20
8.5000E-02	2.1500E-20
9.0000E-02	2.5000E-20
9.5000E-02	2.7500E-20
1.0000E-01	2.9500E-20
1.1000E-01	3.3500E-20
1.2000E-01	3.8000E-20
1.3000E-01	4.1000E-20
1.5000E-01	4.7000E-20
2.0000E-01	6.0000E-20
2.5000E-01	7.4000E-20
3.0000E-01	8.8000E-20
3.5000E-01	1.0250E-19
4.0000E-01	1.1750E-19
4.5000E-01	1.3300E-19
5.0000E-01	1.4900E-19
5.5000E-01	1.6500E-19
6.0000E-01	1.8100E-19
6.5000E-01	2.0000E-19
7.0000E-01	2.2000E-19
8.0000E-01	2.7000E-19
9.0000E-01	3.1600E-19
1.0000E+00	3.6400E-19
1.5000E+00	5.9000E-19
2.0000E+00	8.1000E-19
2.2500E+00	9.0400E-19
2.4500E+00	9.6600E-19
2.7000E+00	1.0240E-18
2.9000E+00	1.0560E-18
3.1000E+00	1.0760E-18
3.3000E+00	1.0880E-18
3.4500E+00	1.0920E-18
3.7500E+00	1.0920E-18
4.0000E+00	1.0780E-18
4.4200E+00	1.0480E-18
5.0000E+00	9.9200E-19
5.5000E+00	9.3500E-19
6.0000E+00	8.8300E-20
7.0000E+00	7.7900E-20
8.0000E+00	6.9300E-20
9.0000E+00	6.2100E-20
1.0000E+01	5.5800E-20

QJ(3), 3544 LEVEL 1 , ENERGY LOSS = .08300
. THRESHHOLD = 0.084 , MW = 44 010

8.2700E-02	0.
8.4400E-02	8.5000E-01
8.6200E-02	1.1600E+00
9.3200E-02	1.8500E+00
1.0350E-01	2.3000E+00
1.2080E-01	2.6000E+00
1.3820E-01	2.6800E+00
1.7260E-01	2.6200E+00
2.0700E-01	2.4800E+00
2.7500E-01	2.1800E+00
3.4500E-01	1.9300E+00
5.0000E-01	1.4500E+00
7.0000E-01	1.1000E+00
9.0000E-01	8.0000E-01
1.1000E+00	6.2000E-01
1.4000E+00	4.6000E-01
1.6000E+00	4.2000E-01
1.8000E+00	4.4000E-01
2.3000E+00	7.0000E-01
2.6000E+00	9.3000E-01
3.0000E+00	1.3400E+00
3.2000E+00	1.5800E+00
3.4000E+00	1.7500E+00
3.6000E+00	1.8000E+00
3.8000E+00	1.7900E+00
4.0000E+00	1.7000E+00
4.2000E+00	1.5200E+00
4.6000E+00	1.0500E+00
5.1000E+00	5.7000E-01
5.5000E+00	5.1000E-01
6.0000E+00	5.0000E-01
7.0000E+00	4.8000E-01
8.0000E+00	4.5000E-01
1.0000E+01	2.0000E-01
2.0000E+01	0.

QJ(4), 2644 LEVEL 2 , ENERGY LOSS = .16700
, THRESHHOLD = 0.168 , MW = 44 020+100

1.6700E-01	0.
2.0000E-01	6.0000E-01
2.2000E-01	7.6000E-01
2.5000E-01	8.0000E-01
3.0000E-01	7.8000E-01
5.0000E-01	6.4000E-01
7.0000E-01	5.3000E-01
1.0000E+00	4.4000E-01
1.2500E+00	4.4000E-01
1.5000E+00	4.4000E-01
2.0000E+00	5.3000E-01
2.5000E+00	8.4000E-01
3.0000E+00	1.2800E+00
3.2000E+00	1.5700E+00
3.4000E+00	1.7700E+00
3.5500E+00	1.7800E+00
3.7000E+00	1.7500E+00
3.9000E+00	1.6000E+00
4.1000E+00	1.2800E+00
4.5000E+00	8.8000E-01
4.9000E+00	3.9000E-01
5.2000E+00	3.3000E-01
6.0000E+00	2.7000E-01
8.0000E+00	2.5000E-01
1.0000E+01	2.1000E-01
2.0000E+01	0.

QJ(5), 744 LEVEL 4 , ENERGY LOSS = .25200
, THRESHHOLD = 2.503 , MW = 44 0N0+N00

2.5000E+00	0.
3.0000E+00	9.2000E-01
3.5600E+00	5.4000E-01
4.1000E+00	3.4000E-01
4.5000E+00	1.6000E-01
5.0600E+00	4.4000E-02
6.0000E+00	0.

QJ(6), 332P LEVEL 1 , ENERGY LOSS = .29000
, THRESHHOLD = 0.284 , MW = 28 01

3.0000E-01	0.
3.3000E-01	2.0000E-21
4.0000E-01	3.0000E-21
7.5000E-01	5.0000E-21
9.0000E-01	6.5000E-21
1.0000E+00	8.0000E-21
1.1000E+00	0.
1.1650E+00	1.2000E-20
1.2000E+00	1.3700E-20
1.2180E+00	1.5000E-20
1.4000E+00	6.7500E-20
1.5000E+00	9.5000E-20
1.6000E+00	1.2200E-19
1.6500E+00	1.3000E-19
1.7000E+00	1.6000E-19
1.8000E+00	3.3000E-19
1.9000E+00	1.5200E-18
2.0000E+00	1.3200E-18
2.1000E+00	4.6000E-19
2.2000E+00	1.6300E-18
2.3000E+00	1.2300E-18
2.4000E+00	4.6000E-19
2.5000E+00	8.6000E-19
2.6000E+00	1.0400E-18
2.7000E+00	2.7000E-19
2.8000E+00	4.2000E-19
2.9000E+00	4.2700E-19
3.0000E+00	4.3000E-19
3.1000E+00	5.8000E-19
3.2000E+00	3.8000E-19
3.3000E+00	2.9000E-19
3.6000E+00	2.9000E-19
5.0000E+00	0.

QJ(7), 1844 LEVEL 3 , ENERGY LOSS = .29100
, THRESHHOLD = 0.286 , MW = 44 001

2.9100E-01	0.
2.9700E-01	4.0000E-01
3.0300E-01	5.0000E-01
3.2700E-01	6.2000E-01
3.6400E-01	7.1000E-01
4.2500E-01	7.7000E-01
4.8500E-01	8.4000E-01
6.0700E-01	9.2000E-01
7.2800E-01	9.7000E-01
9.6900E-01	9.9000E-01
1.2100E+00	9.5000E-01
2.4300E+00	6.6000E-01
4.8500E+00	4.4000E-01
9.6800E+00	2.6000E-01
1.8200E+01	1.5000E-01
3.6400E+01	9.2000E-02
5.8200E+01	5.8000E-02
1.0000E+02	0.

QJ(8), 844 LEVEL 5 , ENERGY LOSS = .33900
, THRESHHOLD = 1.495 , MW = 44 0N0+N00

1.5000E+00	0.
1.9500E+00	7.0000E-02
2.5000E+00	2.0000E-01
3.0000E+00	4.1000E-01
3.5600E+00	6.6000E-01
4.1000E+00	3.4000E-01
4.5000E+00	1.5500E-01
5.0600E+00	0.

QJ(9), 544 LEVEL 6 , ENERGY LOSS = .42200
, THRESHHOLD = 2.503 , MW = 44 0N0+N00

2.5000E+00	0.
3.0000E+00	1.0500E-01
3.5600E+00	2.2500E-01
4.1000E+00	1.0000E-01
4.5000E+00	0.

QJ(10), 544 LEVEL 7 , ENERGY LOSS = .50500
, THRESHHOLD = 2.503 , MW = 44 0N0+N00

2.5000E+00	0.
3.0000E+00	1.5600E-01
3.5600E+00	3.3000E-01
4.1000E+00	1.5600E-01
4.5000E+00	0.

QJ(11), 27 2 LEVEL 3 , ENERGY LOSS = .51600
0, THRESHHOLD = 0.516 , MW = H2 01

5.1600E-01	0.
5.6000E-01	4.5000E-21
6.0000E-01	9.0000E-21
6.5000E-01	1.4500E-20
7.5000E-01	2.7000E-20
8.5000E-01	4.0000E-20
9.5000E-01	5.5000E-20
1.0000E+00	6.3500E-20
1.0500E+00	7.0500E-20
1.1000E+00	7.6000E-20
1.1500E+00	8.2000E-20
1.2000E+00	9.1000E-20
1.3000E+00	1.1200E-19
1.4000E+00	1.4000E-19
1.6000E+00	2.0300E-19
1.8000E+00	2.5800E-19
2.2000E+00	3.4300E-19
2.4000E+00	4.0000E-19
2.6000E+00	4.4000E-19
3.0000E+00	5.4000E-19
3.5000E+00	6.3000E-19
4.0000E+00	6.8000E-19
5.0000E+00	6.8000E-19
6.0000E+00	6.0000E-19
7.0000E+00	3.0000E-19
8.0000E+00	1.0000E-19
1.0000E+01	0.

QJ(12), 1828 LEVEL 2 , ENERGY LOSS = .59000
, THRESHHOLD = 1.700 , MW = 28 02

1.7000E+00	0.
1.8000E+00	9.0000E-20
1.9000E+00	4.0000E-19
2.0000E+00	1.5200E-18
2.1000E+00	1.4800E-18
2.2000E+00	6.2000E-19
2.3000E+00	6.0000E-19
2.4000E+00	1.3900E-18
2.5000E+00	1.1400E-18
2.6000E+00	3.1000E-19
2.7000E+00	4.9000E-19
2.8000E+00	5.1000E-19
2.9000E+00	1.8000E-19
3.0000E+00	2.4000E-19
3.1000E+00	1.5000E-19
3.2000E+00	1.1000E-19
3.3000E+00	7.0000E-20
3.4000E+00	0.

QJ(13), 1728 LEVEL 3 , ENERGY LOSS = .88000
, THRESHHOLD = 1.700 , MW = 28 03

1.8000E+00	0.
1.9000E+00	1.8000E-19
2.0000E+00	7.5000E-19
2.1000E+00	1.4100E-18
2.2000E+00	1.6900E-18
2.3000E+00	9.5000E-19
2.4000E+00	2.9000E-19
2.5000E+00	7.7000E-19
2.6000E+00	1.1700E-18
2.7000E+00	6.4000E-19
2.8000E+00	2.6000E-19
2.9000E+00	4.0000E-19
3.0000E+00	4.0000E-19
3.1000E+00	1.6000E-19
3.2000E+00	1.6000E-19
3.3000E+00	1.6000E-19
3.4000E+00	0.

QJ(14), 1628 LEVEL 4 , ENERGY LOSS = 1.17000
, THRESHHOLD = 1.700 , MW = 28 04

1.9000E+00	0.
2.0000E+00	1.6000E-19
2.1000E+00	4.6000E-19
2.2000E+00	1.1000E-18
2.3000E+00	1.3000E-18
2.4000E+00	7.1000E-19
2.5000E+00	2.0000E-19
2.6000E+00	3.1000E-19
2.7000E+00	6.0000E-19
2.8000E+00	4.9000E-19
2.9000E+00	1.8000E-19
3.0000E+00	1.6000E-19
3.1000E+00	1.6000E-19
3.2000E+00	1.1000E-19
3.3000E+00	7.0000E-20
3.4000E+00	0.

QJ(15), 1528 LEVEL 5 , ENERGY LOSS = 1.47000
, THRESHHOLD = 1.700 , MW = 28 05

2.0000E+00	0.
2.1000E+00	2.0000E-19
2.2000E+00	4.6000E-19
2.3000E+00	7.7000E-19
2.4000E+00	1.0400E-18
2.5000E+00	1.0100E-18
2.6000E+00	5.1000E-19
2.7000E+00	2.7000E-19
2.8000E+00	3.7000E-19
2.9000E+00	6.2000E-19
3.0000E+00	4.2000E-19
3.1000E+00	2.7000E-19
3.2000E+00	3.5000E-19
3.3000E+00	3.1000E-19
3.4000E+00	0.

QJ(16), 1328 LEVEL 6 , ENERGY LOSS = 1.76000
, THRESHHOLD = 2.197 , MW = 28 06

2.2000E+00	0.
2.3000E+00	1.1000E-19
2.4000E+00	3.7000E-19
2.5000E+00	6.0000E-19
2.6000E+00	6.0000E-19
2.7000E+00	3.7000E-19
2.8000E+00	1.5000E-19
2.9000E+00	9.0000E-20
3.0000E+00	1.6000E-19
3.1000E+00	1.8000E-19
3.2000E+00	7.0000E-20
3.3000E+00	5.0000E-20
3.4000E+00	0.

QJ(17), 1228 LEVEL 7 , ENERGY LOSS = 2.06000
, THRESHHOLD = 2.301 , MW = 28 07

2.3000E+00	0.
2.4000E+00	7.0000E-20
2.5000E+00	1.8000E-19
2.6000E+00	2.9000E-19
2.7000E+00	4.4000E-19
2.8000E+00	3.3000E-19
2.9000E+00	1.8000E-19
3.0000E+00	5.0000E-20
3.1000E+00	7.0000E-20
3.2000E+00	1.6000E-19
3.3000E+00	7.0000E-20
3.4000E+00	0.

QJ(18), 544 LEVEL 8 , ENERGY LOSS = 2.50000
, THRESHHOLD = 2.503 , MW = 44 0N0+N00

2.5000E+00	0.
3.0000E+00	1.8000E-01
3.6000E+00	2.5000E-01
4.1000E+00	1.8000E-01
4.5000E+00	0.

QJ(19), 828 LEVEL 8 , ENERGY LOSS = 2.35000
, THRESHHOLD = 2.507 , MW = 28 08

2.5000E+00	0.
2.6000E+00	7.0000E-20
2.7000E+00	1.1000E-19
2.8000E+00	1.8000E-19
2.9000E+00	2.4000E-19
3.0000E+00	1.5000E-19
3.1000E+00	7.0000E-20
3.2000E+00	0.

QJ(20), 944 LEVEL 9 , ENERGY LOSS = 3.85000
, THRESHHOLD = 3.847 , MW = 44 C0+0-

3.8500E+00	0.
4.3000E+00	1.4000E-03
4.5000E+00	1.4000E-03
5.1000E+00	0.
6.6000E+00	0.
7.2000E+00	7.0000E-04
8.2000E+00	4.5000E-03
8.4000E+00	4.2000E-03
8.9000E+00	1.0000E-03

QJ(21), 728 LEVEL 9 , ENERGY LOSS = 5.00000
, THRESHHOLD = 4.989 , MW = 28 09

5.0000E+00	0.
5.7000E+00	4.0000E-19
5.8000E+00	4.2000E-19
6.1000E+00	4.2000E-19
6.2000E+00	4.0000E-19
7.0000E+00	6.0000E-20
9.0000E+00	0.

QJ(22), 828 LEVEL 10 , ENERGY LOSS = 6.70000
• THRESHHOLD = 6.695 • MW = 28 A3SUP

6.7000E+00	0.
7.1000E+00	5.0000E-19
7.3000E+00	5.6000E-19
8.0000E+00	5.6000E-19
8.3000E+00	5.0000E-19
8.7000E+00	2.4000E-19
9.5000E+00	1.0000E-19
2.0000E+01	0.

QJ(23), 444 LEVEL 10 , ENERGY LOSS = 7.00000
, THRESHHOLD = 7.006 , MW = 44 E-EP

7.0000E+00	0.
8.0000E+00	6.0000E-01
8.5000E+00	6.0000E-01
1.1000E+01	0.

QJ(24), 528 LEVEL 11 , ENERGY LOSS = 8.40000
, THRESHHOLD = 8.401 , MW = 28 A1pG

8.4000E+00	0.
8.7000E+00	4.2000E-19
9.0000E+00	4.2000E-19
1.0000E+01	3.0000E-19
2.0000E+01	0.

QJ(25), 944 LEVEL 11 , ENERGY LOSS = 10.50000
, THRESHHOLD = 10.500 , MW = 44 E-EP

1.0500E+01	0.
1.2000E+01	6.9000E-01
1.2700E+01	7.3000E-01
1.3500E+01	7.8000E-01
1.5000E+01	8.8000E-01
1.7000E+01	1.0400E+00
2.0000E+01	1.2400E+00
4.0000E+01	3.6000E+00
1.0000E+02	6.3000E+00

QJ(26), 728 LEVEL 12 , ENERGY LOSS = 11.20000
, THRESHHOLD = 11.193 , MW = 28 C3PU

1.1200E+01	0.
1.3500E+01	4.4000E-19
1.4000E+01	1.0000E-18
1.4500E+01	1.0000E-18
1.5100E+01	2.4000E-19
2.0500E+01	2.2000E-19
1.0000E+02	5.0000E-20

QJ(27), 528 LEVEL 13 , ENERGY LOSS = 12.50000
, THRESHHOLD = 12.511 , MW = 28 EXC.

1.2500E+01	0.
1.3000E+01	4.0000E-19
1.3500E+01	4.0000E-19
1.4000E+01	1.6000E-19
2.0000E+01	0.

QJ(28), 1144 LEVEL 12 , ENERGY LOSS = 13.30000
, THRESHHOLD = 13.306 , MW = 44 CO2+

1.3300E+01	0.
1.4500E+01	6.0000E-02
1.5000E+01	1.0400E-01
1.6000E+01	1.8800E-01
1.8000E+01	3.5900E-01
2.0000E+01	5.3200E-01
3.0000E+01	1.6300E+00
4.0000E+01	2.2800E+00
5.0000E+01	2.7900E+00
7.0000E+01	3.4300E+00
1.0000E+02	3.7900E+00

QJ(29), 828 LEVEL 14 , ENERGY LOSS = 14.00000
, THRESHHOLD = 14.011 , MW = 28 EXC.

1.4000E+01	0.
1.4200E+01	1.3000E-18
1.4400E+01	1.7000E-18
1.4700E+01	1.7000E-18
1.5600E+01	2.0000E-19
2.0500E+01	2.0000E-19
2.5500E+01	2.8000E-18
1.5000E+02	2.8000E-18

QJ(30), 2728 LEVEL 15 , ENERGY LOSS = 15.50000
, THRESHHOLD = 15.511 • MW = 28 ION

1.5550E+01	0.
1.6590E+01	3.4600E-20
1.6760E+01	4.0800E-20
1.7110E+01	5.1300E-20
1.8680E+01	1.1610E-19
2.0000E+01	2.0100E-19
2.3000E+01	4.4000E-19
2.5000E+01	6.1600E-19
2.8000E+01	8.8000E-19
3.0000E+01	1.0490E-18
3.4000E+01	1.3600E-18
3.7000E+01	1.5730E-18
4.0000E+01	1.7720E-18
4.3000E+01	1.9440E-18
4.6000E+01	2.0880E-18
4.8000E+01	2.1660E-18
5.0000E+01	2.2270E-18
5.4000E+01	2.3700E-18
6.0000E+01	2.5300E-18
6.5000E+01	2.6200E-18
7.0000E+01	2.7000E-18
7.5000E+01	2.7600E-18
8.0000E+01	2.8100E-18
8.5000E+01	2.8500E-18
9.0000E+01	2.8700E-18
9.5000E+01	2.8900E-18
1.0000E+02	2.9000E-18

QJ(31), 7 2 LEVEL 4 , ENERGY LOSS = 13.60000
, THRESHHOLD = 13.6 , MW = 2 H2+

1.3600E+01	0.
2.5000E+01	6.5000E-19
3.0000E+01	8.0000E-19
4.0000E+01	9.1000E-19
5.0000E+01	9.7000E-19
7.0000E+01	1.0300E-18
1.0000E+02	9.7000E-19

QJ(32), 14 4 LEVEL 25 , ENERGY LOSS = 19.80000
, THRESHHOLD = 19.801 , MW = 4 EEP

1.9800E+01	0.
2.0020E+01	4.1000E-20
2.0240E+01	4.6000E-20
2.1450E+01	4.2000E-20
2.1800E+01	5.5000E-20
2.2450E+01	5.5000E-20
2.4220E+01	7.3000E-20
2.5320E+01	9.2000E-20
2.7530E+01	1.0800E-19
2.9750E+01	1.1600E-19
3.4180E+01	1.2100E-19
4.6300E+01	1.2100E-19
1.0000E+02	1.1500E-19
2.0000E+02	1.0000E-19

QJ(33), 13 4 LEVEL 26 , ENERGY LOSS = 24.60000
, THRESHHOLD = 24.609 , MW = 4 HE+

2.4600E+01	0.
3.0000E+01	7.1000E-20
3.4000E+01	1.2100E-19
4.0000E+01	1.7800E-19
4.5000E+01	2.1200E-19
5.0000E+01	2.4200E-19
6.0000E+01	2.8900E-19
7.0000E+01	3.1300E-19
8.0000E+01	3.3200E-19
9.0000E+01	3.4400E-19
1.0000E+02	3.5100E-19
1.5000E+02	3.4600E-19
2.0000E+02	3.2400E-19

MOMENTUM TRANSFER CROSS SECTIONS FOR H2,HE,N2,AND CO2

52 2 H2 GIBSON (UNIV. AUSTR.) ROT AND VIB

0.0000	.0010	.0020	.0030	.0050	.0070	.0085	.0100	.0150	.0200
.0300	.0400	.0500	.0700	.1000	.1500	.2000	.2500	.3000	.3500
.4000	.5000	.7000	1.0000	1.2000	1.3000	1.5000	1.7000	1.9000	2.1000
2.2000	2.5000	2.8000	3.0000	3.3000	3.6000	4.0000	4.5000	5.0000	6.0000
7.0000	8.0000	10.0000	12.0000	15.0000	17.0000	20.0000	25.0000	30.0000	50.0000
75.0000	200.0000								
6.4	6.5	6.6	6.8	6.8	7.0	7.1	7.3	7.65	8.0
8.5	8.96	9.28	9.85	10.5	11.35	12.0	12.5	15.6	13.45
13.9	14.7	16.3	17.38	17.8	18.0	18.25	18.25	18.1	17.9
17.8	17.45	17.1	16.7	16.0	15.3	14.5	13.6	12.8	12.0
11.4	10.7	9.1	8.3	7.6	6.8	6.0	5.	4.	3.
2.	1.1								

52 4 HE PHELPS (NAT.BUR.STD.) VIB EXCIT. AND IONIZATION

0.0000	.0010	.0020	.0030	.0050	.0070	.0085	.0100	.0150	.0200
.0300	.0400	.0500	.0700	.1000	.1500	.2000	.2500	.3000	.3500
.4000	.5000	.7000	1.0000	1.2000	1.3000	1.5000	1.7000	1.9000	2.1000
2.2000	2.5000	2.8000	3.0000	3.3000	3.6000	4.0000	4.5000	5.0000	6.0000
7.0000	8.0000	10.0000	12.0000	15.0000	17.0000	20.0000	25.0000	30.0000	50.0000
75.0000	200.0000								
4.9600	4.9800	5.0200	5.0700	5.1200	5.1500	5.1800	5.2100	5.2800	5.3500
5.4600	5.5400	5.6200	5.7400	5.8600	6.0400	6.1600	6.2700	6.3500	6.4200
6.4900	6.5900	6.7300	6.8500	6.9100	6.9200	6.9600	6.9700	6.9800	6.9800
6.9800	6.9600	6.9200	6.8900	6.8200	6.7300	6.6000	6.4900	6.2600	6.0100
5.5300	5.2400	4.4500	4.0200	3.5800	3.3500	3.0500	2.7100	2.4500	2.8600
1.4000	1.1500								

5228 CO2 PHELPS (NAT.BUR.STD.) VIB EXCIT. AND IONIZATION

0.0000	.0010	.0020	.0030	.0050	.0070	.0085	.0100	.0150	.0200
.0300	.0400	.0500	.0700	.1000	.1500	.2000	.2500	.3000	.3500
.4000	.5000	.7000	1.0000	1.2000	1.3000	1.5000	1.7000	1.9000	2.1000
2.2000	2.5000	2.8000	3.0000	3.3000	3.6000	4.0000	4.5000	5.0000	6.0000
7.0000	8.0000	10.0000	12.0000	15.0000	17.0000	20.0000	25.0000	30.0000	50.0000
75.0000	200.0000								
1.0000	1.3400	1.4900	1.6200	1.8100	2.0000	2.1000	2.1900	2.5500	2.8500
3.4000	3.8600	4.3300	5.1300	6.0000	7.1200	7.4500	8.5000	8.8000	9.4400
9-7/0/	9-940/	9-970/	9-970/	00-500/	01-0/0/	01-950/	03-420/	09-820/	16-370/
28.7600	29.6000	28.0100	21.6300	17.1900	14.6600	12.6200	11.5200	11.1000	10.3000
10.2000	9.9000	9.5100	10.1400	11.1000	11.3000	12.0000	11.7000	11.1000	9.3000
7.7000	6.6000								

5244 CO2 PHELPS (NAT.BUR.STD.) VIB EXCIT. AND IONIZATION

0.0000	.0010	.0020	.0030	.0050	.0070	.0085	.0100	.0150	.0200
.0300	.0400	.0500	.0700	.1000	.1500	.2000	.2500	.3000	.3500
.4000	.5000	.7000	1.0000	1.2000	1.3000	1.5000	1.7000	1.9000	2.1000
2.2000	2.5000	2.8000	3.0000	3.3000	3.6000	4.0000	4.5000	5.0000	6.0000
7.0000	8.0000	10.0000	12.0000	15.0000	17.0000	20.0000	25.0000	30.0000	50.0000
75.0000	200.0000								
600.	540.	380.	325.	247.	200.	185.	170.	145.	120.
102.5	85.	79.	64.	52.	40.	31.5	25.	20.	16.5
13.	7.7	6.3	5.6	5.2	5.1	5.0	5.0	5.1	5.3
5.4	6.5	7.6	9.0	11.3	14.2	15.2	14.8	13.2	10.3
10.2	10.8	12.1	13.1	14.5	15.2	15.7	16.0	16.0	13.0
9.6	8.0								

TABLE B-II

EXCITATION RATES, ELECTRON DRIFT VELOCITIES,
AND CHARACTERISTIC ENERGIES

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/ 0/ 0/*0, 10 RUNS

FRACTIONS H2/HE/N2/CO2
1.0000E-18 1.0000E-18 1.0000E-18 1.0000E+00

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSENDS (X E-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC. E MU	8.6659E+05	1.3688E+06	1.9758E+06	2.8034E+06	3.8827E+06	5.1872E+06
CHARACTERISTIC ENERGY VOLT. D/MU	3.5688E-02	4.4922E-02	6.5612E-02	1.0292E-01	1.7408E-01	2.7908E-01
POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON. LHS	1.8510E-10	4.3855E-10	8.4405E-10	1.4970E-09	2.4881E-09	3.8780E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP. RHS	3.0645E-10	5.5126E-10	9.5195E-10	1.5204E-09	2.3989E-09	3.7131E-09
TOTAL COLL. RATE / ELECTRON / MOL. UNITS 10E16 MOL.SUMA	8.3225E+06	1.4288E+07	2.2555E+07	3.2074E+07	4.4073E+07	6.0543E+07
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL	1.5038E+04	2.0988E+04	3.5928E+04	7.2610E+04	1.6361E+05	3.4396E+05
MUN MOBILITY X MOL/CC. UNITS 10E16 MOL	1.7332E+06	1.8250E+06	1.9758E+06	2.2427E+06	2.5885E+06	2.9641E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL. J= 33

LEVEL	RUN NO. 1	2	3	4	5	6
1	1ST KIND 5.0774E-13	7.4305E-13	1.2194E-12	2.2143E-12	4.7324E-12	9.7996E-12
	2ND KIND -7.4345E-15	-9.3021E-15	-1.3150E-14	-2.1243E-14	-4.1612E-14	-8.2426E-14
2	1ST KIND 1.5340E-13	2.7162E-13	5.2854E-13	1.1286E-12	2.6556E-12	5.7533E-12
	2ND KIND -2.2067E-15	-2.7873E-15	-4.0175E-15	-6.6811E-15	-1.3444E-14	-2.7032E-14
3	1ST KIND 8.1459E+06	1.3408E+07	1.9709E+07	2.5501E+07	3.0710E+07	3.6793E+07
	2ND KIND -9.5584E+04	-1.0455E+05	-1.1556E+05	-1.2256E+05	-1.2940E+05	-1.3518E+05
4	1ST KIND 2.5507E+05	8.2512E+05	2.1139E+06	4.0292E+06	6.9651E+06	1.1036E+07
	2ND KIND -1.8615E+03	-2.1251E+03	-2.4752E+03	-2.7665E+03	-3.2005E+03	-3.8278E+03
5	1ST KIND 1.8473E-07	3.1340E-02	2.5092E+01	1.2568E+03	1.7297E+04	1.0544E+05
	2ND KIND -6.3487E-11	-3.6196E-06	-1.6454E-03	-5.8354E-02	-6.3382E-01	-3.2406E+00
6	1ST KIND 5.0107E-17	5.8867E-16	8.6008E-15	9.5990E-14	5.8148E-13	2.0293E-12
	2ND KIND -7.9320E-20	-9.8862E-20	-1.7205E-19	-6.9241E-19	-3.0966E-18	-9.3922E-18
7	1ST KIND 1.8922E+04	1.6196E+05	8.4985E+05	2.6587E+06	6.4412E+06	1.2433E+07
	2ND KIND -2.3915E+01	-2.7597E+01	-3.3329E+01	-4.0140E+01	-5.0853E+01	-6.5690E+01
8	1ST KIND 8.0774E-04	3.2939E+00	4.4360E+02	8.4109E+03	6.3721E+04	2.6120E+05
	2ND KIND -8.2051E-09	-1.0153E-05	-7.9161E-04	-1.1435E-02	-7.4014E-02	-2.7420E-01
9	1ST KIND 2.1086E-08	3.5848E-03	2.8955E+00	1.4772E+02	2.0896E+03	1.3196E+04
	2ND KIND -9.9570E-14	-2.9993E-09	-1.0148E-06	-3.0998E-05	-3.1086E-04	-1.5245E-03
10	1ST KIND 3.1327E-08	5.3257E-03	4.3011E+00	2.1936E+02	3.1016E+03	1.9576E+04

	2ND KIND	-1.5878E-14	-3.5304E-10	-1.0319E-07	-2.9006E-06	-2.7564E-05	-1.2980E-04
11	1ST KIND	7.6845E-18	5.6659E-16	1.1986E-14	9.2974E-14	4.2638E-13	1.2827E-12
	2ND KIND	-6.4653E-23	-9.4572E-23	-1.6780E-22	-3.5548E-22	-8.7447E-22	-1.9736E-21
12	1ST KIND	1.8960E-21	1.6374E-17	2.7480E-15	5.3375E-14	3.8501E-13	1.4553E-12
	2ND KIND	-1.5612E-29	-1.5935E-26	-9.2084E-25	-9.8533E-24	-4.8453E-23	-1.4149E-22
13	1ST KIND	1.0189E-21	1.1367E-17	2.1557E-15	4.4688E-14	3.3536E-13	1.3026E-12
	2ND KIND	-1.9035E-33	-8.1520E-31	-3.0379E-29	-2.5482E-28	-1.0728E-27	-2.8251E-27
14	1ST KIND	2.8449E-22	4.5752E-18	1.0396E-15	2.3718E-14	1.8864E-13	7.5895E-13
	2ND KIND	-1.2864E-37	-2.3893E-35	-5.8170E-34	-3.8268E-33	-1.3696E-32	-3.2267E-32
15	1ST KIND	1.0115E-22	2.2624E-18	6.2150E-16	1.5998E-14	1.3833E-13	5.9385E-13
	2ND KIND	-1.0158E-41	-6.8371E-40	-1.0399E-38	-5.3983E-38	-1.6800E-37	-3.6299E-37
16	1ST KIND	7.6082E-24	3.7022E-19	1.4687E-16	4.6182E-15	4.5118E-14	2.0996E-13
	2ND KIND	-2.4794E-46	-1.0072E-44	-1.1229E-43	-4.7415E-43	-1.2636E-42	-2.4325E-42
17	1ST KIND	1.2542E-24	9.2513E-20	4.6868E-17	1.7296E-15	1.8915E-14	9.5738E-14
	2ND KIND	-2.9496E-50	-2.7270E-49	-1.5267E-48	-4.5952E-48	-9.9556E-48	-1.6743E-47
18	1ST KIND	3.6145E-08	6.1385E-03	4.9365E+00	2.4957E+02	3.4835E+03	2.1635E+04
	2ND KIND	-8.4269E-38	-1.1999E-37	-1.9240E-37	-3.1387E-37	-5.2950E-37	-8.3445E-37
19	1ST KIND	6.5037E-26	1.0512E-20	7.9905E-18	3.7769E-16	4.8797E-15	2.7879E-14
	2ND KIND	-2.2285E-54	-8.1426E-54	-2.4521E-53	-5.1111E-53	-8.6656E-53	-1.2264E-52
20	1ST KIND	3.3938E-24	1.4491E-14	3.5288E-09	6.1568E-06	9.7324E-04	3.5717E-02
	2ND KIND	-7.0724E-63	-1.0030E-62	-1.5517E-62	-2.2797E-62	-3.2506E-62	-4.2662E-62
21	1ST KIND	0.	1.8571E-36	5.2643E-29	1.5734E-24	1.6486E-21	2.2552E-19
	2ND KIND	-2.9113E-98	-4.1528E-98	-6.7333E-98	-1.1209E-97	-1.9284E-97	-3.0840E-97
22	1ST KIND	0.	6.5121E-41	7.0008E-32	1.3631E-26	4.5267E-23	1.3196E-20
	2ND KIND	-5.1998-127	-7.3760-127	-1.1569-126	-1.8053-126	-2.9107-126	-4.4769-126
23	1ST KIND	0.	3.5358E-24	8.7760E-15	2.4645E-09	1.0630E-05	3.7795E-03
	2ND KIND	-1.8229-114	-2.6026-114	-4.2800-114	-7.5341-114	-1.4351-113	-2.5754-113
24	1ST KIND	0.	0.	4.3695E-36	7.1477E-30	9.7016E-26	7.6407E-23
	2ND KIND	-4.4436-156	-6.2337-156	-9.3779-156	-1.3586-155	-2.0128-155	-2.9046-155
25	1ST KIND	0.	0.	0.	1.2826E-15	9.7281E-11	2.5213E-07
	2ND KIND	-1.4889-174	-2.1261-174	-3.5207-174	-6.4341-174	-1.3238-173	-2.5961-173
26	1ST KIND	0.	0.	0.	2.6753E-35	3.3957E-30	1.2522E-26
	2ND KIND	-6.1677-205	-8.8077-205	-1.4603-204	-2.7027-204	-5.7850-204	-1.2053-203
27	1ST KIND	0.	0.	0.	0.	5.5655E-32	4.4057E-28
	2ND KIND	-1.3129-226	-1.8669-226	-2.9529-226	-4.6306-226	-7.3921-226	-1.1137-225
28	1ST KIND	0.	0.	0.	0.	1.1569E-16	1.6679E-12
	2ND KIND	-1.5590-223	-2.2264-223	-3.7013-223	-6.9612-223	-1.5331-222	-3.2621-222
29	1ST KIND	0.	0.	0.	0.	3.9652E-34	8.5362E-30
	2ND KIND	-1.9741-251	-2.7234-251	-3.9710-251	-5.4843-251	-7.5377-251	-9.8481-251
30	1ST KIND	0.	0.	0.	0.	0.	9.8797E-35
	2ND KIND	0.	0.	0.	0.	0.	0.
31	1ST KIND	0.	0.	0.	0.	3.3210E-35	5.9155E-31
	2ND KIND	-1.2705-246	-1.8143-246	-3.0077-246	-5.5521-246	-1.1745-245	-2.3919-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

RUN NO.	7	8	9	10
E/N VOLT-CM SQ., TOWNSENDS (X E-17)				
	2.0000E+01	3.0000E+01	7.0000E+01	1.0000E+02
DRIFT VELOCITY CM/SEC, E MU				
	6.5379E+06	9.6986E+06	1.2894E+07	1.3588E+07
CHARACTERISTIC ENERGY VOLT, D/MU				
	4.0610E-01	7.9779E-01	1.9451E+00	2.7803E+00
POWER=IE=Q X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS				
	5.5860E-09	1.2430E-08	3.8558E-08	5.8046E-08
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS				
	5.3428E-09	1.0490E-08	3.0137E-08	5.1909E-08
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA				
	7.8411E+07	1.2606E+08	2.3550E+08	2.6241E+08
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL				
	6.0874E+05	1.1696E+06	9.2579E+05	7.2002E+05
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL				
	3.2690E+06	3.2329E+06	1.8420E+06	1.3588E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL	RUN NO. 7	8	9	10
1	1ST KIND 1.7565E-11	4.4961E-11	1.0634E-10	1.2807E-10
	2ND KIND -1.4482E-13	-3.6297E-13	-8.4202E-13	-1.0083E-12
2	1ST KIND 1.0536E-11	2.7407E-11	5.9321E-11	6.4262E-11
	2ND KIND -4.7795E-14	-1.1988E-13	-2.5097E-13	-2.6890E-13
3	1ST KIND 4.1199E+07	4.9384E+07	7.6341E+07	8.4807E+07
	2ND KIND -1.4015E+05	-1.5499E+05	-2.3985E+05	-2.6297E+05
4	1ST KIND 1.6049E+07	3.0603E+07	6.3808E+07	7.0081E+07
	2ND KIND -4.6743E+03	-7.6969E+03	-1.4925E+04	-1.5986E+04
5	1ST KIND 3.7034E+05	3.1475E+06	1.5217E+07	1.6801E+07
	2ND KIND -9.9444E+00	-6.1436E+01	-2.0295E+02	-2.0790E+02
6	1ST KIND 4.7576E-12	1.6197E-11	2.7211E-11	2.5318E-11
	2ND KIND -2.0159E-17	-5.8251E-17	-8.2622E-17	-7.2361E-17
7	1ST KIND 2.0041E+07	3.7528E+07	5.2538E+07	5.4599E+07
	2ND KIND -8.3082E+01	-1.1921E+02	-1.4942E+02	-1.5314E+02
8	1ST KIND 7.0045E+05	3.6297E+06	1.3769E+07	1.5027E+07
	2ND KIND -6.8461E-01	-2.9758E+00	-8.1087E+00	-8.0963E+00
9	1ST KIND 4.8279E+04	4.8441E+05	3.0992E+06	3.5568E+06
	2ND KIND -4.5884E-03	-2.8284E-02	-9.3756E-02	-9.3309E-02
10	1ST KIND 7.1584E+04	7.1739E+05	4.6040E+06	5.2925E+06
	2ND KIND -3.7887E-04	-2.1636E-03	-6.4678E-03	-6.3150E-03
11	1ST KIND 2.7925E-12	9.4130E-12	3.0589E-11	3.8408E-11
	2ND KIND -3.7094E-21	-1.0132E-20	-2.4934E-20	-2.8749E-20
12	1ST KIND 3.5570E-12	1.2674E-11	1.9964E-11	1.6592E-11
	2ND KIND -2.8735E-22	-7.0773E-22	-7.8032E-22	-5.9884E-22
13	1ST KIND 3.2429E-12	1.2080E-11	1.9585E-11	1.6842E-11
	2ND KIND -5.3492E-27	-1.1544E-26	-1.1195E-26	-8.5553E-27
14	1ST KIND 1.9361E-12	7.5279E-12	1.2759E-11	1.0878E-11
	2ND KIND -5.6594E-32	-1.0535E-31	-9.0562E-32	-6.6193E-32
15	1ST KIND 1.5908E-12	6.9798E-12	1.3644E-11	1.1987E-11
	2ND KIND -6.0161E-37	-1.0177E-36	-8.1253E-37	-5.8645E-37

16	1ST KIND	5.9295E-13	2.8496E-12	5.7874E-12	5.1235E-12
	2ND KIND	-3.6966E-42	-5.2854F-42	-3.6135E-42	-2.5271E-42
17	1ST KIND	2.8793E-13	1.5992E-12	3.8037E-12	3.3973E-12
	2ND KIND	-2.3237E-47	-2.8364E-47	-1.6983E-47	-1.1468E-47
18	1ST KIND	7.7707E+04	7.3042E+05	4.3550E+06	4.9811E+06
	2ND KIND	-1.1714E-36	-1.6460E-36	-1.2096E-36	-8.6277E-37
19	1ST KIND	9.1665E-14	6.1292E-13	1.6520E-12	1.5298E-12
	2ND KIND	-1.5017E-52	-1.4720F-52	-7.2443E-53	-4.6806E-53
20	1ST KIND	5.0854E-01	1.0187E+02	1.5301E+04	3.4766E+04
	2ND KIND	-5.1026E-62	-5.5975F-62	-1.3882E-61	-1.8060E-61
21	1ST KIND	8.2804E-18	8.4721E-15	2.2638E-12	4.6487E-12
	2ND KIND	-4.3785E-97	-6.3629E-97	-5.0784E-97	-3.7465E-97
22	1ST KIND	8.2766E-19	2.3523E-15	2.0268E-12	5.7257E-12
	2ND KIND	-6.2664-126	-9.3628-126	-9.0411-126	-7.8276-126
23	1ST KIND	2.7823F-01	1.1737E+03	1.6916E+06	5.2448E+06
	2ND KIND	-4.0578-113	-7.5284-113	-8.0995-113	-6.4809-113
24	1ST KIND	1.0113E-20	1.4764E-16	7.4944E-13	3.0935E-12
	2ND KIND	-3.9357-155	-6.0579-155	-7.9609-155	-8.0692-155
25	1ST KIND	8.0046E-05	7.5745E+00	3.0805E+05	2.1878E+06
	2ND KIND	-4.4290-173	-1.0089-172	-2.3163-172	-3.2308-172
26	1ST KIND	5.2040E-24	9.5015E-19	9.7056E-14	8.2877E-13
	2ND KIND	-2.1953-203	-6.0774-203	-1.3450-202	-1.4732-202
27	1ST KIND	3.1653E-25	1.7240E-19	3.4720E-14	3.0608E-13
	2ND KIND	-1.5267-225	-2.2214-225	-2.2988-225	-2.0139-225
28	1ST KIND	1.9015E-09	3.3252E-03	4.3796E+03	7.4932E+04
	2ND KIND	-5.9869-222	-1.6438-221	-6.8861-221	-1.2589-220
29	1ST KIND	1.2611E-26	3.4108E-20	3.6757E-14	4.5432E-13
	2ND KIND	-1.1980-250	-1.3720-250	-1.3747-250	-1.9707-250
30	1ST KIND	3.7308E-31	9.5684E-24	2.3050E-16	7.5557E-15
	2ND KIND	0.	0.	0.	0.
31	1ST KIND	7.8019E-28	1.8532E-21	3.0624E-15	5.3145E-14
	2ND KIND	-4.2363-245	-1.0776-244	-3.7990-244	-6.4700-244
32	1ST KIND	2.2058E-39	1.2341E-28	1.5890E-18	1.7533E-16
	2ND KIND	0.	0.	0.	0.
33	1ST KIND	0.	4.1264E-37	1.8309E-22	2.3525E-19
	2ND KIND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/50/ 0/50, 10 RUNS

FRACTIONS H2/HE/N2/CO2
5.0000E-19 5.0000E-01 5.0000E-19 5.0000E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSENDS (X E-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC, E MU	3.5746E+06	4.7071E+06	5.5597E+06	6.2708E+06	6.7203E+06	7.0448E+06
CHARACTERISTIC ENERGY VOLT, D/MU	8.6158E-02	1.3749E-01	2.2970E-01	3.4624E-01	4.8805E-01	6.3335E-01
POWER=IE=Q X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS	7.6354E-10	1.5082E-09	2.3751E-09	3.3486E-09	4.3064E-09	5.2667E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS	8.1102E-10	1.5025E-09	2.3701E-09	3.1928E-09	4.0426E-09	4.9018E-09
TOTAL COLL. RATE / ELECTRON / MOL. UNITS 10E16 MOL,SUMA	1.8590E+07	2.8971E+07	3.8963E+07	4.6818E+07	5.4193E+07	6.1382E+07
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL	6.1772E+05	7.5970E+05	9.9597E+05	1.2223E+06	1.3742E+06	1.4397E+06
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL	7.1492E+06	6.2762E+06	5.5597E+06	5.0166E+06	4.4802E+06	4.0256E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL. J= 33

LEVEL	RUN NO. 1	2	3	4	5	6
1	1ST KIND 9.0865E-13	1.9914E-12	4.7047E-12	8.9868E-12	1.4338E-11	1.9664E-11
	2ND KIND -8.9529E-15	-1.7819E-14	-3.9877E-14	-7.4350E-14	-1.1714E-13	-1.5949E-13
2	1ST KIND 4.2840E-13	1.0712E-12	2.7253E-12	5.3690E-12	8.6784E-12	1.1965E-11
	2ND KIND -2.7600E-15	-5.6740E-15	-1.3023E-14	-2.4537E-14	-3.8781E-14	-5.2794E-14
3	1ST KIND 1.5648E+07	2.0899E+07	2.3580E+07	2.4238E+07	2.4417E+07	2.4967E+07
	2ND KIND -6.6351E+04	-7.2241E+04	-7.4071E+04	-7.3300E+04	-7.3157E+04	-7.4755E+04
4	1ST KIND 2.2202E+06	4.7684E+06	7.4715E+06	9.7731E+06	1.2136E+07	1.4481E+07
	2ND KIND -1.5072E+03	-1.7943E+03	-2.1100E+03	-2.4723E+03	-2.9475E+03	-3.4850E+03
5	1ST KIND 2.4781E-02	1.3805E+02	9.9173E+03	9.3113E+04	3.6208E+05	8.6646E+05
	2ND KIND -3.4048E-06	-8.2641E-03	-3.8379E-01	-2.7567E+00	-8.9261E+00	-1.8653E+01
6	1ST KIND 2.8747E-15	4.0485E-14	4.6873E-13	1.8103E-12	3.9924E-12	6.3620E-12
	2ND KIND -8.9584E-20	-3.5847E-19	-2.7203E-18	-8.6338E-18	-1.6916E-17	-2.4901E-17
7	1ST KIND 7.8995E+05	3.3754E+06	7.9262E+06	1.2512E+07	1.6532E+07	1.9444E+07
	2ND KIND -2.1085E+01	-2.9015E+01	-3.9196E+01	-4.8270E+01	-5.5987E+01	-6.1600E+01
8	1ST KIND 6.0113E+00	2.1901E+03	4.5982E+04	2.2912E+05	6.1927E+05	1.1848E+06
	2ND KIND -2.6004E-05	-4.0044E-03	-5.8609E-02	-2.4485E-01	-5.9244E-01	-1.0427E+00
9	1ST KIND 2.8339E-03	1.6057E+01	1.2031E+03	1.2014E+04	5.0143E+04	1.2886E+05
	2ND KIND -3.2270E-09	-5.0038E-06	-1.9481E-04	-1.3072E-03	-4.1344E-03	-8.5975E-03
10	1ST KIND 4.2102E-03	2.3849E+01	1.7857E+03	1.7817E+04	7.4313E+04	1.9091E+05
	2ND KIND -4.0843E-10	-5.0527E-07	-1.7648E-05	-1.1106E-04	-3.3622E-04	-6.7591E-04
11	1ST KIND 2.7805E-15	6.2066E-14	4.1320E-13	1.2079E-12	2.3884E-12	3.7127E-12
	2ND KIND -1.2453E-22	-3.2362E-22	-8.8966E-22	-1.8441E-21	-3.0771E-21	-4.3357E-21
12	1ST KIND 2.4682E-17	1.3356E-14	2.8279E-13	1.2657E-12	2.9668E-12	4.8628E-12
	2ND KIND -4.4799E-26	-4.7538E-24	-4.5909E-23	-1.3465E-22	-2.4209E-22	-3.3245E-22

13	1ST $\bar{K}$IND	1.5954E-17	1.0429E-14	2.4034E-13	1.1255E-12	2.7138E-12	4.5402E-12
	2ND $\bar{K}$IND	-2.9080E-30	-1.6036E-28	-1.1263E-27	-2.7956E-27	-4.5403E-27	-5.8331E-27
14	1ST $\bar{K}$IND	5.8069E-18	5.0039E-15	1.3052E-13	6.4952E-13	1.6226E-12	2.7696E-12
	2ND $\bar{K}$IND	-1.0401E-34	-3.0908E-33	-1.5865E-32	-3.3166E-32	-4.8226E-32	-5.7567E-32
15	1ST $\bar{K}$IND	2.6277E-18	3.0019E-15	9.1658E-14	5.0321E-13	1.3457E-12	2.4245E-12
	2ND $\bar{K}$IND	-3.5675E-39	-5.4125E-38	-2.0777E-37	-3.7907E-37	-5.1049E-37	-5.8176E-37
16	1ST $\bar{K}$IND	3.6067E-19	7.2020E-16	2.8216E-14	1.7581E-13	5.0485E-13	9.4981E-13
	2ND $\bar{K}$IND	-5.6766E-44	-5.6774E-43	-1.6776E-42	-2.5952E-42	-3.1124E-42	-3.2732E-42
17	1ST $\bar{K}$IND	8.3040E-20	2.3657E-16	1.1365E-14	8.0445E-14	2.5176E-13	5.0374E-13
	2ND $\bar{K}$IND	-1.3608E-48	-6.3729E-48	-1.3377E-47	-1.7434E-47	-1.8807E-47	-1.8454E-47
18	1ST $\bar{K}$IND	4.8532E-03	2.7268E+01	2.0019E+03	1.9436E+04	7.8758E+04	1.9702E+05
	2ND $\bar{K}$IND	-1.4826E-37	-3.0495E-37	-5.4742E-37	-7.5528E-37	-8.9367E-37	-9.5456E-37
19	1ST $\bar{K}$IND	8.3674E-21	4.3027E-17	2.8037E-15	2.3734E-14	8.3165E-14	1.7994E-13
	2ND $\bar{K}$IND	-2.5738E-53	-6.8395E-53	-1.0536E-52	-1.1478E-52	-1.0939E-52	-9.8472E-53
20	1ST $\bar{K}$IND	6.9014E-14	6.1059E-07	2.1452E-03	2.0894E-01	3.8643E+00	2.8134E+01
	2ND $\bar{K}$IND	-1.2224E-62	-2.2335E-62	-3.1873E-62	-3.5313E-62	-3.5027E-62	-3.3496E-62
21	1ST $\bar{K}$IND	0.	2.7671E-25	1.3968E-20	5.4017E-18	2.2183E-16	2.5766E-15
	2ND $\bar{K}$IND	-5.1648E-98	-1.0975E-97	-2.0209E-97	-2.8191E-97	-3.3667E-97	-3.6333E-97
22	1ST $\bar{K}$IND	0.	1.4428E-27	6.0483E-22	5.6389E-19	3.9771E-17	6.6634E-16
	2ND $\bar{K}$IND	-8.9838-127	-1.7305-126	-2.9073-126	-3.9318-126	-4.7011-126	-5.1495-126
23	1ST $\bar{K}$IND	0.	1.3540E-10	1.6414E-04	1.9965E-01	1.7080E+01	3.3136E+02
	2ND $\bar{K}$IND	-3.2439-114	-7.2077-114	-1.4938-113	-2.3835-113	-3.2208-113	-3.8457-113
24	1ST $\bar{K}$IND	0.	0.	2.9548E-24	9.7714E-21	1.5218E-18	4.4323E-17
	2ND $\bar{K}$IND	-7.2697-156	-1.2498-155	-1.8794-155	-2.4060-155	-2.8418-155	-3.1583-155
25	1ST $\bar{K}$IND	0.	0.	0.	1.5886E-04	6.2390E-02	3.2292E+00
	2ND $\bar{K}$IND	-2.6509-174	-6.0163-174	-1.3546-173	-2.4016-173	-3.5845-173	-4.6659-173
26	1ST $\bar{K}$IND	0.	0.	0.	1.1176E-23	7.8619E-21	5.0994E-19
	2ND $\bar{K}$IND	-1.0982-204	-2.5014-204	-5.8217-204	-1.1077-203	-1.8022-203	-2.5444-203
27	1ST $\bar{K}$IND	0.	0.	0.	0.	1.4808E-21	1.2199E-19
	2ND $\bar{K}$IND	-2.2966-226	-4.5184-226	-7.4948-226	-9.8062-226	-1.1391-225	-1.2273-225
28	1ST $\bar{K}$IND	0.	0.	0.	0.	2.5385E-05	4.0365E-03
	2ND $\bar{K}$IND	-2.7761-223	-6.3740-223	-1.5337-222	-2.9994-222	-4.9219-222	-6.9561-222
29	1ST $\bar{K}$IND	0.	0.	0.	0.	2.7286E-22	4.3878E-20
	2ND $\bar{K}$IND	-3.0226-251	-4.9219-251	-6.8099-251	-7.7816-251	-8.0995-251	-8.0109-251
30	1ST $\bar{K}$IND	0.	0.	0.	0.	0.	3.2125E-23
	2ND $\bar{K}$IND	0.	0.	0.	0.	0.	0.
31	1ST $\bar{K}$IND	0.	0.	0.	0.	1.3228E-23	2.4958E-21
	2ND $\bar{K}$IND	-2.2621-246	-5.1506-246	-1.1890-245	-2.2044-245	-3.4572-245	-4.7186-245
32	1ST $\bar{K}$IND	0.	0.	0.	0.	0.	0.
	2ND $\bar{K}$IND	0.	0.	0.	0.	0.	0.
33	1ST $\bar{K}$IND	0.	0.	0.	0.	0.	0.
	2ND $\bar{K}$IND	0.	0.	0.	0.	0.	0.

RUN NO.	7	8	9	10
E/N VOLT-CM SQ., TOWNSENDS (X E-17)				
	2.0000E+01	3.0000E+01	7.0000E+01	1.0000E+02
DRIFT VELOCITY CM/SEC. E MU				
	7.3403E+06	8.5089E+06	1.2583E+07	1.5872E+07
CHARACTERISTIC ENERGY VOLT, D/MU				
	7.6733E-01	1.1994E+00	2.6891E+00	3.5920E+00
POWER=IE=Q X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS				
	6.2716E-09	1.0905E-08	3.7629E-08	6.7806E-08
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS				
	5.7598E-09	9.4060E-09	3.4322E-08	6.5673E-08
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA				
	6.8213E+07	9.3221E+07	1.2885E+08	1.3216E+08
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL				
	1.4499E+06	1.3535E+06	1.2189E+06	1.2694E+06
MUN MOBILITY X MOL/CC. UNITS 10E16 MOL				
	3.6702E+06	2.8363E+06	1.7976E+06	1.5872E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL	RUN NO. 7	8	9	10
1	1ST $\bar{K}$IND 2.4381E-11	3.8942E-11	6.3934E-11	6.5530E-11
	2ND $\bar{K}$IND -1.9685E-13	-3.1094E-13	-5.0240E-13	-5.1341E-13
2	1ST $\bar{K}$IND 1.4854E-11	2.3140E-11	3.0779E-11	2.8452E-11
	2ND $\bar{K}$IND -6.5010E-14	-9.9333E-14	-1.2855E-13	-1.1802E-13
3	1ST $\bar{K}$IND 2.5769E+07	3.1287E+07	4.1279E+07	4.0440E+07
	2ND $\bar{K}$IND -7.7851E+04	-9.6619E+04	-1.2784E+05	-1.2466E+05
4	1ST $\bar{K}$IND 1.6724E+07	2.4562E+07	3.3766E+07	3.2602E+07
	2ND $\bar{K}$IND -4.0235E+03	-5.8593E+03	-7.6363E+03	-7.2884E+03
5	1ST $\bar{K}$IND 1.5421E+06	4.5739E+06	7.6631E+06	6.9317E+06
	2ND $\bar{K}$IND -2.9944E+01	-6.9986E+01	-9.3647E+01	-8.1574E+01
6	1ST $\bar{K}$IND 8.4177E-12	1.2705E-11	1.1098E-11	9.2869E-12
	2ND $\bar{K}$IND -3.1190E-17	-4.2022E-17	-3.2492E-17	-2.5985E-17
7	1ST $\bar{K}$IND 2.1445E+07	2.4952E+07	2.7150E+07	2.6946E+07
	2ND $\bar{K}$IND -6.5393E+01	-7.2109E+01	-7.6272E+01	-7.5503E+01
8	1ST $\bar{K}$IND 1.8388E+06	4.4318E+06	6.8946E+06	6.1928E+06
	2ND $\bar{K}$IND -1.5111E+00	-2.9930E+00	-3.6453E+00	-3.1262E+00
9	1ST $\bar{K}$IND 2.4485E+05	8.5736E+05	1.6281E+06	1.4876E+06
	2ND $\bar{K}$IND -1.3827E-02	-3.2416E-02	-4.1625E-02	-3.5420E-02
10	1ST $\bar{K}$IND 3.6276E+05	1.2720E+06	2.4241E+06	2.2168E+06
	2ND $\bar{K}$IND -1.0592E-03	-2.3319E-03	-2.8029E-03	-2.3655E-03
11	1ST $\bar{K}$IND 5.0093E-12	9.8701E-12	1.9075E-11	1.9264E-11
	2ND $\bar{K}$IND -5.4763E-21	-9.0970E-21	-1.4010E-20	-1.3492E-20
12	1ST $\bar{K}$IND 6.4917E-12	9.5368E-12	7.5326E-12	5.7616E-12
	2ND $\bar{K}$IND -3.9239E-22	-4.5001E-22	-2.8213E-22	-2.0404E-22
13	1ST $\bar{K}$IND 6.1443E-12	9.3391E-12	7.4560E-12	5.8738E-12
	2ND $\bar{K}$IND -6.5958E-27	-6.9620E-27	-3.9953E-27	-2.8985E-27
14	1ST $\bar{K}$IND 3.8005E-12	5.9132E-12	4.8675E-12	3.7958E-12
	2ND $\bar{K}$IND -6.2079E-32	-5.9673E-32	-3.1775E-32	-2.2247E-32
15	1ST $\bar{K}$IND 3.4612E-12	5.9312E-12	5.3444E-12	4.2396E-12
	2ND $\bar{K}$IND -6.0895E-37	-5.5462E-37	-2.8192E-37	-1.9598E-37

16	1ST $\bar{K}$IND	1.3914E-12	2.4773E-12	2.2599E-12	1.8063E-12
	2ND $\bar{K}$IND	-3.2401E-42	-2.6516E-42	-1.2191E-42	-8.3211E-43
17	1ST $\bar{K}$IND	7.7120E-13	1.5131E-12	1.5186E-12	1.2122E-12
	2ND $\bar{K}$IND	-1.7456E-47	-1.3116E-47	-5.5662E-48	-3.7181E-48
18	1ST $\bar{K}$IND	3.6620E+05	1.2265E+06	2.2809E+06	2.0851E+06
	2ND $\bar{K}$IND	-9.6482E-37	-8.3681E-37	-4.1287E-37	-2.8604E-37
19	1ST $\bar{K}$IND	2.9061E-13	6.3232E-13	6.6893E-13	5.4828E-13
	2ND $\bar{K}$IND	-8.7686E-53	-5.8912E-53	-2.2424E-53	-1.4697E-53
20	1ST $\bar{K}$IND	1.1552E+02	2.0373E+03	2.0052E+04	2.7210E+04
	2ND $\bar{K}$IND	-3.2693E-62	-4.3934E-62	-9.0014E-62	-8.8078E-62
21	1ST $\bar{K}$IND	1.3907E-14	3.2402E-13	2.6269E-12	3.2078E-12
	2ND $\bar{K}$IND	-3.7117E-97	-3.3460E-97	-1.7725E-97	-1.2588E-97
22	1ST $\bar{K}$IND	4.7140E-15	1.9913E-13	3.5313E-12	5.4184E-12
	2ND $\bar{K}$IND	-5.3588-126	-5.2324-126	-3.7886-126	-3.1837-126
23	1ST $\bar{K}$IND	2.6306E+03	1.4482E+05	3.2675E+06	5.1257E+06
	2ND $\bar{K}$IND	-4.2478-113	-4.5931-113	-2.9910-113	-2.2424-113
24	1ST $\bar{K}$IND	4.7173E-16	4.8411E-14	2.2350E-12	4.3314E-12
	2ND $\bar{K}$IND	-3.3761-155	-3.7954-155	-3.9393-155	-3.6606-155
25	1ST $\bar{K}$IND	5.2499E+01	1.4210E+04	2.4211E+06	7.2512E+06
	2ND $\bar{K}$IND	-5.5647-173	-8.3060-173	-1.7957-172	-2.4016-172
26	1ST $\bar{K}$IND	9.8728E-18	4.0563E-15	9.6619E-13	2.8090E-12
	2ND $\bar{K}$IND	-3.2345-203	-5.2229-203	-7.2128-203	-7.4285-203
27	1ST $\bar{K}$IND	2.7335E-18	1.4028E-15	3.5011E-13	9.7871E-13
	2ND $\bar{K}$IND	-1.2697-225	-1.2678-225	-9.5630-226	-7.8178-226
28	1ST $\bar{K}$IND	1.2537E-01	1.5477E+02	1.8659E+05	9.6287E+05
	2ND $\bar{K}$IND	-8.9310-222	-1.8111-221	-7.6780-221	-1.2209-220
29	1ST $\bar{K}$IND	1.3332E-18	1.3326E-15	6.8772E-13	2.5184E-12
	2ND $\bar{K}$IND	-7.7684-251	-6.9187-251	-1.2362-250	-2.0156-250
30	1ST $\bar{K}$IND	1.9684E-21	7.6829E-18	3.5682E-14	2.6065E-13
	2ND $\bar{K}$IND	0.	0.	0.	0.
31	1ST $\bar{K}$IND	8.1025E-20	1.0748E-16	1.3071E-13	6.5809E-13
	2ND $\bar{K}$IND	-5.8905-245	-1.0844-244	-3.8139-244	-5.6712-244
32	1ST $\bar{K}$IND	5.8490E-08	5.7996E-02	2.2270E+03	2.2864E+04
	2ND $\bar{K}$IND	0.	0.	0.	0.
33	1ST $\bar{K}$IND	0.	1.1896E-05	4.1515E+01	1.2792E+03
	2ND $\bar{K}$IND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/67/ 0/33, 10 RUNS

FRACTIONS H2/HE/N2/CO2
3.3333E-19 6.6667E-01 3.3333E-19 3.3333E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSENDS (X E-17)						
	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC. E MU						
	3.8339E+06	4.7346E+06	5.2039E+06	5.5906E+06	5.8676E+06	6.1278E+06
CHARACTERISTIC ENERGY VOLT, D/MU						
	1.1866E-01	2.0664E-01	3.5244E-01	5.1077E-01	6.7638E-01	8.3364E-01
POWER=IE=Q X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS						
	8.1892E-10	1.5170E-09	2.2231E-09	2.9854E-09	3.7600E-09	4.5812E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS						
	8.4496E-10	1.4928E-09	2.1947E-09	2.8279E-09	3.5043E-09	4.2368E-09
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA						
	1.7312E+07	2.5249E+07	3.1964E+07	3.7283E+07	4.2693E+07	4.8356E+07
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL						
	9.7869E+05	1.1552E+06	1.3388E+06	1.4331E+06	1.4518E+06	1.4338E+06
MUN MORILITY X MOL/CC, UNITS 10E16 MOL						
	7.6678E+06	6.3128E+06	5.2039E+06	4.4724E+06	3.9117E+06	3.5016E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL	RUN NO. 1	2	3	4	5	6
1	1ST KIND	9.8579E-13	2.5753E-12	6.0028E-12	1.0095E-11	1.4211E-11	1.7974E-11
	2ND KIND	-9.0781E-15	-2.2061E-14	-4.9705E-14	-8.2407E-14	-1.1510E-13	-1.4480E-13
2	1ST KIND	5.0826E-13	1.4705E-12	3.5825E-12	6.1150E-12	8.6511E-12	1.0931E-11
	2ND KIND	-2.8541E-15	-7.1663E-15	-1.6403E-14	-2.7288E-14	-3.8070E-14	-4.7663E-14
3	1ST KIND	1.3214E+07	1.5839E+07	1.6419E+07	1.6451E+07	1.6806E+07	1.7670E+07
	2ND KIND	-4.7586E+04	-4.9743E+04	-4.9045E+04	-4.8797E+04	-5.0334E+04	-5.3462E+04
4	1ST KIND	2.6586E+06	4.7567E+06	6.7080E+06	8.4164E+06	1.0214E+07	1.2054E+07
	2ND KIND	-1.1437E+03	-1.3677E+03	-1.6581E+03	-2.0161E+03	-2.4419E+03	-2.8891E+03
5	1ST KIND	1.8575E+00	1.9774E+03	5.2116E+04	2.6836E+05	7.0939E+05	1.3250E+06
	2ND KIND	-1.6489E-04	-8.6415E-02	-1.5680E+00	-6.4239E+00	-1.4530E+01	-2.4212E+01
6	1ST KIND	7.4534E-15	1.5821E-13	1.1151E-12	2.8076E-12	4.6520E-12	6.2078E-12
	2ND KIND	-1.0003E-19	-1.0405E-18	-5.4977E-18	-1.1899E-17	-1.8001E-17	-2.2581E-17
7	1ST KIND	1.4880E+06	4.6875E+06	8.6710E+06	1.1600E+07	1.3660E+07	1.4991E+07
	2ND KIND	-1.7532E+01	-2.5023E+01	-3.2977E+01	-3.8505E+01	-4.2367E+01	-4.4914E+01
8	1ST KIND	1.1143E+02	1.3260E+04	1.3639E+05	4.4415E+05	9.1866E+05	1.4922E+06
	2ND KIND	-3.1564E-04	-1.9093E-02	-1.4941E-01	-4.2135E-01	-7.8694E-01	-1.1755E+00
9	1ST KIND	2.1355E-01	2.3669E+02	6.7346E+03	3.8001E+04	1.0964E+05	2.2064E+05
	2ND KIND	-1.2344E-07	-4.6105E-05	-7.4953E-04	-2.9805E-03	-6.7122E-03	-1.1203E-02
10	1ST KIND	3.1723E-01	3.5137E+02	9.9874E+03	5.6314E+04	1.6244E+05	3.2698E+05
	2ND KIND	-1.3944E-08	-4.3214E-06	-6.4091E-05	-2.4094E-04	-5.2190E-04	-8.4558E-04
11	1ST KIND	1.2514E-14	1.7428E-13	7.7670E-13	1.6943E-12	2.7545E-12	3.8480E-12
	2ND KIND	-1.4876E-22	-4.6806E-22	-1.2247E-21	-2.1716E-21	-3.1523E-21	-4.0723E-21
12	1ST KIND	5.7491E-16	8.2604E-14	7.6408E-13	2.0805E-12	3.5482E-12	4.7688E-12
	2ND KIND	-4.8051E-25	-1.7841E-23	-8.7593E-23	-1.7089E-22	-2.3703E-22	-2.7769E-22
13	1ST KIND	4.0759E-16	6.8153E-14	6.7420E-13	1.9046E-12	3.3252E-12	4.5472E-12
	2ND KIND	-2.2733E-29	-4.9113E-28	-1.8723E-27	-3.2151E-27	-4.1344E-27	-4.6085E-27

14	1ST $\bar{K}$IND	1.6981E-16	3.5474E-14	3.8541E-13	1.1379E-12	2.0374E-12	2.8239E-12
	2ND $\bar{K}$IND	-5.9875E-34	-7.7273E-33	-2.2816E-32	-3.4251E-32	-4.0482E-32	-4.2684E-32
15	1ST $\bar{K}$IND	8.7761E-17	2.3601E-14	2.9447E-13	9.4786E-13	1.8018E-12	2.6189E-12
	2ND $\bar{K}$IND	-1.4313E-38	-1.1069E-37	-2.6488E-37	-3.6178E-37	-4.0588E-37	-4.1462E-37
16	1ST $\bar{K}$IND	1.6025E-17	6.7199E-15	1.0123E-13	3.5641E-13	7.1025E-13	1.0605E-12
	2ND $\bar{K}$IND	-1.8467E-43	-9.7565E-43	-1.8493E-42	-2.2009E-42	-2.2521E-42	-2.1628E-42
17	1ST $\bar{K}$IND	4.4040E-18	2.5421E-15	4.5724E-14	1.7924E-13	3.8334E-13	6.0120E-13
	2ND $\bar{K}$IND	-2.7872E-48	-8.4656E-48	-1.2489E-47	-1.3141E-47	-1.2482E-47	-1.1416E-47
18	1ST $\bar{K}$IND	3.6475E-01	3.9638E+02	1.0889E+04	5.9185E+04	1.6550E+05	3.2543E+05
	2ND $\bar{K}$IND	-1.6107E-37	-3.3632E-37	-5.2625E-37	-6.2284E-37	-6.5432E-37	-6.4633E-37
19	1ST $\bar{K}$IND	6.0603E-19	5.7588E-16	1.3300E-14	5.9997E-14	1.3966E-13	2.3190E-13
	2ND $\bar{K}$IND	-3.6373E-53	-7.0852E-53	-8.1703E-53	-7.4782E-53	-6.4696E-53	-5.5538E-53
20	1ST $\bar{K}$IND	5.2129E-10	2.4071E-04	1.4562E-01	4.7080E+00	4.1502E+01	1.8057E+02
	2ND $\bar{K}$IND	-1.2688E-62	-2.1097E-62	-2.4809E-62	-2.4000E-62	-2.2619E-62	-2.2524E-62
21	1ST $\bar{K}$IND	0.	1.0791E-21	4.3444E-18	3.3696E-16	4.6341E-15	2.5121E-14
	2ND $\bar{K}$IND	-5.7072E-98	-1.2372E-97	-1.9654E-97	-2.3488E-97	-2.4972E-97	-2.4996E-97
22	1ST $\bar{K}$IND	0.	1.9206E-23	4.6763E-19	6.8265E-17	1.4023E-15	1.0067E-14
	2ND $\bar{K}$IND	-9.4472-127	-1.8072-126	-2.7233-126	-3.2666-126	-3.5445-126	-3.6387-126
23	1ST $\bar{K}$IND	0.	2.0334E-06	1.6785E-01	3.1061E+01	7.5303E+02	6.1064E+03
	2ND $\bar{K}$IND	-3.6313-114	-8.7263-114	-1.6353-113	-2.2566-113	-2.6940-113	-2.9490-113
24	1ST $\bar{K}$IND	0.	0.	7.6906E-21	3.2960E-18	1.2424E-16	1.3535E-15
	2ND $\bar{K}$IND	-7.1653-156	-1.1927-155	-1.6557-155	-1.9641-155	-2.1808-155	-2.3287-155
25	1ST $\bar{K}$IND	0.	0.	0.	1.4422E-01	1.2566E+01	2.1352E+02
	2ND $\bar{K}$IND	-2.9798-174	-7.6256-174	-1.6229-173	-2.5199-173	-3.3383-173	-4.0393-173
26	1ST $\bar{K}$IND	0.	0.	0.	1.2459E-20	2.2712E-18	4.7305E-17
	2ND $\bar{K}$IND	-1.2349-204	-3.2174-204	-7.3875-204	-1.2706-203	-1.8496-203	-2.3994-203
27	1ST $\bar{K}$IND	0.	0.	0.	0.	6.1828E-19	1.4589E-17
	2ND $\bar{K}$IND	-2.4540-226	-4.7146-226	-6.8245-226	-7.9070-226	-8.4297-226	-8.6251-226
28	1ST $\bar{K}$IND	0.	0.	0.	0.	1.6050E-02	8.9688E-01
	2ND $\bar{K}$IND	-3.1255-223	-8.3545-223	-1.9950-222	-3.4716-222	-5.0882-222	-6.7973-222
29	1ST $\bar{K}$IND	0.	0.	0.	0.	1.9879E-19	9.3882E-18
	2ND $\bar{K}$IND	-2.8811-251	-4.4513-251	-5.4075-251	-5.5440-251	-5.3777-251	-5.1276-251
30	1ST $\bar{K}$IND	0.	0.	0.	0.	0.	1.5815E-20
	2ND $\bar{K}$IND	0.	0.	0.	0.	0.	0.
31	1ST $\bar{K}$IND	0.	0.	0.	0.	9.0511E-21	5.9910E-19
	2ND $\bar{K}$IND	-2.5436-246	-6.6049-246	-1.4780-245	-2.4351-245	-3.4225-245	-4.4103-245
32	1ST $\bar{K}$IND	0.	0.	0.	0.	0.	0.
	2ND $\bar{K}$IND	0.	0.	0.	0.	0.	0.
33	1ST $\bar{K}$IND	0.	0.	0.	0.	0.	0.
	2ND $\bar{K}$IND	0.	0.	0.	0.	0.	0.

RUN NO.	7	8	9	10
E/N VOLT-CM SQ.. TOWNSENDS (X E-17)				
	2.0000E+01	3.0000E+01	7.0000E+01	1.0000E+02
DRIFT VELOCITY CM/SEC, E MU				
	6.4093E+06	7.5708E+06	1.2814E+07	1.7016E+07
CHARACTERISTIC ENERGY VOLT, D/MU				
	9.7678E-01	1.5044E+00	3.2074E+00	4.2057E+00
POWER=JE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LHS				
	5.4761E-09	9.7027E-09	3.8318E-08	7.2692E-08
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS				
	5.0077E-09	8.6774E-09	3.6316E-08	7.1399E-08
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL.SUMA				
	5.3871E+07	7.1582E+07	8.7041E+07	8.9361E+07
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL				
	1.4071E+06	1.3440E+06	1.5076E+06	1.7082E+06
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL				
	3.2046E+06	2.5236E+06	1.8305E+06	1.7016E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL. J= 33

LEVEL	RUN NO. 7	8	9	10
1	1ST KIND 2.1295E-11	3.1840E-11	4.3355E-11	4.1860E-11
	2ND KIND -1.7088E-13	-2.5284E-13	-3.3975E-13	-3.2736E-13
2	1ST KIND 1.2868E-11	1.8065E-11	1.9476E-11	1.7068E-11
	2ND KIND -5.5721E-14	-7.6798E-14	-8.0996E-14	-7.0585E-14
3	1ST KIND 1.8782E+07	2.3527E+07	2.7105E+07	2.5432E+07
	2ND KIND -5.7415E+04	-7.2872E+04	-8.3708E+04	-7.8265E+04
4	1ST KIND 1.3809E+07	1.9151E+07	2.1943E+07	2.0375E+07
	2ND KIND -3.3073E+03	-4.4890E+03	-4.9179E+03	-4.5299E+03
5	1ST KIND 1.9919E+06	4.0828E+06	4.7480E+06	4.0493E+06
	2ND KIND -3.3422E+01	-5.7004E+01	-5.6530E+01	-4.6880E+01
6	1ST KIND 7.3212E-12	8.8742E-12	6.4211E-12	5.1974E-12
	2ND KIND -2.5506E-17	-2.8211E-17	-1.8520E-17	-1.4405E-17
7	1ST KIND 1.5865E+07	1.7438E+07	1.7997E+07	1.7650E+07
	2ND KIND -4.6576E+01	-4.9636E+01	-5.0510E+01	-4.9511E+01
8	1ST KIND 2.0729E+06	3.8130E+06	4.2600E+06	3.6115E+06
	2ND KIND -1.5230E+00	-2.3444E+00	-2.1792E+00	-1.7850E+00
9	1ST KIND 3.5176E+05	8.1270E+05	1.0173E+06	8.7148E+05
	2ND KIND -1.5484E-02	-2.6117E-02	-2.4776E-02	-2.0132E-02
10	1ST KIND 5.2155E+05	1.2074E+06	1.5156E+06	1.2992E+06
	2ND KIND -1.1428E-03	-1.8326E-03	-1.6555E-03	-1.3383E-03
11	1ST KIND 4.9227E-12	8.8112E-12	1.2822E-11	1.2066E-11
	2ND KIND -4.8987E-21	-7.4471E-21	-9.1168E-21	-8.2627E-21
12	1ST KIND 5.5890E-12	6.4059E-12	4.2301E-12	3.1575E-12
	2ND KIND -2.9606E-22	-2.8102E-22	-1.5512E-22	-1.1034E-22
13	1ST KIND 5.3892E-12	6.3490E-12	4.2030E-12	3.2267E-12
	2ND KIND -4.7620E-27	-4.2490E-27	-2.1817E-27	-1.5608E-27
14	1ST KIND 3.3792E-12	4.0432E-12	2.7469E-12	2.0864E-12
	2ND KIND -4.2602E-32	-3.5431E-32	-1.7201E-32	-1.1917E-32
15	1ST KIND 3.2415E-12	4.1967E-12	3.0478E-12	2.3457E-12
	2ND KIND -4.0545E-37	-3.2421E-37	-1.5188E-37	-1.0468E-37

16	1ST $\bar{K}$IND	1.3329E-12	1.7615E-12	1.2878E-12	9.9870E-13
	2ND $\bar{K}$IND	-2.0286E-42	-1.4955E-42	-6.4863E-43	-4.4121E-43
17	1ST $\bar{K}$IND	7.8203E-13	1.1113E-12	8.7265E-13	6.7398E-13
	2ND $\bar{K}$IND	-1.0376E-47	-7.1808E-48	-2.9306E-48	-1.9602E-48
18	1ST $\bar{K}$IND	5.1062E+05	1.1497E+06	1.4247E+06	1.2218E+06
	2ND $\bar{K}$IND	-6.2047E-37	-4.8197E-37	-2.2155E-37	-1.5248E-37
19	1ST $\bar{K}$IND	3.1324E-13	4.7754E-13	3.8647E-13	3.0559E-13
	2ND $\bar{K}$IND	-4.8338E-53	-3.0789E-53	-1.1602E-53	-7.6720E-54
20	1ST $\bar{K}$IND	5.0555E+02	3.7730E+03	1.6591E+04	1.9698E+04
	2ND $\bar{K}$IND	-2.4289E-62	-4.0200E-62	-5.9654E-62	-5.3834E-62
21	1ST $\bar{K}$IND	7.7946E-14	5.9570E-13	2.0291E-12	2.1885E-12
	2ND $\bar{K}$IND	-2.4300E-97	-1.9648E-97	-9.6120E-98	-6.7604E-98
22	1ST $\bar{K}$IND	3.8631E-14	4.8154E-13	3.1876E-12	4.2133E-12
	2ND $\bar{K}$IND	-3.6299-126	-3.2781-126	-2.2672-126	-1.8797-126
23	1ST $\bar{K}$IND	2.5693E+04	3.9018E+05	2.9960E+06	3.9739E+06
	2ND $\bar{K}$IND	-3.0630-113	-2.8827-113	-1.6621-113	-1.2230-113
24	1ST $\bar{K}$IND	7.0481E-15	1.7092E-13	2.3955E-12	3.8592E-12
	2ND $\bar{K}$IND	-2.4304-155	-2.6335-155	-2.5061-155	-2.2439-155
25	1ST $\bar{K}$IND	1.5441E+03	8.1909E+04	3.6472E+06	9.0687E+06
	2ND $\bar{K}$IND	-4.6529-173	-6.9639-173	-1.4580-172	-1.9516-172
26	1ST $\bar{K}$IND	3.9333E-16	2.8154E-14	1.4271E-12	3.2437E-12
	2ND $\bar{K}$IND	-2.8668-203	-4.0362-203	-4.8795-203	-4.9952-203
27	1ST $\bar{K}$IND	1.3009E-16	1.0215E-14	5.0164E-13	1.0714E-12
	2ND $\bar{K}$IND	-8.6472-226	-8.1042-226	-5.6155-226	-4.4727-226
28	1ST $\bar{K}$IND	1.1125E+01	1.9826E+03	4.3989E+05	1.7376E+06
	2ND $\bar{K}$IND	-8.6805-222	-1.9108-221	-7.0687-221	-1.0879-220
29	1ST $\bar{K}$IND	1.0430E-16	1.3204E-14	1.2167E-12	3.7122E-12
	2ND $\bar{K}$IND	-4.9029-251	-4.7071-251	-1.1583-250	-1.8402-250
30	1ST $\bar{K}$IND	4.0289E-19	1.7555E-16	1.1242E-13	5.8972E-13
	2ND $\bar{K}$IND	0.	0.	0.	0.
31	1ST $\bar{K}$IND	7.6177E-18	1.4001E-15	3.0234E-13	1.1510E-12
	2ND $\bar{K}$IND	-5.4449-245	-1.0744-244	-3.3454-244	-4.7946-244
32	1ST $\bar{K}$IND	7.8205E-05	7.3480E+00	1.8806E+04	1.2043E+05
	2ND $\bar{K}$IND	0.	0.	0.	0.
33	1ST $\bar{K}$IND	0.	1.0356E-02	8.7568E+02	1.3398E+04
	2ND $\bar{K}$IND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/75/ 0/25, 10 RUNS

FRACTIONS H2/HE/N2/CO2
2.5000E-19 7.5000E-01 2.5000E-19 2.5000E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSENDS (X E-17)						
	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC, E MU						
	3.7626E+06	4.4354E+06	4.7163E+06	5.0224E+06	5.2921E+06	5.5626E+06
CHARACTERISTIC ENERGY VOLT, D/MU						
	1.4796E-01	2.7153E-01	4.5860E-01	6.3991E-01	8.1757E-01	9.8755E-01
POWER=IE=Q X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS						
	8.0368E-10	1.4211E-09	2.0148E-09	2.6820E-09	3.3912E-09	4.1586E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS						
	8.2006E-10	1.3916E-09	1.9753E-09	2.5298E-09	3.1521E-09	3.8505E-09
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA						
	1.5529E+07	2.1685E+07	2.6744E+07	3.1164E+07	3.5914E+07	4.0860E+07
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL						
	1.1753E+06	1.3321E+06	1.4309E+06	1.4491E+06	1.4275E+06	1.3996E+06
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL						
	7.5251E+06	5.9139E+06	4.7163E+06	4.0179E+06	3.5280E+06	3.1786E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL	RUN NO. 1	2	3	4	5	6
1	1ST KIND 1.0511E-12	2.9844E-12	6.4688E-12	9.9629E-12	1.3226E-11	1.6223E-11
	2ND KIND -9.3687E-15	-2.5079E-14	-5.3032E-14	-8.0821E-14	-1.0660E-13	-1.3012E-13
2	1ST KIND 5.6707E-13	1.7489E-12	3.9032E-12	6.0603E-12	8.0422E-12	9.7858E-12
	2ND KIND -2.9838E-15	-8.2247E-15	-1.7554E-14	-2.6747E-14	-3.5093E-14	-4.2345E-14
3	1ST KIND 1.1010E+07	1.2309E+07	1.2352E+07	1.2538E+07	1.3174E+07	1.4197E+07
	2ND KIND -3.6859E+04	-3.7256E+04	-3.6493E+04	-3.7328E+04	-3.9818E+04	-4.3372E+04
4	1ST KIND 2.6534E+06	4.3338E+06	5.8992E+06	7.3626E+06	8.9209E+06	1.0492E+07
	2NO KIND -9.2587E+02	-1.1228E+03	-1.4106E+03	-1.7539E+03	-2.1334E+03	-2.5083E+03
5	1ST KIND 2.1890E+01	8.2424E+03	1.1856E+05	4.3789E+05	9.4430E+05	1.5395E+06
	2ND KIND -1.4831E-03	-2.9636E-01	-3.0545E+00	-9.2033E+00	-1.7294E+01	-2.5544E+01
6	1ST KIND 1.5312E-14	3.3249E-13	1.5851E-12	3.1485E-12	4.5233E-12	5.5228E-12
	2ND KIND -1.4705E-19	-1.8994E-18	-7.1118E-18	-1.2455E-17	-1.6591E-17	-1.9230E-17
7	1ST KIND 1.9020E+06	5.0349E+06	8.1180E+06	1.0004E+07	1.1215E+07	1.1979E+07
	2ND KIND -1.5248E+01	-2.1897E+01	-2.7827E+01	-3.1342E+01	-3.3610E+01	-3.5083E+01
8	1ST KIND 5.6450E+02	3.3652E+04	2.2728E+05	5.9267E+05	1.0733E+06	1.5936E+06
	2ND KIND -1.2377E-03	-4.2232E-02	-2.2703E-01	-5.1838E-01	-8.4864E-01	-1.1601E+00
9	1ST KIND 2.5377E+00	1.0207E+03	1.6288E+04	6.6876E+04	1.5750E+05	2.7448E+05
	2ND KIND -9.6800E-07	-1.4855E-04	-1.4291E-03	-4.2565E-03	-8.0045E-03	-1.1829E-02
10	1ST KIND 3.7693E+00	1.5145E+03	2.4142E+04	9.9087E+04	2.3342E+05	4.0703E+05
	2ND KIND -1.0196E-07	-1.3293E-05	-1.1777E-04	-3.3326E-04	-6.0495E-04	-8.7072E-04
11	1ST KIND 2.7548E-14	2.8892E-13	9.9875E-13	1.8717E-12	2.8083E-12	3.7800E-12
	2ND KIND -1.6981E-22	-5.7709E-22	-1.3683E-21	-2.1955E-21	-2.9912E-21	-3.7363E-21
12	1ST KIND 3.2412E-15	2.0318E-13	1.1451E-12	2.3841E-12	3.4618E-12	4.2033E-12
	2ND KIND -1.6651E-24	-3.2350E-23	-1.0666E-22	-1.6812E-22	-2.0568E-22	-2.2297E-22
13	1ST KIND 2.4311E-15	1.7322E-13	1.0337E-12	2.2221E-12	3.2934E-12	4.0603E-12
	2ND KIND -6.4663E-29	-7.8778E-28	-2.1044E-27	-2.9904E-27	-3.4436E-27	-3.5862E-27

I4	1ST KIND	1.1004E-15	9.4484E-14	6.0792E-13	1.3526E-12	2.0443E-12	2.5453E-12
	2ND KIND	-1.4090E-33	-1.0948E-32	-2.3536E-32	-2.9934E-32	-3.2188E-32	-3.2040E-32
I5	1ST KIND	6.2115E-16	6.7221E-14	4.9051E-13	1.1807E-12	1.8836E-12	2.4469E-12
	2ND KIND	-2.7385E-38	-1.4049E-37	-2.5640E-37	-3.0347E-37	-3.1371E-37	-3.0479E-37
I6	1ST KIND	1.3449E-16	2.1101E-14	1.7889E-13	4.6064E-13	7.6002E-13	1.0055E-12
	2ND KIND	-3.0800E-43	-1.1057E-42	-1.6358E-42	-1.7212E-42	-1.6487E-42	-1.5227E-42
I7	1ST KIND	4.1504E-17	8.7308E-15	8.6698E-14	2.4513E-13	4.2962E-13	5.9215E-13
	2ND KIND	-3.6573E-48	-8.3720E-48	-1.0119E-47	-9.6615E-48	-8.7344E-48	-7.7635E-48
I8	1ST KIND	4.3166E+00	1.6823E+03	2.5675E+04	1.0138E+05	2.3225E+05	3.9758E+05
	2ND KIND	-1.6543E-37	-3.3004E-37	-4.5655E-37	-4.9376E-37	-4.8946E-37	-4.6518E-37
I9	1ST KIND	6.9152E-18	2.2565E-15	2.7720E-14	8.7960E-14	1.6489E-13	2.3766E-13
	2ND KIND	-3.9307E-53	-6.1181E-53	-5.9785E-53	-5.0822E-53	-4.2578E-53	-3.5963E-53
20	1ST KIND	8.4176E-08	6.3242E-03	1.3215E+00	2.2846E+01	1.3403E+02	4.3689E+02
	2ND KIND	-1.2281E-62	-1.8108E-62	-1.8715E-62	-1.7361E-62	-1.7072E-62	-1.8659E-62
21	1ST KIND	0.	8.4903E-20	7.7169E-17	2.4429E-15	1.8749E-14	6.8192E-14
	2ND KIND	-5.9546E-98	-1.2257E-97	-1.7154E-97	-1.8780E-97	-1.8893E-97	-1.8229E-97
22	1ST KIND	0.	2.5682E-21	1.2936E-17	6.9328E-16	7.4786E-15	3.4660E-14
	2ND KIND	-9.3997-127	-1.7247-126	-2.3672-126	-2.6452-126	-2.7384-126	-2.7268-126
23	1ST KIND	0.	2.8653E-04	5.4344E+00	3.6430E+02	4.5495E+03	2.3406E+04
	2ND KIND	-3.8714-114	-9.2707-114	-1.5612-113	-1.9681-113	-2.2027-113	-2.3028-113
24	1ST KIND	0.	0.	3.8395E-19	5.6460E-17	1.0183E-15	6.6727E-15
	2ND KIND	-6.7618-156	-1.0818-155	-1.4160-155	-1.6115-155	-1.7421-155	-1.8321-155
25	1ST KIND	0.	0.	0.	3.8366E+00	1.6134E+02	1.5684E+03
	2ND KIND	-3.2079-174	-8.5271-174	-1.6648-173	-2.3752-173	-2.9879-173	-3.5428-173
26	1ST KIND	0.	0.	0.	3.6036E-19	3.5110E-17	4.1422E-16
	2ND KIND	-1.3312-204	-3.6878-204	-8.0400-204	-1.2850-203	-1.7578-203	-2.1773-203
27	1ST KIND	0.	0.	0.	0.	1.0942E-17	1.3915E-16
	2ND KIND	-2.4651-226	-4.4360-226	-5.7965-226	-6.3103-226	-6.4910-226	-6.5003-226
28	1ST KIND	0.	0.	0.	0.	3.4069E-01	1.1915E+01
	2ND KIND	-3.3811-223	-9.7590-223	-2.1921-222	-3.5311-222	-4.9903-222	-6.7067-222
29	1ST KIND	0.	0.	0.	0.	4.4560E-18	1.1767E-16
	2ND KIND	-2.6601-251	-3.8273-251	-4.2247-251	-4.1062-251	-3.8850-251	-3.6782-251
30	1ST KIND	0.	0.	0.	0.	0.	2.9098E-19
	2ND KIND	0.	0.	0.	0.	0.	0.
31	1ST KIND	0.	0.	0.	0.	1.9811E-19	8.1866E-18
	2ND KIND	-2.7418-246	-7.5164-246	-1.5697-245	-2.3988-245	-3.2468-245	-4.1880-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

RUN NO.	7	8	9	10
E/N VOLT-CM SQ., TOWNSENDS (X E-17)				
	2.0000E+01	3.0000E+01	7.0000E+01	1.0000E+02
DRIFT VELOCITY CM/SEC, E MU				
	5.8558E+06	7.1073E+06	1.3022E+07	1.7701E+07
CHARACTERISTIC ENERGY VOLT, D/MU				
	1.1481E+00	1.7617E+00	3.6038E+00	4.6854E+00
POWER=IE=Q X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS				
	5.0032E-09	9.1087E-09	3.8942E-08	7.5621E-08
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS				
	4.6051E-09	8.3648E-09	3.7490E-08	7.4655E-08
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA				
	4.5419E+07	5.7634E+07	6.5842E+07	6.8620E+07
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL				
	1.3807E+06	1.3870E+06	1.7496E+06	2.0594E+06
MUN MORILITY X MOL/CC, UNITS 10E16 MOL				
	2.9279E+06	2.3691E+06	1.8604E+06	1.7701E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL	RUN NO. 7	8	9	10
1	1ST KIND 1.8891E-11	2.6670E-11	3.2206E-11	2.9991E-11
	2ND KIND -1.5095E-13	-2.1111E-13	-2.5197E-13	-2.3429E-13
2	1ST KIND 1.1223E-11	1.4525E-11	1.3847E-11	1.1764E-11
	2ND KIND -4.8242E-14	-6.1391E-14	-5.7449E-14	-4.8564E-14
3	1ST KIND 1.5313E+07	1.8832E+07	1.9831E+07	1.8131E+07
	2ND KIND -4.7143E+04	-5.8336E+04	-6.1157E+04	-5.5745E+04
4	1ST KIND 1.1904E+07	1.5447E+07	1.5970E+07	1.4495E+07
	2NO KIND -2.8319E+03	-3.5788E+03	-3.5631E+03	-3.2135E+03
5	1ST KIND 2.0970E+06	3.4340E+06	3.3278E+06	2.7468E+06
	2ND KIND -3.2382E+01	-4.5763E+01	-3.9083E+01	-3.1517E+01
6	1ST KIND 6.1305E-12	6.5652E-12	4.3350E-12	3.4397E-12
	2ND KIND -2.0577E-17	-2.0392E-17	-1.2392E-17	-9.4769E-18
7	1ST KIND 1.2475E+07	1.3336E+07	1.3390E+07	1.3044E+07
	2ND KIND -3.6039E+01	-3.7724E+01	-3.7582E+01	-3.6627E+01
8	1ST KIND 2.0642E+06	3.1628E+06	2.9805E+06	2.4467E+06
	2ND KIND -1.4065E+00	-1.8468E+00	-1.4982E+00	-1.1953E+00
9	1ST KIND 3.9229E+05	7.0179E+05	7.1555E+05	5.9182E+05
	2ND KIND -1.4968E-02	-2.0762E-02	-1.6994E-02	-1.3451E-02
10	1ST KIND 5.8211E+05	1.0434E+06	1.0664E+06	8.8249E+05
	2ND KIND -1.0806E-03	-1.4377E-03	-1.1308E-03	-8.9180E-04
11	1ST KIND 4.7267E-12	7.6727E-12	9.4266E-12	8.5218E-12
	2ND KIND -4.3981E-21	-6.1773E-21	-6.5851E-21	-5.7621E-21
12	1ST KIND 4.5978E-12	4.6070E-12	2.8071E-12	2.0641E-12
	2ND KIND -2.2562E-22	-1.9398E-22	-1.0150E-22	-7.1443E-23
13	1ST KIND 4.4835E-12	4.5972E-12	2.7956E-12	2.1126E-12
	2ND KIND -3.5397E-27	-2.8948E-27	-1.4210E-27	-1.0076E-27
14	1ST KIND 2.8313E-12	2.9362E-12	1.8285E-12	1.3667E-12
	2ND KIND -3.0762E-32	-2.3761E-32	-1.1141E-32	-7.6644E-33
15	1ST KIND 2.8031E-12	3.1063E-12	2.0414E-12	1.5430E-12
	2ND KIND -2.8804E-37	-2.1555E-37	-9.8081E-38	-6.7206E-38

16	1ST KIND	1.1637E-12	1.3059E-12	8.6236E-13	6.5677E-13
	2ND KIND	-1.3912E-42	-9.7400E-43	-4.1573E-43	-2.8197E-43
17	1ST KIND	7.0485E-13	8.3813E-13	5.8722E-13	4.4475E-13
	2ND KIND	-6.9209E-48	-4.6017E-48	-1.8675E-48	-1.2488E-48
18	1ST KIND	5.6186E+05	9.8884E+05	1.0021E+06	8.2987E+05
	2ND KIND	-4.3424E-37	-3.1822E-37	-1.4279E-37	-9.7804E-38
19	1ST KIND	2.9118E-13	3.6505E-13	2.6087E-13	2.0198E-13
	2ND KIND	-3.0968E-53	-1.9241E-53	-7.3262E-54	-4.8626E-54
20	1ST KIND	9.8408E+02	4.5705E+03	1.3640E+04	1.5079E+04
	2ND KIND	-2.1743E-62	-3.5690E-62	-4.3256E-62	-3.7378E-62
21	1ST KIND	1.5907E-13	6.9518E-13	1.5977E-12	1.6156E-12
	2ND KIND	-1.7245E-97	-1.3140E-97	-6.2381E-98	-4.3583E-98
22	1ST KIND	9.7292E-14	6.5666E-13	2.7563E-12	3.3685E-12
	2ND KIND	-2.6641-126	-2.3174-126	-1.5729-126	-1.2898-126
23	1ST KIND	7.0930E+04	5.5985E+05	2.5989E+06	3.1574E+06
	2ND KIND	-2.3086-113	-2.0051-113	-1.0953-113	-7.9650-114
24	1ST KIND	2.4111E-14	2.8350E-13	2.2829E-12	3.3343E-12
	2ND KIND	-1.8944-155	-2.0026-155	-1.7981-155	-1.5711-155
25	1ST KIND	7.5485E+03	1.7826E+05	4.2933E+06	9.7465E+06
	2ND KIND	-4.0686-173	-6.0996-173	-1.2466-172	-1.6747-172
26	1ST KIND	2.2352E-15	6.6096E-14	1.6207E-12	3.2516E-12
	2ND KIND	-2.5098-203	-3.2382-203	-3.6910-203	-3.7776-203
27	1ST KIND	7.8204E-16	2.4202E-14	5.5427E-13	1.0288E-12
	2ND KIND	-6.4181-226	-5.7917-226	-3.8307-226	-2.9996-226
28	1ST KIND	9.5705E+01	6.5680E+03	6.5863E+05	2.2705E+06
	2ND KIND	-8.7512-222	-1.9343-221	-6.4794-221	-9.8026-221
29	1ST KIND	7.9314E-16	3.6344E-14	1.5764E-12	4.4640E-12
	2ND KIND	-3.5435-251	-3.8442-251	-1.0800-250	-1.6674-250
30	1ST KIND	5.0735E-18	7.7592E-16	1.9516E-13	8.6490E-13
	2ND KIND	0.	0.	0.	0.
31	1ST KIND	6.6820E-17	4.6476E-15	4.4549E-13	1.4686E-12
	2ND KIND	-5.2598-245	-1.0466-244	-2.9673-244	-4.1683-244
32	1ST KIND	2.3803E-03	7.6230E+01	5.5000E+04	2.7879E+05
	2ND KIND	0.	0.	0.	0.
33	1ST KIND	0.	2.6748E-01	4.0006E+03	4.3604E+04
	2ND KIND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/60/20/20. 10 RUNS

FRACTIONS H2/HE/N2/CO2

2.0000E-19	6.0000E-01	2.0000E-01	2.0000E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ.. TOWNSENDS (X E-17)						
	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC. E MU						
	3.4856E+06	4.0218E+06	4.3735E+06	4.8637E+06	5.3263E+06	5.8037E+06
CHARACTERISTIC ENERGY VOLT. D/MU						
	1.7092E-01	3.0271E-01	4.5707E-01	5.7107E-01	6.7250E-01	7.5739E-01
POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON. LHS						
	7.4453E-10	1.2886E-09	1.8684E-09	2.5972E-09	3.4131E-09	4.3388E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP. RHS						
	7.5590E-10	1.2578E-09	1.8372E-09	2.4695E-09	3.2525E-09	4.1333E-09
TOTAL COLL. RATE / ELECTRON / MOL. UNITS 10E16 MOL.SUMA						
	1.3688E+07	1.8455E+07	2.2078E+07	2.4949E+07	2.8049E+07	3.1356E+07
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL						
	1.1652E+06	1.2210E+06	1.2264E+06	1.2128E+06	1.1894E+06	1.1685E+06
MUN MOBILITY X MOL/CC. UNITS 10E16 MOL						
	6.9713E+06	5.3623E+06	4.3735E+06	3.8910E+06	3.5509E+06	3.3164E+06

COLL RATE EACH LEVEL FOR Q(J). UNITS 10E16 MOL. J= 33

LEVEL	RUN NO. 1	2	3	4	5	6
1	1ST KIND 1.0268E-12	2.5772E-12	4.4394E-12	5.8444E-12	7.1108E-12	8.2641E-12
	2ND KIND -9.0213E-15	-2.1644E-14	-3.6672E-14	-4.7939E-14	-5.8037E-14	-6.7175E-14
2	1ST KIND 5.6507E-13	1.5134E-12	2.6644E-12	3.5364E-12	4.3209E-12	5.0279E-12
	2ND KIND -2.8917E-15	-7.1105E-15	-1.2150E-14	-1.5922E-14	-1.9282E-14	-2.2277E-14
3	1ST KIND 9.2820E+06	9.9599E+06	9.7285E+06	9.4824E+06	9.3664E+06	9.4637E+06
	2ND KIND -2.9948E+04	-2.9624E+04	-2.8274E+04	-2.7492E+04	-2.7302E+04	-2.7749E+04
4	1ST KIND 2.4477E+06	3.6711E+06	4.4580E+06	4.9233E+06	5.3638E+06	5.8308E+06
	2ND KIND -7.7402E+02	-9.1314E+02	-1.0368E+03	-1.1330E+03	-1.2362E+03	-1.3509E+03
5	1ST KIND 2.6958E-01	1.8856E+02	4.4798E+03	2.6444E+04	8.7628E+04	2.0345E+05
	2ND KIND -5.0560E-05	-1.2418E-02	-1.7228E-01	-7.3577E-01	-1.9681E+00	-3.9389E+00
6	1ST KIND 1.5347E+04	1.6344E+05	5.7205E+05	1.0728E+06	1.6291E+06	2.1620E+06
	2ND KIND -1.6131E-01	-1.4252E+00	-4.0960E+00	-6.5992E+00	-8.9032E+00	-1.0729E+01
7	1ST KIND 1.9705E+06	4.5600E+06	6.6237E+06	7.7354E+06	8.4841E+06	8.9570E+06
	2ND KIND -1.3307E+01	-1.8609E+01	-2.2531E+01	-2.4577E+01	-2.5950E+01	-2.6845E+01
8	1ST KIND 4.4044E+02	1.0888E+04	4.7376E+04	1.0725E+05	2.0180E+05	3.3509E+05
	2ND KIND -1.4568E-03	-2.2467E-02	-7.5191E-02	-1.4060E-01	-2.2429E-01	-3.2309E-01
9	1ST KIND 3.0958E-02	2.2628E+01	5.8905E+02	3.8681E+03	1.4083E+04	3.5182E+04
	2ND KIND -7.5044E-08	-9.6350E-06	-1.0146E-04	-3.8444E-04	-9.7393E-04	-1.8982E-03
10	1ST KIND 4.5990E-02	3.3592E+01	8.7358E+02	5.7335E+03	2.0877E+04	5.2177E+04
	2ND KIND -1.2282E-08	-1.1380E-06	-1.0086E-05	-3.4355E-05	-8.1090E-05	-1.5028E-04
11	1ST KIND 3.4711E-14	2.3104E-13	5.5100E-13	8.4010E-13	1.1383E-12	1.4508E-12
	2ND KIND -1.7140E-22	-4.9724E-22	-9.1030E-22	-1.2314E-21	-1.5277E-21	-1.8053E-21
12	1ST KIND 1.5158E+03	5.7889E+04	2.8513E+05	6.2415E+05	1.0365E+06	1.4503E+06
	2ND KIND -2.3554E-06	-2.9057E-05	-7.8430E-05	-1.1793E-04	-1.4885E-04	-1.6953E-04
13	1ST KIND 8.2382E+02	3.8837E+04	2.1414E+05	5.0208E+05	8.7314E+05	1.2637E+06
	2ND KIND -9.2200E-11	-7.8379E-10	-1.7894E-09	-2.4651E-09	-2.9275E-09	-3.1882E-09

14	1ST KIND	2.2362E+02	1.4687E+04	9.6446E+04	2.5024E+05	4.6483E+05	7.0195E+05
	2ND KIND	-1.8999E-15	-1.1156E-14	-2.1568E-14	-2.7348E-14	-3.0648E-14	-3.2049E-14
15	1ST KIND	7.7298E+01	7.0115E+03	5.5767E+04	1.6486E+05	3.3707E+05	5.4913E+05
	2ND KIND	-3.3804E-20	-1.3904E-19	-2.3478E-19	-2.8107E-19	-3.0461E-19	-3.1213E-19
16	1ST KIND	5.7882E+00	1.1459E+03	1.3094E+04	4.7083E+04	1.0823E+05	1.8995E+05
	2ND KIND	-3.5630E-25	-1.0601E-24	-1.4995E-24	-1.6351E-24	-1.6622E-24	-1.6333E-24
17	1ST KIND	1.0819E+00	3.2928E+02	4.7985E+03	2.0102E+04	5.1245E+04	9.6729E+04
	2ND KIND	-3.8040E-30	-7.5849E-30	-8.9823E-30	-9.0188E-30	-8.7146E-30	-8.2908E-30
18	1ST KIND	5.2908E-02	3.7858E+01	9.4658E+02	5.9662E+03	2.1055E+04	5.1499E+04
	2ND KIND	-1.5757E-37	-2.9899E-37	-4.0479E-37	-4.5089E-37	-4.7139E-37	-4.7408E-37
19	1ST KIND	8.9992E-02	5.6004E+01	1.1514E+03	5.8455E+03	1.6765E+04	3.4232E+04
	2ND KIND	-3.7349E-35	-5.2088E-35	-5.0708E-35	-4.5894E-35	-4.1350E-35	-3.7628E-35
20	1ST KIND	5.0195E-10	1.0467E-04	4.0555E-02	1.1118E+00	9.5054E+00	4.1731E+01
	2ND KIND	-1.1223E-62	-1.5498E-62	-1.6022E-62	-1.5240E-62	-1.4404E-62	-1.3972E-62
21	1ST KIND	0.	1.0262E-03	1.4785E+00	7.8188E+01	9.7089E+02	5.2846E+03
	2ND KIND	-5.7200E-80	-1.1106E-79	-1.5025E-79	-1.6711E-79	-1.7489E-79	-1.7650E-79
22	1ST KIND	0.	1.4857E-05	1.0834E-01	1.1208E+01	2.1585E+02	1.6062E+03
	2ND KIND	-8.7799-109	-1.5255-108	-2.0045-108	-2.2339-108	-2.3618-108	-2.4155-108
23	1ST KIND	0.	1.5507E-06	3.6828E-02	4.8291E+00	1.0979E+02	9.2369E+02
	2ND KIND	-3.7710-114	-8.3502-114	-1.2674-113	-1.5215-113	-1.6960-113	-1.8026-113
24	1ST KIND	0.	0.	1.5974E-03	4.5433E-01	1.5902E+01	1.7988E+02
	2ND KIND	-6.1284-138	-9.2985-138	-1.1456-137	-1.2539-137	-1.3269-137	-1.3761-137
25	1ST KIND	0.	0.	0.	1.5733E-02	1.2749E+00	2.2719E+01
	2ND KIND	-3.1416-174	-7.5303-174	-1.2342-173	-1.5657-173	-1.8393-173	-2.0670-173
26	1ST KIND	0.	0.	0.	1.3664E-03	2.1217E-01	4.4896E+00
	2ND KIND	-1.3032-186	-3.1632-186	-5.3108-186	-6.9584-186	-8.5308-186	-1.0053-185
27	1ST KIND	0.	0.	0.	0.	5.2922E-02	1.2989E+00
	2ND KIND	-2.3111-208	-3.9082-208	-4.8867-208	-5.2718-208	-5.4583-208	-5.5268-208
28	1ST KIND	0.	0.	0.	0.	9.9484E-04	4.7353E-02
	2ND KIND	-3.3142-223	-8.3059-223	-1.4393-222	-1.9196-222	-2.3852-222	-2.8693-222
29	1ST KIND	0.	0.	0.	0.	1.0352E-02	4.7252E-01
	2ND KIND	-2.3816-233	-3.2770-233	-3.6043-233	-3.6176-233	-3.5488-233	-3.4518-233
30	1ST KIND	0.	0.	0.	0.	0.	6.2226E-04
	2ND KIND	-3.3306-261	-8.8688-261	-1.5239-260	-2.0021-260	-2.4556-260	-2.9284-260
31	1ST KIND	0.	0.	0.	0.	5.1376E-22	2.9289E-20
	2ND KIND	-2.6844-246	-6.5130-246	-1.0895-245	-1.4141-245	-1.7107-245	-1.9995-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

RUN NO.	7	8	9	10
E/N VOLT-CM SQ.. TOWNSENDS (X E-17)				
	2.0000E+01	3.0000E+01	7.0000E+01	1.0000E+02
DRIFT VELOCITY CM/SEC. E MU				
	6.2687E+06	7.9259E+06	1.3084E+07	1.7085E+07
CHARACTERISTIC ENERGY VOLT. D/MU				
	8.3571E-01	1.1554E+00	2.6352E+00	3.5704E+00
POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON. LHS				
	5.3560E-09	1.0158E-08	3.9125E-08	7.2988E-08
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP. RHS				
	5.0969E-09	9.4854E-09	3.7707E-08	7.1875E-08
TOTAL COLL. RATE / ELECTRON / MOL. UNITS 10E16 MOL.SUMA				
	3.4874E+07	4.8631E+07	6.8830E+07	7.2957E+07
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL				
	1.1517E+06	1.1312E+06	1.2914E+06	1.4620E+06
MUN MORILITY X MOL/CC. UNITS 10E16 MOL				
	3.1343E+06	2.6420E+06	1.8691E+06	1.7085E+06

COLL RATE EACH LEVEL FOR Q(J). UNITS 10E16 MOL. J= 33

LEVEL	RUN NO. 7	8	9	10
1 1ST KIND	9.4262E-12	1.4378E-11	2.4558E-11	2.5045E-11
2ND KIND	-7.6331E-14	-1.1496E-13	-1.9294E-13	-1.9623E-13
2 1ST KIND	5.7242E-12	8.3960E-12	1.1615E-11	1.0775E-11
2ND KIND	-2.5193E-14	-3.6143E-14	-4.8529E-14	-4.4723E-14
3 1ST KIND	9.7127E+06	1.1751E+07	1.5836E+07	1.5527E+07
2ND KIND	-2.8741E+04	-3.5642E+04	-4.8831E+04	-4.7762E+04
4 1ST KIND	6.3678E+06	8.8813E+06	1.2777E+07	1.2442E+07
2ND KIND	-1.4822E+03	-2.0654E+03	-2.8732E+03	-2.7762E+03
5 1ST KIND	3.7553E+05	1.3251E+06	2.7153E+06	2.5300E+06
2ND KIND	-6.5461E+00	-1.8790E+01	-3.2713E+01	-2.9655E+01
6 1ST KIND	2.6587E+06	4.0053E+06	4.0447E+06	3.4832E+06
2ND KIND	-1.2190E+01	-1.5107E+01	-1.2264E+01	-9.9769E+00
7 1ST KIND	9.3047E+06	1.0085E+07	1.0776E+07	1.0675E+07
2ND KIND	-2.7495E+01	-2.9001E+01	-3.0307E+01	-2.9949E+01
8 1ST KIND	5.0739E+05	1.3522E+06	2.4730E+06	2.2764E+06
2ND KIND	-4.3516E-01	-8.8645E-01	-1.7927E+00	-1.1466E+00
9 1ST KIND	6.8495E+04	2.6720E+05	5.8167E+05	5.4402E+05
2ND KIND	-3.1058E-03	-8.6274E-03	-1.4384E-02	-1.2803E-02
10 1ST KIND	1.0164E+05	3.9719E+05	8.6653E+05	8.1091E+05
2ND KIND	-2.3733E-04	-6.1424E-04	-9.6635E-04	-8.5500E-04
11 1ST KIND	1.8055E-12	3.5722E-12	7.2422E-12	7.2852E-12
2ND KIND	-2.0917E-21	-3.3188E-21	-5.3071E-21	-5.1081E-21
I2 IST KIND	1.8343E+06	2.8116E+06	2.7035E+06	2.1572E+06
2ND KIND	-1.8202E-04	-1.8821E-04	-1.1446E-04	-8.2816E-05
13 1ST KIND	1.6376E+06	2.6602E+06	2.6492E+06	2.1825E+06
2ND KIND	-3.3117E-09	-3.1492E-09	-1.6824E-09	-1.2088E-09
14 1ST KIND	9.3806E+05	1.6178E+06	1.7112E+06	1.4022E+06
2ND KIND	-3.2348E-14	-2.8581E-14	-1.3874E-14	-9.5480E-15
15 1ST KIND	7.7762E+05	1.5380E+06	1.8464E+06	1.5452E+06
2ND KIND	-3.1049E-19	-2.6592E-19	-1.2412E-19	-8.4867E-20

16	1ST KIND	2.8249E+05	6.0893E+05	7.7077E+05	6.5353E+05
	2ND KIND	-1.5768E-24	-1.2685E-24	-5.4673E-25	-3.6783E-25
17	1ST KIND	1.5159E+05	3.6522E+05	5.1368E+05	4.3563E+05
	2ND KIND	-7.8364E-30	-6.0456E-30	-2.4905E-30	-1.6527E-30
18	1ST KIND	9.8911E+04	3.7784E+05	8.1497E+05	7.6289E+05
	2ND KIND	-4.6653E-37	-3.9272E-37	-1.8121E-37	-1.2387E-37
19	1ST KIND	5.6590E+04	1.5096E+05	2.2475E+05	1.9596E+05
	2ND KIND	-3.4496E-35	-2.5247E-35	-9.8961E-36	-6.5458E-36
20	1ST KIND	1.2193E+02	1.1775E+03	8.2006E+03	1.0632E+04
	2ND KIND	-1.4113E-62	-1.9588E-62	-3.4949E-62	-3.3543E-62
21	1ST KIND	1.7439E+04	1.8657E+05	1.0453E+06	1.2293E+06
	2ND KIND	-1.7456E-79	-1.5091E-79	-7.5340E-80	-5.3050E-80
22	1ST KIND	6.7213E+03	1.2607E+05	1.4829E+06	2.1640E+06
	2ND KIND	-2.4256-108	-2.2599-108	-1.5480-108	-1.2816-108
23	1ST KIND	4.2456E+03	9.8403E+04	1.3853E+06	2.0439E+06
	2ND KIND	-1.8650-113	-1.8509-113	-1.1821-113	-8.9197-114
24	1ST KIND	1.0277E+03	3.8899E+04	1.0195E+06	1.8394E+06
	2ND KIND	-1.4140-137	-1.5155-137	-1.5428-137	-1.4221-137
25	1ST KIND	1.8181E+02	1.5257E+04	1.3410E+06	3.8256E+06
	2ND KIND	-2.2845-173	-3.2575-173	-7.4062-173	-1.0100-172
26	1ST KIND	4.0973E+01	4.7149E+03	5.1371E+05	1.3734E+06
	2ND KIND	-1.1613-185	-1.7638-185	-2.7392-185	-2.8965-185
27	1ST KIND	1.2971E+01	1.7048E+03	1.8224E+05	4.5882E+05
	2ND KIND	-5.5336-208	-5.2752-208	-3.8093-208	-3.0933-208
28	1ST KIND	6.8129E-01	2.4195E+02	1.4750E+05	6.8257E+05
	2ND KIND	-3.4511-222	-7.3172-222	-3.2987-221	-5.3140-221
29	1ST KIND	6.3289E+00	1.6328E+03	4.0582E+05	1.4617E+06
	2ND KIND	-3.3471-233	-3.0502-233	-5.5509-233	-8.9591-233
30	1ST KIND	2.0919E-02	2.1237E+01	3.7110E+04	2.2266E+05
	2ND KIND	-3.5121-260	-7.8061-260	-4.0881-259	-6.8670-259
31	1ST KIND	4.4261E-19	1.6827E-16	1.0158E-13	4.5604E-13
	2ND KIND	-2.3279-245	-4.3424-245	-1.6067-244	-2.4045-244
32	1ST KIND	7.1816E-06	1.4919E+00	9.1460E+03	6.6859E+04
	2ND KIND	0.	0.	0.	0.
33	1ST KIND	0.	1.1619E-03	2.9989E+02	5.6994E+03
	2ND KIND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/50/33/17, 10 RUNS

FRACTIONS H2/HE/N2/CO2
1.6667E-19 5.0000E-01 3.3333E-01 1.6667E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ. TOWNSENDS (X E-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC. E MU	3.2486E+06	3.6877E+06	4.0114E+06	4.4999E+06	4.9587E+06	5.4504E+06
CHARACTERISTIC ENERGY VOLT. D/MU	1.9175E-01	3.3500E-01	4.8872E-01	5.9109E-01	6.8060E-01	7.4909E-01
POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON. LHS	6.9791E-10	1.1815E-09	1.7137E-09	2.4029E-09	3.1775E-09	4.0748E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP. RHS	7.0211E-10	1.1487E-09	1.6795E-09	2.2650E-09	3.0138E-09	3.8643E-09
TOTAL COLL. RATE / ELECTRON / MOL. UNITS 10E16 MOL.SUMA	1.2247E+07	1.6179E+07	1.9275E+07	2.1805E+07	2.4610E+07	2.7537E+07
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL	1.1355E+06	1.1361E+06	1.1031E+06	1.0745E+06	1.0433E+06	1.0193E+06
MUN MOBILITY X MOL/CC. UNITS 10E16 MOL	6.4973E+06	4.9170E+06	4.0114E+06	3.5999E+06	3.3058E+06	3.1145E+06

COLL RATE EACH LEVEL FOR Q(J). UNITS 10E16 MOL. J= 33

LEVEL	RUN NO. 1	2	3	4	5	6
1 1ST KIND	1.0099E-12	2.4098E-12	3.8678E-12	4.8329E-12	5.6619E-12	6.3478E-12
2ND KIND	-8.7825E-15	-2.0169E-14	-3.1936E-14	-3.9684E-14	-4.6310E-14	-5.1763E-14
2 1ST KIND	5.6395E-13	1.4220E-12	2.3237E-12	2.9231E-12	3.4381E-12	3.8623E-12
2ND KIND	-2.8296E-15	-6.6398E-15	-1.0588E-14	-1.3186E-14	-1.5401E-14	-1.7210E-14
3 1ST KIND	7.9881E+06	8.3252E+06	8.0526E+06	7.8279E+06	7.6772E+06	7.6576E+06
2ND KIND	-2.5153E+04	-2.4505E+04	-2.3284E+04	-2.2592E+04	-2.2240E+04	-2.2261E+04
4 1ST KIND	2.2564E+06	3.2208E+06	3.7878E+06	4.0816E+06	4.3357E+06	4.5735E+06
2ND KIND	-6.6689E+02	-7.8031E+02	-8.7137E+02	-9.3164E+02	-9.9037E+02	-1.0492E+03
5 1ST KIND	3.0929E-02	2.9925E+01	8.8505E+02	6.2195E+03	2.4090E+04	6.3693E+04
2ND KIND	-1.2039E-05	-3.1399E-03	-4.7074E-02	-2.1894E-01	-6.4436E-01	-1.4085E+00
6 1ST KIND	3.4402E+04	2.8781E+05	8.6449E+05	1.5000E+06	2.2039E+06	2.8775E+06
2ND KIND	-3.7005E-01	-2.7820E+00	-7.0501E+00	-1.0624E+01	-1.3920E+01	-1.6483E+01
7 1ST KIND	1.9891E+06	4.2078E+06	5.7950E+06	6.5831E+06	7.1212E+06	7.4452E+06
2ND KIND	-1.1880E+01	-1.6311E+01	-1.9297E+01	-2.0738E+01	-2.1720E+01	-2.2330E+01
8 1ST KIND	5.3251E+02	9.1378E+03	3.2349E+04	6.3242E+04	1.0769E+05	1.6775E+05
2ND KIND	-1.9030E-03	-2.1286E-02	-5.9575E-02	-9.8419E-02	-1.4390E-01	-1.9429E-01
9 1ST KIND	3.5402E-03	3.5308E+00	1.1297E+02	8.8040E+02	3.7587E+03	1.0743E+04
2ND KIND	-3.0702E-08	-3.4230E-06	-3.4350E-05	-1.3040E-04	-3.4502E-04	-7.1286E-04
10 1ST KIND	5.2595E-03	5.2430E+00	1.6760E+02	1.3054E+03	5.5733E+03	1.5935E+04
2ND KIND	-6.4926E-09	-4.8489E-07	-3.9206E-06	-1.2967E-05	-3.1222E-05	-6.0206E-05
11 1ST KIND	4.1781E-14	2.2638E-13	4.7608E-13	6.6861E-13	8.5270E-13	1.0251E-12
2ND KIND	-1.7319E-22	-4.7027E-22	-7.9434E-22	-1.0140E-21	-1.2059E-21	-1.3682E-21
12 1ST KIND	2.8459E+03	8.2114E+04	3.0274E+05	7.5931E+05	1.2545E+06	1.7680E+06
2ND KIND	-6.3108E-06	-5.9180E-05	-1.4166E-04	-2.0129E-04	-2.4922E-04	-2.8179E-04
13 1ST KIND	1.3480E+03	4.9168E+04	2.4812E+05	5.6485E+05	9.8813E+05	1.4526E+06
2ND KIND	-2.4038E-10	-1.6038E-09	-3.2913E-09	-4.3243E-09	-5.0601E-09	-5.4881E-09

14	1ST KIND	2.8924E+02	1.5435E+04	9.6330E+04	2.4971E+05	4.7696E+05	7.4403E+05
	2ND KIND	-4.6950E-15	-2.2394E-14	-3.9554E-14	-4.8364E-14	-5.3723E-14	-5.6215E-14
15	1ST KIND	7.9297E+01	6.1167E+03	4.7260E+04	1.4190E+05	3.0244E+05	5.1515E+05
	2ND KIND	-7.7884E-20	-2.7055E-19	-4.2393E-19	-4.9350E-19	-5.3220E-19	-5.4727E-19
16	1ST KIND	3.0767E+00	6.5391E+02	8.2113E+03	3.2370E+04	8.1737E+04	1.5570E+05
	2ND KIND	-7.7762E-25	-1.9921E-24	-2.0500E-24	-2.8402E-24	-2.8890E-24	-2.8625E-24
17	1ST KIND	4.2675E-01	1.5016E+02	2.5113E+03	1.1907E+04	3.4166E+04	7.1358E+04
	2ND KIND	-7.6463E-30	-1.3628E-29	-1.5435E-29	-1.5389E-29	-1.4953E-29	-1.4400E-29
18	1ST KIND	6.0602E-03	5.9557E+00	1.8396E+02	1.3763E+03	5.6824E+03	1.5864E+04
	2ND KIND	-1.5048E-37	-2.7256E-37	-3.5581E-37	-3.9067E-37	-4.0859E-37	-4.1362E-37
19	1ST KIND	2.1251E-02	1.8631E+01	4.8374E+02	2.9399E+03	9.8497E+03	2.2828E+04
	2ND KIND	-6.9919E-35	-8.9065E-35	-8.4002E-35	-7.6302E-35	-6.9506E-35	-6.4345E-35
20	1ST KIND	3.2108E-11	1.2626E-05	6.8527E-03	2.3304E-01	2.3419E+00	1.1578E+01
	2ND KIND	-1.0290E-62	-1.3372E-62	-1.3464E-62	-1.2803E-62	-1.2109E-62	-1.1632E-62
21	1ST KIND	0.	2.2911E-04	4.2220E-01	2.7370E+01	4.0695E+02	2.5733E+03
	2ND KIND	-1.0999E-79	-2.0266E-79	-2.6356E-79	-2.8848E-79	-3.0140E-79	-3.0547E-79
22	1ST KIND	0.	2.1015E-06	1.9562E-02	2.6783E+00	6.5123E+01	5.8508E+02
	2ND KIND	-1.6489-108	-2.7457-108	-3.4870-108	-3.8230-108	-4.0251-108	-4.1199-108
23	1ST KIND	0.	1.0443E-07	2.9231E-03	5.1399E-01	1.4923E+01	1.5306E+02
	2ND KIND	-3.6793-114	-7.7339-114	-1.1144-113	-1.2985-113	-1.4291-113	-1.5075-113
24	1ST KIND	0.	0.	1.8327E-04	7.1654E-02	3.3392E+00	4.7557E+01
	2ND KIND	-1.1221-137	-1.6419-137	-1.9652-137	-2.1153-137	-2.2173-137	-2.2821-137
25	1ST KIND	0.	0.	0.	7.8680E-04	8.7331E-02	2.0734E+00
	2ND KIND	-3.0860-174	-7.0219-174	-1.0814-173	-1.3146-173	-1.5016-173	-1.6435-173
26	1ST KIND	0.	0.	0.	1.2862E-04	2.5267E-02	7.1241E-01
	2ND KIND	-2.5611-186	-5.8907-186	-9.2205-186	-1.1417-185	-1.3364-185	-1.5070-185
27	1ST KIND	0.	0.	0.	0.	5.3124E-03	1.8149E-01
	2ND KIND	-4.3468-208	-6.9868-208	-8.4393-208	-8.9729-208	-9.2469-208	-9.3538-208
28	1ST KIND	0.	0.	0.	0.	3.6872E-05	2.1410E-03
	2ND KIND	-3.2633-223	-7.7448-223	-1.2471-222	-1.5706-222	-1.8617-222	-2.1255-222
29	1ST KIND	0.	0.	0.	0.	6.4598E-04	4.0404E-02
	2ND KIND	-4.3123-233	-5.6945-233	-6.1266-233	-6.1291-233	-6.0347-233	-5.9100-233
30	1ST KIND	0.	0.	0.	0.	0.	3.3155E-05
	2ND KIND	-6.7605-261	-1.6635-260	-2.6564-260	-3.3077-260	-3.8787-260	-4.3889-260
31	1ST KIND	0.	0.	0.	0.	1.7484E-23	1.2117E-21
	2ND KIND	-2.6378-246	-6.0664-246	-9.4853-246	-1.1704-245	-1.3611-245	-1.5241-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

RUN NO.	7	8	9	10
E/N VOLT-CM SQ., TOWNSENDS (X E-17)				
	2.0000E+01	3.0000E+01	7.0000E+01	1.0000E+02
DRIFT VELOCITY CM/SEC, E MU				
	5.9426E+06	7.7833E+06	1.2901E+07	1.6560E+07
CHARACTERISTIC ENERGY VOLT, D/MU				
	8.0777E-01	1.0246E+00	2.2420E+00	3.0934E+00
POWER=IE=Q X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS				
	5.0774E-09	9.9751E-09	3.8579E-08	7.0746E-08
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS				
	4.8099E-09	9.2640E-09	3.7112E-08	6.9542E-08
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA				
	3.0436E+07	4.3621E+07	6.9783E+07	7.5250E+07
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL				
	1.0004E+06	9.6741E+05	1.0682E+06	1.1900E+06
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL				
	2.9713E+06	2.5944E+06	1.8430E+06	1.6560E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL	RUN NO. 7	8	9	10
1	1ST KIND 7.0032E-12	9.9339E-12	1.9213E-11	2.0695E-11
	2ND KIND -5.6947E-14	-7.9880E-14	-1.5134E-13	-1.6241E-13
2	1ST KIND 4.2628E-12	5.9267E-12	9.5036E-12	9.3023E-12
	2ND KIND -1.8900E-14	-2.5770E-14	-3.9880E-14	-3.8729E-14
3	1ST KIND 7.7183E+06	8.7719E+06	1.2762E+07	1.3059E+07
	2ND KIND -2.2590E+04	-2.6271E+04	-3.9315E+04	-4.0163E+04
4	1ST KIND 4.8387E+06	6.2917E+06	1.0269E+07	1.0470E+07
	2ND KIND -1.1155E+03	-1.4614E+03	-2.3195E+03	-2.3447E+03
5	1ST KIND 1.3167E+05	6.5047E+05	2.1322E+06	2.1596E+06
	2ND KIND -2.5463E+00	-9.6949E+00	-2.6099E+01	-2.5622E+01
6	1ST KIND 3.5265E+06	5.6110E+06	6.9962E+06	6.3302E+06
	2ND KIND -1.8595E+01	-2.3697E+01	-2.2092E+01	-1.8604E+01
7	1ST KIND 7.6808E+06	8.2207E+06	8.9465E+06	8.9514E+06
	2ND KIND -2.2765E+01	-2.3796E+01	-2.5214E+01	-2.5117E+01
8	1ST KIND 2.4796E+05	7.3780E+05	1.9696E+06	1.9580E+06
	2ND KIND -2.5216E-01	-5.3343E-01	-1.0565E+00	-1.0042E+00
9	1ST KIND 2.3523E+04	1.2975E+05	4.5536E+05	4.6349E+05
	2ND KIND -1.2472E-03	-4.4979E-03	-1.1537E-02	-1.1120E-02
10	1ST KIND 3.4908E+04	1.9286E+05	6.7825E+05	6.9075E+05
	2ND KIND -1.0029E-04	-3.2799E-04	-7.8017E-04	-7.4591E-04
11	1ST KIND 1.2104E-12	2.2156E-12	5.6189E-12	6.0518E-12
	2ND KIND -1.5272E-21	-2.2589E-21	-4.2443E-21	-4.3328E-21
12	1ST KIND 2.2734E+06	3.8777E+06	4.7513E+06	3.9860E+06
	2ND KIND -3.0311E-04	-3.2899E-04	-2.2259E-04	-1.6349E-04
13	1ST KIND 1.9263E+06	3.5423E+06	4.6028E+06	4.0006E+06
	2ND KIND -5.7244E-09	-5.7282E-09	-3.3557E-09	-2.4307E-09
14	1ST KIND 1.0309E+06	2.0753E+06	2.9441E+06	2.5571E+06
	2ND KIND -5.7184E-14	-5.3523E-14	-2.8336E-14	-1.9555E-14
15	1ST KIND 7.6519E+05	1.8306E+06	3.0997E+06	2.7715E+06
	2ND KIND -5.4975E-19	-5.0074E-19	-2.5513E-19	-1.7480E-19

16	1ST KIND	2.4962E+05	6.8868E+05	1.2808E+06	1.1659E+06
	2ND KIND	-2.8008E-24	-2.4149E-24	-1.1398E-24	-7.6710E-25
17	1ST KIND	1.2242E+05	3.9192E+05	8.4031E+05	7.6892E+05
	2ND KIND	-1.3833E-29	-1.1502E-29	-5.2124E-30	-3.4620E-30
18	1ST KIND	3.4203E+04	1.8404E+05	6.3836E+05	6.5012E+05
	2ND KIND	-4.1173E-37	-3.6952E-37	-1.8639E-37	-1.2767E-37
19	1ST KIND	4.2102E+04	1.5520E+05	3.6345E+05	3.4353E+05
	2ND KIND	-6.0172E-35	-4.7836E-35	-2.0769E-35	-1.3771E-35
20	1ST KIND	3.7224E+01	4.8340E+02	5.5289E+03	7.9494E+03
	2ND KIND	-1.1432E-62	-1.3708E-62	-2.7762E-62	-2.8461E-62
21	1ST KIND	9.6646E+03	1.5250E+05	1.4704E+06	1.9113E+06
	2ND KIND	-3.0488E-79	-2.7865E-79	-1.5139E-79	-1.0719E-79
22	1ST KIND	2.8685E+03	8.5210E+04	1.8804E+06	3.0824E+06
	2ND KIND	-4.1562-108	-4.0011-108	-2.8472-108	-2.3626-108
23	1ST KIND	8.3142E+02	3.1389E+04	8.6838E+05	1.4550E+06
	2ND KIND	-1.5585-113	-1.5955-113	-1.1200-113	-8.6159-114
24	1ST KIND	3.2917E+02	2.1543E+04	1.1685E+06	2.4088E+06
	2ND KIND	-2.3306-137	-2.4647-137	-2.6104-137	-2.4721-137
25	1ST KIND	2.0953E+01	3.2981E+03	6.3046E+05	2.0790E+06
	2ND KIND	-1.7699-173	-2.3180-173	-5.2786-173	-7.2761-173
26	1ST KIND	8.2440E+00	1.8284E+03	4.7948E+05	1.5312E+06
	2ND KIND	-1.6773-185	-2.4180-185	-4.2903-185	-4.6751-185
27	1ST KIND	2.3747E+00	6.4350E+02	1.7310E+05	5.2473E+05
	2ND KIND	-9.3813-208	-9.1187-208	-6.9523-208	-5.7443-208
28	1ST KIND	3.9766E-02	3.0511E+01	5.5226E+04	3.1438E+05
	2ND KIND	-2.4139-222	-4.3360-222	-2.1365-221	-3.5744-221
29	1ST KIND	7.4912E-01	4.6061E+02	3.3532E+05	1.4355E+06
	2ND KIND	-5.7763-233	-5.2931-233	-7.5637-233	-1.2064-232
30	1ST KIND	1.5262E-03	4.2031E+00	2.5230E+04	1.8800E+05
	2ND KIND	-4.9537-260	-9.0593-260	-5.1840-259	-9.0852-259
31	1ST KIND	2.4134E-20	2.0777E-17	3.8288E-14	2.1283E-13
	2ND KIND	-1.6927-245	-2.7187-245	-1.0741-244	-1.6700-244
32	1ST KIND	2.0189E-07	1.1561E-01	2.8307E+03	2.6642E+04
	2ND KIND	0.	0.	0.	0.
33	1ST KIND	0.	3.3150E-05	5.4783E+01	1.5168E+03
	2ND KIND	0.	0.	0.	0.