Investigations of Direct Methods for the Determination of Fine Structure Associated with the Velocity Dependence of Total Elastic Scattering Cross-sections for Neutral Particles in the Thermal Energy Range

A Thesis

presented to the Department of Chemistry of Washington and Lee University as the completion of work for Chemistry 272 and partial completion for the Bachelor of Science with Special Attainments in Chemistry degree.

By

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on

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VITA

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INTRODUCTION

The project at hand is an investigation of methods which might be used for the determination of a plot of ln Q vs γr, as shown in Figure 1, where Q is the cross-section, and γr is the relative velocity of interacting particles. Previously, plots of this nature have been obtained only through much diligent and laborious work. At a specifically selected relative velocity, an individual cross-section was measured, via a machine shown schematically in Figure 2. By making measurements at many relative velocities, the desired graph could be constructed.

It is proposed that by making certain modifications (shown in Figure 3) of the instrument, the plot can be displayed on an oscilloscope screen. My work has been concerned with determining the theoretical, practical, and financial feasibility of this proposal. I have been able to show the feasibility, at least on the first two counts.

THEORETICAL

Significance of - ln Q vs ln γr: The cross-section is the probability of particles in two crossed beams interacting with one another, and it is velocity dependent. If we assume a certain velocity distribution in the source beam, we can measure the effect of different velocities on the cross-section. As the relative velocity of interacting particles increases the collisional cross-section decreases. This effect is a direct result of the interaction time available to the interacting particles.

With reference to Figure 1, as the relative velocity increases (or the ln γr for that matter), the cross-section becomes smaller, and since $0 \leqq Q \leqq 1$, the ln Q becomes a more negative number. Therefore - ln Q becomes a more positive number. This accounts for the slope of the plot.

As a digression, let us examine Q more closely in order to gain an appreciation for its magnitude. The unit of the cross-section is square centimeters, or area. It is a measure of the area of molecular influence. The radius of this influence is on the order of 10^{-7} cm. Using the equation $A = \pi r^2$, an area on the order of 10^{-14} cm^2 is obtained.

The minima in the curve are indicative of the bound or stable states that can exist while the particles are interacting. The distance along the x-axis, between minima is related to the depth of the potential energy well.

As can be seen, the plot yields much information about systems of interacting particles, and it would be desirable to have a fast, convenient, and accurate means of obtaining it.

Basic Mechanics of the Proposed Instrument: Referring to Figure 3, it can be seen that the parts of the instrument include:

1. Oven- for the generation of a source beam of particles,
2. Difining slits- collimation of the beam,
3. Source beam chopper- pulses the source beam,
4. Flight tube- length allows velocity selection among particles within a give pulse,
5. Cross target beam- used to interact with source beam,

6. Target beam chopper- pulses target beam,

7. Vacuum pumps- evacuation of flight tube, oven, and detector chambers to 10^{-6}- 10^{-7} torr,

8. Detector- detects the intensity of the source beam after interaction,

9. Electronics for taking the ln of the output signal of detector,

10. Oscilloscope screen- displays the desired plot.

For a gas which is in thermal equilibrium, the Maxwellian distribution law will hold.

If we arrange things so that the diameter or width of the defining slits is less than or equal to the mean free path of the molecules in the oven, the beam be governed by the laws of effusive flow. This is because the number of collisions which occur within the vicinity of the slits is drastically reduced, thereby giving a non-turbulent flow. This is convenient as there is a good mathematical treatment of effusive flow, and because the intensity of the beam is described by a cosine relationship.

Velocity selection and distribution are governed by the length of the tube and period of the pulsing beam. When the source beam particles interact with the target beam they are scattered out of the beam with a resultant attenuation. The detector measures this attenuation and by comparison with the measurements of beam intensity of an unattenuated beam, puts out a signal which can be converted electronically to an ln signal and displayed on the oscilloscope screen.

Reproducing the Conditions which Exist within the Apparatus: As stated previously, the velocity distribution of the particles in the oven is consistent with the Maxwell distribution law,

$$\frac{1}{N}\frac{dn_c}{dc} = 4\pi\left(\frac{m}{2\pi kt}\right)^{3/2} c^2 e^{-\beta c^2}, \quad (1)$$

Where, N is the total number of molecules in the oven, $(1/N)(dn_c/dc)$ is the fraction of molecules in the speed range c to c + dc per unit width

of the interval, m is the mass in grams of one molecule, k is Boltzmann's constant in cgs units, $\overline{T}$ is the absolute temperature in degrees Kelvin, c is the velocity in cgs units, and $\beta = m/2k\overline{T}$. Figure 4 shows a typical plot of $(1/N)\,(dn_c/dc)$ vs. c. According to Maxwellian law the most probable velocity, c_{mp}, is $(2kT/m)^{1/2}$, and the root mean square velocity, $(\overline{c^2})^{1/2}$, is $(3kT/m)^{1/2}$, where $(\overline{c^2})^{1/2} > \overline{c} > c_{mp}$.

An expression for the distribution of particles as a function of time spent along the flight tube is now needed (that is an expression for the velocity distribution). According to the laws of effusive flow the number of particles within the velocity range v and v + dv is $C\, v^3 e^{-\beta v^2} dv$. After time t a particle of velocity v well have undergone a displacement s, where s = vt. Therefore particles in the velocity range v + dv will be spread over a distance ds, where ds = t dv. If I is the number of particles per unit length of the flight tube then,

$$Ids = Cv^3 e^{-\beta v^2} dv \qquad , (2)$$

Where, C is a constant of proportionality, v is the velocity and $\beta = m/2k\overline{T}$. Substituting tdv for ds, one obtains,

$$Itdv = Cv^3 e^{-\beta v^2} dv.$$

$$It = Cv^3 e^{-\beta v^2}.$$

$$I = (C/t)\, v^3 e^{-\beta v^2}, \text{ and since } v = s/t,$$

$$I = C[(s/t)^3/t] e^{-\beta s^2/t^2}, \text{ so that}$$

$$I = C(s^3/t^4) e^{-\beta s^2/t^2}. \qquad (3)$$

Equation (3) is the desired expression. Comparing equation (1) with equation (3), it is seen that the Maxwellian expression has a c^2 term, while equation (3) has a v^3 term (c=v). The reason for this is that the molecules with the greatest probability of escaping into the flight tube are those with the highest velocity. To be sure, some molecules of lower velocity will escape but the probability decreases with decrease in velocity. As a consequence the most probable velocity found in the beam can be shown to be the root mean square velocity,

$(\overline{c^2})^{1/2}$, within the oven.

The most probable velocity is that associated with the maximum on the velocity distribution curve. Therefore, equation (3) is used, and the derivative is taken, which is then set equal to zero and solved for v.

$$f(v) = Cv^3 e^{-\beta v^2},$$

$$\frac{df(v)}{dv} = 3Cv^2 e^{-\beta v^2} - (2\beta v e^{-\beta v^2})\, Cv^3.$$

Setting this equal to zero, and substituting for β,

$$0 = \frac{f(v)}{dv} = 3Cv^2 e^{-v^2 m/2kT} - v^3 C(vm/kT) e^{-v^2 m/2kT},$$

$$0 = Cv^2 e^{-v^2 m/2kT}(3 - v^2 m/kT)$$

The condition which determines v_{mp} is ,

$$0 = 3 - v^2 m/kT,$$

$$v^2\,(m/kT) = 3,$$

$$v^2 = 3kT/m$$

$$v_{mp}(\text{effusive flow}) = (3kT/m)^{1/2}, \qquad (4)$$

Comparison of equation (4) with $(\overline{c^2})^{1/2}$, for the Maxwellian law shows that,

$$v_{mp}(\text{effusive flow}) = (3kT/m)^{1/2} = (\overline{c^2})^{1/2}, \qquad (5)$$

The use of equation (3) in a computer program approximates the condition where there is no cross beam, and where it is tacitly assumed that there is no attenuation of the source beam by background gases in the flight tube.

In order to take attenuation by a background gas into account the following equations are used.

$$\frac{I}{I^o} = e^{-L/\lambda}, \qquad (6)$$

Where, (I/I^o) is the ratio of the attenuated beam to the unattenuated beam, L is the length of the flight tube.

$$\lambda = \pi^{1/2}(v/\alpha)^2 \,/\, (n_g Q_{eff} \Psi (v/\alpha)),^1 \qquad (7)$$

[1]Dr. Thomas C. Imeson, Doctoral Thesis.

where, v is the velocity of the molecules in the beam, $\alpha=(2kT/m_g)^{1/2}$ (where m_g is the mass of the attenuating gas), n_g is the number density of the attenuating gas (n_g = [N/Vol.] = [P/kT], units are all cgs), and Q_{eff} is the effective cross-section.

If (v/α) is allowed to equal x, then,

$$\Psi(x) = xe^{-x^2} + (2x^2 + 1)\left[(2/\pi^{1/2})\int_o^x e^{-t^2}\,dt\right], \quad (8)$$

where the factor $(2/\pi^{1/2})\int_o^x e^{-t^2}\,dt$ is the error function (erf). This integral cannot be evaluated by ordinary integration techniques. In a computer it can be approximated by,

$$\text{erf} = (2/\pi^{1/2})[1.0-(1.0/\{1.0+A_1\cdot x^2+A_3\cdot x^3+A_4\cdot x^4+A_5\cdot x^5+A_6\cdot x^6\}^{16})]^1, \quad (9)$$

where, A_1 = .07052308,
A_2 = .04228202,
A_3 = .00927057,
A_4 = .0001560^4,
A_5 = .00027257,
A_6 = .00004303,

Q_{eff} in equation (7) can be approximated roughly by the equation [2],

$$Q_{eff} = Q_o\,(1/v)^{2/(s-1)}, \quad (10)$$

where, s = 6.1, v is velocity of beam particles, and $Q_o = e^{5.37}\,(kT/d)$, where d = 1.27 cm.

The next step which must be taken is the calculation of the absolute intensity as a function of the angle measured from a normal to the slit (or detector). The equation used is,

$$I = (1/n)\,(dn_v/dv) = 2\pi A(v^3/t)e^{-\beta v^2}\sin\theta\cos\theta\,d\theta, \quad (11)$$

[3]

[1]Cecil Hastings, Jr., Approximations for Digital Computers, p. 187, (1966), Princeton University Press.

[2]M. M. Hessel and P. Kusch, "Deviations from the $1/r^6$ potential in Scattering of a Polar Molecule by Non-Polar Gases," J. Chem. Phys. 43, 305, (1965).

[3]Earle H. Kennard, Kinetic Theory of Gases, pp. 61-64, (1938), McGraw-Hill Book Company, Inc.

where, $A = (\rho/\pi)^{3/2}$, θ is the angle measured from the normal to the slit, and $d\theta$ is the radius of the detector. Equation (11) can be rewritten slightly so that,

$$I = 2\pi(m/2kT\pi)^{3/2}\ (s^3/t^4)e^{-mv^2/2kT}, \qquad (12)$$

where s is the length of the flight tube. Using equation (12), the absolute intensity can be calculated as a function of θ for a flight tube length of two meters (assuming 10^{-6} torr background air pressure, and detector area of 3×10^{-4} sq. in.).

EXPERIMENTAL

Experimental Results: The following data are for potassium, cesium, and rubidium at an oven temperature of 450.0°K, with flight tube lengths of 50.0 cm, 100.0 cm, 150.0 cm, 200.0 cm, and 250.0 cm. The first three plots are I vs S, with five constant times. The times are calculated using the equation $t = s/v$, where for each elements $v = v_{mp}$ (effusive flow), and a time is obtained for each flight tube length.

These graphs are fairly insensitive because of the large increment of distant (9.0 cm) along the x-axis. That is, the velocity spread is compressed. Nevertheless, a first approximation of the tube lengths which will yield the best velocity distribution, with the least attenuation of intensity can be made. These lengths are 150.0 cm, 200.0 cm, and 250.0 cm.

In order to narrow down the choices further, the next three plots are used. These are I vs t, and are much more sensitive, because (keeping the above three distances constant) the increment of t is on the order of 10^{-4} sec. This is a much smaller increment along the x-axis, and has the effect of expanding the velocity spread. According to these data a flight tube distance of 150.0 cm to 200.0 cm is appropriate, because the distribution of velocities for the flight tube of 250.0 cm is spread over too great a range with a resultant loss in intensity.

The last set of data is a table of values for the attenuation of a beam of potassium atoms, due to the background scattering of nitrogen in the flight tube. Tube lengths and velocities used are thos obtained from the second set of graphs. (I/I°), the attenuation, is calculated at a flight tube temperature of 300°K, and pressures of 10^{-5}, 10^{-6}, and 10^{-7} torr. The data show that for both tube lengths, at a pressure of 10^{-7} torr, (I/I°) is very close to 1. That is, attenuation is small. It might well be noted that a tube length of 150.0 cm gives slightly better results.

COMPARISON OF MOST PROBABLE SPEED, AVERAGE SPEED, AND ROOT MEAN SQUARE SPEED OF MAXWELLIAN DISTRIBUTION, AND DISTRIBUTION IN EFFUSIVE FLOW

TYPE OF ATOM IS K MASS= 0.64953E-22GRAMS TEMPERATURE= 450.0DEG. K.

ACCORDING TO MAXWELLIAN DISTRIBUTION, VMP=(2KT/M)**.5, AV=(8KT/3.141M)**.5, RMSV=(3KT/M)**.5

VMP= 0.43734E 05CM/SEC AV= 0.49353E 05CM/SEC RMSV= 0.53563E 05CM/SEC

ACCORDING TO EFFUSIVE FLOW DISTRIBUTION, VMP=(3KT/M)**.5, AV=.75(2*3.141KT/M)**.5, RMSV=(KT/M)**.5

VMP= 0.53563E 05CM/SEC AV= 0.58132E 05CM/SEC RMSV= 0.30924E 05CM/SEC

TIME= 0.933E-03SEC DISTANCE= 0.500E 02CM FOR POINTS 1

TIME= 0.186E-02SEC DISTANCE= 0.100E 03CM FOR POINTS 2

TIME= 0.280E-02SEC DISTANCE= 0.150E 03CM FOR POINTS 3

TIME= 0.373E-02SEC DISTANCE= 0.200E 03CM FOR POINTS 4

TIME= 0.466E-02SEC DISTANCE= 0.250E 03CM FOR POINTS 5

PLOT OF I VS S ACCORDING TO THE EQUATION I=C(S**3/T**4)*E**(-BS**2/T**2)

INCREMENT ALONG X-AXIS= 9.0CM,---CONSTANT TIME UNNORMALIZED DATA

STEP	DISTANCE(IN CM)	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.0	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
2	9.0	0.914E 15	0.592E 14	0.117E 14	0.373E 13	0.153E 13
3	18.0	0.632E 16	0.457E 15	0.928E 14	0.296E 14	0.121E 14
4	27.0	0.167E 17	0.145E 16	0.304E 15	0.985E 14	0.407E 14
5	36.0	0.282E 17	0.316E 16	0.695E 15	0.228E 15	0.953E 14
6	45.0	0.356E 17	0.553E 16	0.129E 16	0.434E 15	0.182E 15
7	54.0	0.360E 17	0.836E 16	0.210E 16	0.726E 15	0.309E 15
8	63.0	0.304E 17	0.113E 17	0.312E 16	0.110E 16	0.479E 15
9	72.0	0.219E 17	0.141E 17	0.429E 16	0.158E 16	0.694E 15
10	81.0	0.136E 17	0.163E 17	0.557E 16	0.213E 16	0.956E 15
11	90.0	0.744E 16	0.178E 17	0.690E 16	0.276E 16	0.126E 16
12	99.0	0.356E 16	0.183E 17	0.820E 16	0.345E 16	0.161E 16
13	108.0	0.151E 16	0.180E 17	0.941E 16	0.418E 16	0.200E 16
14	117.0	0.571E 15	0.169E 17	0.104E 17	0.493E 16	0.242E 16
15	126.0	0.192E 15	0.152E 17	0.112E 17	0.567E 16	0.287E 16
16	135.0	0.577E 14	0.131E 17	0.118E 17	0.639E 16	0.334E 16
17	144.0	0.155E 14	0.109E 17	0.121E 17	0.705E 16	0.382E 16
18	153.0	0.374E 13	0.880E 16	0.122E 17	0.765E 16	0.430E 16
19	162.0	0.812E 12	0.682E 16	0.120E 17	0.817E 16	0.477E 16
20	171.0	0.158E 12	0.512E 16	0.115E 17	0.859E 16	0.522E 16
21	180.0	0.277E 11	0.372E 16	0.109E 17	0.890E 16	0.564E 16
22	189.0	0.437E 10	0.261E 16	0.101E 17	0.909E 16	0.603E 16
23	198.0	0.622E 09	0.178E 16	0.924E 16	0.918E 16	0.638E 16
24	207.0	0.798E 08	0.118E 16	0.828E 16	0.915E 16	0.668E 16
25	216.0	0.923E 07	0.757E 15	0.730E 16	0.901E 16	0.693E 16
26	225.0	0.964E 06	0.472E 15	0.633E 16	0.877E 16	0.712E 16

27	234.0	0.910E 05	0.285E 15	0.541E 16	0.845E 16	0.725E 16
28	243.0	0.775E 04	0.168E 15	0.455E 16	0.806E 16	0.732E 16
29	252.0	0.597E 03	0.961E 14	0.377E 16	0.760E 16	0.734E 16
30	261.0	0.415E 02	0.534E 14	0.308E 16	0.710E 16	0.730E 16
31	270.0	0.261E 01	0.288E 14	0.248E 16	0.657E 16	0.721E 16
32	279.0	0.148E 00	0.151E 14	0.196E 16	0.603E 16	0.706E 16
33	288.0	0.766E-02	0.776E 13	0.154E 16	0.547E 16	0.687E 16
34	297.0	0.356E-03	0.386E 13	0.118E 16	0.493E 16	0.664E 16
35	306.0	0.150E-04	0.187E 13	0.906E 15	0.440E 16	0.638E 16
36	315.0	0.573E-06	0.884E 12	0.681E 15	0.389E 16	0.608E 16
37	324.0	0.198E-07	0.406E 12	0.505E 15	0.341E 16	0.577E 16
38	333.0	0.619E-09	0.181E 12	0.369E 15	0.296E 16	0.543E 16
39	342.0	0.175E-10	0.790E 11	0.267E 15	0.256E 16	0.508E 16
40	351.0	0.448E-12	0.335E 11	0.190E 15	0.219E 16	0.473E 16
41	360.0	0.104E-13	0.138E 11	0.134E 15	0.186E 16	0.438E 16
42	369.0	0.218E-15	0.557E 10	0.933E 14	0.156E 16	0.403E 16
43	378.0	0.416E-17	0.218E 10	0.640E 14	0.130E 16	0.368E 16
44	387.0	0.000E 00	0.835E 09	0.434E 14	0.108E 16	0.335E 16
45	396.0	0.000E 00	0.311E 09	0.291E 14	0.892E 15	0.303E 16
46	405.0	0.000E 00	0.112E 09	0.192E 14	0.728E 15	0.273E 16
47	414.0	0.000E 00	0.399E 08	0.125E 14	0.590E 15	0.244E 16
48	423.0	0.000E 00	0.137E 08	0.812E 13	0.474E 15	0.217E 16
49	432.0	0.000E 00	0.461E 07	0.517E 13	0.378E 15	0.192E 16
50	441.0	0.000E 00	0.151E 07	0.326E 13	0.300E 15	0.169E 16
51	450.0	0.000E 00	0.482E 06	0.203E 13	0.236E 15	0.148E 16
52	459.0	0.000E 00	0.150E 06	0.124E 13	0.184E 15	0.129E 16
53	468.0	0.000E 00	0.455E 05	0.759E 12	0.142E 15	0.112E 16
54	477.0	0.000E 00	0.134E 05	0.456E 12	0.109E 15	0.972E 15
55	486.0	0.000E 00	0.387E 04	0.270E 12	0.840E 14	0.835E 15
56	495.0	0.000E 00	0.108E 04	0.158E 12	0.637E 14	0.713E 15
57	504.0	0.000E 00	0.298E 03	0.920E 11	0.480E 14	0.607E 15
58	513.0	0.000E 00	0.797E 02	0.527E 11	0.359E 14	0.514E 15
59	522.0	0.000E 00	0.207E 02	0.298E 11	0.267E 14	0.433E 15
60	531.0	0.000E 00	0.528E 01	0.167E 11	0.197E 14	0.363E 15
61	540.0	0.000E 00	0.130E 01	0.923E 10	0.144E 14	0.303E 15
62	549.0	0.000E 00	0.315E 00	0.505E 10	0.105E 14	0.251E 15
63	558.0	0.000E 00	0.744E-01	0.272E 10	0.759E 13	0.208E 15
64	567.0	0.000E 00	0.171E-01	0.145E 10	0.544E 13	0.171E 15
65	576.0	0.000E 00	0.383E-02	0.769E 09	0.388E 13	0.140E 15
66	585.0	0.000E 00	0.837E-03	0.401E 09	0.275E 13	0.114E 15
67	594.0	0.000E 00	0.178E-03	0.207E 09	0.193E 13	0.927E 14
68	603.0	0.000E 00	0.371E-04	0.105E 09	0.135E 13	0.749E 14
69	612.0	0.000E 00	0.752E-05	0.533E 08	0.937E 12	0.602E 14
70	621.0	0.000E 00	0.148E-05	0.266E 08	0.645E 12	0.482E 14
71	630.0	0.000E 00	0.286E-06	0.131E 08	0.442E 12	0.384E 14
72	639.0	0.000E 00	0.539E-07	0.639E 07	0.300E 12	0.304E 14
73	648.0	0.000E 00	0.990E-08	0.307E 07	0.203E 12	0.240E 14
74	657.0	0.000E 00	0.177E-08	0.146E 07	0.136E 12	0.189E 14
75	666.0	0.000E 00	0.309E-09	0.690E 06	0.907E 11	0.148E 14
76	675.0	0.000E 00	0.527E-10	0.321E 06	0.601E 11	0.115E 14
77	684.0	0.000E 00	0.876E-11	0.148E 06	0.395E 11	0.896E 13
78	693.0	0.000E 00	0.141E-11	0.674E 05	0.258E 11	0.692E 13
79	702.0	0.000E 00	0.224E-12	0.303E 05	0.167E 11	0.532E 13
80	711.0	0.000E 00	0.346E-13	0.135E 05	0.108E 11	0.407E 13
81	720.0	0.000E 00	0.520E-14	0.594E 04	0.692E 10	0.310E 13
82	729.0	0.000E 00	0.764E-15	0.258E 04	0.441E 10	0.235E 13
83	738.0	0.000E 00	0.109E-15	0.111E 04	0.278E 10	0.178E 13
84	747.0	0.000E 00	0.152E-16	0.473E 03	0.175E 10	0.134E 13
85	756.0	0.000E 00	0.208E-17	0.199E 03	0.109E 10	0.100E 13
86	765.0	0.000E 00	0.276E-18	0.828E 02	0.678E 09	0.749E 12

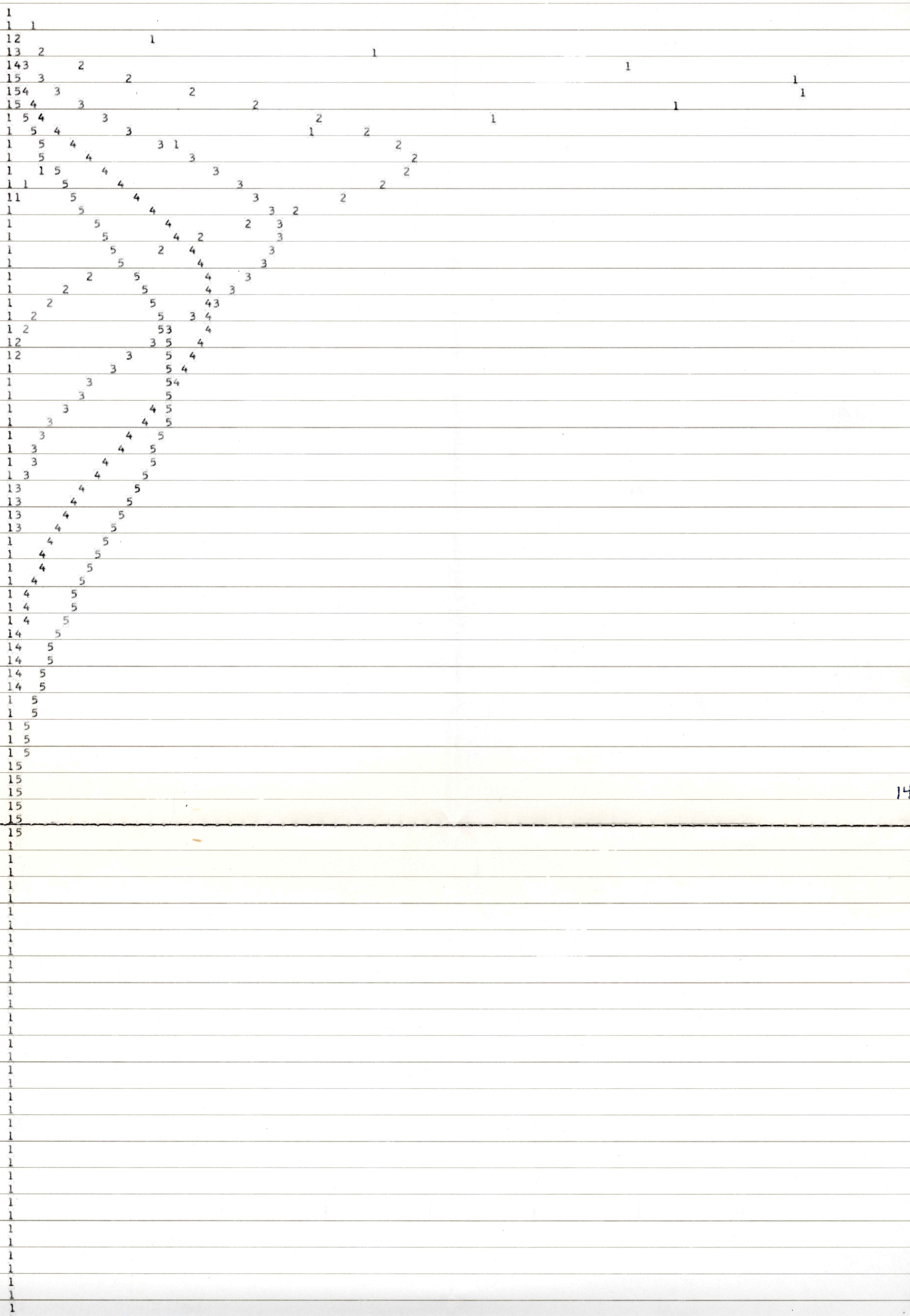
87	774.0	0.000E 00	0.000E 00	0.340E 02	0.417E 09	0.556E 12
88	783.0	0.000E 00	0.000E 00	0.138E 02	0.255E 09	0.411E 12
89	792.0	0.000E 00	0.000E 00	0.557E 01	0.155E 09	0.303E 12
90	801.0	0.000E 00	0.000E 00	0.221E 01	0.939E 08	0.222E 12
91	810.0	0.000E 00	0.000E 00	0.872E 00	0.564E 08	0.162E 12
92	819.0	0.000E 00	0.000E 00	0.339E 00	0.336E 08	0.118E 12
93	828.0	0.000E 00	0.000E 00	0.130E 00	0.199E 08	0.854E 11
94	837.0	0.000E 00	0.000E 00	0.496E-01	0.117E 08	0.616E 11
95	846.0	0.000E 00	0.000E 00	0.186E-01	0.687E 07	0.442E 11
96	855.0	0.000E 00	0.000E 00	0.694E-02	0.399E 07	0.316E 11
97	864.0	0.000E 00	0.000E 00	0.255E-02	0.230E 07	0.225E 11
98	873.0	0.000E 00	0.000E 00	0.929E-03	0.132E 07	0.159E 11
99	882.0	0.000E 00	0.000E 00	0.334E-03	0.755E 06	0.112E 11
100	891.0	0.000E 00	0.000E 00	0.118E-03	0.428E 06	0.791E 10

RANGE = 0.100E 01 TOP = 0.100E 01 BOTTOM = 0.000E 00 SCALE = 0.100E-01 PER STEP
VALUE OF AXIS IS 0.000E 00

DATA FOR PLOTS

STEP	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
2	0.253E-01	0.164E-02	0.327E-03	0.103E-03	0.000E 00
3	0.175E 00	0.126E-01	0.257E-02	0.822E-03	0.338E-03
4	0.464E 00	0.402E-01	0.845E-02	0.273E-02	0.113E-02
5	0.783E 00	0.877E-01	0.193E-01	0.634E-02	0.264E-02
6	0.987E 00	0.153E 00	0.359E-01	0.120E-01	0.507E-02
7	0.100E 01	0.232E 00	0.584E-01	0.201E-01	0.858E-02
8	0.844E 00	0.314E 00	0.865E-01	0.307E-01	0.132E-01
9	0.607E 00	0.391E 00	0.119E 00	0.438E-01	0.192E-01
10	0.378E 00	0.453E 00	0.154E 00	0.592E-01	0.265E-01
11	0.206E 00	0.493E 00	0.191E 00	0.767E-01	0.350E-01
12	0.990E-01	0.509E 00	0.227E 00	0.958E-01	0.448E-01
13	0.420E-01	0.500E 00	0.261E 00	0.116E 00	0.556E-01
14	0.158E-01	0.469E 00	0.289E 00	0.136E 00	0.673E-01
15	0.533E-02	0.422E 00	0.313E 00	0.157E 00	0.798E-01
16	0.160E-02	0.364E 00	0.329E 00	0.177E 00	0.928E-01
17	0.430E-03	0.303E 00	0.337E 00	0.195E 00	0.106E 00
18	0.103E-03	0.244E 00	0.339E 00	0.212E 00	0.119E 00
19	0.000E 00	0.189E 00	0.333E 00	0.226E 00	0.132E 00
20	0.000E 00	0.142E 00	0.321E 00	0.238E 00	0.144E 00
21	0.000E 00	0.103E 00	0.303E 00	0.246E 00	0.156E 00
22	0.000E 00	0.725E-01	0.281E 00	0.252E 00	0.167E 00
23	0.000E 00	0.495E-01	0.256E 00	0.254E 00	0.177E 00
24	0.000E 00	0.327E-01	0.229E 00	0.253E 00	0.185E 00
25	0.000E 00	0.210E-01	0.202E 00	0.250E 00	0.192E 00
26	0.000E 00	0.130E-01	0.175E 00	0.243E 00	0.197E 00
27	0.000E 00	0.792E-02	0.150E 00	0.234E 00	0.201E 00
28	0.000E 00	0.466E-02	0.126E 00	0.223E 00	0.203E 00
29	0.000E 00	0.266E-02	0.104E 00	0.211E 00	0.203E 00
30	0.000E 00	0.148E-02	0.854E-01	0.197E 00	0.202E 00
31	0.000E 00	0.800E-03	0.688E-01	0.182E 00	0.200E 00
32	0.000E 00	0.421E-03	0.546E-01	0.167E 00	0.195E 00
33	0.000E 00	0.215E-03	0.427E-01	0.151E 00	0.190E 00
34	0.000E 00	0.107E-03	0.330E-01	0.136E 00	0.184E 00
35	0.000E 00	0.000E 00	0.251E-01	0.122E 00	0.176E 00
36	0.000E 00	0.000E 00	0.188E-01	0.107E 00	0.168E 00
37	0.000E 00	0.000E 00	0.140E-01	0.947E-01	0.160E 00
38	0.000E 00	0.000E 00	0.102E-01	0.823E-01	0.150E 00
39	0.000E 00	0.000E 00	0.740E-02	0.710E-01	0.141E 00
40	0.000E 00	0.000E 00	0.528E-02	0.607E-01	0.131E 00
41	0.000E 00	0.000E 00	0.372E-02	0.516E-01	0.121E 00
42	0.000E 00	0.000E 00	0.258E-02	0.434E-01	0.111E 00
43	0.000E 00	0.000E 00	0.177E-02	0.362E-01	0.102E 00
44	0.000E 00	0.000E 00	0.120E-02	0.300E-01	0.930E-01
45	0.000E 00	0.000E 00	0.807E-03	0.247E-01	0.842E-01
46	0.000E 00	0.000E 00	0.533E-03	0.202E-01	0.757E-01
47	0.000E 00	0.000E 00	0.348E-03	0.163E-01	0.678E-01
48	0.000E 00	0.000E 00	0.225E-03	0.131E-01	0.603E-01
49	0.000E 00	0.000E 00	0.143E-03	0.105E-01	0.534E-01
50	0.000E 00	0.000E 00	0.000E 00	0.832E-02	0.470E-01
51	0.000E 00	0.000E 00	0.000E 00	0.654E-02	0.412E-01
52	0.000E 00	0.000E 00	0.000E 00	0.511E-02	0.359E-01

53	0.000E 00	0.000E 00	0.000E 00	0.396E-02	0.312E-01
54	0.000E 00	0.000E 00	0.000E 00	0.305E-02	0.269E-01
55	0.000E 00	0.000E 00	0.000E 00	0.233E-02	0.231E-01
56	0.000E 00	0.000E 00	0.000E 00	0.176E-02	0.198E-01
57	0.000E 00	0.000E 00	0.000E 00	0.133E-02	0.168E-01
58	0.000E 00	0.000E 00	0.000E 00	0.997E-03	0.142E-01
59	0.000E 00	0.000E 00	0.000E 00	0.740E-03	0.120E-01
60	0.000E 00	0.000E 00	0.000E 00	0.546E-03	0.100E-01
61	0.000E 00	0.000E 00	0.000E 00	0.400E-03	0.840E-02
62	0.000E 00	0.000E 00	0.000E 00	0.291E-03	0.698E-02
63	0.000E 00	0.000E 00	0.000E 00	0.210E-03	0.577E-02
64	0.000E 00	0.000E 00	0.000E 00	0.151E-03	0.474E-02
65	0.000E 00	0.000E 00	0.000E 00	0.107E-03	0.388E-02
66	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.317E-02
67	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.257E-02
68	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.207E-02
69	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.167E-02
70	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.133E-02
71	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.106E-02
72	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.845E-03
73	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.668E-03
74	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.525E-03
75	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.411E-03
76	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.320E-03
77	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.248E-03
78	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.192E-03
79	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.147E-03
80	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.113E-03
81	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
82	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
83	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
84	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
85	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
86	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
87	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
88	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
89	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
90	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
91	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
92	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
93	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
94	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
95	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
96	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
97	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
98	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
99	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
100	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00



TYPE OF ATOM IS RB MASS= 0.14198E-21GRAMS TEMPERATURE= 450.0DEG. K.

ACCORDING TO MAXWELLIAN DISTRIBUTION, VMP=(2KT/M)**.5, AV=(8KT/3.141M)**.5,
RMSV=(3KT/M)**.5

VMP= 0.29580E 05CM/SEC AV= 0.33381E 05CM/SEC RMSV= 0.36228E 05CM/SEC

ACCORDING TO EFFUSIVE FLOW DISTRIBUTION, VMP=(3KT/M)**.5,
AV=.75(2*3.141KT/M)**.5, RMSV=(KT/M)**.5

VMP= 0.36228E 05CM/SEC AV= 0.39319E 05CM/SEC RMSV= 0.20916E 05CM/SEC

TIME= 0.138E-02SEC DISTANCE= 0.500E 02CM FOR POINTS 1

TIME= 0.276E-02SEC DISTANCE= 0.100E 03CM FOR POINTS 2

TIME= 0.414E-02SEC DISTANCE= 0.150E 03CM FOR POINTS 3

TIME= 0.552E-02SEC DISTANCE= 0.200E 03CM FOR POINTS 4

TIME= 0.690E-02SEC DISTANCE= 0.250E 03CM FOR POINTS 5

PLOT OF I VS S ACCORDING TO THE EQUATION I=C(S**3/T**4)*E**(-BS**2/T**2)

INCREMENT ALONG X-AXIS= 9.0CM,---CONSTANT TIME UNNORMALIZED DATA

STEP	DISTANCE(IN CM)	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.0	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
2	9.0	0.191E 15	0.124E 14	0.246E 13	0.782E 12	0.320E 12
3	18.0	0.132E 16	0.957E 14	0.194E 14	0.620E 13	0.255E 13
4	27.0	0.350E 16	0.303E 15	0.638E 14	0.206E 14	0.853E 13
5	36.0	0.590E 16	0.661E 15	0.145E 15	0.478E 14	0.199E 14
6	45.0	0.745E 16	0.115E 16	0.270E 15	0.909E 14	0.382E 14
7	54.0	0.754E 16	0.175E 16	0.441E 15	0.151E 15	0.647E 14
8	63.0	0.636E 16	0.237E 16	0.653E 15	0.231E 15	0.100E 15
9	72.0	0.458E 16	0.295E 16	0.899E 15	0.330E 15	0.145E 15
10	81.0	0.285E 16	0.342E 16	0.116E 16	0.447E 15	0.200E 15
11	90.0	0.155E 16	0.372E 16	0.144E 16	0.579E 15	0.264E 15
12	99.0	0.747E 15	0.384E 16	0.171E 16	0.723E 15	0.338E 15
13	108.0	0.317E 15	0.377E 16	0.196E 16	0.875E 15	0.419E 15
14	117.0	0.119E 15	0.354E 16	0.218E 16	0.103E 16	0.508E 15
15	126.0	0.402E 14	0.318E 16	0.236E 16	0.118E 16	0.602E 15
16	135.0	0.120E 14	0.275E 16	0.248E 16	0.133E 16	0.700E 15
17	144.0	0.325E 13	0.229E 16	0.255E 16	0.147E 16	0.800E 15
18	153.0	0.784E 12	0.184E 16	0.255E 16	0.160E 16	0.900E 15
19	162.0	0.169E 12	0.142E 16	0.251E 16	0.171E 16	0.998E 15
20	171.0	0.330E 11	0.107E 16	0.242E 16	0.179E 16	0.109E 16
21	180.0	0.580E 10	0.778E 15	0.228E 16	0.186E 16	0.118E 16
22	189.0	0.915E 09	0.547E 15	0.212E 16	0.190E 16	0.126E 16
23	198.0	0.130E 09	0.373E 15	0.193E 16	0.192E 16	0.133E 16
24	207.0	0.167E 08	0.247E 15	0.173E 16	0.191E 16	0.139E 16
25	216.0	0.193E 07	0.158E 15	0.152E 16	0.188E 16	0.145E 16
26	225.0	0.201E 06	0.988E 14	0.132E 16	0.183E 16	0.149E 16
27	234.0	0.190E 05	0.598E 14	0.113E 16	0.177E 16	0.151E 16

28	243.0	0.162E 04	0.351E 14	0.952E 15	0.168E 16	0.153E 16
29	252.0	0.124E 03	0.201E 14	0.789E 15	0.159E 16	0.153E 16
30	261.0	0.870E 01	0.111E 14	0.644E 15	0.148E 16	0.152E 16
31	270.0	0.547E 00	0.604E 13	0.519E 15	0.137E 16	0.150E 16
32	279.0	0.311E-01	0.317E 13	0.412E 15	0.126E 16	0.147E 16
33	288.0	0.160E-02	0.162E 13	0.322E 15	0.114E 16	0.143E 16
34	297.0	0.747E-04	0.809E 12	0.249E 15	0.103E 16	0.139E 16
35	306.0	0.314E-05	0.392E 12	0.189E 15	0.921E 15	0.133E 16
36	315.0	0.120E-06	0.185E 12	0.142E 15	0.814E 15	0.127E 16
37	324.0	0.414E-08	0.849E 11	0.105E 15	0.714E 15	0.120E 16
38	333.0	0.129E-09	0.380E 11	0.773E 14	0.621E 15	0.113E 16
39	342.0	0.366E-11	0.165E 11	0.559E 14	0.536E 15	0.106E 16
40	351.0	0.939E-13	0.701E 10	0.398E 14	0.458E 15	0.991E 15
41	360.0	0.218E-14	0.290E 10	0.280E 14	0.389E 15	0.917E 15
42	369.0	0.458E-16	0.116E 10	0.195E 14	0.327E 15	0.843E 15
43	378.0	0.872E-18	0.457E 09	0.134E 14	0.273E 15	0.772E 15
44	387.0	0.000E 00	0.174E 09	0.909E 13	0.227E 15	0.702E 15
45	396.0	0.000E 00	0.651E 08	0.609E 13	0.186E 15	0.635E 15
46	405.0	0.000E 00	0.236E 08	0.402E 13	0.152E 15	0.571E 15
47	414.0	0.000E 00	0.835E 07	0.263E 13	0.123E 15	0.511E 15
48	423.0	0.000E 00	0.287E 07	0.169E 13	0.993E 14	0.455E 15
49	432.0	0.000E 00	0.966E 06	0.108E 13	0.792E 14	0.403E 15
50	441.0	0.000E 00	0.316E 06	0.682E 12	0.628E 14	0.355E 15
51	450.0	0.000E 00	0.100E 06	0.425E 12	0.494E 14	0.311E 15
52	459.0	0.000E 00	0.314E 05	0.261E 12	0.385E 14	0.271E 15
53	468.0	0.000E 00	0.952E 04	0.158E 12	0.299E 14	0.235E 15
54	477.0	0.000E 00	0.281E 04	0.954E 11	0.230E 14	0.203E 15
55	486.0	0.000E 00	0.811E 03	0.566E 11	0.175E 14	0.174E 15
56	495.0	0.000E 00	0.228E 03	0.332E 11	0.133E 14	0.149E 15
57	504.0	0.000E 00	0.624E 02	0.192E 11	0.100E 14	0.127E 15
58	513.0	0.000E 00	0.166E 02	0.110E 11	0.752E 13	0.107E 15
59	522.0	0.000E 00	0.435E 01	0.624E 10	0.559E 13	0.906E 14
60	531.0	0.000E 00	0.110E 01	0.349E 10	0.412E 13	0.760E 14
61	540.0	0.000E 00	0.273E 00	0.193E 10	0.302E 13	0.634E 14
62	549.0	0.000E 00	0.661E-01	0.105E 10	0.219E 13	0.526E 14
63	558.0	0.000E 00	0.155E-01	0.571E 09	0.158E 13	0.435E 14
64	567.0	0.000E 00	0.357E-02	0.305E 09	0.114E 13	0.358E 14
65	576.0	0.000E 00	0.802E-03	0.161E 09	0.812E 12	0.293E 14
66	585.0	0.000E 00	0.175E-03	0.841E 08	0.575E 12	0.239E 14
67	594.0	0.000E 00	0.373E-04	0.434E 08	0.404E 12	0.194E 14
68	603.0	0.000E 00	0.776E-05	0.221E 08	0.282E 12	0.156E 14
69	612.0	0.000E 00	0.157E-05	0.111E 08	0.196E 12	0.126E 14
70	621.0	0.000E 00	0.311E-06	0.556E 07	0.135E 12	0.100E 14
71	630.0	0.000E 00	0.600E-07	0.274E 07	0.925E 11	0.804E 13
72	639.0	0.000E 00	0.112E-07	0.133E 07	0.629E 11	0.638E 13
73	648.0	0.000E 00	0.207E-08	0.644E 06	0.424E 11	0.504E 13
74	657.0	0.000E 00	0.371E-09	0.306E 06	0.285E 11	0.396E 13
75	666.0	0.000E 00	0.647E-10	0.144E 06	0.190E 11	0.310E 13
76	675.0	0.000E 00	0.110E-10	0.673E 05	0.125E 11	0.241E 13
77	684.0	0.000E 00	0.183E-11	0.309E 05	0.827E 10	0.187E 13
78	693.0	0.000E 00	0.297E-12	0.141E 05	0.540E 10	0.144E 13
79	702.0	0.000E 00	0.469E-13	0.634E 04	0.350E 10	0.111E 13
80	711.0	0.000E 00	0.724E-14	0.282E 04	0.226E 10	0.853E 12
81	720.0	0.000E 00	0.109E-14	0.124E 04	0.145E 10	0.650E 12
82	729.0	0.000E 00	0.160E-15	0.541E 03	0.923E 09	0.493E 12
83	738.0	0.000E 00	0.229E-16	0.232E 03	0.583E 09	0.373E 12
84	747.0	0.000E 00	0.320E-17	0.990E 02	0.366E 09	0.280E 12
85	756.0	0.000E 00	0.436E-18	0.416E 02	0.228E 09	0.210E 12
86	765.0	0.000E 00	0.579E-19	0.173E 02	0.141E 09	0.156E 12
87	774.0	0.000E 00	0.000E 00	0.712E 01	0.874E 08	0.116E 12

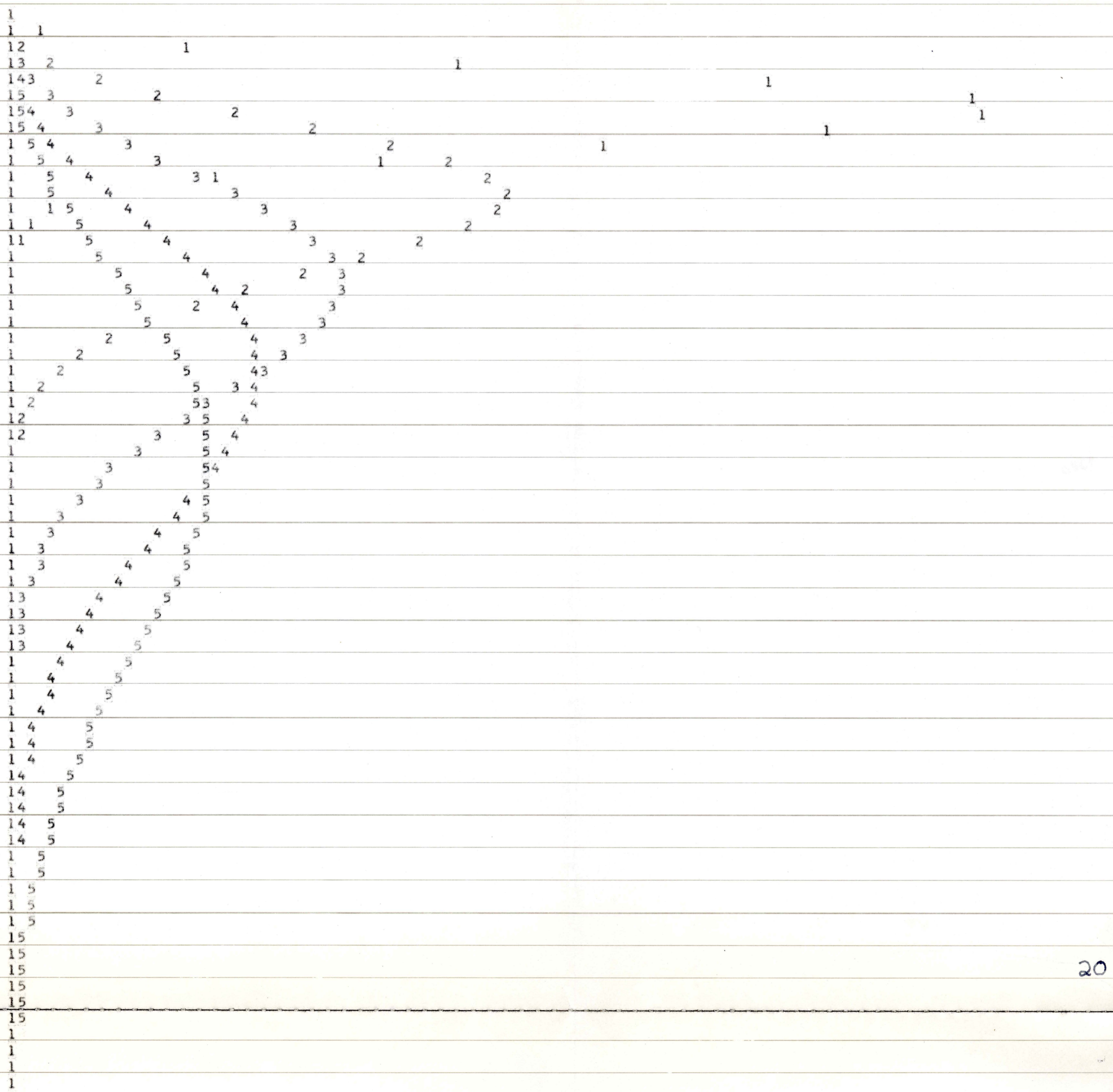
88	783.0	0.000E 00	0.000E 00	0.290E 01	0.535E 08	0.861E 11
89	792.0	0.000E 00	0.000E 00	0.116E 01	0.325E 08	0.634E 11
90	801.0	0.000E 00	0.000E 00	0.463E 00	0.196E 08	0.465E 11
91	810.0	0.000E 00	0.000E 00	0.182E 00	0.118E 08	0.339E 11
92	819.0	0.000E 00	0.000E 00	0.709E-01	0.704E 07	0.247E 11
93	828.0	0.000E 00	0.000E 00	0.273E-01	0.417E 07	0.178E 11
94	837.0	0.000E 00	0.000E 00	0.103E-01	0.245E 07	0.128E 11
95	846.0	0.000E 00	0.000E 00	0.390E-02	0.143E 07	0.926E 10
96	855.0	0.000E 00	0.000E 00	0.145E-02	0.836E 06	0.661E 10
97	864.0	0.000E 00	0.000E 00	0.534E-03	0.483E 06	0.471E 10
98	873.0	0.000E 00	0.000E 00	0.194E-03	0.277E 06	0.334E 10
99	882.0	0.000E 00	0.000E 00	0.699E-04	0.158E 06	0.235E 10
100	891.0	0.000E 00	0.000E 00	0.249E-04	0.896E 05	0.165E 10

RANGE = 0.100E 01 TOP = 0.100E 01 BOTTOM = 0.000E 00 SCALE = 0.100E-01 PER STEP
VALUE OF AXIS IS 0.000E 00

DATA FOR PLOTS

STEP	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
2	0.253E-01	0.164E-02	0.327E-03	0.103E-03	0.000E 00
3	0.175E 00	0.126E-01	0.257E-02	0.822E-03	0.338E-03
4	0.464E 00	0.402E-01	0.845E-02	0.273E-02	0.113E-02
5	0.783E 00	0.877E-01	0.193E-01	0.634E-02	0.264E-02
6	0.987E 00	0.153E 00	0.359E-01	0.120E-01	0.507E-02
7	0.100E 01	0.232E 00	0.584E-01	0.201E-01	0.858E-02
8	0.844E 00	0.314E 00	0.865E-01	0.307E-01	0.132E-01
9	0.607E 00	0.391E 00	0.119E 00	0.438E-01	0.192E-01
10	0.378E 00	0.453E 00	0.154E 00	0.592E-01	0.265E-01
11	0.206E 00	0.493E 00	0.191E 00	0.767E-01	0.350E-01
12	0.990E-01	0.509E 00	0.227E 00	0.958E-01	0.448E-01
13	0.420E-01	0.500E 00	0.261E 00	0.116E 00	0.556E-01
14	0.158E-01	0.469E 00	0.289E 00	0.136E 00	0.673E-01
15	0.533E-02	0.422E 00	0.313E 00	0.157E 00	0.798E-01
16	0.160E-02	0.364E 00	0.329E 00	0.177E 00	0.928E-01
17	0.430E-03	0.303E 00	0.337E 00	0.195E 00	0.106E 00
18	0.103E-03	0.244E 00	0.339E 00	0.212E 00	0.119E 00
19	0.000E 00	0.189E 00	0.333E 00	0.226E 00	0.132E 00
20	0.000E 00	0.142E 00	0.321E 00	0.238E 00	0.144E 00
21	0.000E 00	0.103E 00	0.303E 00	0.246E 00	0.156E 00
22	0.000E 00	0.725E-01	0.281E 00	0.252E 00	0.167E 00
23	0.000E 00	0.495E-01	0.256E 00	0.254E 00	0.177E 00
24	0.000E 00	0.327E-01	0.229E 00	0.253E 00	0.185E 00
25	0.000E 00	0.210E-01	0.202E 00	0.250E 00	0.192E 00
26	0.000E 00	0.130E-01	0.175E 00	0.243E 00	0.197E 00
27	0.000E 00	0.792E-02	0.150E 00	0.234E 00	0.201E 00
28	0.000E 00	0.466E-02	0.126E 00	0.223E 00	0.203E 00
29	0.000E 00	0.266E-02	0.104E 00	0.211E 00	0.203E 00
30	0.000E 00	0.148E-02	0.854E-01	0.197E 00	0.202E 00
31	0.000E 00	0.800E-03	0.688E-01	0.182E 00	0.199E 00
32	0.000E 00	0.421E-03	0.546E-01	0.167E 00	0.195E 00
33	0.000E 00	0.215E-03	0.427E-01	0.151E 00	0.190E 00
34	0.000E 00	0.107E-03	0.330E-01	0.136E 00	0.184E 00
35	0.000E 00	0.000E 00	0.251E-01	0.122E 00	0.176E 00
36	0.000E 00	0.000E 00	0.188E-01	0.107E 00	0.168E 00
37	0.000E 00	0.000E 00	0.140E-01	0.947E-01	0.160E 00
38	0.000E 00	0.000E 00	0.102E-01	0.823E-01	0.150E 00
39	0.000E 00	0.000E 00	0.740E-02	0.710E-01	0.141E 00
40	0.000E 00	0.000E 00	0.528E-02	0.607E-01	0.131E 00
41	0.000E 00	0.000E 00	0.372E-02	0.516E-01	0.121E 00
42	0.000E 00	0.000E 00	0.258E-02	0.434E-01	0.111E 00
43	0.000E 00	0.000E 00	0.177E-02	0.362E-01	0.102E 00
44	0.000E 00	0.000E 00	0.120E-02	0.300E-01	0.930E-01
45	0.000E 00	0.000E 00	0.807E-03	0.247E-01	0.842E-01
46	0.000E 00	0.000E 00	0.533E-03	0.202E-01	0.757E-01
47	0.000E 00	0.000E 00	0.348E-03	0.163E-01	0.678E-01
48	0.000E 00	0.000E 00	0.225E-03	0.131E-01	0.603E-01
49	0.000E 00	0.000E 00	0.143E-03	0.105E-01	0.534E-01
50	0.000E 00	0.000E 00	0.000E 00	0.832E-02	0.470E-01
51	0.000E 00	0.000E 00	0.000E 00	0.654E-02	0.412E-01
52	0.000E 00	0.000E 00	0.000E 00	0.511E-02	0.359E-01

53	0.000E 00	0.000E 00	0.000E 00	0.396E-02	0.312E-01
54	0.000E 00	0.000E 00	0.000E 00	0.305E-02	0.269E-01
55	0.000E 00	0.000E 00	0.000E 00	0.233E-02	0.231E-01
56	0.000E 00	0.000E 00	0.000E 00	0.176E-02	0.198E-01
57	0.000E 00	0.000E 00	0.000E 00	0.133E-02	0.168E-01
58	0.000E 00	0.000E 00	0.000E 00	0.997E-03	0.142E-01
59	0.000E 00	0.000E 00	0.000E 00	0.740E-03	0.120E-01
60	0.000E 00	0.000E 00	0.000E 00	0.546E-03	0.100E-01
61	0.000E 00	0.000E 00	0.000E 00	0.400E-03	0.840E-02
62	0.000E 00	0.000E 00	0.000E 00	0.291E-03	0.698E-02
63	0.000E 00	0.000E 00	0.000E 00	0.210E-03	0.577E-02
64	0.000E 00	0.000E 00	0.000E 00	0.151E-03	0.474E-02
65	0.000E 00	0.000E 00	0.000E 00	0.107E-03	0.388E-02
66	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.317E-02
67	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.257E-02
68	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.207E-02
69	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.167E-02
70	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.133E-02
71	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.106E-02
72	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.845E-03
73	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.668E-03
74	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.525E-03
75	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.411E-03
76	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.320E-03
77	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.248E-03
78	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.192E-03
79	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.147E-03
80	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.113E-03
81	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
82	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
83	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
84	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
85	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
86	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
87	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
88	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
89	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
90	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
91	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
92	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
93	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
94	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
95	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
96	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
97	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
98	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
99	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
100	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00



TYPE OF ATOM IS CS MASS= 0.22080E-21GRAMS TEMPERATURE= 450.0DEG. K.

ACCORDING TO MAXWELLIAN DISTRIBUTION, VMP=(2KT/M)**.5, AV=(8KT/3.141M)**.5,
RMSV=(3KT/M)**.5

VMP= 0.23720E 05CM/SEC AV= 0.26768E 05CM/SEC RMSV= 0.29051E 05CM/SEC

ACCORDING TO EFFUSIVE FLOW DISTRIBUTION, VMP=(3KT/M)**.5,
AV=.75(2*3.141KT/M)**.5, RMSV=(KT/M)**.5

VMP= 0.29051E 05CM/SEC AV= 0.31529E 05CM/SEC RMSV= 0.16772E 05CM/SEC

TIME= 0.172E-02SEC DISTANCE= 0.500E 02CM FOR POINTS 1

TIME= 0.344E-02SEC DISTANCE= 0.100E 03CM FOR POINTS 2

TIME= 0.516E-02SEC DISTANCE= 0.150E 03CM FOR POINTS 3

TIME= 0.688E-02SEC DISTANCE= 0.200E 03CM FOR POINTS 4

TIME= 0.860E-02SEC DISTANCE= 0.250E 03CM FOR POINTS 5

PLOT OF I VS S ACCORDING TO THE EQUATION I=C(S**3/T**4)*E**(-BS**2/T**2)

INCREMENT ALONG X-AXIS= 9.0CM,---CONSTANT TIME UNNORMALIZED DATA

STEP	DISTANCE(IN CM)	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.0	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
2	9.0	0.791E 14	0.513E 13	0.102E 13	0.323E 12	0.132E 12
3	18.0	0.547E 15	0.395E 14	0.803E 13	0.256E 13	0.105E 13
4	27.0	0.144E 16	0.125E 15	0.263E 14	0.852E 13	0.352E 13
5	36.0	0.244E 16	0.273E 15	0.602E 14	0.197E 14	0.824E 13
6	45.0	0.308E 16	0.479E 15	0.112E 15	0.376E 14	0.158E 14
7	54.0	0.311E 16	0.724E 15	0.182E 15	0.628E 14	0.267E 14
8	63.0	0.263E 16	0.982E 15	0.270E 15	0.959E 14	0.414E 14
9	72.0	0.189E 16	0.122E 16	0.371E 15	0.136E 15	0.601E 14
10	81.0	0.118E 16	0.141E 16	0.482E 15	0.184E 15	0.827E 14
11	90.0	0.643E 15	0.154E 16	0.597E 15	0.239E 15	0.109E 15
12	99.0	0.308E 15	0.158E 16	0.710E 15	0.299E 15	0.139E 15
13	108.0	0.131E 15	0.155E 16	0.814E 15	0.362E 15	0.173E 15
14	117.0	0.494E 14	0.146E 16	0.904E 15	0.426E 15	0.210E 15
15	126.0	0.166E 14	0.131E 16	0.976E 15	0.491E 15	0.249E 15
16	135.0	0.499E 13	0.113E 16	0.102E 16	0.553E 15	0.289E 15
17	144.0	0.134E 13	0.948E 15	0.105E 16	0.610E 15	0.331E 15
18	153.0	0.324E 12	0.761E 15	0.105E 16	0.662E 15	0.372E 15
19	162.0	0.702E 11	0.590E 15	0.103E 16	0.707E 15	0.412E 15
20	171.0	0.136E 11	0.443E 15	0.100E 16	0.743E 15	0.451E 15
21	180.0	0.239E 10	0.321E 15	0.946E 15	0.770E 15	0.488E 15
22	189.0	0.378E 09	0.226E 15	0.877E 15	0.787E 15	0.522E 15
23	198.0	0.538E 08	0.154E 15	0.800E 15	0.794E 15	0.552E 15
24	207.0	0.690E 07	0.102E 15	0.717E 15	0.791E 15	0.578E 15
25	216.0	0.799E 06	0.655E 14	0.632E 15	0.779E 15	0.599E 15
26	225.0	0.834E 05	0.408E 14	0.548E 15	0.759E 15	0.616E 15
27	234.0	0.787E 04	0.247E 14	0.468E 15	0.731E 15	0.627E 15

28	243.0	0.671E 03	0.145E 14	0.393E 15	0.697E 15	0.634E 15
29	252.0	0.516E 02	0.831E 13	0.326E 15	0.658E 15	0.635E 15
30	261.0	0.359E 01	0.462E 13	0.266E 15	0.615E 15	0.632E 15
31	270.0	0.226E 00	0.249E 13	0.214E 15	0.569E 15	0.623E 15
32	279.0	0.128E-01	0.131E 13	0.170E 15	0.521E 15	0.611E 15
33	288.0	0.663E-03	0.672E 12	0.133E 15	0.474E 15	0.595E 15
34	297.0	0.308E-04	0.334E 12	0.102E 15	0.426E 15	0.575E 15
35	306.0	0.130E-05	0.162E 12	0.784E 14	0.380E 15	0.552E 15
36	315.0	0.496E-07	0.765E 11	0.589E 14	0.336E 15	0.526E 15
37	324.0	0.171E-08	0.351E 11	0.437E 14	0.295E 15	0.499E 15
38	333.0	0.535E-10	0.157E 11	0.319E 14	0.257E 15	0.470E 15
39	342.0	0.151E-11	0.684E 10	0.231E 14	0.221E 15	0.440E 15
40	351.0	0.388E-13	0.290E 10	0.164E 14	0.189E 15	0.409E 15
41	360.0	0.901E-15	0.119E 10	0.116E 14	0.160E 15	0.379E 15
42	369.0	0.189E-16	0.482E 09	0.807E 13	0.135E 15	0.348E 15
43	378.0	0.360E-18	0.189E 09	0.554E 13	0.113E 15	0.319E 15
44	387.0	0.000E 00	0.723E 08	0.376E 13	0.938E 14	0.290E 15
45	396.0	0.000E 00	0.269E 08	0.251E 13	0.772E 14	0.262E 15
46	405.0	0.000E 00	0.976E 07	0.166E 13	0.630E 14	0.236E 15
47	414.0	0.000E 00	0.345E 07	0.108E 13	0.510E 14	0.211E 15
48	423.0	0.000E 00	0.118E 07	0.702E 12	0.410E 14	0.188E 15
49	432.0	0.000E 00	0.399E 06	0.448E 12	0.327E 14	0.166E 15
50	441.0	0.000E 00	0.130E 06	0.282E 12	0.259E 14	0.146E 15
51	450.0	0.000E 00	0.417E 05	0.175E 12	0.204E 14	0.128E 15
52	459.0	0.000E 00	0.129E 05	0.108E 12	0.159E 14	0.112E 15
53	468.0	0.000E 00	0.393E 04	0.657E 11	0.123E 14	0.974E 14
54	477.0	0.000E 00	0.116E 04	0.394E 11	0.951E 13	0.841E 14
55	486.0	0.000E 00	0.335E 03	0.234E 11	0.727E 13	0.722E 14
56	495.0	0.000E 00	0.943E 02	0.137E 11	0.551E 13	0.617E 14
57	504.0	0.000E 00	0.258E 02	0.796E 10	0.415E 13	0.525E 14
58	513.0	0.000E 00	0.690E 01	0.456E 10	0.311E 13	0.444E 14
59	522.0	0.000E 00	0.179E 01	0.258E 10	0.231E 13	0.374E 14
60	531.0	0.000E 00	0.456E 00	0.144E 10	0.170E 13	0.314E 14
61	540.0	0.000E 00	0.113E 00	0.799E 09	0.124E 13	0.262E 14
62	549.0	0.000E 00	0.273E-01	0.437E 09	0.909E 12	0.217E 14
63	558.0	0.000E 00	0.644E-02	0.236E 09	0.657E 12	0.180E 14
64	567.0	0.000E 00	0.148E-02	0.126E 09	0.471E 12	0.148E 14
65	576.0	0.000E 00	0.331E-03	0.666E 08	0.336E 12	0.121E 14
66	585.0	0.000E 00	0.724E-04	0.347E 08	0.237E 12	0.989E 13
67	594.0	0.000E 00	0.154E-04	0.179E 08	0.167E 12	0.802E 13
68	603.0	0.000E 00	0.321E-05	0.915E 07	0.116E 12	0.648E 13
69	612.0	0.000E 00	0.650E-06	0.461E 07	0.810E 11	0.521E 13
70	621.0	0.000E 00	0.128E-06	0.230E 07	0.558E 11	0.417E 13
71	630.0	0.000E 00	0.248E-07	0.113E 07	0.382E 11	0.332E 13
72	639.0	0.000E 00	0.467E-08	0.552E 06	0.260E 11	0.263E 13
73	648.0	0.000E 00	0.857E-09	0.266E 06	0.175E 11	0.208E 13
74	657.0	0.000E 00	0.153E-09	0.126E 06	0.117E 11	0.163E 13
75	666.0	0.000E 00	0.267E-10	0.597E 05	0.785E 10	0.128E 13
76	675.0	0.000E 00	0.456E-11	0.278E 05	0.520E 10	0.999E 12
77	684.0	0.000E 00	0.758E-12	0.128E 05	0.342E 10	0.775E 12
78	693.0	0.000E 00	0.122E-12	0.583E 04	0.223E 10	0.599E 12
79	702.0	0.000E 00	0.194E-13	0.262E 04	0.145E 10	0.460E 12
80	711.0	0.000E 00	0.299E-14	0.116E 04	0.935E 09	0.352E 12
81	720.0	0.000E 00	0.450E-15	0.514E 03	0.599E 09	0.268E 12
82	729.0	0.000E 00	0.661E-16	0.223E 03	0.381E 09	0.204E 12
83	738.0	0.000E 00	0.947E-17	0.962E 02	0.241E 09	0.154E 12
84	747.0	0.000E 00	0.132E-17	0.409E 02	0.151E 09	0.116E 12
85	756.0	0.000E 00	0.180E-18	0.172E 02	0.946E 08	0.869E 11
86	765.0	0.000E 00	0.239E-19	0.716E 01	0.586E 08	0.648E 11
87	774.0	0.000E 00	0.000E 00	0.294E 01	0.361E 08	0.481E 11

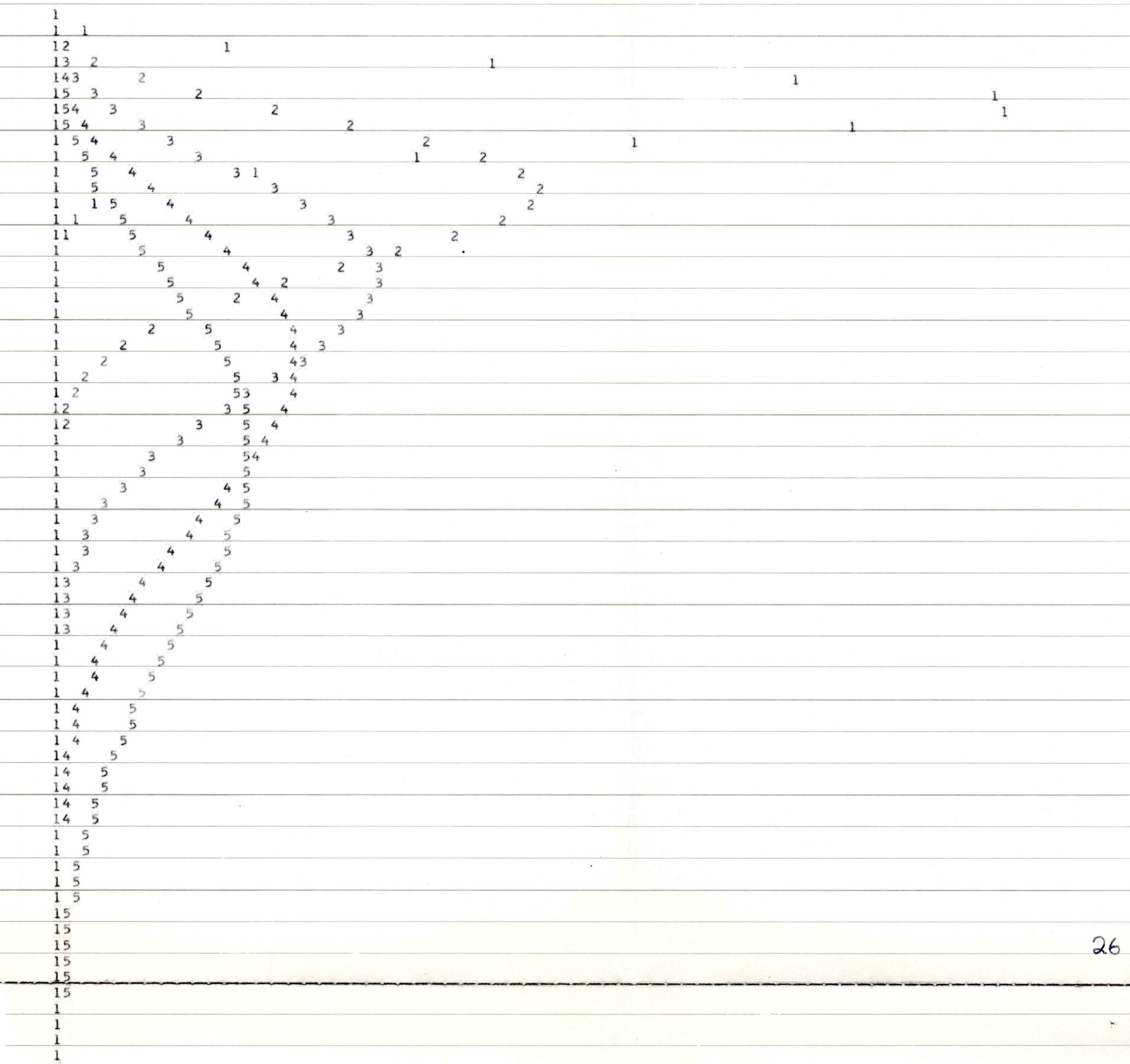
88	783.0	0.000E 00	0.000E 00	0.119E 01	0.221E 08	0.356E 11
89	792.0	0.000E 00	0.000E 00	0.482E 00	0.134E 08	0.262E 11
90	801.0	0.000E 00	0.000E 00	0.191E 00	0.813E 07	0.192E 11
91	810.0	0.000E 00	0.000E 00	0.754E-01	0.488E 07	0.140E 11
92	819.0	0.000E 00	0.000E 00	0.293E-01	0.291E 07	0.102E 11
93	828.0	0.000E 00	0.000E 00	0.112E-01	0.172E 07	0.739E 10
94	837.0	0.000E 00	0.000E 00	0.429E-02	0.101E 07	0.533E 10
95	846.0	0.000E 00	0.000E 00	0.161E-02	0.594E 06	0.382E 10
96	855.0	0.000E 00	0.000E 00	0.600E-03	0.345E 06	0.273E 10
97	864.0	0.000E 00	0.000E 00	0.221E-03	0.199E 06	0.194E 10
98	873.0	0.000E 00	0.000E 00	0.804E-04	0.114E 06	0.138E 10
99	882.0	0.000E 00	0.000E 00	0.289E-04	0.654E 05	0.974E 09
100	891.0	0.000E 00	0.000E 00	0.102E-04	0.370E 05	0.685E 09

RANGE = 0.100E 01 TOP = 0.100E 01 BOTTOM = 0.000E 00 SCALE = 0.100E-01 PER STEP
VALUE OF AXIS IS 0.000E 00

DATA FOR PLOTS

STEP	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
2	0.253E-01	0.164E-02	0.327E-03	0.103E-03	0.000E 00
3	0.175E 00	0.126E-01	0.257E-02	0.822E-03	0.338E-03
4	0.464E 00	0.402E-01	0.845E-02	0.273E-02	0.113E-02
5	0.783E 00	0.877E-01	0.193E-01	0.634E-02	0.264E-02
6	0.987E 00	0.153E 00	0.359E-01	0.120E-01	0.507E-02
7	0.100E 01	0.232E 00	0.584E-01	0.201E-01	0.858E-02
8	0.844E 00	0.314E 00	0.865E-01	0.307E-01	0.132E-01
9	0.607E 00	0.391E 00	0.119E 00	0.438E-01	0.192E-01
10	0.378E 00	0.453E 00	0.154E 00	0.592E-01	0.265E-01
11	0.206E 00	0.493E 00	0.191E 00	0.767E-01	0.350E-01
12	0.990E-01	0.509E 00	0.227E 00	0.958E-01	0.448E-01
13	0.420E-01	0.500E 00	0.261E 00	0.116E 00	0.556E-01
14	0.158E-01	0.469E 00	0.289E 00	0.136E 00	0.673E-01
15	0.533E-02	0.422E 00	0.313E 00	0.157E 00	0.798E-01
16	0.160E-02	0.364E 00	0.329E 00	0.177E 00	0.928E-01
17	0.430E-03	0.303E 00	0.337E 00	0.195E 00	0.106E 00
18	0.103E-03	0.244E 00	0.339E 00	0.212E 00	0.119E 00
19	0.000E 00	0.189E 00	0.333E 00	0.226E 00	0.132E 00
20	0.000E 00	0.142E 00	0.321E 00	0.238E 00	0.144E 00
21	0.000E 00	0.103E 00	0.303E 00	0.246E 00	0.156E 00
22	0.000E 00	0.725E-01	0.281E 00	0.252E 00	0.167E 00
23	0.000E 00	0.495E-01	0.256E 00	0.254E 00	0.177E 00
24	0.000E 00	0.327E-01	0.229E 00	0.253E 00	0.185E 00
25	0.000E 00	0.210E-01	0.202E 00	0.250E 00	0.192E 00
26	0.000E 00	0.130E-01	0.175E 00	0.243E 00	0.197E 00
27	0.000E 00	0.792E-02	0.150E 00	0.234E 00	0.201E 00
28	0.000E 00	0.466E-02	0.126E 00	0.223E 00	0.203E 00
29	0.000E 00	0.266E-02	0.104E 00	0.211E 00	0.203E 00
30	0.000E 00	0.148E-02	0.854E-01	0.197E 00	0.202E 00
31	0.000E 00	0.800E-03	0.688E-01	0.182E 00	0.200E 00
32	0.000E 00	0.421E-03	0.546E-01	0.167E 00	0.195E 00
33	0.000E 00	0.215E-03	0.427E-01	0.151E 00	0.190E 00
34	0.000E 00	0.107E-03	0.330E-01	0.136E 00	0.184E 00
35	0.000E 00	0.000E 00	0.251E-01	0.122E 00	0.176E 00
36	0.000E 00	0.000E 00	0.188E-01	0.107E 00	0.168E 00
37	0.000E 00	0.000E 00	0.140E-01	0.947E-01	0.160E 00
38	0.000E 00	0.000E 00	0.102E-01	0.823E-01	0.150E 00
39	0.000E 00	0.000E 00	0.740E-02	0.710E-01	0.141E 00
40	0.000E 00	0.000E 00	0.528E-02	0.607E-01	0.131E 00
41	0.000E 00	0.000E 00	0.372E-02	0.516E-01	0.121E 00
42	0.000E 00	0.000E 00	0.258E-02	0.434E-01	0.111E 00
43	0.000E 00	0.000E 00	0.177E-02	0.362E-01	0.102E 00
44	0.000E 00	0.000E 00	0.120E-02	0.300E-01	0.930E-01
45	0.000E 00	0.000E 00	0.807E-03	0.247E-01	0.842E-01
46	0.000E 00	0.000E 00	0.533E-03	0.202E-01	0.757E-01
47	0.000E 00	0.000E 00	0.348E-03	0.163E-01	0.678E-01
48	0.000E 00	0.000E 00	0.225E-03	0.131E-01	0.603E-01
49	0.000E 00	0.000E 00	0.143E-03	0.105E-01	0.534E-01
50	0.000E 00	0.000E 00	0.000E 00	0.832E-02	0.470E-01
51	0.000E 00	0.000E 00	0.000E 00	0.654E-02	0.412E-01
52	0.000E 00	0.000E 00	0.000E 00	0.511E-02	0.359E-01

53	0.000E 00	0.000E 00	0.000E 00	0.396E-02	0.312E-01
54	0.000E 00	0.000E 00	0.000E 00	0.305E-02	0.269E-01
55	0.000E 00	0.000E 00	0.000E 00	0.233E-02	0.231E-01
56	0.000E 00	0.000E 00	0.000E 00	0.176E-02	0.198E-01
57	0.000E 00	0.000E 00	0.000E 00	0.133E-02	0.168E-01
58	0.000E 00	0.000E 00	0.000E 00	0.997E-03	0.142E-01
59	0.000E 00	0.000E 00	0.000E 00	0.740E-03	0.120E-01
60	0.000E 00	0.000E 00	0.000E 00	0.546E-03	0.100E-01
61	0.000E 00	0.000E 00	0.000E 00	0.400E-03	0.840E-02
62	0.000E 00	0.000E 00	0.000E 00	0.291E-03	0.698E-02
63	0.000E 00	0.000E 00	0.000E 00	0.210E-03	0.577E-02
64	0.000E 00	0.000E 00	0.000E 00	0.151E-03	0.474E-02
65	0.000E 00	0.000E 00	0.000E 00	0.107E-03	0.388E-02
66	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.317E-02
67	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.257E-02
68	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.207E-02
69	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.167E-02
70	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.133E-02
71	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.106E-02
72	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.845E-03
73	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.668E-03
74	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.525E-03
75	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.411E-03
76	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.320E-03
77	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.248E-03
78	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.192E-03
79	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.147E-03
80	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.113E-03
81	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
82	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
83	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
84	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
85	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
86	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
87	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
88	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
89	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
90	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
91	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
92	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
93	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
94	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
95	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
96	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
97	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
98	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
99	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00
100	0.000E 00	0.000E 00	0.000E 00	0.000E 00	0.000E 00



COMPARISON OF MOST PROBABLE SPEED, AVERAGE SPEED, AND ROOT MEAN SQUARE SPEED OF MAXWELLIAN DISTRIBUTION, AND DISTRIBUTION IN EFFUSIVE FLOW

TYPE OF ATOM IS K MASS= 0.64953E-22GRAMS TEMPERATURE= 450.0DEG. K.

ACCORDING TO MAXWELLIAN DISTRIBUTION, VMP=(2KT/M)**.5, AV=(8KT/3.141M)**.5, RMSV=(3KT/M)**.5

VMP= 0.43734E 05CM/SEC AV= 0.49353E 05CM/SEC RMSV= 0.53563E 05CM/SEC

ACCORDING TO EFFUSIVE FLOW DISTRIBUTION, VMP=(3KT/M)**.5, AV=.75(2*3.141KT/M)**.5, RMSV=(KT/M)**.5

VMP= 0.53563E 05CM/SEC AV= 0.58132E 05CM/SEC RMSV= 0.30924E 05CM/SEC

TIME= 0.280E-02SEC DISTANCE= 0.150E 03CM FOR POINTS 1

TIME= 0.373E-02SEC DISTANCE= 0.200E 03CM FOR POINTS 2

TIME= 0.466E-02SEC DISTANCE= 0.250E 03CM FOR POINTS 3

PLOT OF I VS T ACCORDING TO THE EQUATION I=C(S**3/T**4)*E**(-BS**2/T**2)

INCREMENT ALONG X-AXIS= 0.163000E-03SEC,---CONSTANT DISTANCE UNNORMALIZED DATA

STEP	TIME(IN SEC)	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.163000E-03	0.000E 00	0.000E 00	0.000E 00		
2	0.326000E-03	0.000E 00	0.000E 00	0.000E 00		
3	0.489000E-03	0.254E-01	0.145E-17	0.000E 00		
4	0.651999E-03	0.179E 08	0.191E-01	0.358E-13		
5	0.814999E-03	0.155E 12	0.384E 06	0.152E-01		
6	0.977999E-03	0.168E 14	0.279E 10	0.248E 05		
7	0.114099E-02	0.237E 15	0.498E 12	0.115E 09		
8	0.130399E-02	0.115E 16	0.126E 14	0.243E 11		
9	0.146699E-02	0.308E 16	0.104E 15	0.859E 12		
10	0.162999E-02	0.571E 16	0.432E 15	0.100E 14		
11	0.179299E-02	0.841E 16	0.115E 16	0.582E 14		
12	0.195599E-02	0.106E 17	0.231E 16	0.208E 15		
13	0.211899E-02	0.121E 17	0.376E 16	0.535E 15		
14	0.228199E-02	0.130E 17	0.531E 16	0.108E 16		
15	0.244499E-02	0.131E 17	0.677E 16	0.184E 16		
16	0.260799E-02	0.129E 17	0.799E 16	0.276E 16		
17	0.277099E-02	0.123E 17	0.890E 16	0.375E 16		
18	0.293399E-02	0.116E 17	0.951E 16	0.473E 16		
19	0.309699E-02	0.107E 17	0.982E 16	0.562E 16		
20	0.325999E-02	0.987E 16	0.989E 16	0.639E 16		
21	0.342299E-02	0.900E 16	0.977E 16	0.699E 16		
22	0.358599E-02	0.817E 16	0.951E 16	0.744E 16		
23	0.374899E-02	0.739E 16	0.914E 16	0.773E 16		
24	0.391199E-02	0.668E 16	0.871E 16	0.788E 16		
25	0.407499E-02	0.602E 16	0.823E 16	0.791E 16		
26	0.423799E-02	0.543E 16	0.774E 16	0.785E 16		
27	0.440099E-02	0.490E 16	0.724E 16	0.770E 16		
28	0.456399E-02	0.442E 16	0.675E 16	0.750E 16		
29	0.472699E-02	0.399E 16	0.628E 16	0.725E 16		
30	0.488999E-02	0.360E 16	0.583E 16	0.696E 16		
31	0.505299E-02	0.326E 16	0.540E 16	0.666E 16		
32	0.521599E-02	0.295E 16	0.501E 16	0.635E 16		

33	0.537899E-02	0.268E 16	0.463E 16	0.603E 16
34	0.554199E-02	0.243E 16	0.429E 16	0.571E 16
35	0.570499E-02	0.221E 16	0.397E 16	0.540E 16
36	0.586799E-02	0.202E 16	0.367E 16	0.510E 16
37	0.603099E-02	0.184E 16	0.340E 16	0.480E 16
38	0.619399E-02	0.168E 16	0.315E 16	0.452E 16
39	0.635699E-02	0.154E 16	0.291E 16	0.426E 16
40	0.651999E-02	0.141E 16	0.270E 16	0.400E 16
41	0.668299E-02	0.130E 16	0.251E 16	0.376E 16
42	0.684599E-02	0.119E 16	0.233E 16	0.354E 16
43	0.700899E-02	0.110E 16	0.216E 16	0.332E 16
44	0.717199E-02	0.101E 16	0.201E 16	0.312E 16
45	0.733499E-02	0.936E 15	0.187E 16	0.294E 16
46	0.749799E-02	0.866E 15	0.174E 16	0.276E 16
47	0.766099E-02	0.801E 15	0.162E 16	0.259E 16
48	0.782399E-02	0.743E 15	0.151E 16	0.244E 16
49	0.798699E-02	0.689E 15	0.141E 16	0.230E 16
50	0.814999E-02	0.640E 15	0.132E 16	0.216E 16
51	0.831299E-02	0.596E 15	0.123E 16	0.203E 16
52	0.847599E-02	0.555E 15	0.115E 16	0.192E 16
53	0.863899E-02	0.517E 15	0.108E 16	0.181E 16
54	0.880199E-02	0.483E 15	0.101E 16	0.170E 16
55	0.896499E-02	0.451E 15	0.954E 15	0.161E 16
56	0.912799E-02	0.422E 15	0.896E 15	0.152E 16
57	0.929099E-02	0.395E 15	0.842E 15	0.143E 16
58	0.945399E-02	0.370E 15	0.792E 15	0.135E 16
59	0.961699E-02	0.347E 15	0.745E 15	0.128E 16
60	0.977999E-02	0.326E 15	0.702E 15	0.121E 16
61	0.994299E-02	0.306E 15	0.662E 15	0.114E 16
62	0.101059E-01	0.288E 15	0.624E 15	0.108E 16
63	0.102689E-01	0.271E 15	0.589E 15	0.103E 16
64	0.104319E-01	0.255E 15	0.557E 15	0.977E 15
65	0.105949E-01	0.241E 15	0.526E 15	0.926E 15
66	0.107579E-01	0.227E 15	0.498E 15	0.879E 15
67	0.109209E-01	0.214E 15	0.471E 15	0.835E 15
68	0.110839E-01	0.203E 15	0.447E 15	0.793E 15
69	0.112469E-01	0.192E 15	0.423E 15	0.754E 15
70	0.114099E-01	0.181E 15	0.401E 15	0.717E 15
71	0.115729E-01	0.172E 15	0.381E 15	0.682E 15
72	0.117359E-01	0.163E 15	0.362E 15	0.649E 15
73	0.118989E-01	0.154E 15	0.344E 15	0.618E 15
74	0.120619E-01	0.147E 15	0.327E 15	0.589E 15
75	0.122249E-01	0.139E 15	0.311E 15	0.562E 15
76	0.123879E-01	0.132E 15	0.296E 15	0.536E 15
77	0.125509E-01	0.126E 15	0.282E 15	0.511E 15
78	0.127139E-01	0.120E 15	0.269E 15	0.488E 15
79	0.128769E-01	0.114E 15	0.256E 15	0.466E 15
80	0.130399E-01	0.108E 15	0.244E 15	0.445E 15
81	0.132029E-01	0.103E 15	0.233E 15	0.426E 15
82	0.133659E-01	0.990E 14	0.222E 15	0.407E 15
83	0.135289E-01	0.944E 14	0.213E 15	0.390E 15
84	0.136919E-01	0.901E 14	0.203E 15	0.373E 15
85	0.138549E-01	0.861E 14	0.194E 15	0.357E 15
86	0.140179E-01	0.823E 14	0.186E 15	0.342E 15
87	0.141809E-01	0.787E 14	0.178E 15	0.328E 15
88	0.143439E-01	0.752E 14	0.170E 15	0.314E 15
89	0.145069E-01	0.720E 14	0.163E 15	0.302E 15
90	0.146699E-01	0.689E 14	0.156E 15	0.289E 15
91	0.148329E-01	0.660E 14	0.150E 15	0.278E 15
92	0.149959E-01	0.633E 14	0.144E 15	0.267E 15

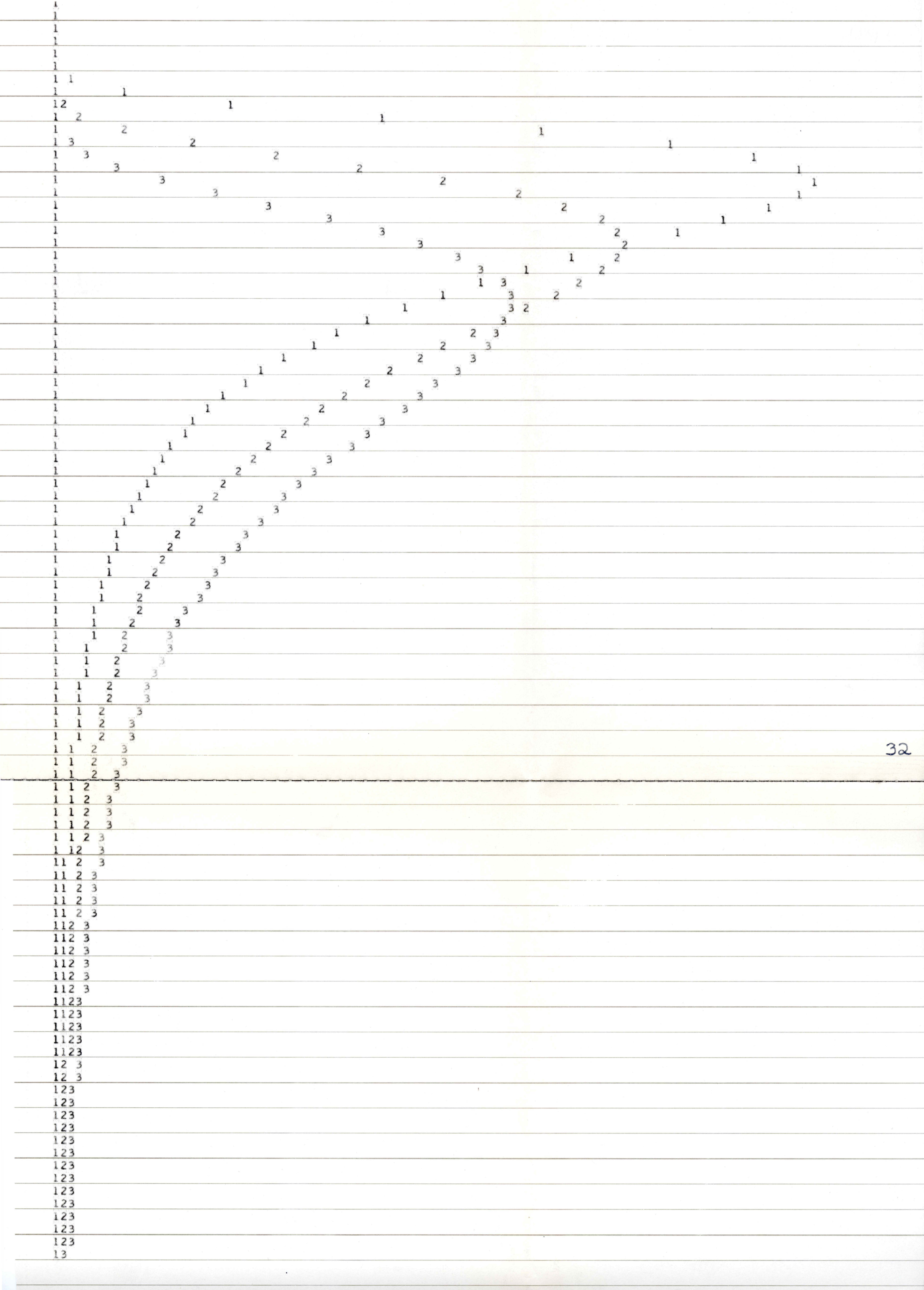
93	0.151589E-01	0.607E 14	0.138E 15	0.256E 15
94	0.153219E-01	0.582E 14	0.132E 15	0.246E 15
95	0.154849E-01	0.558E 14	0.127E 15	0.237E 15
96	0.156479E-01	0.536E 14	0.122E 15	0.228E 15
97	0.158109E-01	0.515E 14	0.117E 15	0.219E 15
98	0.159739E-01	0.494E 14	0.113E 15	0.211E 15
99	0.161369E-01	0.475E 14	0.108E 15	0.203E 15
100	0.162999E-01	0.457E 14	0.104E 15	0.195E 15

RANGE = 0.100E 01 TOP = 0.100E 01 BOTTOM = 0.000E 00 SCALE = 0.100E-01 PER STEP
VALUE OF AXIS IS 0.000E 00

DATA FOR PLOTS

STEP	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.000E 00	0.000E 00	0.000E 00		
2	0.000E 00	0.000E 00	0.000E 00		
3	0.000E 00	0.000E 00	0.000E 00		
4	0.000E 00	0.000E 00	0.000E 00		
5	0.000E 00	0.000E 00	0.000E 00		
6	0.127E-02	0.000E 00	0.000E 00		
7	0.179E-01	0.000E 00	0.000E 00		
8	0.875E-01	0.955E-03	0.000E 00		
9	0.233E 00	0.788E-02	0.000E 00		
10	0.432E 00	0.327E-01	0.764E-03		
11	0.637E 00	0.877E-01	0.441E-02		
12	0.807E 00	0.175E 00	0.157E-01		
13	0.923E 00	0.285E 00	0.405E-01		
14	0.984E 00	0.402E 00	0.822E-01		
15	0.100E 01	0.513E 00	0.140E 00		
16	0.980E 00	0.605E 00	0.209E 00		
17	0.937E 00	0.674E 00	0.284E 00		
18	0.879E 00	0.720E 00	0.358E 00		
19	0.815E 00	0.744E 00	0.426E 00		
20	0.748E 00	0.750E 00	0.484E 00		
21	0.682E 00	0.740E 00	0.530E 00		
22	0.619E 00	0.720E 00	0.563E 00		
23	0.560E 00	0.692E 00	0.586E 00		
24	0.506E 00	0.659E 00	0.597E 00		
25	0.456E 00	0.623E 00	0.600E 00		
26	0.411E 00	0.586E 00	0.594E 00		
27	0.371E 00	0.548E 00	0.583E 00		
28	0.335E 00	0.511E 00	0.568E 00		
29	0.302E 00	0.476E 00	0.549E 00		
30	0.273E 00	0.442E 00	0.527E 00		
31	0.247E 00	0.409E 00	0.504E 00		
32	0.224E 00	0.379E 00	0.481E 00		
33	0.203E 00	0.351E 00	0.457E 00		
34	0.184E 00	0.325E 00	0.433E 00		
35	0.168E 00	0.300E 00	0.409E 00		
36	0.153E 00	0.278E 00	0.386E 00		
37	0.139E 00	0.257E 00	0.364E 00		
38	0.127E 00	0.238E 00	0.343E 00		
39	0.117E 00	0.221E 00	0.322E 00		
40	0.107E 00	0.205E 00	0.303E 00		
41	0.985E-01	0.190E 00	0.285E 00		
42	0.905E-01	0.176E 00	0.268E 00		
43	0.833E-01	0.164E 00	0.252E 00		
44	0.768E-01	0.152E 00	0.237E 00		
45	0.709E-01	0.141E 00	0.222E 00		
46	0.656E-01	0.132E 00	0.209E 00		
47	0.607E-01	0.123E 00	0.196E 00		
48	0.563E-01	0.114E 00	0.185E 00		
49	0.522E-01	0.107E 00	0.174E 00		
50	0.485E-01	0.100E 00	0.164E 00		
51	0.451E-01	0.937E-01	0.154E 00		
52	0.420E-01	0.877E-01	0.145E 00		

53	0.392E-01	0.822E-01	0.137E 00
54	0.365E-01	0.770E-01	0.129E 00
55	0.341E-01	0.723E-01	0.122E 00
56	0.319E-01	0.679E-01	0.115E 00
57	0.299E-01	0.638E-01	0.108E 00
58	0.280E-01	0.600E-01	0.102E 00
59	0.263E-01	0.565E-01	0.971E-01
60	0.247E-01	0.532E-01	0.919E-01
61	0.232E-01	0.501E-01	0.870E-01
62	0.218E-01	0.473E-01	0.824E-01
63	0.205E-01	0.446E-01	0.780E-01
64	0.193E-01	0.422E-01	0.740E-01
65	0.182E-01	0.399E-01	0.702E-01
66	0.172E-01	0.377E-01	0.666E-01
67	0.162E-01	0.357E-01	0.632E-01
68	0.153E-01	0.338E-01	0.601E-01
69	0.145E-01	0.321E-01	0.571E-01
70	0.137E-01	0.304E-01	0.543E-01
71	0.130E-01	0.289E-01	0.517E-01
72	0.123E-01	0.274E-01	0.492E-01
73	0.117E-01	0.260E-01	0.468E-01
74	0.111E-01	0.247E-01	0.446E-01
75	0.105E-01	0.235E-01	0.425E-01
76	0.100E-01	0.224E-01	0.406E-01
77	0.956E-02	0.213E-01	0.387E-01
78	0.909E-02	0.203E-01	0.370E-01
79	0.866E-02	0.194E-01	0.353E-01
80	0.825E-02	0.185E-01	0.337E-01
81	0.786E-02	0.176E-01	0.322E-01
82	0.750E-02	0.168E-01	0.308E-01
83	0.715E-02	0.161E-01	0.295E-01
84	0.683E-02	0.154E-01	0.282E-01
85	0.652E-02	0.147E-01	0.270E-01
86	0.623E-02	0.141E-01	0.259E-01
87	0.596E-02	0.135E-01	0.248E-01
88	0.570E-02	0.129E-01	0.238E-01
89	0.545E-02	0.123E-01	0.228E-01
90	0.522E-02	0.118E-01	0.219E-01
91	0.500E-02	0.113E-01	0.210E-01
92	0.479E-02	0.109E-01	0.202E-01
93	0.460E-02	0.104E-01	0.194E-01
94	0.441E-02	0.100E-01	0.186E-01
95	0.423E-02	0.966E-02	0.179E-01
96	0.406E-02	0.928E-02	0.172E-01
97	0.390E-02	0.891E-02	0.166E-01
98	0.375E-02	0.857E-02	0.159E-01
99	0.360E-02	0.824E-02	0.153E-01
100	0.346E-02	0.793E-02	0.148E-01



TYPE OF ATOM IS RB MASS= 0.14198E-21GRAMS TEMPERATURE= 450.0DEG. K.

ACCORDING TO MAXWELLIAN DISTRIBUTION, VMP=(2KT/M)**.5, AV=(8KT/3.141M)**.5,
RMSV=(3KT/M)**.5

VMP= 0.29580E 05CM/SEC AV= 0.33381E 05CM/SEC RMSV= 0.36228E 05CM/SEC

ACCORDING TO EFFUSIVE FLOW DISTRIBUTION, VMP=(3KT/M)**.5,
AV=.75(2*3.141KT/M)**.5, RMSV=(KT/M)**.5

VMP= 0.36228E 05CM/SEC AV= 0.39319E 05CM/SEC RMSV= 0.20916E 05CM/SEC

TIME= 0.414E-02SEC DISTANCE= 0.150E 03CM FOR POINTS 1

TIME= 0.552E-02SEC DISTANCE= 0.200E 03CM FOR POINTS 2

TIME= 0.690E-02SEC DISTANCE= 0.250E 03CM FOR POINTS 3

PLOT OF I VS T ACCORDING TO THE EQUATION I=C(S**3/T**4)*E**(-BS**2/T**2)

INCREMENT ALONG X-AXIS= 0.241999E-03SEC,---CONSTANT DISTANCE UNNORMALIZED DATA

STEP	TIME(IN SEC)	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.241999E-03	0.000E 00	0.000E 00	0.000E 00		
2	0.483999E-03	0.000E 00	0.000E 00	0.000E 00		
3	0.725999E-03	0.789E-02	0.621E-18	0.000E 00		
4	0.967999E-03	0.464E 07	0.592E-02	0.139E-13		
5	0.120999E-02	0.371E 11	0.102E 06	0.473E-02		
6	0.145199E-02	0.383E 13	0.689E 09	0.680E 04		
7	0.169399E-02	0.526E 14	0.117E 12	0.294E 08		
8	0.193599E-02	0.251E 15	0.287E 13	0.588E 10		
9	0.217799E-02	0.663E 15	0.232E 14	0.200E 12		
10	0.241999E-02	0.121E 16	0.950E 14	0.230E 13		
11	0.266199E-02	0.178E 16	0.251E 15	0.130E 14		
12	0.290399E-02	0.224E 16	0.497E 15	0.460E 14		
13	0.314599E-02	0.256E 16	0.805E 15	0.117E 15		
14	0.338799E-02	0.272E 16	0.113E 16	0.235E 15		
15	0.362999E-02	0.276E 16	0.143E 16	0.398E 15		
16	0.387199E-02	0.270E 16	0.168E 16	0.592E 15		
17	0.411399E-02	0.257E 16	0.187E 16	0.801E 15		
18	0.435599E-02	0.241E 16	0.199E 16	0.100E 16		
19	0.459799E-02	0.223E 16	0.205E 16	0.119E 16		
20	0.483999E-02	0.205E 16	0.207E 16	0.134E 16		
21	0.508199E-02	0.186E 16	0.204E 16	0.147E 16		
22	0.532399E-02	0.169E 16	0.198E 16	0.156E 16		
23	0.556599E-02	0.153E 16	0.190E 16	0.162E 16		
24	0.580799E-02	0.138E 16	0.181E 16	0.165E 16		
25	0.604999E-02	0.124E 16	0.171E 16	0.165E 16		
26	0.629199E-02	0.112E 16	0.160E 16	0.164E 16		
27	0.653399E-02	0.101E 16	0.150E 16	0.160E 16		
28	0.677599E-02	0.914E 15	0.140E 16	0.156E 16		
29	0.701799E-02	0.825E 15	0.130E 16	0.151E 16		
30	0.725999E-02	0.745E 15	0.120E 16	0.145E 16		
31	0.750199E-02	0.674E 15	0.112E 16	0.138E 16		
32	0.774399E-02	0.611E 15	0.103E 16	0.132E 16		
33	0.798599E-02	0.554E 15	0.960E 15	0.125E 16		

34	0.822799E-02	0.503E 15	0.888E 15	0.118E 16
35	0.846999E-02	0.458E 15	0.821E 15	0.112E 16
36	0.871199E-02	0.417E 15	0.760E 15	0.105E 16
37	0.895399E-02	0.380E 15	0.703E 15	0.997E 15
38	0.919599E-02	0.348E 15	0.651E 15	0.938E 15
39	0.943799E-02	0.318E 15	0.603E 15	0.883E 15
40	0.967999E-02	0.292E 15	0.559E 15	0.830E 15
41	0.992199E-02	0.268E 15	0.518E 15	0.780E 15
42	0.101639E-01	0.246E 15	0.481E 15	0.733E 15
43	0.104059E-01	0.226E 15	0.447E 15	0.688E 15
44	0.106479E-01	0.209E 15	0.415E 15	0.647E 15
45	0.108899E-01	0.193E 15	0.386E 15	0.608E 15
46	0.111319E-01	0.178E 15	0.360E 15	0.571E 15
47	0.113739E-01	0.165E 15	0.335E 15	0.537E 15
48	0.116159E-01	0.153E 15	0.313E 15	0.505E 15
49	0.118579E-01	0.142E 15	0.292E 15	0.475E 15
50	0.120999E-01	0.132E 15	0.273E 15	0.447E 15
51	0.123419E-01	0.122E 15	0.255E 15	0.421E 15
52	0.125839E-01	0.114E 15	0.239E 15	0.396E 15
53	0.128259E-01	0.106E 15	0.223E 15	0.374E 15
54	0.130679E-01	0.995E 14	0.209E 15	0.352E 15
55	0.133099E-01	0.930E 14	0.196E 15	0.332E 15
56	0.135519E-01	0.869E 14	0.184E 15	0.313E 15
57	0.137939E-01	0.814E 14	0.173E 15	0.296E 15
58	0.140359E-01	0.763E 14	0.163E 15	0.280E 15
59	0.142779E-01	0.715E 14	0.153E 15	0.264E 15
60	0.145199E-01	0.672E 14	0.144E 15	0.250E 15
61	0.147619E-01	0.631E 14	0.136E 15	0.237E 15
62	0.150039E-01	0.594E 14	0.128E 15	0.224E 15
63	0.152459E-01	0.559E 14	0.121E 15	0.212E 15
64	0.154879E-01	0.526E 14	0.114E 15	0.201E 15
65	0.157299E-01	0.496E 14	0.108E 15	0.191E 15
66	0.159719E-01	0.468E 14	0.102E 15	0.181E 15
67	0.162139E-01	0.442E 14	0.972E 14	0.172E 15
68	0.164559E-01	0.418E 14	0.921E 14	0.163E 15
69	0.166979E-01	0.395E 14	0.873E 14	0.155E 15
70	0.169399E-01	0.374E 14	0.828E 14	0.147E 15
71	0.171819E-01	0.354E 14	0.786E 14	0.140E 15
72	0.174239E-01	0.336E 14	0.746E 14	0.133E 15
73	0.176659E-01	0.319E 14	0.709E 14	0.127E 15
74	0.179079E-01	0.302E 14	0.674E 14	0.121E 15
75	0.181499E-01	0.287E 14	0.641E 14	0.115E 15
76	0.183919E-01	0.273E 14	0.610E 14	0.110E 15
77	0.186339E-01	0.259E 14	0.581E 14	0.105E 15
78	0.188759E-01	0.247E 14	0.554E 14	0.100E 15
79	0.191179E-01	0.235E 14	0.528E 14	0.962E 14
80	0.193599E-01	0.224E 14	0.504E 14	0.919E 14
81	0.196019E-01	0.213E 14	0.481E 14	0.878E 14
82	0.198439E-01	0.203E 14	0.459E 14	0.840E 14
83	0.200859E-01	0.194E 14	0.438E 14	0.804E 14
84	0.203279E-01	0.185E 14	0.419E 14	0.769E 14
85	0.205699E-01	0.177E 14	0.401E 14	0.737E 14
86	0.208119E-01	0.169E 14	0.383E 14	0.706E 14
87	0.210539E-01	0.162E 14	0.367E 14	0.676E 14
88	0.212959E-01	0.155E 14	0.351E 14	0.648E 14
89	0.215379E-01	0.148E 14	0.336E 14	0.622E 14
90	0.217799E-01	0.142E 14	0.322E 14	0.597E 14
91	0.220219E-01	0.136E 14	0.309E 14	0.573E 14
92	0.222639E-01	0.130E 14	0.296E 14	0.550E 14
93	0.225059E-01	0.125E 14	0.284E 14	0.528E 14

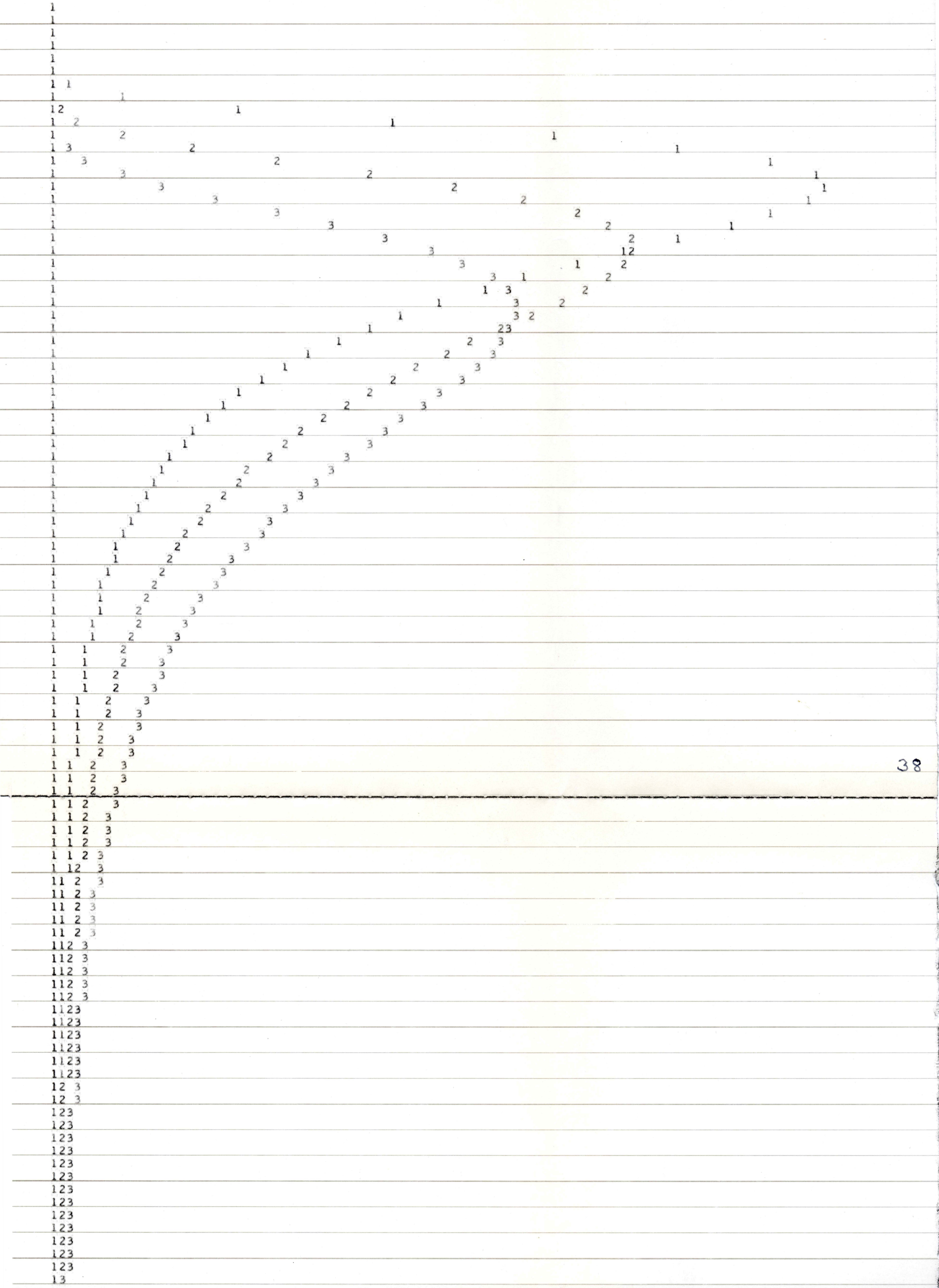
94	0.227479E-01	0.119E 14	0.273E 14	0.508E 14
95	0.229899E-01	0.115E 14	0.262E 14	0.488E 14
96	0.232319E-01	0.110E 14	0.252E 14	0.469E 14
97	0.234739E-01	0.106E 14	0.242E 14	0.452E 14
98	0.237159E-01	0.101E 14	0.233E 14	0.435E 14
99	0.239579E-01	0.979E 13	0.224E 14	0.418E 14
100	0.241999E-01	0.941E 13	0.215E 14	0.403E 14

RANGE = 0.100E 01 TOP = 0.100E 01 BOTTOM = 0.000E 00 SCALE = 0.100E-01 PER STEP
VALUE OF AXIS IS 0.000E 00

DATA FOR PLOTS

STEP	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.000E 00	0.000E 00	0.000E 00		
2	0.000E 00	0.000E 00	0.000E 00		
3	0.000E 00	0.000E 00	0.000E 00		
4	0.000E 00	0.000E 00	0.000E 00		
5	0.000E 00	0.000E 00	0.000E 00		
6	0.138E-02	0.000E 00	0.000E 00		
7	0.190E-01	0.000E 00	0.000E 00		
8	0.912E-01	0.104E-02	0.000E 00		
9	0.240E 00	0.840E-02	0.000E 00		
10	0.441E 00	0.344E-01	0.832E-03		
11	0.646E 00	0.910E-01	0.472E-02		
12	0.814E 00	0.180E 00	0.166E-01		
13	0.928E 00	0.291E 00	0.424E-01		
14	0.987E 00	0.409E 00	0.851E-01		
15	0.100E 01	0.519E 00	0.144E 00		
16	0.978E 00	0.610E 00	0.214E 00		
17	0.933E 00	0.679E 00	0.290E 00		
18	0.875E 00	0.723E 00	0.364E 00		
19	0.810E 00	0.745E 00	0.431E 00		
20	0.743E 00	0.749E 00	0.488E 00		
21	0.676E 00	0.739E 00	0.533E 00		
22	0.614E 00	0.718E 00	0.566E 00		
23	0.555E 00	0.690E 00	0.587E 00		
24	0.501E 00	0.656E 00	0.598E 00		
25	0.451E 00	0.620E 00	0.600E 00		
26	0.407E 00	0.582E 00	0.594E 00		
27	0.367E 00	0.544E 00	0.582E 00		
28	0.331E 00	0.507E 00	0.566E 00		
29	0.298E 00	0.472E 00	0.546E 00		
30	0.270E 00	0.438E 00	0.525E 00		
31	0.244E 00	0.405E 00	0.502E 00		
32	0.221E 00	0.375E 00	0.478E 00		
33	0.200E 00	0.347E 00	0.453E 00		
34	0.182E 00	0.321E 00	0.429E 00		
35	0.165E 00	0.297E 00	0.406E 00		
36	0.151E 00	0.275E 00	0.383E 00		
37	0.137E 00	0.254E 00	0.361E 00		
38	0.126E 00	0.235E 00	0.339E 00		
39	0.115E 00	0.218E 00	0.319E 00		
40	0.105E 00	0.202E 00	0.300E 00		
41	0.971E-01	0.187E 00	0.282E 00		
42	0.892E-01	0.174E 00	0.265E 00		
43	0.821E-01	0.161E 00	0.249E 00		
44	0.757E-01	0.150E 00	0.234E 00		
45	0.699E-01	0.140E 00	0.220E 00		
46	0.646E-01	0.130E 00	0.207E 00		
47	0.598E-01	0.121E 00	0.194E 00		
48	0.554E-01	0.113E 00	0.183E 00		
49	0.514E-01	0.105E 00	0.172E 00		
50	0.478E-01	0.988E-01	0.162E 00		
51	0.444E-01	0.924E-01	0.152E 00		
52	0.414E-01	0.865E-01	0.143E 00		

53	0.386E-01	0.810E-01	0.135E 00
54	0.360E-01	0.760E-01	0.127E 00
55	0.336E-01	0.713E-01	0.120E 00
56	0.314E-01	0.669E-01	0.113E 00
57	0.294E-01	0.629E-01	0.107E 00
58	0.276E-01	0.591E-01	0.101E 00
59	0.259E-01	0.557E-01	0.959E-01
60	0.243E-01	0.524E-01	0.907E-01
61	0.228E-01	0.494E-01	0.858E-01
62	0.215E-01	0.466E-01	0.812E-01
63	0.202E-01	0.440E-01	0.770E-01
64	0.190E-01	0.416E-01	0.730E-01
65	0.179E-01	0.393E-01	0.692E-01
66	0.169E-01	0.372E-01	0.657E-01
67	0.160E-01	0.352E-01	0.623E-01
68	0.151E-01	0.333E-01	0.592E-01
69	0.143E-01	0.316E-01	0.563E-01
70	0.135E-01	0.299E-01	0.535E-01
71	0.128E-01	0.284E-01	0.509E-01
72	0.121E-01	0.270E-01	0.485E-01
73	0.115E-01	0.256E-01	0.462E-01
74	0.109E-01	0.244E-01	0.440E-01
75	0.104E-01	0.232E-01	0.419E-01
76	0.989E-02	0.221E-01	0.400E-01
77	0.941E-02	0.210E-01	0.382E-01
78	0.895E-02	0.200E-01	0.364E-01
79	0.852E-02	0.191E-01	0.348E-01
80	0.812E-02	0.182E-01	0.332E-01
81	0.774E-02	0.174E-01	0.318E-01
82	0.738E-02	0.166E-01	0.304E-01
83	0.704E-02	0.158E-01	0.291E-01
84	0.672E-02	0.151E-01	0.278E-01
85	0.642E-02	0.145E-01	0.266E-01
86	0.613E-02	0.138E-01	0.255E-01
87	0.586E-02	0.132E-01	0.245E-01
88	0.561E-02	0.127E-01	0.235E-01
89	0.537E-02	0.121E-01	0.225E-01
90	0.514E-02	0.116E-01	0.216E-01
91	0.492E-02	0.112E-01	0.207E-01
92	0.472E-02	0.107E-01	0.199E-01
93	0.452E-02	0.103E-01	0.191E-01
94	0.434E-02	0.990E-02	0.184E-01
95	0.416E-02	0.951E-02	0.176E-01
96	0.400E-02	0.913E-02	0.170E-01
97	0.384E-02	0.878E-02	0.163E-01
98	0.369E-02	0.844E-02	0.157E-01
99	0.354E-02	0.811E-02	0.151E-01
100	0.341E-02	0.781E-02	0.146E-01



TYPE OF ATOM IS CS MASS= 0.22080E-21GRAMS TEMPERATURE= 450.0DEG. K.

ACCORDING TO MAXWELLIAN DISTRIBUTION, VMP=(2KT/M)**.5, AV=(8KT/3.141M)**.5,
RMSV=(3KT/M)**.5

VMP= 0.23720E 05CM/SEC AV= 0.26768E 05CM/SEC RMSV= 0.29051E 05CM/SEC

ACCORDING TO EFFUSIVE FLOW DISTRIBUTION, VMP=(3KT/M)**.5,
AV=.75(2*3.141KT/M)**.5, RMSV=(KT/M)**.5

VMP= 0.29051E 05CM/SEC AV= 0.31529E 05CM/SEC RMSV= 0.16772E 05CM/SEC

TIME= 0.516E-02SEC DISTANCE= 0.150E 03CM FOR POINTS 1

TIME= 0.688E-02SEC DISTANCE= 0.200E 03CM FOR POINTS 2

TIME= 0.860E-02SEC DISTANCE= 0.250E 03CM FOR POINTS 3

PLOT OF I VS T ACCORDING TO THE EQUATION I=C(S**3/T**4)*E**(-BS**2/T**2)

INCREMENT ALONG X-AXIS= 0.300999E-03SEC,---CONSTANT DISTANCE UNNORMALIZED DATA

STEP	TIME(IN SEC)	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.300999E-03	0.000E 00	0.000E 00	0.000E 00		
2	0.601999E-03	0.000E 00	0.000E 00	0.000E 00		
3	0.902999E-03	0.255E-02	0.164E-18	0.000E 00		
4	0.120399E-02	0.168E 07	0.191E-02	0.391E-14		
5	0.150499E-02	0.141E 11	0.364E 05	0.153E-02		
6	0.180599E-02	0.150E 13	0.257E 09	0.237E 04		
7	0.210699E-02	0.209E 14	0.450E 11	0.107E 08		
8	0.240799E-02	0.101E 15	0.112E 13	0.222E 10		
9	0.270899E-02	0.269E 15	0.922E 13	0.774E 11		
10	0.300999E-02	0.497E 15	0.381E 14	0.901E 12		
11	0.331099E-02	0.731E 15	0.101E 15	0.517E 13		
12	0.361199E-02	0.925E 15	0.202E 15	0.184E 14		
13	0.391299E-02	0.105E 16	0.328E 15	0.471E 14		
14	0.421399E-02	0.112E 16	0.463E 15	0.951E 14		
15	0.451499E-02	0.114E 16	0.588E 15	0.161E 15		
16	0.481599E-02	0.111E 16	0.693E 15	0.241E 15		
17	0.511699E-02	0.106E 16	0.772E 15	0.327E 15		
18	0.541799E-02	0.100E 16	0.824E 15	0.412E 15		
19	0.571899E-02	0.928E 15	0.850E 15	0.489E 15		
20	0.601999E-02	0.852E 15	0.856E 15	0.555E 15		
21	0.632099E-02	0.777E 15	0.845E 15	0.607E 15		
22	0.662199E-02	0.705E 15	0.822E 15	0.645E 15		
23	0.692299E-02	0.637E 15	0.790E 15	0.670E 15		
24	0.722399E-02	0.575E 15	0.752E 15	0.682E 15		
25	0.752499E-02	0.519E 15	0.710E 15	0.685E 15		
26	0.782599E-02	0.468E 15	0.668E 15	0.679E 15		
27	0.812699E-02	0.422E 15	0.625E 15	0.666E 15		
28	0.842799E-02	0.380E 15	0.582E 15	0.648E 15		
29	0.872899E-02	0.343E 15	0.542E 15	0.626E 15		
30	0.902999E-02	0.310E 15	0.503E 15	0.601E 15		
31	0.933099E-02	0.281E 15	0.466E 15	0.575E 15		
32	0.963199E-02	0.254E 15	0.431E 15	0.548E 15		
33	0.993299E-02	0.231E 15	0.399E 15	0.520E 15		

34	0.102339E-01	0.210E 15	0.369E 15	0.493E 15
35	0.105349E-01	0.191E 15	0.342E 15	0.466E 15
36	0.108359E-01	0.174E 15	0.316E 15	0.440E 15
37	0.111369E-01	0.158E 15	0.293E 15	0.414E 15
38	0.114379E-01	0.145E 15	0.271E 15	0.390E 15
39	0.117389E-01	0.132E 15	0.251E 15	0.367E 15
40	0.120399E-01	0.121E 15	0.233E 15	0.345E 15
41	0.123409E-01	0.111E 15	0.216E 15	0.324E 15
42	0.126419E-01	0.102E 15	0.200E 15	0.305E 15
43	0.129429E-01	0.947E 14	0.186E 15	0.286E 15
44	0.132439E-01	0.873E 14	0.173E 15	0.269E 15
45	0.135449E-01	0.806E 14	0.161E 15	0.253E 15
46	0.138459E-01	0.745E 14	0.150E 15	0.238E 15
47	0.141469E-01	0.689E 14	0.140E 15	0.223E 15
48	0.144479E-01	0.639E 14	0.130E 15	0.210E 15
49	0.147489E-01	0.593E 14	0.121E 15	0.198E 15
50	0.150499E-01	0.551E 14	0.113E 15	0.186E 15
51	0.153509E-01	0.512E 14	0.106E 15	0.175E 15
52	0.156519E-01	0.477E 14	0.997E 14	0.165E 15
53	0.159529E-01	0.445E 14	0.934E 14	0.155E 15
54	0.162539E-01	0.415E 14	0.875E 14	0.147E 15
55	0.165549E-01	0.388E 14	0.821E 14	0.138E 15
56	0.168559E-01	0.363E 14	0.771E 14	0.130E 15
57	0.171569E-01	0.340E 14	0.725E 14	0.123E 15
58	0.174579E-01	0.318E 14	0.682E 14	0.116E 15
59	0.177589E-01	0.298E 14	0.641E 14	0.110E 15
60	0.180599E-01	0.280E 14	0.604E 14	0.104E 15
61	0.183609E-01	0.263E 14	0.570E 14	0.988E 14
62	0.186619E-01	0.248E 14	0.537E 14	0.936E 14
63	0.189629E-01	0.233E 14	0.507E 14	0.887E 14
64	0.192639E-01	0.220E 14	0.479E 14	0.841E 14
65	0.195649E-01	0.207E 14	0.453E 14	0.797E 14
66	0.198659E-01	0.195E 14	0.428E 14	0.757E 14
67	0.201669E-01	0.184E 14	0.406E 14	0.718E 14
68	0.204679E-01	0.174E 14	0.384E 14	0.682E 14
69	0.207689E-01	0.165E 14	0.364E 14	0.649E 14
70	0.210699E-01	0.156E 14	0.345E 14	0.617E 14
71	0.213709E-01	0.148E 14	0.328E 14	0.587E 14
72	0.216719E-01	0.140E 14	0.311E 14	0.559E 14
73	0.219729E-01	0.133E 14	0.296E 14	0.532E 14
74	0.222739E-01	0.126E 14	0.281E 14	0.507E 14
75	0.225749E-01	0.120E 14	0.267E 14	0.483E 14
76	0.228759E-01	0.114E 14	0.255E 14	0.461E 14
77	0.231769E-01	0.108E 14	0.242E 14	0.440E 14
78	0.234779E-01	0.103E 14	0.231E 14	0.420E 14
79	0.237789E-01	0.983E 13	0.220E 14	0.401E 14
80	0.240799E-01	0.936E 13	0.210E 14	0.383E 14
81	0.243809E-01	0.893E 13	0.200E 14	0.366E 14
82	0.246819E-01	0.851E 13	0.191E 14	0.350E 14
83	0.249829E-01	0.812E 13	0.183E 14	0.335E 14
84	0.252839E-01	0.775E 13	0.175E 14	0.321E 14
85	0.255849E-01	0.740E 13	0.167E 14	0.307E 14
86	0.258859E-01	0.708E 13	0.160E 14	0.294E 14
87	0.261869E-01	0.677E 13	0.153E 14	0.282E 14
88	0.264879E-01	0.647E 13	0.146E 14	0.270E 14
89	0.267889E-01	0.619E 13	0.140E 14	0.259E 14
90	0.270899E-01	0.593E 13	0.134E 14	0.249E 14
91	0.273909E-01	0.568E 13	0.129E 14	0.239E 14
92	0.276919E-01	0.544E 13	0.123E 14	0.229E 14
93	0.279929E-01	0.522E 13	0.118E 14	0.220E 14

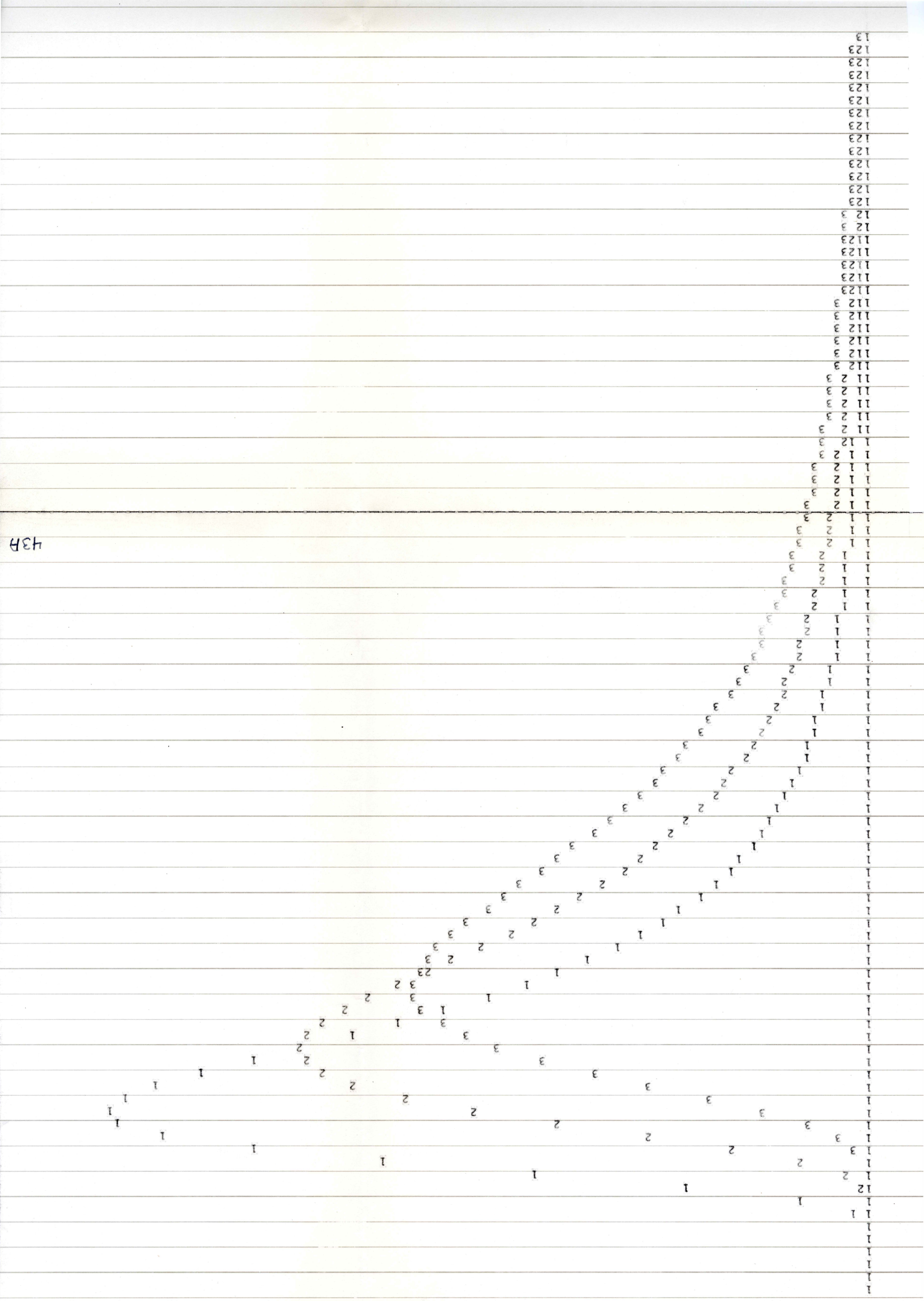
94	0.282939E-01	0.500E 13	0.114E 14	0.212E 14
95	0.285949E-01	0.480E 13	0.109E 14	0.204E 14
96	0.288959E-01	0.461E 13	0.105E 14	0.196E 14
97	0.291969E-01	0.443E 13	0.101E 14	0.188E 14
98	0.294979E-01	0.425E 13	0.973E 13	0.181E 14
99	0.297989E-01	0.409E 13	0.936E 13	0.174E 14
100	0.300999E-01	0.393E 13	0.901E 13	0.168E 14

RANGE = 0.100E 01 TOP = 0.100E 01 BOTTOM = 0.000E 00 SCALE = 0.100E-01 PER STEP
VALUE OF AXIS IS 0.000E 00

DATA FOR PLOTS

STEP	POINTS 1	POINTS 2	POINTS 3	POINTS 4	POINTS 5
1	0.000E 00	0.000E 00	0.000E 00		
2	0.000E 00	0.000E 00	0.000E 00		
3	0.000E 00	0.000E 00	0.000E 00		
4	0.000E 00	0.000E 00	0.000E 00		
5	0.000E 00	0.000E 00	0.000E 00		
6	0.131E-02	0.000E 00	0.000E 00		
7	0.183E-01	0.000E 00	0.000E 00		
8	0.888E-01	0.986E-03	0.000E 00		
9	0.235E 00	0.807E-02	0.000E 00		
10	0.435E 00	0.333E-01	0.789E-03		
11	0.640E 00	0.889E-01	0.452E-02		
12	0.809E 00	0.176E 00	0.161E-01		
13	0.925E 00	0.287E 00	0.412E-01		
14	0.985E 00	0.405E 00	0.833E-01		
15	0.100E 01	0.515E 00	0.141E 00		
16	0.979E 00	0.607E 00	0.211E 00		
17	0.935E 00	0.676E 00	0.286E 00		
18	0.878E 00	0.721E 00	0.360E 00		
19	0.813E 00	0.744E 00	0.428E 00		
20	0.746E 00	0.749E 00	0.485E 00		
21	0.680E 00	0.740E 00	0.531E 00		
22	0.617E 00	0.720E 00	0.564E 00		
23	0.558E 00	0.691E 00	0.586E 00		
24	0.504E 00	0.658E 00	0.597E 00		
25	0.454E 00	0.622E 00	0.599E 00		
26	0.410E 00	0.584E 00	0.594E 00		
27	0.369E 00	0.547E 00	0.583E 00		
28	0.333E 00	0.510E 00	0.567E 00		
29	0.301E 00	0.474E 00	0.548E 00		
30	0.272E 00	0.440E 00	0.526E 00		
31	0.246E 00	0.408E 00	0.503E 00		
32	0.223E 00	0.378E 00	0.480E 00		
33	0.202E 00	0.350E 00	0.455E 00		
34	0.183E 00	0.323E 00	0.431E 00		
35	0.167E 00	0.299E 00	0.408E 00		
36	0.152E 00	0.277E 00	0.385E 00		
37	0.139E 00	0.256E 00	0.363E 00		
38	0.127E 00	0.237E 00	0.341E 00		
39	0.116E 00	0.220E 00	0.321E 00		
40	0.106E 00	0.204E 00	0.302E 00		
41	0.979E-01	0.189E 00	0.284E 00		
42	0.900E-01	0.175E 00	0.267E 00		
43	0.829E-01	0.163E 00	0.251E 00		
44	0.764E-01	0.151E 00	0.236E 00		
45	0.705E-01	0.141E 00	0.221E 00		
46	0.652E-01	0.131E 00	0.208E 00		
47	0.604E-01	0.122E 00	0.196E 00		
48	0.559E-01	0.114E 00	0.184E 00		
49	0.519E-01	0.106E 00	0.173E 00		
50	0.482E-01	0.997E-01	0.163E 00		
51	0.449E-01	0.932E-01	0.153E 00		
52	0.418E-01	0.873E-01	0.144E 00		

53	0.389E-01	0.817E-01	0.136E 00
54	0.363E-01	0.766E-01	0.128E 00
55	0.339E-01	0.719E-01	0.121E 00
56	0.317E-01	0.675E-01	0.114E 00
57	0.297E-01	0.634E-01	0.108E 00
58	0.278E-01	0.597E-01	0.102E 00
59	0.261E-01	0.562E-01	0.967E-01
60	0.245E-01	0.529E-01	0.914E-01
61	0.230E-01	0.499E-01	0.865E-01
62	0.217E-01	0.470E-01	0.819E-01
63	0.204E-01	0.444E-01	0.776E-01
64	0.192E-01	0.419E-01	0.736E-01
65	0.181E-01	0.397E-01	0.698E-01
66	0.171E-01	0.375E-01	0.662E-01
67	0.161E-01	0.355E-01	0.629E-01
68	0.153E-01	0.336E-01	0.597E-01
69	0.144E-01	0.319E-01	0.568E-01
70	0.137E-01	0.302E-01	0.540E-01
71	0.129E-01	0.287E-01	0.514E-01
72	0.123E-01	0.272E-01	0.489E-01
73	0.116E-01	0.259E-01	0.466E-01
74	0.110E-01	0.246E-01	0.444E-01
75	0.105E-01	0.234E-01	0.423E-01
76	0.999E-02	0.223E-01	0.404E-01
77	0.950E-02	0.212E-01	0.385E-01
78	0.904E-02	0.202E-01	0.368E-01
79	0.861E-02	0.193E-01	0.351E-01
80	0.820E-02	0.184E-01	0.335E-01
81	0.781E-02	0.175E-01	0.321E-01
82	0.745E-02	0.167E-01	0.307E-01
83	0.711E-02	0.160E-01	0.293E-01
84	0.679E-02	0.153E-01	0.281E-01
85	0.648E-02	0.146E-01	0.269E-01
86	0.619E-02	0.140E-01	0.258E-01
87	0.592E-02	0.134E-01	0.247E-01
88	0.567E-02	0.128E-01	0.237E-01
89	0.542E-02	0.123E-01	0.227E-01
90	0.519E-02	0.118E-01	0.218E-01
91	0.497E-02	0.113E-01	0.209E-01
92	0.476E-02	0.108E-01	0.201E-01
93	0.457E-02	0.104E-01	0.193E-01
94	0.438E-02	0.100E-01	0.185E-01
95	0.420E-02	0.960E-02	0.178E-01
96	0.404E-02	0.922E-02	0.171E-01
97	0.388E-02	0.886E-02	0.165E-01
98	0.372E-02	0.852E-02	0.159E-01
99	0.358E-02	0.819E-02	0.153E-01
100	0.344E-02	0.788E-02	0.147E-01



TABULAR DATA FOR A BEAM OF K ATTENUATED BY N2 AT 300.0 DEG. K

TABLE NUMBER 1---TUBE LENGTH= 150.00 CM

VELOCITY---FOR PRESSURES OF (A) 0.1E-04 MMHG	I/I(0) (B) 0.1E-05 MMHG	I/I(0) (C) 0.1E-06 MMHG
0.2191E 05 CM/SEC	0.6922E-04	0.3837E 00	0.9086E 00
0.3287E 05 CM/SEC	0.7536E-03	0.4872E 00	0.9306E 00
0.4383E 05 CM/SEC	0.2153E-02	0.5411E 00	0.9404E 00
0.5479E 05 CM/SEC	0.3757E-02	0.5721E 00	0.9456E 00
0.6575E 05 CM/SEC	0.5242E-02	0.5915E 00	0.9488E 00
0.7671E 05 CM/SEC	0.6504E-02	0.6044E 00	0.9508E 00
0.8767E 05 CM/SEC	0.7535E-02	0.6133E 00	0.9522E 00
0.9863E 05 CM/SEC	0.8360E-02	0.6197E 00	0.9532E 00
0.1096E 06 CM/SEC	0.9016E-02	0.6244E 00	0.9540E 00
0.1206E 06 CM/SEC	0.9538E-02	0.6279E 00	0.9545E 00
0.1315E 06 CM/SEC	0.9953E-02	0.6306E 00	0.9549E 00

TABLE NUMBER 2---TUBE LENGTH= 200.00 CM

VELOCITY---FOR PRESSURES OF (A) 0.1E-04 MMHG	I/I(0) (B) 0.1E-05 MMHG	I/I(0) (C) 0.1E-06 MMHG
0.2504E 05 CM/SEC	0.9784E-05	0.3155E 00	0.8910E 00
0.3617E 05 CM/SEC	0.1166E-03	0.4042E 00	0.9134E 00
0.4730E 05 CM/SEC	0.3686E-03	0.4535E 00	0.9239E 00
0.5843E 05 CM/SEC	0.6932E-03	0.4831E 00	0.9298E 00
0.6596E 05 CM/SEC	0.9168E-03	0.4968E 00	0.9324E 00
0.8069E 05 CM/SEC	0.1314E-02	0.5150E 00	0.9358E 00
0.9182E 05 CM/SEC	0.1565E-02	0.5241E 00	0.9374E 00
0.1030E 06 CM/SEC	0.1772E-02	0.5307E 00	0.9386E 00
0.1141E 06 CM/SEC	0.1940E-02	0.5355E 00	0.9394E 00
0.1252E 06 CM/SEC	0.2075E-02	0.5391E 00	0.9400E 00
0.1363E 06 CM/SEC	0.2186E-02	0.5419E 00	0.9405E 00

SUMMARY

It has been shown that the proposed apparatus is feasible theoretically and practically. The physical conditions necessary to obtain good beam intensity are certainly not prohibitive; pressures of 10^{-7} torr are obtainable, as are flight tube lengths of 150.0 cm to 200.0 cm. Not only that, but there are no new methods used, just a recombination of old ones into a fresh pattern.

FIGURE 1: $-\ln Q$ vs $\ln Vr$

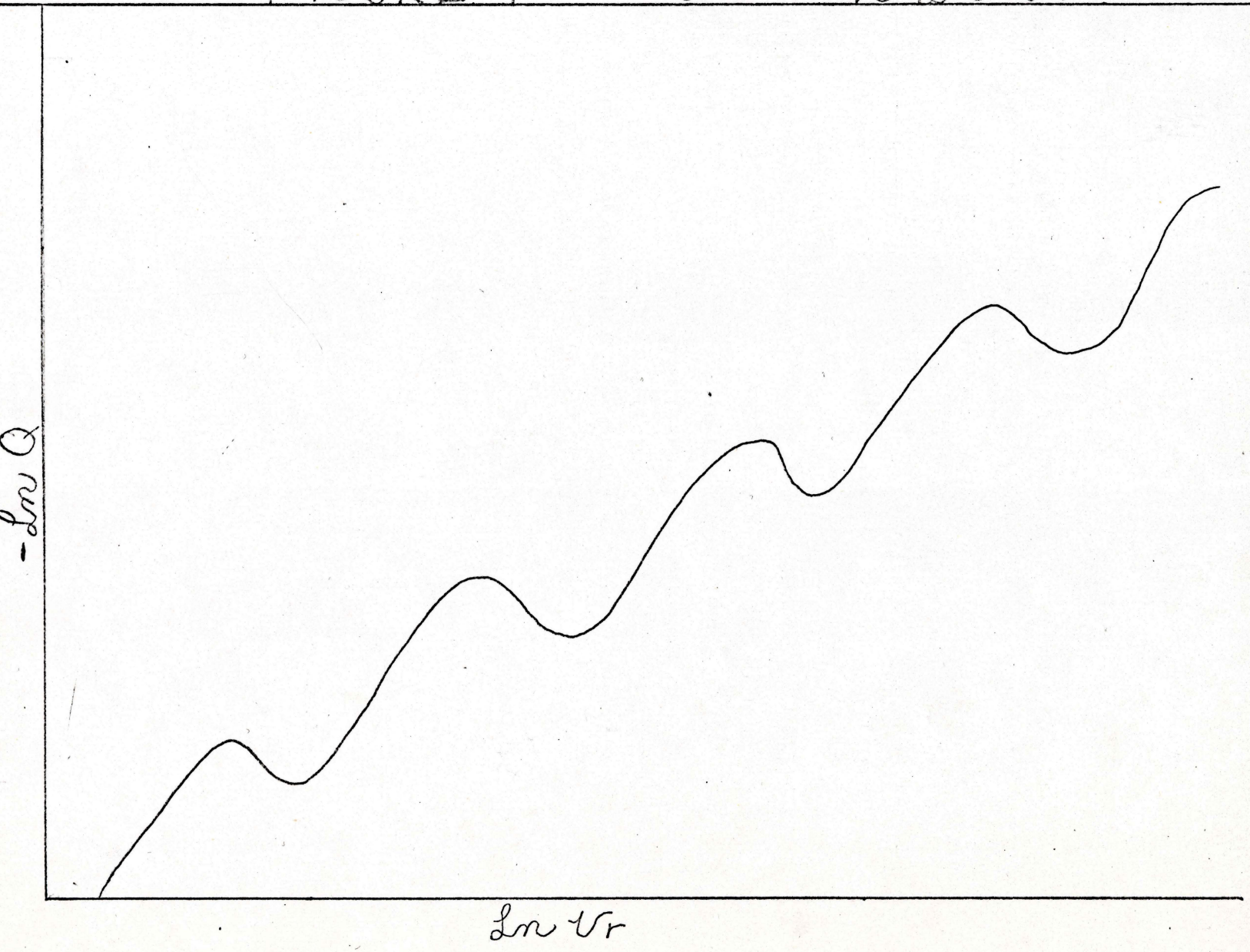


FIGURE 2: SCHEMATIC OF PREVIOUSLY USED MACHINE

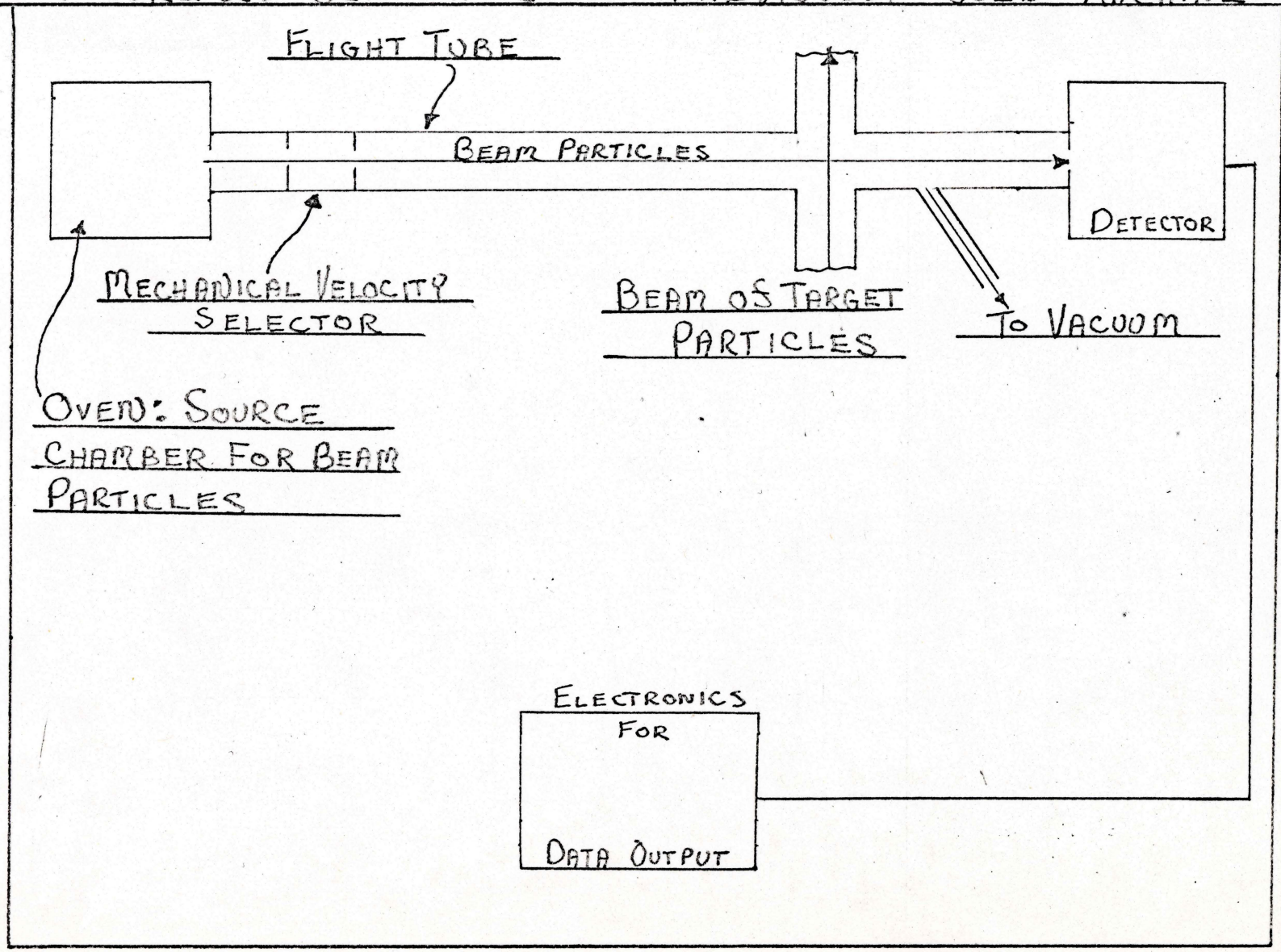


FIGURE 3: PROPOSED MACHINE (SCHEMATIC)

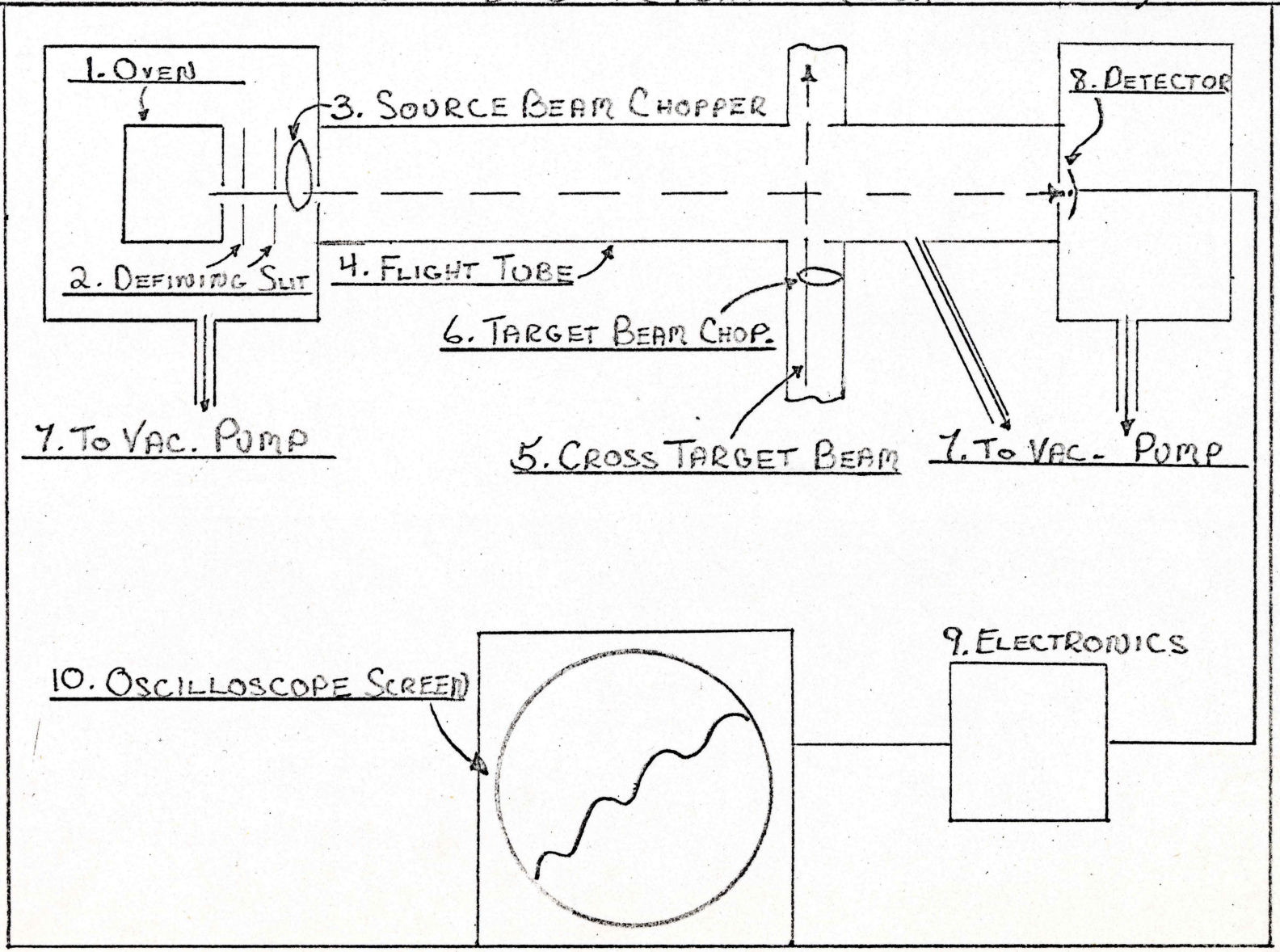
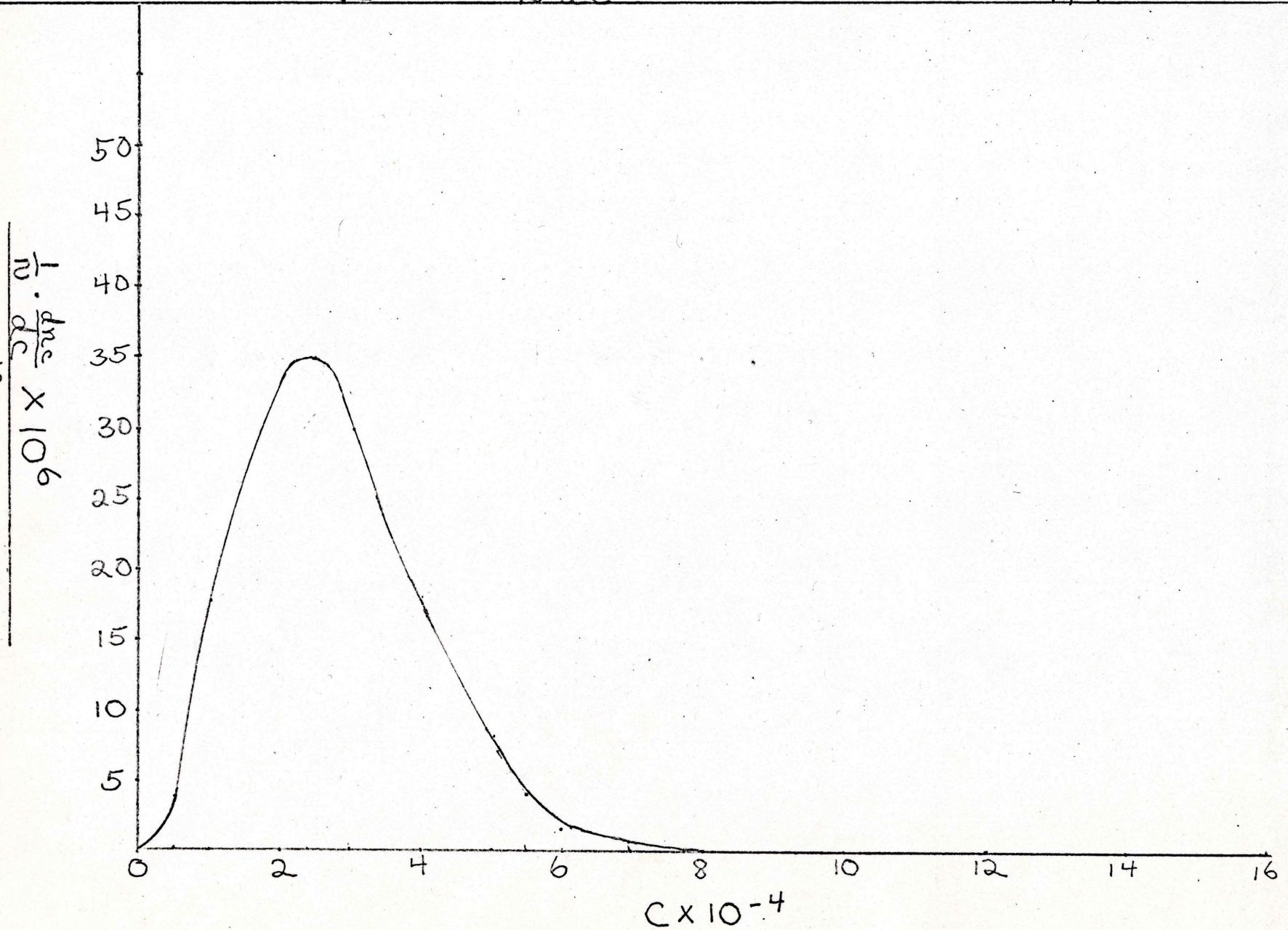


FIGURE 4: $\frac{1}{n}\frac{dn_c}{dc}$ VS c FOR N_2 AT 100°K



```
// JOB
// FOR
* ONE WORD INTEGERS
* EXTENDED PRECISION
* IOCS(CARD,1403 PRINTER,TYPEWRITER)
** ROBERT M. HENES          CHEMISTRY 272          TIME CONSTANT
      DIMENSION S(20),T(20),S1(101)
      COMMON AI(5,100)
      WRITE(5,100)
    1 READ(2,101) ANAME,AMASS,ATEMK
      IF(AMASS-99.9)300,301,300
  300 WRITE(5,102) ANAME,AMASS,ATEMK
      AK=1.3804E-16
      PI=3.141
      B=AMASS/(2.0*AK*ATEMK)
      Z=AK*ATEMK/AMASS
      VMP=(2.0*Z)**.5
      VA=(8.0*Z/PI)**.5
      VRMS=(3.0*Z)**.5
      WRITE(5,103)
      WRITE(5,104) VMP,VA,VRMS
      WRITE(5,105)
      VMP2=VRMS
      VA2=(.75*(2.0*PI*Z)**.5)
      VRMS2=Z**.5
      WRITE(5,104)VMP2,VA2,VRMS2
      BIGG=0.0
      DO 2 I=1,20
      READ(2,108) S(I)
      IF(S(I)-99.9)12,3,12
   12 IF(S(I)-BIGG)2,2,13
   13 BIGG=S(I)
    2 CONTINUE
    3 J=I-1
      DO 4 K=1,J
      J2=K
      T(K)=S(K)/VMP2
    4 WRITE(5,109) T(K),S(K),J2
      WRITE(5,106)
      S1(1)=0.0
      LS=(BIGG*3.5/100.0)+.5
      QS=LS
      WRITE(5,110) QS
      BBIG=0.0
      WRITE(5,111)
      DO 6 M=1,100
      MM=M
      DO 7 K=1,J
      AI(K,M)=(S1(M)**3/T(K)**4)*EXP(-B*S1(M)**2/T(K)**2)
      IF(AI(K,M)-BBIG) 7,7,31
   31 BBIG=AI(K,M)
    7 CONTINUE
      WRITE(5,112)MM,S1(M),(AI(K,M),K=1,J)
    6 S1(M+1)=S1(M)+QS
      DO 30 K=1,J
      DO 32 M=1,100
      AI(K,M)=AI(K,M)/BBIG
      IF(AI(K,M)-1.0E-04) 14,32,32
   14 AI(K,M)=0.0
   32 CONTINUE
   30 CONTINUE
```

```
      CALL PLT02(J,100)
      WRITE(5,116)
      WRITE(1,113)
      PAUSE 1
      CALL DATSW(2,NNN)
      GO TO (1,72),NNN
   72 DO 8 K=1,J
      J2=1
      BBIG=0.0
      S1(1)=0.0
      IS=(S(K)*3.5/100.0)+.5
      AS=IS
      WRITE(5,102)ANAME,AMASS,ATEMK
      WRITE(5,109)T(K),S(K),J2
      WRITE(5,106)
      WRITE(5,110) AS
      WRITE(5,115)
      DO 9 M=1,100
      MM=M
      AI(K,M)=(S1(M)**3/T(K)**4)*EXP(-B*S1(M)**2/T(K)**2)
      IF(AI(K,M)-BBIG)20,20,21
   21 BBIG=AI(K,M)
   20 WRITE(5,114)MM,S1(M),AI(K,M)
    9 S1(M+1)=S1(M)+AS
      DO 60 M=1,100
      AI(K,M)=AI(K,M)/BBIG
      IF(AI(K,M)-1.0E-04) 33,60,60
   33 AI(K,M)=0.0
   60 CONTINUE
      CALL PLT02(1,100)
      WRITE(5,116)
    8 CONTINUE
      GO TO 1
  301 CALL EXIT
  100 FORMAT('1COMPARISON OF MOST PROBABLE SPEED, AVERAGE SPEED, AND ',
     1'ROOT MEAN SQUARE SPEED OF ',/,' MAXWELLIAN DISTRIBUTION, AND ',
     2'DISTRIBUTION IN EFFUSIVE FLOW')
  101 FORMAT(A2,1XE11.4,1XF4.0)
  102 FORMAT('0TYPE OF ATOM IS ',A2,'   MASS=',E12.5,'GRAMS   ',
     1'TEMPERATURE=',F6.1,'DEG. K.')
  103 FORMAT('0ACCORDING TO MAXWELLIAN DISTRIBUTION, VMP=(2KT/M)**.5,',
     1' AV=(8KT/3.141M)**.5, '/,' RMSV=(3KT/M)**.5')
  104 FORMAT('0VMP=',E12.5,'CM/SEC   AV=',E12.5,'CM/SEC   RMSV=',
     1E12.5,'CM/SEC')
  105 FORMAT('0ACCORDING TO EFFUSIVE FLOW DISTRIBUTION, ',
     1'VMP=(3KT/M)**.5,',/,' AV=.75(2*3.141KT/M)**.5, RMSV=(KT/M)**.5')
  106 FORMAT('0PLOT OF I VS S ACCORDING TO THE EQUATION',
     1' I=C(S**3/T**4)*E**(-BS**2/T**2)')
  108 FORMAT(E8.2)
  109 FORMAT('0TIME=',E11.3,'SEC   DISTANCE=',E11.3,'CM   FOR POINTS',
     1I2,/)
  110 FORMAT('0INCREMENT ALONG X-AXIS=',F5.1,'CM,---CONSTANT TIME',
     1'    UNNORMALIZED DATA')
  111 FORMAT(' STEP  DISTANCE(IN CM)   POINTS 1      POINTS 2      ',
     1'POINTS 3      POINTS 4      POINTS 5')
  112 FORMAT(' ',I4,7XF5.1,7XE10.3,4(4XE10.3))
  113 FORMAT('DATSW NO. 2 DOWN FOR INDIVIDUAL GRAPHS, UP FOR SKIPPING',
     1' INDIVIDUAL GRAPHS, PUSH START.')
  114 FORMAT(' ',I4,7XF5.1,7XE10.3)
  115 FORMAT(' STEP  DISTANCE(IN CM)   POINTS 1')
  116 FORMAT('1')
```

```
END
```

```
// FOR
*  ONE WORD INTEGERS
*  EXTENDED PRECISION
*  IOCS(CARD,1403 PRINTER,TYPEWRITER)
*LIST ALL
** ROBERT M. HENES              CHEMISTRY 272              DISTANCE CONSTANT
      DIMENSION S(20),T(20),T1(101)
      COMMON AI(5,100)
      WRITE(5,100)
    1 READ(2,101) ANAME,AMASS,ATEMK
      IF(AMASS-99.9)300,301,300
  300 WRITE(5,102) ANAME,AMASS,ATEMK
      AK=1.3804E-16
      PI=3.141
      B=AMASS/(2.0*AK*ATEMK)
      Z=AK*ATEMK/AMASS
      VMP=(2.0*Z)**.5
      VA=(8.0*Z/PI)**.5
      VRMS=(3.0*Z)**.5
      WRITE(5,103)
      WRITE(5,104) VMP,VA,VRMS
      WRITE(5,105)
      VMP2=VRMS
      VA2=(.75*(2.0*PI*Z)**.5)
      VRMS2=Z**.5
      WRITE(5,104)VMP2,VA2,VRMS2
      BIGG=0.0
      DO 2 I=1,20
      READ(2,108) S(I)
      IF(S(I)-99.9)2,3,2
    2 CONTINUE
    3 J=I-1
      DO 4 K=1,J
      J2=K
      T(K)=S(K)/VMP2
      IF(T(K)-BIGG)4,4,13
   13 BIGG=T(K)
    4 WRITE(5,109) T(K),S(K),J2
      WRITE(5,106)
      LS=((BIGG*3.5/100.0)/1.0E-06)+.5
      QS=1.0E-06*LS
      T1(1)=QS
      WRITE(5,110) QS
      BBIG=0.0
      WRITE(5,111)
      DO 6 M=1,100
      MM=M
      DO 7 K=1,J
      AI(K,M)=(S(K)**3/T1(M)**4)*EXP(-B*S(K)**2/T1(M)**2)
      IF(AI(K,M)-BBIG) 7,7,31
   31 BBIG=AI(K,M)
    7 CONTINUE
      WRITE(5,112)MM,T1(M),(AI(K,M),K=1,J)
    6 T1(M+1)=T1(M)+QS
      DO 30 K=1,J
      DO 32 M=1,100
      AI(K,M)=AI(K,M)/BBIG
      IF(AI(K,M)-1.0E-04) 14,32,32
   14 AI(K,M)=0.0
   32 CONTINUE
   30 CONTINUE
```

```
      CALL PLT02(J,100)
      WRITE(5,116)
      WRITE(1,113)
      PAUSE 1
      CALL DATSW(2,NNN)
      GO TO (1,72),NNN
   72 DO 8 K=1,J
      J2=1
      BBIG=0.0
      IS=((T(K)*3.5/100.0)/1.0E-06)+.5
      AS=1.0E-06*IS
      T1(1)=AS
      WRITE(5,102)ANAME,AMASS,ATEMK
      WRITE(5,109)T(K),S(K),J2
      WRITE(5,106)
      WRITE(5,110) AS
      WRITE(5,115)
      DO 9 M=1,100
      MM=M
      AI(K,M)=(S(K)**3/T1(M)**4)*EXP(-B*S(K)**2/T1(M)**2)
      IF(AI(K,M)-BBIG)20,20,21
   21 BBIG=AI(K,M)
   20 WRITE(5,114)MM,T1(M),AI(K,M)
    9 T1(M+1)=T1(M)+AS
      DO 60 M=1,100
      AI(K,M)=AI(K,M)/BBIG
      IF(AI(K,M)-1.0E-04) 33,60,60
   33 AI(K,M)=0.0
   60 CONTINUE
      CALL PLT02(1,100)
      WRITE(5,116)
    8 CONTINUE
      GO TO 1
  301 CALL EXIT
  100 FORMAT('1COMPARISON OF MOST PROBABLE SPEED, AVERAGE SPEED, AND ',
     1'ROOT MEAN SQUARE SPEED OF ',/,' MAXWELLIAN DISTRIBUTION, AND ',
     2'DISTRIBUTION IN EFFUSIVE FLOW')
  101 FORMAT(A2,1XE11.4,1XF4.0)
  102 FORMAT('0TYPE OF ATOM IS ',A2,'   MASS=',E12.5,'GRAMS   ',
     1'TEMPERATURE=',F6.1,'DEG. K.')
  103 FORMAT('0ACCORDING TO MAXWELLIAN DISTRIBUTION, VMP=(2KT/M)**.5,',
     1' AV=(8KT/3.141M)**.5, '/,' RMSV=(3KT/M)**.5')
  104 FORMAT('0VMP=',E12.5,'CM/SEC   AV=',E12.5,'CM/SEC   RMSV=',
     1E12.5,'CM/SEC')
  105 FORMAT('0ACCORDING TO EFFUSIVE FLOW DISTRIBUTION, ',
     1'VMP=(3KT/M)**.5,',/,' AV=.75(2*3.141KT/M)**.5, RMSV=(KT/M)**.5')
  106 FORMAT('0PLOT OF I VS T ACCORDING TO THE EQUATION',
     1' I=C(S**3/T**4)*E**(-BS**2/T**2)')
  108 FORMAT(E8.2)
  109 FORMAT('0TIME=',E11.3,'SEC   DISTANCE=',E11.3,'CM   FOR POINTS',
     1I2,/)
  110 FORMAT('0INCREMENT ALONG X-AXIS=',E13.6,'SEC,---CONSTANT',
     1' DISTANCE    UNNORMALIZED DATA')
  111 FORMAT(' STEP   TIME(IN SEC)     POINTS 1      POINTS 2      ',
     1'POINTS 3      POINTS 4      POINTS 5')
  112 FORMAT(' ',I4,2XE13.6,3XE10.3,4(4XE10.3))
  113 FORMAT('DATSW NO. 2 DOWN FOR INDIVIDUAL GRAPHS, UP FOR SKIPPING',
     1' INDIVIDUAL GRAPHS, PUSH START.')
  114 FORMAT(' ',I4,2XE13.6,3XE10.3)
  115 FORMAT(' STEP   TIME(IN SEC)    POINTS 1')
  116 FORMAT('1')
```

```
END
```

```
// FOR
* LIST ALL
* ONE WORD INTEGERS
* EXTENDED PRECISION
* IOCS(CARD,1403 PRINTER)
** ROBERT M. HENES          CHEMISTRY 272   I/I(0)
      DIMENSION VEL(2,11),ANG(3),ALEN(2),ALAM(2,3,11),AITI(2,3,11),
     1PSI(2,11),PRE(3)
      AK=1.38E-16
      PI=3.141
      A1=.070523078
      A2=.042282012
      A3=.009270527
      A4=.000152014
      A5=.000276567
      A6=.000043063
      FAC1=SQRT(PI)
      FAC2=2.0/FAC1
      READ(2,100) TEMP,AMG,QEFF
      ALPHA=SQRT((2.0*AK*TEMP)/AMG)
      READ(2,101) NAME1,NAME2
      READ(2,102)(ALEN(I),I=1,2)
      READ(2,103)(PRE(I),I=1,3)
      DO 2 I=1,3
      PRESA=(PRE(I)/760.0)*1.01E 06
    2 ANG(I)=PRESA/(AK*TEMP)
      READ(2,104)((VEL(I,J),I=1,2),J=1,11)
      DO 3 I=1,2
      DO 4 J=1,11
      X=VEL(I,J)/ALPHA
      DENO=(1.0+A1*X+A2*X**2+A3*X**3+A4*X**4+A5*X**5+A6*X**6)**16
      ERF=FAC2*(1.0-(1.0/DENO))
    4 PSI(I,J)=(X*EXP(-X**2))+((2.0*X**2+1.0)*ERF)
    3 CONTINUE
      DO 5 I=1,2
      DO 6 J=1,3
      DO 7 K=1,11
      ALAM(I,J,K)=FAC1*(VEL(I,K)/ALPHA)**2/(ANG(J)*QEFF*PSI(I,K))
    7 AITI(I,J,K)=EXP(-ALEN(I)/ALAM(I,J,K))
    6 CONTINUE
    5 CONTINUE
      WRITE(5,105) NAME1,NAME2,TEMP
      DO 8 I=1,2
      M1=I
      WRITE(5,106) M1,ALEN(I)
      WRITE(5,107)(PRE(L),L=1,3)
      WRITE(5,108)
      DO 9 K=1,11
    9 WRITE(5,109) VEL(I,K),(AITI(I,J,K),J=1,3)
      WRITE(5,110)
    8 CONTINUE
  100 FORMAT(F5.1,1XE10.4,1XE10.4)
  101 FORMAT(A3,1XA3)
  102 FORMAT(F6.2,1XF6.2)
  103 FORMAT(E7.1,2(1XE7.1))
  104 FORMAT(E10.4,1XE10.4)
  105 FORMAT('1',18X'TABULAR DATA FOR A BEAM OF',A3,' ATTENUATED BY',A3,
     1' AT',F6.1,' DEG. K',/////)
  106 FORMAT(' ',30X'TABLE NUMBER',I2,'---TUBE LENGTH=',F7.2,' CM',///)
  107 FORMAT(' ',9X'VELOCITY---FOR PRESSURES OF (A)'E8.1,' MMHG   (B)',
     1E8.1,' MMHG   (C)',E8.1,' MMHG',//)
```

```
  108 FORMAT(' '39X'I/I(0)',13X'I/I(0)',13X'I/I(0)')
  109 FORMAT(' '4XE11.4,' CM/SEC',15XE11.4,2(8XE11.4))
  110 FORMAT(' ',/////)
      CALL EXIT
      END
```

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