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**A Generalized Age-Dependent
Lung Model with Applications
to Radiation Standards**

D. J. Crawford

Prepared by the
U.S. Nuclear Regulatory Commission
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D. J. Crawford

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HIGHLIGHTS

A computer-based lung model has been developed which incorporates age-dependent changes in lung anatomy. The model is used to estimate deposition in any and all generations of the lung, as well as total number of disintegrations occurring within each generation. Depth-dose curves for alpha-emitters of 4 energies (5-8 MeV) in variously sized cylindrical channels are presented to facilitate the computation of doses to basal cell nuclei. This information may be combined to determine the effect of age on regulatory guidelines governing exposure to radioactive atmospheres.

This document describes the assumptions underlying the computer model and provides an historical sketch of the rationale. Complete flexibility is provided in the specification of anatomical model, aerosol characteristics, radionuclide half-life, and breathing characteristics. Representative results for the most-widely used anatomical model (Weibel), as well as for a wide range of aerosol diameters and radionuclide half-lives, are provided. These results should be sufficient for a complete assessment of the effect of age on doses delivered to the lung following inhalation of an atmosphere containing radioactive elements.

A GENERALIZED AGE-DEPENDENT LUNG MODEL
WITH APPLICATIONS TO RADIATION STANDARDS

D. J. Crawford

INTRODUCTION

Regulatory standards designed to limit nonoccupational exposure to airborne radionuclides would, in their ideal form, embody an assessment of the total risk accumulated throughout the lifetime of an individual. Such an assessment requires a detailed knowledge of the metabolic behavior of radionuclides in humans of all ages, knowledge which is rarely available for newborn infants and young children. As a result, retention functions derived from data on adults are normally employed for all age groups, with age-dependency being accounted for by adjusting intake patterns to follow changes in dietary habits or breathing characteristics. While this practice certainly introduces a much needed element of reality into the theories, it does not account for the very noticeable morphological, anatomical, and physiological changes which most organs undergo during growth. As a first step toward introducing these age-dependent physical and biological parameters into the framework of a generalized theory of internal dose assessment, a lung model has been developed for which a variety of parameters may be varied to reflect changes with age. In particular, the model allows the user to predict total deposition in any specified region of the lung during inhalation and exhalation. In addition, the model permits computation of average doses to each region of the lung, depth dose curves and basal cell doses for each region (for alpha irradiation), as well as the linear energy transfer

(LET) spectrum for alpha particles at assigned depths in the surrounding tissue. Deposition data are employed to estimate age-dependent transfer into systemic blood and into the gastrointestinal (GI) tract.

GENESIS OF THE MODEL ANATOMY

The lung is typically conceptualized as a series of bifurcating cylinders whose diameters decrease as one progresses into the distal, or alveolar, region. A number of anatomical models have been proposed, the most familiar of which are those of Weibel,¹ Findeisen,² Landahl,³ Davies,⁴ and Horsfield and Cumming.⁵ These models differ in the number and dimensions of the regions of the lung employed, in the degree of symmetry assumed in the branching process, and in the direction of regional numbering. Adult values for the two most common models (Weibel and Findeisen-Landahl) are displayed in Tables 1 and 2. The age-dependent values for these parameters may be derived by noting that relative regional volumes should remain invariant during growth,⁶ so that regional volumes at a given age may be defined as a fixed fraction of the total lung volume. In addition, the number of airways in a given region may be assumed to be constant with age for regions located proximally to the respiratory passages, with the number increasing for the distal sections as one ages (remaining constant after age 8). The latter assumption has been questioned by Horsfield,⁷ who feels that increases in number of channels may be incomplete at age 8. However, given a lack of data in this regard, it is impossible at present to improve on this assumption.

In this report, the methodology employed to estimate regional values for airway diameter, length, and number is identical to that

Table 1. Anatomical dimensions of the adult Weibel model

Region of lung	α^a	Volume (cc)	Number of airways per generation
1	0.143	20.00	1
2	0.500	20.00	1
3	0.075	30.52	1
4	0.128	11.12	2
5	0.218	4.11	4
6	0.368	1.50	8
7	0.177	3.23	16
8	0.164	3.29	32
9	0.156	3.54	64
10	0.151	4.04	128
11	0.145	4.45	256
12	0.143	5.15	512
13	0.141	6.25	1,024
14	0.140	7.45	2,048
15	0.144	9.58	4,096
16	0.152	11.67	8,192
17	0.161	16.20	16,384
18	0.165	22.41	32,768
19	0.182	30.56	65,536
20	0.191	42.00	131,072
21	0.214	61.00	262,144
22	0.237	93.00	542,288
23	0.271	140.00	1,048,576
24	0.307	224.00	2,097,152
25	0.347	350.00	4,194,304
26	0.410	591.00	8,388,608
27	0.500	3150.00	3×10^8

^aRatio: radius per length.

Table 2. Anatomical dimensions of the adult Findeisen-Landhahl model

Region of lung	α	Volume (cc)	Number of airways per generation
Mouth	0.143	20	1
Pharynx	0.500	20	1
Trachea	0.0667	25	1
Main Bronchi	0.0833	10	2
Lobar	0.0667	4	12
Segmental	0.0667	5	100
Subsegmental	0.150	7	770
Terminal	0.0667	50	6×10^4
Respiratory	0.1333	30	1.5×10^5
Alveolar 1	0.300	100	3×10^6
Alveolar 2	0.4167	600	4×10^7
Alveolar 3	0.500	2000	1×10^8

suggested by Hoffmann, Steinhäusler, and Pohl.⁸ Age-dependent regional volumes $V_R(\alpha)$ for the space above the respiratory bronchioles are calculated from the relation

$$V_R(\alpha) = V_R V_{DS}(\alpha) / V_{DS,A} , \quad (1)$$

where $V_R/V_{DS,A}$ is the fraction of the total "dead space" in an adult represented by region R and $V_{DS}(\alpha)$ is the age-dependent volume of the "dead space," taken from Table 119 in ICRP Publication 23.⁹ Since the regional volume is dependent on both the diameter and length of the airways in a region, and since no data are available on either of these parameters as a function of age, a simplifying assumption is introduced. This approximation asserts that the ratio of the airway diameter to length remains invariant with age, an assumption which may be derived from the belief that growth occurs due to the random division of cells in a cylindrical wall. If $\alpha_n(\alpha)$ is the value of this ratio for the adult and $N_n(\alpha)$ is the number of airways, the regional radii (in the n th region) are given by

$$R_n(\alpha) = [\alpha_n(A) V_n(\alpha) / \pi N_n(\alpha)]^{1/3} . \quad (2)$$

The length is then

$$L_n(\alpha) = R_n(\alpha) / \alpha_n(A) . \quad (3)$$

Values for $N_n(\alpha)$ are constant above age 8 for all regions and are constant (at the value for the adult) for all ages in regions above the alveolar. Adult values are reported in Tables 1 and 2 for the various regions and the age-dependent correction factor may be taken from Fig. 1, which is

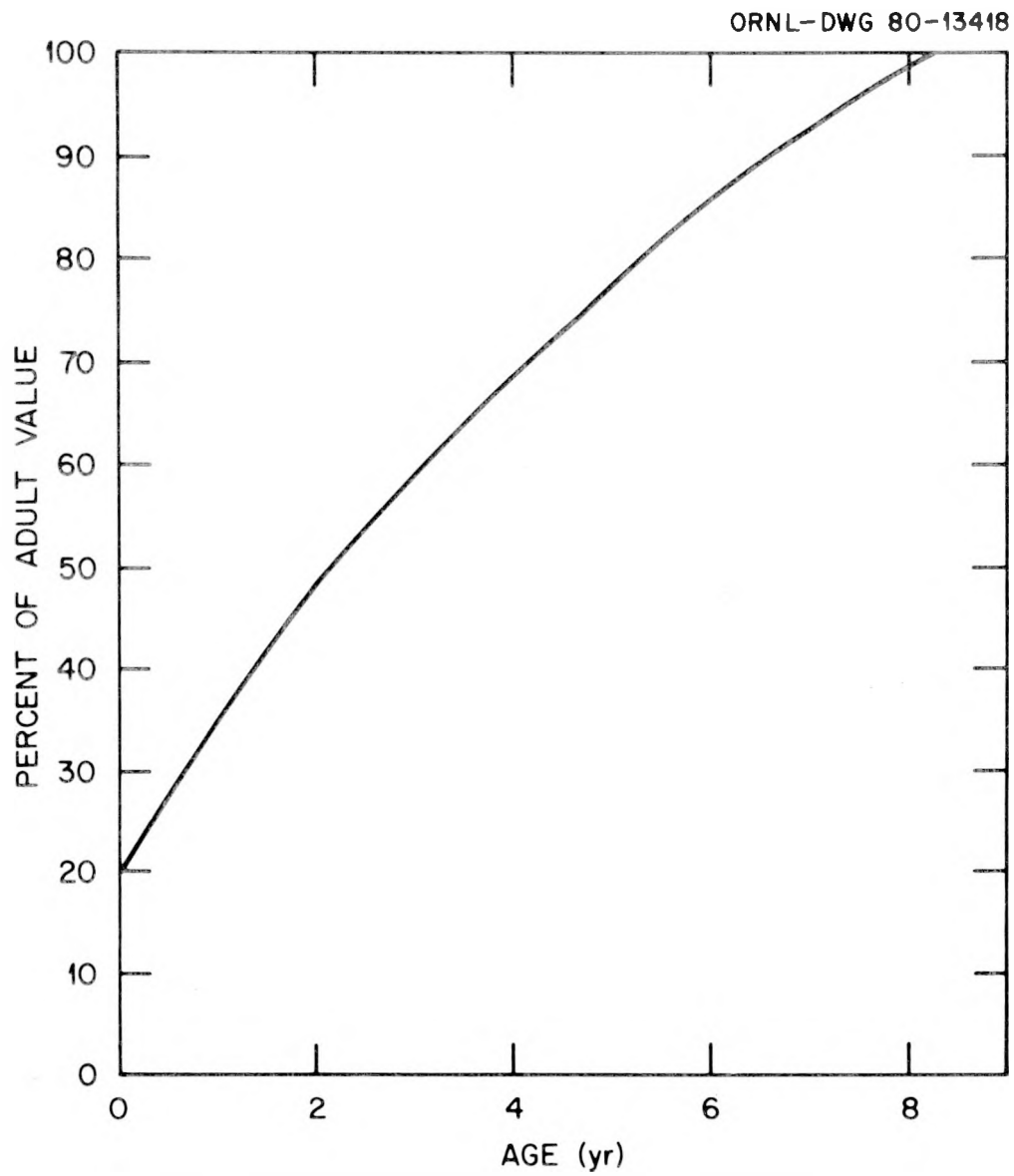


Fig. 1. Age-dependent change in the number of airways present in each generation of the pulmonary region of the lung.

similar to Fig. 3 in the paper by Hoffmann, Steinhäusler, and Pohl.⁸ The increase in alveolar volume follows the increase in the number of airways, indicating that the volumetric changes of airways in this region may be accounted for simply by the effect of increasing number. Therefore, it is assumed that linear dimensions in regions distal to the terminal bronchioles are invariant up to age 8. The regional volumes in distal airways are calculated from Eq. (1) after replacing the values for "dead space" by those determined for the total alveolar volume.

DEPOSITION

Several processes contribute to the deposition of atoms, molecules, and aerosol particles in a cylindrical tube. The most important mechanisms are impaction, sedimentation, and diffusion (or Brownian motion), with possibly significant contributions from deposition of charged particles by the image force.¹⁰ The latter mechanism is not, at present, included formally in the computer model, but can be easily inserted. The probability of deposition in the n th region by impaction is given by

$$IM(n) = 150\rho d^2 V_{n-1} / (R_n + 150\rho d^2 V_{n-1}) , \quad (4)$$

where V_{n-1} is the linear velocity in the $n-1$ region, R_n is the radius of the airway in the n th region, ρ is the particle density (g/cm^3), and d is the particle diameter (cm). For gases, the probability of impaction is negligible and IM is set equal to zero. Note that IM yields the fraction of the particles which enter the region and are deposited. This will be true of all deposition fractions discussed unless otherwise stated.

The probability of deposition by sedimentation, or gravitational settling, may be found from the relation

$$SD(n) = 1 - \exp(-0.8 U_t t_n \cos \phi_n / R_n) , \quad (5)$$

where t_n is the time during which the air is present within the n th region and ϕ_n is the average angle of inclination of the airway with respect to the horizontal. Values for t_n may be found by computing the ratio of the regional volume to the volumetric flow rate. The terminal settling velocity, U_t , is given by Stoke's equation

$$U_t = Cg\rho d^2 / 18\eta , \quad (6)$$

where η is the viscosity of air, g is the gravitational acceleration, and C is the Cunningham correction factor which corrects Stoke's Law for particles whose diameters are small compared to the average molecular distances. Several formulations of C are available, with Millikan¹¹ giving

$$C = 1 + (1.8 \times 10^{-5})/d , \quad (7a)$$

and Findeisen² reporting

$$C = 1 + (2 \times 10^{-5}) (0.864 + 0.29e^{-6.25 \times 10^4 d})/d . \quad (7b)$$

Relations for the probability of deposition due to Brownian motion have been reported and are reviewed by Martin and Jacobi.¹² Included in this review is a comparison of normalized results based on the various methods. The theory of Gormley and Kennedy¹³ states that the deposition fraction, FFA , in a tube of length L , under flow rate v , and for a

particle of diameter D , is given by

$$FFA = 4.07h^{2/3} - 2.4h - 0.446h^{4/3} + \dots, \quad (8a)$$

if $h < 0.0156$, and

$$FFA = 1 - 0.819e^{-7.314h} - 0.0975e^{-44.6h} - 0.0325e^{-114h} + \dots, \quad (8b)$$

if $h \geq 0.0156$, where $h = \pi LD/2v$. Landahl¹⁴ developed an analagous expression for nonlaminar flow. This relation takes the form

$$FFA = \frac{4}{d} \sqrt{\frac{DV}{v}} \left(1 - \frac{4}{gd} \sqrt{\frac{DV}{v}} + \dots \right) \quad (8c)$$

for $d > 4 \sqrt{\frac{DV}{v}}$, where V is the tube volume and d the diameter. Both Davies¹⁵ and Ingham¹⁶ have recalculated the coefficients in the Gormley-Kennedy equations and determine that the deposition fraction is given by

$$FFA = 1 - 0.819e^{-14.63\Delta} - 0.0976e^{-89.22\Delta} - 0.0325e^{-228\Delta} \dots, \quad (8d)$$

where $\Delta = DL/vR^2$, R being the tube radius. Their results differ from the Gormley-Kennedy relation only at small values of Δ . An alternative approach is to present the deposition fraction as a function of the length of time t spent within a region. Landahl³ published the following relation:

$$FFA = 1 - \exp\left(-4 \times 10^{-6} \sqrt{ct/dR}\right), \quad (8e)$$

where C is the Cunningham correction factor, previously defined. Equation (8e) is employed in computing deposition within the alveolar region at all times and within the other regions during breathholding. In the computer program reported in this document, the user specifies which of the above functions (8a-8d) is to be used in computing deposition fractions.

In addition, it is a simple matter to insert any other function specified by the user, such as might appear in attempting to account for deposition due to turbulence or to the image force on charged particles.

As a differential element of air passes through the various regions of the lung, aerosols and gases will be deposited on the airway walls. The deposition probabilities formulated in Eqs. (4) through (8) refer to the total deposition from each mechanism following traversal of the entire length of the region. It should be clear that these deposition probabilities are not additive. In other words, if there are n processes by which particles may be deposited in a given region, each yielding a probability P_n for deposition, the total deposition is not given by a simple summation over all values of P_n . An exact approach would be to insert deposition rate constants for each of the mechanisms into a governing differential equation and generate an exact solution. This time-consuming process can be avoided by noting that deposition along a given length is roughly uniform for each mechanism, thereby allowing one to approximate the final differential equation by

$$dN/dX = \left(- \sum_n P_n/L \right) N ,$$

where L is the total length of a region, and N is the number of particles which enter the region in the volume of air under study. The total deposition fraction from all processes is then

$$F = 1 - \exp\left(- \sum_n P_n \right) , \quad (9)$$

and it is this deposition fraction which is employed in the present model.

Again, this value refers to the fraction of particles which enter the region and are deposited.

Consider a volume of air which passes through all of the regions and into the alveolar sacs. This volume is equal to

$$V = V_T - \sum_{n=1}^m V_n, \quad (10)$$

where V_T is the tidal volume, V_n is the volume of the n th region, and m is the total number of regions proximal to the alveolar region. Following the standard methodology of Landahl,³ the probability of deposition in the i th region, $D(i)$, given as the fraction of total atoms inhaled (not which enter the region, as in the F values), is

$${}_1D(i) = F(i) \prod_{j=1}^{i-1} [1 - F(j)] \left(V_T - \sum_{n=1}^m V_n \right) \quad (11)$$

This volume of air, whose concentration has been decreased by a fraction equal to $\prod_{i=1}^m F(i)$, then mixes with the pulmonary air, the behavior of which will be treated later. The remainder of inhaled air, equal in volume to $\sum_{n=1}^m V_n$ or to V_T , whichever is smaller, passes into the "dead space," remains for a time equal to the length of breathholding, and is completely exhaled. The probability of deposition in the i th region during inhalation is then

$${}_2D(i) = \prod_{j=1}^{i-1} [1 - F(j)] \left[F(i) \left(\sum_{n=1}^m V_n - \sum_{n=1}^i V_n \right) + 1/2F(i) (V_{i,e} - V_{i,L}) \right], \quad (12)$$

where $V_{i,e}$ is the volume of air entering the i th region and $V_{i,L}$ is the volume of air passing through that region and into the next. Here,

$$V_{i,e} = \sum_{n=1}^m V_n - \sum_{n=1}^{i-1} V_n, \quad (13)$$

and

$$V_{i,L} = \sum_{n=1}^m V_n - \sum_{n=1}^i V_n \quad , \quad (14)$$

with

$$V_{i,e} - V_{i,L} = \begin{cases} V_{i,e}, & \text{if } V_{i,L} \leq 0 \\ V_n, & \text{if } V_{i,L} > 0 \end{cases} \quad . \quad (15)$$

Following inhalation, there is a period of breathholding of length τ , usually set equal to 1/8 of the total breathing cycle. Let $F_i(\tau)$ be the probability of deposition in the i th region during breathholding. To obtain this fraction, Eqs. (5) and (8e) are employed, setting t equal τ . The deposition probability $3^D(i)$ is then

$$3^D(i) = \prod_{j=1}^{i-1} [1 - F(j)] [1 - 1/2F(i)] F_i(\tau) (V_{i,e} - V_{i,L}) \quad . \quad (16)$$

The volume of air in each region will then pass back through the "dead space" during exhalation, traveling in the opposite direction to that experienced during inhalation. The deposition probability in the i th region is then given by

$$4^D(i) = \left\{ \sum_{K=i+1}^M \prod_{j=1}^{K-1} [1 - F(j)] [1 - 1/2F(K)]^2 [1 - F_K(\tau)] \prod_{n=i+1}^{K-1} [1 - F(n)] F(i) (V_{K,e} - V_{K,L}) \right\} + \prod_{j=1}^{i-1} [1 - F(j)] \times [1 - 1/2F(i)] [1 - F_i(\tau)] 1/2F(i) (V_{i,e} - V_{i,L}) \quad . \quad (17)$$

In that quantity of air which does not pass into the pulmonary airways, the total deposition in the i th region is given by

$$D(i) = {}_2D(i) + {}_3D(i) + {}_4D(i) . \quad (18)$$

Returning to the volume of air which enters the alveolar region, note that this air mixes with a volume of "clean" air equal to the residual, or normal alveolar, volume V_R . The fraction of the total number of inhaled atoms which ultimately reach this region is given by

$$1 - \sum_{n=1}^m {}_1D(n) = G .$$

If C_0 is the concentration of particles in the external atmosphere, then the concentration in the alveolar region following inhalation will be

$$C_0 G \left(V_T - \sum_{n=1}^m V_n \right) / (V_T + V_R) .$$

If one allows $F(T)$ to be the fraction of atoms deposited in the alveolar region during one breathing cycle, then the concentration in air which is exhaled from this region is simply

$$C_1 = C_0 G \left(V_T - \sum_{n=1}^m V_n \right) [1 - F(T)] / (V_T + V_R) ,$$

where T is the length of one breathing cycle minus the length of one incident of breathholding (that experienced following exhalation). This exhaled air will deposit particles within the upper passageways, with the deposition probabilities being computed from Eqs. (4)-(8) after renumbering the regions in reverse order. Clearly, a quantity of this exhaled air equal to

$$V_T - \sum_{n=1}^m V_n$$

will emerge from the body and not be reinhaled. The remainder will pass into the "dead space," deposit atoms, and be brought back into the alveolar region. Therefore, the total fraction of the atoms which leave the alveolar region and are not reinhaled is given by

$$f = \left\{ V_T - \sum_{n=1}^m V_n + \sum_{n=1}^m \left[IM(n) + SD(n) + FFA(n) \right] \right\} / V_T . \quad (19)$$

[Remember that $IM(n)$, $SD(n)$, and $FFA(n)$ are computed with the regional indices reversed]. This process will continue until all atoms have been either deposited or exhaled from the body. The concentration of atoms in alveolar air will decrease continuously (with time), with the concentration during the j th breathing cycle being

$$C_j = C_{j-1} \left[1 - F(T) \right] V_R / (V_T + V_R) + (1 - f) V_T / (V_T + V_R)^{j-1} . \quad (20)$$

Deposition within the i th region during the j th breathing cycle is simply

$$D(i)C_j = C_j \left[{}_1D(i) + {}_2D(i) + {}_3D(i) + {}_4D(i) \right] , \quad (21)$$

with total deposition in that region being given by

$$\sum_{j=1}^K D(i)C_j ,$$

where K is the maximum number of breathing cycles required to reduce the alveolar concentration below some critical value. In the existing computer program, K is defined as the number of cycles required to reduce this concentration to less than 2% of the inlet concentration, but this fraction can be varied easily. If $F(T)$ is the fraction of atoms deposited within the alveolar region during one cycle, then total deposition will be given by

$$\sum_{j=1}^K C_j F(T) X ,$$

where X is the average volume of the alveolar region during the breathing cycle (equal to $V_R + 1/2V_T$). Values for $F(T)$ are computed through the use of Eqs. (5) and (8e), with t being set equal to T . The radius employed for the alveolar region is the average radius of all airways considered to be within this region, correcting for expansion during breathing. If the volume of this region expands from V_R to $V_T + V_R$, then the average radius (assuming constant length) increases by a factor of

$$[(V_T/2 + V_R)/V_R]^{1/2} .$$

It is this corrected average radius which is inserted into Eqs. (5) and (8e).

DISINTEGRATIONS

Computation of the number of disintegrations occurring in each region follows directly from the preceding calculations of regional deposition. Particles deposited in ciliated regions will be carried upward on the muco-ciliary blanket, ultimately to disintegrate within the lung, to be absorbed into the blood, or to be swallowed and passed into the GI tract. It should be clear that atoms deposited in a given region may disintegrate within any region located proximally. Removal via the mucal blanket from each ciliated region is characterized by the transit time, $TT(n)$, for that region, which is simply the length of time required for a differential element of mucus to traverse the entire length of the n th region. It is impossible at present to state accurately

the values which should be assigned to most of these transit times. The only reliable existing data concern transport within the trachea and main bronchi, where measurements by Friedman et al.,¹⁷ Yeates et al.,¹⁸ and others^{19,20} indicate a range of tracheal values from less than 10 min to greater than 25 min. (The smaller values may be due to the invasive techniques employed to insert the tracer into the lung.) Estimates of the tracheal velocity are then employed in conjunction with a mass balance equation to estimate transit times through more distally located regions. Published values are reviewed in Table 3 for both the Weibel and Findeisen-Landahl anatomy. Transit times for other lung anatomy models may be determined following the mathematical formalism published by Altshuler, Nelson, and Kushner.²¹ However, these calculations require some estimate of the average thickness of the mucal blanket in each lung region and of the rate of mucus production and absorption, information which is not available in any detail.

In the same article, Altshuler, Nelson, and Kushner²¹ have reviewed the mathematical relations between deposition and the site of disintegration (assuming no absorption into blood). According to this formalism, the number of disintegrations occurring in the i th region, $DIR(i)$, is given by

$$\begin{aligned}
 DIR(i) = & RR(i) \left\{ 1 - \left[1 - e^{-\lambda TT(i)} \right] / \left[\lambda TT(i) \right] \right\} + RR(i+1) \left[1 - e^{-\lambda TT(i)} \right] \\
 & \times \left[1 - e^{-\lambda TT(i+1)} \right] / \left[\lambda TT(i) \right] + \sum_{n=i+2}^m RR(n) \left[1 - e^{-\lambda TT(i)} \right] \\
 & \times \left[1 - e^{-\lambda TT(n)} \right] \left[e^{-\lambda \sum_{j=i+1}^{n-1} TT(j)} \right] / \left[\lambda TT(i) \right] . \quad (22)
 \end{aligned}$$

Table 3. Adult regional transit times (min)

Region	Hague and Collinson	Altschuler et al.	This study ^a
3 Trachea	9.6	8	24.0
4 Main Bronchi	3.8	6	13.0
5 Lobar	7.6	11	7.0
6	3.04		3.8
7 Segmental	25.4	37	10.2
8	21.4		13.3
9	18		17.9
10 Subsegmental	Long	82	24.9
11	Long		33.9
12	Long		47.3
13 Terminal		1980	68.1
14			96.7
15			142.8
16			201.5
17			309.9
18			480.8
19			721.1

^aUtilizes a tracheal velocity of 5 mm/min.

Here, λ is the radiological decay constant for the radionuclide of interest and $RR(i)$ is the deposition in the i th region, m being the total number of ciliated regions. Equation (22) applies only to the decay of a single radionuclide or to a parent nuclide in a decay chain. For the equations relating to the decay of the daughter products in a series, the reader is referred to the relations reported by Altshuler, Nelson, and Kushner.²¹ Alternatively, one may simply set the values of $DIR(n)$ for the parent equal to the deposition of the first daughter, recompute new $DIR(n)$ values for the daughter, etc., until all daughters have been accounted for. The latter procedure is employed in this computer model.

Absorption into the blood stream is computed after apportioning a percentage of the total tracheobronchial deposition to a transfer compartment which empties into the blood. This fraction, along with its associated biological half-time, is taken directly from the revised values for the International Commission on Radiological Protection (ICRP) Task Group Lung Model (TGLM).²² The remaining fraction is assumed to follow the kinetics of removal derived for transport by the mucal blanket. Final estimates of the total number of atoms which follow each of these pathways of removal are obtained by summing deposition over all sub-regions of the tracheobronchial region and multiplying by the compartmental fractions.

The blood-transfer kinetics in this approach are identical to that employed in the INREM II computer code,²³ which utilizes a mathematical analogue of the TGLM. The kinetics of removal from the pulmonary region also follow the methodology in the INREM II code, with the exception that atoms displaced into the tracheobronchial region are assumed to

move upward on the mucal blanket. The INREM II code simply assumes that removal from the pulmonary to the tracheobronchial region is followed by exponential removal from the tracheobronchial region, yielding a formalism which is difficult to correct for any age-dependent effects. For a complete review of the logical foundations of the INREM II code TGLM, the reader is referred to the original ICRP Task Group Report.²²

Age-dependent values for the transit times are not available currently and, hence, it is not possible to specify empirically these values for non-adults. Since mucal velocities depend on the density of cilia, frequency of cilia strokes, density of goblet and serous cells, and blood supply,²⁴ as well as other parameters, extrapolation from adult data to children cannot be placed on any formalized, theoretical foundations. Instead, certain rather arbitrary assumptions must be utilized. The reader must decide which of these appear to be more acceptable as an a priori basis for extrapolation. The author has chosen to start from a belief that tracheal mucal velocities remain constant with age, as this greatly simplifies necessary age-dependent corrections. The validity of this proposition is founded on the assumption that ciliary action, or force per unit area, and the production rate of mucus per unit area remain constant with age. Transit time in a given region is then equal to the product of the radius, length, and number of channels in a region, divided by the tracheal velocity and radius. This approach differs from that employed by Hoffmann, Steinhäusler, and Pohl,⁸ since they assumed that clearance rates from the 3 regions of the ICRP model remained invariant with age. While their approach seems reasonable for the nonciliated regions (and for tracheobronchial removal

into systemic blood), it is not deemed appropriate by this author for clearance by mucus transport. Age-dependent transit times for all ciliated regions are displayed in Table 4.

Materials deposited in the alveolar, or pulmonary, region are removed either by transport through the alveolo-capillary walls and into the blood stream or lymphatic system or by transfer into the ciliated regions followed by transport up the blanket. In the latter case, regional disintegrations may be computed by adding these atoms to the deposition computed for the distal edge of the last ciliated region. This material then begins the process of transport via the blanket. Displacement half-times for the alveolar region are assumed to remain invariant with age. This assumption is supported by the recent work of Lundgren, Hahn, and McClellan.²⁵ The ICRP Task Group Lung Model contains data concerning removal from the alveolar region for different chemical classes of inhalants. Removal rates are based on the solubility of the aerosol particles, with three classes [days (D), weeks (W), and years (Y)] being specified. These removal rates, and corresponding subcompartmental fractions, are reported in ICRP Publication 19.²⁶

DOSE CALCULATIONS

Values for the lung dose accrued from a given exposure may be obtained directly from the estimates of regional disintegrations. In the case of low-LET radiation (beta and gamma), it is sufficient to employ the S-factors presented by Dunning, Pleasant, and Killough.²⁶ Age-dependent effects on these factors may be derived from the compilation by Cristy.²⁸ Doses to critical cells are then assumed to be identical

Table 4. Age dependent transit times (min) for Weibel model as employed in this study

Region	Age							
	0	2	4	8	12	16	24	32
3	7.3	8.0	11.6	15.2	18.0	20.6	22.3	24.0
4	4.0	6.1	6.3	8.3	9.7	10.9	12.0	13.0
5	2.2	3.2	3.4	4.4	5.2	5.8	6.4	7.0
6	1.3	1.9	1.9	2.5	3.0	3.3	3.6	3.8
7	3.1	4.7	4.9	6.4	7.5	8.4	9.3	10.2
8	4.2	6.3	6.5	8.6	10.1	11.3	12.4	13.3
9	5.4	8.4	8.6	11.3	13.3	15.0	16.5	17.9
10	7.8	11.6	12.1	15.8	18.6	21.0	23.1	24.9
11	10.5	16.0	16.3	21.4	25.2	28.3	31.1	33.9
12	14.7	22.1	22.7	30.0	35.2	39.6	43.5	47.3
13	21.0	32.5	33.3	43.6	51.4	57.8	63.6	68.1
14	30.3	45.7	47.3	62.1	73.1	82.2	90.5	96.7
15	44.3	67.9	69.6	91.3	107.6	120.9	133.0	142.8
16	62.5	95.6	98.2	128.8	157.9	170.7	187.8	201.5
17	95.8	146.3	151.0	198.0	233.5	262.5	285.2	309.9
18	147.1	226.9	233.5	305.9	361.0	405.8	446.6	480.8
19	221.8	341.1	350.7	459.7	542.4	609.6	670.8	721.1

to (or closely approximated by) the average lung dose. No attempt was made to include these S-factors in the existing program and, hence, output for beta and gamma emitters is left in units of disintegrations. Given the short range of most alpha particles, the above approach is clearly inappropriate when computing doses from alpha emitters. An exception arises within the pulmonary region, where wall thicknesses are sufficiently small to allow the traversal of several alveolar sacs by each alpha particle. Therefore, in this region, only the average dose is computed (by dividing the total energy of decay by the alveolar mass). The absorbed fraction for all alpha emitters is assumed to be equal to unity following correction for absorption in the blood mass of the lung.

In the proximal regions (tracheobronchial and nasopharyngeal), a more exact approach is employed in order to account for differential irradiation of various cellular subgroups. This method is similar to that employed by Haque²⁹ and Desrosiers, Kennedy, and Little.³⁰ Consider a uniformly contaminated internal cylindrical surface and a volume (target) element located at some depth within the walls of the cylinder. If one considers the flux contribution from a differential surface element of area dA located at a distance τ from the point of interest, it is clear that the flux at that point is given by

$$\phi = S_A dA/4\pi\tau^2 , \quad (23)$$

where S_A is the density of emissions on the cylindrical surface. Let $S(\tau)$ be the stopping power of an alpha that has traversed a distance τ through the intervening tissue. The total energy delivered by each

particle to a sphere of diameter d centered about the point of interest is then $\epsilon = S(\tau)^{2d/3}$. The factor of $2/3$ arises from a consideration of the average chord length through a sphere (see ref. 31). Since this sphere has a cross-sectional area equal to $\pi(d/2)^2$ and a mass of $\rho\pi d^3/6$, where ρ is the density of tissue, the dose is equal to

$$D = \Phi S(\tau)/\rho . \quad (24)$$

The total dose at the point of interest is then the integral over all surface elements;

$$D = \int_A S_A S(\tau) dA / 100\rho 4\pi\tau^2 . \quad (25)$$

For nonuniformly distributed emitters, S_A may be replaced by the function $S_A(X, \Phi)$ where X and Φ are the cylindrical coordinates of the source element.

Lung doses from alpha particles are typically divided into "near" and "far" wall contributions. These contributions differ in that the "far" wall emissions must traverse the air space of a channel before penetrating into the tissue. As a result, a sphere located at some depth in the near wall "sees" an area source on the far wall whose emission energy spectrum has been degraded. This effect is accounted for by computing the total distance travelled in air for all alpha particles and converting this distance into an equivalent path length in lung tissue. Such a conversion may be accomplished by noting that the tissue equivalent path length in 1 cm of air is roughly invariant (within $\pm 3\%$) when the alpha energy varies from 1 to 10 MeV. This conversion factor is given by Lea³² as 1.1μ in tissue per 1 mm in air, and it is this value which is used in the present calculations.

In the event the reader should require information on the LET spectrum at some depth in the lung walls, the computer program is designed to calculate the dose-averaged LET for each point in the depth-dose curve. Such information might prove useful in determining an average quality factor (QF) for the emissions (see, for example, Sect. 6.1 of ref. 33). The dose-averaged LET at a point may be found by the relation

$$\bar{S} = \frac{\sum_A S_i \cdot D_i}{\sum_A D_i} , \quad (26)$$

where S_i and D_i are the stopping powers and doses from the i th source element. For alpha particles, the stopping power and $-dE/dx$ curves are identical due to the very short range ($\sim 0.1\mu$) of the delta rays.³²

REPRESENTATIVE RESULTS AND DISCUSSION

The preceding model was employed to calculate regional deposition and disintegrations within the various subregions of the Weibel model. A wide variety of radionuclide half-lives, particle diameters, and human ages were utilized to generate the data. In addition, the calculations were performed assuming both resting and light activity. Results are displayed in Appendix A. For a complete discussion of these results and others, as well as a graphical representation of the data, the reader is referred to the article by Crawford.³⁴ Age-dependent lung doses may be assessed from a knowledge of the total number of disintegrations within the lung and of the lung mass as a function of age. Values reported in Appendix A refer to the 70-year commitment resulting from a single breath. The reference atmosphere was assumed to contain 1 atom/cm³. Subregions 20-27 have been combined into a single alveolar region.

All values for regional disintegrations were computed for class D aerosols. Should the user wish data for a different set of removal parameters, these values may be obtained directly from Appendix A. Let X_1 , X_2 , and X_3 be the number of atoms deposited in the nasopharyngeal, tracheobronchial, and pulmonary regions, respectively; λ_R the radiological decay constant, $\lambda_{i,j}$ the removal constant associated with the i th pathway in the j th region; f_C the fraction of tracheobronchial (T-B) depositions apportioned to pathway C , and f_1 the fraction of atoms deposited in compartment d which decay ultimately within the tracheobronchial region. The total number of disintegrations in the lung volume is given by

$$\begin{aligned}
 T = & X_1 \lambda_R / \left(\lambda_R + \sum_i f_{i,NP} \lambda_{i,NP} \right) + X_3 \lambda_R / \lambda_R + \sum_i f_{i,P} \lambda_{i,P} \\
 & + X_2 f_i \lambda_R / \lambda_R + \sum_i f_{i,TB} \lambda_{i,TB} \\
 & + X_3 f_T \left(\lambda_f f_f + \lambda_g f_g \right) / \left(\lambda_R + \sum_i f_{i,P} \lambda_{i,P} \right) + X_2 f_1, \quad (27)
 \end{aligned}$$

where f_T is the fraction of atoms which decay in traversing the entire length of the tracheobronchial region. This fraction is given by the relation

$$f_T = (1 - e^{-\lambda_R \tau}), \quad (28)$$

where τ is the total time required to transit the tracheobronchial (Fig. 2). Given X_1 , X_2 , and X_3 , as well as the total number of disintegrations for class D particles, T , (obtained from Appendix A), it is a simple matter to compute f_1 , which is invariant with the choice of model parameters

(at least for a given age, particle size, and radionuclide half-life). One may then insert the new lung model removal parameters into Eq. (27) and solve for the value of T associated with that parameter set. The same technique applies to the data in individual subregions of the lung.

Actual regional densities may be obtained from the data in Appendix A after dividing by the appropriate regional surface area. The latter information is contained in Table 5, along with age-dependent data on radii and lengths in the various subregions above the pulmonary. Basal cell doses may be computed by a superposition of a basal-depth frequency curve over the depth-dose curves. Such frequency distributions may be found in the work by Gastineau, Walsh, and Underwood.³⁵ All stopping powers in tissue were obtained from the published results of Walsh³⁶ and have been incorporated into the existing model.

Table 5. Age dependent regional surface areas [SA(cm²)] and channel radii [R(cm)]

Region/Age (years)	SA/R							
	0	2	4	8	12	16	24	32
1	4.2/0.31	7.2/0.41	10.8/0.49	18.5/0.65	25.8/0.77	32.4/0.86	39.4/0.95	41.3/0.97
2	2.8/0.47	4.8/0.61	7.1/0.75	12.2/0.98	17.0/1.16	21.4/1.31	26.0/1.44	27.2/1.47
3	6.3/0.27	7.6/0.30	16.0/0.44	27.4/0.57	38.2/0.67	48.2/0.76	58.4/0.83	67.8/0.90
4	3.4/0.19	5.8/0.24	8.6/0.30	14.8/0.39	20.7/0.46	26.1/0.52	31.6/0.57	36.5/0.61
5	1.9/0.13	3.1/0.16	4.6/0.20	7.9/0.26	11.0/0.31	13.9/0.35	16.9/0.38	19.8/0.41
6	1.1/0.09	1.8/0.11	2.6/0.14	4.5/0.18	6.3/0.21	7.9/0.24	9.5/0.26	10.7/0.28
7	2.6/0.068	4.5/0.089	6.7/0.11	11.4/0.14	15.9/0.17	20.1/0.19	24.4/0.21	28.7/0.22
8	3.7/0.055	6.0/0.070	8.9/0.085	15.4/0.11	21.4/0.13	27.0/0.15	32.6/0.16	37.6/0.18
9	4.7/0.043	7.9/0.055	11.9/0.068	20.3/0.089	28.3/0.10	35.7/0.12	43.3/0.13	50.6/0.14
10	6.7/0.036	11.0/0.045	16.5/0.056	28.5/0.073	39.5/0.086	50.0/0.097	60.5/0.11	70.4/0.11
11	9.1/0.029	15.2/0.037	22.3/0.045	38.4/0.059	53.4/0.069	67.5/0.078	81.7/0.086	95.8/0.093
12	12.7/0.024	21.0/0.031	31.2/0.037	53.7/0.049	74.7/0.058	94.3/0.065	114.1/0.071	133.7/0.077
13	18.1/0.020	30.8/0.026	45.6/0.032	78.3/0.041	109.0/0.049	137.7/0.055	166.8/0.060	192.6/0.065
14	26.1/0.017	43.3/0.022	64.8/0.027	111.5/0.035	155.0/0.041	196.0/0.046	237.2/0.051	273.4/0.055
15	38.3/0.015	64.4/0.019	95.4/0.023	163.9/0.030	228.1/0.036	288.2/0.040	348.9/0.044	403.6/0.048
16	54.0/0.013	90.6/0.016	134.6/0.020	231.3/0.026	322.0/0.031	406.7/0.035	492.4/0.034	596.6/0.041
17	82.7/0.011	138.7/0.015	207.0/0.018	355.7/0.024	495.0/0.028	625.4/0.031	755.6/0.034	876.1/0.037
18	127.0/0.010	215.1/0.013	320.1/0.016	549.6/0.021	765.5/0.025	966.7/0.028	1171.1/0.031	1359.3/0.033
19	191.5/0.009	323.3/0.012	480.8/0.015	825.9/0.019	1150.1/0.023	1452.4/0.025	1759.2/0.028	2038.4/0.030

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Appendix A

REGIONAL DEPOSITION AND DISINTEGRATION FOR
MONODISPERSE AEROSOL PARTICLES
(PER BREATHING CYCLE)

AGE = 0 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	5.1764E-2	5.3727E-2	5.0740E-2	2.1894E-2	6.9427E-3	7.7279E-4	7.8201E-5
2	3.9191E-2	3.9165E-2	3.5740E-2	2.2653E-2	4.9671E-3	5.4950E-4	5.5694E-5
3	5.7707E-2	5.7640E-2	5.3949E-2	3.3484E-2	7.0976E-3	8.1337E-4	8.2921E-5
4	7.5442E-2	7.5417E-2	7.1646E-2	4.3055E-2	4.3252E-3	4.4834E-4	4.5916E-5
5	2.5282E-2	2.5224E-2	2.3366E-2	1.4398E-2	2.0706E-3	3.4655E-4	3.5974E-5
6	2.0377E-2	2.0374E-2	1.9714E-2	1.1624E-2	2.5173E-3	2.9376E-4	3.0245E-5
7	4.3026E-2	4.3001E-2	4.0700E-2	2.5162E-2	5.3127E-3	5.9978E-4	6.5502E-5
8	6.0621E-2	6.0595E-2	5.7254E-2	3.5706E-2	7.5270E-3	8.4804E-4	9.2265E-5
9	8.2479E-2	8.2424E-2	7.7291E-2	4.3221E-2	1.0354E-2	1.1658E-3	1.2212E-4
10	0.11713	0.11693	0.110308	7.0566E-2	1.4869E-2	1.6735E-3	1.7326E-4
11	0.162474	0.162373	0.153004	9.0947E-2	2.1602E-2	2.3627E-3	2.4088E-4
12	0.226657	0.226513	0.213289	0.136653	3.0340E-2	3.3839E-3	3.4588E-4
13	0.312934	0.31270	0.29998	0.197704	4.3666E-2	4.9289E-3	5.0326E-4
14	0.449913	0.449529	0.421871	0.278472	6.4011E-2	7.3113E-3	7.4435E-4
15	0.670096	0.670592	0.628290	0.39744	9.3047E-2	1.0922E-2	1.1027E-3
16	0.950897	0.950747	0.899405	0.525815	0.134315	1.6201E-2	1.6674E-3
17	1.19150	1.19276	1.11173	0.726634	0.19787	2.5905E-2	2.6984E-3
18	1.6493	1.6493	1.5471	1.01471	0.284769	4.1719E-2	4.3076E-3
19	2.20919	2.20774	2.07344	1.34936	0.321485	7.8713E-2	7.9091E-3
20	23.6753	23.675	23.6428	23.354	20.8122	9.9656	1.60433

AGE = 0 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	2.40677E-2	2.40412E-2	2.25139E-2	1.42715E-2	3.3618E-3	3.4579E-4	3.5083E-5
2	1.91815E-2	1.91744E-2	1.76170E-2	1.17879E-2	2.3443E-3	2.6137E-4	2.6475E-5
3	2.61365E-2	2.61187E-2	2.40451E-2	1.51760E-2	3.2159E-3	3.62603E-4	3.6212E-5
4	3.06893E-2	3.06574E-2	2.79166E-2	1.99108E-2	4.9150E-3	2.68550E-4	2.7115E-5
5	1.35965E-2	1.35566E-2	1.2203E-2	7.6266E-3	1.6258E-3	1.8348E-4	2.1565E-5
6	1.23825E-2	1.23407E-2	1.19681E-2	7.1096E-3	1.5091E-3	1.71331E-4	2.0058E-5
7	3.18951E-2	3.18280E-2	2.92453E-2	1.37536E-2	2.9051E-3	3.27447E-4	3.5629E-5
8	4.18628E-2	4.18769E-2	3.87669E-2	1.9762E-2	3.9568E-3	4.4592E-4	4.7405E-5
9	5.7571E-2	5.75415E-2	5.39097E-2	2.4063E-2	5.2512E-3	5.91281E-4	6.1947E-5
10	7.96699E-2	7.96120E-2	7.45253E-2	3.038677	7.3087E-3	8.20651E-4	8.7376E-5
11	0.10759	0.107512	0.100225E-2	4.7575E-2	1.0084E-2	1.13497E-3	1.1670E-4
12	0.150295	0.150199	0.141331	6.6258E-2	1.4048E-2	1.60537E-3	1.64194E-4
13	0.21217	0.211692	0.198541	9.3146E-2	2.0070E-2	2.3266E-3	2.37247E-4
14	0.290846	0.290656	0.277989	0.13076	3.0139E-2	3.4426E-3	3.50594E-4
15	0.40779	0.405537	0.381251	0.183132	4.4024E-2	5.1217E-3	5.2199E-4
16	0.572344	0.571944	0.537635	0.25295	6.2450E-2	7.7949E-3	7.9787E-4
17	0.814121	0.813692	0.764733	0.35295	9.6032E-2	1.2605E-2	1.30444E-3
18	1.12113	1.12039	1.05224	0.504733	0.141329	2.0003E-2	2.1943E-3
19	1.52113	1.52039	1.43224	0.684268	0.163148	1.9443E-2	1.98384E-3
20	12.9995	12.9983	12.9806	12.9221	11.4265	5.4714	0.880827

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 0 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	1.66666E-2	1.66552E-2	1.55971E-2	9.88695E-3	2.12120E-3	2.39551E-4	2.43051E-7
2	1.49608E-2	1.49505E-2	1.40007E-2	8.87503E-3	1.90410E-3	2.15042E-4	2.17860E-5
3	1.92161E-2	1.91974E-2	1.80031E-2	1.11920E-2	2.36899E-3	2.67061E-4	2.95607E-5
4	1.65291E-2	1.65184E-2	1.54638E-2	9.52346E-3	2.02240E-3	2.28125E-4	2.53809E-5
5	1.67702E-2	1.67603E-2	1.56225E-2	9.59169E-3	2.04292E-3	2.30532E-4	2.54150E-5
6	2.00352E-2	2.00285E-2	1.90675E-2	1.16244E-2	2.46006E-3	2.77391E-4	2.99703E-5
7	3.14238E-2	3.14050E-2	2.96125E-2	1.83106E-2	3.87177E-3	4.36464E-4	4.59151E-5
8	3.84643E-2	3.84404E-2	3.62102E-2	2.25540E-2	4.76196E-3	5.36636E-4	5.59123E-5
9	4.51533E-2	4.51252E-2	4.25307E-2	2.67989E-2	5.64680E-3	6.35964E-4	6.58395E-5
10	5.55112E-2	5.54761E-2	5.22368E-2	3.32792E-2	7.02005E-3	7.90334E-4	8.13582E-5
11	6.76130E-2	6.75703E-2	6.36202E-2	4.10592E-2	8.70387E-3	9.79741E-4	1.00442E-4
12	8.66431E-2	8.65880E-2	8.14936E-2	5.31898E-2	1.14288E-2	1.28771E-3	1.31525E-4
13	0.113829	0.113756	0.107025	7.03942E-2	1.55220E-2	1.75540E-3	1.78898E-4
14	0.153381	0.153283	0.144162	9.50731E-2	2.18186E-2	2.49143E-3	2.53673E-4
15	0.209211	0.209076	0.196575	0.129439	3.10675E-2	3.61294E-3	3.68187E-4
16	0.282722	0.282539	0.265616	0.174739	4.47433E-2	5.42141E-3	5.49292E-4
17	0.395886	0.395629	0.371876	0.244138	6.64055E-2	8.71516E-3	9.01915E-4
18	0.562237	0.561872	0.528066	0.346005	9.76405E-2	1.43792E-2	1.51679E-3
19	0.776196	0.775687	0.7295	0.473742	0.112953	1.34615E-2	1.37348E-3
20	10.03	10.0299	10.0163	9.89392	8.81706	4.2219	0.679673

AGE = 0 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	2.27080E-2	2.36918E-2	2.21866E-2	1.40641E-2	3.01730E-3	3.45230E-4	3.45737E-7
2	0.198662	0.198466	0.185857	0.117815	2.52766E-2	2.85465E-3	2.89624E-6
3	0.113024	0.112975	0.108477	6.85164E-2	1.43135E-2	1.61017E-3	5.25040E-6
4	0.17849	0.17828	0.176658	0.219260	4.64544E-2	5.23846E-3	9.92951E-6
5	0.577927	0.577643	0.560933	0.331215	7.04773E-2	7.95204E-3	1.17020E-5
6	0.858248	0.857927	0.810426	0.495963	0.10516	1.18602E-2	1.56741E-5
7	1.12406	1.12335	1.05607	0.650696	0.13826	1.55885E-2	1.94233E-5
8	1.2119	1.2111	1.1274	0.707567	0.18026	1.69657E-2	2.17122E-5
9	1.20027	1.19944	1.1267	0.717123	0.14932	1.68235E-2	2.06641E-5
10	1.17747	1.17669	1.10457	0.698291	0.147596	1.66254E-2	2.04596E-5
11	1.05537	1.05464	0.99052	0.622663	0.134155	1.51084E-2	1.89174E-5
12	0.990969	0.990317	0.929993	0.598044	0.127037	1.44177E-2	1.80135E-5
13	0.873233	0.87282	0.819739	0.530353	0.115339	1.30285E-2	1.68060E-5
14	0.75235	0.752857	0.707150	0.459242	0.102485	1.16494E-2	1.54114E-5
15	0.63026	0.630946	0.59282	0.390019	0.084897	1.03397E-2	1.40987E-5
16	0.52774	0.527377	0.504876	0.329261	0.061093	0.84433E-2	1.20274E-5
17	0.429442	0.42913	0.40109	0.29009	0.040937	0.56163E-2	1.03860E-5
18	0.459258	0.45806	0.43043	0.29147	0.029977	0.37977E-2	1.12837E-5
19	0.407409	0.407103	0.46683	0.306	0.02386E-2	0.2386E-2	8.1717E-6
20	19.2162	19.2159	19.2896	19.0541	16.9802	8.17060	1.30894

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 2 YEARS, LIGHT ACTIVITY
PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
"	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.140258	0.140157	0.131259	8.32009E-2	1.70504E-2	2.91596E-3	2.04238E-4
2	0.140238	0.10231	0.58105E-2	6.0734E-2	1.30302E-2	1.47157E-3	1.49303E-4
3	0.114142	0.114066	0.106097	6.68216E-2	1.41501E-2	1.59467E-3	6.91574E-5
4	9.43480E-2	9.42031E-2	8.81789E-2	5.45839E-2	1.15779E-2	1.30570E-3	6.87208E-5
5	6.43829E-2	6.44937E-2	6.04924E-2	3.72465E-2	7.02661E-3	8.94380E-4	6.83637E-5
6	5.10497E-2	5.18390E-2	5.02675E-2	3.08709E-2	6.46826E-3	7.28303E-4	6.8113E-5
7	0.112556	0.11229	0.106109	6.65287E-2	1.40092E-2	1.57792E-3	1.60773E-4
8	0.155509	0.154504	0.14676	7.30232E-2	1.95799E-2	2.20440E-3	1.92679E-5
9	0.21407	0.214137	0.14676	0.129677	2.70527E-2	3.07829E-3	7.00124E-5
10	0.300007	0.299882	0.21936	0.193515	3.90097E-2	4.30695E-3	7.12848E-5
11	0.420866	0.4206	0.282473	0.259483	5.60097E-2	6.31332E-3	7.31550E-5
12	0.587108	0.587014	0.395853	0.364584	8.16452E-2	9.18791E-3	7.59092E-5
13	0.819176	0.837638	0.552389	0.519959	0.120157	1.37477E-2	8.05474E-5
14	1.17450	1.17383	1.16374	0.707773	0.177337	2.07574E-2	8.76937E-5
15	1.65845	1.65738	1.558	1.02396	0.26167	3.17767E-2	9.90542E-5
16	2.27513	2.2739	2.13736	1.40301	0.380799	4.98793E-2	1.18204E-4
17	3.09045	3.20267	3.00348	1.97256	0.560919	8.35172E-2	1.55259E-4
18	4.5639	4.55784	4.2833	2.80322	0.807272	0.140779	1.55822E-4
19	6.24254	6.23946	5.86095	3.81771	0.949345	0.119729	1.11289E-4
20	106.513	106.512	106.367	105.069	93.6322	44.8342	7.73677E-2

AGE = 2 YEARS, LIGHT ACTIVITY
PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
"	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	5.83802E-2	5.83482E-2	5.46413E-2	3.46377E-2	7.43122E-3	8.39255E-4	8.51482E-7
2	4.70642E-2	4.70320E-2	4.40441E-2	2.79195E-2	5.98099E-3	6.76488E-4	6.86344E-7
3	4.07196E-2	4.06875E-2	4.67093E-2	2.92061E-2	6.18745E-3	6.97112E-4	3.18079E-5
4	5.28047E-2	5.27692E-2	4.94202E-2	3.06038E-2	6.48777E-3	7.31516E-4	3.17823E-5
5	4.29511E-2	4.29239E-2	4.01546E-2	2.46860E-2	5.24713E-3	5.91953E-4	1.16629E-5
6	4.66473E-2	4.66299E-2	4.46652E-2	2.74980E-2	5.78562E-3	6.51793E-4	1.16380E-5
7	8.07580E-2	8.03086E-2	7.57119E-2	4.74150E-2	9.99610E-3	1.12612E-3	3.26943E-5
8	6.10034E	0.100293	0.45177E-2	5.97848E-2	1.25950E-2	1.41826E-3	3.2055E-5
9	0.126673	0.126594	0.110261	7.63656E-2	1.61169E-2	1.81414E-3	3.26417E-5
10	0.163234	0.163111	0.153592	9.89107E-2	2.11461E-2	1.94061E-3	3.18902E-5
11	0.213608	0.213472	0.200903	0.131377	2.8335E-2	2.38049E-3	3.39774E-5
12	0.284577	0.284351	0.267533	0.176279	3.91425E-2	3.19390E-3	3.23718E-4
13	0.391648	0.391396	0.37802	0.232935	5.60048E-2	4.43219E-3	3.52028E-5
14	0.537418	0.537071	0.504988	0.303374	8.16045E-2	6.40599E-3	3.71670E-5
15	0.750562	0.750076	0.705096	0.463374	0.118327	9.47846E-3	4.53426E-5
16	1.02605	1.02539	0.963814	0.672697	0.171775	1.43694E-2	5.39499E-5
17	1.4074	1.40646	1.35947	0.89113	0.257748	2.25043E-2	7.08333E-5
18	2.07489	2.07358	1.94869	1.27561	0.368053	3.78295E-2	7.13032E-5
19	2.87564	2.87316	2.69886	1.75798	0.436696	6.47862E-2	5.12466E-5
20	51.9425	51.9418	51.8712	51.2377	45.6609	0.055133	3.77294E-2

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 2 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	3.90903E-2	3.9635E-2	3.65818E-2	2.1891E-2	4.97512E-3	5.61872E-4	5.69236E-5
2	4.70812E-2	4.70489E-2	4.40599E-2	2.79295E-2	5.99215E-3	6.76731E-4	6.86590E-5
3	4.22277E-2	4.22038E-2	3.99990E-2	2.53893E-2	5.33143E-3	6.00048E-4	6.13037E-5
4	8.24524E-2	8.23988E-2	7.73319E-2	4.79174E-2	1.01468E-2	1.14402E-3	1.16341E-4
5	8.29225E-2	8.28761E-2	7.79168E-2	4.78085E-2	1.01477E-2	1.14461E-3	1.16344E-4
6	0.117368	0.117311	0.111434	6.87232E-2	1.45600E-2	1.63414E-3	1.65864E-4
7	0.167038	0.166932	0.157074	9.1908E-2	2.07269E-2	2.33548E-3	2.36850E-4
8	0.18433	0.184212	0.173306	0.109309	2.30568E-2	2.59693E-3	2.63281E-4
9	0.204081	0.20395	0.191816	0.122228	2.58210E-2	2.90732E-3	2.94673E-4
10	0.224801	0.224656	0.211241	0.135961	2.88886E-2	3.25293E-3	3.29647E-4
11	0.248342	0.248182	0.233372	0.151685	3.26404E-2	3.67921E-3	3.72783E-4
12	0.286089	0.286089	0.269007	0.176208	3.89074E-2	4.40311E-3	4.46255E-4
13	0.343703	0.343481	0.32293	0.212158	4.85873E-2	5.55039E-3	5.63074E-4
14	0.425784	0.425509	0.400029	0.263107	6.35343E-2	7.41872E-3	7.54497E-4
15	0.544885	0.544526	0.521236	0.342215	8.68183E-2	1.05157E-2	1.07455E-3
16	0.724543	0.724073	0.680575	0.446568	0.120664	1.57633E-2	1.62854E-3
17	0.984891	0.984246	0.934441	0.612428	0.173893	2.58558E-2	2.73182E-3
18	1.4052	1.40428	1.3197	0.863845	0.249021	4.35028E-2	4.76533E-3
19	1.93674	1.93547	1.81806	1.18425	0.294175	3.71398E-2	3.82626E-3
20	40.4053	40.4047	40.3498	39.857	35.5189	17.0076	2.73801

AGE = 2 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	4.22637E-2	4.22348E-2	3.95516E-2	2.50717E-2	5.37902E-3	6.07487E-4	6.15449E-5
2	1.14240	1.1417	1.06917	0.677745	0.145407	1.64217E-2	1.66410E-2
3	0.676256	0.676046	0.657542	0.422434	0.93316E-2	1.00225E-2	1.01512E-2
4	3.26696	3.26488	3.06812	1.90182	0.40247	4.53730E-2	4.59633E-2
5	3.67659	3.67463	3.46131	2.12224	0.450221	5.0779E-2	5.14419E-2
6	5.66636	5.66327	5.35740	3.30686	0.698692	7.8756E-2	7.97768E-2
7	7.23475	7.23005	6.79353	4.24256	0.896284	0.101095	1.02309E-2
8	7.70957	7.70481	6.86355	4.3263	0.912086	0.102748	1.04069E-2
9	7.29335	7.28858	6.84597	4.34572	0.918745	0.103471	1.04798E-2
10	6.97662	6.96604	6.54173	4.18424	0.8888	0.103471	1.04798E-2
11	6.32929	6.32514	5.94094	3.82973	0.821524	0.101066	1.01016E-2
12	5.77111	5.76733	5.41678	3.50797	0.766041	9.26001E-2	9.37259E-2
13	4.98693	4.98367	4.6811	3.14015	0.680266	8.65961E-2	8.78459E-2
14	4.16067	4.15795	3.95595	2.54207	0.58993	7.73917E-2	7.84595E-2
15	3.47763	3.47136	3.26109	2.12352	0.508499	6.80420E-2	6.91020E-2
16	2.73222	2.73144	2.56299	1.67299	0.449821	6.0133E-2	6.12654E-2
17	2.19678	2.19535	2.06266	1.34579	0.398878	5.21370E-2	5.35274E-2
18	1.77372	1.77257	1.66553	1.08769	0.354863	4.70150E-2	4.89064E-2
19	1.50618	1.50534	1.48917	0.970019	0.324099	4.4833E-2	4.61122E-2
20	74.2876	74.2866	74.1855	73.2795	65.3037	31.2412E-2	31.2412E-2

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 4 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.243655	0.243609	0.243622	0.144581	7.10106E-2	3.50222E-3	3.54812E-4
2	0.191085	0.181556	0.170026	0.157774	2.31215E-2	2.61148E-3	2.64571E-4
3	0.267926	0.267745	0.250951	0.157182	3.32581E-2	3.74809E-3	3.89908E-4
4	0.166484	0.165774	0.149980	0.149330E-2	1.97011E-2	2.22172E-3	2.26994E-4
5	0.100000	0.107943	0.100540	0.193120E-2	1.31785E-2	1.48693E-3	1.52296E-4
6	8.43193E-2	8.43003E-2	8.12250E-2	5.02500E-2	1.05258E-2	1.18512E-3	1.21462E-4
7	0.182612	0.182507	0.172435	0.108217	2.27954E-2	2.56630E-3	2.61160E-4
8	0.252085	0.252311	0.238115	0.151096	3.13054E-2	3.58065E-3	3.63713E-4
9	0.347329	0.347113	0.327309	0.210492	4.44220E-2	4.99918E-3	5.07214E-4
10	0.48710	0.486894	0.458618	0.298027	5.34041E-2	5.93041E-3	7.12731E-4
11	0.677567	0.677138	0.627451	0.418059	7.03820E-2	7.88965E-3	1.07749E-3
12	0.949674	0.949089	0.892122	0.588855	0.131263	1.48727E-2	1.56765E-3
13	1.31124	1.35630	1.27005	0.83838	0.194565	2.22911E-2	2.26204E-3
14	1.90107	1.89984	1.79634	1.17739	0.287894	3.37694E-2	3.42631E-3
15	2.67090	2.67425	2.51383	1.65264	0.423769	5.16639E-2	5.20953E-3
16	3.67722	3.67484	3.45415	2.26721	0.618017	8.15546E-2	8.43803E-3
17	5.1927	5.18933	4.87118	3.19645	0.910916	0.137067	1.45136E-2
18	7.29535	7.29254	6.94535	4.54589	1.31016	0.211473	2.54352E-2
19	10.1436	10.1369	0.5201	6.20303	1.94479	0.195969	2.70707E-2
20	192.72	192.718	192.456	190.105	169.414	81.121	13.0595

AGE = 4 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	9.93753E-2	2.93073E-2	9.29988E-2	5.99515E-2	1.20478E-2	1.42939E-3	1.44711E-4
2	8.09142E-2	8.08589E-2	7.57219E-2	4.80000E-2	1.02987E-2	1.16304E-3	1.17998E-4
3	0.110000	0.110949	0.154064	6.53999E-2	1.38115E-2	1.55631E-3	1.58665E-4
4	8.15000E-2	8.29461E-2	7.58589E-2	4.70118E-2	9.96060E-3	1.12311E-3	1.14647E-4
5	6.94531E-2	6.94089E-2	6.49357E-2	3.99320E-2	8.48662E-3	9.57298E-4	9.77419E-5
6	7.42707E-2	7.43430E-2	7.12711E-2	4.38910E-2	0.21105E-2	1.03989E-3	1.05977E-4
7	0.129728	0.129048	0.121686	7.62513E-2	1.60737E-2	1.81071E-3	1.83960E-4
8	0.161811	0.160981	0.151711	9.60583E-2	2.02380E-2	2.27881E-3	2.31285E-4
9	0.202019	0.202891	0.191127	0.129544	2.58751E-2	2.91247E-3	2.95383E-4
10	0.261788	0.261622	0.246295	0.159604	3.39485E-2	3.82194E-3	3.07440E-4
11	0.340619	0.340402	0.320359	0.21066	4.52892E-2	5.10580E-3	5.17330E-4
12	0.455818	0.455517	0.428555	0.282393	6.28422E-2	7.11965E-3	7.21632E-4
13	0.625867	0.625464	0.588219	0.39797	8.98832E-2	1.02947E-2	1.04464E-3
14	0.861851	0.861295	0.80982	0.535578	0.120295	1.52778E-2	1.55458E-3
15	1.19884	1.19884	1.12697	0.740548	0.189848	2.31399E-2	2.36639E-3
16	1.64196	1.6409	1.54236	1.01217	0.276007	3.64260E-2	3.76889E-3
17	2.32077	2.31923	2.17973	1.42866	0.407616	6.14001E-2	6.50264E-3
18	3.32521	3.32305	3.12289	2.04414	0.59019	0.104567	1.14951E-2
19	4.60959	4.60658	4.32717	2.81887	0.701999	8.90553E-2	9.18289E-3
20	92.8893	92.8881	92.7617	91.6288	81.6555	39.0995	6.29453

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 4 YEARS, LIGHT ACTIVITY
PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	6.61985E-2	6.61532E-2	6.19505E-2	3.92703E-2	8.42527E-3	9.51519E-4	9.63989E-5
2	7.84399E-2	7.83862E-2	7.34063E-2	4.65321E-2	9.98326E-3	1.12747E-3	1.14390E-4
3	8.57784E-2	8.57239E-2	8.06706E-2	5.09998E-2	1.07628E-2	1.21214E-3	1.23459E-4
4	0.106878	0.106811	0.100497	6.23675E-2	1.31879E-2	1.48657E-3	1.51169E-4
5	0.131378	0.131304	0.123465	7.57837E-2	1.60825E-2	1.81399E-3	1.84262E-4
6	0.185306	0.185217	0.176025	0.108625	2.29100E-2	2.58180E-3	2.61945E-4
7	0.267162	0.266992	0.251219	0.15716	3.31710E-2	3.73750E-3	3.78939E-4
8	0.294395	0.294207	0.27677	0.174717	3.68552E-2	4.15093E-3	4.20742E-4
9	0.324795	0.324586	0.305258	0.194721	4.11519E-2	4.63343E-3	4.69549E-4
10	0.356721	0.356491	0.335193	0.215862	4.58953E-2	5.16812E-3	5.23667E-4
11	0.393617	0.393364	0.369903	0.240642	5.18559E-2	5.84604E-3	5.92176E-4
12	0.457723	0.457428	0.4301	0.281746	6.23266E-2	7.05626E-3	7.15129E-4
13	0.54779	0.546937	0.514211	0.337886	7.76725E-2	8.88364E-3	9.01273E-4
14	0.679982	0.679542	0.638835	0.420068	0.101762	1.19060E-2	1.21116E-3
15	0.883235	0.882663	0.82967	0.54468	0.138725	1.68637E-2	1.72401E-3
16	1.15566	1.15481	1.08543	0.712158	0.193212	2.54232E-2	2.62948E-3
17	1.58947	1.58844	1.49288	0.978331	0.278343	4.18128E-2	4.26597E-3
18	2.24387	2.24241	2.10734	1.37935	0.397891	7.03964E-2	7.3705E-3
19	3.09402	3.092	2.90446	1.89207	0.471192	9.97752E-2	9.55053E-3
20	73.2234	73.2224	73.1228	72.2298	64.3682	30.8216	4.9619

AGE = 4 YEARS, LIGHT ACTIVITY
PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	7.81872E-2	7.81336E-2	7.31698E-2	4.63822E-2	9.95109E-3	1.12384E-3	1.13857E-4
2	1.82356	1.82231	1.70654	1.38177	0.22209	2.62114E-2	2.65932E-3
3	0.948979	0.949271	0.908586	0.595675	0.124431	1.39778E-2	1.41500E-3
4	3.72701	3.72483	3.51722	2.18551	0.461314	5.19863E-2	5.26615E-3
5	5.83725	5.83413	5.49749	3.37178	0.715108	8.65227E-2	8.17036E-3
6	9.06949	9.06462	8.58167	5.2995	1.1192	0.126149	1.27781E-2
7	11.8199	11.8115	11.0992	6.93658	1.4652	0.16511	1.67041E-2
8	11.0965	11.0978	11.2552	7.09078	1.49698	0.16863	1.70798E-2
9	11.0641	11.0563	11.7301	7.13666	1.50906	0.169951	1.72129E-2
10	11.4078	11.4003	10.7064	6.85323	1.45648	0.164047	1.66150E-2
11	10.4121	10.4053	9.77407	6.30728	1.35466	0.152716	1.54638E-2
12	9.65566	9.64932	9.06275	5.87004	1.28356	0.14514	1.47038E-2
13	8.29364	8.28818	7.78506	5.25714	1.17453	0.129179	1.30970E-2
14	6.92217	6.91764	6.49841	4.2295	0.982801	0.113634	1.15429E-2
15	5.75297	5.74921	5.40104	3.51772	0.805489	0.100271	1.02197E-2
16	4.57267	4.57069	4.2942	2.79973	0.703159	0.09293E-2	9.03993E-3
17	3.88177	3.87937	3.65699	2.25575	0.59009	0.11174E-2	8.47994E-3
18	2.99806	2.9961	2.8152	1.83866	0.5	7.99504E-2	8.64793E-3
19	2.72408	2.723	2.56187	1.66889	0.415614	5.27246E-2	5.42668E-3
20	142.907	142.899	142.704	142.961	125.619	60.1506	9.68249

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 8 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
"	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.478537	0.478209	0.487928	0.283878	6.09047E-2	6.87835E-3	6.96950E-4
2	0.16684	0.166509	0.16433	0.217617	4.66088E-2	5.27286E-3	5.34197E-4
3	0.524811	0.534452	0.501122	0.315801	6.68564E-2	7.52213E-3	7.63169E-4
4	0.203904	0.203777	0.284449	0.176951	3.74757E-2	4.22495E-3	4.28242E-4
5	0.106438	0.106302	0.183379	0.113114	2.40296E-2	2.71662E-3	2.74817E-4
6	0.149444	0.149365	0.144287	0.1251E-2	1.88266E-2	2.11232E-3	2.14723E-4
7	0.222368	0.222172	0.324054	0.192859	4.05934E-2	4.57066E-3	4.63001E-4
8	0.444094	0.443809	0.418368	0.28254	5.65871E-2	6.26884E-3	6.45126E-4
9	0.657294	0.666914	0.571811	0.371333	7.98926E-2	8.87989E-3	9.09400E-4
10	0.853867	0.853328	0.80048	0.52003	0.11292	1.27259E-2	1.28896E-3
11	1.10016	1.17941	1.10978	0.72992	0.161355	1.82492E-2	1.84885E-3
12	1.64943	1.64837	1.50571	1.2426	0.2353	2.60656E-2	2.72448E-3
13	2.34467	2.34316	2.20329	1.4528	0.34976	4.06909E-2	4.13572E-3
14	3.29717	3.2954	3.0777	2.03074	0.519599	6.26956E-2	6.39219E-3
15	4.63751	4.6345	4.35615	2.85889	0.760993	9.71600E-2	1.02023E-2
16	6.36678	6.36265	5.9801	3.92093	1.10043	0.15648	1.63957E-2
17	8.98700	8.98126	8.40059	5.52783	1.59816	0.267568	2.39961E-2
18	12.708	12.7736	12.0095	7.85724	2.26882	0.455549	5.19048E-2
19	17.5293	17.5179	16.4566	10.7493	2.73447	0.766408	3.97023E-2
20	262.94	262.935	362.441	258.015	319.048	152.771	24.5942

AGE = 8 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
"	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.192019	0.192557	0.190324	0.114307	2.45241E-2	2.76966E-3	2.91601E-4
2	0.156404	0.156297	0.146368	0.27823E-2	1.99060E-2	2.24811E-3	2.28087E-4
3	0.216127	0.215993	0.202601	0.127976	2.70659E-2	3.04929E-3	3.09737E-4
4	0.141769	0.141674	0.132821	8.27243E-2	1.75068E-2	1.97343E-3	2.00020E-4
5	0.111366	0.111293	0.104271	6.43069E-2	1.36452E-2	1.53899E-3	1.56002E-4
6	0.110593	0.110593	0.105918	6.60899E-2	1.38548E-2	1.56974E-3	1.58055E-4
7	0.199329	0.199205	0.187777	0.118875	2.50414E-2	2.81965E-3	2.85644E-4
8	0.252976	0.252837	0.229102	0.152971	3.22030E-2	3.63294E-3	3.68086E-4
9	0.325051	0.324846	0.305802	0.198167	4.20859E-2	4.73757E-3	4.78842E-4
10	0.42749	0.427218	0.42047	0.262045	0.56546	6.37272E-3	6.45462E-4
11	0.564497	0.564136	0.50749	0.349073	7.69591E-2	8.70316E-3	8.81714E-4
12	0.763277	0.763287	0.71719	0.473719	0.108629	1.23991E-2	1.25738E-3
13	1.08002	1.05734	0.994195	0.655243	0.157506	1.83172E-2	1.86164E-3
14	1.46661	1.46566	1.37787	0.906425	0.230403	2.78003E-2	2.83882E-3
15	2.08867	2.04734	1.92437	1.26292	0.326103	4.29083E-2	4.41723E-3
16	2.80943	2.8076	2.6388	1.73022	0.485829	6.91115E-2	7.24175E-3
17	3.97578	3.9732	3.74403	2.44559	0.707979	0.118736	1.28660E-2
18	5.69799	5.69429	5.35114	3.5072	1.01269	0.204087	2.32876E-2
19	7.89988	7.89472	7.41644	4.8286	1.23234	0.165128	1.72167E-2
20	178.144	178.141	177.899	175.726	156.6	74.9854	12.0717

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 8 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.128333	0.128245	0.120098	7.61298E-2	1.63333E-2	1.84462E-3	1.87150E-6
2	0.134695	0.134603	0.126052	7.99039E-2	1.71430E-2	1.93607E-3	1.96427E-6
3	0.158269	0.158166	0.148628	9.44051E-2	1.99706E-2	2.24917E-3	2.27880E-6
4	0.160285	0.160182	0.150614	9.40757E-2	1.98733E-2	2.23951E-3	2.26921E-6
5	0.180123	0.180015	0.169452	0.164447	2.21239E-2	2.49469E-3	2.52771E-6
6	0.249777	0.249752	0.229738	0.143195	0.030121	3.39262E-3	3.43675E-6
7	0.356823	0.356596	0.335559	0.211842	4.46772E-2	5.03180E-3	5.09678E-6
8	0.401889	0.401631	0.377801	0.290751	5.08488E-2	5.72522E-3	5.79878E-6
9	0.451611	0.451321	0.424455	0.273322	5.80539E-2	6.53654E-3	6.62044E-6
10	0.511091	0.510762	0.480253	0.311791	6.69539E-2	7.55024E-3	7.64713E-6
11	0.591876	0.591501	0.546793	0.357804	7.85506E-2	8.87993E-3	8.99582E-6
12	0.698549	0.698098	0.656361	0.411226	0.098131	1.11872E-2	1.13433E-3
13	0.86477	0.864211	0.812847	0.534129	0.127327	1.47771E-2	1.50151E-3
14	1.10593	1.10522	1.03893	0.682611	0.172223	2.07235E-2	2.11549E-3
15	1.46558	1.46463	1.37661	0.902956	0.239994	3.04204E-2	3.13649E-3
16	1.94296	1.9426	1.82577	1.19685	0.334838	4.78966E-2	4.97429E-3
17	2.69786	2.6961	2.5338	1.65937	0.479487	8.02207E-2	8.68958E-3
18	3.82761	3.82512	3.59461	2.35188	0.674967	0.136902	1.56191E-2
19	5.29118	5.28772	4.96738	3.2341	0.825393	0.110599	1.15114E-2
20	143.699	143.697	143.502	141.749	126.321	60.4868	9.73761

AGE = 8 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.181408	0.181294	0.169767	0.167615	2.30883E-2	2.60751E-3	2.64168E-6
2	2.42023	2.41857	2.26492	1.43573	0.300029	3.47877E-2	3.52436E-3
3	1.71492	1.71423	1.25138	0.83215	0.175358	1.97022E-2	1.99482E-3
4	4.87724	4.8743	4.60064	2.88426	0.607891	6.84753E-2	6.93549E-3
5	7.62639	7.62211	7.19552	4.43362	0.938129	0.105769	1.07138E-2
6	11.8783	11.8721	11.2393	7.00174	1.47525	0.166201	1.68339E-2
7	15.6612	15.6511	14.7115	9.27082	1.95668	0.220406	2.22355E-2
8	16.1504	16.1399	15.1666	9.62583	2.03642	0.22933	2.32265E-2
9	16.2497	16.2391	15.2554	9.77138	2.0751	0.233699	2.36696E-2
10	15.6607	15.6504	14.7	9.47207	2.02981	0.228776	2.31706E-2
11	14.7444	14.7349	13.4665	8.7322	1.90774	0.21496	2.17747E-2
12	12.3813	12.3726	12.5612	8.16087	1.82055	0.206878	2.09969E-2
13	11.5726	11.565	10.8641	7.69889	1.62709	0.197156	1.89981E-2
14	9.73997	9.73357	9.14436	5.95811	1.4262	0.181887	1.71280E-2
15	8.17739	8.17704	7.67704	5.00486	1.24699	0.152144	1.55826E-2
16	6.63355	6.63122	6.23043	4.07536	1.05292	0.119552	1.44822E-2
17	5.56355	5.55993	5.22411	3.41105	0.916517	0.138181	1.47344E-2
18	4.86563	4.86246	4.569	2.99523	0.826931	0.150588	1.68897E-2
19	4.83346	4.8303	4.53767	2.95434	0.754992	0.101032	1.05329E-2
20	298.692	298.683	297.682	294.046	262.042	125.475	20.1999

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 12 YEARS, LIGHT ACTIVITY
PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	J.73770	J.733077	0.686524	0.436196	9.32672E-2	7.05446E-2	1.06932E-5
2	0.573752	0.573359	0.536934	0.340361	7.30230E-2	8.26495E-3	8.36769E-6
3	0.830168	0.829613	0.778661	0.49213	0.104288	1.17495E-2	4.05206E-4
4	0.453214	0.452926	0.424901	0.264782	5.60436E-2	6.31716E-3	3.99110E-4
5	0.202878	0.202634	0.264262	0.163324	3.46619E-2	3.90936E-3	3.95419E-4
6	0.216642	0.216564	0.202911	0.12812	2.67280E-2	3.00617E-3	3.04465E-4
7	0.454927	0.454617	0.428757	0.273686	5.76566E-2	6.48977E-3	3.96173E-4
8	0.623401	0.623071	0.597058	0.378674	8.11477E-2	9.01668E-3	3.98151E-4
9	0.856243	0.849708	0.800212	0.522143	0.111653	1.25731E-2	4.00814E-4
10	1.19773	1.18597	1.11633	0.732999	0.159637	1.80159E-2	4.05379E-4
11	1.64314	1.64209	1.54482	1.01399	0.22849	2.59267E-2	4.12720E-4
12	2.29477	2.2933	2.15683	1.42422	0.334445	3.80425E-2	4.24766E-4
13	3.25976	3.25726	3.06249	2.1725	0.497164	5.36160E-2	4.44936E-4
14	4.577	4.57404	4.29970	2.82628	0.736367	9.10072E-2	4.78126E-4
15	6.43572	6.43155	6.04497	3.96459	1.0769	0.142599	5.32462E-4
16	8.83064	8.8249	8.29401	5.43519	1.54614	0.232351	6.31612E-4
17	12.4645	12.4525	11.7025	7.6614	2.22442	0.400993	8.31370E-4
18	17.7262	17.7147	16.6469	10.8891	3.13999	0.684669	8.18324E-4
19	24.2812	24.2653	22.7961	14.8499	4.83726	0.525421	4.89776E-4
20	515.383	515.376	514.675	568.389	453.056	216.938	0.374358

AGE = 12 YEARS, LIGHT ACTIVITY
PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.29222	0.292091	0.273535	0.173393	3.72008E-2	4.20132E-3	4.26253E-6
2	0.238405	0.238241	0.223106	0.141427	3.07424E-2	3.42676E-3	3.47669E-6
3	0.329985	0.329765	0.309359	0.195924	4.15209E-2	4.67767E-3	4.73655E-6
4	0.201938	0.201807	0.19213	0.11823	2.50103E-2	2.81880E-3	2.85541E-6
5	0.149262	0.149164	0.139817	8.64303E-2	1.83231E-2	2.06627E-3	2.09326E-6
6	0.141398	0.141325	0.135266	8.51781E-2	1.78282E-2	2.00621E-3	2.03192E-6
7	0.260948	0.260785	0.245742	0.156559	3.30003E-2	3.71499E-3	3.76256E-6
8	0.37576	0.375148	0.35609	0.203166	4.29903E-2	4.83895E-3	4.90069E-6
9	0.433337	0.433022	0.407640	0.265383	5.67257E-2	6.38911E-3	6.46987E-6
10	0.574616	0.574249	0.540317	0.354215	7.70662E-2	8.69688E-3	8.80954E-6
11	0.765738	0.764717	0.719343	0.473913	0.106134	1.20411E-2	1.22026E-6
12	1.04144	1.04077	0.97878	0.645822	0.151249	1.73870E-2	1.76471E-6
13	1.44656	1.44863	1.36198	0.896865	0.22075	2.60167E-2	2.64854E-6
14	2.01298	2.01298	1.89228	1.24369	0.323803	4.00622E-2	4.09836E-6
15	2.81955	2.81772	2.64836	1.73694	0.471843	6.24778E-2	6.46854E-6
16	3.8706	3.86809	3.6354	2.38242	0.678177	0.101981	1.07980E-6
17	5.49093	5.47737	5.14753	3.37015	0.979846	0.177077	1.95354E-6
18	7.8592	7.85409	7.39069	4.82809	1.39402	0.305101	3.65275E-6
19	10.895	10.8879	10.2286	6.66316	1.72178	0.240245	2.19763E-6
20	252.135	252.131	251.788	248.713	221.643	106.13	0.183142

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 12 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.194702	0.194569	0.182208	0.115501	2.47803E-2	2.79860E-3	2.83528E-4
2	0.192747	0.192615	0.180378	0.114341	2.45314E-2	2.77049E-3	2.83937E-4
3	0.235223	0.235069	0.220772	0.140553	2.97940E-2	3.35583E-3	2.81085E-4
4	0.207428	0.207294	0.194813	0.122151	2.58005E-2	2.90700E-3	2.94797E-4
5	0.217278	0.217146	0.204426	0.126415	2.67496E-2	3.01573E-3	1.20926E-4
6	0.282356	0.282206	0.268089	0.168311	3.53575E-2	3.98104E-3	3.05488E-4
7	0.424019	0.423794	0.398719	0.253165	5.34153E-2	6.01463E-3	4.03208E-4
8	0.482403	0.482094	0.457474	0.290654	6.15252E-2	6.92678E-3	1.23892E-4
9	0.550139	0.549786	0.517052	0.334683	7.14639E-2	8.04914E-3	7.01527E-4
10	0.634287	0.633878	0.596021	0.388552	8.42684E-2	9.63132E-3	8.15217E-4
11	0.738938	0.738462	0.69436	0.455461	0.101474	1.15052E-2	9.63132E-4
12	0.904198	0.903615	0.849558	0.558612	0.129757	1.48924E-2	1.16588E-3
13	1.14202	1.14128	1.07287	0.705189	0.17217	2.02427E-2	1.51126E-3
14	1.48319	1.48223	1.39327	0.914919	0.236602	2.91463E-2	2.06019E-3
15	1.98795	1.98666	1.86721	1.22416	0.330998	4.36959E-2	2.98478E-3
16	2.65597	2.65424	2.49454	1.63452	0.463936	6.95680E-2	4.52224E-3
17	3.7036	3.7012	3.4783	2.27717	0.661199	0.119202	7.36324E-3
18	5.27058	5.26715	4.94967	3.23782	0.934657	0.204444	0.013151
19	7.29464	7.28988	6.8485	4.46126	1.15281	0.160854	2.44739E-2
20	204.148	204.145	203.867	201.378	179.459	85.9312	1.69280E-2
							13.8338
							0.148286

AGE = 12 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.368011	0.3678	0.288245	0.182718	3.92614E-2	4.42726E-3	4.49176E-4
2	2.84082	2.83888	2.65953	1.68523	0.361559	4.08332E-2	4.14281E-3
3	1.60868	1.6078	1.52643	1.02602	0.216717	2.43632E-2	2.46625E-3
4	5.60053	5.59712	5.28040	3.32982	0.701573	7.90085E-2	8.00205E-3
5	8.74278	8.73778	8.25321	5.1051	1.07871	6.12158E-2	1.23159E-2
6	13.7197	13.7119	12.9754	8.12339	1.71187	1.02803	1.95276E-2
7	18.1707	18.1589	17.0685	10.8116	2.28274	0.257083	2.60377E-2
8	18.7773	18.7651	17.634	11.2604	2.38434	0.268492	2.71925E-2
9	18.9727	18.9603	17.8127	11.4587	2.444	0.275318	2.78846E-2
10	18.3567	18.3383	17.2261	11.1377	2.40412	0.274206	2.74711E-2
11	16.9133	16.9023	15.8791	10.3195	2.27151	0.257423	2.60824E-2
12	15.794	15.7837	14.8269	9.64452	2.18272	0.249209	2.52752E-2
13	13.6384	13.6294	12.851	8.36935	1.95462	0.227479	2.31180E-2
14	11.5926	11.5851	10.8842	7.09574	1.72143	0.207684	2.11995E-2
15	9.94547	9.93905	9.24413	6.02941	1.52382	0.190017	1.97519E-2
16	8.1725	8.172	7.63622	4.98473	1.31447	0.182402	1.90990E-2
17	7.05944	7.05494	6.62961	4.32961	1.18058	0.180904	1.87122E-2
18	6.02712	6.02287	6.12928	4.00546	1.11909	0.223069	2.57598E-2
19	6.8765	6.87156	6.4555	4.20526	1.08665	0.151624	1.59566E-2
20	448.659	448.653	448.643	442.571	394.401	188.852	30.4029
							0.325891

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 16 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	1.00912	1.00843	0.944366	0.59632	0.128434	1.45048E-2	1.46949E-3
2	0.802297	0.801747	0.750813	0.475939	0.102111	1.15320E-2	1.16931E-3
3	1.15168	1.15091	1.07955	0.684539	0.145233	1.63626E-2	1.65713E-3
4	0.60908	0.608668	0.570355	0.356785	7.54967E-2	8.50883E-3	8.61867E-4
5	0.370929	0.370675	0.346795	0.21467	4.55276E-2	5.13425E-3	5.20093E-4
6	0.270909	0.2708	0.26046	0.165769	3.45691E-2	3.98694E-3	4.09149E-4
7	0.584931	0.584468	0.550972	0.353231	7.45093E-2	8.38599E-3	8.49286E-4
8	0.797642	0.797141	0.750823	0.486186	0.103173	1.16130E-2	1.17609E-3
9	1.08435	1.08366	1.02028	0.667773	0.143657	1.61866E-2	1.63895E-3
10	1.51184	1.51088	1.42164	0.935192	0.205553	2.32319E-2	2.35347E-3
11	2.08849	2.08714	1.96324	1.29534	0.294172	3.34853E-2	3.39466E-3
12	2.9116	2.90972	2.7363	1.8059	0.430549	4.98411E-2	5.06259E-3
13	4.13428	4.13161	3.88431	2.55665	0.641011	7.64866E-2	7.79871E-3
14	5.80197	5.79822	5.45031	3.5802	0.948989	0.119581	1.22868E-2
15	8.15391	8.14862	7.65862	5.32079	1.38155	0.188506	1.96142E-2
16	11.183	11.1758	10.5032	6.88071	1.97221	0.309687	3.30817E-2
17	15.7845	15.7743	14.8241	9.70288	2.82033	0.537401	6.01969E-2
18	22.4552	22.4406	21.0878	13.7923	3.96849	0.917226	1.12683E-1
19	30.7709	30.7507	28.8895	18.8255	4.90352	0.706336	7.49329E-2
20	675.793	675.781	674.587	663.919	573.268	242.356	35.786

AGE = 16 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.396848	0.396576	0.371382	0.235418	5.05079E-2	5.70418E-3	5.77894E-4
2	0.326861	0.326637	0.305886	0.1939	4.16004E-2	4.69820E-3	4.76665E-4
3	0.450649	0.450349	0.422519	0.268235	5.69198E-2	6.41264E-3	6.49441E-4
4	0.264597	0.26442	0.247956	0.155328	3.28521E-2	3.70219E-3	3.74994E-4
5	0.18955	0.189425	0.177614	0.11001	2.33064E-2	2.62791E-3	2.66199E-4
6	0.175034	0.174953	0.167274	0.106606	2.21874E-2	2.49603E-3	2.52778E-4
7	0.32575	0.325546	0.306676	0.196223	4.14075E-2	4.66097E-3	4.72043E-4
8	0.418845	0.41858	0.394087	0.254684	5.40454E-2	6.08379E-3	6.16134E-4
9	0.541991	0.541646	0.5098	0.332935	7.15733E-2	8.06504E-3	8.16614E-4
10	0.720484	0.720023	0.677378	0.444879	9.76654E-2	1.10373E-2	1.11810E-3
11	0.956029	0.954674	0.902625	0.594969	0.134921	1.53547E-2	1.55659E-3
12	1.30772	1.30688	1.22893	0.810541	0.192883	2.23191E-2	2.26695E-3
13	1.82278	1.8216	1.71253	1.12692	0.282187	3.36568E-2	3.43154E-3
14	2.53413	2.53249	2.38052	1.56361	0.413801	5.21755E-2	5.36078E-3
15	3.54776	3.54546	3.33226	2.18457	0.601219	8.20429E-2	8.53678E-3
16	4.87024	4.86707	4.57418	2.99667	0.85952	0.135068	1.44299E-2
17	6.89933	6.89485	6.47954	4.2413	1.23444	0.235782	2.64207E-2
18	9.8936	9.88716	9.29113	6.07704	1.75113	0.406566	4.88985E-2
19	13.719	13.7101	12.8802	8.39327	2.18621	0.314917	3.34085E-2
20	326.363	326.357	325.78	320.629	276.85	117.042	17.2823

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 16 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.263969	0.263788	0.24703	0.156592	3.35960E-2	3.79421E-3	3.84394E-4
2	0.257223	0.257047	0.240717	0.15259	3.27375E-2	3.69725E-3	3.74571E-4
3	0.317458	0.317249	0.297908	0.190035	4.03559E-2	4.54590E-3	4.60378E-4
4	0.261706	0.261536	0.245743	0.154538	3.26425E-2	3.67747E-3	3.72476E-4
5	0.264809	0.264646	0.249144	0.154481	3.26688E-2	3.68208E-3	3.72968E-4
6	0.337714	0.337532	0.320473	0.202317	4.24769E-2	4.78146E-3	4.84253E-4
7	0.511429	0.511102	0.480858	0.306541	6.47358E-2	7.28859E-3	7.38172E-4
8	0.583486	0.583111	0.548452	0.352858	7.48762E-2	8.43034E-3	8.53797E-4
9	0.668666	0.668236	0.62841	0.408039	8.75680E-2	9.86756E-3	9.99134E-4
10	0.775172	0.774672	0.728367	0.475818	0.104031	1.17530E-2	1.19059E-3
11	0.907966	0.90738	0.853142	0.560125	0.126263	1.43571E-2	1.45532E-3
12	1.11747	1.11675	1.04989	0.690334	0.162824	1.88033E-2	1.90944E-3
13	1.42023	1.41931	1.33418	0.876566	0.217664	2.58883E-2	2.63864E-3
14	1.85207	1.85087	1.73972	1.14187	0.300181	3.77245E-2	3.87444E-3
15	2.48942	2.48781	2.33816	1.53238	0.419858	0.057107	5.93961E-3
16	3.3319	3.32974	3.12933	2.04985	0.586393	9.18774E-2	9.81166E-3
17	4.6534	4.65038	4.37026	2.86051	0.831611	0.158512	1.77565E-2
18	6.62719	6.62288	6.22363	4.07066	1.1728	0.272163	3.27308E-2
19	9.17814	9.17215	8.617	5.61518	1.4626	0.210682	2.23506E-2
20	264.052	264.047	263.58	259.412	223.992	54.6955	13.9826

AGE = 16 YEARS, LIGHT ACTIVITY
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.444435	0.444131	0.415916	0.263648	5.65645E-2	6.38819E-3	6.47191E-4
2	3.44441	3.44205	3.22338	2.04329	0.438379	4.95090E-2	5.01578E-3
3	2.00002	1.99889	1.8947	1.26962	0.271633	3.05556E-2	3.09389E-3
4	6.70442	6.7003	6.31496	4.00172	0.843274	9.49514E-2	9.61656E-3
5	10.4285	10.4224	9.84469	6.10965	1.28982	0.145359	1.47233E-2
6	16.3559	16.3465	15.4626	9.73849	2.04867	0.230686	2.33639E-2
7	21.7552	21.7411	20.4352	12.9918	2.74516	0.309131	3.13086E-2
8	22.5026	22.4879	21.1326	13.5411	2.87334	0.323568	3.27705E-2
9	22.7964	22.7815	21.4031	13.8066	2.95701	0.333233	3.37417E-2
10	22.0493	22.0349	20.6992	13.4097	2.91297	0.328932	3.33193E-2
11	20.3098	20.2966	19.0684	12.4072	2.75868	0.313056	3.17270E-2
12	19.0161	19.0037	17.8523	11.6205	2.65971	0.30503	3.09520E-2
13	16.5243	16.5135	15.5138	10.1077	2.397	0.280568	2.85437E-2
14	14.0197	14.0105	13.1632	8.58814	2.12308	0.258458	2.64400E-2
15	11.9722	11.9644	11.2412	7.33392	1.87716	0.242032	2.49935E-2
16	9.98469	9.97819	9.37551	6.12129	1.63133	0.234725	2.47577E-2
17	8.81212	8.80638	8.27478	5.40549	1.48423	0.252686	2.77917E-2
18	8.34509	8.33966	7.83647	5.12137	1.43508	0.304112	3.59575E-2
19	9.0042	8.99832	8.45369	5.50876	1.43488	0.206689	0.021927
20	607.81	607.799	606.725	597.131	515.599	217.976	32.186

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 32 YEAR, LIGHT ACTIVITY
PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT	70	0.7	0.07	0.007	0.0007	0.00007
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	1.22664	1.32572	1.24451	0.786992	0.168845	1.906882-2
2	1.72208	1.72208	1.72208	0.626503	0.136576	1.542442-2
3	1.72208	1.72208	1.61523	1.02753	0.218515	2.462192-2
4	0.949771	0.949771	0.796945	0.406604	0.105078	1.104082-2
5	0.400554	0.400554	0.4061516	0.20759	0.04708-2	6.304708-2
6	0.230543	0.329406	0.329406	0.209643	4.270132-2	4.912218-3
7	0.754152	0.750582	0.71022	0.455642	0.648855-2	1.095108-2
8	1.00003	1.00004	0.941939	0.61726	0.130945	1.474465-2
9	1.26167	1.3608	1.28074	0.840942	0.182902	2.362452-2
10	1.90001	1.8026	1.77402	1.16704	0.260715	2.956062-2
11	2.50005	2.59799	2.4423	1.61183	0.371993	4.283752-2
12	3.10001	3.60789	3.10225	2.22593	0.545455	6.300592-2
13	5.00012	5.00283	4.77919	3.14165	0.816191	9.816332-2
14	7.10007	7.11102	6.68404	4.29717	1.10717	1.390952-2
15	9.00003	9.00081	8.39456	6.15361	1.71595	2.595912-2
16	10.0000	12.6774	12.054	8.44727	2.43039	4.409762-2
17	10.0000	19.204	18.1221	11.0582	3.44469	6.710042-2
18	27.4000	27.4139	25.7609	16.9458	4.82885	9.151461
19	37.4000	37.4472	35.1917	22.5754	6.93544	1.292622-2
20	90.0000	90.0573	80.0142	75.363	68.0765	42.871

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AGE = 32 YEAR, LIGHT ACTIVITY
PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT	70	0.7	0.07	0.007	0.0007	0.00007
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.512204	0.512553	0.479991	0.24265	6.527882-2	7.372342-3
2	0.427439	0.427146	0.40004	0.253565	5.440132-2	7.408902-4
3	0.652626	0.659109	0.618495	0.393766	8.376132-2	6.224412-4
4	0.340101	0.347868	0.326235	0.265099	4.328572-2	9.508822-4
5	0.222132	0.22979	0.218418	0.15647	4.328572-2	4.951432-4
6	0.197214	0.197221	0.188593	0.121032	2.872152-2	3.279942-4
7	0.196154	0.19591	0.186348	0.233752	2.529542-2	2.844112-3
8	0.492855	0.490543	0.461759	0.360186	4.946612-2	2.900042-4
9	0.646041	0.644629	0.606579	0.397623	6.406152-2	5.629062-4
10	0.860253	0.860253	0.809191	0.52927	7.216622-2	7.300142-4
11	1.15009	1.15714	1.08837	0.717552	8.639652-2	9.873182-4
12	1.59223	1.58121	1.49671	0.979556	0.119944	1.365362-3
13	2.26704	2.26162	2.06964	1.36064	0.166222	1.904122-2
14	3.06497	3.06497	2.80091	1.80089	2.279462-2	2.794672-3
15	4.30434	4.31154	4.04274	2.69	4.247072-2	4.342112-3
16	5.90506	5.90573	5.50519	3.63461	0.511559	6.893272-3
17	8.27562	8.27562	7.86587	5.14735	0.740908	1.144082-2
18	12.0144	12.0144	11.29	7.38319	1.49744	3.577862-2
19	16.6505	16.6396	15.6329	10.1911	2.11054	6.693122-2
20	385.665	385.658	384.378	378.3	2.68183	4.369582-2
					126.647	20.3908

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 32 YEAR, LIGHT ACTIVITY
PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT-	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.34039	0.340156	0.318546	0.201926	4.33223E-2	4.89266E-3	4.96394E-4
2	0.327115	0.326891	0.306124	0.194051	4.16329E-2	4.76186E-3	4.77369E-4
3	0.455091	0.45479	0.426917	0.272678	5.80678E-2	6.54281E-3	6.24601E-4
4	0.310579	0.310375	0.291489	0.183967	3.88842E-2	4.38023E-3	4.47646E-4
5	0.284452	0.284273	0.267429	0.166419	3.51705E-2	3.96396E-3	4.1509E-4
6	0.33987	0.339686	0.322661	0.205694	4.31492E-2	4.85488E-3	4.91657E-4
7	0.54072	0.540373	0.508231	0.325605	6.89273E-2	7.76034E-3	7.85942E-4
8	0.668376	0.667986	0.571881	0.370182	7.99706E-2	8.89372E-3	8.95740E-4
9	0.719795	0.718332	0.675487	0.440446	9.54310E-2	1.07659E-2	1.09044E-3
10	0.846877	0.84633	0.795746	0.521855	0.115764	1.31163E-2	1.32914E-3
11	1.01795	1.01929	0.958315	0.629869	0.144974	1.65869E-2	1.68246E-3
12	1.27971	1.27888	1.20227	0.790489	0.190997	2.23176E-2	2.24927E-3
13	1.6573	1.65623	1.55683	1.02243	0.260297	3.15943E-2	3.15443E-3
14	2.19599	2.19456	2.0627	1.35319	0.364055	4.74409E-2	4.8757E-3
15	2.98488	2.98294	2.80343	1.83657	0.511824	7.31291E-2	7.67264E-3
16	4.01874	4.01613	3.77432	2.47147	0.712951	0.119672	1.29763E-2
17	5.63709	5.63343	5.294	3.46427	1.00714	0.208944	2.40228E-2
18	8.05621	8.05097	7.56554	4.94757	1.42037	0.358582	4.48579E-2
19	11.1607	11.1531	10.4783	6.83095	1.79756	0.27224	2.92878E-2
20	370.389	370.384	309.835	304.936	263.3	111.313	16.4364

AGE = 32 YEAR, LIGHT ACTIVITY
PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT-	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.620599	0.620174	0.590774	0.368152	7.89853E-2	8.92021E-3	9.03700E-4
2	4.00185	3.99911	3.74505	2.37391	0.509327	5.75215E-2	5.82754E-3
3	2.40328	2.40184	2.26926	1.51145	0.326375	3.67642E-2	3.72320E-3
4	6.60138	6.59728	6.21807	3.90242	0.835845	9.40983E-2	9.52995E-3
5	10.1327	10.1262	9.56234	5.3636	1.25774	0.14709	1.43530E-2
6	15.90	15.9037	15.1175	9.59701	2.07788	0.227137	2.30034E-2
7	21.0472	21.043	20.6149	13.0952	2.77295	0.312259	3.16250E-2
8	21.7381	21.7339	20.4637	13.1826	2.81008	0.316517	3.20569E-2
9	22.5169	22.5021	21.1403	13.6804	2.7521	0.333996	3.37265E-2
10	24.5587	24.5447	20.2399	13.1455	2.88872	0.326911	3.31233E-2
11	19.3535	19.3405	18.7343	12.2039	2.75547	0.314137	3.18521E-2
12	18.5088	18.5867	17.4616	11.2773	2.6516	0.306705	3.11572E-2
13	16.7486	16.7779	15.3872	10.0329	2.40783	0.288542	2.94163E-2
14	14.2339	14.2339	13.2735	9.72537	2.20134	0.275039	2.82485E-2
15	12.3025	12.3844	11.6361	7.59462	1.97987	0.265611	2.76240E-2
16	9.85995	10.6468	9.36644	6.50049	1.76358	0.230324	2.39127E-2
17	16.0139	9.85253	9.25796	6.04942	1.60118	0.313209	3.58490E-2
18	11.4784	10.0119	9.40791	6.14909	1.73212	0.409976	5.12640E-2
19	11.4709	11.4709	10.777	7.02564	1.84879	0.279998	3.12205E-2
20	774.249	774.256	772.897	763.666	656.805	277.672	41.0007

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 0 YEARS, RESTING
PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	3.92377E-2	3.67450E-2	2.32926E-2	4.99732E-3	5.64770E-4	5.71776E-5	5.72601E-7
2	2.49156E-2	2.47986E-2	2.32231E-2	1.47211E-2	3.15834E-3	3.61367E-5	3.61988E-7
3	3.90669E-2	3.90401E-2	3.65383E-2	2.26836E-2	4.80684E-3	5.87826E-5	5.88275E-7
4	2.54834E-2	2.54656E-2	2.37464E-2	1.46384E-2	3.11264E-3	3.90887E-5	3.92547E-7
5	1.86909E-2	1.86776E-2	1.73037E-2	1.06619E-2	2.27375E-3	2.91857E-5	2.93547E-7
6	1.52293E-2	1.52287E-2	1.47361E-2	9.91270E-3	1.87873E-3	2.11741E-4	2.13051E-6
7	3.22788E-2	3.22609E-2	3.04759E-2	1.88414E-2	3.97819E-3	4.48371E-4	4.50530E-6
8	4.52773E-2	4.52522E-2	4.27522E-2	2.66609E-2	5.62653E-3	6.33248E-4	6.35484E-6
9	6.12793E-2	6.12332E-2	5.79420E-2	3.65515E-2	7.68985E-3	8.65818E-4	8.68983E-6
10	8.62364E-2	8.62032E-2	8.13672E-2	5.20314E-2	1.09651E-2	1.29417E-3	1.30594E-6
11	0.118718	0.118644	0.111786	7.23569E-2	1.52372E-2	1.72617E-3	1.74271E-6
12	0.163715	0.163612	0.154044	0.106021	2.16730E-2	2.44189E-3	2.46012E-6
13	0.227113	0.226958	0.213553	0.140621	3.10359E-2	3.51016E-3	3.52239E-6
14	0.312621	0.31342	0.29477	0.194333	4.46643E-2	5.09310E-3	5.10070E-6
15	0.427055	0.42678	0.401239	0.263992	6.31884E-2	7.34324E-3	7.47811E-6
16	0.562097	0.561723	0.528035	0.346973	8.81210E-2	1.06574E-2	1.09013E-5
17	0.748993	0.748434	0.703437	0.461232	0.123679	1.46943E-2	1.56332E-5
18	0.986631	0.979984	0.926947	0.602739	0.166536	2.40347E-2	2.54301E-5
19	1.20089	1.201	1.1271	0.732948	0.174755	2.68769E-2	2.12497E-5
20	6.59393	6.59384	6.58487	6.50444	5.79649	2.77556	4.78961E-5

AGE = 0 YEARS, RESTING
PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.015869	1.48599E-2	9.41970E-3	2.02095E-3	2.28239E-4	2.31230E-5	2.31564E-7
2	1.04746E-2	9.90311E-3	6.21798E-3	1.32404E-3	1.50662E-4	1.52636E-5	1.52856E-7
3	1.58567E-2	1.58450E-2	1.48316E-2	9.20810E-3	1.95120E-3	2.20062E-4	2.43799E-5
4	1.04703E-2	1.04630E-2	9.75942E-3	6.01574E-3	1.27904E-3	1.44297E-4	1.65141E-5
5	7.88921E-3	7.88367E-3	7.30708E-3	4.50117E-3	9.59824E-4	1.08325E-4	1.26946E-5
6	6.05143E-3	6.05110E-3	6.42958E-3	3.89061E-3	8.20310E-4	9.24551E-5	1.09277E-5
7	1.38475E-2	1.38398E-2	1.30979E-2	8.09778E-3	1.70977E-3	1.92704E-4	2.09421E-5
8	1.94385E-2	1.94270E-2	1.83544E-2	1.14463E-2	2.41300E-3	2.71865E-4	2.88360E-5
9	2.63449E-2	2.63292E-2	2.48762E-2	1.57201E-2	3.30719E-3	3.72363E-4	3.89045E-5
10	3.71896E-2	3.71667E-2	3.50516E-2	2.24182E-2	4.72421E-3	5.31722E-4	5.49479E-5
11	5.14136E-2	5.13815E-2	4.84153E-2	3.13486E-2	6.64476E-3	7.47845E-4	7.67540E-5
12	7.4496E-2	7.44244E-2	7.2527E-2	4.40268E-2	9.46824E-3	1.06678E-3	1.09966E-4
13	0.100211	0.100148	9.42394E-2	6.20976E-2	1.37132E-2	1.55103E-3	1.58019E-4
14	0.140444	0.140354	0.132011	8.71215E-2	8.71215E-2	2.00192E-2	2.28643E-3
15	0.194963	0.194837	0.181817	0.120621	2.89484E-2	3.36643E-3	3.42969E-4
16	0.263251	0.263081	0.247316	0.162636	4.15048E-2	5.02883E-3	5.14600E-4
17	0.362566	0.362311	0.340564	0.223458	6.04006E-2	7.89728E-3	8.16772E-4
18	0.497156	0.496833	0.466922	0.305767	8.53939E-2	1.24526E-2	1.31181E-3
19	0.647971	0.647546	0.608155	0.395482	9.42937E-2	1.12377E-2	1.14659E-3
20	5.18522	5.18515	5.1781	5.11486	4.55815	2.18259	0.35137

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 0 YEARS, RESTING
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	1.12499E-2	1.12421E-2	1.05279E-2	6.67364E-3	1.43180E-3	1.61702E-4	1.64058E-7
2	7.83083E-3	7.82546E-3	7.32832E-3	4.64541E-3	9.9651E-4	1.12558E-4	1.14198E-7
3	1.14334E-2	1.14256E-2	1.06967E-2	6.64209E-3	1.40726E-3	1.58669E-4	1.75847E-5
4	7.82140E-3	7.81602E-3	7.29489E-3	4.49592E-3	9.55711E-4	1.07817E-4	1.22913E-5
5	6.23588E-3	6.23166E-3	5.78328E-3	3.55984E-3	7.58894E-4	8.56455E-5	9.91863E-6
6	5.75219E-3	5.75141E-3	5.53455E-3	3.35646E-3	7.08475E-4	7.98611E-5	9.21760E-6
7	1.10904E-2	1.10841E-2	1.04805E-2	6.47973E-3	1.36864E-3	1.54264E-4	1.66529E-5
8	1.50761E-2	1.50670E-2	1.42258E-2	8.86919E-3	1.87036E-3	2.10738E-4	2.22834E-5
9	1.98277E-2	1.98158E-2	1.87134E-2	1.18191E-2	2.48724E-3	2.80059E-4	3.66982E-6
10	2.72945E-2	2.72777E-2	2.57184E-2	1.64379E-2	3.46459E-3	3.89965E-4	4.02865E-5
11	3.69669E-2	3.69438E-2	3.48071E-2	2.25266E-2	4.77487E-3	5.37408E-4	5.51596E-5
12	5.07962E-2	5.07641E-2	4.77963E-2	3.12776E-2	6.72569E-3	7.57779E-4	7.74143E-5
13	7.06444E-2	7.05994E-2	6.64331E-2	4.37670E-2	9.66368E-3	1.09300E-3	1.113370E-4
14	9.86170E-2	9.85537E-2	9.26953E-2	6.11736E-2	1.40562E-2	1.60538E-3	1.63418E-4
15	0.13683	0.136742	0.128567	8.46611E-2	2.03229E-2	2.36349E-3	2.40809E-4
16	0.185155	0.185035	0.173949	0.114404	2.92186E-2	3.54124E-3	3.62402E-4
17	0.256352	0.256185	0.240797	0.158018	4.27760E-2	5.59813E-3	5.79034E-4
18	0.354502	0.354272	0.332946	0.218059	6.10331E-2	8.91889E-3	9.39823E-4
19	0.467817	0.46751	0.43907	0.285527	8.60773E-2	1.13332E-2	1.17803E-4
20	4.45846	4.4584	4.45233	4.39796	3.91928	1.87668	0.302122

AGE = 0 YEARS, RESTING
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	2.02821E-2	2.02682E-2	1.89806E-2	1.20317E-2	2.58136E-3	2.91529E-4	2.95350E-5
2	3.84733E-2	3.84470E-2	3.60644E-2	2.28232E-2	4.89660E-3	5.53005E-4	5.61061E-7
3	3.18097E-2	3.17914E-2	3.00775E-2	1.88110E-2	3.96192E-3	4.46280E-4	4.65408E-5
4	5.67100E-2	5.66769E-2	5.32259E-2	3.28060E-2	6.95397E-3	7.84230E-4	8.06539E-5
5	7.80429E-2	7.80036E-2	7.30058E-2	4.47162E-2	9.51598E-3	1.07372E-3	1.09871E-4
6	0.113189	0.113137	0.107023	6.54503E-2	1.38728E-2	1.56455E-3	1.59482E-4
7	0.153507	0.153411	0.144302	8.92374E-2	1.88874E-2	2.12945E-3	2.16610E-4
8	0.169668	0.169548	0.159297	9.91146E-2	2.09548E-2	2.36192E-3	2.40072E-4
9	0.172364	0.172252	0.161885	0.10166	2.14602E-2	2.44773E-3	2.45642E-4
10	0.175385	0.17527	0.164597	0.104166	2.20112E-2	2.47919E-3	2.51800E-4
11	0.164917	0.16481	0.154862	9.90900E-2	2.10106E-2	2.36599E-3	2.40276E-4
12	0.164685	0.164578	0.154627	9.97679E-2	2.13641E-2	2.44750E-3	2.44282E-4
13	0.161066	0.160907	0.151196	9.93114E-2	2.14712E-2	2.46222E-3	2.46334E-4
14	0.162407	0.162301	0.15253	9.96980E-2	2.25152E-2	2.56418E-3	2.60504E-4
15	0.172682	0.17257	0.162184	0.16197	2.50003E-2	2.89319E-3	2.94419E-4
16	0.191139	0.191015	0.179541	0.117805	0.029647	3.57231E-3	3.64628E-4
17	0.23836	0.238206	0.223805	0.146804	0.03948E-2	5.12662E-3	5.20899E-4
18	0.313004	0.312801	0.293972	0.192539	0.05222E-2	7.89410E-3	8.30855E-4
19	0.414421	0.414149	0.388956	0.252937	0.03671E-2	7.18728E-3	7.33319E-4
20	6.75335	6.75326	6.74407	6.66171	5.93664	2.84266	0.457633

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 2 YEARS, RESTING
PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT= H	70 DISINTEGRATIONS	0.7 DISINTEGRATIONS	0.07 DISINTEGRATIONS	0.007 DISINTEGRATIONS	0.0007 DISINTEGRATIONS	0.00007 DISINTEGRATIONS	7.00000E-7 DISINTEGRATIONS
1	9.46570E-2	3.86430E-2	5.61910E-2	1.20550E-2	1.36151E-3	1.37935E-4	1.38134E-6
2	6.30904E-2	5.90418E-2	3.78265E-2	8.02969E-3	9.06844E-4	9.18729E-5	9.20355E-7
3	7.74050E-2	7.72537E-2	7.25693E-2	4.53982E-2	9.59820E-3	1.08167E-3	4.46943E-5
4	6.51434E-2	6.50983E-2	6.69642E-2	7.77040E-2	7.99624E-3	9.01752E-4	4.44270E-5
5	4.67202E-2	4.67995E-2	4.35950E-2	2.68453E-2	5.71290E-3	6.44593E-4	4.41972E-5
6	2.78178E-2	3.78163E-2	3.66910E-2	2.25793E-2	4.71970E-3	5.31368E-4	4.39635E-5
7	9.26012E-2	8.25524E-2	7.80137E-2	4.89167E-2	1.03000E-2	1.16013E-3	4.40535E-5
8	0.1148	0.11473	0.10828	6.86337E-2	1.44462E-2	1.62642E-3	4.40189E-5
9	0.15819	0.158093	0.14828	9.57335E-2	2.01932E-2	2.27256E-3	4.54820E-5
10	0.221115	0.221177	0.208366	0.115354	2.87721E-2	3.23861E-3	4.64245E-5
11	0.30964	0.309444	0.291303	0.190865	4.11957E-2	4.64349E-3	4.77981E-5
12	0.433394	0.430109	0.407799	0.267056	5.92797E-2	6.72459E-3	4.99664E-5
13	0.61074	0.610348	0.574031	0.378741	8.74902E-2	1.05067E-2	5.31442E-5
14	0.849046	0.849099	0.797873	0.559595	0.723799	1.49765E-2	5.32136E-5
15	1.18659	1.18581	1.11468	0.723799	0.106735	2.26630E-2	6.61412E-5
16	1.60505	1.60401	1.50766	0.989365	0.267614	3.49830E-2	7.91804E-5
17	2.21713	2.21589	2.09257	1.36462	0.385972	5.71804E-2	1.02791E-4
18	3.06804	3.06695	2.88131	1.88546	0.539188	9.20340E-2	1.02791E-4
19	4.06322	4.062759	3.78325	2.46474	0.612159	7.72854E-2	7.18374E-5
20	46.3706	46.3701	40.2752	39.7833	35.4533	16.9762	2.92948E-2

AGE = 2 YEARS, RESTING
PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT= H	70 DISINTEGRATIONS	0.7 DISINTEGRATIONS	0.07 DISINTEGRATIONS	0.007 DISINTEGRATIONS	0.0007 DISINTEGRATIONS	0.00007 DISINTEGRATIONS	7.00000E-7 DISINTEGRATIONS
1	4.01440E-2	1.75937E-2	2.39306E-2	5.11275E-3	5.77415E-4	5.94982E-5	5.85927E-7
2	2.81455E-2	2.63575E-2	1.67079E-2	3.58461E-3	4.09332E-4	4.10139E-5	4.10719E-7
3	3.26780E-2	3.26173E-2	3.36107E-2	1.91587E-2	4.04964E-3	4.56754E-4	2.14695E-5
4	2.86722E-2	2.86527E-2	2.68119E-2	1.65995E-2	1.52005E-2	1.96957E-4	2.13683E-5
5	2.11455E-2	2.11311E-2	1.97016E-2	1.21279E-2	2.58027E-3	2.91125E-4	2.12759E-5
6	1.83031E-2	1.82987E-2	1.76975E-2	1.08744E-2	2.28048E-3	2.56804E-4	2.11839E-5
7	3.79161E-2	3.78935E-2	3.57967E-2	2.24296E-2	4.72592E-3	5.32325E-4	2.14460E-5
8	5.17354E-2	5.17354E-2	4.88173E-2	3.09399E-2	6.51180E-3	7.33157E-4	2.15922E-5
9	7.04777E-2	7.04331E-2	6.64107E-2	4.26299E-2	8.99262E-3	1.01206E-3	2.19310E-5
10	9.75351E-2	9.75351E-2	9.18809E-2	5.96697E-2	1.26837E-2	1.42771E-3	2.22342E-5
11	0.135709	0.135623	0.12767	8.36447E-2	1.80531E-2	2.03491E-3	2.28254E-5
12	0.188321	0.188201	0.177096	0.116859	2.59845E-2	2.94269E-3	2.37255E-5
13	0.267453	0.267282	0.251382	0.165892	3.82269E-2	4.38498E-3	2.51631E-5
14	0.373663	0.373422	0.351122	0.231434	5.63935E-2	6.60042E-3	2.74220E-5
15	0.526284	0.525944	0.494465	0.324921	8.29864E-2	1.0784E-2	3.10079E-5
16	0.720318	0.719851	0.676623	0.444127	1.20472	1.57747E-2	3.70343E-5
17	1.01100	1.01037	0.949593	0.622375	0.176802	2.63000E-2	4.86303E-5
18	1.43063	1.43063	1.34445	0.879955	0.252984	4.40129E-2	4.86969E-5
19	1.9419	1.94063	1.8229	1.1874	0.294959	3.72387E-2	3.46137E-5
20	27.18	27.1796	27.1427	26.8112	23.893	11.4468	1.97427E-2

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 2 YEARS, RESTING
PARTICLE DIAMETER = 0,1 μ

DECAY CONSTANT= N	70 DEPOSITION DISINTEGRATIONS	0.7 DISINTEGRATIONS	0.07 DISINTEGRATIONS	0.007 DISINTEGRATIONS	0.0007 DISINTEGRATIONS	0.00007 DISINTEGRATIONS	7.00000E-7 DISINTEGRATIONS
1	2.79893E-2	2.79702E-2	2.61932E-2	1.66038E-2	3.56228E-3	4.02311E-4	4.07584E-5
2	2.18101E-2	2.13954E-2	2.00362E-2	1.27009E-2	2.72492E-3	3.07743E-4	3.11776E-5
3	2.38566E-2	2.34414E-2	2.20318E-2	1.38190E-2	2.91803E-3	3.28770E-4	3.36704E-5
4	2.43895E-2	2.43731E-2	2.28250E-2	1.41343E-2	2.99617E-3	3.37860E-4	3.45421E-5
5	1.97130E-2	1.97004E-2	1.84213E-2	1.13269E-2	2.40788E-3	2.71648E-4	2.77925E-5
6	2.08385E-2	2.08311E-2	1.99769E-2	1.22961E-2	2.58602E-3	2.91319E-4	2.97435E-5
7	3.67844E-2	3.67579E-2	3.46713E-2	2.17110E-2	4.57652E-3	5.15617E-4	5.24237E-5
8	4.65096E-2	4.64809E-2	4.38155E-2	4.38155E-2	5.83953E-3	6.57545E-4	6.67746E-5
9	5.93629E-2	5.93258E-2	5.58968E-2	7.27944E-2	7.55615E-3	8.50508E-4	8.62912E-5
10	7.73576E-2	7.73088E-2	7.27944E-2	9.61230E-2	1.00262E-2	1.12867E-3	1.14443E-4
11	0.102198	0.102133	0.128794	0.128794	1.35623E-2	1.52872E-3	1.54941E-4
12	0.136976	0.136888	0.189285	0.189285	1.88516E-2	2.13465E-3	2.16392E-4
13	0.189406	0.189285	0.178015	0.178015	2.76889E-2	3.09855E-3	3.14404E-4
14	0.260243	0.260075	0.244538	0.244538	3.92221E-2	4.58933E-3	4.66860E-4
15	0.363205	0.36297	0.341201	0.341201	5.72260E-2	6.94799E-3	7.10187E-4
16	0.494775	0.494454	0.464761	0.464761	8.27408E-2	1.08334E-2	1.11953E-3
17	0.694036	0.693585	0.651867	0.651867	0.121420	1.80709E-2	1.90953E-3
18	0.985128	0.984488	0.925185	0.925185	0.605563	0.174257	0.32458E-3
19	1.34364	1.34276	1.26131	1.26131	0.204089	2.57663E-2	2.65452E-3
20	23.1893	23.189	23.1575	22.8746	20.385	9.761	1.5714

AGE = 2 YEARS, RESTING
PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT= N	70 DEPOSITION DISINTEGRATIONS	0.7 DISINTEGRATIONS	0.07 DISINTEGRATIONS	0.007 DISINTEGRATIONS	0.0007 DISINTEGRATIONS	0.00007 DISINTEGRATIONS	7.00000E-7 DISINTEGRATIONS
1	4.39587E-2	4.39279E-2	4.11372E-2	2.60768E-2	5.59466E-3	6.31841E-4	6.40122E-5
2	0.168798	0.168679	0.157967	0.160137	2.14829E-2	2.42620E-3	2.46155E-4
3	0.110657	0.110608	0.106607	0.106607	6.92599E-2	1.61600E-3	1.63933E-4
4	0.42177	0.421501	0.396011	0.396011	5.19502E-2	5.95777E-3	5.93515E-4
5	0.465169	0.465863	0.438933	0.438933	5.70831E-2	6.43823E-3	6.50409E-4
6	0.726492	0.726111	0.687895	0.687895	8.96408E-2	1.01036E-2	1.02361E-3
7	0.964829	0.964207	0.906445	0.906445	0.566276	0.119597	0.124772E-2
8	1.06672	1.06607	0.945654	0.945654	0.595603	0.125709	0.13036E-2
9	1.03744	1.03747	0.973763	0.973763	0.618635	0.130767	0.137265E-2
10	1.02248	1.02281	0.960693	0.960693	0.615067	0.130656	0.137153E-2
11	0.959906	0.959279	0.901152	0.901152	0.581575	0.124809	0.128686E-2
12	0.907037	0.906444	0.851485	0.851485	0.552337	0.120809	0.120809E-2
13	0.82701	0.82687	0.776792	0.776792	0.505474	0.113557	0.113557E-2
14	0.786692	0.786205	0.701133	0.701133	0.457487	0.107148	0.107148E-2
15	0.709266	0.708804	0.665994	0.665994	0.434845	0.106167	0.106167E-2
16	0.678273	0.67837	0.616966	0.616966	0.416585	0.108374	0.108374E-2
17	0.735183	0.734705	0.690435	0.690435	0.45178	0.12453	0.12453E-2
18	0.878045	0.878344	0.82541	0.82541	0.540027	0.153685	0.153685E-2
19	1.12033	1.1196	1.05169	1.05169	0.685044	0.17617	0.17617E-2
20	35.7823	35.7818	35.7332	35.2967	31.455	15.0617	2.42475

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 4 YEARS, RESTING
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT= N	DEPOSITION	70 DISINTEGRATIONS	0.7 DISINTEGRATIONS	0.07 DISINTEGRATIONS	0.007 DISINTEGRATIONS	0.0007 DISINTEGRATIONS	7.00000E-7 DISINTEGRATIONS
1	0.162070	0.161963	0.151670	0.14483E-2	2.06282E-2	2.32967E-3	2.36202E-4
2	0.11647	0.116395	0.103301	6.59332E-2	1.40598E-2	1.58787E-3	1.61160E-6
3	0.172177	0.172031	0.161243	0.10106	2.13802E-2	2.40939E-3	2.45509E-4
4	0.100123	0.100049	0.102026	6.31911E-2	1.32997E-2	1.51106E-3	1.54220E-4
5	7.67162E-2	7.66629E-2	7.14228E-2	4.39889E-2	9.26010E-3	1.05609E-3	1.08061E-4
6	6.06801E-2	6.06866E-2	5.88625E-2	3.61990E-2	7.57919E-3	8.53334E-4	8.72513E-5
7	0.122567	0.122488	0.12519	7.85715E-2	1.65426E-2	1.86317E-3	1.89507E-4
8	0.184037	0.183924	0.173565	0.110139	2.31837E-2	2.61002E-3	2.65030E-4
9	0.252432	0.252275	0.238023	0.153585	3.24125E-2	3.64764E-3	3.70010E-4
10	0.355228	0.355105	0.330481	0.217236	4.62371E-2	5.20485E-3	5.27647E-4
11	0.492996	0.492673	0.463787	0.304117	6.57434E-2	7.41179E-3	7.50968E-4
12	0.697775	0.687336	0.646749	0.426795	9.51161E-2	1.07768E-2	1.09240E-3
13	0.974856	0.97423	0.916257	0.604667	0.140246	1.60661E-2	1.63029E-3
14	1.36172	1.36084	1.27952	0.843107	0.205928	2.41477E-2	2.45710E-3
15	1.89913	1.89795	1.7841	1.17234	0.300102	3.65590E-2	3.73843E-3
16	2.57661	2.57494	2.40226	1.58817	0.431577	5.68433E-2	5.87990E-3
17	3.52627	3.52394	3.3589	2.20081	0.624144	9.24675E-2	9.89092E-3
18	4.96335	4.96013	4.66126	3.05018	0.873631	0.15282	1.67674E-2
19	6.5566	6.55137	6.154	4.06993	0.998369	0.126652	1.30597E-2
20	74.1528	74.1527	74.0519	73.1475	65.196	31.2132	5.02494

AGE = 4 YEARS, RESTING
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT= N	DEPOSITION	70 DISINTEGRATIONS	0.7 DISINTEGRATIONS	0.07 DISINTEGRATIONS	0.007 DISINTEGRATIONS	0.0007 DISINTEGRATIONS	7.00000E-7 DISINTEGRATIONS
1	6.84799E-2	6.84330E-2	6.40855E-2	4.06237E-2	8.71562E-3	9.84311E-4	9.97211E-5
2	4.89325E-2	4.89989E-2	4.58860E-2	2.90871E-2	6.24049E-3	7.04779E-4	7.14015E-5
3	7.26291E-2	7.25904E-2	6.80417E-2	4.26534E-2	9.02317E-3	1.01683E-3	1.03687E-4
4	4.71828E-2	4.71828E-2	4.40967E-2	2.73148E-2	5.79126E-3	6.53058E-4	6.67459E-5
5	3.44235E-2	3.44000E-2	3.20766E-2	1.97994E-2	4.20130E-3	4.74015E-4	4.85280E-5
6	2.92356E-2	2.92284E-2	2.82657E-2	1.73873E-2	3.64526E-3	4.10465E-4	4.20105E-5
7	6.06545E-2	6.06192E-2	5.72590E-2	3.59270E-2	7.56574E-3	8.52747E-4	8.66866E-5
8	8.27152E-2	8.26646E-2	7.79935E-2	4.94764E-2	1.04159E-2	1.17265E-3	1.19922E-4
9	0.112511	0.112441	0.106012	6.81482E-2	1.43829E-2	1.61867E-3	1.64213E-4
10	0.15607	0.155972	0.146966	9.54217E-2	2.03622E-2	2.28542E-3	2.31705E-4
11	0.215292	0.215156	0.202528	0.132795	2.87066E-2	3.2364E-3	3.27925E-4
12	0.299751	0.299751	0.28187	0.186009	4.18542E-2	4.69882E-3	4.76111E-4
13	0.424868	0.424596	0.399334	0.263573	6.11518E-2	7.00577E-3	7.10919E-4
14	0.595785	0.595401	0.559828	0.368957	8.01871E-2	9.01871E-3	9.16736E-4
15	0.836353	0.835811	0.785685	0.516297	0.132383	1.05778E-2	1.05023E-3
16	1.14612	1.14538	1.07659	0.706605	0.192403	1.61368E-2	1.62684E-3
17	1.61244	1.6114	1.51446	0.992502	0.282538	2.53899E-2	2.62684E-3
18	2.28176	2.28176	2.1443	1.40341	0.403826	4.26688E-2	4.49616E-3
19	3.10182	3.09979	2.91177	1.89683	0.472379	7.11648E-2	7.81690E-3
20	49.0179	49.0172	48.9506	48.3527	43.09	5.99258E-2	5.56452E-3

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 4 YEARS, RESTING
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT*	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	4.74803E-2	4.74478E-2	4.44335E-2	2.81663E-2	6.04295E-3	6.82469E-4	6.92412E-7
2	3.67806E-2	3.67554E-2	3.44203E-2	2.18190E-2	4.68116E-3	5.28674E-4	5.36376E-7
3	5.14591E-2	5.14247E-2	4.82335E-2	3.02705E-2	6.40154E-3	7.21339E-4	7.35396E-5
4	3.74990E-2	3.74739E-2	3.51134E-2	2.17596E-2	4.61065E-3	5.19879E-4	5.30695E-5
5	3.16213E-2	3.16010E-2	2.95511E-2	1.81754E-2	3.86325E-3	4.35831E-4	4.45004E-5
6	3.29111E-2	3.28993E-2	3.15583E-2	1.94414E-2	4.08727E-3	4.60413E-4	4.69343E-5
7	5.85132E-2	5.84774E-2	5.51540E-2	3.45669E-2	7.28567E-3	8.20717E-4	8.33865E-5
8	7.39111E-2	7.38652E-2	6.96232E-2	4.40948E-2	9.28910E-3	1.04593E-3	1.06157E-4
9	9.41933E-2	9.41344E-2	8.86876E-2	5.68859E-2	1.20106E-2	1.35186E-3	1.37105E-4
10	0.122847	0.122769	0.115585	7.49288E-2	1.59381E-2	1.79430E-3	1.81890E-4
11	0.161275	0.161172	0.151688	9.92997E-2	2.14523E-2	2.41849E-3	2.45043E-4
12	0.217103	0.216964	0.204127	0.134536	2.99453E-2	3.39241E-3	3.43872E-4
13	0.299494	0.299291	0.28147	0.185658	4.30171E-2	4.92701E-3	4.99959E-4
14	0.412964	0.412698	0.388033	0.255663	6.24251E-2	7.31948E-3	7.44781E-4
15	0.574282	0.57401	0.539581	0.35454	9.08437E-2	1.10703E-2	1.13207E-3
16	0.783419	0.782911	0.715894	0.482984	0.131549	1.73509E-2	1.79511E-3
17	1.10133	1.10061	1.03441	0.677913	0.193062	2.90298E-2	3.07369E-3
18	1.56288	1.56187	1.46778	0.960668	0.27666	4.88200E-2	5.64225E-3
19	2.13391	2.13252	2.00317	1.30494	0.324976	4.12263E-2	4.25103E-3
20	42.2474	42.2468	42.1993	41.674	37.1382	17.783	2.86284

AGE = 4 YEARS, RESTING
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT*	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	7.02971E-2	7.92320E-2	7.41991E-2	4.70347E-2	1.00911E-2	1.13065E-3	1.15459E-6
2	0.275575	0.275386	0.257891	0.163477	3.50732E-2	3.96104E-3	4.11974E-6
3	0.188274	0.18817	0.178593	0.115016	2.41458E-2	2.71580E-3	2.80865E-5
4	0.406522	0.406633	0.45918	0.28525	6.02318E-2	6.78799E-3	6.87919E-5
5	0.729701	0.729333	0.697309	0.42153	8.93977E-2	1.00826E-2	1.02166E-3
6	1.13912	1.13984	1.07957	0.666514	0.140698	1.58575E-2	1.60649E-3
7	1.53811	1.53712	1.44504	0.902389	0.190773	2.14969E-2	2.17762E-3
8	1.60387	1.60293	1.5065	0.949599	0.200432	2.25770E-2	2.28688E-3
9	1.64529	1.64432	1.54492	0.982324	0.207716	2.30920E-2	2.30931E-3
10	1.61436	1.61331	1.51537	0.970835	0.206339	2.30397E-2	2.35388E-3
11	1.51731	1.51632	1.42455	0.922315	0.197759	2.22938E-2	2.25755E-3
12	1.45603	1.45599	1.3677	0.88737	0.194375	2.19832E-2	2.20721E-3
13	1.40240	1.40240	1.24329	0.809339	0.182393	2.07852E-2	2.10769E-3
14	1.26374	1.26295	1.13027	0.73762	0.173322	2.01047E-2	2.04305E-3
15	1.14771	1.14696	1.07771	0.70389	0.172728	2.06717E-2	2.10927E-3
16	1.11049	1.11777	1.05039	0.687093	0.179801	2.31262E-2	2.38493E-3
17	1.23070	1.23199	1.15776	0.757627	0.209765	3.06895E-2	3.23473E-3
18	1.49442	1.49316	1.40318	0.919057	0.261901	4.55183E-2	4.98939E-3
19	1.92511	1.92385	1.80716	1.17725	0.293177	3.71022E-2	3.92506E-3
20	65.2399	65.239	65.1502	64.3545	57.3501	27.4612	4.4209

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 8 YEARS, RESTING
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT	70	0.7	0.07	0.007	0.0007	0.00007	0.000007
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.2172	0.312935	0.292102	0.195797	3.98618E-2	4.50105E-3	4.56085E-4
2	0.277764	0.217615	0.26377	0.128182	2.77155E-2	3.17008E-3	3.17111E-4
3	0.327695	0.327459	0.316477	0.199595	4.22465E-2	4.75979E-3	4.82275E-4
4	0.205657	0.205497	0.192481	0.119777	2.53621E-2	2.85919E-3	2.80909E-4
5	0.140243	0.140152	0.130925	0.077422-2	1.71581E-2	1.93547E-3	1.96213E-4
6	0.100948	0.100914	0.105256	0.075677-2	1.37221E-2	1.54507E-3	1.56599E-4
7	0.237049	0.236905	0.223599	0.141844	2.98542E-2	3.36098E-3	3.40495E-4
8	0.200002	0.207878	0.309089	0.198194	4.19378E-2	4.70542E-3	4.76621E-4
9	0.449255	0.449974	0.423604	0.274622	5.07605E-2	6.56387E-3	6.65319E-4
10	0.620142	0.628744	0.591875	0.387422	8.34799E-2	9.40806E-3	9.52993E-4
11	0.870359	0.89834	0.81844	0.52999	0.118958	1.34539E-2	1.36302E-3
12	1.21181	1.21102	1.13113	0.752326	0.172749	1.97247E-2	2.00030E-3
13	1.71272	1.71272	1.64646	1.06164	0.255384	2.97053E-2	3.01910E-3
14	2.39212	2.39056	2.24736	1.47822	0.375629	4.52168E-2	4.62743E-3
15	3.32267	3.32051	3.13643	2.05402	0.545545	6.95739E-2	7.16104E-3
16	4.51512	4.51219	4.24094	2.77999	0.777615	0.110276	1.15503E-2
17	6.26103	6.25696	5.89021	3.85021	1.10774	0.184277	1.99449E-2
18	8.67245	8.66681	8.1444	5.32749	1.59951	0.303215	3.45071E-2
19	11.42956	11.4181	10.7264	6.9836	1.78233	0.279825	2.49065E-2
20	133.352	133.352	133.17	131.544	117.226	56.1219	9.68635E-2

AGE = 8 YEARS, RESTING
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT	70	0.7	0.07	0.007	0.0007	0.00007	0.000007
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.129804	0.129805	0.121558	7.0555E-2	1.65319E-2	1.86705E-3	1.89152E-4
2	0.42804E-2	0.42157E-2	0.89239E-2	5.59884E-2	1.20121E-2	1.35660E-3	1.37636E-4
3	0.139103	0.13901	0.110373	0.22331E-2	1.74062E-2	1.96109E-3	1.98714E-4
4	0.60223E-2	0.59651E-2	0.05351E-2	5.01242E-2	1.06123E-2	1.19636E-3	1.21269E-4
5	0.04905E-2	0.04494E-2	0.05046E-2	3.49578E-2	7.40282E-3	9.35020E-4	8.46579E-5
6	0.07463E-2	0.07277E-2	0.07963E-2	2.99566E-2	6.26115E-3	7.04560E-4	7.14116E-5
7	0.104153	0.104089	0.082253E-2	6.22929E-2	1.31125E-2	1.47624E-3	1.49550E-4
8	0.142274	0.142445	0.114271	0.67588E-2	1.81581E-2	2.04771E-3	2.07014E-4
9	0.193784	0.193662	0.182449	0.118446	2.51645E-2	2.87247E-3	2.86886E-4
10	0.269066	0.269435	0.253672	0.1666	3.57676E-2	4.03096E-3	4.08277E-4
11	0.372058	0.37182	0.349863	0.230405	5.08516E-2	5.75124E-3	5.82661E-4
12	0.518023	0.51769	0.446958	0.321628	7.38665E-2	8.43342E-3	8.55241E-4
13	0.723642	0.731169	0.689461	0.454521	0.109394	1.27258E-2	1.29341E-3
14	1.02369	1.02803	0.968455	0.635835	0.161712	1.95161E-2	1.99292E-3
15	1.44278	1.44155	1.35496	0.889196	0.236548	3.01922E-2	3.01806E-3
16	1.9721	1.9721	1.85352	1.21521	0.34072	4.84115E-2	5.07194E-3
17	2.7711	2.7693	2.60258	1.70435	0.49203	8.22197E-2	8.90458E-3
18	3.91164	3.9091	3.6735	2.40325	0.692626	0.138487	1.57823E-2
19	5.29266	5.2892	4.96877	3.235	0.825624	0.11063	1.15346E-2
20	89.0695	89.0683	88.9471	87.8408	78.2979	37.4917	6.46971E-2

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 8 YEARS, RESTING
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	8.97824E-2	8.97209E-2	8.46210E-2	5.32607E-2	1.44269E-2	1.29051E-3	1.30742E-4
2	6.88925E-2	6.88453E-2	6.44716E-2	4.08688E-2	8.76813E-3	9.90241E-4	1.00467E-4
3	9.72913E-2	9.72264E-2	9.12091E-2	5.75839E-2	1.21877E-2	1.37308E-3	5.24386E-5
4	6.52560E-2	6.52123E-2	6.11375E-2	3.80780E-2	6.05840E-3	9.08375E-4	5.18858E-5
5	5.13225E-2	5.12889E-2	4.80404E-2	2.96289E-2	6.28753E-3	7.09155E-4	5.16405E-5
6	5.00032E-2	4.99826E-2	4.79200E-2	2.99046E-2	5.48924E-3	7.05424E-4	5.16432E-5
7	9.20873E-2	9.20303E-2	8.67647E-2	0.411693	1.75725E-2	1.30303E-3	1.32002E-4
8	0.118638	0.118564	0.111693	0.111693	1.50842E-2	1.69792E-3	1.71984E-4
9	0.152326	0.15314	0.144211	0.144211	1.98492E-2	2.26307E-3	5.23218E-5
10	0.263314	0.263185	0.191221	0.191221	2.69045E-2	3.03213E-3	5.27248E-5
11	0.270177	0.270005	0.254029	0.254029	3.68455E-2	4.16684E-3	5.34638E-5
12	6.36896	6.36651	0.344861	0.344861	5.21950E-2	5.95781E-3	5.45334E-5
13	0.509437	0.509109	0.478702	0.478702	7.58327E-2	8.81884E-3	5.62652E-5
14	0.705761	0.705305	0.663056	0.663056	0.110928	0.133707E-2	5.91391E-5
15	4.982445	4.982808	0.923772	0.923772	0.161187	2.05679E-2	6.37883E-5
*6	1.34151	1.34064	1.26003	1.26003	0.231643	3.29154E-2	8.47024E-5
17	1.98464	1.98341	1.77603	1.77603	0.334817	5.59879E-2	1.11224E-4
18	2.66809	2.66636	2.50566	2.50566	0.472827	9.47074E-2	1.09641E-4
19	3.62999	3.62762	3.40785	3.40785	0.566257	7.58762E-2	6.97224E-5
20	78.2355	78.2344	78.128	77.1738	68.7742	32.9314	5.68277E-2

AGE = 8 YEARS, RESTING
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	6.170004	6.16983	0.159095	0.159095	2.16269E-2	2.44359E-3	2.47562E-4
2	6.41114	6.410858	0.384757	0.384757	5.23269E-2	5.90961E-3	5.97906E-4
3	6.315095	6.315106	0.297752	0.297752	6.152874	4.07320E-2	4.64122E-4
4	6.675657	6.675242	0.636676	0.636676	0.398777	4.40974E-2	9.50640E-4
5	0.978542	0.97799	0.923013	0.923013	0.563745	0.412035	1.35695E-2
6	1.50407	1.50415	1.42533	1.42533	0.888051	0.187032	1.37456E-3
7	2.04311	2.04179	1.91969	1.91969	1.21024	0.187032	2.10411E-3
8	2.15007	2.14947	2.02024	2.02024	1.28423	0.255387	2.97664E-2
9	2.21033	2.20894	2.07549	2.07549	1.3305	0.271375	3.05597E-3
10	2.19812	2.19867	2.0542	2.0542	1.30501	0.282550	3.18210E-3
11	2.07679	2.07692	1.94437	1.94437	1.30501	0.284045	3.20140E-2
12	2.01881	2.01749	1.89543	1.89543	1.28274	0.275451	3.11210E-2
13	1.89000	1.88976	1.86634	1.86634	1.23411	0.276394	3.11210E-2
14	1.79576	1.79459	1.77556	1.77556	1.15939	0.268972	3.10095E-2
15	1.81389	1.81389	1.68634	1.68634	1.10199	0.268886	3.19399E-2
*6	1.8966	1.89527	1.76447	1.76447	1.14420	0.284777	3.64847E-2
17	2.2590	2.25673	1.79109	1.79109	1.15560	0.317441	4.59690E-3
18	2.8777	2.87981	2.12077	2.12077	1.3879	0.394372	6.96613E-3
19	3.97963	3.97709	2.73440	2.73440	1.79876	0.54331	0.16537E-2
20	117.959	117.957	117.921	117.921	2.37132	0.6052	8.45613E-3
					116.358	103.693	7.99333

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 12 YEARS, RESTING
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT =	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.470366	0.440844	0.279222	5.99058E-2	6.76554E-3	6.85421E-4	6.96411E-6
2	0.332621	0.310929	0.197097	4.22860E-2	4.77565E-3	4.82824E-4	4.84522E-6
3	0.513229	0.481805	0.304806	6.45944E-2	7.27722E-3	7.36879E-4	7.41571E-6
4	0.303641	0.283973	0.17729	3.75177E-2	4.23878E-3	4.27372E-4	4.28160E-6
5	0.200999	0.18798	0.116181	2.46542E-2	2.78060E-3	2.81699E-4	2.85823E-6
6	0.153695	0.148169	9.35697E-2	1.95165E-2	2.19500E-3	2.22366E-4	2.25005E-6
7	0.334925	0.315762	0.201554	4.24587E-2	4.77905E-3	4.84019E-4	4.86647E-6
8	0.464488	0.44612	0.43455	5.93057E-2	6.67462E-3	6.75771E-4	6.81919E-6
9	0.620905	0.59224	0.397063	8.27675E-2	9.32037E-3	9.43947E-4	9.58265E-6
10	0.979265	0.926946	0.543003	0.118251	1.33451E-2	1.35180E-3	1.37305E-4
11	1.21315	1.14127	0.752596	0.168734	1.91457E-2	1.94027E-3	1.97174E-4
12	1.68820	1.6872	1.58678	0.245656	2.82468E-2	2.87700E-3	2.78603E-4
13	2.38464	2.3931	2.24057	1.47551	0.363203	4.29186E-2	4.35904E-3
14	3.3215	3.31935	3.12029	2.05055	0.53339	6.58747E-2	6.74809E-3
15	4.62265	4.61965	4.34192	2.84703	0.771437	0.101979	1.05560E-2
16	6.25242	6.24837	5.8724	3.84754	1.09050	0.163316	1.73826E-2
17	8.64948	8.64948	8.12848	5.3253	1.53709	0.274899	3.62011E-2
18	11.9508	11.9521	11.2315	7.34546	2.1056	0.451922	5.29027E-2
19	15.6934	15.6831	14.7336	9.59774	2.8001	0.746054	8.16551E-2
20	183.144	183.139	182.089	180.656	160.093	77.0889	12.4103

AGE = 12 YEARS, RESTING
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT =	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.193556	0.18126	0.1149	2.46513E-2	2.78403E-3	2.82052E-4	2.82459E-6
2	0.142542	0.133486	8.46168E-2	1.91542E-2	2.05026E-3	2.07713E-4	2.08013E-6
3	0.209242	0.19628	0.124268	2.63349E-2	2.96689E-3	3.00424E-4	3.01988E-6
4	0.124555	0.116734	7.28938E-2	1.54243E-2	1.73851E-3	1.76111E-4	1.78466E-6
5	8.48841E-2	7.93844E-2	4.90655E-2	1.04098E-2	1.17402E-3	1.18939E-4	1.17522E-6
6	6.92543E-2	6.56776E-2	4.14516E-2	8.65205E-3	9.73195E-4	9.85652E-5	1.17215E-6
7	0.143903	0.135713	8.66220E-2	1.82489E-2	2.05408E-3	2.08036E-4	1.17861E-6
8	0.196858	0.185358	0.11955	7.52930E-2	2.84667E-3	2.88297E-4	1.18491E-6
9	0.267723	0.25196	0.164371	3.51470E-2	3.95789E-3	4.00847E-4	1.19337E-6
10	0.371967	0.349833	0.229711	5.00235E-2	5.64536E-3	5.71851E-4	1.20765E-6
11	0.513322	0.4826	0.319261	7.13596E-2	8.09700E-3	8.20571E-4	1.23049E-6
12	0.714784	0.671812	0.443562	0.104036	1.19632E-2	1.21424E-3	1.26784E-4
13	1.01193	0.950803	0.626239	0.154285	1.91884E-2	1.85167E-3	1.37009E-4
14	1.41692	1.3111	0.874874	0.227815	0.227815	2.81487E-2	1.43221E-4
15	1.98534	1.8648	1.2295	0.331936	0.474244	4.39284E-2	1.59888E-4
16	2.71216	2.54733	1.6692	0.474244	0.777451	7.11918E-2	1.89959E-4
17	3.8018	3.79933	2.33778	0.677451	0.94597	1.34298E-2	2.44924E-4
18	5.35285	5.35037	3.502784	0.94597	1.14035	0.204965	2.44923E-4
19	7.21581	7.2111	4.71449	1.14035	0.159116	1.67453E-2	1.45550E-4
20	122.09	122.088	121.922	120.433	107.325	51.3907	8.86819E-2

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 12 YEARS, RESTING
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=		70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.13388	0.133788	0.125289	7.94202E-2	1.70393E-2	1.92435E-3	1.94957E-4	1.95239E-6
2	0.102808	0.102738	9.62108E-2	6.09879E-2	1.30847E-2	1.47773E-3	1.49716E-4	1.49926E-6
3	0.145555	0.145558	0.136563	8.65230E-2	1.83366E-2	2.06574E-3	2.09174E-4	8.22669E-5
4	9.21579E-2	9.20962E-2	8.63560E-2	5.39648E-2	1.14152E-2	1.28655E-3	1.30326E-4	8.13571E-5
5	6.98736E-2	6.88281E-2	6.45043E-2	3.99738E-2	8.45782E-3	9.53336E-4	9.65790E-5	8.07643E-5
6	6.42794E-2	6.42514E-2	6.15505E-2	3.87723E-2	8.11178E-3	9.12758E-4	9.24449E-5	8.06522E-5
7	0.121222	0.121146	0.114174	7.27612E-2	1.53356E-2	1.72636E-3	1.74845E-4	8.11689E-5
8	0.157458	0.157359	0.148197	9.54277E-2	2.01922E-2	2.27278E-3	2.30177E-4	8.16037E-5
9	0.20517	0.20504	0.193032	0.125708	2.68713E-2	3.02611E-3	3.06480E-4	8.21753E-5
10	0.274156	0.273981	0.257798	0.169042	3.67830E-2	4.15096E-3	4.20473E-4	8.31216E-5
11	0.366913	0.366678	0.344925	0.227266	5.09035E-2	5.77518E-3	5.85264E-4	8.46301E-5
12	0.500629	0.500307	0.470509	0.310466	7.27175E-2	8.35950E-3	8.48455E-4	8.71232E-5
13	0.697636	0.697186	0.655482	0.431614	0.106212	1.25169E-2	1.27423E-3	9.12788E-5
14	0.967703	0.967077	0.909083	0.597446	0.155461	1.92026E-2	1.96711E-3	9.81328E-5
15	1.3497	1.34883	1.26775	0.831379	0.225584	2.98477E-2	3.08994E-3	1.09351E-4
16	1.84647	1.83928	1.72862	1.13273	0.321901	4.83269E-2	5.11585E-3	1.29772E-4
17	2.58311	2.58144	2.42597	1.58816	0.460581	8.28758E-2	9.14672E-3	1.70714E-4
18	3.65051	3.64813	3.42822	2.24237	0.645534	0.140168	1.64411E-2	1.67562E-4
19	4.9497	4.94647	4.64697	3.02714	0.782224	0.109146	1.14863E-2	9.98405E-5
20	107.495	107.493	107.747	106.036	94.4951	45.2474	7.28426	7.86808E-2

AGE = 12 YEARS, RESTING
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=		70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.274414	0.274226	0.256804	0.162788	3.49254E-2	3.94435E-3	3.99604E-4	4.00181E-6
2	0.52717	0.526809	0.493341	0.312728	6.70944E-2	7.57739E-3	7.67670E-4	7.68778E-6
3	0.441691	0.441419	0.41621	0.269789	5.72377E-2	6.44239E-3	6.52250E-4	1.01917E-4
4	0.806778	0.806277	0.759751	0.478256	0.106943	1.13587E-2	1.15041E-3	1.06761E-4
5	1.13112	1.13047	1.06723	0.660116	0.139514	1.57260E-2	1.59293E-3	1.10890E-4
6	1.72775	1.72678	1.62538	1.02546	0.215745	2.42972E-2	2.46087E-3	1.19497E-4
7	2.3536	2.35208	2.21126	1.40127	0.295804	3.32147E-2	3.37415E-3	1.28276E-4
8	2.47626	2.47465	2.32583	1.48606	0.31465	3.54305E-2	3.58835E-3	1.30279E-4
9	2.55208	2.55042	2.39644	1.54308	0.329175	3.78008E-2	3.75559E-3	1.31725E-4
10	2.5409	2.53924	2.38559	1.54435	0.333592	3.76333E-2	3.81198E-3	1.32058E-4
11	2.43455	2.43296	2.28604	1.4882	0.32855	3.72101E-2	3.77029E-3	1.31476E-4
12	2.40284	2.40128	2.25616	1.47133	0.315069	3.82045E-2	3.88544E-3	1.32460E-4
13	2.30643	2.30493	2.16577	1.41443	0.315481	3.91004E-2	3.97547E-3	1.32237E-4
14	2.26809	2.26662	2.12995	1.39287	0.348548	4.20656E-2	4.32465E-3	1.36640E-4
15	2.29932	2.29776	2.2532	1.47363	0.386159	4.90218E-2	5.15265E-3	1.44904E-4
16	2.62409	2.62409	2.46603	1.62412	0.449005	6.59897E-2	6.96530E-3	1.63216E-4
17	3.27167	3.26954	3.07255	2.01069	0.573746	0.12236	1.12491E-2	2.08887E-4
18	4.35803	4.3556	4.09303	2.67718	0.77035	0.17061	1.95913E-2	1.99663E-4
19	5.89884	5.895	5.52868	3.6015	0.926641	0.120855	1.36657E-2	1.19784E-4
20	164.123	164.121	163.899	161.896	144.275	69.0838	11.1216	0.119214

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 16 YEARS, RESTING
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.631212	0.630779	0.590706	0.374449	9.02360E-2	9.07286E-3	9.19176E-4
2	0.451970	0.451662	0.420999	0.268119	5.75237E-2	6.49651E-3	6.58165E-4
3	0.694971	0.694508	0.651563	0.413554	8.77536E-2	9.88646E-3	1.00125E-3
4	0.400362	0.400356	0.375264	0.234878	4.96914E-2	5.60021E-3	5.67247E-4
5	0.261062	0.260804	0.244142	0.151139	3.20494E-2	3.61422E-3	3.66114E-4
6	0.196742	0.196662	0.18923	0.120466	2.51163E-2	2.80239E-3	2.85975E-4
7	0.42871	0.428444	0.403923	0.259016	5.46334E-2	6.14887E-3	6.22721E-4
8	0.588575	0.588206	0.554039	0.358795	7.61396E-2	8.57012E-3	8.79269E-4
9	0.801956	0.801447	0.754572	0.493864	0.106244	1.19711E-2	1.21211E-3
10	1.11708	1.11727	1.05126	0.691457	0.151969	1.71756E-2	1.73994E-3
11	1.54033	1.53932	1.44792	0.955169	0.216863	2.46844E-2	2.50243E-3
12	2.17859	2.17721	2.0698	1.32616	0.315995	3.71509E-2	3.71251E-3
13	3.01076	3.01781	2.83713	1.867	0.467575	5.57711E-2	5.68627E-3
14	4.20279	4.20007	3.94801	2.59287	0.695427	8.62771E-2	8.87423E-3
15	5.84464	5.84084	5.48954	3.52816	0.98752	0.134484	1.39899E-2
16	7.99030	7.99325	7.41814	4.85882	1.38761	0.217007	2.31684E-2
17	10.9239	10.9239	10.2658	6.71916	1.94325	0.366994	4.10515E-2
18	15.0824	15.0825	14.1731	9.26832	2.65263	0.60295	7.22428E-2
19	19.7867	19.7739	18.557	12.1055	3.15313	0.854199	4.81845E-2
20	278.862	238.86	238.535	235.622	269.976	100.544	16.1863
							0.173502

AGE = 16 YEARS, RESTING
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.258761	0.258584	0.242156	0.153503	3.29333E-2	3.71936E-3	3.77355E-4
2	0.193129	0.192996	0.180736	0.114568	2.45900E-2	2.77598E-3	2.81642E-4
3	0.281855	0.281667	0.264253	0.167732	3.55921E-2	4.00985E-3	4.06099E-4
4	0.163182	0.163072	0.152869	0.957017E-2	2.02454E-2	2.28162E-3	2.31106E-4
5	0.109044	0.10897	0.102021	6.31642E-2	1.33915E-2	1.51011E-3	1.52972E-4
6	8.6365E-2	8.62701E-2	8.29022E-2	5.27339E-2	1.10020E-2	1.21716E-3	1.25285E-4
7	0.182408	0.182355	0.171904	0.110208	2.32470E-2	2.61644E-3	2.64978E-4
8	0.248861	0.248704	0.234251	0.151681	3.21880E-2	3.62303E-3	3.66918E-4
9	0.33709	0.337767	0.318007	0.208099	4.47659E-2	5.04400E-3	5.10722E-4
10	0.469591	0.469291	0.441558	0.290434	6.38321E-2	7.21436E-3	7.30838E-4
11	0.647154	0.646739	0.608339	0.40134	9.11306E-2	1.01731E-2	1.05155E-3
12	0.90026	0.899447	0.845833	0.55817	0.130303	1.53991E-2	1.56415E-3
13	1.27406	1.27324	1.19702	0.787819	0.197447	2.35566E-2	2.40184E-3
14	1.7828	1.78165	1.67474	1.10603	0.291119	3.67068E-2	3.77145E-3
15	2.49602	2.4944	2.34439	1.53683	0.422521	5.76143E-2	5.99433E-3
16	3.40665	3.40444	3.19954	2.0959	0.59992	9.40584E-2	1.00455E-2
17	4.77294	4.75984	4.4825	2.91376	0.851178	0.161643	1.80971E-2
18	6.71413	6.70976	6.30523	4.12361	1.10393	0.271799	3.26242E-2
19	9.03829	9.03239	8.4857	5.52961	1.44031	0.207472	0.02201
20	157.088	157.086	156.872	154.956	138.091	66.1225	10.6449
							0.114104

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 16 YEARS, RESTING
PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.178644	0.178522	0.16718	0.105975	2.27365E-2	2.56778E-3	2.60143E-4
2	0.138296	0.138201	0.129422	8.20401E-2	1.76013E-2	1.98783E-3	2.01679E-4
3	0.19538	0.19525	0.183201	0.116362	2.46939E-2	2.78200E-3	2.81747E-4
4	0.119428	0.119348	0.111927	7.01262E-2	1.48310E-2	1.67132E-3	1.69288E-4
5	8.70581E-2	8.70005E-2	8.15662E-2	5.65189E-2	1.07034E-2	1.20686E-3	1.22252E-4
6	7.94916E-2	7.94553E-2	7.60298E-2	4.82344E-2	1.00855E-2	1.13452E-3	1.14894E-4
7	0.151172	0.151077	0.142338	9.11062E-2	1.92240E-2	2.16387E-3	2.19147E-4
8	0.196507	0.196383	0.184905	0.119537	2.53665E-2	2.85542E-3	2.89181E-4
9	0.25645	0.256287	0.241231	0.157594	3.38839E-2	3.81795E-3	3.86581E-4
10	0.343476	0.343256	0.322934	0.212137	4.65784E-2	5.26394E-3	5.33251E-4
11	0.459998	0.459703	0.432379	0.285031	6.46451E-2	7.35711E-3	7.45830E-4
12	0.627833	0.627429	0.590006	0.38915	9.26132E-2	1.07168E-2	1.08851E-3
13	0.875874	0.875308	0.822897	0.541472	0.135548	1.61655E-2	1.64816E-3
14	1.21508	1.21429	1.14142	0.749669	0.198264	2.49905E-2	2.56755E-3
15	1.69428	1.69318	1.59135	1.04317	0.286724	3.90899E-2	4.06691E-3
16	2.36904	2.36754	2.16866	1.42663	0.406749	6.37924E-2	6.81336E-3
*7	3.24008	3.23798	3.04292	1.99162	0.578188	0.109924	1.23089E-2
18	4.57504	4.57206	4.29642	2.80991	0.807362	0.185785	2.23093E-2
19	6.19708	6.19304	5.8182	3.79137	0.987544	0.142253	1.56911E-2
20	139.15	138.148	137.96	136.275	121.443	58.1508	9.36155

AGE = 16 YEARS, RESTING
PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
N	DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.37923	0.37897	0.354895	0.224967	4.82657E-2	5.45095E-3	5.52239E-4
2	0.664693	0.664228	0.62203	0.394304	8.45961E-2	9.50997E-3	9.67918E-4
3	0.579259	0.577996	0.54452	0.353428	7.52551E-2	8.47287E-3	8.58015E-4
4	0.980694	0.980079	0.92317	0.583298	0.123012	1.38534E-2	1.46309E-3
5	1.35011	1.34932	1.27276	0.79077	0.166904	1.89104E-2	1.96530E-3
6	2.04622	2.04505	1.93595	1.21987	0.256513	2.88828E-2	2.92523E-3
7	2.79078	2.78967	2.62938	1.67239	0.353345	3.97887E-2	4.02977E-3
8	2.94439	2.94248	2.76551	1.77313	0.376248	4.23683E-2	4.29099E-3
9	3.4176	3.41738	2.85591	1.84418	0.395102	4.45245E-2	4.50834E-3
*10	3.63743	3.63145	2.8481	1.84756	0.401759	4.53701E-2	4.59585E-3
11	2.91455	2.91266	2.71694	1.78396	0.397747	4.51547E-2	4.57643E-3
*12	2.89063	2.89074	2.72177	1.77628	0.400767	4.70807E-2	4.77832E-3
13	2.81707	2.81604	2.64608	1.72875	0.416336	4.89922E-2	4.90812E-3
14	2.81173	2.80994	2.64051	1.72705	0.439449	5.43151E-2	5.56695E-3
15	3.02977	3.0278	2.84527	1.86093	0.495012	6.59341E-2	6.82706E-3
16	3.77572	3.77253	3.17031	2.07498	0.58736	8.96267E-2	9.54432E-3
17	4.77658	4.7738	4.01627	2.63296	0.75706	0.141997	1.58544E-2
*18	5.75994	5.7522	5.40541	3.53523	1.01596	0.233926	2.86931E-2
19	7.00899	7.0019	7.37156	4.77753	1.24441	0.170254	1.90164E-2
20	215.913	215.91	215.616	212.983	189.701	90.8833	14.6711

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 32 YEARS, RESTING
 PARTICLE DIAMETER = 0.01 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.800817	0.900268	0.749427	0.475061	0.101922	1.15107E-2	1.16616E-3
2	0.576886	0.576491	0.539867	0.342221	7.34219E-2	8.29200E-3	8.41280E-6
3	0.981243	0.980591	0.920103	0.586032	0.124678	1.40484E-2	1.42282E-3
4	0.537643	0.537282	0.503771	0.316546	6.69681E-2	7.54598E-3	7.64307E-4
5	0.342121	0.341888	0.320104	0.198646	4.20911E-2	4.74590E-3	4.80733E-4
6	0.244592	0.24449	0.234979	0.15157	3.15894E-2	3.54993E-3	3.59457E-4
7	0.547443	0.5471	0.515396	0.332265	7.03014E-2	7.91247E-3	8.01320E-4
8	0.736483	0.736018	0.693026	0.451262	9.63563E-2	1.08499E-2	1.09883E-3
9	1.00481	1.00417	0.945092	0.620551	0.134953	1.52267E-2	1.54226E-3
10	1.39	1.38911	1.30676	0.86099	0.192314	2.18047E-2	2.20973E-3
11	1.91206	1.91083	1.79703	1.18525	0.274816	3.14845E-2	3.19403E-3
12	2.64117	2.63946	2.48174	1.63537	0.398599	4.66855E-2	4.74892E-3
13	3.6933	3.69091	3.46964	2.28075	0.584349	7.11069E-2	7.26953E-3
14	5.11242	5.10911	4.80221	3.15135	0.850741	0.110686	1.14476E-2
15	7.08817	7.08357	6.65727	4.36118	1.21487	0.173513	1.82039E-2
16	9.5199	9.51372	8.94081	5.85367	1.64255	0.24106	3.04547E-2
17	13.0865	13.078	12.2899	8.04047	2.32229	0.474777	5.44579E-2
18	17.9017	17.8901	16.8112	10.9915	3.1118	0.767989	9.54342E-2
19	23.0869	23.0710	21.676	14.1309	3.71853	0.563169	6.25863E-2
20	257.592	257.589	257.238	254.096	226.44	108.427	17.4554
							0.187106

AGE = 32 YEARS, RESTING
 PARTICLE DIAMETER = 0.05 μ

DECAY CONSTANT=	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DEPOSITION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.320594	0.320374	0.300021	0.190193	4.38028E-2	4.60812E-3	4.67525E-6
2	0.240228	0.240063	0.224812	0.142508	3.26745E-2	3.45297E-3	3.50227E-6
3	0.388935	0.388677	0.364697	0.232266	4.94133E-2	5.57775E-3	5.63902E-6
4	0.211778	0.211636	0.198453	0.124729	2.63961E-2	2.97315E-3	3.11405E-6
5	0.13795	0.137857	0.129118	0.081424E-2	1.69781E-2	1.91429E-3	1.92005E-6
6	0.10344	0.103396	9.92696E-2	6.39662E-2	1.33391E-2	1.49917E-3	1.51804E-6
7	0.225536	0.225394	0.212327	0.136869	2.89592E-2	3.25941E-3	3.30090E-6
8	0.302607	0.302416	0.284751	0.185414	3.95909E-2	4.45803E-3	4.51483E-6
9	0.412932	0.412569	0.388295	0.254949	5.54436E-2	6.25568E-3	6.33617E-6
10	0.571765	0.5704	0.536597	0.353595	7.89891E-2	8.95566E-3	9.07604E-6
11	0.787177	0.786671	0.73983	0.488028	0.113197	1.26680E-2	1.31588E-6
12	1.09117	1.09047	1.02532	0.675731	0.164784	1.93022E-2	1.96354E-6
13	1.53244	1.53145	1.43965	0.94649	0.24274	2.95496E-2	2.98117E-6
14	2.13554	2.13415	2.00598	1.31653	0.35588	4.64105E-2	4.78289E-6
15	2.98214	2.9812	2.80181	1.93567	0.512348	0.73302	7.69216E-6
16	4.05083	4.0482	3.80445	2.49107	0.717707	0.120269	1.30378E-5
17	5.64262	5.63895	5.29151	3.46723	1.0443	0.206747	2.37196E-5
18	7.87675	7.87163	7.39695	4.82669	1.38227	0.342971	4.38233E-5
19	10.4587	10.4519	9.81857	6.40151	1.68455	0.555124	2.74465E-5
20	167.831	167.829	167.6	165.553	147.534	70.6444	11.3729
							0.121907

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

AGE = 32 YEARS, RESTING
 PARTICLE DIAMETER = 0.1 μ

DECAY CONSTANT =	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DISINTEGRATION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.226761	0.22021	0.20522	0.13073	2.80460E-2	3.10741E-3	3.21356E-6
2	0.176656	0.170539	0.159705	0.103237	2.17190E-2	2.45296E-3	2.48870E-6
3	0.150928	0.146775	0.139246	0.100077	3.40602E-2	3.3781E-3	1.50785E-6
4	0.131008	0.126957	0.114591	0.95543E-2	6.12305E-2	1.07365E-2	1.48707E-6
5	0.115000	0.115101	0.85909E-2	6.12305E-2	1.29645E-2	1.46362E-3	1.48650E-6
6	0.104802E-2	0.95668E-2	8.59147E-2	5.40201E-2	1.14737E-2	1.2899E-3	1.47146E-6
7	0.178475	0.178322	0.167916	0.13074	2.28695E-2	2.57423E-3	1.47806E-6
8	0.229627	0.229481	0.216624	0.14083	2.99909E-2	3.37714E-3	1.48101E-6
9	0.269444	0.269385	0.285925	0.15742	4.07427E-2	4.55886E-3	1.48886E-6
10	0.400300	0.40041	0.38382	0.20768	5.67874E-2	6.32587E-3	1.50757E-6
11	0.455000	0.550648	0.597837	0.26768	7.9020E-2	9.07094E-3	1.52696E-6
12	0.45028	0.752542	0.707555	0.347469	0.9020E-2	1.3096E-2	1.56721E-6
13	1.0467	1.04602	0.99384	0.466171	0.117543	1.3096E-2	1.56721E-6
14	1.45013	1.44919	1.36215	0.646397	0.165631	2.06662E-3	1.57560E-6
15	2.0203	2.01961	1.85809	0.909051	0.24155	3.14930E-3	1.75295E-6
16	2.74064	2.74185	2.57676	1.24357	0.347076	4.96546E-3	1.94884E-6
17	3.8313	3.82934	3.59858	1.68724	0.496617	8.15497E-3	2.31609E-6
18	5.3745	5.37195	5.04922	2.35461	0.692617	0.140735	3.06626E-6
19	7.1011	7.10664	6.75186	3.30086	0.94094	0.234965	4.01111E-6
20	147.17	147.168	146.968	4.40163	1.15028	0.175422	1.00135E-6
				145.173	129.372	61.9478	0.1069

AGE = 32 YEARS, RESTING
 PARTICLE DIAMETER = 1.0 μ

DECAY CONSTANT =	70	0.7	0.07	0.007	0.0007	0.00007	7.00000E-7
DISINTEGRATION	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS	DISINTEGRATIONS
1	0.492495	0.493147	0.461818	0.292785	6.28072E-2	7.0932E-3	7.19655E-6
2	0.803328	0.802777	0.751777	0.47655	0.102242	1.15468E-2	1.17150E-5
3	0.767923	0.767431	0.721894	0.467435	0.100002	1.12669E-2	2.20427E-4
4	1.03195	1.03129	0.970704	0.616344	0.13011	1.46510E-2	2.23379E-4
5	1.34235	1.34244	1.26658	0.789508	0.166588	0.018771	2.27004E-4
6	2.00638	1.99924	1.8928	1.20261	0.252745	2.94471E-2	2.36748E-4
7	2.82258	2.82074	2.6508	1.69294	0.358472	0.040366	2.47524E-4
8	2.86552	2.86366	2.69169	1.72524	0.369938	4.16676E-2	2.48107E-4
9	3.02587	3.0239	2.84135	1.84115	0.397596	4.40474E-2	2.50693E-4
10	3.01057	3.0116	2.82967	1.84102	0.40537	4.58855E-2	2.51287E-4
11	2.9515	2.94958	2.77164	1.80947	0.416505	4.69420E-2	2.51738E-4
12	2.90435	2.90241	2.90247	1.83125	0.431903	4.81147E-2	2.54723E-4
13	3.02173	3.01977	2.83768	1.85559	0.458425	5.49631E-2	2.59544E-4
14	3.17725	3.17518	2.98387	1.95250	0.510323	6.52128E-2	2.70769E-4
15	3.60391	3.60147	3.38441	2.21408	0.602126	8.41475E-2	2.91211E-4
16	4.18981	4.18709	3.93486	2.57353	0.7344	0.121356	3.35052E-4
17	5.50209	5.49851	5.16714	3.38061	0.977104	0.200087	4.35085E-4
18	7.56275	7.55843	7.10266	4.64453	1.32291	0.33251	4.26532E-4
19	10.2319	10.2252	9.6066	6.26266	1.64801	0.249591	2.27842E-4
20	236.956	236.952	236.63	233.74	209.3	99.7408	0.172117

TABLE 5. REGIONAL DEPOSITION AND DISINTEGRATION FOR MONODISPERSE AEROSOL PARTICLES (PER BREATHING CYCLE)

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APPENDIX B

COMPUTER CODES FOR THE AGE-DEPENDENT LUNG MODEL
AND THE DEPTH-DOSE MODEL

Appendix B

COMPUTER CODES FOR THE AGE-DEPENDENT LUNG MODEL
AND THE DEPTH-DOSE MODEL

Both codes are written in BASIC and are largely self-explanatory. The LUNG model computes total deposition in the Nth region of the lung, $R3(N)$; fractional regional deposition, $S3(N)$; regional disintegrations, $D3(N)$; total tracheo-bronchial deposition, Z ; total transfer into the GI tract, $Y9$; total transfer into the systemic blood, $Z9$; and total transfer into the lymphatics, $Z8$. Output is printed on a scratch file (#1), which may subsequently be printed on the line-printer. The following parameters must be specified before running the program:

- N1 = the total number of regions in the lung (27 for the Weibel, 12 for the Findeisen-Landahl),
- N2 = the total number of generations assumed to be within the alveolar region (5 for the Weibel, 3 for the Findeisen-Landahl),
- V1 = the tidal volume (ℓ) for a given age,
- T1 = the time(s) interval during which breathing occurs for a given age,
- T2 = the time(s) interval during which breathholding occurs for a given age,
- P1 = particle diameter (cm) for the assumed aerosol,
- R1 = particle density (g/cm^3) for the assumed aerosol,
- G1 = gravitational constant (cm/s^2),
- P2 = average angle of inclination of channels to the horizontal (radians),
- C0 = inlet air concentration (atoms/cm^3),

$V(n)$ = regional age-dependent lung volumes (cm^3),

$A1(n)$ = ratio of regional radii to lengths in the adult model,

$N4(n)$ = number of channels in the N^{th} region of the lung (age-dependent),

$V9$ = tracheal mucus velocity (cm/min).

The parameters B1-B6, D4-D9, R8, R9, L3-L6, and L9 are the removal parameters from the lung and correspond to those specified in the ICRP Task Group Lung Model (TGLM). For removal from the pulmonary (P) region, all pathways have been assigned kinetics governed by the sum of two exponentials. If desired, one exponential can be removed by assigning a fraction of 0 to that subcompartment.

B1, D4 = removal fraction from the P region to GI tract (B1) and corresponding removal constant (D4, min^{-1}).

B2, D5 = a second compartment for the same removal pathway as in B1, D4.

B3, D6 = removal fraction from the P region to lymphatics (B3) and corresponding removal constant (D6, min^{-1}).

B4, D7 = a second compartment for the same removal pathway as in B3, D6.

B5, D8 = removal fraction from the P region to systemic blood (B5) and corresponding removal constant (D8, min^{-1}).

B6, D9 = a second compartment for the same removal pathway as in B5, D8.

R8, L9 = removal fraction from the tracheobronchial region to the systemic blood (R8) and corresponding removal constant (L9, min^{-1}).

R9 = fraction of atoms deposited in the TB region which could be transferred into the GI tract.

L5, L3 = removal fraction from the nasopharyngeal (NP) region to the systemic blood (L5) and corresponding removal constant (L3, min^{-1}).

L6, L4 = removal fraction from the NP region to the GI tract (L6) and corresponding removal constant (L4, min^{-1})

T7 = time of integration (min).

The DOSE model computes doses (D3) in rads to $1\text{-}\mu$ -diam spheres located at prespecified depths within the walls of a cylinder of given diameter. In addition, the dose-averaged stopping power, S6, in units of MeV/cm is computed and provided as output. The following parameters must be specified:

S(n) = energy correction factor for the Nth alpha energy (difference between the range (cm) in tissue of the Nth alpha particle and that of an 8 MeV particle).

N(n) = radius (cm) of the Nth cylinder.

T = a conversion factor to change path length in air to an equivalent length in tissue.

As in the LUNG model, results are stored in a scratch file (#1) and may be printed as specified by the user.

LUNG

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10-JUL-80

```
10 REM THIS PROGRAM COMPUTES REGIONAL DEPOSITION AND DISINTEGRATIONS
20 REM WITHIN AN AGE-DEPENDENT LUNG MODEL
30 DIM R2(30),A1(30),V(30),N4(30),V2(30),T4(30),I1(30)
40 DIM S1(30),T(30),S2(30),F3(30),F4(30),F(30),A2(30)
50 DIM D4(30),H(30),G(30),L(30),Z(30),W(30),X(30),B(30)
60 DIM C(30),D(30),E(30),J(30),A(30),N(30),K(30),P1(30)
70 DIM P(30),M(30),Q(30),S(30),R(30),D2(30),E1(30)
80 DIM F5(30),C1(100),Z1(30),R3(30),S3(30),Q1(30)
90 DIM E2(30),F6(30),G2(30),D3(30),B2(30),L1(30),K1(50)
100 N1=27
110 N2=5
120 V1=1500
130 T1=1.07
140 T2=0.36
150 P1=1E-05
160 R1=2.5
170 G1=975.36
180 N3=1.9E-04
190 P2=0.7854
200 D1=4.39E-15/N3/P1
210 C0=1
220 P3=3.1416
230 FOR N=1 TO N1
240 READ V(N)
250 NEXT N
260 REM SPECIFY REGIONAL VOLUMES
270 DATA 20,20,30.52,11.12,4.11,1.5,3.23,3.29,3.54,4.04,4.45
280 DATA 5.15,6.25,7.45,9.58,11.67,16.2,22.41,30.56,42.61,93
290 DATA 140,224,350,591,3150
300 FOR N=1 TO N1
310 READ A1(N)
320 NEXT N
330 REM SPECIFY ALPHA VALUES
340 DATA .143,.5,.075,.128,.218,.368,.177,.164,.156,.151,.145,.143,.141
350 DATA .14,.144,.152,.161,.165,.182,.191,.214,.237,.271,.307,.347,.41,.5
360 FOR N=1 TO N1
370 READ N4(N)
380 NEXT N
390 REM SPECIFY NUMBER OF CHANNELS IN EACH REGION
400 DATA 1,1,1,2,4,8,16,32,64,128,256,512,1024,2048,4096
410 DATA 8192,16384,32768,65536,131072,262144,542288,1048576
420 DATA 2097152,4194304,8388608,300E06
430 REM SPECIFY REMOVAL PARAMETERS
440 B4=0
450 B5=0.8
460 B6=0
470 D4=1
480 D5=1
```

```

490 D6=9.63E-04
500 D7=1
510 D8=9.63E-04
520 D9=1
530 T7=1E08
540 R8=0.95
550 R9=0.05
560 L9=4.8E-02
570 N9=3
580 M8=7
590 FOR N=1 TO M8
600 READ K1(N)
610 NEXT N
620 REM SPECIFY DECAY CONSTANTS
630 DATA 7E01,7E-01,7E-02,7E-03,7E-04,7E-05,7E-07
640 FOR N=1 TO N1
650 REM COMPUTE REGIONAL RADII AND LENGTHS
660 R2(N)=(A1(N)*V(N)/N4(N)/P3)^0.3333
670 L1(N)=R2(N)/A1(N)
680 NEXT N
690 V9=0.5
700 B1=0
710 B2=0
720 B3=0.2
730 FOR N=1 TO N1-N2-N9
740 REM COMPUTE REGIONAL TRANSIT TIMES
750 T4(N)=L1(N)*N4(N)*R2(N)/V9/R2(3)
760 NEXT N
770 L4=4.8E-02
780 L6=0.5
790 L3=4.8E-02
800 L5=0.5
810 FOR N=1 TO 12
820 READ P1(N)
830 NEXT N
840 REM SPECIFY PARTICLE DIAMETERS
850 DATA 2.3E-10,1E-6,2E-6,5E-6,1E-5,2E-5,5E-5,1E-4,2E-4,4E-4,6E-4,1E-3
860 FILES OUT.LPT
870 SCRATCH #1
880 REM INCREMENT PARTICLE DIAMETERS
890 FOR J7=2 TO 12
900 P1=P1(J7)
910 REM COMPUTE DIFFUSION COEFFICIENT
920 D1=4.39E-15/N3/P1
930 N5=N1-N2
940 N4=N5-N9+1
950 FOR N=1 TO N1
960 REM COMPUTE REGIONAL FLOW RATES
970 V2(N)=V1/T1/N4(N)/P3/(R2(N))^2
980 NEXT N
990 FOR N=1 TO N5
1000 REM COMPUTE IMPACTION FRACTIONS

```

```

1010 I1(N)=150*R1*P1^2*V2(N-1)/(R2(N)+150*R1*P1^2*V2(N-1))
1020 NEXT N
1030 FOR N=1 TO N5
1040 X=1+2.63E-06*(6.23+2.01*EXP(-8.32E04*P1))/P1
1050 Y= X*G1*R1*P1^2/18/PI
1060 REM COMPUTE SEDIMENTATION FRACTIONS
1070 S1(N)=1-EXP(-0.8*Y*T1*V(N)*COS(P2)/V1/R2(N))
1080 S2(N)=1-EXP(-0.8*Y*T2*COS(P2)/R2(N))
1090 NEXT N
1100 REM COMPUTE DIFFUSION FRACTIONS
1110 FOR N=1 TO N5
1120 H=2*D1*V(N)*T1/V1/(2*R2(N))^2
1130 IF H<0.0156, THEN 1160
1140 F3(N)=1-0.819*EXP(-7.314*H)-0.097*EXP(-44.6*H)-0.0325*EXP(-114*H)
1150 GO TO 1170
1160 F3(N)=4.07*H^0.66667-2.4*H-0.446*H^1.333333
1170 NEXT N
1180 FOR N=1 TO N5
1190 F4(N)=1-EXP(-4.0E-06*(X*T2/P1/R2(N))^0.5)
1200 NEXT N
1210 FOR N=1 TO N5
1220 REM COMPUTE TOTAL DEPOSITION FRACTIONS
1230 F(N)=I1(N)+S1(N)+F3(N)
1240 F(N)=1-EXP(-F(N))
1250 REM COMPUTE DEPOSITION DURING BREATH-HOLDING
1260 A2(N)=1-EXP(-S2(N)-F4(N))
1270 B2(N)=A2(N)
1280 IF N>=3, THEN 1300
1290 F(N)=0.5*F(N)+F(N)
1300 NEXT N
1310 V3=0
1320 FOR N=N5+1 TO N1
1330 V3=V3+V(N)
1340 NEXT N
1350 R4=0
1360 V4=0
1370 FOR N=N5+1 TO N1
1380 V4=V4+V(N)
1390 R4=R4+R2(N)*V(N)/V3
1400 NEXT N
1410 REM COMPUTE AVERAGE ALVEOLAR RADIUS
1420 R4=R4*((0.5*V1+V3)/V3)^0.5
1430 T3=2*(T1+T2)
1440 REM COMPUTE ALVEOLAR DEPOSITION FRACTION
1450 F7=1-EXP(-4.0E-06*(X*T3/P1/R4)^0.5)
1460 F8= 1-EXP(-0.8*Y*T3*COS(P2)/R4)
1470 F9=1-EXP(-F7-F8)
1480 REM BEGIN TO COMPUTE TOTAL REGIONAL DEPOSITION
1490 FOR N=1 TO N5
1500 Y=1
1510 IF N=1, THEN 1550
1520 FOR P=1 TO N-1

```

```
1530 Y=Y*(1-F(P))
1540 NEXT P
1550 H(N)=Y
1560 NEXT N
1570 FOR N=1 TO N5
1580 Y=N5-N+1
1590 G(N)=F(Y)
1600 NEXT N
1610 FOR N=1 TO N5
1620 Y=1
1630 IF N=1, THEN 1670
1640 FOR P=1 TO N-1
1650 Y=Y*(1-G(P))
1660 NEXT P
1670 L(N)=Y
1680 NEXT N
1690 V=0
1700 FOR N=1 TO N5
1710 V=V+V(N)
1720 NEXT N
1730 X=V1-V
1740 IF X<=0, THEN 1760
1750 IF X>0, THEN 1770
1760 X=0
1770 FOR N=1 TO N5
1780 Y=N5-N+1
1790 Z(N)=V(Y)
1800 NEXT N
1810 FOR N=1 TO N5
1820 Y=0
1830 FOR P=1 TO N
1840 Y=Y+V(P)
1850 NEXT P
1860 Y=V1-X-Y
1870 W(N)=Y
1880 NEXT N
1890 FOR N=1 TO N5
1900 Y=0
1910 FOR P=1 TO N
1920 Y=Y+Z(P)
1930 NEXT P
1940 Y=V1-X-Y
1950 X(N)=Y
1960 NEXT N
1970 FOR N=1 TO N5
1980 IF N=1, THEN 2040
1990 V=0
2000 FOR P=1 TO N-1
2010 V=V+V(P)
2020 NEXT P
2030 GO TO 2050
2040 B(1)=V1
```

```
2050 GO TO 2100
2060 B(N)=V1-X-V
2070 IF B(N)<=0, THEN 2090
2080 GO TO 2100
2090 B(N)=0
2100 NEXT N
2110 FOR N=1 TO N5
2120 IF N=1, THEN 2180
2130 V=0
2140 FOR P=1 TO N-1
2150 V=V+Z(P)
2160 NEXT P
2170 GO TO 2200
2180 C(1)=V1
2190 GO TO 2240
2200 C(N)=V1-X-V
2210 IF C(N)<=0, THEN 2230
2220 GO TO 2240
2230 C(N)=0
2240 NEXT N
2250 FOR N=1 TO N5
2260 V=0
2270 FOR P=1 TO N
2280 V=V+V(P)
2290 NEXT P
2300 D(N)=V1-X-V
2310 NEXT N
2320 FOR N=1 TO N5
2330 V=0
2340 FOR P=1 TO N
2350 V=V+Z(P)
2360 NEXT P
2370 E(N)=V1-X-V
2380 NEXT N
2390 FOR N=1 TO N5
2400 Y=D(N)
2410 IF Y<=0, THEN 2440
2420 J(N)=V(N)
2430 GO TO 2450
2440 J(N)=B(N)
2450 NEXT N
2460 FOR N=1 TO N5
2470 Y=E(N)
2480 IF Y<=0, THEN 2510
2490 A(N)=Z(N)
2500 GO TO 2520
2510 A(N)=C(N)
2520 NEXT N
2530 FOR N=1 TO N5
2540 N(N)=F(N)*X*H(N)
2550 NEXT N
2560 FOR N=1 TO N5
```

```

2570 K(N)=G(N)*X*L(N)
2580 NEXT N
2590 FOR N=1 TO N5
2600 P(N)=H(N)*(F(N)*W(N)+0.5*F(N)*J(N))
2610 NEXT N
2620 FOR N=1 TO N5
2630 M(N)=L(N)*(G(N)*X(N)+0.5*G(N)*A(N))
2640 NEXT N
2650 FOR N=1 TO N5
2660 Q(N)=H(N)*(1-0.5*F(N))*A2(N)*J(N)
2670 NEXT N
2680 FOR N=1 TO N5
2690 S(N)=L(N)*(1-0.5*G(N))+B2(N)*A(N)
2700 NEXT N
2710 FOR N=1 TO N5
2720 R=1
2730 B=0
2740 FOR K=N+1 TO N5
2750 FOR L=N+1 TO K-1
2760 IF K=N+1, THEN 2790
2770 R=R*(1-F(L))
2780 NEXT L
2790 B=B+H(K)*(1-0.5*F(K))^2*(1-A2(K))*R*F(N)*J(K)
2800 NEXT K
2810 A=H(N)*(1-0.5*F(N))*(1-A2(N))*0.5*F(N)*J(N)
2820 R(N)=B+A
2830 NEXT N
2840 FOR N=1 TO N5
2850 R=1
2860 B=0
2870 FOR K=N+1 TO N5
2880 FOR L=N+1 TO K-1
2890 IF K=N+1, THEN 2920
2900 R=R*(1-G(L))
2910 NEXT L
2920 B=B+L(K)*(1-0.5*G(K))^2*(1-B2(K))*R*G(N)*A(K)
2930 NEXT K
2940 A=L(N)*(1-0.5*G(N))*(1-B2(N))*0.5*G(N)*A(N)
2950 T(N)=B+A
2960 NEXT N
2970 F1=0
2980 FOR N=1 TO N5
2990 D2(N)=(N(N)+P(N)+Q(N)+R(N))*C0
3000 NEXT N
3010 FOR N=1 TO N5
3020 F1=F1+M(N)+S(N)+T(N)
3030 NEXT N
3040 F2=(F1+X)/V1
3050 FOR N=1 TO N5
3060 E1(N)=K(N)+M(N)+S(N)+T(N)
3070 NEXT N
3080 FOR N=1 TO N5

```

```

3090 Y=N5-N+1
3100 F5(N)=E1(Y)
3110 NEXT N
3120 C1(1)=C0*(1-F9)*X/(V1+V4)
3130 G3=1
3140 FOR N=1 TO N5
3150 G3=G3*(1-F(N))
3160 NEXT N
3170 REM COMPUTE CONCENTRATION IN ALVEOLI
3180 C1(1)=G3*C1(1)
3190 C1(1)=C1(1)*(T3/(T2+0.5*T1*(1+X/V1)))
3200 X9= ((1-F9)*V4/(V1+V4))+((1-F2)*V1/(V1+V4))
3210 FOR K=2 TO 100
3220 C1(K)=C1(K-1)*X9^(K-1)
3230 M9=K
3240 IF C1(K)<=00.02*C1(1), THEN 3260
3250 NEXT K
3260 FOR N=1 TO N5
3270 Z4=0
3280 FOR J=1 TO M9
3290 Z4=Z4+C1(J)*F5(N)
3300 NEXT J
3310 Z1(N)=Z4
3320 NEXT N
3330 REM COMPUTE REGIONAL DEPOSITION ( TOTAL AND FRACTION )
3340 FOR N=1 TO N5
3350 R3(N)=D2(N)+Z1(N)
3360 S3(N)=R3(N)/(C0*V1)
3370 NEXT N
3380 Q1(1)=C0*G3*X*(T2+0.5*T1*(1+X/V1))*F9*(V4+0.5*V1)/(V1+V4)/T3
3390 FOR J=1 TO M9
3400 Q1(J)=C1(J)*F9*(V4+0.5*V1)
3410 NEXT J
3420 REM COMPUTE ALVEOLAR DEPOSITION
3430 A9=0
3440 FOR J=1 TO M9
3450 A9=A9+Q1(J)
3460 NEXT J
3470 A8=A9/(C0*V1)
3480 T9=0
3490 Y=0
3500 Z=0
3510 FOR N=N4 TO N5
3520 Z=Z+R3(N)
3530 Y=Y+S3(N)
3540 NEXT N
3550 R3(N4)=Z+A9
3560 S3(N4)=Y+A8
3570 FOR I=1 TO M8
3580 FOR N=3 TO N4-2
3590 X=K1(I)*T4(N)
3600 Y=K1(I)*T4(N+1)

```

```

3610 IF X>=20, THEN 3710
3620 IF Y>=20, THEN 3680
3630 IF X>=1E-03, THEN 3740
3640 REM COMPUTE REGIONAL DISINTEGRATIONS
3650 E2(N)=R3(N)*(0.5*X-X^2/6)
3660 F6(N)=R3(N+1)*(1-0.5*X)*(Y-Y^2/2)
3670 GO TO 3760
3680 E2(N)=R3(N)*(1-(1-EXP(-X))/X)
3690 F6(N)=R3(N+1)*(1-EXP(-X))/X
3700 GO TO 3760
3710 E2(N)=R3(N)*(1-1/X)
3720 F6(N)=R3(N+1)/X
3730 GO TO 3760
3740 E2(N)=R3(N)*(1-(1-EXP(-K1(I)*T4(N)))/(K1(I)*T4(N)))
3750 F6(N)=R3(N+1)*(1-EXP(-K1(I)*T4(N)))*(1-EXP(-K1(I)*T4(N+1)))/K1(I)/T4(N)
3760 IF N=N4-2, THEN 3980
3770 FOR J=N+2 TO N4-1
3780 X=K1(I)*T4(N)
3790 Y=K1(I)*T4(J)
3800 IF X>=20, THEN 3870
3810 IF Y>=20, THEN 3830
3820 GO TO 3850
3830 G2(N)=R3(J)*(1-EXP(-X))/X
3840 GO TO 3880
3850 G2(N)=R3(J)*(1-EXP(-K1(I)*T4(N)))*(1-EXP(-K1(I)*T4(J)))/(K1(I)*T4(N))
3860 GO TO 3880
3870 G2(N)=R3(J)/(K1(I)*T4(N))
3880 FOR K=N+1 TO J-1
3890 T9=T9+T4(K)
3900 NEXT K
3910 X=K1(I)*T9
3920 IF X>=20, THEN 3950
3930 G2(N)=G2(N)*EXP(-K1(I)*T9)
3940 GO TO 3960
3950 G2(N)=0
3960 NEXT J
3970 GO TO 3990
3980 G2(N)=0
3990 D3(N)=E2(N)+F6(N)+G2(N)
4000 NEXT N
4010 IF X>=20, THEN 4050
4020 IF X<=1E-03, THEN 4070
4030 D3(N4-1)=R3(N4-1)*(1-(1-EXP(-K1(I)*T4(N4-1)))/(K1(I)*T4(N4-1)))
4040 GO TO 4090
4050 D3(N4-1)=R3(N4-1)*(1-1/X)
4060 GO TO 4090
4070 D3(N4-1)=R3(N4-1)*(0.5*X-X^2/6)
4080 X=B1*D4+B2*D5+B3*D6+B4*D7+B5*D8+B6*D9+K1(I)
4090 Y=X*T7
4100 IF Y>=20, THEN 4130
4110 D3(N4)=R3(N4)*K1(I)*(1-EXP(-X*T7))/X
4120 GO TO 4140

```

```
4130 D3(N4)=R3(N4)*K1(I)/X
4140 Z5=0
4150 Z6=0
4160 FOR N=3 TO N4-1
4170 Z5=Z5+R3(N)*R9
4180 Z6=Z6+D3(N)*R9
4190 NEXT N
4200 Z6=Z5-Z6
4210 IF Z6<=0, THEN 4230
4220 GO TO 4240
4230 Z6=0
4240 X=L3*L5+L4*L6+K1(I)
4250 FOR N=1 TO 2
4260 D3(N)=R3(N)*K1(I)/X
4270 NEXT N
4280 Z7=(L6*L4/X)*(L6*R3(1)+L6*R3(2))
4290 Z6=Z6+Z7
4300 FOR N=3 TO N4-1
4310 D3(N)=R9*D3(N)+R8*K1(I)*R3(N)/(K1(I)+L9)
4320 NEXT N
4330 Y=B1+B2
4340 IF Y>0, THEN 4370
4350 Y=K1(I)
4360 GO TO 4380
4370 Y=(B1*D4+B2*D5)/(B1+B2)+K1(I)
4380 Z=Y*T7
4390 IF Z>=20, THEN 4420
4400 Y2=R3(N4)*(B1*D4+B2*D5)*(1-EXP(-Y*T7))/Y
4410 GO TO 4430
4420 Y2=R3(N4)*(B1*D4+B2*D5)/Y
4430 Z=1
4440 FOR N=3 TO N4-1
4450 X=K1(I)*T4(N)
4460 IF X>=20, THEN 4500
4470 IF X<=1E-03, THEN 4520
4480 Z=Z*EXP(-K1(I)*T4(N))
4490 GO TO 4530
4500 Z=0
4510 GO TO 4530
4520 Z=1
4530 NEXT N
4540 Y9=Y2*Z
4550 FOR N=3 TO N4-1
4560 E3=1
4570 IF N=N4-1, THEN 4670
4580 FOR J=N+1 TO N4-1
4590 X=K1(I)*T4(J)
4600 IF X>=20, THEN 4640
4610 IF X<=1E-03, THEN 4650
4620 E3=E3*(1-EXP(-K1(I)*T4(J)))
4630 GO TO 4660
4650 E3=0
```

```

4660 NEXT J
4670 X=K1(I)*T4(N)
4680 IF X>=10, THEN 4720
4690 IF X<=1E-03, THEN 4740
4700 D4(N)=E3*Y2*(1-EXP(-K1(I)*T4(N)))
4710 GO TO 4750
4720 D4(N)=E3*Y2
4730 GO TO 4750
4740 D4(N)=0
4750 NEXT N
4760 Y=(B5*D8+B6*D9)/(B5+B6)+K1(I)
4770 Z=Y*T7
4780 IF Z>=20, THEN 4810
4790 Z7=R3(N4)*(B5*D8+B6*D9)*(1-EXP(-Y*T7))/Y
4800 GO TO 4820
4810 Z7=R3(N4)*(B5*D8+B6*D9)/Y
4820 Y=(B3*D6+B4*D7)/(B3+B4)+K1(I)
4830 Z=Y*T7
4840 IF Z>=20, THEN 4870
4850 Z8=R3(N4)*(B3*D6+B4*D7)*(1-EXP(-Y*T7))/Y
4860 GO TO 4880
4870 Z8=R3(N4)*(B3*D6+B4*D7)/Y
4880 Z9=Z5*R8/R9
4890 Z=(L9+K1(I))*T7
4900 IF Z>=20, THEN 4930
4910 Z9=Z9*L9*(1-EXP(-(L9+K1(I))*T7))/(L9+K1(I))
4920 GO TO 4940
4930 Z9=Z9*L9/(L9+K1(I))
4940 Z9=Z9+Z7
4950 Z9=Z9+((L3*L5)/(L3*L5+L4*L6+K1(I)))*(L5*R3(1)+L5*R3(2))
4960 Y9=Y9+Z6
4970 GO TO 5000
4980 PRINT #1, "G.I. TRACT      BLOOD      LYMPHATICS "
4990 PRINT #1, Y9, Z9, Z8
5000 FOR N=1 TO N4-1
5010 D3(N)=D3(N)+D4(N)
5020 NEXT N
5030 PRINT #1, "PARTICLE DIAMETER=", P1
5040 PRINT #1, "DECAY CONSTANT=", K1(I)
5050 PRINT #1, " N              DEPOSITION    DISINTEGRATIONS    DEP.FRACTION"
5060 FOR N=1 TO N4
5070 PRINT #1, N, R3(N), D3(N), S3(N)
5080 NEXT N
5090 GO TO 5100
5100 NEXT I
5110 Z=0
5120 FOR N=3 TO 19
5130 Z=Z+S3(N)
5140 NEXT N
5150 PRINT #1, "TRACHEO-BRONCHIAL DEPOSITION FRACTION=" , Z
5160 NEXT J7
5170 PRINT #1, V1, T1, T2

```

DOSE

13:13

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1 REM THIS PROGRAM COMPUTES THE DOSE AND DOSE-AVERAGED STOPPING POWERS
2 REM AT VARIOUS DEPTHS IN THE WALLS OF A CYLINDER
10 DIM S(30),N(30)
100 FILES OUT.LPT
101 SCRATCH #1
110 FOR N=1 TO 4
120 READ S(N)
130 NEXT N
135 REM ENTER ENERGY CORRECTION FACTORS
140 DATA 0,14.3,28.25,40
150 FOR N=1 TO 4
160 READ N(N)
170 NEXT N
175 REM ENTER CHANNEL RADII
180 DATA 0.005,0.01,0.05,0.1
190 FOR J=1 TO 4
200 R=N(J)
210 FOR L=1 TO 4
220 Z8=S(L)*1E-04
230 R9=75.5E-04
240 FOR M=1 TO 2
250 T=0.00110
260 R2=1
270 X5=1.57E04*R
280 D3=0
290 D4=0
300 D=M*10E-04
305 REM INCREMENT ANGULAR COORDINATES
310 FOR N=1 TO X5
311 Z3=2*N-1
340 P1=Z3/R/1E04
345 REM INCREMENT AXIAL COORDINATES
350 FOR K=1 TO 100
360 H=K*1E-04
370 L1=((R^2*(SIN(P1))^2)+(R+D-R*COS(P1))^2)^0.5
380 X=ATN(H/L1)
390 L2=L1/COS(X)
400 Y=R*COS(P1-3.1416/2)/(R*SIN(P1-3.1416/2)+R+D)
410 P2=ATN(Y)
420 A=(D/COS(P2))
430 U=0.5
440 C=(4*R^2-8*D*R*(TAN(P2))^2-4*(D^2)*(TAN(P2))^2)^0.5
450 B=2*R-2*D*(TAN(P2))^2
460 A=(A+(B-C)/(2*COS(P2)))/COS(X)
465 REM COMPUTE PATHLENGTH (UNCORRECTED FOR ENERGY)
470 L3=T*(L2-A)+A
475 REM COMPUTE PATHLENGTH (CORRECTED FOR ENERGY)
480 L3=L3+Z8
490 IF L3>R9, THEN 1850

```

```
500 IF L3<2.5E-04, THEN 940
510 IF L3<5.0E-04, THEN 960
520 IF L3<7.5E-04, THEN 980
530 IF L3<1E-03, THEN 1000
540 IF L3<12.5E-04, THEN 1020
550 IF L3<15E-04, THEN 1040
560 IF L3<17.5E-04, THEN 1060
570 IF L3<20E-04, THEN 1080
580 IF L3<22.5E-04, THEN 1100
590 IF L3<25E-04, THEN 1120
600 IF L3<27.5E-04, THEN 1140
610 IF L3<30E-04, THEN 1160
620 IF L3<32.5E-04, THEN 1180
630 IF L3<35E-04, THEN 1200
640 IF L3<37.5E-04, THEN 1220
650 IF L3<40 E-04, THEN 1240
660 IF L3<42.5E-04, THEN 1260
670 IF L3<45E-04, THEN 1280
680 IF L3<47.5E-04, THEN 1300
690 IF L3<50E-04, THEN 1320
700 IF L3<52.5E-04, THEN 1340
710 IF L3<55E-04, THEN 1360
720 IF L3<57.5E-04, THEN 1380
730 IF L3<60E-04, THEN 1400
740 IF L3<62.5E-04, THEN 1420
750 IF L3<65E-04, THEN 1440
760 IF L3<65.5E-04, THEN 1460
770 IF L3<67E-04, THEN 1480
780 IF L3<67.5E-04, THEN 1500
790 IF L3<68E-04, THEN 1520
800 IF L3<68.5E-04, THEN 1540
810 IF L3<69E-04, THEN 1560
820 IF L3<69.5E-04, THEN 1580
830 IF L3<70E-04, THEN 1600
840 IF L3<71E-04, THEN 1620
850 IF L3<71.5E-04, THEN 1640
860 IF L3<72E-04, THEN 1660
870 IF L3<72.5E-04, THEN 1680
880 IF L3<73E-04, THEN 1700
890 IF L3<73.5E-04, THEN 1720
900 IF L3<74E-04, THEN 1740
910 IF L3<74.5E-04, THEN 1760
920 IF L3<75E-04, THEN 1780
930 IF L3<75.5E-04, THEN 1800
935 REM SPECIFY STOPPING POWER ASSOCIATED WITH PATHLENGTH
940 S=662.5
950 GO TO 1810
960 S=672.5
970 GO TO 1810
980 S=682.5
990 GO TO 1810
1000 S=695
```

1010 GO TO 1810
1020 S=705
1030 GO TO 1810
1040 S=717.5
1050 GO TO 1810
1060 S=730
1070 GO TO 1810
1080 S=742.5
1090 GO TO 1810
1100 S=757.5
1110 GO TO 1810
1120 S=772.5
1130 GO TO 1810
1140 S=790
1150 GO TO 1810
1160 S=810
1170 GO TO 1810
1180 S=830
1190 GO TO 1810
1200 S=850
1210 GO TO 1810
1220 S=872.5
1230 GO TO 1810
1240 S=900
1250 GO TO 1810
1260 S=930
1270 GO TO 1810
1280 S=962.5
1290 GO TO 1810
1300 S=995
1310 GO TO 1810
1320 S=1045
1330 GO TO 1810
1340 S=1100
1350 GO TO 1810
1360 S=1150
1370 GO TO 1810
1380 S=1215
1390 GO TO 1810
1400 S=1285
1410 GO TO 1810
1420 S=1385
1430 GO TO 1810
1440 S=1520
1450 GO TO 1810
1460 S=1605
1470 GO TO 1810
1480 S=1695
1490 GO TO 1810
1500 S=1790
1510 GO TO 1810
1520 S=1850

```
1530 GO TO 1810
1540 S=1900
1550 GO TO 1810
1560 S=1952.5
1570 GO TO 1810
1580 S=2022.5
1590 GO TO 1810
1600 S=2105
1610 GO TO 1810
1620 S=2200
1630 GO TO 1810
1640 S=2450
1650 GO TO 1810
1660 S=2560
1670 GO TO 1810
1680 S=2705
1690 GO TO 1810
1700 S=2840
1710 GO TO 1810
1720 S=2840
1730 GO TO 1810
1740 S=2635
1750 GO TO 1810
1760 S=2200
1770 GO TO 1810
1780 S=1560
1790 GO TO 1810
1800 S=600
1805 REM COMPUTE DOSE
1810 D2=S*2/(7.844E08*R2*L2^2)
1820 D3=D3+D2
1830 D4=S*D2+D4
1840 NEXT K
1850 NEXT N
1851 IF D3K=0, THEN 1855
1855 REM COMPUTE DOSE-AVERAGED STOPPING POWERS
1860 S6=D4/D3
1861 GO TO 1870
1865 S6=0
1870 D3=D3*K4
1880 PRINT #1,"RADIUS=",R
1890 PRINT #1,"ENERGY FACTOR=",Z8
1900 PRINT #1,"DEPTH=",D
1910 PRINT #1,"DOSE=",D3
1920 PRINT #1,"DOSE-AVERAGED STOPPING POWER=",S6
1930 NEXT M
1940 NEXT L
1950 NEXT J
1960 END
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