

Dielectric Modeling of Biological Cells. Models and Algorithm

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Shell models pertinent to the dielectric analysis of biological cells and organelles are described. These include: 1) one-shell, 2) two-abutting-shell, 3) multi-shell, 4) vesicle-inclusion, and 5) composite-shell models, with their spherical or ellipsoidal variations. A systematic procedure for depicting the dielectric behavior of each model is also presented on the basis of the theory of interfacial polarization. As an example, data from a suspension measurement on lymphoid cells are analyzed using model 5.

KEY WORDS: Dielectric dispersion/ Permittivity/ Conductivity/ One-shell model/ Multi-shell model/ Spherical cell/ Ellipsoidal cell/

I. INTRODUCTION

Biological cells, prokaryotic or eukaryotic, are demarcated from their environment by a diffusion barrier of lipidic nature, viz., the plasma membrane. In higher organisms, the cell develops within it a secondary structure of organelles, which are mostly membrane bounded, as is the case with the nucleus, mitochondria and endoplasmic reticulum.

In physical terms, all these membranes can be regarded as a shell dielectric that separates two more conducting aqueous compartments to form an interface on each side of the shell phase. This interface in turn becomes the site of charge accumulation or depletion (i.e., "polarization") depending on the electric field applied. When subjected to a c. field, the degree of polarization across the interface varies with frequency. Thus, in cells and tissues, interfacial polarization is the major mechanism that is responsible for the dielectric relaxation phenomena we usually observe.

Impedance analysis of cells and tissues has long attracted biophysicists' attention partly because this method allows a noninvasive approach to the electrical properties of living cells. However, some workers, especially those who are electrically oriented, often end up with mere equivalent-circuit analyses, leaving the assignment of dielectric spectroscopic data behind. To some workers with a biomedical background, on the other hand, dielectric modeling and associated theories of interfacial polarization both seem too complicated to have a good command of these. Hence a systematic procedure should be desirable which is easy to apply in extracting the passive electrical prop-

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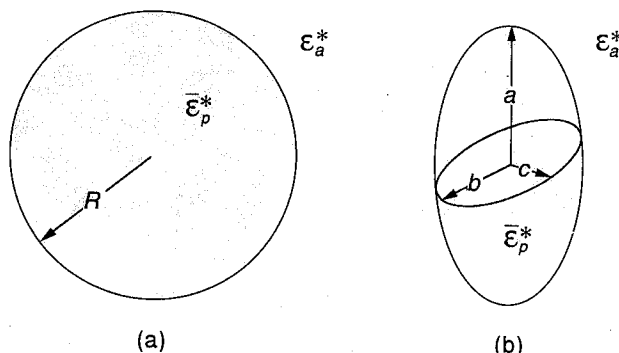


Fig. 1. Zero-shell model: (a) Sphere of radius R and equivalent homogeneous permittivity $\bar{\epsilon}_p^*$; (b) ellipsoid of revolution with semi-axes a , b and c ($=b$), an ellipsoidal version of (a).

erties, such as relative permittivity and conductivity, of the component phases that comprise a cell.

In this article, we summarize the dielectric models of our routine use and present some examples of the models' predicted behavior, followed by a program list with which to execute relevant calculations.

II. SUSPENSION EQUATIONS FOR THE TWO-PHASE SYSTEM

Complex relative permittivity ϵ^* for a dilute suspension made up of medium (ϵ_a^*) interspersed with spherical particles (Fig. 1a) was formulated by Wagner¹⁾, on the basis of the theory of interfacial polarization, as

$$\epsilon^* = \epsilon_a^* \frac{2(1-\Phi)\epsilon_a^* + (1+2\Phi)\bar{\epsilon}_p^*}{(2+\Phi)\epsilon_a^* + (1-\Phi)\bar{\epsilon}_p^*} \quad (1)$$

where Φ is volume fraction.

For more concentrated suspensions, Hanai^{2,3)} derived an extended version of Eq. (1), which is of the form:

$$\left(\frac{\epsilon^* - \bar{\epsilon}_p^*}{\epsilon_a^* - \bar{\epsilon}_p^*} \right) \left(\frac{\epsilon_a^*}{\epsilon^*} \right)^{1/3} = 1 - \Phi \quad (2)$$

Combination of Eq. (1) or Eq. (2) with the expression for a particular model to be given in the following section enables calculation of ϵ^* for the whole suspension of shelled spheres.

Suspension equations for ellipsoids (Fig. 1b) have been proposed by several authors. Among these, Sillars' extension⁴⁾ of the Maxwell-Wagner theory to non-spherical particles makes the starting point for subsequent modifications. (For a didactic derivation of Sillars' equation, see e. g. Takashima⁵⁾.) Pertinent equations have been derived by Asami et al.^{6,7)} for dilute systems and by Watanabe et al.⁸⁾ for concentrated systems, to name but a few.

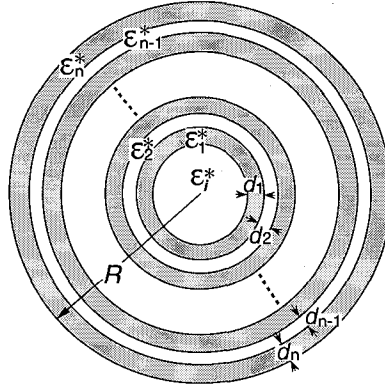


Fig. 2. Multi-shell model, spherical. The core of ϵ_i^* is surrounded by n concentric strata of ϵ_k^* 's and thicknesses d_k 's ($k=1, 2, \dots, n$).

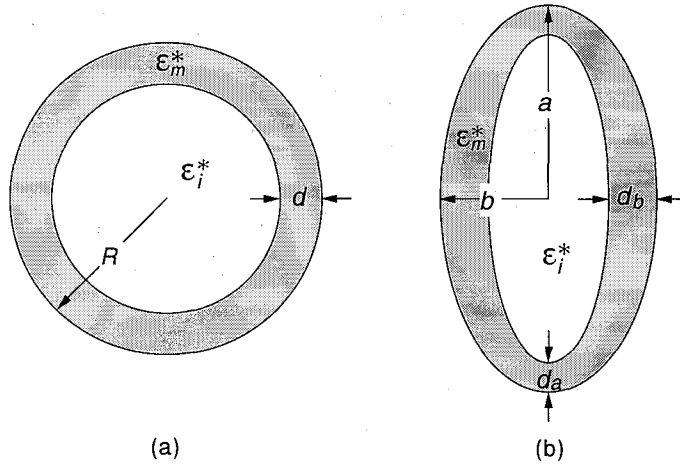


Fig. 3. One-shell model. (a) Sphere, (b) Ellipsoid of revolution.

III. MODELS FOR THE SUSPENDED PHASE

In the dielectric modeling of spherical cells, a sphere of concentric strata (Fig. 2), the number (n) of which is a parameter may be the basic model to start with. Fig. 3 shows the simplest possible versions. Hereafter, the spherical model (Fig. 3a) rather than the spheroidal one (Fig. 3b) will be focused on since mathematics would become too lengthy to give a full description to the latter.

Applying Maxwell's homogenization procedure^{9,10} one can write down the homogeneous permittivity of the "one-shell" model as

$$\bar{\epsilon}_p^* = \epsilon_m^* \frac{2(1-v)\epsilon_m^* + (1+2v)\epsilon_i^*}{(2+v)\epsilon_m^* + (1-v)\epsilon_i^*} \quad (3)$$

with $v = (1-d/R)^3$. Likewise, $\bar{\epsilon}_p^*$ for a larger number of strata can be readily obtained through repeated applications of Eq. (3).

The model in Fig. 4 illustrates two abutting shells. This model applies to the case

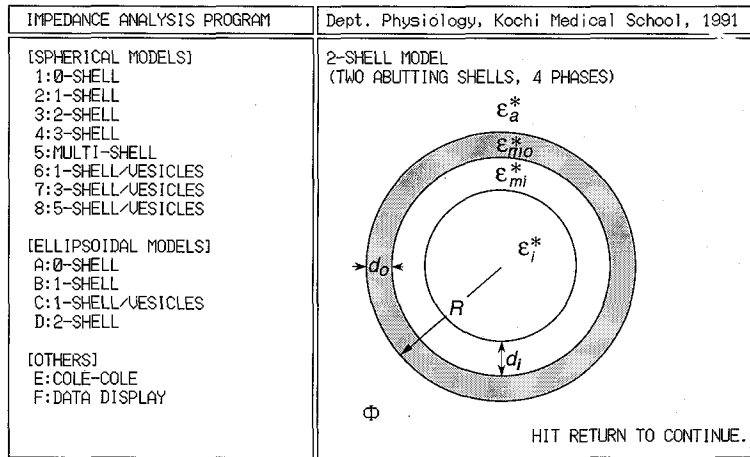


Fig. 4. Two-abutting shell model (right). The whole picture is a hard copy of "main menu" displayed upon selecting model #3 in the program "IMPEDANCE ANALYSIS mini".

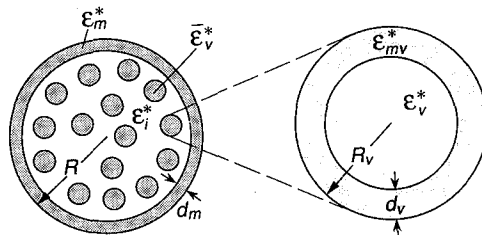


Fig. 5. Vesicle-inclusion model.

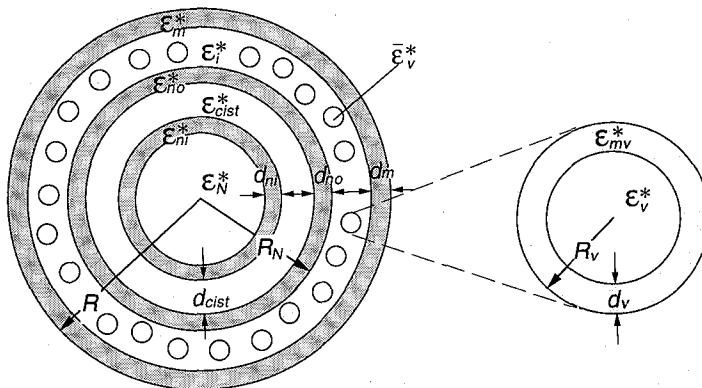


Fig. 6. Triple-shell model with vesicle inclusions.

where an overcoat- or an undercoat layer is closely attached to the membrane phase proper.

As previously reported by Irimajiri et al.¹¹⁾, a multi-stratified sphere with n discrete shells in general gives rise to $n+1$ different relaxations, reflecting that the number of emerging relaxations corresponds to the number of interfaces involved.

Single shells containing membrane-bounded vesicles as a secondary suspension may be modeled as in Fig. 5, which we have named the “vesicle-inclusion” model¹²⁾. Although its theoretical basis is rather weak compared with the concentric shells described above, we attempt to define the $\bar{\epsilon}_p^*$ of this model by incorporating the results from a suspension equation (Eq. (1) or (2)) for vesicles into the parameter ϵ_i^* in Eq. (3). In this calculation, we prefer Eq. (2) to Eq. (1) because intracellular vesicles are usually resident in a high volume concentration.

Figure 6 depicts a more realistic model for cells, in which the nucleus, demarcated by a double membrane system, resides at the center of cytoplasm that has been simplified to a vesicular suspension.

Besides these, many other models that allow size distribution for the suspended particles as well as cytoplasmic structures have already been developed in our laboratories^{8,13)}. For brevity, however, these sophistications are omitted here.

IV. OUTLINE OF THE PROGRAM “IMPEDANCE ANALYSIS mini”

One may start this program by simply choosing an intended model or operation from the “menu” listed in Fig. 4 (*left* block). For each model, both the calculation conditions (i.e., frequency range, number of points per decade, type of mixture equation, etc.) and parameter values can be easily entered while referring to the symbols displayed as in Fig. 4 (*right* block). The results of calculations will then be visualized in a colored format of dispersion curves or of Cole-Cole plots. Up to eighth previous calculations are to be stored and hence superimposable on the display for ready comparison. Finally, analyses of experiment by curve fitting are also feasible if the data to be handled are fed through the format “FEK” (cf. “menu”), which means “frequency(F)/relative permittivity(E)/conductivity(K)”. The program list is in the

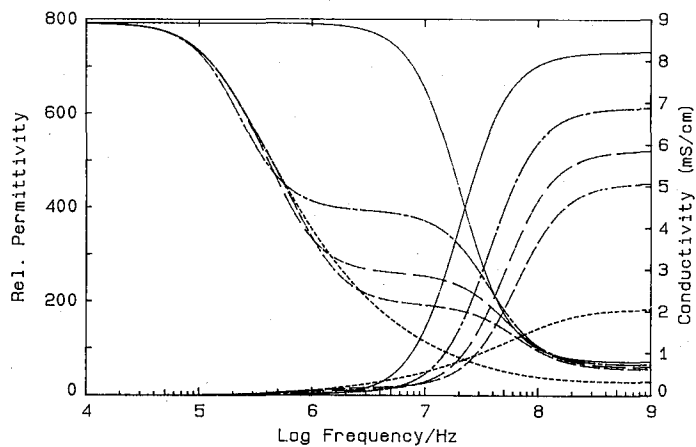


Fig. 7. Dispersion curves predicted from the “multi-shell” model for: $n=1$ (—), 3 (— — — —), 5 (— · — · —), 7 (— · — · —), and 99 (·····). Calculations employed the following parameters:
 $\epsilon_1 = \epsilon_3 = \dots = \epsilon_{n(\text{odd})} = 8$, $\kappa_1 = \kappa_3 = \dots = \kappa_{n(\text{odd})} = 0.1$ nS/cm,
 $\epsilon_i = \epsilon_2 = \dots = \epsilon_{n(\text{even})} = 78$, $\kappa_i = \kappa_2 = \dots = \kappa_{n(\text{even})} = 10$ mS/cm,
 $d_1 = d_2 = \dots = d_n = 5$ nm, and $R = 0.5$ μm .

attached Appendix. This program, written in N₈₈-BASIC (NEC), has been confirmed to run on NEC "PC-9801" series computers excepting PC-9801, PC-9801E, and PC-98LT.

V. EXAMPLE OF PREDICTED DIELECTRIC BEHAVIOR

As stated in Section III, the "multi-shell" model may represent a variety of shelled particles composed of concentric strata, so that it is of general interest to depict the model's behavior predictable upon varying the number of shells involved in it. Figs. 7 and 8 show an example of such calculations where a dielectric shell and a conducting aqueous phase, both being of an identical thickness ($d=5$ nm), alternately build up to increase the number of strata towards filling up the core phase. Clearly, the "one-shell" model ($n=1$) traced a semicircle in the Cole-Cole plots (Fig. 8), while the final concentric structure ($n=99$) gave rise to a skewed-arc-like pattern indicative of the involvement of many relaxation times. The results of calculations for intermediate numbers of strata such as the "double-shell" ($n=3$) and "triple-shell" ($n=5$) models are also displayed in Fig. 8.

Figure 9 shows the behavior of the "vesicle-inclusion" model. In this calculation, we have chosen a thin-walled particle of $8\text{ }\mu\text{m}$ in diameter and changed the vesicle size (R_v), as a parameter, from $3\text{ }\mu\text{m}$ down to $0.1\text{ }\mu\text{m}$ with the intraparticulate volume fraction of those vesicles (ϕ_v) fixed at 0.4234. Under such constraints, the case with $R_v=3\text{ }\mu\text{m}$ corresponds to the "double-shell" model, which showed a flattened arc in the complex permittivity plane plot (Fig. 9, *top*). With a decrease in the vesicle size (i. e., with an increase in the vesicle number), separation between two major relaxation frequencies, one being due to the outer shell and the other due to the vesicle membrane,

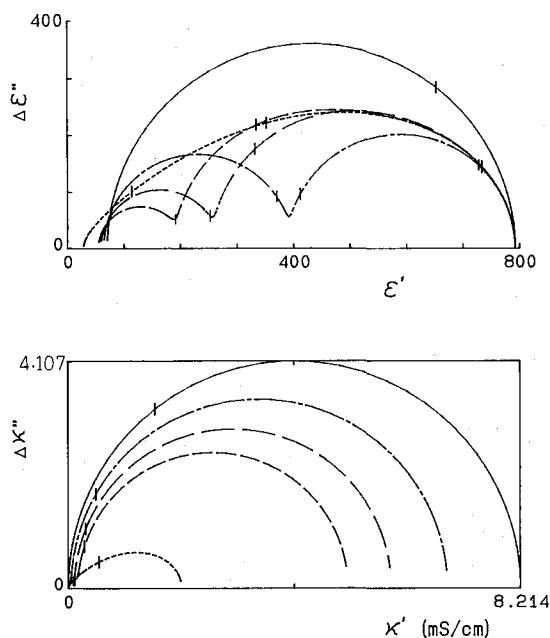


Fig. 8. Cole-Cole plots for curves in Fig. 7. Line specifications, same as in Fig. 7.

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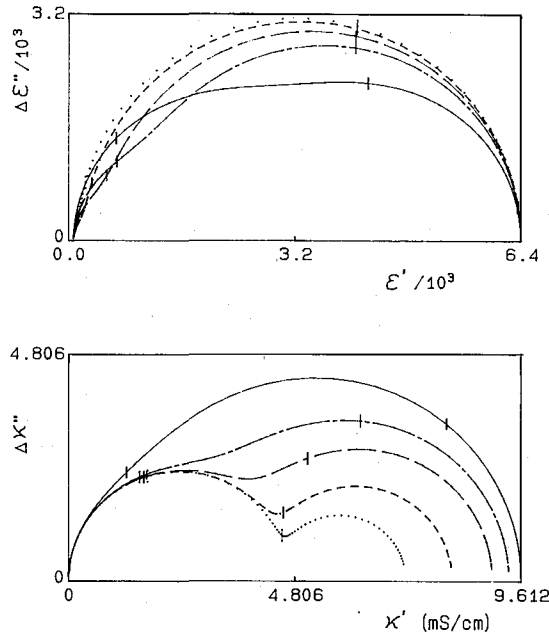


Fig. 9 Cole-Cole plots for the dielectric behavior predictable from model 6 (one-shell/vesicles) or the "vesicle-inclusion model" (Fig. 5). Calculations employed the following parameters: $\epsilon_m = \epsilon_{mv} = 8$, $\epsilon_i = \epsilon_v = 78$, $\kappa_m = \kappa_{mv} = 0.1$ nS/cm, $\kappa_i = \kappa_v = 10$ mS/cm, $d_m = d_v = 5$ nm, $R = 4$ μ m, ϕ_v (volume fraction of vesicles) = 0.4234, and $R_v = 3$ ($\phi_v = 0.1$), 1 ($\phi_v = 0.2$), 0.5 ($\phi_v = 0.5$), 0.2 ($\phi_v = 0.8$), and 0.1 ($\phi_v = 1.0$) μ m.

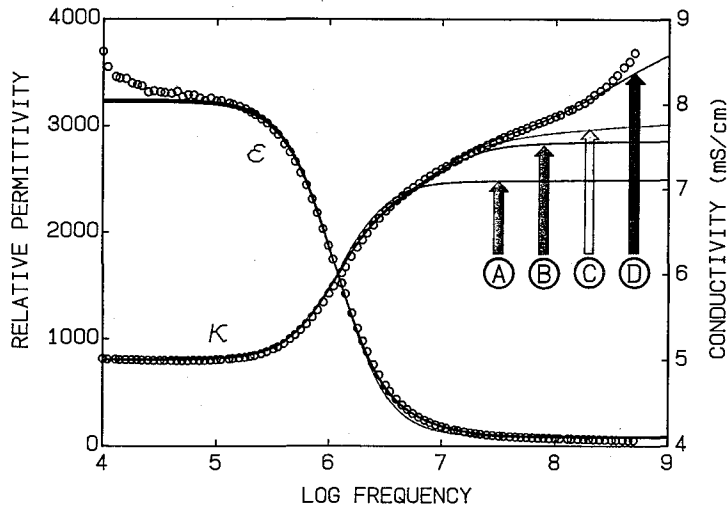


Fig. 10. Dielectric behavior of cultured lymphoma cells (L5178Y) in suspension. Circles, observed; lines A-D, best-fit theoretical curves calculated using Eq. (1) and models A-D with appropriate parameter values.

became dominant, as shown in Fig. 9 (bottom).

The last example (Fig. 10) deals with simulation of the dispersion curves obtained from measurements with cultured lymphoma cells in suspension¹⁴. Here, model A refers to the "one-shell" or the simplest available model for living cells. Model B is the

"triple-shell", a version of the "multiple shells", whose inner double-shell is meant for the nucleus. Models C and D are special versions of the "triple-shell with vesicle inclusions", or the "composite cell" model. The "vesicles" in model C represent mitochondria whose size ($\sim 0.6 \mu\text{m}$) and cytoplasmic volume fraction ($\phi_v \approx 0.05$) were both determined stereologically. In model D, the presence of vesicles smaller than the mitochondria was also considered. The most sophisticated model has thus been shown to mimic the dielectric behavior observed.

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Appendix

By T. Suzaki and K. Asami

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[Program Name: RESET.BAS]
1000 ' SAVE "RESET.BAS",A
1010 CLEAR 0,32,1000,0
1020 DIM ND(15),DAT(40)
1030 FOR I=1 TO 31: READ DAT(I): NEXT I
1040 OPEN "PLOT.DAT" FOR OUTPUT AS #1: FOR I=1 TO 30
1050 PRINT #1, DAT(I): NEXT I: PRINT #1, DAT(31): CLOSE #1: NPP=0
1060 CRLF=0: OPEN "IAZ.DAT" FOR OUTPUT AS #1: PRINT #1: NPP,CRLF
1070 CLOSE #1: READ NPD,NPT,MAX,NPT,MINF,MAXF: READ FILENAMES
1080 OPEN "CRTD.DAT" FOR OUTPUT AS #1
1090 PRINT #1,NPD,NPT,MAX,NPT,MINF,MAXF: PRINT #1,FILENAMES: CLOSE #1
1100 RESTORE 1200: FOR I=1 TO 13: READ ND(I): NEXT I: FOR I=1 TO 13
1110 FOR J=1 TO ND(I): READ DAT(J): NEXT J: AS=RIGHT$(STR$(I),1)
1120 IF I>8 THEN AS=CHR$(166+I)
1130 OPEN "IMP1"+AS+".DAT" FOR OUTPUT AS #1: FOR J=1 TO ND(I)-1
1140 PRINT #1, DAT(J): NEXT J: PRINT #1, DAT(ND(I)): CLOSE #1
1150 NEXT I: FOR I=1 TO 6: READ LTLF(I): NEXT I
1160 OPEN "LTLF.DAT" FOR OUTPUT AS #1: PRINT #1, LTLF(I)
1170 FOR I=2 TO 6: PRINT #1, LTLF(I): NEXT I: CLOSE #1: RUN "IAZ.BAS"
1180 DATA 1,1,1,1,0,1,5,0,5,2,0,10,0,1,5,200,0,500,4,11,4,1,2,9,3,1
1190 DATA 0,0,0,0,0,0,0,0,8,9,9,1,1,80,12,60,10,8
1200 DATA 13,16,19,31,21,27,33,13,16,24,19,9,4,9,1,1,80,15,60,10,5
1210 DATA 5,4,9,1,1,80,15,60,10,8,0,1,5,7,5,4,9,1,1,80,12,60,10,8
1220 DATA 0,1,20,2,5,10,8,6,1,1,80,12,60,10,8,5,8,0,01,5,10,8,6
1230 DATA 5,4,3,4,9,1,1,2,10,10,7,5,8,0,01,5,8,0,10,5,100,5,5,8
1240 DATA 0,0,1,8,0,12,15,0,8,0,01,5,8,0,12,6,20,4,9,1,1,78,5,25
1250 DATA 5,0,0,0,0,0,0,0,0,0,0,1,1,78,5,25,6,3,4,2,5
1260 DATA 58,1,8,0,01,17,102,13,0,01,6,8,3,7,3,40,2,0,05,4,9,1,2,1
1270 DATA 78,1,8,0,0,1,18,19,20,10,8,2,0,01,18,85,18,50,8,0,01,6,8
1280 DATA 1,1,8,0,0,1,15,0,0,15,0,0,15,0,0,15,3,4,9,1,1
1290 DATA 20,10,7,0,5,8,0,01,5,10,8,3,4,9,1,1,1,0,80,18,50,1,10
1300 DATA 0,01,25,58,5,5,8,3,20,0,01,50,5,5,8,3,4,9,1,1,80,10,80
1310 DATA 1,80,3,5,5,8,3,20,0,01,5,5,8,3,4,9,1,1,72,12,1,510,2,1
1320 DATA 1,0,400,0,100,5

[Program Name: IASTART.BAS]
1000 ' SAVE "IASTART.BAS",A
1010 DIM A(40): CLS 3: ON ERROR GOTO 1110
1020 OPEN "PLOT.DAT" FOR INPUT AS #1: FOR I=1 TO 31: INPUT #1, A(I)
1030 NEXT I: CLOSE #1: A(27)=0: OPEN "PLOT.DAT" FOR OUTPUT AS #1
1040 FOR I=1 TO 31: PRINT #1, A(I): NEXT I: CLOSE #1: NPP=0
1050 OPEN "CRTD.DAT" FOR INPUT AS #1: PRINT #1: NPP: CLOSE #1
1060 OPEN "CRTD.DAT" FOR INPUT AS #1
1070 INPUT #1,NPD,NPT,MAX,NPT,MINF,MAXF: INPUT #1,FILENAMES: CLOSE #1
1080 NPD=0: NPT=0: MAX=NPT: MINF=MAXF: OPEN "CRTD.DAT" FOR OUTPUT AS #1
1090 PRINT #1,NPD,NPT,MAX,NPT,MINF,MAXF: PRINT #1,FILENAMES: CLOSE #1
1100 RUN "IAZ.BAS"
1110 IF ERR=53 THEN RUN "RESET.BAS"
1120 RESUME 1100

[Program Name: IAZ.BAS]
1000 ' SAVE "IAZ.BAS",A
1010 WIDTH 80: CLS: CLEAR 0,32,4000,0
1020 CONSOLE=0: DIM C(15): DIM D(15): DIM E(15): VIEW (0,0)-(639,399)
1030 DIM CDD(3,15): FDS(16): DDE="1991-08-31": COLOR 0: CLS 3: HRC=1
1040 OPEN "IAZ.DAT" FOR INPUT AS #1: INPUT #1,NPP,CRLF: CLOSE #1
1050 OPEN "OSGT.DAT" FOR OUTPUT AS #1
1060 M$="1": PRINT #1: CLS: CLOSE #1: FOR I=1 TO 15: FOR J=1 TO 3
1070 READ CDD(J,I): NEXT J: NEXT I
1080 DATA 0,0,0,0,13,8,0,11,0,0,0,0,6,9,2,0,7,0,15,15,15,1,8,8
1090 DATA 2,0,3,5,5,8,3,20,0,01,50,5,5,8,3,4,9,1,1,72,12,1,510,2,1
1100 FOR I=1 TO 14: READ FDS(I): NEXT I
1110 DATA "1:0-SHELL","2:1-SHELL","3:2-SHELL","4:3-SHELL"
1120 DATA "5:MULTI-SHELL","6:1-SHELL/VELOCITIES"
1130 DATA "7:3-SHELL/VELOCITIES","8:5-SHELL/VELOCITIES","A:0-SHELL"
1140 DATA "B:1-SHELL","C:1-SHELL/VELOCITIES","D:2-SHELL","E:COLE-COLE"
1150 DATA "F:DATA DISPLAY"
1160 FOR I=1 TO 3: FOR J=2 TO 13: CDD(I,J)=CDD(I,J)+CRLF: NEXT J
1170 NEXT I: COLOR 7,0,0,7,2: GOSUB *COLORSET: CL=3: C2=7
1180 WIDTH 80,25: CONSOLE=0: FOR I=1 TO 15: VIEW (0,0)-(639,399)
1190 IF NPP=1 THEN NPD=0: NPP=0: GOTO 1220
1200 IF NPP=2 THEN NPD=0: NPP=0: GOTO 1220
1210 IF NPP=3 THEN NPD=0: NPP=0: GOTO 1220
1220 COLOR C2: CLS 3: CONSOLE=2,25,0,1: LINE (2,12)-(261,36),7,B
1230 LINE (2,40)-(261,39),7,B: LINE (265,12)-(637,36),7,B
1240 LINE (2,40)-(637,39): VIEW (268,41)-(636,392): LOCATE 1,1
1250 PRINT "IMPEDANCE ANALYSIS PROGRAM: LOCATE 34,1"
1260 PRINT "Dept. Physiology, Kochi Medical School, 1991"
1270 LOCATE 2,3: COLOR C2: PRINT " [SPHERICAL MODELS]": LOCATE 1,13
1280 COLOR C2: PRINT " [ELLIPTICAL MODELS]": LOCATE 1,19: COLOR C2
1290 PRINT " [OTHERS]"
1300 FOR N=1 TO 14: N$=N+1
1310 IF N<9 THEN N$=N+2
1320 IF N=12 THEN N$=N+3
1330 LOCATE 3,N+3: COLOR CL: IF N=N THEN COLOR C2
1340 PRINT FDS(N1): NEXT N1: COLOR CL: CLS 2: IF N=8 THEN 1360
1350 ON NPP GOSUB *S1,*S2,*S3,*S4,*S5,*S6,*S7,*S8: GOTO 1370
1360 ON NPP GOSUB *A,*B,*C,*D,*E,*F
1370 FOR I=1 TO 200
1380 IF KYS=INKEY$: IF KYS="1": THEN 1400
1390 GOTO 1440
1400 IF W$=1 THEN 1:1: GOSUB *HRC
1410 IF NPP=0 THEN 1610
1420 NEXT I
1430 NP=N+1: KYS="1": GOTO 1570
1440 W$=1: VK=VAL(KYS): IF VK=0 AND VK=9 THEN NP=VK
1450 AR=ASC(KYS): IF VK=0 AND AR=8 THEN NP=VK
1460 IF AR=248 THEN GOSUB *COLORUP: GOTO 1460
1470 IF AR=249 THEN GOSUB *COLORDOWN: GOTO 1460
1480 IF AR=8 OR AR=27 THEN SYSTEM
1490 IF KYS="A" OR KYS="a" THEN NP=9
1500 IF KYS="B" OR KYS="b" THEN NP=10
1510 IF KYS="C" OR KYS="c" THEN NP=11
1520 IF KYS="D" OR KYS="d" THEN NP=12
1530 IF KYS="E" OR KYS="e" THEN NP=13
1540 IF KYS="F" OR KYS="f" THEN NP=14
1550 IF ASC(KYS)=31 THEN NP=NP+1
1560 IF ASC(KYS)=30 THEN NP=NP-1
1570 IF NP=0 THEN NP=14
1580 IF NP=15 THEN NP=1
1590 IF ASC(KYS)=13 THEN 1610
1600 GOTO 1300
1610 COLOR C1: VIEW (0,0)-(639,399): LINE (266,36)-(636,50),0,BP
1620 LINE (265,36)-(265,41): LINE (637,36)-(637,41)
1630 LINE (265,50)-(637,50): GOSUB *HRC2: GOSUB *HRC2
1640 VIEW (3,39)-(25,39): LINE (3,39)-(25,39): LINE (3,39)-(25,39)
1650 OPEN "IAZ.DAT" FOR OUTPUT AS #1: PRINT #1: NPP,CRLF: CLOSE #1
1660 NPP$=RIGHT$(STR$(NP),1): IF NPP$ THEN NPP$=CHR$(56+NP)
1670 RUN "DSET"+NPP$+".BAS"
1680 HRC: LOCATE 56,23: COLOR 7: PRINT "HIT *": COLOR 4
1690 PRINT RETURN: Y=1: COLOR 7: PRINT "TO CONTINUE.",
1700 LOCATE 55,22: COLOR 7: RETURN
1710 *DO: LOCATE 34,3: PRINT SPACES(34): LOCATE 34,4
1720 PRINT SPACES(34): COLOR 4: RETURN
1730 *CL: CIRCLE (150,190),CD,CL: F: RETURN
1740 *DR: LINE (150,190)-(108,148): F: LINE (92,132)-(58,98)
1750 LINE (58,98)-(62,98): LINE (62,98)-(58,122)
1760 PUT (92,132),KANJI(4H2352),OR RETURN
1770 *DRN: LINE (150,190)-(130,210): LINE (112,228)-(94,246),7
1780 LINE (122,210),KANJI(4H2352),OR PUT (128,218),KANJI(4H14E),OR
1790 PUT (112,210),KANJI(4H2352),OR PUT (128,218),KANJI(4H14E),OR
1800 RETURN
1810 *DD: PUT (X-15,Y+7),KANJI(4H2364),OR,7,0: X=0-1
1820 FOR I=1 TO LEN(L$): X=X+7: L$=MID$(L$,I,1): KA=6H100+ASC(LL$)
1830 PUT (X+X-11,Y+14),KANJI(KA),OR,7,0: NEXT I: RETURN
1840 *DF: PUT (X,Y),KANJI(4H2635),OR: RETURN
1850 *DE: GOSUB *EP: X=X+7: FOR I=1 TO LEN(L$): X=X+8
1860 L$=MID$(L$,I,1): KA=6H100+ASC(LL$)
1870 PUT (X+X-1,Y+5),KANJI(KA),OR,7,0: NEXT I: RETURN
1880 *VESICLE: CIRCLE (310,85),40,2,,,F: CIRCLE (310,85),25,1,,,F
1890 LINE (310,85)-(282,57): LINE (282,57)-(286,57)
1900 LINE (282,57)-(282,61): RETURN
1910 *INSET1: GOSUB *VESICLE: X=340: Y=92: L$="mv": GOSUB *DE
1920 X=310: Y=92: L$="": GOSUB *DE: X=285: Y=85: GOSUB *VARROW2
1930 PUT (255,40),KANJI(4H2352),OR: PUT (270,47),KANJI(4H15E),OR
1940 PUT (242,75),KANJI(4H2364),OR: PUT (257,82),KANJI(4H15E),OR
1950 PUT (331,29),KANJI(4H2655),OR
1960 PUT (347,36),KANJI(4H15E),OR: RETURN
1970 *E1: CIRCLE (150,190),59,7,,,3: LINE (150,190)-(132,208),7
1980 LINE (132,208)-(136,208): LINE (132,208)-(132,204)
1990 LINE (150,190)-(150,132): LINE (150,132)-(153,135)
2000 LINE (150,132)-(147,135): LINE (150,190)-(265,190),7
2010 LINE (265,190)-(262,187): LINE (265,190)-(262,193)
2020 PUT (235,259),KANJI(4H2635),OR: PUT (153,145),KANJI(4H61),OR
2030 PUT (135,181),KANJI(4H62),OR: PUT (205,190),KANJI(4H63),OR
2040 X=X+190: L$="": GOSUB *DE: X=X+30: L$="a"
2050 X=210: Y=80: L$="a": GOSUB *DE: RETURN
2060 *S1: GOSUB *DO: LOCATE 34,3: PRINT "0-SHELL MODEL": LOCATE 34,4
2070 LOCATE 34,4: PRINT " (2 PHASES)": CD=130: CL=2: GOSUB *CL
2080 GOSUB *CL: X=35: Y=309: GOSUB *DO: X=340: Y=230: L$="a"
2090 GOSUB *DE: X=127: Y=250: L$="m": GOSUB *DE: RETURN
2100 *S2: GOSUB *DO: LOCATE 34,3: PRINT "1-SHELL MODEL": LOCATE 34,4
2110 LOCATE 34,4: PRINT " (3 PHASES)": CD=130: CL=2: GOSUB *CL
2120 CD=115: CL=3: GOSUB *CL: GOSUB *DR: X=280: Y=185: L$="a"
2130 GOSUB *VARROW2: GOSUB *DO: X=340: Y=230: L$="a"
2140 GOSUB *VARROW2: GOSUB *DO: X=340: Y=230: L$="a"
2150 FOR I=2 TO 265: Y=309: GOSUB *DO: X=340: Y=230: L$="a"
2160 GOSUB *DE: X=127: Y=250: L$="m": GOSUB *DE: X=30: Y=230
2170 L$="m": GOSUB *DE: RETURN
2180 *S3: GOSUB *DO: LOCATE 34,3: PRINT "2-SHELL MODEL": LOCATE 34,4
2190 PRINT " (TWO ABUTTING SHELLS, 4 PHASES)": CD=130: CL=2: GOSUB *CL
2200 CD=115: CL=3: GOSUB *CL: CD=100: CL=0: GOSUB *CL: GOSUB *DR
2210 GOSUB *VARROW2: GOSUB *DO: X=340: Y=230: L$="a"
2220 L$="a": GOSUB *VARROW2: GOSUB *DO: GOSUB *VARROW2: GOSUB *DO
2230 X=340: Y=230: L$="m": GOSUB *DO: X=340: Y=230: L$="a"
2240 FOR I=2 TO 265: Y=309: GOSUB *DO: X=340: Y=230: L$="a"
2250 X=127: Y=250: L$="m": GOSUB *DE: RETURN
2260 *S4: GOSUB *DO: LOCATE 34,3: PRINT "3-SHELL MODEL": LOCATE 34,4
2270 LOCATE 34,4: PRINT " (3 PHASES)": CD=130: CL=2: GOSUB *CL
2280 CD=115: CL=3: GOSUB *CL: CD=80: CL=2: GOSUB *CL: CD=65: CL=0
2290 GOSUB *CL: GOSUB *DR: GOSUB *DR: X=280: Y=185: L$="a"
2300 GOSUB *VARROW2: GOSUB *DO: X=340: Y=230: L$="a"
2310 GOSUB *DO: X=150: Y=170: L$="np": GOSUB *DE: X=127: Y=250
2320 L$="m": GOSUB *DE: X=340: Y=230: L$="a": GOSUB *DE: X=30: Y=230
2330 L$="m": GOSUB *DE: X=340: Y=230: L$="a": GOSUB *DE: X=35: Y=309
2340 GOSUB *DF: RETURN
2350 *S5: GOSUB *DO: LOCATE 34,3: PRINT "MULTI-SHELL MODEL": CD=130
2360 CL=2: GOSUB *CL: CD=115: CL=3: GOSUB *CL: CD=70: CL=2: GOSUB *CL
2370 GOSUB *CL: CD=85: CL=2: GOSUB *CL: CD=70: CL=2: GOSUB *CL
2380 CD=55: CL=0: GOSUB *CL: GOSUB *DR: X=280: Y=185: L$="a"
2390 GOSUB *VARROW2: GOSUB *DO: X=340: Y=230: L$="a": GOSUB *DE
2400 CD=62: X=170: L$="np": GOSUB *DO: X=340: Y=230: L$="a"
2410 *S6: GOSUB *DO: LOCATE 34,3: PRINT "VESICLE INCLUSION MODEL"
2420 *S61: CD=130: CL=2: GOSUB *CL: CD=115: CL=1: GOSUB *CL: IK=1
2430 FOR I=2 TO 265: Y=309: GOSUB *DO: X=340: Y=230: L$="a"
2440 J=J+1: IF IK=0 THEN J=J+8
2450 IK=(150-I)+(150-I)+(190-J)+(190-J): IF IK=111 THEN 2480
2460 IF I=97 AND J=136 THEN F: CIRCLE (1,3),2,1,,,F
2470 CIRCLE (1,3),4,2,1,,,F: CIRCLE (1,3),2,1,,,F
2480 NEXT J: NEXT I: GOSUB *INSET1: CIRCLE (240,144),6,7
2490 PUT (245,140)-(275,110): LINE (275,110)-(275,15),7
2500 LINE (275,110)-(270,110): GOSUB *DR: X=280: Y=185: L$="a"
2510 GOSUB *VARROW2: GOSUB *DO: X=35: Y=309: GOSUB *DF: X=295
2520 GOSUB *VARROW2: GOSUB *DO: X=340: Y=230: L$="a"
2530 X=30: Y=230: L$="m": GOSUB *DE: LINE (250,230)-(285,265)
2540 LINE (285,265)-(285,260): LINE (285,265)-(280,265): RETURN
2550 *S7: LOCATE 34,3: PRINT "TWO CONCENTRIC CIRCLES"
2560 *S71: LOCATE 34,4: PRINT "WITH VESICLE INCLUSIONS": GOSUB *S61
2570 CD=80: CL=2: GOSUB *CL: CD=65
2580 GOSUB *CL: GOSUB *DR: GOSUB *DR: X=280: Y=185: L$="m"
2590 GOSUB *VARROW2: GOSUB *DO: X=150: Y=170: L$="np": GOSUB *DE
2600 X=127: Y=250: L$="m": GOSUB *DE: RETURN
2610 *S8: GOSUB *DO: LOCATE 34,3: PRINT "THREE CONCENTRIC SHELLS"
2620 GOSUB *S71: CD=50: CL=2: GOSUB *CL: CD=35: CL=3: GOSUB *CL
2630 GOSUB *DR: GOSUB *DR: X=200: Y=185: L$="np": GOSUB *VARROW2
2640 GOSUB *VARROW2: GOSUB *DO: X=340: Y=230: L$="a"
2650 X=100: Y=185: L$="clst": GOSUB *VARROW2: GOSUB *DO: X=150
2660 Y=170: L$="np": GOSUB *EP: GOSUB *DE: X=168: Y=130: L$="clst"
2670 GOSUB *DE: X=158: Y=230: L$="a": GOSUB *EP: GOSUB *EP
2680 GOSUB *DE: X=127: Y=250: L$="m": GOSUB *EP: GOSUB *DE: RETURN
2690 *A: GOSUB *DO: LOCATE 34,3: PRINT "0-SHELL MODEL": LOCATE 34,4
2700 *A1: CIRCLE (150,190),100,3,,,F: CIRCLE (150,190),115,2,,,5,F
2710 GOSUB *E1: RETURN
2720 *B: GOSUB *DO: LOCATE 34,3: PRINT "1-SHELL MODEL": LOCATE 34,4
2730 PRINT " (2 PHASES)": CIRCLE (150,190),115,7,,,5,F
2740 CIRCLE (150,190),100,3,,,F: GOSUB *E1: RETURN
2750 GOSUB *VARROW2
2760 *E2: PUT (35,195),KANJI(4H2364),OR: X=70: Y=230: L$="m"
2770 L$="m": GOSUB *DE: RETURN
2780 *C: GOSUB *DO: LOCATE 34,3: PRINT "1-SHELL MODEL": LOCATE 34,4
2790 PRINT "WITH VESICLE INCLUSIONS": CIRCLE (150,190),115,2,,,5,F
2800 CIRCLE (150,190),100,3,,,F: X=50: Y=190: GOSUB *VARROW2
2810 IK=1: FOR I=29 TO 265 STEP 16: IK=IK+1
2820 FOR J=72 TO 305 STEP 16: J=J+1: IF IK=0 THEN J=J+8
2830 IF IK=99 THEN 2890
2840 IF IK=99 THEN 2890
2850 IF I=29+16*7 AND J=72+16*7 THEN 2890
2860 IF I=29+16*8 AND J=72+16*8 THEN 2890
2870 IF I=29+16*11 AND J=72+16*8 THEN 2890
2880 CIRCLE (1,0),4,2,,,F: CIRCLE (1,0),2,1,,,F
2890 NEXT J: NEXT I
2900 GOSUB *INSET1: CIRCLE (221,176),6,7: LINE (225,172)-(282,115),7
2910 LINE (282,115)-(278,115): LINE (278,115)-(282,120),7
2920 GOSUB *E2: RETURN
2930 *DO: LOCATE 34,3: PRINT "2-SHELL MODEL"
2940 LOCATE 34,4: PRINT " (5 PHASES)": CIRCLE (150,190),115,2,,,5,F
2950 CIRCLE (150,190),100,3,,,F: CIRCLE (150,190),115,2,,,5,F
2960 GOSUB *E1: X=50: Y=190: L$="c": GOSUB *VARROW2: X=45: Y=160
2970 GOSUB *DO: X=65: Y=190: L$="m": GOSUB *VARROW2: GOSUB *DO
2980 X=30: Y=185: L$="np": GOSUB *EP: GOSUB *DE: X=80: Y=230
2990 L$="m": GOSUB *DE: GOSUB *DE: RETURN
3000 *E: GOSUB *DO: LOCATE 34,3: PRINT "SIMULATION WITH": LOCATE 34,4
3010 *E1: CIRCLE (150,190),100,3,,,F: CIRCLE (150,190),115,2,,,5,F
3020 X=X+10: Y=Y+4: PUT(X,Y),KANJI(4H2361),OR: X=X+40: Y=Y+4
3030 GOSUB *E2: X=X+47: Y=Y+4: PUT(X,Y),KANJI(4H168),OR: X=X+60
3040 Y=Y+4: PUT(X,Y),KANJI(4H2361),OR: X=X+40: Y=Y+4
3050 LINE (X+85,Y+40)-(X+90,Y+45)
3060 LINE (X+90,Y+40)-(X+90,Y+30)
3070 LINE (X+90,Y+30)-(X+90,Y+20)
3080 PUT(X,Y),KANJI(4H2331),OR: X=X+105: Y=Y+10
3090 PUT(X,Y),KANJI(4H28),OR: X=X+115: Y=Y+10
3100 PUT(X,Y),KANJI(4H28),OR: X=X+115: Y=Y+10
3110 PUT(X,Y),KANJI(4H168),OR: X=X+163: Y=Y+8
3120 X=X+140: Y=Y+18: GOSUB *E1: LINE (X+158,Y+8)-(X+145,Y+30)
3130 X=X+140: Y=Y+18: GOSUB *E1: LINE (X+158,Y+8)-(X+145,Y+30)
3140 PUT(X,Y),KANJI(4H168),OR: X=X+173: Y=Y+24
3150 PUT(X,Y),KANJI(4H168),OR: X=X+180: Y=Y+10
3160 PUT(X,Y),KANJI(4H29),OR: X=X+187: Y=Y+5

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3170 PUT(X,Y),KANJI(#E2642),OR: X=XO+200: Y=Y+15
3180 LINE(X,Y),KANJI(#E16E),OR: LINE(XO+135,YO-4)(XO+142,YO-4)
3190 LINE(XO+142,YO-4)(XO+139,YO-15)
3200 LINE(XO+135,YO-4)(XO+139,YO-15): X=XO+145: Y=Y-17
3210 PUT(X,Y),KANJI(#E2645),OR: X=XO+158: Y=Y+15
3220 PUT(X,Y),KANJI(#416E),OR: LINE(XO+215,YO+14)(XO+215,YO-25)
3230 LINE(XO+215,YO+14)(XO+215,YO-25): X=XO+218: Y=Y+35
3240 LINE(XO+215,YO-25)(XO+210,YO-30): X=XO+218: Y=Y+35
3250 PUT(X,Y),KANJI(#E6E),OR: X=XO+220: Y=Y-4
3260 PUT(X,Y),KANJI(#E21),OR: LINE(XO+240,YO-3)(XO+325,YO+3)
3270 X=XO+Y-18: GOSUB #I: GOTO#253: Y=Y+10
3280 PUT(X,Y),KANJI(#E28),OR: X=XO+262: Y=Y+10
3290 PUT(X,Y),KANJI(#E32),OR: X=XO+269: Y=Y+10
3300 PUT(X,Y),KANJI(#E265),OR: X=XO+270: Y=Y+10
3310 X=XO+294: Y=Y+10: PUT(X,Y),KANJI(#E29),OR
3320 X=XO+301: Y=Y+10: PUT(X,Y),KANJI(#E265),OR
3330 X=XO+311: Y=Y+21: PUT(X,Y),KANJI(#E265),OR
3340 X=XO+270: Y=Y-18: PUT(X,Y),KANJI(#E264),OR
3350 X=XO+278: Y=Y-15: PUT(X,Y),KANJI(#E264),OR: RETURN
3360 GOSUB #D: RETURN
3370 *VARROW2: LINE(X,Y)(X-15,Y),7
3380 LINE(X,Y)(X-4,Y-4),LINE(X,Y)(X-4,Y+4)
3390 LINE(X,Y)(X-11,Y-11),LINE(X-15,Y-11),Y+4: RETURN
3400 *P: CIRCLE(X,Y),5,7,7,4.8,5: CIRCLE(X+Y6),5,7,1.5,5.5,.5
3410 XS=X+Y: YS=Y: LINE(XS-3,Y)(XS+3,Y)
3420 LINE(XS,Y-3)(XS+2,Y+3)
3430 LINE(XS+3,Y-3)(XS+1,Y): RETURN
3440 *E2: CIRCLE(X,Y),5,7,7,4.8,5: CIRCLE(X+Y6),5,7,1.5,5.5,.5
3450 XS=X+Y: YS=Y: RETURN
3460 *Y=Y+Y: YS=Y+Y: LINE(XS-5,Y),5,2.9,1: LINE(X+3,Y-6)(X,Y+7)
3470 CIRCLE(X-3,Y+7),2,7,3.8,6,2,1
3480 LINE(X+4,Y-1)(X-1,Y): RETURN
3490 *X=X+X: XS=X: YS=Y: LINE(XS-1,Y)(X+1,Y-1),X-1,X-2,Y+2)
3500 CIRCLE(X-3,Y+7),2,7,3.8,6,2,1: CIRCLE(X+1,Y-5),1
3510 PSET(X+1,Y-5): RETURN
3520 FOR I=1 TO 10: FOR J=1 TO 3: CC(J)=CCD(J,I)
3530 IF CC(J)<0 THEN CC(J)=0
3540 IF CC(J)>15 THEN CC(J)=15
3550 NEXT J: CRUM=1+6*(4+CC(2)+6*CC(2)+CC(3))
3560 COLOR=(I,CNUM): NEXT I: RETURN
3570 *COLORP: FOR I=1 TO 3: FOR J=1 TO 15: CDD(I,J)=CCD(I,J)+1
3580 NEXT J: NEXT I: GOSUB *COLORSET: CPLCS=CPLS+1: RETURN
3590 *COLORC: FOR I=1 TO 3: FOR J=1 TO 15: CDD(I,J)=CCD(I,J)-1
3600 NEXT J: NEXT I: GOSUB *COLORSET: CPLCS=CPLS-1: RETURN
3610 *HC2: COLOR 7: LOCATE 1,1: X=2: Y=12: PRINT "HELP MAIN MENU "
3620 LOCATE 1,1: X=2: Y=12: PRINT "HELP MAIN MENU "
3630 LINE(X+1,Y)(X-13,Y+23),7,B
3640 LINE(X+132,Y)(X+134,Y+24),0,B
3650 LINE(X+2,Y+2)(X+4,Y+2) LINE(X+1,Y)(X+130,Y+23),7,B
3660 PRESET(X,Y+24): LINE(X+2,Y+2)(X+44,Y+21),7,B: RETURN
3670 *HCRC: COLOR 7: LOCATE 1,1: PRINT " CONTINUE": X=137: Y=12
3680 LINE(X+1,Y+1)(X+122,Y+22),2,B: LINE(X,Y)(X+123,Y+23),7,B
3690 PRESET(X,Y+22): LINE(X+2,Y+2)(X+4,Y+2)
3700 LINE(X+2,Y+2)(X+37,Y+21),1,B: LINE(X+2,Y+2)(X+37,Y+21),7,B
3710 LINE(X+2,Y+4)(X+2,Y+4),1,B
3720 LINE(X+6,Y+10)(X+6,Y+10),1,B
3730 LINE(X+15,Y+15)(X+15,Y+15): LINE(X+6,Y+12)(X+15,Y+12),7
3740 LINE(X+8,Y+12)(X+15,Y+15): PAINT(X+9,Y+12),7
3750 LINE(2,40)(260,39)
3760 PRESET(2,395): PRESET(261,40): RETURN

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1000  Program Name: DSET1.BAS)
1010  'SAVE "DSET1.BAS",A
1020  CHAIN DEFEND "DISP.BAS",1020
1030  DIM DTP(3,50), DTPC(5), PMS(50)
1040  GOSUB "INS: GOSUB "DATAREAD1: GOSUB "DATASET1
1050  GOSUB "DATAOUTPUT1: RUN "CALC1.BAS"
1060  'DATAREAD1: OPEN "DMS1.DAT" FOR INPUT AS #1
1070  FOR I=1 TO 10: INPUT #1: DTP(1,I): NEXT I: CLOSE #1: RETURN
1080  'DATAOUTPUT1: OPEN "IPM1.DAT" FOR OUTPUT AS #1
1090  FOR I=1 TO 10: PRINT #1: DTP(1,I): NEXT I: CLOSE #1: RETURN
1100  'DATASET1: LOCATE 1,4: COLOR 5: PRINT I3: LOCATE 1,8: PRINT I25
1110  LOCATE 1,1: PRINT I38: FOR I=1 TO 10: READ DTP(I): NEXT I
1120  IF I=1 TO 10: READ DTP(3,I): NEXT I: FOR I=1 TO 10: READ DTP(2,I)
1130  NEXT I: FOR I=1 TO 10: READ DTP(3,I): NEXT I
1140  DATA 2,2,2,2,2,6,16,2,6,16,2,6,"Ea","Ka","E1","K1","K2","K3","K4","K5","K6","K7","K8","K9","K10","K11","K12","K13","K14","K15","K16","K17","K18","K19","K20","K21","K22","K23","K24","K25","K26","K27","K28","K29","K30","K31","K32","K33","K34","K35","K36","K37","K38","K39","K40","K41","K42","K43","K44","K45","K46","K47","K48","K49","K50","K51","K52","K53","K54","K55","K56","K57","K58","K59","K60","K61","K62","K63","K64","K65","K66","K67","K68","K69","K70","K71","K72","K73","K74","K75","K76","K77","K78","K79","K80","K81","K82","K83","K84","K85","K86","K87","K88","K89","K90","K91","K92","K93","K94","K95","K96","K97","K98","K99","K100","K101","K102","K103","K104","K105","K106","K107","K108","K109","K110","K111","K112","K113","K114","K115","K116","K117","K118","K119","K120","K121","K122","K123","K124","K125","K126","K127","K128","K129","K130","K131","K132","K133","K134","K135","K136","K137","K138","K139","K140","K141","K142","K143","K144","K145","K146","K147","K148","K149","K150","K151","K152","K153","K154","K155","K156","K157","K158","K159","K160","K161","K162","K163","K164","K165","K166","K167","K168","K169","K170","K171","K172","K173","K174","K175","K176","K177","K178","K179","K180","K181","K182","K183","K184","K185","K186","K187","K188","K189","K190","K191","K192","K193","K194","K195","K196","K197","K198","K199","K200","K201","K202","K203","K204","K205","K206","K207","K208","K209","K210","K211","K212","K213","K214","K215","K216","K217","K218","K219","K220","K221","K222","K223","K224","K225","K226","K227","K228","K229","K230","K231","K232","K233","K234","K235","K236","K237","K238","K239","K240","K241","K242","K243","K244","K245","K246","K247","K248","K249","K250","K251","K252","K253","K254","K255","K256","K257","K258","K259","K260","K261","K262","K263","K264","K265","K266","K267","K268","K269","K270","K271","K272","K273","K274","K275","K276","K277","K278","K279","K280","K281","K282","K283","K284","K285","K286","K287","K288","K289","K290","K291","K292","K293","K294","K295","K296","K297","K298","K299","K300","K301","K302","K303","K304","K305","K306","K307","K308","K309","K310","K311","K312","K313","K314","K315","K316","K317","K318","K319","K320","K321","K322","K323","K324","K325","K326","K327","K328","K329","K330","K331","K332","K333","K334","K335","K336","K337","K338","K339","K340","K341","K342","K343","K344","K345","K346","K347","K348","K349","K350","K351","K352","K353","K354","K355","K356","K357","K358","K359","K360","K361","K362","K363","K364","K365","K366","K367","K368","K369","K370","K371","K372","K373","K374","K375","K376","K377","K378","K379","K380","K381","K382","K383","K384","K385","K386","K387","K388","K389","K390","K391","K392","K393","K394","K395","K396","K397","K398","K399","K400","K401","K402","K403","K404","K405","K406","K407","K408","K409","K410","K411","K412","K413","K414","K415","K416","K417","K418","K419","K420","K421","K422","K423","K424","K425","K426","K427","K428","K429","K430","K431","K432","K433","K434","K435","K436","K437","K438","K439","K440","K441","K442","K443","K444","K445","K446","K447","K448","K449","K450","K451","K452","K453","K454","K455","K456","K457","K458","K459","K460","K461","K462","K463","K464","K465","K466","K467","K468","K469","K470","K471","K472","K473","K474","K475","K476","K477","K478","K479","K480","K481","K482","K483","K484","K485","K486","K487","K488","K489","K490","K491","K492","K493","K494","K495","K496","K497","K498","K499","K500","K501","K502","K503","K504","K505","K506","K507","K508","K509","K510","K511","K512","K513","K514","K515","K516","K517","K518","K519","K520","K521","K522","K523","K524","K525","K526","K527","K528","K529","K530","K531","K532","K533","K534","K535","K536","K537","K538","K539","K540","K541","K542","K543","K544","K545","K546","K547","K548","K549","K550","K551","K552","K553","K554","K555","K556","K557","K558","K559","K560","K561","K562","K563","K564","K565","K566","K567","K568","K569","K570","K571","K572","K573","K574","K575","K576","K577","K578","K579","K580","K581","K582","K583","K584","K585","K586","K587","K588","K589","K590","K591","K592","K593","K594","K595","K596","K597","K598","K599","K600","K601","K602","K603","K604","K605","K606","K607","K608","K609","K610","K611","K612","K613","K614","K615","K616","K617","K618","K619","K620","K621","K622","K623","K624","K625","K626","K627","K628","K629","K630","K631","K632","K633","K634","K635","K636","K637","K638","K639","K640","K641","K642","K643","K644","K645","K646","K647","K648","K649","K650","K651","K652","K653","K654","K655","K656","K657","K658","K659","K660","K661","K662","K663","K664","K665","K666","K667","K668","K669","K670","K671","K672","K673","K674","K675","K676","K677","K678","K679","K680","K681","K682","K683","K684","K685","K686","K687","K688","K689","K690","K691","K692","K693","K694","K695","K696","K697","K698","K699","K700","K701","K702","K703","K704","K705","K706","K707","K708","K709","K710","K711","K712","K713","K714","K715","K716","K717","K718","K719","K720","K721","K722","K723","K724","K725","K726","K727","K728","K729","K730","K731","K732","K733","K734","K735","K736","K737","K738","K739","K740","K741","K742","K743","K744","K745","K746","K747","K748","K749","K750","K751","K752","K753","K754","K755","K756","
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1000 Program Name: DSET2.BAS
1010 SAVE "DSET2.BAS"
1020 CHAIN MERGE "DSET1.BAS", "DTP1", "GOTO", "1020
1030 DIM DTP(3, 50), DTT(50), PNT(50)
1040 GOSUB "INS: GOSUB "DATAHEAD2: GOSUB "DATASET2
1050 GOSUB "DATAOUTPUT2: RETURN "C2C.BAS"
1060 "DATAHEAD2: OPEN "INPUT1.DAT" FOR INPUT AS #1
1070 FOR I=1 TO 13: INPUT DTP(1, I): NEXT I: CLOSE #1: RETURN
1080 "DATAOUTPUT2: OPEN "OUTPUT1.DAT" FOR OUTPUT AS #2
1090 FOR M=1 TO 13: PRINT #1, DTP(1, M): NEXT M: CLOSE #1: RETURN
1100 "DATASET2: LOCATE 1, 4: COLOR 5: PRINT #1: LOCATE 1, 8: PRINT #1:
1110 FOR I=4 TO 13: READ PNT(1): NEXT I: FOR I=1 TO 13: READ DTP(2, I)
1120 NEXT I
1130 FOR I=2, 2, 2, 1, 0, 0: READ DTT(3, I): NEXT I
1140 DATA "K", "Km": "R", "Rd": "V", "6, 6, 15, 19, 6, 20, 6, 20, 6, 20, 6, 20"
1150 DATA "K", "Km": "R", "Rd": "V", "6, 6, 15, 19, 6, 20, 6, 20, 6, 20, 6, 20"
1160 DTCM=13: DTC=1: DTCB=1: COLOR 7: FOR I=1 TO 13
1170 LOCATE DTT(1), DTP(3, I): PRINT PNT(1): LOCATE DTP(2, 1), DTP(3, 1)
1180 ELSE PRINT " "
1190 IF DTP(1, 1) THEN PRINT #2 ELSE PRINT #2

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1200 NEXT I
1210 DAT=DTP(1,DTCC): GOSUB *DISPMULL
1220 IF DTCC=1 OR DTCC=2 THEN GOSUB *DISPM: GOTO 1280
1230 IF DTCC=4 THEN GOSUB *DISPM: GOTO 1280
1240 IF DTCC=6 OR DTCC=8 THEN GOSUB *DISPM: GOTO 1280
1250 IF DTCC=10 THEN GOSUB *DISPM: GOTO 1280
1260 IF DTCC=11 THEN GOSUB *DISPM: GOTO 1280
1270 IF DTCC=12 THEN GOSUB *DISPM: GOTO 1280
1280 COLOR 2: LOCATE DTP(2,DTCC): DTP(2,DTCC)=1
1290 IF DTCC=4 THEN ELSE PRINT DDT: GOTO 1310
1300 IF DDA7=1 THEN PRINT W$ ELSE PRINT H$
1310 COLOR 7
1320 KS=INKEY$: IF KS="" THEN 1320
1330 IF ASC(KS)=1 THEN GOTO *HLP
1340 IF ASC(KS)=27 THEN KS=1530
1350 IF ASC(KS)=13 THEN KS=1530
1360 IF ASC(KS)=32 THEN KS=1380
1370 IF DTCC=4 THEN GOSUB *DATAGT2: GOTO 1210
1380 IF ASC(KS)<=57 AND ASC(KS)=48 THEN GOSUB *DATAGET: GOTO 1210
1390 IF ASC(KS)=57 AND DTCC=1 OR DTCC=2 OR DTCC=4 OR DTCC=6 OR DTCC=8 OR DTCC=10 OR DTCC=11 OR DTCC=12 THEN GOTO 1440
1400 IF ASC(KS)=*31 AND ASC(KS)=*28 THEN ELSE 1320
1410 COLOR 7: LOCATE DTP(2,DTCC): DTP(2,DTCC)=1
1420 IF DTCC=4 THEN ELSE PRINT DDT: GOTO 1440
1430 IF DDA7=1 THEN PRINT W$ ELSE PRINT H$
1440 IF ASC(KS)=30 AND DTCC=6 THEN DTCC=DTCC-2: GOTO 1500
1450 IF ASC(KS)=30 AND DTCC=8 THEN DTCC=DTCC-2: GOTO 1500
1460 IF ASC(KS)=31 AND DTCC=5 THEN DTCC=DTCC+2: GOTO 1500
1470 IF ASC(KS)=31 AND DTCC=7 THEN DTCC=DTCC+2: GOTO 1500
1480 IF ASC(KS)=28 AND DTCC=5 THEN DTCC=DTCC-2
1490 IF ASC(KS)=29 AND DTCC=6 THEN DTCC=DTCC-1
1500 IF DTCC=6 THEN DTCC=13
1510 IF DTCC=34 THEN DTCC=1
1520 GOTO 1210
1530 RETURN

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1000 Program Name: DSET3.BAS[
1001 ' SAVE "DSET3.BAS",A
1010 CHAIN MERGE "DISP.BAS",1020
1020 DIM DTP(13,16), DTC(15,16)
1030 GOSUB *INS: GOSUB *DATAREAD3: GOSUB *DATASET3
1040 GOSUB *DATAOUTPUT13: RUN "CALC3.BAS"
1050 *DATASET3: OPEN "INPUT3.DAT" FOR INPUT AS #1
1060 FOR I=1 TO 16: INPUT #1, DTP(1,1): NEXT I: CLOSE #1: RETURN
1070 *DATAOUTPUT13: OPEN "INPUT3.DAT" FOR OUTPUT AS #1
1080 FOR I=1 TO 16: PRINT #1, DTP(I,1): NEXT M: CLOSE #1: RETURN
1090 *DATASET3: LOCATE 1,1: COLOR 7: PRINT T3: LOCATE 1,8: PRINT T2$
1100 LOCATE 1,10: PRINT T3: FOR I=1 TO 16: READ DTP(1,1): NEXT I
1110 FOR I=4 TO 16: READ PMS(1,1): NEXT I: FOR I=1 TO 16: READ DTP(2,1)
1120 LOCATE 1,16: PRINT PMS(1,1): NEXT I: LOCATE 1,16: PRINT T2$
1130 DATA 2,2,2,2,16,2,16,2,16,2,16,2,16,2,16,"", "Ka": "Ks": "B1
1140 DATA "Ki": "Emo": "Kmo": "Sml": "Kml": "Rk": "Dk": "VF": "E1
1150 DATA 1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1
1160 DATA 13,13,14,14,15,15,16,16
1170 DTCMA=16: DTC=1: DTCB=1: COLOR 7: FOR I=1 TO 16
1180 LOCATE 1,13: PRINT DTP(13,1): LOCATE DTP(2,1), DTP(3,1)
1190 IF DTP(1,1) THEN ELSE PRINT DTP(1,1): GOTO 1210
1200 IF DTP(4,1)=1 THEN PRINT M1 ELSE PRINT H$
1210 NEXT I
1220 DDA7=DTF(1,DTC): GOSUB *DISPMUL
1230 IF DTC=1 OR DTC=2 THEN GOSUB *DISPLH: GOTO 1290
1240 IF DTC=3 THEN GOSUB *DISPDM: GOTO 1290
1250 IF DTC=4 OR DTC=8 THEN GOSUB *DISPMS: GOTO 1290
1260 IF DTC=10 OR DTC=12 THEN GOSUB *DISPCS: GOTO 1290
1270 IF DTC=13 THEN GOSUB *DISPHM: GOTO 1290
1280 IF DTC=14 OR DTC=15 THEN GOSUB *DISPDM: GOTO 1290
1290 COLOR 2: LOCATE DTP(2,DTC), DTP(3,DTC)
1300 IF DTC=7 THEN ELSE PRINT DDA7: GOTO 1320
1310 DDA7=1: DDA1=1 THEN PRINT M1 ELSE PRINT H$
1320 COLOR 7
1330 K$=INKEY$: IF K$="" THEN 1330
1340 IF ASC(K$)=1 THEN GOTO *RUL
1350 IF ASC(K$)=13 OR ASC(K$)=27 THEN 1530
1360 IF ASC(K$)=32 THEN ELSE 1380
1370 IF DTC=1 THEN GOSUB *DISPDM: GOTO 1220
1380 IF ASC(K$)=47 AND ASC(K$)=48 THEN GOSUB *DATASET: GOTO 1220
1390 IF ASC(K$)=46 THEN GOSUB *DATASET: GOTO 1220
1400 IF ASC(K$)=41 AND ASC(K$)=42 THEN GOSUB *DISPDM: GOTO 1220
1410 COLOR 7: LOCATE DTP(2,DTC), DTP(3,DTC)
1420 IF DTC=4 THEN ELSE PRINT DDA7: GOTO 1440
1430 IF DDA7=1 THEN PRINT M1 ELSE PRINT H$
1440 IF ASC(K$)=30 AND DTC=6 THEN DTC=DT-1: GOTO 1500
1450 IF ASC(K$)=31 AND DTC=6 THEN DTC=DT-1: GOTO 1500
1460 IF ASC(K$)=32 AND DTC=6 THEN DTC=DT-1: GOTO 1500
1470 IF ASC(K$)=31 AND DTC=5 THEN DTC=DTC+1: GOTO 1500
1480 IF ASC(K$)=28 AND DTC=5 THEN DTC=DTC-1: GOTO 1500
1490 IF ASC(K$)=29 AND DTC=6 THEN DTC=DTC-1: GOTO 1500
1500 IF DTC=0 THEN DTC=16
1510 IF DTC=17 THEN DTC=1
1520 GOTO 1220
1530 RETURN

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Dielectric Modeling of Biological Cells

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1320 IF DTC=15 OR DTC=17 OR DTC=19 THEN GOSUB *DISPCS: GOTO 1350
1330 IF DTC=20 OR DTC=22 THEN GOSUB *DISPMN: GOTO 1350
1340 IF DTC=23 OR DTC=25 THEN GOSUB *DISPMN: GOTO 1350
1350 COLOR 2: LOCATE DTP (2,DTC), DTP (3,DTC)
1360 IF DTC=4 THEN DTP THEN ELSE PRINT DATA: GOTO 1380
1370 DATA=1 THEN PRINT W5 ELSE PRINT H5
1380
1390 K$=INKEY$: IF K$="" THEN 1390
1400 IF ASC(K$)=1 THEN GOTO *HLP
1410 IF ASC(K$)=27 OR ASC(K$)=13 THEN 1670
1420 IF ASC(K$)=32 THEN ELSE 1440
1430 IF DTC=4 OR DTC=5 THEN GOSUB *DATAGET2: GOTO 1270
1440 IF ASC(K$)=65 AND DTC=5 THEN GOSUB *DATAGET: GOTO 1270
1450 IF ASC(K$)=46 THEN GOSUB *DATAGET: GOTO 1270
1460 IF ASC(K$)=61 AND ASC(K$)=28 THEN ELSE 1390
1470 IF DTC=7 THEN LOCATE DTP (2,DTC), DTP (3,DTC)
1480 IF DTC=4 OR DTC=5 THEN ELSE PRINT DATA: GOTO 1500
1490 IF DATA=1 THEN PRINT W5 ELSE PRINT H5
1500 IF DTC=3 OR DTC=4 THEN ELSE PRINT ELSE 1530
1510 IF DTC=4 THEN DTC=1: GOTO 1650
1520 IF DTC=5 THEN DTC=2: GOTO 1650
1530 IF ASC(K$)=30 AND DTC=2 THEN DTC=3: GOTO 1650
1540 IF ASC(K$)=30 THEN DTC=DTC-1
1550 IF ASC(K$)=31 AND DTC=1 THEN DTC=3: GOTO 1650
1560 IF ASC(K$)=31 AND DTC=2 THEN DTC=3: GOTO 1650
1570 IF ASC(K$)=31 AND DTC=3 THEN DTC=5: GOTO 1650
1580 IF DTC=1 THEN DTC=4: GOTO 1650
1590 IF DTC=2 THEN DTC=5: GOTO 1650
1600 IF ASC(K$)=31 THEN DTC=3
1610 IF ASC(K$)=28 THEN DTC=DTC-1
1620 IF ASC(K$)=29 THEN DTC=DTC-1
1630 IF DTC=2 THEN DTC=1
1640 IF DTC=28 THEN DTC=1
1650 DTC=DTC-1
1660 GOTO 1270
1670 DTP (1,24)=DTP (1,24)+DTP (1,20)
1680 RETURN

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0001  PROGRAM NAME: D5E78.BAS]
0002  SAVE "D5E78.BAS",A
0003  CHAIN MERGE "DISP.BAS",1020
0004  DINT DTP(3,50),DTT(1,2),FNS(50),CCD(13),CC(11)
0005  GOSUB *INS:GOSUB *DATAREAD:GOSUB *DATAE78
0006  GOSUB *DATAOUTPU:GOSUB *CALC:BA5
0007  *DATAE78= OPEN "INPUT.DAT" FOR INPUT AS #1
0008  FOR I=1 TO 33: INPUT #1, DTP(1,I): NEXT I: CLOSE #1: RETURN
0009  *DATAOUTPU= OPEN "D5E78.DAT" FOR OUTPUT AS #1
0010  FOR I=1 TO 33: PRINT #1, DTP(1,I): NEXT I: CLOSE #1: RETURN
0011  *DATAE78= LOCATE 1,4: COLOR 5: PRINT IT: LOCATE 1,7: PRINT T
0012  LOCATE 1,10: PRINT DTP(1,28): DTP(1,28)/DTP(1,24)
0013  FOR I=1 TO 33: READ DTP(1,I): NEXT I: FOR I=1 TO 33: READ FNS(I)
0014  NEXT I: FOR I=1 TO 33: READ DTP(2,I): NEXT I: FOR I=1 TO 33:
0015  DATA 2,15,2,2,14,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15
0016  DATA 15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15
0017  DATA 15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15
0018  DATA 15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15,2,15
0019  DATA 17,5,19,19,19,6,21,19,19,5,5,6,8,10,10,11,11,12,12,13,13
0020  DATA 14,15,15,16,16,17,17,19,18,18,19,20,20,21,21,22,22,23,23
0021  DATA 19,19,20,20,21,21,22,22,23,23,24,24,25,25,26,26,27,27,28,28
0022  PRINT FNS(1): NEXT I: FOR I=1 TO 33: LOCATE DTP(1,I),DTP(3,I)
0023  IF I=4 OR I=5 THEN ELSE PRINT DTP(1,I),: GOTO 1260
0024  IF DTP(1,I)=1 THEN PRINT HS ELSE PRINT HS
0025  NEXT I
0026  DTP=DTP(1,DTCT):GOSUB *DISPNLU
0027  DTC=1: DTC=2: DTC=3: DTC=4: DTPSLH: GOTO 1370
0028  IF DTC=4 OR DTC=5 THEN GOSUB *DISPSEQ: GOTO 1370
0029  IF DTC=7 OR DTC=9 OR DTC=11 THEN GOSUB *DISPMG: GOTO 1370
0030  IF DTC=12 OR DTC=14 OR DTC=16 THEN GOSUB *DISPDM: GOTO 1370
0031  IF DTC=17 OR DTC=19 OR DTC=21 THEN GOSUB *DISPCS: GOTO 1370
0032  IF DTC=23 THEN GOSUB *DISPCS: GOTO 1370
0033  IF DTC=24 OR DTC=26 OR DTC=28 THEN GOSUB *DISPMG: GOTO 1370
0034  IF DTC=25 OR DTC=27 OR DTC=29 THEN GOSUB *DISPMG: GOTO 1370
0035  IF DTC=30 OR DTC=31 THEN GOSUB *DISPBM
0036  COLOR 2: LOCATE DTP(1,DTCT)
0037  IF DTC=4 OR DTC=5 THEN ELSE PRINT HS: GOTO 1400
0038  IF DDT=1 THEN PRINT WS ELSE PRINT HS
0039  COLOR 7
0040  KS=INKEY$: IF KS="" THEN 1410
0041  IF ASC(KS)=1 THEN GOSUB *HLP
0042  IF ASC(KS)=13 OR AND(KS)=13 THEN 1700
0043  IF ASC(KS)=32 THEN ELSE 1460
0044  IF DTC=4 OR DTC=5 THEN GOSUB *DATAE782: GOTO 1270
0045  IF DTC=7 OR DTC=9 OR DTC=11 THEN GOSUB *DATGET: GOTO 1270
0046  IF ASC(KS)=46 THEN GOSUB *DATGET: GOTO 1270
0047  IF ASC(KS)<=31 AND ASC(KS)>=28 THEN ELSE 1410
0048  IF DTC=7: COLOR 7: LOCATE DTP(1,DTCT): DTP(3,DTCT)
0049  IF DTC=4 OR DTC=5 THEN ELSE PRINT HS: GOTO 1520
0050  IF DDT=1 THEN PRINT WS ELSE PRINT HS
0051  IF DTC=7: AND DTC=3: DTC=3: GOTO 1530
0052  IF DTC=4: DTC=4: GOTO 1680
0053  IF DTC=5: THEN DTC=5: GOTO 1680
0054  IF ASC(KS)=30 AND DTC=4 THEN DTC=3: GOTO 1680
0055  IF ASC(KS)=30 THEN DTC=DTC-2
0056  IF DTC=31 THEN DTC=30: GOTO 1680
0057  IF DTC=1 THEN DTC=3: GOTO 1680
0058  IF DTC=2 THEN DTC=3: GOTO 1680
0059  IF DTC=3 THEN ELSE 1680
0060  IF DTC=1 THEN DTC=4: GOTO 1680
0061  IF DTC=2 THEN DTC=5: GOTO 1680
0062  DTC=DTC-2
0063  DTC=DTC-2
0064  IF ASC(KS)=28 THEN DTC=DTC+1
0065  IF ASC(KS)=29 THEN DTC=DTC-1
0066  IF DTC=0 THEN DTC=0
0067  IF DTC=34 THEN DTC=1
0068  DTC=DTC-2
0069  GOTO 1270
0070  DTP(1,28)=DTP(1,28)+DTP(1,24): RETURN

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[illegible]

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1220 NEXT I
1230 DDAT=DTF(1, DTC): GOSUB "DISPNML"
1240 LOCATE DTF(5), DTF(3,5): PRINT SPACES(20)
1250 IF DTC=1 OR DTC=9 THEN GOTO 1310
1260 IF DTC=4 THEN GOSUB "DISPEQ2: GOTO 1310
1270 IF DTC=5 THEN GOSUB "DISP1: GOTO 1310
1280 IF DTC=7 OR DTC=9 THEN GOSUB "DISPM: GOTO 1310
1290 IF DTC=10 OR DTC=11 THEN GOSUB "DISPN: GOTO 1310
1300 IF DTC=12 THEN GOSUB "DISP1: GOTO 1310
1310 IF DTF(1,4)=2 THEN GOTO 1330
1320 LOCATE DTF(5), DTF(3,5): PRINT SPACES(20): GOTO 1350
1330 IF DTF(5), DTF(3,5): PRINT PMS(5)
1340 LOCATE DTF(2,5), DTF(3,5): PRINT DTF(1,5)
1350 COLOR 2: LOCATE DTF(2, DTC), DTF(3, DTC)
1360 IF DTC=4 THEN ELSE DDAT=DDAT: GOTO 1380
1370 IF DDAT=1 THEN PRINT DTC ELSE PRINT C$
1380 COLOR 7
1390 K$=INKEY: IF K$="" THEN 1390
1400 IF ASC(K$)=1 THEN GOTO *H*P
1410 IF ASC(K$)=13 OR ASC(K$)=27 THEN 1620
1420 IF ASC(K$)=32 THEN GOTO 1620
1430 IF DTC=4 THEN GOSUB "DATAGET2: GOTO 1230
1440 IF ASC(K$)<=57 AND ASC(K$)=48 THEN GOSUB "DATAGET: GOTO 1230
1450 IF ASC(K$)=46 THEN GOSUB "DATAGET: GOTO 1230
1460 IF ASC(K$)<=31 AND DTC=7 THEN GOTO 1390
1470 COLOR 7: LOCATE DTF(2, DTC), DTF(3, DTC)
1480 IF DTC=4 THEN ELSE PRINT DDT: GOTO 1500
1490 IF DTC=1 THEN PRINT D$ ELSE PRINT C$
1500 IF ASC(K$)=30 AND DTC=7 THEN DTC=DTC-2: GOTO 1560
1510 IF ASC(K$)=30 AND DTC=7 THEN DTC=DTC-1: GOTO 1560
1520 IF ASC(K$)=31 AND DTC=7 THEN DTC=DTC-1: GOTO 1560
1530 IF ASC(K$)=31 AND DTC=6 THEN DTC=DTC-1: GOTO 1560
1540 IF ASC(K$)=28 AND DTC=6 THEN DTC=DTC+1
1550 IF ASC(K$)=29 AND DTC=7 THEN DTC=DTC-1
1560 IF DTC=8 THEN DTC=13
1570 IF DTC=14 THEN DTC=1
1580 IF DTC=5 AND DTF(1,4)=1 THEN ELSE GOTO 1610
1590 IF ASC(K$)=29 OR ASC(K$)=30 THEN DTC=4
1600 IF ASC(K$)=28 OR ASC(K$)=31 THEN DTC=6
1610 GOTO 1230
1620 RETURN

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Program Name: DSETB.BAS
1000 'SAVE "DSETB.BAS",A
1010 CHAIN MENU,"DISP.BAS",1020
1020 DIM DT(3,50),DTCP(5),FNS(50)
1030 GOSUB *INS;GOSUB *DATAREADS;GOSUB *DATASETS
1040 GOSUB *DATAOUTPUT;:RUN "CALC.BAS"
1050 *DATAOUTPUT: OPEN "IEMTB.DAT" FOR INPUT AS #1
1060 FOR I=1 TO 16: PRINT DT(I,1);: NEXT I: CLOSE #1: RETURN
1070 *DATAREAD: OPEN "IEMTB.DAT" FOR INPUT AS #1
1080 FOR I=1 TO 16: DT(I,1)=I: NEXT I: CLOSE #1: RETURN
1090 *DATASET: LOCATE 1,1: DT(1,1): LOCATE 1,1: PRINT T25
1100 LOCATE 1,1: PRINT T35: COLOR 7: FOR I=1 TO 16: READ DT(I)
1110 NEXT FOR I=4 TO 16: READ FNS(I): NEXT I: FOR I=1 TO 16
1120 DT(2,2)=2,2,2,2,2,16,2,16,2,16,2,16,2,16,2,16: FNS(1)=
1130 DATA "A": FNS(2)=B: FNS(3)=C: FNS(4)=D: FNS(5)=E: FNS(6)=F:
1140 FNS(7)=G: FNS(8)=H: FNS(9)=I: FNS(10)=J: FNS(11)=K: FNS(12)=L:
1150 FNS(13)=M: FNS(14)=N: FNS(15)=O: FNS(16)=P: FNS(17)=Q: FNS(18)=R: FNS(19)=S: FNS(20)=T: FNS(21)=U: FNS(22)=V: FNS(23)=W: FNS(24)=X: FNS(25)=Y: FNS(26)=Z: FNS(27)=A: FNS(28)=B: FNS(29)=C: FNS(30)=D: FNS(31)=E: FNS(32)=F: FNS(33)=G: FNS(34)=H: FNS(35)=I: FNS(36)=J: FNS(37)=K: FNS(38)=L: FNS(39)=M: FNS(40)=N: FNS(41)=O: FNS(42)=P: FNS(43)=Q: FNS(44)=R: FNS(45)=S: FNS(46)=T: FNS(47)=U: FNS(48)=V: FNS(49)=W: FNS(50)=X: FNS(51)=Y: FNS(52)=Z: FNS(53)=A: FNS(54)=B: FNS(55)=C: FNS(56)=D: FNS(57)=E: FNS(58)=F: FNS(59)=G: FNS(60)=H: FNS(61)=I: FNS(62)=J: FNS(63)=K: FNS(64)=L: FNS(65)=M: FNS(66)=N: FNS(67)=O: FNS(68)=P: FNS(69)=Q: FNS(70)=R: FNS(71)=S: FNS(72)=T: FNS(73)=U: FNS(74)=V: FNS(75)=W: FNS(76)=X: FNS(77)=Y: FNS(78)=Z: FNS(79)=A: FNS(80)=B: FNS(81)=C: FNS(82)=D: FNS(83)=E: FNS(84)=F: FNS(85)=G: FNS(86)=H: FNS(87)=I: FNS(88)=J: FNS(89)=K: FNS(90)=L: FNS(91)=M: FNS(92)=N: FNS(93)=O: FNS(94)=P: FNS(95)=Q: FNS(96)=R: FNS(97)=S: FNS(98)=T: FNS(99)=U: FNS(100)=V: FNS(101)=W: FNS(102)=X: FNS(103)=Y: FNS(104)=Z: FNS(105)=A: FNS(106)=B: FNS(107)=C: FNS(108)=D: FNS(109)=E: FNS(110)=F: FNS(111)=G: FNS(112)=H: FNS(113)=I: FNS(114)=J: FNS(115)=K: FNS(116)=L: FNS(117)=M: FNS(118)=N: FNS(119)=O: FNS(120)=P: FNS(121)=Q: FNS(122)=R: FNS(123)=S: FNS(124)=T: FNS(125)=U: FNS(126)=V: FNS(127)=W: FNS(128)=X: FNS(129)=Y: FNS(130)=Z: FNS(131)=A: FNS(132)=B: FNS(133)=C: FNS(134)=D: FNS(135)=E: FNS(136)=F: FNS(137)=G: FNS(138)=H: FNS(139)=I: FNS(140)=J: FNS(141)=K: FNS(142)=L: FNS(143)=M: FNS(144)=N: FNS(145)=O: FNS(146)=P: FNS(147)=Q: FNS(148)=R: FNS(149)=S: FNS(150)=T: FNS(151)=U: FNS(152)=V: FNS(153)=W: FNS(154)=X: FNS(155)=Y: FNS(156)=Z: FNS(157)=A: FNS(158)=B: FNS(159)=C: FNS(160)=D: FNS(161)=E: FNS(162)=F: FNS(163)=G: FNS(164)=H: FNS(165)=I: FNS(166)=J: FNS(167)=K: FNS(168)=L: FNS(169)=M: FNS(170)=N: FNS(171)=O: FNS(172)=P: FNS(173)=Q: FNS(174)=R: FNS(175)=S: FNS(176)=T: FNS(177)=U: FNS(178)=V: FNS(179)=W: FNS(180)=X: FNS(181)=Y: FNS(182)=Z: FNS(183)=A: FNS(184)=B: FNS(185)=C: FNS(186)=D: FNS(187)=E: FNS(188)=F: FNS(189)=G: FNS(190)=H: FNS(191)=I: FNS(192)=J: FNS(193)=K: FNS(194)=L: FNS(195)=M: FNS(196)=N: FNS(197)=O: FNS(198)=P: FNS(199)=Q: FNS(200)=R: FNS(201)=S: FNS(202)=T: FNS(203)=U: FNS(204)=V: FNS(205)=W: FNS(206)=X: FNS(207)=Y: FNS(208)=Z: FNS(209)=A: FNS(210)=B: FNS(211)=C: FNS(212)=D: FNS(213)=E: FNS(214)=F: FNS(215)=G: FNS(216)=H: FNS(217)=I: FNS(218)=J: FNS(219)=K: FNS(220)=L: FNS(221)=M: FNS(222)=N: FNS(223)=O: FNS(224)=P: FNS(225)=Q: FNS(226)=R: FNS(227)=S: FNS(228)=T: FNS(229)=U: FNS(230)=V: FNS(231)=W: FNS(232)=X: FNS(233)=Y: FNS(234)=Z: FNS(235)=A: FNS(236)=B: FNS(237)=C: FNS(238)=D: FNS(239)=E: FNS(240)=F: FNS(241)=G: FNS(242)=H: FNS(243)=I: FNS(244)=J: FNS(245)=K: FNS(246)=L: FNS(247)=M: FNS(248)=N: FNS(249)=O: FNS(250)=P: FNS(251)=Q: FNS(252)=R: FNS(253)=S: FNS(254)=T: FNS(255)=U: FNS(256)=V: FNS(257)=W: FNS(258)=X: FNS(259)=Y: FNS(260)=Z: FNS(261)=A: FNS(262)=B: FNS(263)=C: FNS(264)=D: FNS(265)=E: FNS(266)=F: FNS(267)=G: FNS(268)=H: FNS(269)=I: FNS(270)=J: FNS(271)=K: FNS(272)=L: FNS(273)=M: FNS(274)=N: FNS(275)=O: FNS(276)=P: FNS(277)=Q: FNS(278)=R: FNS(279)=S: FNS(280)=T: FNS(281)=U: FNS(282)=V: FNS(283)=W: FNS(284)=X: FNS(285)=Y: FNS(286)=Z: FNS(287)=A: FNS(288)=B: FNS(289)=C: FNS(290)=D: FNS(291)=E: FNS(292)=F: FNS(293)=G: FNS(294)=H: FNS(295)=I: FNS(296)=J: FNS(297)=K: FNS(298)=L: FNS(299)=M: FNS(300)=N: FNS(301)=O: FNS(302)=P: FNS(303)=Q: FNS(304)=R: FNS(305)=S: FNS(306)=T: FNS(307)=U: FNS(308)=V: FNS(309)=W: FNS(310)=X: FNS(311)=Y: FNS(312)=Z: FNS(313)=A: FNS(314)=B: FNS(315)=C: FNS(316)=D: FNS(317)=E: FNS(318)=F: FNS(319)=G: FNS(320)=H: FNS(321)=I: FNS(322)=J: FNS(323)=K: FNS(324)=L: FNS(325)=M: FNS(326)=N: FNS(327)=O: FNS(328)=P: FNS(329)=Q: FNS(330)=R: FNS(331)=S: FNS(332)=T: FNS(333)=U: FNS(334)=V: FNS(335)=W: FNS(336)=X: FNS(337)=Y: FNS(338)=Z: FNS(339)=A: FNS(340)=B: FNS(341)=C: FNS(342)=D: FNS(343)=E: FNS(344)=F: FNS(345)=G: FNS(346)=H: FNS(347)=I: FNS(348)=J: FNS(349)=K: FNS(350)=L: FNS(351)=M: FNS(352)=N: FNS(353)=O: FNS(354)=P: FNS(355)=Q: FNS(356)=R: FNS(357)=S: FNS(358)=T: FNS(359)=U: FNS(360)=V: FNS(361)=W: FNS(362)=X: FNS(363)=Y: FNS(364)=Z: FNS(365)=A: FNS(366)=B: FNS(367)=C: FNS(368)=D: FNS(369)=E: FNS(370)=F: FNS(371)=G: FNS(372)=H: FNS(373)=I: FNS(374)=J: FNS(375)=K: FNS(376)=L: FNS(377)=M: FNS(378)=N: FNS(379)=O: FNS(380)=P: FNS(381)=Q: FNS(382)=R: FNS(383)=S: FNS(384)=T: FNS(385)=U: FNS(386)=V: FNS(387)=W: FNS(388)=X: FNS(389)=Y: FNS(390)=Z: FNS(391)=A: FNS(392)=B: FNS(393)=C: FNS(394)=D: FNS(395)=E: FNS(396)=F: FNS(397)=G: FNS(398)=H: FNS(399)=I: FNS(400)=J: FNS(401)=K: FNS(402)=L: FNS(403)=M: FNS(404)=N: FNS(405)=O: FNS(406)=P: FNS(407)=Q: FNS(408)=R: FNS(409)=S: FNS(410)=T: FNS(411)=U: FNS(412)=V: FNS(413)=W: FNS(414)=X: FNS(415)=Y: FNS(416)=Z: FNS(417)=A: FNS(418)=B: FNS(419)=C: FNS(420)=D: FNS(421)=E: FNS(422)=F: FNS(423)=G: FNS(424)=H: FNS(425)=I
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[illegible]

Dielectric Modeling of Biological Cells

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1200 IF I=6 AND DTP(1,5)=2 THEN L220
1210 LOCATE DTT(I),DTP(3,1): PRINT PMS(I)
1220 NEXT I
1230 FOR I=1 TO 24: LOCATE DTP(2,1),DTP(3,I): IF I=4 THEN ELSE L260
1240 IF DTP(1,I)=1 THEN PRINT MS ELSE PRINT CS
1250 GOTO 1310
1260 IF I=5 THEN ELSE L290
1270 IF DTP(1,I)=1 THEN PRINT DS ELSE PRINT CS
1280 GOTO 1310
1290 IF I=6 AND DTP(1,5)=1 THEN PRINT SPACES(10): GOTO 1310
1300 PRINT DTP(1,I)
1310 NEXT I
1320 DDAT=DTP(1,DTC): GOSUB *DISPNUL
1330 LOCATE DTT(6),DTP(3,6): PRINT SPACES(15)
1340 IF DTC=1 OR DTC=2 THEN GOSUB *DISPIN: GOTO 1430
1350 IF DTC=3 THEN GOSUB *DISPDC: GOTO 1430
1360 IF DTC=5 THEN GOSUB *DISPDC2: GOTO 1430
1370 IF DTC=6 THEN GOSUB *DISPIN: GOTO 1430
1380 IF DTC=8 OR DTC=10 OR DTC=21 THEN GOSUB *DISPMS: GOTO 1430
1390 IF DTC=9 OR DTC=10 OR DTC=21 THEN GOSUB *DISPDC: GOTO 1430
1400 IF DTC=13 OR DTC=14 THEN GOSUB *DISPDM: GOTO 1430
1410 IF DTC=15 OR DTC=22 THEN GOSUB *DISPDM: GOTO 1430
1420 IF DTC=16 OR DTC=23 THEN GOSUB *DISPDM
1430 LOCATE DTT(6),DTP(3,6): IF DTP(1,5)=2 THEN GOTO 1450
1440 PRINT SPACES(15): GOTO 1460
1450 IF DTC=1 THEN LOCATE DTT(6),DTP(3,6): PRINT DTT(1,6)
1460 COLOR 2: LOCATE DTP(2,DTC),DTP(3,DTC): IF DTC=4 THEN ELSE L490
1470 IF DDAT=1 THEN PRINT MS ELSE PRINT HS
1480 GOTO 1530
1490 IF DTC=5 THEN ELSE L520
1500 IF DDAT=1 THEN PRINT DS ELSE PRINT CS
1510 GOTO 1530
1520 PRINT DDAT
1530 COLOR 7
1540 K$=INKEY$: IF K$="" THEN L540
1550 IF ASC(K$)=1 THEN GOTO *HLP
1560 IF ASC(K$)=13 OR ASC(K$)=27 THEN L880
1570 IF ASC(K$)=32 THEN ELSE L590
1580 IF DTC=4 OR DTC=5 THEN GOSUB *DATAGE2: GOTO 1320
1590 IF ASC(K$)<57 AND ASC(K$)>48 THEN GOSUB *DATAGE: GOTO 1320
1600 IF ASC(K$)=46 THEN GOSUB *DATGE: GOTO 1320
1610 IF ASC(K$)<31 AND ASC(K$)>28 THEN ELSE L540
1620 COLOR 7: LOCATE DTP(2,DTC),DTP(3,DTC)
1630 IF DTC=4 THEN ELSE L660
1640 IF DDAT=1 THEN PRINT MS ELSE PRINT HS
1650 GOTO 1700
1660 IF DTC=5 THEN ELSE L690
1670 IF DDAT=1 THEN PRINT DS ELSE PRINT CS
1680 GOTO 1700
1690 PRINT DDAT
1700 IF ASC(K$)=30 THEN ELSE L730
1710 IF DTC=6 AND DTC=17 THEN DTC=DTC-2: GOTO 1800
1720 IF DTC=6 OR DTC=18 THEN DTC=DTC-1: GOTO 1810
1730 IF ASC(K$)=31 THEN ELSE L770
1740 IF DTC=16 THEN DTC=DTC-1: GOTO 1810
1750 IF DTC=5 AND DTC=17 THEN DTC=DTC-2: GOTO 1810
1760 IF DTC=5 OR DTC=17 THEN DTC=DTC-1: GOTO 1810
1770 IF ASC(K$)=28 THEN ELSE L790
1780 IF DTC=5 THEN DTC=DTC-1
1790 IF ASC(K$)=29 THEN ELSE L810
1800 IF DTC=6 THEN DTC=DTC-1
1810 IF DTC=6 THEN DTC=1
1820 IF DTC=25 THEN DTC=1
1830 IF DTC=6 AND DTP(1,5)=1 THEN ELSE L870
1840 IF ASC(K$)=28 THEN DTC=1
1850 IF ASC(K$)=29 THEN DTC=7
1860 IF ASC(K$)=30 THEN DTC=8
1870 GOTO L520
1880 RETURN

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[illegible]

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1650 IF DTC<=DTCMAK(1) THEN DTC=-1
1660 IF DTC=19 AND DTP(1,4) THEN I=1 THEN ELSE GOTO 1670
1670 IF ASC(KS)=29 OR ASC(KS)=30 THEN DTC=18
1680 IF ASC(KS)=28 OR ASC(KS)=31 THEN DTC=1
1690 GOTO 1270
1700 RETURN

[Program Name: DSET.E.BAS]
1000 ' SAVE "DSET.E.BAS",A
1010 ' CHAIN MPEM "DISP.BAS",1020
1020 DIM DTP(5,2),DTF(50),PNS(50)
1030 GOSUB #INS:GOSUB #DATAREAD:GOSUB #DATASETE
1040 GOSUB #DATACORRUPT:NEW "ALCE.BAS"
1050 #DATAREAD: OPEN "DATA.DAT" FOR INPUT AS #1
1060 FOR I=1 TO 6: INPUT #1, DTP(1,I): NEXT I: FOR I=1 TO RETURN(1,4)
1070 INPUT #1, DE(1),FC(1),B(1): INPUT #1: CLOSE #1: RETURN
1080 #DATASETE: OPEN "DATA.DAT" FOR INPUT AS #1
1090 FOR I=1 TO 6: PRINT #1, DTP(1,I): NEXT I: FOR I=1 TO DTP(1,4)
1100 PRINT #1, DE(1),FC(1),B(1): INPUT #1: CLOSE #1: RETURN
1110 #DATACORRUPT: OPEN "DATA.DAT" FOR INPUT AS #1
1120 #DATASETE: #1,4: COLOR 7: FOR I=1 TO 9: DTT(1)=2: NEXT I
1130 FOR I=4 TO 9: READ PNS(I): NEXT I: FOR I=1 TO 9: READ DTP(2,I),
1140 NEXT I: FOR I=1 TO 12: READ DTP(3,I): NEXT I
1150 DATA 5,6,7,10,11,12,15,16,17: DATA 5,6,16,5,5,5,14,14,14
1160 FOR I=1 TO 9: LOCATE DTP(1,I),DTP(3,I): PRINT PNS(I): NEXT I
1170 DTC=1
1180 DTA(1)=DE(IGRU-1): DTA(2)=FC(IGRU-1): DTA(3)=B(IGRU-1)
1190 DTP(1)=DE(IGRU): DTP(2)=FC(IGRU): DTP(3)=B(IGRU)
1200 DTA(1)=DTP(1,IGRU-1): DTA(2)=FC(IGRU-1): DTA(3)=B(IGRU-1)
1210 IF DTC=1 OR DTC=2 THEN GOSUB #DISPH: GOTO 1260
1220 IF DTC=8 THEN GOSUB #DISPMH: GOTO 1260
1230 IF DTC=6 THEN GOSUB #DISPMH: GOTO 1260
1240 GOSUB #DISPWL
1250 FOR I=1 TO 6: IF I=DTC THEN GOSUB 2 ELSE LOCATE 7
1260 LOCATE DTP(2,I),DTP(3,I): PRINT DTP(1,I,I): NEXT I: COLOR 7
1270 LOCATE DTP(2,I),DTP(3,I): PRINT 1580
1280 LOCATE 7,14: PRINT SPACES(28): GOSUB 5: LOCATE 14,14
1290 PRINT IGRU: FOR I=7 TO 9: IF I=DTC THEN COLOR 2 ELSE COLOR 7
1300 LOCATE DTP(2,I),DTP(3,I): PRINT SPACES(23)
1310 LOCATE DTP(2,I),DTP(3,I): PRINT DTA(I-I*9): COLOR 7: NEXT I
1320 IF IGRU=1 THEN ELSE 1360
1330 COLOR 5: LOCATE 7,14: PRINT IGRU-1: DTA(1)=1: FOR I=7 TO 9
1340 LOCATE DTP(2,I),DTP(3,I): PRINT DTA(I-I*9): NEXT I
1350 IF IGRU=1=DTP(1,4) THEN ELSE 1390
1360 COLOR 5: LOCATE 21,17: PRINT IGRU-1: DTA(1)=1: FOR I=7 TO 9
1370 LOCATE DTP(2,I),DTP(3,I): PRINT DTC(I-I*6): NEXT I
1380 KS=INKEY$: IF KS="" THEN GOTO 1390
1390 IF ASC(KS)=1 THEN GOSUB #HLP
1400 IF ASC(KS)=13 OR ASC(KS)=27 THEN 1500
1410 IF ASC(KS)=25 AND ASC(KS)=48 THEN GOSUB #DATAGET: GOTO 1570
1420 IF ASC(KS)=46 OR ASC(KS)=32 THEN GOSUB #DATAGET: GOTO 1570
1430 IF DTC<7 THEN ELSE 1490
1440 IF ASC(KS)=31 THEN DTC=DTC+1
1450 IF ASC(KS)=30 THEN DTC=DTC-1
1460 IF DTC<1 THEN DTC=9
1470 GOTO 1570
1480 IF ASC(KS)=28 THEN IGRU=IGRU-1
1490 IF ASC(KS)=29 THEN IGRU=IGRU-1
1500 IF ASC(KS)=30 THEN DTC=DTC-1
1510 IF ASC(KS)=31 THEN DTC=DTC+1
1520 IF IGRU=0 THEN DTC=1
1530 IF IGRU>DTP(1,4) THEN IGRU=DTP(1,4)
1540 IF IGRU<1 THEN IGRU=1
1550 IF DTC=9 THEN DTC=1
1560 GOTO 1580
1570 DE(IGRU)=DTP(1,I): FC(IGRU)=DTP(2,I): B(IGRU)=DTP(3,I)
1580 GOTO 1190
1590 RETURN

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0000 Program Name: DISP,.BAS]
0001 'SAVE "DISP,.BAS",A
10010 'FMS
10020 PMS(1)=-MIN="
10030 OPEN "IAG.DAT" FOR INPUT AS #1: PMS(2)=-MAX="
10040 INPUT #1, NPP, C1P1S: CLOSE #1: PMS(3)=-POINTS/DECAINE="
10050 C=C-SPACE BAR=" " : PMS(4)=-PARAMETERS: WIDTH=80, 25
10060 T1S="FREQUENCY RANGE": T2S="WIMMER EQUATION": GOSUB H
10070 NIS="WAGNER": H="HAKATI": DS="DILUTE": CS="CONC.": RETURN
10080 D1="DATE#": DATES#="DATE": DTC=1: LOCATE DTP(2, DTC)+1, DTP(3, DTC)
10090 PRINT " "
10100 LOCATE DTP(2, DTC)+1, DTP(3, DTC): LINE INPUT " #, AD#
10110 LOCATE DTP(2, DTC)+2, DTP(3, DTC): LINE INPUT " #, AD#
10120 DTS(DTP(2, DTC)+1, DTP(3, DTC))=DTC-1 THEN ELSE GOTO 10170
10130 IF DTP(1, 4)+10 THEN LOCATE 1, 4)+10: GOTO 10160
10140 IF DTP(1, 4)+1 THEN LOCATE 1, 4)+1: GOTO 10160
10150 IF DTC-1=1: IF DTC=10 THEN DTC=1: GOTO 10160
10160 GOTO 10190
10170 IF DTS(DTP(2, DTC)+1, DTP(3, DTC))=DTC-1 THEN ELSE GOTO 10170
10180 PRINT DATES: DTC: DTC=DTC+1: IF DTC=DTCMAX+1 THEN DTC=1
10190 RETURN
10200 DATES2: COLOR 6: IF DDATE=1 THEN ELSE 10250
10210 LOCATE DTP(2, DTC), DTP(3, DTC)
10220 IF NPP=9 OR NPP=10 THEN PRINT CS: GOTO 10300
10230 PRINT NIS: GOTO 10310
10240 IF DDATE=1 THEN ELSE 10300
10250 IF NPP=9 OR NPP=10 THEN PRINT DS: GOTO 10300
10260 LOCATE DTP(2, DTC), DTP(3, DTC)
10270 IF NPP=9 OR NPP=10 THEN PRINT DS: GOTO 10300
10280 PRINT MS
10290 IF DDATE=1 THEN 10320
10300 DTC=DTC+1: GOTO 10330
10310 DTP(1, DTC)=2
10320 DTP(1, DTC)=2
10330 LOCATE 1, DTC=DTCMAX+1 THEN DTC=1
10340 RETURN
10350 DATES2: COLOR 6
10360 IF DDATE=1 THEN LOCATE 2, 10: PRINT "MULTI-COMPONENT"
10370 IF DDATE=1 THEN LOCATE 2, 10: PRINT "3-COMPONENT"
10380 IF DDATE=1 THEN ELSE 10420
10390 DTP(1, DTC)=2: MMSNC=2: BS=DT(1, 1)+3: KS=DT(1, 1)+4
10400 DTP(1, DTC)=1: DTP(1, 15): DTP(1, 15): DTP(1, 15): DTP(1, 15)
10410 THICK1=DT(1, 18): THICK2=DATE#-NPP+3: GOTO 10450
10420 DTP(1, DTC)=1: MMSNC=1: FOR I=1 TO NPP-1
10430 BS(I)=DTP(1, I)+12: BS(I)=DTP(1, I)+12: BS(I)=DTP(1, I)+12
10440 THICK1(I)=DTP(1, I)+12: NEXT I: LOCATE 2, 10: DTP(1, 15)
10450 LOCATE DTC: DTC=DTC+1: IF DTC=DTCMAX THEN DTC=1
10460 RETURN
10470 DISP#H: LOCATE 52, 2: PRINT " (Log F/H2)": RETURN
10480 DISP#Q: LOCATE 40, 2: PRINT MS: BS: HS: RETURN
10490 DISP#Q: LOCATE 40, 2: PRINT MS: BS: HS: RETURN
10500 DISP#M: LOCATE 54, 2: PRINT " (um)": RETURN
10510 DISP#NULL: LOCATE 55, 1: PRINT SPACES(45): LOCATE 35, 2
10520 PRINT SPACES(145): LOCATE 4: RETURN
10530 DISP#S: LOCATE 53, 2: PRINT " (cm/s)": RETURN
10540 DISP#S: LOCATE 53, 2: PRINT " (us/cm)": RETURN
10550 DISP#M: LOCATE 54, 2: PRINT " (um)": RETURN
10560 DISP#M: LOCATE 54, 2: PRINT " (um)": RETURN
10570 DISP#M: LOCATE 40, 2: PRINT "3-COMP.": BS: MULTI-COMP.: RETURN
10580 DISP#RAD: LOCATE 52, 1: PRINT "RADIUS(um)": LOCATE 41, 2
10590 DISP#RAD: LOCATE 52, 1: PRINT "RADIUS(um)": LOCATE 41, 2
10600 DISP#RAD2: LOCATE 59, 1: PRINT "RADIUS(um)": LOCATE 2, 10
10610 DISP#RAD2: LOCATE 59, 1: PRINT "RADIUS(um)": LOCATE 2, 10
10620 DISP#RAD2: LOCATE 59, 1: PRINT "RADIUS OF NUCLEUS (u of Cell "
10630 PRINT "radius)": LOCATE 2, 10: PRINT "rn": RETURN
10640 DISP#RAD2: LOCATE 59, 1: PRINT "DIAMETER(um)": LOCATE 41, 2
10650 PRINT "RADIUS": BS: "DIAMETER": LOCATE 2, 10: PRINT "d": RETURN

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10660 *DISPVR: LOCATE 45,1: PRINT "RELATIVE VF (Total Vfr = 1) "
10670 LOCATE 39,2: PRINT "ABSOLUTE":SBS;"RELATIVE"
10680 LOCATE 2,1L: PRINT "VF":*. RETURN
10690 *DISPVA: LOCATE 45,1: PRINT "ABSOLUTE VF (Total Vfa = VF)"
10700 LOCATE 39,2: PRINT "ABSOLUTE":SBS;"RELATIVE"
10710 LOCATE 2,1L: PRINT "Vfa":*. RETURN
10720 *DISPNI: LOCATE 35,2: PRINT "Number of Steps for Numerical *:"
10730 PRINT "Integration":*. RETURN
10740 *MER: LOCATE 2,1: PRINT "MAIN MENU": LOCATE 23,1
10750 PRINT "CONTINUE":*. RETURN
10760 *HLP: NPP=0: OPEN "IAZ.DAT" FOR OUTPUT AS #1
10770 PRINT #1, NPP, CLPS: CLOSE #1: RUN "IAZ.BAS"
10780 *ALL: LOCATE 14,DTE: COLOR 7: PRINT DTG(DTE): LOCATE 6,DTE
10790 COLOR 4: PRINT "ALL":COLOR 7
10800 KS=INKEY$: IF KS="" THEN 10800
10810 IF ASC(KS)>48 AND ASC(KS)<57 THEN 10830
10820 IF ASC(KS)<46 THEN ELSE 10800
10830 LOCATE 10,DTE: PRINT KS:LOCATE 11,DTE: INPUT **,RALLAS
10840 RALL=VAL(KS+RALLAS):LOCATE 5,DTE: PRINT *
10850 LOCATE 6,DTE: PRINT * :*. RETURN

```

```

[Program Name: CALC1.BAS]
1000 ' SAVE "CALC1.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC1"
1230 *DATA.GET: OPEN "IPMT1.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.1: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.1: WORN=QOUTER: EA=GEA: KA=QKA
1340 E1=QEI: K1=QKI: VP=QVF: RETURN

```

```

[Program Name: CALC2.BAS]
1000 ' SAVE "CALC2.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC2"
1230 *DATA.GET: OPEN "IPMT2.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.3: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.3: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC3.BAS]
1000 ' SAVE "CALC3.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC3"
1230 *DATA.GET: OPEN "IPMT3.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.3: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.3: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC4.BAS]
1000 ' SAVE "CALC4.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC4"
1230 *DATA.GET: OPEN "IPMT4.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.4: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.4: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC5.BAS]
1000 ' SAVE "CALC5.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC5"
1230 *DATA.GET: OPEN "IPMT5.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.5: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.5: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC6.BAS]
1000 ' SAVE "CALC6.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC6"
1230 *DATA.GET: OPEN "IPMT6.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.6: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.6: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC7.BAS]
1000 ' SAVE "CALC7.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC7"
1230 *DATA.GET: OPEN "IPMT7.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.7: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.7: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC6"
1230 *DATA.GET: OPEN "IPMT6.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.6: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.6: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC7.BAS]
1000 ' SAVE "CALC7.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC7"
1230 *DATA.GET: OPEN "IPMT7.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.7: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.7: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC8.BAS]
1000 ' SAVE "CALC8.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC8"
1230 *DATA.GET: OPEN "IPMT8.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.8: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.8: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC9.BAS]
1000 ' SAVE "CALC9.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC9"
1230 *DATA.GET: OPEN "IPMT9.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.9: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.9: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

```

[Program Name: CALC10.BAS]
1000 ' SAVE "CALC10.BAS",A
1010 CHAIN MERGE "CALC.BAS",1020
1020 PMS="CALC10"
1230 *DATA.GET: OPEN "IPMT10.DAT" FOR INPUT AS #1
1240 INPUT #1, QMIN,QMAX,QPD,QOUTER,GEA,QKA,QEI,QKI,QKV,QVF: CLOSE #1
1250 GOSUB *FPFAL: RETURN
1270 *CALC: GOSUB *PARAM.10: GOSUB *XDS1: FOR M=1 TO TNFP+2
1280 F=F(M): IF QVF=0 THEN GOTO 1300
1290 E(M)=EA: K(M)=KA: GOTO 1330
1300 P1=E1: P2=K1/C/F: P3=EA: P4=KA/C/F: P7=VFS1: GOSUB *WAGNER
1310 P1=P5: P2=P6: P3=EA: P4=KA/C/F: P7=VF
1320 E(M)=P5: K(M)=P6/C/F: GOSUB *XDS2: NEXT M: GOSUB *XEHKL: RETURN
1330 *PARAM.10: WORN=QOUTER: EA=GEA: KA=QKA: ESQ=QEM: KSO=QKM/1000
1340 E1=QEI: K1=QKI: VP=QVF: THICK=QD: VP=QVF: RETURN
1350 VFS1=((RADIUS-THICK*10^-3)/RADIUS)*3: RETURN

```

Dielectric Modeling of Biological Cells

[illegible]

(436)

Dielectric Modeling of Biological Cells

```

3860 KL=KLL
3870 SPT=1: FOR I=1 TO TNFPD: PF(I)=FD(I): PYL(I)=ED(I)
3880 PYR(I)=(KD(I)-KL)/C/FPD(I): NEXT I: NFP=TNFPD: NKND=0
3890 KLM=0: IF IQD2<0 THEN KLM=1
3900 GOSUB *PLDACC2: GOSUB *PLDACC3
3910 GOSUB *P.NAME: IF NPT=0 THEN 4000
3920 IF NPT=1 THEN 3970
3930 FOR J=1 TO STEP -1: KLL=KT(J,TNFP(J)+1)
3940 FOR I=1 TO TNFP(J): PF(I)=FT(J,I): PYL(I)=ET(J,I)
3950 PYR(I)=(KT(J,I)-KLL)/C/FT(J,I): NEXT I: NFP=TNFP(J): NKND=J+1
3960 MPDT=PUT(J): GOSUB *PLDACC2: NEXT J
3970 KLL=K(TNFP+1): FOR I=1 TO TNFP: PF(I)=F(I): PYL(I)=E(I)
3980 PYR(I)=(K(I)-KLL)/C/F(I): NEXT I: NFP=TNFP: NKND=1: MPDT=PUT
3990 GOSUB *PLDACC2
4000 GOSUB *NUM.LINE
4010 IQD1=IQD1: IQD2=IQD2: IQD3=IQD3: ISTART=ISTART: IEND=IEND
4020 KS=INKEYS: IF KS="" THEN 4020
4030 IF ASC(KS)=8 THEN NPT=NPT-1: GOTO 3770
4040 IF ASC(KS)=28 AND ASC(KS)<31 THEN ELSE 4070
4050 GOSUB *P.CHANGE: IQ1=IQD1: IQ2=IQD2: IQ3=IQD3: ISTART=ISTART
4060 IEND=IEND: GOSUB *PLDACC2: GOTO 4000
4070 CLS 3: RETURN *PLOT
4080 *K: IF NPT=0 AND NPD=0 THEN RETURN *PLOT
4090 IQD1=IQK1: IQD2=IQK2: IQD3=IQK3: ISTART=ISTART: IEND=IEND
4100 WIDTH 80,25: TTITLE="COLE-COLE (K)": RMAX=RMKAX: RMIN=RMKIN
4110 RTS=RTKS
4120 IF NPT=NPT.MAX THEN NPT=NPT.MAX
4130 GOSUB *CCBLOT: GOSUB *PNAME: IF NPD=0 THEN 4260
4140 EHL=EH: PRS=EH="": KLL=EHL: GOSUB *SETKL: EHL=KLL
4150 VIEW (99,49)-(499,249): WINDOW (0,-50)-(100,0): GOTO 4200
4160 LOCATE 11,18: PRINT "EH=": PRINT USING "###.###":EH:
4170 INPUT "K=": IF QK="" OR QK="n" THEN ELSE 4210
4180 LOCATE 11,20: PRINT "EH=": PRINT "K="
4190 LOCATE 18,20: INPUT "EH=",EHL
4200 EH=EHL
4210 SPT=1: FOR I=1 TO TNFPD: PF(I)=FD(I): PYL(I)=KD(I)
4220 PYR(I)=(ED(I)-EHL)/C/FPD(I): NEXT I: NFP=TNFPD: NKND=0
4230 KLM=0: IF IQD2<0 THEN KLM=1
4240 GOSUB *PLDACC2: GOSUB *PLDACC3: GOSUB *PLDACC3
4250 GOSUB *P.NAME: IF NPT=0 THEN 4340
4260 IF NPT=1 THEN 4310
4270 FOR J=1 TO STEP -1: EHL=ET(J,TNFP(J)+2)
4280 FOR I=1 TO TNFP(J): PF(I)=FT(J,I): PYL(I)=KT(J,I)
4290 PYR(I)=(ET(J,I)-EHL)/C/FT(J,I): NEXT I: NFP=TNFP(J): NKND=J+1
4300 MPDT=PUT(J): KLM=0: GOSUB *PLDACC2: NEXT J
4310 EHL=E(TNFP+1): FOR I=1 TO TNFP: PF(I)=F(I): PYL(I)=K(I)
4320 PYR(I)=(E(I)-EHL)/C/F(I): NEXT I: NFP=TNFP: NKND=1: MPDT=PUT
4330 GOSUB *PLDACC2
4340 GOSUB *NUM.LINE
4350 IQD1=IQD1: IQD2=IQD2: IQD3=IQD3: ISTART=ISTART: IEND=IEND
4360 KS=INKEYS: IF KS="" THEN 4360
4370 IF ASC(KS)=8 THEN NPT=NPT-1: GOTO 4120
4380 IF ASC(KS)=28 AND ASC(KS)<31 THEN ELSE 4410
4390 GOSUB *P.CHANGE: IQ1=IQD1: IQ2=IQD2: IQ3=IQD3: ISTART=ISTART
4400 IEND=IEND: GOSUB *PLDACC2: GOTO 4340
4410 CLS 3: RETURN *PLOT
4420 *P.CHANGE: IF ASC(KS)=28 THEN ELSE 4460
4430 IF SPT=1 THEN SPT=1: GOTO 4500
4440 IF SPT=2 THEN SPT=1: GOTO 4500
4450 IF SPT=3 THEN SPT=1: GOTO 4500
4460 IF ASC(KS)=29 THEN ELSE 4500
4470 IF SPT=1 THEN SPT=2: GOTO 4500
4480 IF SPT=2 THEN SPT=3: GOTO 4500
4490 IF SPT=3 THEN SPT=1: GOTO 4500
4500 IF TTITLE="COLE-COLE (K)": THEN ELSE 4790
4510 IF ASC(KS)=30 THEN ELSE 4610
4520 IF SPT=1 THEN ELSE 4580
4530 IF IQD1>IQD3-1 THEN IQD1=IQD3-1: GOTO 4710
4540 IQD1=IQD1+1: GOTO 4710
4550 IF SPT=2 THEN ELSE 4580
4560 IF IQD2>IEND THEN IQD2=IEND: GOTO 4710
4570 IQD2=IQD2+1: GOTO 4710
4580 IF SPT=3 THEN ELSE 4610
4590 IF IQD3>IQD2-1 THEN IQD3=IQD2-1: GOTO 4710
4600 IQD3=IQD3+1: GOTO 4710
4610 IF ASC(KS)=31 THEN ELSE 4710
4620 IF SPT=1 THEN ELSE 4650
4630 IF IQD1>ISTART THEN IQD1=ISTART: GOTO 4710
4640 IQD1=IQD1+1: GOTO 4710
4650 IF SPT=2 THEN ELSE 4680
4660 IF IQD2>IQD3+1 THEN IQD2=IQD3+1: GOTO 4710
4670 IQD2=IQD2+1: GOTO 4710
4680 IF SPT=3 THEN ELSE 4710
4690 IF IQD3>IQD1+1 THEN IQD3=IQD1+1: GOTO 4710
4700 IQD3=IQD3+1
4710 QX1=XQ1: XQ2=XQ2: XQ3=XQ3: YQ1=YQ1: YQ2=YQ2: YQ3=YQ3
4720 QX1=(KD(IQD1)-RMIN)*IFACT
4730 YQ1=(ED(IQD1)-KL)/C/FPD(IQD1)-IMIN)*IFACT
4740 QX2=(KD(IQD2)-RMIN)*IFACT
4750 YQ2=(ED(IQD2)-KL)/C/FPD(IQD2)-IMIN)*IFACT
4760 QX3=(KD(IQD3)-RMIN)*IFACT
4770 YQ3=(ED(IQD3)-KL)/C/FPD(IQD3)-IMIN)*IFACT
4780 GOTO 5060
4790 IF ASC(KS)=31 THEN ELSE 4890
4800 IF SPT=1 THEN ELSE 4830
4810 IF IQD1>IEND THEN IQD1=IEND: GOTO 4990
4820 IQD1=IQD1+1: GOTO 4990
4830 IF SPT=2 THEN ELSE 4860
4840 IF IQD2>IQD3-1 THEN IQD2=IQD3-1: GOTO 4990
4850 IQD2=IQD2+1: GOTO 4990
4860 IF SPT=3 THEN ELSE 4990
4870 IF IQD3>IQD1-1 THEN IQD3=IQD1-1: GOTO 4990
4880 IQD3=IQD3+1: GOTO 4990
4890 IF ASC(KS)=30 THEN ELSE 4990
4900 IF IQD1>IQD3+1 THEN IQD1=IQD3+1: GOTO 4990
4910 IQD1=IQD1+1: GOTO 4990
4920 IF SPT=2 THEN ELSE 4960
4930 IF IQD2>ISTART THEN IQD2=ISTART: GOTO 4990
4940 IQD2=IQD2+1: GOTO 4990
4950 IF SPT=3 THEN ELSE 4990
4960 IF IQD3>IQD2+1 THEN IQD3=IQD2+1: GOTO 4990
4970 IQD3=IQD3+1: GOTO 4990
4980 QX1=XQ1: XQ2=XQ2: XQ3=XQ3: YQ1=YQ1: YQ2=YQ2: YQ3=YQ3
5000 QX1=(KD(IQD1)-RMIN)*IFACT
5010 YQ1=(ED(IQD1)-KL)/C/FPD(IQD1)-IMIN)*IFACT
5020 QX2=(KD(IQD2)-RMIN)*IFACT
5030 YQ2=(ED(IQD2)-KL)/C/FPD(IQD2)-IMIN)*IFACT
5040 QX3=(KD(IQD3)-RMIN)*IFACT
5050 YQ3=(ED(IQD3)-KL)/C/FPD(IQD3)-IMIN)*IFACT
5060 RETURN
5070 *MAXMIN: MAXE=-1D+38: MINE=1D+38: MAXK=-1D+38: MINK=1D+38
5080 FOR I=1 TO TNFP: PF(I)=F(I): PYL(I)=E(I)
5090 IF K(I)>MAXK THEN MAXK=K(I)
5100 IF E(I)<MINE THEN MINE=E(I)
5110 IF K(I)<MINK THEN MINK=K(I)
5120 NEXT I
5130 IF MAXK=10000000000 THEN MAXE=0: MINE=0
5140 IF MAXK=10000000000 THEN MAXE=0: MINK=0
5150 IF MAXE=1E+08 THEN MAXE=9999999: MINK=0
5160 LINE (210,140)-(280,204): L=280: L2=280: L3=280: L4=280: L5=280: L6=280: L7=280: L8=280: L9=280: L10=280: L11=280: L12=280: L13=280: L14=280: L15=280: L16=280: L17=280: L18=280: L19=280: L20=280: L21=280: L22=280: L23=280: L24=280: L25=280: L26=280: L27=280: L28=280: L29=280: L30=280: L31=280: L32=280: L33=280: L34=280: L35=280: L36=280: L37=280: L38=280: L39=280: L40=280: L41=280: L42=280: L43=280: L44=280: L45=280: L46=280: L47=280: L48=280: L49=280: L50=280: L51=280: L52=280: L53=280: L54=280: L55=280: L56=280: L57=280: L58=280: L59=280: L60=280: L61=280: L62=280: L63=280: L64=280: L65=280: L66=280: L67=280: L68=280: L69=280: L70=280: L71=280: L72=280: L73=280: L74=280: L75=280: L76=280: L77=280: L78=280: L79=280: L80=280: L81=280: L82=280: L83=280: L84=280: L85=280: L86=280: L87=280: L88=280: L89=280: L90=280: L91=280: L92=280: L93=280: L94=280: L95=280: L96=280: L97=280: L98=280: L99=280: L100=280: L101=280: L102=280: L103=280: L104=280: L105=280: L106=280: L107=280: L108=280: L109=280: L110=280: L111=280: L112=280: L113=280: L114=280: L115=280: L116=280: L117=280: L118=280: L119=280: L120=280: L121=280: L122=280: L123=280: L124=280: L125=280: L126=280: L127=280: L128=280: L129=280: L130=280: L131=280: L132=280: L133=280: L134=280: L135=280: L136=280: L137=280: L138=280: L139=280: L140=280: L141=280: L142=280: L143=280: L144=280: L145=280: L146=280: L147=280: L148=280: L149=280: L150=280: L151=280: L152=280: L153=280: L154=280: L155=280: L156=280: L157=280: L158=280: L159=280: L160=280: L161=280: L162=280: L163=280: L164=280: L165=280: L166=280: L167=280: L168=280: L169=280: L170=280: L171=280: L172=280: L173=280: L174=280: L175=280: L176=280: L177=280: L178=280: L179=280: L180=280: L181=280: L182=280: L183=280: L184=280: L185=280: L186=280: L187=280: L188=280: L189=280: L190=280: L191=280: L192=280: L193=280: L194=280: L195=280: L196=280: L197=280: L198=280: L199=280: L200=280: L201=280: L202=280: L203=280: L204=280: L205=280: L206=280: L207=280: L208=280: L209=280: L210=280: L211=280: L212=280: L213=280: L214=280: L215=280: L216=280: L217=280: L218=280: L219=280: L220=280: L221=280: L222=280: L223=280: L224=280: L225=280: L226=280: L227=280: L228=280: L229=280: L230=280: L231=280: L232=280: L233=280: L234=280: L235=280: L236=280: L237=280: L238=280: L239=280: L240=280: L241=280: L242=280: L243=280: L244=280: L245=280: L246=280: L247=280: L248=280: L249=280: L250=280: L251=280: L252=280: L253=280: L254=280: L255=280: L256=280: L257=280: L258=280: L259=280: L260=280: L261=280: L262=280: L263=280: L264=280: L265=280: L266=280: L267=280: L268=280: L269=280: L270=280: L271=280: L272=280: L273=280: L274=280: L275=280: L276=280: L277=280: L278=280: L279=280: L280=280: L281=280: L282=280: L283=280: L284=280: L285=280: L286=280: L287=280: L288=280: L289=280: L290=280: L291=280: L292=280: L293=280: L294=280: L295=280: L296=280: L297=280: L298=280: L299=280: L300=280: L301=280: L302=280: L303=280: L304=280: L305=280: L306=280: L307=280: L308=280: L309=280: L310=280: L311=280: L312=280: L313=280: L314=280: L315=280: L316=280: L317=280: L318=280: L319=280: L320=280: L321=280: L322=280: L323=280: L324=280: L325=280: L326=280: L327=280: L328=280: L329=280: L330=280: L331=280: L332=280: L333=280: L334=280: L335=280: L336=280: L337=280: L338=280: L339=280: L340=280: L341=280: L342=280: L343=280: L344=280: L345=280: L346=280: L347=280: L348=280: L349=280: L350=280: L351=280: L352=280: L353=280: L354=280: L355=280: L356=280: L357=280: L358=280: L359=280: L360=280: L361=280: L362=280: L363=280: L364=280: L365=280: L366=280: L367=280: L368=280: L369=280: L370=280: L371=280: L372=280: L373=280: L374=280: L375=280: L376=280: L377=280: L378=280: L379=280: L380=280: L381=280: L382=280: L383=280: L384=280: L385=280: L386=280: L387=280: L388=280: L389=280: L390=280: L391=280: L392=280: L393=280: L394=280: L395=280: L396=280: L397=280: L398=280: L399=280: L400=280: L401=280: L402=280: L403=280: L404=280: L405=280: L406=280: L407=280: L408=280: L409=280: L410=280: L411=280: L412=280: L413=280: L414=280: L415=280: L416=280: L417=280: L418=280: L419=280: L420=280: L421=280: L422=280: L423=280: L424=280: L425=280: L426=280: L427=280: L428=280: L429=280: L430=280: L431=280: L432=280: L433=280: L434=280: L435=280: L436=280: L437=280: L438=280: L439=280: L440=280: L441=280: L442=280: L443=280: L444=280: L445=280: L446=280: L447=280: L448=280: L449=280: L450=280: L451=280: L452=280: L453=280: L454=280: L455=280: L456=280: L457=280: L458=280: L459=280: L460=280: L461=280: L462=280: L463=280: L464=280: L465=280: L466=280: L467=280: L468=280: L469=280: L470=280: L471=280: L472=280: L473=280: L474=280: L475=280: L476=280: L477=280: L478=280: L479=280: L480=280: L481=280: L482=280: L483=280: L484=280: L485=280: L486=280: L487=280: L488=280: L489=280: L490=280: L491=280: L492=280: L493=280: L494=280: L495=280: L496=280: L497=280: L498=280: L499=280: L500=280: L501=280: L502=280: L503=280: L504=280: L505=280: L506=280: L507=280: L508=280: L509=280: L510=280: L511=280: L512=280: L513=280: L514=280: L515=280: L516=280: L517=280: L518=280: L519=280: L520=280: L521=280: L522=280: L523=280: L524=280: L525=280: L526=280: L527=280: L528=280: L529=280: L530=280: L531=280: L532=280: L533=280: L534=280: L535=280: L536=280: L537=280: L538=280: L539=280: L540=280: L541=280: L542=280: L543=280: L544=280: L545=280: L546=280: L547=280: L548=280: L549=280: L550=280: L551=280: L552=280: L553=280: L554=280: L555=280: L556=280: L557=280: L558=280: L559=280: L560=280: L561=280: L562=280: L563=280: L564=280: L565=280: L566=280: L567=280: L568=280: L569=280: L570=280: L571=280: L572=280: L573=280: L574=280: L575=280: L576=280: L577=280: L578=280: L579=280: L580=280: L581=280: L582=280: L583=280: L584=280: L585=280: L586=280: L587=280: L588=280: L589=280: L590=280: L591=280: L592=280: L593=280: L594=280: L595=280: L596=280: L597=280: L598=280: L599=280: L600=280: L601=280: L602=280: L603=280: L604=280: L605=280: L606=280: L607=280: L608=280: L609=280: L610=280: L611=280: L612=280: L613=280: L614=280: L615=280: L616=280: L617=280: L618=280: L619=280: L620=280: L621=280: L622=280: L623=280: L624=280: L625=280: L626=280: L627=280: L628=280: L629=280: L630=280: L631=280: L632=280: L633=280: L634=280: L635=280: L636=280: L637=280: L638=280: L639=280: L640=280: L641=280: L642=280: L643=280: L644=280: L645=280: L646=280: L647=280: L648=280: L649=280: L650=280: L651=280: L652=280: L653=280: L654=280: L655=280: L656=280: L657=280: L658=280: L659=280: L660=280: L661=280: L662=280: L663=280: L664=280: L665=280: L666=280: L667=280: L668=280: L669=280: L670=280: L671=280: L672=280: L673=280: L674=280: L675=280: L676=280: L677=280: L678=280: L679=280: L680=280: L681=280: L682=280: L683=280: L684=280: L685=280: L686=280: L687=280: L688=280: L689=280: L690=280: L691=280: L692=280: L693=280: L694=280: L695=280: L696=280: L697=280: L698=280: L699=280: L700=280: L701=280: L702=280: L703=280: L704=280: L705=280: L706=280: L707=280: L708=280: L709=280: L710=280: L711=280: L712=280: L713=280: L714=280: L715=280: L716=280: L717=280: L718=280: L719=280: L720=280: L721=280: L722=280: L723=280: L724=280: L725=280: L726=280: L727=280: L728=280: L729=280: L730=280: L731=280: L732=280: L733=280: L734=280: L735=280: L736=280: L737=280: L738=280: L739=280: L740=280: L741=280: L742=280: L743=280: L744=280: L745=280: L746=280: L747=280: L748=280: L749=280: L750=280: L751=280: L752=280: L753=280: L754=280: L755=280: L756=280: L757=280: L758=280: L759=280: L760=280: L761=280: L762=280: L763=280: L764=280: L765=280: L766=280: L767=280: L768=280: L769=280: L770=280: L771=280: L772=280: L773=280: L774=280: L775=280: L776=280: L777=280: L778=280: L779=280: L780=280: L781=280: L782=280: L783=280: L784=280: L785=280: L786=280: L787=280: L788=280: L789=280: L790=280: L791=280: L792=280: L793=280: L794=280: L795=280: L796=280: L797=280: L798=280: L799=280: L800=280: L801=280: L802=280: L803=280: L804=280: L805=280: L806=280: L807=280: L808=280: L809=280: L810=280: L811=280: L812=280: L813=280: L814=280: L815=280: L816=280: L817=280: L818=280: L819=280: L820=280: L821=280: L822=280: L823=280: L824=280: L825=280: L826=280: L827=280: L828=280: L829=280: L830=280: L831=280: L832=280: L833=280: L834=280: L835=280: L836=280: L837=280: L838=280: L839=280: L840=280: L841=280: L842=280: L843=280: L844=280: L845=280: L846=280: L847=280: L848=280: L849=280: L850=280: L851=280: L852=280: L853=280: L854=280: L855=280: L856=280: L857=280: L858=280: L859=280: L860=280: L861=280: L862=280: L863=280: L864=280: L865=280: L866=280: L867=280: L868=280: L869=280: L870=280: L871=280: L872=280: L873=280: L874=280: L875=280: L876=280: L877=280: L878=280: L879=280: L880=280: L881=280: L882=280: L883=280: L884=280: L885=280: L886=280: L887=280: L888=280: L889=280: L890=280: L891=280: L892=280: L893=280: L894=280: L895=280: L896=280: L897=280: L898=280: L899=280: L900=280: L901=280: L902=280: L903=280: L904=280: L905=280: L906=280: L907=280: L908=280: L909=280: L910=280: L911=280: L912=280: L913=280: L914=280: L915=280: L916=280: L917=280: L918=280: L919=280: L920=280: L921=280: L922=280: L923=280: L924=280: L925=280: L926=280: L927=280: L928=280: L929=280: L930=280: L931=280: L932=280: L933=280: L934=280: L935=280: L936=280: L937=280: L938=280: L939=280: L940=280: L941=280: L942=280: L943=280: L944=280: L945=280: L946=280: L947=280: L948=280: L949=280: L950=280: L951=280: L952=280: L953=280: L954=280: L955=280: L956=280: L957=280: L958=280: L959=280: L960=280: L961=280: L962=280: L963=280: L964=280: L965=280: L966=280: L967=280: L968=280: L969=280: L970=280: L971=280: L972=280: L973=280: L974=280: L975=280: L976=280: L977=280: L978=280: L979=280: L980=280: L981=280: L982=280: L983=280: L984=280: L985=280: L986=280: L987=280: L988=280: L989=280: L990=280: L991=280: L992=280: L993=280: L994=280: L995=280: L996=280: L997=280: L998=280: L999=280: L1000=280

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8580 PRT1=PYL(1): NEXT I: NEXT J: CLM5
8590 GOTO 8270
8600 IF LFTS="L" THEN YMAK=YAK: YMIN=YMIN
8610 IF LFTS="U" THEN YMAK=YAK: YMIN=YMIN
8620 IF ASC(K)=8 THEN RETURN PLOT
8630 RETURN
8640 *P3.PRM: IF ASC(K)=28 THEN ELSE ELSE 6630
8650 CNP(CN)-CNP(CN-1): IF CNP(CN)=0 THEN CNP(CN)=1
8660 GOTO 6730
8670 IF ASC(K)=29 THEN ELSE ELSE 6660
8680 CNP(CN)-CNP(CN+1): IF CNP(CN)=7 THEN CNP(CN)=6
8690 GOTO 6730
8700 IF CN=1 THEN YMAK=YAK:INT(10*(CNP(1)-1)+.1)/10
8710 IF CN=2 THEN YMIN=YMIN:INT(10*(CNP(2)-1)+.1)/10
8720 GOTO 6730
8730 IF ASC(K)=31 THEN ELSE ELSE 6730
8740 IF CN=1 THEN YMAK=YAK:INT(10*(CNP(1)-1)+.1)/10
8750 IF CN=2 THEN YMIN=YMIN:INT(10*(CNP(2)-1)+.1)/10
8760 RETURN
8770 *KIN2: IF CN=1 OR CN=2 THEN LKX1=17 ELSE LK1=58
8780 CN=1 OR CN=3 THEN LK1=22 ELSE LK1=22
8790 LOCATE LK1,LY1: PRINT K$;: " LOCATE LK1+1,LY1
8800 INPUT "*,YK1: YK1=K$+YK1: IF CN=1 THEN YMAK=VAL(YK1$)
8810 CN=1 THEN YMIN=VAL(YK1$)
8820 IF CN=3 THEN YMAK=VAL(YK1$)
8830 IF CN=4 THEN YMIN=VAL(YK1$)
8840 CN=CN+1: IF CN=5 THEN CN=1
8850 RETURN
8860 *KIN3: LK1=17: IF CN=1 THEN LY1=21 ELSE LY1=22
8870 LOCATE LK1,LY1: PRINT K$;: " LOCATE LK1+1,LY1
8880 IF CN=1 THEN YK1=K$+YK1: IF CN=1 THEN YMAK=VAL(YK1$)
8890 IF CN=2 THEN YMIN=VAL(YK1$)
8900 IF CN=3 THEN CN=1
8910 RETURN
8920 *CPLTOT: CLS 3: WINDOW (0,-50)-(100,0): VIEW (99,49)-(499,249)
8930 RWID=RWAK-RMIN: NTR=INT(RWID/10): RFAC2=100/RWID
8940 IF RWID=0 THEN RFAC2=1: B: FOR I=1 TO NTR/2
8950 LINE (0,RTS+1)*FAC2: (1,RTS+1)*FAC2
8960 LINE (99,RTS+1)*FAC2: (100,RTS+1)*FAC2: NEXT I
8970 IF I=1 TO NTR-1: LINE (0,-50)-(100,0): (RTS+1)*FAC2: (1,RTS+1)*FAC2
8980 LINE (RTS+1)*FAC2: (100,RTS+1)*FAC2: (99,RTS+1)*FAC2: NEXT I: RETURN
8990 *PTCE: LOCATE 15,22: PRINT TITLES: LOCATE 9,16
9000 PRINT USING "####.###": RMIN: LOCATE 57,16
9010 PRINT USING "####.###": RMAX: RETURN
9020 *PTCE: LOCATE 15,22: PRINT TITLES: LOCATE 8,16
9030 PRINT USING "####.###": RMIN: LOCATE 54,16
9040 PRINT USING "####.###": RMAX: RETURN
9050 *PLDATAFAC: RSD=0: NRSDE=0: RSDK=0: NRSDEK=0: RMIN=100000000
9060 RMAX=0: RMINK=100000000: RMAXK=0: FOR I=1 TO NPT-1
9070 IF 6+LOG(PF(I))-CNP(CN) OR (PF(I)-1)*CNP(CN) MAXF THEN 7220
9080 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9090 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9100 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9110 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9120 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9130 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9140 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9150 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9160 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9170 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9180 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9190 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9200 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9210 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9220 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9230 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9240 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9250 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9260 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9270 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9280 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9290 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9300 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9310 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9320 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9330 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9340 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9350 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9360 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9370 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9380 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9390 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9400 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9410 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9420 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9430 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9440 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9450 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9460 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9470 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9480 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9490 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9500 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9510 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9520 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9530 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9540 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9550 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9560 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9570 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9580 IF RMIN=CYL(1) THEN RMIN=CYL(1)
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9620 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9630 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9640 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9650 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9660 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9670 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9680 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9690 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9700 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9710 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9720 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9730 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9740 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9750 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9760 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9770 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9780 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9790 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9800 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9810 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9820 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9830 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9840 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9850 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9860 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9870 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9880 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9890 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9900 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9910 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9920 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9930 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9940 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9950 IF RMAX=CYR(1) THEN RMAX=CYR(1)
9960 IF RMIN=PYL(1) THEN RMIN=PYL(1)
9970 IF RMAX=PYR(1) THEN RMAX=PYR(1)
9980 IF RMIN=CYL(1) THEN RMIN=CYL(1)
9990 IF RMAX=CYR(1) THEN RMAX=CYR(1)

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