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BIOLOGY DIVISION

QUARTERLY PROGRESS REPORT

TO THE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

January 1 - March 31, 1968

Diana B. Smith
F. J. de Serres

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BIOLOGY DIVISION

QUARTERLY PROGRESS REPORT
TO THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

January 1 - March 31, 1968

MAY 1969

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QUARTERLY PROGRESS REPORT
TO THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Title of Project:

Mutagenic Effectiveness of Known Doses of Gamma Irradiation in Combination with Zero Gravity on Neurospora

For the Period:

January 1 - March 31, 1968

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COMPUTER PROGRAMS FOR STATISTICAL ANALYSIS OF FORWARD-MUTATION EXPERIMENTS AT SPECIFIC LOCI IN *NEUROSPORA CRASSA*

Diana B. Smith F. J. de Serres

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I. INTRODUCTION

A series of computer programs were written to facilitate the statistical analysis of large-scale forward-mutation experiments on the haploid organism *Neurospora crassa*. Specifically, the experiments involve induction of recessive lethal mutations at specific loci using a genetically balanced 2-component heterokaryon of the genotype shown in Table 1. Adenine-3 (*ad-3*) mutants (component II in Table 1) are detected by the appearance of purple pigment as opposed to white in the nonmutant colonies. For a more detailed discussion, see de Serres and Osterbind (1962). Each *ad-3* mutant is tested extensively to characterize it as to whether the mutation in the *ad-3* region is (1) a point mutation, (2) a chromosome deletion, or (3) a point mutation with a separate site of recessive lethal damage elsewhere in the genome. In addition, since the *ad-3B* locus codes for a polymer, mutants at this locus show allelic complementation and can be characterized according to their complementation patterns as (1) nonpolarized, (2) polarized, or (3) noncomplementing.

Different mutagenic agents would be expected to have different frequencies of mutation-induction for each of the different classes, according to their mode of action.

Table 1. Genetic composition of each component of the dikaryon used in forward-mutation experiments*

Linkage Group	Component I (Strain No. 74-OR60-29A)	Component II (Strain No. 74-OR31-16A)
IR	A hist-2 ad-3A ad-3B nic-2	A al-2
III	ad-2	-
IV	-	cot
V	inos	-
VI	-	pan-2

*Genetic markers are as follows: A, mating type; hist-2, histidine-requiring; ad-3A, ad-3B, ad-2, adenine-requiring; nic-2, niacine-requiring; al-2, albino mycelium and conidia; cot, temperature-sensitive morphological (more restricted growth the higher the temperature); inos, inositol-requiring; pan-2, pantothenate-requiring.

The computer programs summarize the raw data (in the form of counts and volumes for the forward-mutation study and in the form of growth or no growth with testers of known genotype for the characterization of the mutants) and provide a statistical analysis of the data.

II. FORWARD-MUTATION ANALYSIS

The number of survivors in a jug is estimated from sample counts of unpigmented (white background) surviving heterokaryotic colonies. If a count y of a sample of volume v is made from a jug of volume w, then the number of survivors S is $S = (y/v)w$. This may be as high as 10^6 or more. All the ad-3 mutants (purple) in a jug are counted, as they are fewer in number and easily seen if present. If this number is assigned the value x, then the forward-mutation is x/S. The count x has an expected Poisson distribution, so 95% confidence intervals on x are computed using Poisson tables; if x is large, however, the approximation used is $x - 1.96\sqrt{x}$, $x + 1.96\sqrt{x}$. The intervals on x are divided by S to give confidence intervals on the mutation frequency x/S. This procedure gives confidence limits even if x is close to or equal to zero.

Each experiment may consist of one or more designs with each design receiving several doses of the mutagen. For instance, experiment 54 (Gemini XI) has four designs (flight suspensions, ground suspensions, flight filters, and ground filters). For the experiment-designs with

three or more doses, the dose-power equation $Y = aD^b$, with x/S an estimate of Y and D equal to the dose, is fitted to the data (pooled jugs within a dose). This is done by a linear regression of log x/S on log D. The slope is an estimate of b, and the antilog of the intercept is an estimate of a.

Use of the dose-power equation assumes the spontaneous mutation frequency to be nil or very much smaller than the observed values of x/S. Too, a good fit requires that the dose be not so large as to exceed a threshold.

Up to this point the computer analysis of forward-mutation data is done by the Jug Analysis Program. See sample output in section VIII A.

For comparisons of mutation-induction curves, the Special Plotting Program is used. This program plots the two mutation induction curves on the same plot and gives a statistical test of the difference between slopes; then, assuming the difference is not significant, it tests adjusted means to see if the distance between the curves is significant. A sample plot is given in section VIII B.

III. SURVIVAL ANALYSIS

Survival analysis is also performed by the Jug Analysis Program. Before a suspension of conidia is inoculated into a jug, an estimate of the number of conidia per ml is made using a hemocytometer. If the count is e, the dilution before counting f, the correction factor for the

hemocytometer g, and the volume counted h, then the suspension Q is $Q = efg/h$. It follows that the survival fraction Z is $Z = S/nQ$, where S is as previously defined and n is the volume of the suspension inoculated into the jug.

The survival fraction can be redefined as $Z = \beta\ (y/e)$ where y and e are the counts and β is a constant composed of other terms. Using a method developed by Birnbaum (1954) and described by Kimball (1961), which assumes Poisson distributions for the counts, 95% confidence limits on the survival fraction are computed.

Survival ratios are computed as $R_t = Z_t/Z_c$ where t = treatment, and c = control. Intervals given for this ratio are not 95% confidence intervals (exact confidence intervals cannot be computed) but *a priori* they should be wider than 95% intervals. These survival ratios are computed as follows:

$$R_t\ (\text{lower}) = \frac{Z_t(\text{lower } 95\%)}{Z_c(\text{upper } 95\%)}$$

$$R_t\ (\text{upper}) = \frac{Z_t(\text{upper } 95\%)}{Z_c(\text{lower } 95\%)}$$

The single-hit dose response curve for survival ratios is $y = e^{-kD}$ with R_t an estimate of y. A linear regression is fitted to

log R_t on dose through the origin, and also to log Z_t on dose not through the origin. If the single-hit equation is really a good fit, the latter regression should give a realistic estimate of the zero-dose survival. For most of the Neurospora experiments a multihit curve may better explain the data, but as a rule only the shoulder of this curve is obtained; so a fit to this more complex equation as a standard procedure is not attempted.

Where the same initial suspension is used for every jug in every treatment within an experiment-design, it is not necessary to make suspension counts in order to compute survival ratios. In this case S/n is fitted (not through the origin) on a semilog plot, and 95% confidence intervals on S/n are computed assuming a Poisson distribution of background counts. If, in actuality, the suspensions were not really quite the same, the intervals on the survival ratio, $R_t = (S_t/n_t)/(S_c/n_c)$, may seem smaller than they should be.

Sample survival analysis and plots are given in section VIII A.

IV. MUTANT CHARACTERIZATION

A sample of mutants from each dose in an experiment-design is tested for growth as a homokaryon or as a dikaryon in combination with tester strains of known genotype. The test scores (up to 4 input cards are punched per mutant) are sent to the computer along with, for each treatment, (1) first and last isolate numbers for identification of

mutants, (2) the number of mutants observed in the original jug analysis, (3) the forward-mutation frequency, and (4) the dose for that treatment. The Mutant Analysis Program does the following:

1) Lists all the mutants (with the test results).
2) Lists those designated not in stock.
3) Lists those having one or more of four cards containing incomplete data.
4) Lists those having one or more cards completely missing.
5) Lists those having all the tests completed.
6) Lists completed mutants that have inconsistencies in the test data; these may be errors or just unusual results.
7) Tallies tha number of mutants of every type for each treatment and prints out the fraction and mutation frequency for each type.
8) Using information read into the computer (not part of the program so that changes or additions are allowed), summarizes by adding together designated appropriate types) the number of mutants, the fraction, and the mutation frequencies for 40 (at present) different general classes of mutants such as $\underline{ad\text{-}3}^{\underline{R}}$, $\underline{ad\text{-}3}^{\underline{IR}}$, $\underline{ad\text{-}3A}^{\underline{R}}$ and $\underline{ad\text{-}3B}^{\underline{R}}$, etc. ($\underline{R}$ = point mutation, $\underline{IR}$ = chromosome deletion). For a better explanation of the classes, see Webber and de Serres (1965).
9) Computes a dose-power regression for each experiment-design as described for the Jug Analysis Program, but this time for all

the different classes of mutants. These statistics are printed and the curves plotted for each class where there are three or more nonzero frequencies within an experiment-design.

Sample output (but not a complete set) for an experiment is given in section VIII C.

Computing confidence intervals on mutation frequencies involves the following generalizations:

x mutants are observed in a treatment.

$t \leq x$ are characterized.

p are found to be in a class or type.

The mutation frequency $Y = p/t\ (x/S)$.

This represents p mutants per (tS/x) survivors and confidence limits are computed for p as they were for x, and then for Y as for x/s.

V. ANALYSIS OF MUTANT CHARACTERIZATION OUTPUT

The results of the mutant anlyses are punched on cards for each experiment-design. This makes it possible to later compare any two experiment-designs (with the Compare Program) or to combine data (with the Combine Program) from two experiment-designs when they show no difference. Results of these programs are given in sections VIII D and VIII E respectively. The Compare Program computes the same statistics as the Special Plotting Program, but always uses summary titles for plots.

The Combine Program combines treatments having the same dose by adding together the number of mutants and the number of survivors this represents. It works only with nonzero frequencies, so care must be used in interpreting results if zero frequencies are valid.

The Chi-Square Program takes the number of ad-3B^{R} mutants observed at each dose; they have been further categorized as ad-3B(R-P), ad-3B(R-NP), or ad-3B(R-NC), which are exclusive categories within ad-3B^{R}. Using the numbers observed, it computes χ^2 for between doses within each experiment-design and (assuming no significant χ^2 within) then, using total numbers observed, between experiment-designs. The symbols shown on the printout are as follows:

P = point mutation with a polarized complementation pattern

NP = point mutation with a nonpolarized complementation pattern

NC = point mutation which is noncomplementing

C = P + NP = point mutations showing complementation.

Sample output of this program is found in section VIII F.

VI. COMPUTING FACILITIES AND LANGUAGE

The programs described were written for use on an IBM 360, model 75 computer at Oak Ridge National Laboratory. This computer has the following features available to the user:

1) 60,000 bytes fast storage

2) 1,750,000 bytes bulk storage

3) a model 2301 drum

4) models 2311 and 2314 disk units

5) two 7-track and three 9-track tapes.

'FORTRAN 360', a compiler written by J. G. Sullivan, Jr., and associates at ORNL, was used. This compiler incorporates the features of IBM FORTRAN IV with those of CDC FORTRAN 63. The plotting package (EZPLOT) was written by R. B. Bullock and D. R. Proctor, and the assembly language subroutine providing linkage to IBM SORT-MERGE was written by D. R. Winkler.

VII. SUMMARY

A series of programs have been written to provide basic statistical analyses of forward-mutation experiments on the organism *Neurospora crassa*. Besides providing these analyses, the data is summarized in such a way that any additional analysis can be easily performed.

Literature Cited

Birnbaum, Allan, 1954, Statistical methods for Poisson processes and exponential populations. Am. Statistical Assoc. J. 49: 254-266.

de Serres, F. J., and Rosalie S. Osterbind, 1962, Estimation of the relative frequencies of X-ray-induced viable and recessive lethal mutations in the ad-3 region of Neurospora crassa. Genetics 47: 793-796.

Kimball, A. W., 1961, Confidence intervals for recombination experiments with microorganisms. Biometrics 17: 150-153.

Webber, B. B., and F. J. de Serres, 1965, Induction kinetics and genetic analysis of X-ray-induced mutations in the ad-3 region of Neurospora crassa, Proc. Natl. Acad. Sci. U.S. 53: 430-437.

VIII. PROGRAMS AND OUTPUT

A. Jug Analysis Program and Output

Order of input:

(1) Program (hex deck or control cards for program on disk)

(2) 80210 cards (experiment information sheet), if punched

(3) 80211 cards (hemacytometer count), if punched

(4) 80213 cards (jug harvesting data worksheet), must be present

(5) 80214 cards (title card for regression *Neurospora crassa*), if present

(6) END card (cols. 1-3)

(7) Repeat (2), (3), (4), (5), (6) for next experiment

(8) /* and // cards, cols 1-2

360 job card:

Tape 25 pool plot (7), program on disk 666666

Calcomp request card:

Black ink, plain paper

Number of plots = (number of 80214 cards) X 3

Note: In some cases fewer plots will be returned.

EXPERIMENT INFORMATION SHEET

CARD TYPE					WILD TYPE			EXP. NO.		
1	2	3	4	5	6	7	8	9	10	11
8	0	2	1	0						

DATE COMPILED

TREATMENT NUMBER	DOSE	TREATMENT DESCRIPTION	DESIGN
12 13 14	15 16 17 18 19	20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77	78 79 80

UCN-8655
(3 7-68)

HEMACYTOMETER COUNT

Hemacytometer Count After Resuspending
The Conidia From Millipore Filters

CARD TYPE					WILD TYPE			EXP. NO.		
1	2	3	4	5	6	7	8	9	10	11
8	0	2	1	1						

DATE COMPILED

TREAT-MENT	DILUTION COUNTED		BASIC UNIT	TECH.	NO. UNITS	COUNT	NO. UNITS	COUNT	NO. UNITS	COUNT	NO. UNITS	COUNT
12 - 14	15 - 18	19 - 20	21 - 22	23 - 24	25 - 26	27 - 30	31 - 32	33 - 36	37 - 38	39 - 42	43 - 44	45 - 48

UCN-8869
(3 9-68)

JUG HARVESTING DATA WORKSHEET

1-5	Wild Type 6-8	Experiment 9-11	Treatment 12-14	Jug 15-17	Vol. Inoc. 18-20
8 0 2 1 3					

Sample No.	21-22: 0 1	50-51: 0 2	21-22: 0 3	50-51: 0 4	21-22: 0 5	50-51: 0 6
Sample vol. for mutants	23-26: 1 5 0 0	52-55: 1 5 0 0	23-26: 1 5 0 0	52-55: 1 5 0 0	23-26: 1 5 0 0	52-55:
Sample vol. background	27-28: 1 0	56-57: 1 0	27-28: 1 0	56-57: 1 0	27-28: 1 0	56-57: 1 0
Background count	29-32:	58-61:	29-32:	58-61:	29-32:	58-61:
Technician	33-34:	62-63:	33-34:	62-63:	33-34:	62-63:
Purple Colonies	35-38:	64-67:	35-38:	64-67:	35-38:	64-67:
First Isolate No.	39-42:	68-71:	39-42:	68-71:	39-42:	68-71:
Last Isolate No.	43-46:	72-75:	43-46:	72-75:	43-46:	72-75:
Purple pigmentation	47:	76:	47:	76:	47:	76:
Colony morphology	48-49:	77-78:	48-49:	77-78:	48-49:	77-78:
		79-80:		79-80:		79-80:

Comments:

UCN-7204
(3 6-68)

TITLE CARD FOR REGRESSION
NEUROSPORA CRASSA

Card Type					Wildtype			Exp. No.			Design			Initials			Charge			Heterokaryon Tech. No.			Heterokaryon Exp. No.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
8	0	2	1	4																				

Information

26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52

53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

The sequence for the information:

A) Strains, if more specific than given above

B) General problem and treatment conditions

C) Specific information for the different treatment, including the code for the treatment

Remark: The title will be printed exactly as given, which means that when space is desirable between words, one or two blanks have to be left between those words.

UCN-8892
(3 9-68)

```
//              12182,MSGLEVEL=1  DIANA SMITH 9704-1 Y12  EXT.3-5048
//JOBLIB DD DSNAME=SYS1.LINKLIB,VOLUME=REF=LKOBSMPL,DISP=(OLD,PASS)
// EXEC ACGT,PARM.GO='EU=-1,DUMP=G'
//SYSPUNCH DD DUMMY
//ASSEMBLE.SYSIN DD *
SORTER   START
         USING *,12
         STM   14,12,12(13)
         LR    5,13
         LR    12,15
         LA    13,AREA
         ST    13,8(0,5)
         ST    5,AREA+4
         LA    1,PARLIST
         ATTACH EP=SORT,MF=(E,(1))
         L     13,AREA+4
         LM    14,12,12(13)
         BR    14
         LTORG
AREA     DS    18F
         CNOP   0,8
* PARAMETER LIST
PARLIST  DC     X'80'
         DC     AL3(ADLST)
         DC     X'0000'
ADLST    DC     X'0018'
         DC     A(SORTCD)
         DC     A(STCDED)
         DC     A(RCDCD)
         DC     A(RDCDED)
```

```
         DC     F'0'
         DC     F'0'
SORTCD   DC      C' SORT FIELDS=(5,13,CH,A),'
         DC      C'SIZE=E2000'
STCDED   DC      C' '
RCDCD    DC      C' RECORD TYPE=F,LENGTH=80'
RCCDED   DC      C' '
         END
/*
//FT63.FT50F001 DD *
```

```
      SUBROUTINE XLIST
C*****LISTS 80213 JUG HARVESTING DATA CARDS
      DIMENSION I(4),NOW(2)
      DIMENSION X(500,8)
      DIMENSION LIST(20)
      DIMENSION IA(22),BI(22)
      DATA IA/4H-    ,4HJ    ,4HK    ,4HL    ,4HM    ,4HN    ,4HO    ,4HP    ,
     14HQ    ,4HR    ,4H0    ,4H1    ,4H2    ,4H3    ,4H4    ,4H5    ,4H6    ,
     *4H7    ,4H8    ,4H9    ,4H     ,4H.    /
      DATA BI/0.,1.,2.,3.,4.,5.,6.,7.,8.,9.,0.,10.,20.,30.,40.,50.,60.,
     * 70.,80.,90.,0.,0./
    2 FORMAT(5X,I3,3I3,A1,F2.1,2X,F4.0,F2.0,F4.0,2X,F4.0,2I4,5X,F4.0,
     * F2.0,F4.0,2X,F4.0,2I4)
    6 FORMAT(1H0,I2,2I4,T14,I3,T22,F5.2,T29,F5.0,T34,F9.0,T45,F8.0,
     * T54,F6.0,T65,F11.0,T79,E12.6,T93,2I5)
      CALL IDAY(NOW)
      REWIND 13
      NO=0
      PRINT 1,NOW
      PRINT11
    1 FORMAT('1',T30,'LISTING OF JUG HARVESTING DATA',T90,'DATE ',2A4)
      LINE=0
      SB=0.
      SX=0.
      VLX=0.
      S2=0.
      S3=0.
      S4=0.
 4040 CONTINUE
      READ(13,212,END=99) IJ,LIST
  212 FORMAT(I5,T1,20A4)
      IF(IJ.NE.80213) GO TO 4040
      DECODE(84,2,LIST(1))IX,IG,IM,JCT,IXJ,XZ,SM1,SV1,BCT1,PUR1,I(1),
     * I(2),SM2,SV2,BCT2,PUR2,I(3),I(4)
  222 CONTINUE
      DO 951 K=1,22
      IF(ICOMPARE(IXJ,IA(K),4).NE.0)951,952
  952 IF(K.NE.22) GO TO 960
      XQ=XZ*.1
      GO TO 970
  960 IF(K.GT.10) GO TO 965
      XQ=XZ*.1+BI(K)
      GO TO 970
  965 XQ=XZ+ BI(K)
      GO TO 970
  951 CONTINUE
  970 CONTINUE
      SVOL=SM1+SM2
      SPU=PUR1+PUR2
      SVL=SV1+SV2
      IF(BCT1.EQ.0.) SVL=SVL-SV1
      IF(BCT2.EQ.0.) SVL=SVL-SV2
      SUM=BCT1+BCT2
      MIN=9999
      MAX=0
   22 DO 3 J=1,4
      IF(I(J).EQ.0) GO TO 3
      IF(I(J).LT.MIN) MIN=I(J)
      IF(I(J).GT.MAX) MAX=I(J)
    3 CONTINUE
```

```
**FTN,L,P,G,E.
      COMMON/BULK/ABC,DEF
      DIMENSION CXQ(1000)
      DIMENSION ABC(500,27),DEF(500,27)
      DIMENSION LIST(20)
      DATA IEND /4HEND /
      CALL PLOTS(CXQ,1000)
  999 CONTINUE
      REWIND 30
    1 READ(50,30,END=987) LIST
      IF(ICOMPARE(LIST,IEND,3).EQ.0) GO TO 2
      WRITE(30,30) LIST
      GO TO 1
    2 END FILE 30
      REWIND 30
      REWIND 30
      REWIND 10
      REWIND 11
      REWIND 13
      REWIND 14
  888 READ(30,30,END=9999) LIST
   30 FORMAT(20A4)
      DECODE(20,31,LIST) IJ
   31 FORMAT(I5)
      IF(IJ.NE.80213) GO TO 32
      WRITE(13,30) LIST
      GO TO 888
   32 IF(IJ.NE.80210) GO TO 33
      WRITE(10,30) LIST
      GO TO 888
   33 IF(IJ.NE.80211) GO TO 34
      WRITE(11,30)LIST
      GO TO 888
   34 IF(IJ.NE.80214) GO TO 888
      WRITE(14,30) LIST
      GO TO 888
 9999 CONTINUE
      END FILE 13
      END FILE 14
      END FILE 10
      END FILE 11
      CALL XLIST
      GO TO 999
  987 PRINT 99
   99 FORMAT('1 JOB COMPLETED')
      CALL EXIT
      END
```

```
  4 READ(13,212,END=88) IJ,LIST
    IF(IJ.NE.80213) GO TO 4
    DECODE(84,2,LIST(1))IZ,IE,IT,ICT,IXX,XY,SM1,SV1,BCT1,PUR1,I(1),
   * I(2),SM2,SV2,BCT2,PUR2,I(3),I(4)
    IF(IE.NE.IG) GO TO 5
    IF(IX.NE.IZ) GO TO 5
    IF(IT.NE.IM) GO TO 5
    IF(ICT.NE.JCT) GO TO 5
    SVOL=SVOL+SM1+SM2
    SPU=SPU+PUR1+PUR2
    SVL=SVL+SV1+SV2
    IF(BCT1.EQ.0.) SVL=SVL-SV1
    IF(BCT2.EQ.0.) SVL=SVL-SV2
    SUM=SUM+BCT1+BCT2
    GO TO 22
  5 TS=0.
    IF(SVL.NE.0.) TS=(SUM*SVOL)/SVL
    FM=0.
    IF(TS.NE.0.) FM=SPU/TS
    IF(MIN.EQ.9999) MIN=0
    PRINT 6,IX,IG,IM,JCT,XQ,SVL,SUM,SVOL,SPU,TS,FM,MIN,MAX
    SB=SB+SPU
    S2=S2+SVL
    S3=S3+SUM
    S4=S4+SVOL
    SX=S3*S4/S2
    VLX=VLX+XQ
    IF(IM.EQ.IT) GO TO 444
439 FM=0.
    IF(SX.NE.0.) FM=SB/SX
    CALL POIS(SB,SX,XL,XU)
    PRINT 445,VLX,S2,S3,S4,SB,SX,FM,XL,XU
445 FORMAT('0**********',T18,F9.2,T29,F5.0,T34,F9.0,T45,F8.0,T54,F6.0,
   * T61,F15.0,T79,E12.6,T105,E12.6,2X,E12.6)
    NO=NO+1
    X(NO,1)=IG
    X(NO,2)=IM
    X(NO,3)=VLX
    X(NO,4)=SB
    X(NO,5)=SX
    X(NO,6)=S2
    X(NO,7)=S3
    X(NO,8)=S4
    LINE=LINE+1
    SB=0.
    SX=0.
    S2=0.
    S3=0.
    S4=0.
    VLX=0.
    GO TO 446
444 IF(IE.NE.IG) GO TO 439
    GO TO 555
446 IF(IE.EQ.IG) GO TO 555
    PRINT 1,NOW
    PRINT 11
    LINE=0
    GO TO 55
555 CONTINUE
    LINE=LINE+1
    IF(LINE.LT.29)GO TO 55
    PRINT 1,NOW
```

```
      PRINT 11
      LINE=0
   11 FORMAT('0','EXPERIMENT  JUG VOL-INOC VOL-CT BACKGROUND JUG-VOL   MU
     *TANTS TOTAL SURVIVORS  MUT.-FREQ.        ISOLATES',
     *T112,'95 PC CONFIDENCE')
   55 IG=IE
      IM=IT
      IX=IZ
      IXJ=IXX
      XZ=XY
      JCT=ICT
      GO TO 222
   88 TS=0.
      IF(SVL.NE.0.) TS=(SUM*SVOL)/SVL
      FM=0.
      IF(TS.NE.0.) FM=SPL/TS
      IF(MIN.EQ.9999) MIN=0
      PRINT 6,IX,IG,IM,JCT,XQ,SVL,SUM,SVOL,SPU,TS,FM,MIN,MAX
      SB=SB+SPU
      S2=S2+SVL
      S3=S3+SUM
      S4=S4+SVOL
      SX=S3*S4/S2
      VLX=VLX+XQ
      FM=0.
      IF(SX.NE.0.) FM=SB/SX
      CALL POIS(SB,SX,XL,XU)
      PRINT 445,VLX,S2,S3,S4,SB,SX,FM,XL,XU
      NO=NO+1
      X(NO,1)=IG
      X(NO,2)=IM
      X(NO,3)=VLX
      X(NO,4)=SB
      X(NO,5)=SX
      X(NO,6)=S2
      X(NO,7)=S3
      X(NO,8)=S4
   99 CALL OTHER(X,NO)
      RETURN
      END
```

```
      SUBROUTINE POIS(XX,DEN,XL,XU)
C**** COMPUTES POISSON 95 PC CONFIDENCE LIMITS FOR XX, RETURNS XL LOWER
C**** LIMIT FOR FREQUENCY AND XU UPPER. DEN IS DENOMINATOR OF FREQUENCY.
      DIMENSION A(200),B(100),A1(200),B1(100)
      EQUIVALENCE (A(101),B(1)),
     *            (A1(101),B1(1))
      DATA A/ 00000, 0.051, 0.355, 0.818, 1.366, 1.970, 2.613, 3.285,
     *        3.285, 4.460, 5.323, 5.323, 6.686, 6.686, 8.102, 8.102,
     *        9.598, 9.598,11.177,11.177,12.817,12.817,13.765,14.921,
     *       14.921,16.768,16.770,17.630,19.050,19.050,20.330,22.360,
     *       21.360,22.940,23.760,23.760,25.400,26.310,26.310,27.730,
     *       28.970,28.970,30.020,31.670,31.670,32.280,34.050,34.660,
     *       34.660,36.030,37.670,37.670,38.160,39.760,40.940,40.940,
     *       41.750,43.450,44.260,44.260,45.280,47.020,47.690,47.690,
     *       48.740,50.420,51.290,51.290,52.150,53.720,54.990,54.990,
     *       55.510,56.990,58.720,58.720,58.840,60.240,61.900,62.810,
     *       62.810,63.490,64.950,66.760,66.760,66.760,68.100,69.620,
     *       71.090,71.090,71.280,72.660,74.220,75.490,75.490,75.780,
     *       77.160,78.730,79.980,79.980/
      DATA B/ 80.25, 81.61, 83.14, 84.57, 84.57, 84.67, 86.01, 87.48,
     *        89.23, 89.23, 89.23, 90.37, 91.78, 93.48, 94.23, 94.23,
     *        94.70, 96.06, 97.54, 99.17, 99.17, 99.17,100.32,101.71,
     *       103.31,104.40,104.40,104.58,105.90,107.32,109.11,109.61,
     *       109.61,110.11,111.44,112.87,114.84,114.84,114.84,115.60,
     *       116.93,118.35,120.36,120.36,120.36,121.06,122.37,123.77,
     *       125.46,126.26,126.26,126.48,127.78,129.14,130.68,132.03,
     *       132.03,132.03,133.14,134.48,135.92,137.79,137.79,137.79,
     *       138.49,139.79,141.16,142.70,144.01,144.01,144.01,145.08,
     *       146.39,147.80,149.53,150.19,150.19,150.36,151.63,152.96,
     *       154.39,156.32,156.32,156.32,156.87,158.15,159.48,160.92,
     *       162.79,162.79,162.79,163.35,164.63,165.96,167.39,169.33,
     *       169.33,169.33,169.80,171.07/
      DATA A1/ 3.285, 5.323, 6.686, 8.102, 9.598,11.177,12.817,13.765,
     *        14.921,16.768,17.633,19.050,20.335,21.364,22.945,23.762,
     *        25.400,26.306,27.735,28.966,30.017,31.675,32.277,34.048,
     *        34.665,36.030,37.670,38.160,39.760,40.940,41.750,43.450,
     *        44.260,45.280,47.020,47.690,48.740,50.420,51.290,52.150,
     *        53.720,54.990,55.510,56.990,58.720,58.840,60.240,61.900,
     *        62.810,63.490,64.950,66.760,66.760,68.100,69.620,71.090,
     *        71.280,72.660,74.220,75.490,75.780,77.160,78.730,79.980,
     *        80.250,81.610,83.140,84.570,84.670,86.010,87.480,89.230,
     *        89.230,90.370,91.780,93.480,94.230,94.700,96.060,97.540,
     *        99.170,99.170,100.32,101.71,103.31,104.40,104.58,105.90,
     *        107.32,109.11,109.61,110.11,111.44,112.87,114.84,114.84,
     *        115.60,116.93,118.35,120.36/
      DATA B1/ 120.36,121.06,122.37,123.77,125.46,126.26,126.48,127.78,
     *         129.14,130.68,132.03,132.03,133.14,134.48,135.92,137.79,
     *         137.79,138.49,139.79,141.16,142.70,144.01,144.01,145.08,
     *         146.39,147.80,149.53,150.19,150.36,151.63,152.96,154.39,
     *         156.32,156.32,156.87,158.15,159.48,160.92,162.79,162.79,
     *         163.35,164.63,165.96,167.39,169.33,169.33,169.80,171.07,
     *         172.38,173.79,175.48,176.23,176.23,177.48,178.77,180.14,
     *         181.67,183.05,183.05,183.86,185.13,186.46,187.89,189.83,
     *         189.83,190.21,191.46,192.76,194.11,195.63,197.09,197.09,
     *         197.78,199.04,200.35,201.73,203.35,204.36,204.36,205.31,
     *         206.58,207.90,209.30,211.03,211.69,211.69,212.82,214.09,
     *         215.40,216.81,218.56,219.16,219.16,220.29,221.56,222.86,
     *         224.26,225.90,226.81,226.81/
      IF(DEN.EQ.0.) GO TO 3
      FR=XX/DEN
```

```
      NUM=XX+1.
      IF(NUM.GT.200) GO TO 1
      XL=A(NUM)/DEN
      XU=A1(NUM)/DEN
      GO TO 2
    1 XL=FR-1.96*SQRT(XX)/DEN
      XU=FR+1.96*SQRT(XX)/DEN
    2 RETURN
    3 XL=0.
      XU=0.
      RETURN
      END
```

```
      SUBROUTINE OTHER(X,N)
      COMMON/BULK/Q,Z
      EQUIVALENCE (Q(1,13),LAMB(1,1)),(Z(1,13),MAMY(1,1))
      DIMENSION LAMB(500,15),MAMY(500,15)
      DIMENSION Z(500,27)
      DIMENSION Q(500,27)
      DIMENSION X(500,8),SUS(500,6),ITIT(14),LIST(15)
      DIMENSION LAMX(50),NS(50),NZERO(50)
C01***80214 TITLE CARDS ON UNIT 14
C02***80210 DOSE-DESIGN CARDS ON UNIT 10
C03***80211 SUSPENSION CARDS ON UNIT 11
C04***JUG DATA IN ARRAY X,J=1 FOR EXP.,J=2 FOR TRT,J=3 FOR VOL-INOC,
C05**   J=4 FOR PURPLES,J=5 FOR SURVIVORS, J=6 FOR SUM VOL-COUNTED,
C05**   J=7 FOR SUM BACKGROUND,   J=8 FOR SUM JUG VOLUMES.
      CALL CONV(SUS,MAX,X,N,&10,&99)
   10 CONTINUE
      REWIND 14
      NQ=0
    1 READ(14,2,END= 7)IE,ID,ITIT
      NQ=NQ+1
      LAMX(NQ)=ID
    2 FORMAT(T9,2I3,T26,13A4,A3)
      REWIND 10
      NUM=0
    3 READ(10,4,END= 5)IEX,ITR,IDS,DOSE,LIST
      IF(IEX.NE.IE) GO TO 3
      IF(IDS.NE.ID) GO TO 3
    4 FORMAT(T9,2I3,T78,I3,T15,F5.0,14A4,A2)
      NUM=NUM+1
      CALL SEARCH(X,  IEX,ITR,IDS,DOSE,LIST,KAN,NUM,N)
      IF(KAN.EQ.1) GO TO 881
      GO TO 3
    5 L=NUM
      IF(L.EQ.0) GO TO 883
      CALL SUSP(  L,NS,NQ,MAX,SUS)
      CALL POOL(    L,NOUT,NZERO,NQ,NS)
      CALL FMUT(  NOUT,ID,ITIT)
      IF(NS(NQ).EQ.0) GO TO 66
      CALL FSUR(  NOUT,ID,ITIT)
    6 CALL RSUR(  NOUT,ID,ITIT,NS,NQ)
      GO TO 1
   66 CALL SURV(NOUT,ID,ITIT)
      GO TO 6
    7 IF(NQ.LE.1) GO TO 99
      GO TO 99
  883 PRINT 884,IEX,IDS
  884 FORMAT('1NO DOSE CARDS FOR EXPERIMENT',I5,' DESIGN'I5)
      GO TO 99
  881 PRINT 882,IEX,ITR
  882 FORMAT('1 NO JUG DATA FOR EXPERIMENT'I5,' TRT',I5)
   99 RETURN
      END
```

```
      SUBROUTINE CONV(SUS,MAX,X,N,*,*)
C**** READS SUSPENSION DATA, PRINTS DATA AND COMPUTED SUSPENSION  AND
C**** CORRESPONDING SURVIVAL FRACTIONS AND CONFIDENCE LIMITS FOR TRT.
      DIMENSION X(500,8)
      DIMENSION NOW(2)
      DIMENSION SUS(500,6)
      CALL IDAY(NOW)
      PRINT 1,NOW
    1 FORMAT('1',T30,'SUSPENSIONS COUNTED, JUG HARVEST DATA',T90,'DATE '
     *,2A4)
      PRINT 11
   11 FORMAT('0','EXP',T10,'TRT',T20,'B.U.',T30,'DIL',T40,'VOL',
     * T50,'COUNT',T60,'SUSPENSION',T80,'SURVIVAL FRACTION',T105,'LIMITS
     *')
      ISW=0
      SUM1=0.
      MAX=0
      REWIND 11
 9999 READ(11,2,END=99)IJ,IE,IT,DCL,DEX,BC,CN1,C1,CN2,C2,CN3,C3,CN4,C4
  222 SUM1=0.
      SUM2=0.
    2 FORMAT(I5,3X,2I3,F4.0,F2.0,F2.0,2X,4(F2.0,F4.0))
 8888 IF(IJ.NE.80211) GO TO 9999
      IF(DCL.EQ.0.) GO TO 86
      IF(C1+CN1.EQ.0.) GO TO 80
      IF(C1*CN1.EQ.0.) GO TO 83
   80 IF(C2+CN2.EQ.0.) GO TO 81
      IF(C2*CN2.EQ.0.) GO TO 83
   81 IF(C3+CN3.EQ.0.) GO TO 82
      IF(C3*CN3.EQ.0.) GO TO 83
   82 IF(C4+CN4.EQ.0.) GO TO 85
      IF(C4*CN4.NE.0.) GO TO 85
   83 PRINT 84,IE,IT
   84 FORMAT('1 ERROR IN SUSPENSION DATA,VOLUME=0. WHEN COUNT NON-ZERO
     *OR VICE-VERSA FOR EXP.',I4,' TRT.',I4)
      GO TO 78
   86 PRINT 87,IE,IT
   87 FORMAT('1 DILUTION FACTOR IS ZERO FOR EXP',I5,' TRT',I5)
      GO TO 78
   85 CONTINUE
      SUM1=SUM1+C1+C2+C3+C4
      SUM2=SUM2+CN1+CN2+CN3+CN4
      READ(11,2,END=99)IJ,IW,IM,DXL,DXX,BX,CN1,C1,CN2,C2,CN3,C3,CN4,C4
      IF(IW.NE.IE) GO TO 30
      IF(IT.NE.IM) GO TO 30
      GO TO 8888
   30 IF(BC-4.)77,711,712
  711 SUSP=SUM1*4.E6/SUM2
      CON=4.E6
      GO TO 1000
  712 SUSP=SUM1/SUM2*2.5E5
      CON=2.5E5
 1000 CONTINUE
      MAX=MAX+1
      SUS(MAX,1)=IE
      SUS(MAX,2)=IT
      SUS(MAX,3)=SUSP
      SUS(MAX,5)=SUM2
      SUS(MAX,6)=SUM1
      SUSP=SUSP*DCL*10.**DEX
```

```
      DO 22 K=1,N
      IF(X(K,1).NE.IE) GO TO 22
      IF(X(K,2).NE.IT) GO TO 22
      SURV=X(K,5)/(X(K,3)*SUSP)
      B=X(K,8)/(CON*X(K,3)*DCL*10.**DEX)
      SUS(MAX,4)=B
      CALL CONF(B,SUM1,SUM2,X(K,7),X(K,6),CL,CU)
      GO TO 23
   22 CONTINUE
      SURV=0.
      CL=0.
      CU=0.
   23 CONTINUE
      PRINT 12,IE,IT,BC,DCL,DEX,SUM2,SUM1,SUSP,SURV,CL,CU
   12 FORMAT('0',I3,T10,I3,T20,F4.0,T25,F9.3,'E',F3.0,T40,F4.0,
     * T46,F10.0,T60,E16.8,T85,3F10.5)
      IT=IM
      BC=BX
      DCL=DXL
      DEX=DXX
      IF(ISW.EQ.1) GO TO 77
      IF(IE.EQ.IW) GO TO 222
      IE=IW
      PRINT 1,NOW
      PRINT 11
      GO TO 222
   99 ISW=1
      IF(SUM1.NE.0.) GO TO 30
   77 RETURN 1
   78 RETURN 2
      END
```

```
      SUBROUTINE CONF(BX,Y,VY,X,VX,RL,RU)
C
C
C     METHOD FROM KIMBALL IN BICMETRICS,VOL.17,NO.1,MARCH 1961
C
      TOT=X+Y
      Z=Y/TOT
      IF(TOT.GT.300) GO TO 99
      CALL BICONF(Y,TOT,XL,XU)
      GO TO 3
   99 IF(Z.LT..10) GO TO 1
      IF(Z.GT..90) GO TO 2
      Q=1.96*SQRT((Z*(1.-Z)/TOT))
      XL=Z-Q
      XU=Z+Q
      GO TO 3
    1 CALL POIS(Y,TOT,XL,XU)
      GO TO 3
    2 CALL POIS(X,TOT,X1,X2)
      XL=1.-X2
      XU=1.-X1
    3 RL=BX*VY*(1.-XU)/(VX*XU)
      RU=BX*VY*(1.-XL)/(VX*XL)
      RETURN
      END
```

```
      SUBROUTINE SEARCH(X,  IEX,ITR,IDS,DOSE,LIST,KAN,NUM,N)
      COMMON/BULK/B,Z
      EQUIVALENCE(Z(1,13),LAMB(1,1))
      DIMENSION B(500,27),LAMB(500,15)
      DIMENSION X(500,5),Z(500,27),LIST(15)
      KAN=1
      DO 1 I=1,N
      IF(X(I,1).NE.IEX) GO TO 1
      IF(X(I,2).NE.ITR) GO TO 1
      KAN=0
      DO 2 JK=1,8
    2 Z(NUM,JK)=X(I,JK)
      Z(NUM,9)=DOSE
      DO 3 JW=1,15
    3 LAMB(NUM,JW)=LIST(JW)
      GO TO 99
    1 CONTINUE
   99 RETURN
      END
```

```
      SUBROUTINE SUSP(  L,NS,NQ,MAX,SUS)
      COMMON/BULK/B,Z
      DIMENSION B(500,27)
      DIMENSION Z(500,27),NS(50),SUS(500,3)
      IF(MAX.EQ.0) GO TO 88
      DO 2 I=1,L
      IE=Z(I,1)
      IT=Z(I,2)
      DO 1 J=1,MAX
      IQ=SUS(J,1)
      IL=SUS(J,2)
      IF(IE.NE.IQ) GO TO 1
      IF(IT.NE.IL) GO TO 1
      Z(I,10)=SUS(J,4)
      Z(I,11)=SUS(J,5)
      Z(I,12)=SUS(J,6)
      GO TO 2
    1 CONTINUE
      GO TO 881
    2 CONTINUE
      NS(NQ)=1
      GO TO 99
   88 NS(NQ)=0
      GO TO 99
  881 PRINT 3,IE,IT
    3 FORMAT('1 MISSING SUSPENSION DATA FOR EXPERIMENT',I5,' TREATMENT',
     *I5)
      CALL EXIT
   99 RETURN
      END
```

```
      SUBROUTINE POOL(L,NOUT,NZERO,NQ,NS)
      COMMON/BULK/Q,Z
      DIMENSION Z(500,27),NS(50),Q(500,27),A(27)
      CALL SORT(L)
      NOUT=0
      I=1
   99 DOSE=Z(I,9)
      JK=0
      DO 1 M=1,27
    1 A(M)=0.
      DO 4 K=I,L
      IF(Z(K,9).NE.DOSE) GO TO 33
      A(1)=Z(K,1)
      A(2)=Z(K,2)
      A(3)=A(3)+Z(K,3)
      A(4)=A(4)+Z(K,4)
      A(5)=A(5)+Z(K,5)
      A(6)=A(6)+Z(K,6)
      A(7)=A(7)+Z(K,7)
      A(8)=A(8)+Z(K,8)
      A(9)=DOSE
      IF(NS(NQ).EQ.0) GO TO 66
      A(10)=Z(K,10)*Z(K,3)/Z(K,8)
      A(11)=A(11)+Z(K,11)
      A(12)=A(12)+Z(K,12)
   66 DO 22 IM=13,27
   22 A(IM)=Z(K,IM)
      JK=JK+1
    4 CONTINUE
      I=L
   33 NOUT=NOUT+1
      IF(JK.GT.1) A(2)=999.
      A(10)=A(10)*A(8)/A(3)
      DO 44 IB=1,27
   44 Q(NOUT,IB)=A(IB)
      IF(I.EQ.L) GO TO 55
      I=K
      GO TO 99
   55 RETURN
      END
```

```
      SUBROUTINE FMUT(  NOUT,ID,ITIT)
      COMMON/BULK/Q,B
      EQUIVALENCE(Q(1,13),LAMB(1,1))
      DIMENSICN B(500,27),LAMB(500,15)
      DIMENSICN Q(500,27),ITIT(14),NOW(2)
      DIMENSICN LIST(15)
      CALL IDAY(NOW)
      PRINT 88,ITIT,NOW
   88 FORMAT('1',14A4,T9C,2A4//)
      PRINT 77
   77 FCRMAT('0','FCRWARD MUTATICN'//)
      PRINT 55
   55 FORMAT('OEXP DES TRT  DOSE',5X,'N1',T30,'OBSERVEC',T43,'LOWER LIMI
     *T',T59,'UPPER LIMIT')
      REWIND 17
      ICT=0
      DO 1 I=1,NOUT
      FM=Q(I,4)/Q(I,5)
      CALL POIS(Q(I,4),Q(I,5),XL,XU)
      DO 2 JB=1,15
    2 LIST(JB)=LAMB(I,JB)
      L1=Q(I,1)
      L2=Q(I,2)
      PRINT 66,L1,ID,L2,Q(I,9),Q(I,4),FM,XL,XU,LIST
   66 FORMAT('0',I3,I3,I4,F7.0,F7.0,3E16.8,1X,14A4,A3)
      IF(FM.EQ.0.) GO TC 1
      ICT=ICT+1
      IE=Q(I,1)
      WRITE(17)       IE,ID,Q(I,4),FM,XL,XU,Q(I,9)
    1 CONTINUE
      END FILE 17
      IF(ICT.LT.3) GO TC 99
      JBS=0
      CALL REGR(NOW,ITIT)
   99 RETURN
      END
```

```
      SUBROUTINE REGR(NCW,ITIT)
C**** PLOTS LOG-LOG PLOT FOR MUTATION DOSE EFFECT CURVE
      INTEGER TITLE
      DIMENSION ITIT(14)
      DIMENSION QP(16)
      DIMENSION E(50),JCHAR(3),TITLE(19)
      DIMENSICN NOW(2),LIST(15),A(50),B(50),C(50),X(50)
      DIMENSION LAMB(3)
      CATA JCHAR/5,24,24/
      DO 151 I=1,14
  151 LIST(I)=ITIT(I)
      LIST(15)=4H
      ISW=0
      REWIND 17
    1 READ(17,END=999) IE,IVY,A1,SUM,XLCW,XUPP,XYZ
  998 IF(XYZ.EQ.0.) GO TO 1
      I=1
   99 X(I)=XYZ
      A(I)=SUM
      B(I)=XLOW
      C(I)=XUPP
    2 READ(17,END=10 ) IX,IZY,A1,SLM,XLOW,XUPP,XYZ
      IF(IX.NE.IE) GO TC 3
      IF(IZY.NE.IVY) GO TO 3
      IF(XYZ.EQ.0.) GO TC 2
      IF(SUM.EQ.0.) GO TC 2
      I=I+1
      GO TO 99
    3 IF(I.LT.3) GO TO 988
      CALL STAT1(X,A,SL,CL,SENS,F,SE,I)
   98 PRINT 5
    5 FORMAT(//)
      IJ=I-2
      PRINT 6,SL,CL,SENS,F,IJ,SE
    6 FORMAT(//,'0',T05,'SLOPE=',F10.5,' +-',F10.5,5X,'SENS=',E16.8,
     *5X,'F=',F10.5,5X,'DF=' I5,5X,'SE=',F10.5//)
      PRINT 8
      DO 7 J=1,I
      D=X(J)
      O=A(J)
      E(J)=SENS*D**SL
      PRINT 9,D,O,B(J),C(J),E(J)
    9 FORMAT('0',F9.0,T15,E16.8,T40,E16.8,T60,E16.8,T80,E16.8)
    8 FORMAT('0',2X,' DCSE',T18,'OBSERVED',T42,'LOWER LIMIT', T62,
     *'UPPER LIMIT',T84,'EXPECTED')
    7 CONTINUE
      CALL LLPLOT(-I,-3,X,JCHAR,.07,A,B,C)
      CALL GRCORD(X(1),E(1),XG,YG)
      CALL GRCORD(X(I),E(I),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
      DO 14 MP=1,I
      CALL GRCORD(X(MP),B(MP),XG,YG)
      CALL GRCORD(X(MP),C(MP),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
   14 CONTINUE
      CALL SYMBOL(5.5,.1,.14,4HDCSE,C.0,4)
      CALL SYMBOL(0.0,4.5,.14,16HFORWARD MUTATION,90.0,16)
      CALL SYMBOL(0.0,10.0,.14,NOW,90.0,8)
```

```
      DO 11 M=1,15
   11 TITLE(M)=LIST(M)
      TITLE(16)=4HEXP
      ENCODE(10,12,TITLE(17))IE
      ENCODE(10,13,TITLE(18)) IVY
   12 FORMAT(I4)
      TITLE(19)=4H
      CALL SYMBOL(1.5,10.6,.14,TITLE(1),0.0,76)
   13 FORMAT('-',I3)
      ENCODE(15,15,LAMB(1)) SL
   15 FORMAT('SLOPE=',F6.2)
      CALL SYMBOL(8.5,.1,.14,LAMB(1),0.0,12)
      CALL PLOT(13.0,.0,-3)
  988 IF(ISW.EQ.1) GO TO 999
      IE=IX
      IVY=IZY
      GO TO 998
   10 ISW=1
      IF(I.LT.3) GO TO 999
      GO TO 3
  999 RETURN
      END
```

```
      SUBROUTINE STAT1(X,A,B1,F7,F8,F,F6,I)
C*****STAT1 DOES LOG-LOG REGRESICN
      DIMENSICN X(1),A(1),Z(50),Q(50),T(30)
      DATA T/12.706,4.303,3.182,2.776,2.571,2.447,2.365,2.306,2.262,
     *2.228,2.201,2.179,2.160,2.145,2.131,2.120,2.110,2.101,2.093,2.086,
     *2.080,2.074,2.069,2.064,2.060,2.056,2.052,2.048,2.045,2.042/
      S1=0.
      S2=0.
      S3=0.
      S4=0.
      S5=0.
      S6=0.
      DO 1 J=1,I
      X1=ALOG(X(J))
      Y1=ALOG(A(J))
      S1=S1+X1
      S2=S2+Y1
      S3=S3+X1*X1
      S4=S4+Y1*Y1
    1 S5=S5+X1*Y1
      CT=I
      F1=S1/CT
      F2=S2/CT
      F3=S3-S1*F1
      F4=S4-S2*F2
      F5=S5-S2*F1
      E1=F4-(F5*F5)/F3
      F6=SQRT(E1/((CT-2.)*F3))
      B1=F5/F3
      F7=T(I-2)*F6
      F8=F2-B1*F1
      F8=EXP(F8)
      F=(F5*F5)*(CT-2.)/(F3*E1)
      RETURN
      END
```

```
      SUBROUTINE SURV(  NOUT,ID,ITIT)
      COMMON/BULK/Q,B
      EQUIVALENCE(Q(1,13),LAMB(1,1))
      DIMENSION B(500,27),LAMB(500,15)
      DIMENSION Q(500,27),ITIT(14),NOW(2)
      DIMENSION LIST(15)
      CALL IDAY(NOW)
      PRINT 88,ITIT,NOW
   88 FORMAT('1',14A4,T90,2A4//)
      PRINT 77
   77 FORMAT('0 SURVIVORS PER VOLUME INOCULATED')
      PRINT 55
   55 FORMAT('0EXP DES TRT  DOSE',T25,'OBSERVED',T41,'LOWER LIMIT',
     * T57,'UPPER LIMIT')
      REWIND 17
      ICT=0
      DO 1 I=1,NOUT
      IF(Q(I,5)*Q(I,6).EQ.0.) GO TO 1
      ICT=ICT+1
      R=Q(I,8)/(Q(I,3)*Q(I,6))
      FM=R*Q(I,7)
      XL=FM-R*1.96*SQRT(Q(I,7))
      XU=FM+R*1.96*SQRT(Q(I,7))
      IE=Q(I,1)
      WRITE(17)       IE,ID,        FM,XL,XU,Q(I,9)
      DO 2 JB=1,15
    2 LIST(JB)=LAMB(I,JB)
      L1=Q(I,1)
      L2=Q(I,2)
      PRINT 66,L1,ID,L2,Q(I,9),FM,XL,XU,LIST
   66 FORMAT('0',I3,I3,I4,F7.0,3X,3E16.8,3X,15A4)
    1 CONTINUE
      END FILE 17
      IF(ICT.LT.3) GO TO 99
      CALL REGS(NOW,ITIT)
   99 RETURN
      END
```

```
      SUBROUTINE REGS (NOW,ITIT)
C**** PLOTS SEMILOG PLOT FOR SURVIVORS PER VOLUME INOCULATED
      INTEGER TITLE
      DIMENSION QP(16)
      DIMENSION ITIT(14)
      DIMENSION E(50),JCHAR(3),TITLE(19)
      DIMENSION NOW(2),LIST(15),A(50),B(50),C(50),X(50)
      DIMENSION LAMB(3)
      DATA JCHAR/5,24,24/
      DO 151 I=1,14
  151 LIST(I)=ITIT(I)
      LIST(15)=4H
      ISW=0
      REWIND 17
    1 READ(17,END=999) IE,IVY,   SUM,XLOW,XUPP,XYZ
  998 CONTINUE
      I=1
   99 X(I)=XYZ
      A(I)=SUM
      B(I)=XLOW
      C(I)=XUPP
    2 READ(17,END=10 ) IX,IZY,   SUM,XLOW,XUPP,XYZ
      IF(IX.NE.IE) GO TO 3
      IF(IZY.NE.IVY) GO TO 3
      IF(SUM.EQ.0.) GO TO 2
      I=I+1
      GO TO 99
    3 IF(I.LT.3) GO TO 988
      CALL STAT2(X,A,SL,CL,SENS,F,SE,I)
   98 PRINT 5
    5 FORMAT(//)
      IJ=I-2
      PRINT 6,SL,CL,SENS,F,IJ,SE
    6 FORMAT(//,'0',T05,'SLOPE=',E16.8,' +-',E16.8,5X,'INTERCEPT  '
     *E16.8,
     *5X,'F=',F10.5,5X,'DF='I5,5X,'SE=',E16.8//)
      PRINT 8
      DO 7 J=1,I
      D=X(J)
      G=A(J)
      XYZ=ALOG(SENS)+SL*D
      E(J)=EXP(XYZ)
      PRINT 9,D,G,B(J),C(J),E(J)
    9 FORMAT('0',F9.0,T15,E16.8,T40,E16.8,T60,E16.8,T80,E16.8)
    8 FORMAT('0',2X,' DOSE',T18,'OBSERVED',T42,'LOWER LIMIT', T62,
     *'UPPER LIMIT',T84,'EXPECTED')
    7 CONTINUE
      CALL SLPLOT(-I,-3,X,JCHAR,.07,A,B,C)
      DO 14 MP=1,I
      CALL GRCORD(X(MP),B(MP),XG,YG)
      CALL GRCORD(X(MP),C(MP),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
   14 CONTINUE
      CALL SYMBOL(5.5,.1,.14,4HDOSE,0.0,4)
      CALL SYMBOL(0.0,4.5,.14,31HSURVIVORS PER VOLUME INOCULATED,90.,31)
      CALL SYMBOL(0.0,10.0,.14,NOW,90.0,8)
      DO 11 M=1,15
   11 TITLE(M)=LIST(M)
      TITLE(16)=4HEXP
```

```
      ENCODE(10,12,TITLE(17))IE
      ENCODE(10,13,TITLE(18)) IVY
   12 FORMAT(I4)
      TITLE(19)=4H
      CALL SYMBOL(1.5,10.6,.14,TITLE(1),0.0,76)
   13 FORMAT('-',I3)
      ENCODE(15,15,LAMB(1)) SL
   15 FORMAT('K=',F10.6)
      CALL SYMBOL(8.5,.1,.14,LAMB(1),0.0,12)
      CALL PLOT(13.0,.0,-3)
  988 IF(ISW.EQ.1) GO TO 999
      IE=IX
      IVY=IZY
      GO TO 998
   10 ISW=1
      IF(I.LT.3) GO TO 999
      GO TO 3
  999 RETURN
      END
```

```
      SUBROUTINE FSUR(  NOUT,ID,ITIT)
      COMMON/BULK/Q,B
      EQUIVALENCE(Q(1,13),LAMB(1,1))
      DIMENSION B(500,27),LAMB(500,15)
      DIMENSION Q(500,27),ITIT(14),NOW(2)
      DIMENSION LIST(15)
      CALL IDAY(NOW)
      PRINT 88,ITIT,NOW
   88 FORMAT('1',14A4,T90,2A4//)
      PRINT 77
   77 FORMAT('0','SURVIVAL FRACTION'//)
      PRINT 55
   55 FORMAT('0EXP DES TRT  DOSE',T25,'OBSERVED',T41,'LOWER LIMIT',
     * T57,'UPPER LIMIT')
      REWIND 17
      ICT=0
      DO 1 I=1,NOUT
      IF(Q(I,5)*Q(I,6).EQ.0.) GO TO 1
      ICT=ICT+1
      FM=Q(I,10)*Q(I,7)*Q(I,11)/(Q(I,12)*Q(I,6))
      CALL CONF(Q(I,10),Q(I,12),Q(I,11),Q(I,7),Q(I,6),XL,XU)
      IE=Q(I,1)
      WRITE(17)       IE,ID,        FM,XL,XU,Q(I,9)
      DO 2 JB=1,15
    2 LIST(JB)=LAMB(I,JB)
      L1=Q(I,1)
      L2=Q(I,2)
      PRINT 66,L1,ID,L2,Q(I,9),FM,XL,XU,LIST
   66 FORMAT('0',I3,I3,I4,F7.0,3X,3E16.8,3X,15A4)
    1 CONTINUE
      END FILE 17
      IF(ICT.LT.3) GO TO 99
      CALL REGX(NOW,ITIT)
   99 RETURN
      END
```

```
      SUBROUTINE REGX (NOW,ITIT)
C**** PLOTS SEMILOG PLOT FOR SURVIVAL FRACTION DOSE EFFECT CURVE
      INTEGER TITLE
      DIMENSION QP(16)
      DIMENSION ITIT(14)
      DIMENSION E(50),JCHAR(3),TITLE(19)
      DIMENSION NOW(2),LIST(15),A(50),B(50),C(50),X(50)
      DIMENSION LAMB(3)
      DATA JCHAR/5,24,24/
      DO 151 I=1,14
  151 LIST(I)=ITIT(I)
      LIST(15)=4H
      ISW=0
      REWIND 17
    1 READ(17,END=999) IE,IVY,   SUM,XLOW,XUPP,XYZ
  998 CONTINUE
      I=1
   99 X(I)=XYZ
      A(I)=SUM
      B(I)=XLOW
      C(I)=XUPP
    2 READ(17,END=10 ) IX,IZY,   SUM,XLOW,XUPP,XYZ
      IF(IX.NE.IE) GO TO 3
      IF(IZY.NE.IVY) GO TO 3
      IF(SUM.EQ.0.) GO TO 2
      I=I+1
      GO TO 99
    3 IF(I.LT.3) GO TO 988
      CALL STAT2(X,A,SL,CL,SENS,F,SE,I)
   98 PRINT 5
    5 FORMAT(//)
      IJ=I-2
      PRINT 6,SL,CL,SENS,F,IJ,SE
    6 FORMAT(//,'0',T05,'SLOPE=',E16.8,' +-',E16.8,5X,'INTERCEPT
     *E16.8,
     *5X,'F=',F10.5,5X,'DF='I5,5X,'SE=',E16.8//)
      PRINT 8
      DO 7 J=1,I
      D=X(J)
      C=A(J)
      XYZ=ALOG(SENS)+SL*C
      E(J)=EXP(XYZ)
      PRINT 9,D,C,B(J),C(J),E(J)
    9 FORMAT('0',F9.0,T15,E16.8,T40,E16.8,T60,E16.8,T80,E16.8)
    8 FORMAT('0',2X,' DOSE',T18,'OBSERVED',T42,'LOWER LIMIT', T62,
     *'UPPER LIMIT',T84,'EXPECTED')
    7 CONTINUE
      CALL SLPLOT(-1,-3,X,JCHAR,.07,A,B,C)
      DO 14 MP=1,I
      CALL GRCORD(X(MP),B(MP),XG,YG)
      CALL GRCORD(X(MP),C(MP),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
   14 CONTINUE
      CALL SYMBOL(5.5,.1,.14,4HDOSE,0.0,4)
      CALL SYMBOL(0.0,4.5,.14,9HSURVIVAL ,90.0,9)
      CALL SYMBOL(0.0,10.0,.14,NOW,90.0,8)
      DO 11 M=1,15
   11 TITLE(M)=LIST(M)
      TITLE(16)=4HEXP
```

```
      ENCODE(10,12,TITLE(17))IE
      ENCODE(10,13,TITLE(18)) IVY
   12 FORMAT(I4)
      TITLE(19)=4H
      CALL SYMBOL(1.5,10.6,.14,TITLE(1),0.0,76)
   13 FORMAT('-',I3)
      ENCODE(15,15,LAMB(1)) SL
   15 FORMAT('K=',F10.6)
      CALL SYMBOL(8.5,.1,.14,LAMB(1),0.0,12)
      CALL PLOT(13.0,.0,-3)
  988 IF(ISW.EQ.1) GO TO 999
      IE=IX
      IVY=IZY
      GO TO 998
   10 ISW=1
      IF(I.LT.3) GO TO 999
      GO TO 3
  999 RETURN
      END
```

```
      SUBROUTINE STAT2(X,A,B1,F7,F8,F,F6,I)
C**** COMPUTES REGRESION OF LOG SURVIVAL FRACTION ON DOSE
      DIMENSION X(1),A(1),Z(50),Q(50),T(30)
      DATA T/12.706,4.303,3.182,2.776,2.571,2.447,2.365,2.306,2.262,
     *2.228,2.201,2.179,2.160,2.145,2.131,2.120,2.110,2.101,2.093,2.086,
     *2.080,2.074,2.069,2.064,2.060,2.056,2.052,2.048,2.045,2.042/
      S1=0.
      S2=0.
      S3=0.
      S4=0.
      S5=0.
      S6=0.
      DO 1 J=1,I
      X1=X(J)
      Y1=ALOG(A(J))
      S1=S1+X1
      S2=S2+Y1
      S3=S3+X1*X1
      S4=S4+Y1*Y1
    1 S5=S5+X1*Y1
      CT=I
      F1=S1/CT
      F2=S2/CT
      F3=S3-S1*F1
      F4=S4-S2*F2
      F5=S5-S2*F1
      E1=F4-(F5*F5)/F3
      F6=SQRT(E1/((CT-2.)*F3))
      B1=F5/F3
      J=I
      IF(I.GT.32) J=32
      F7=T(J-2)*F6
      F8=F2-B1*F1
      F8=EXP(F8)
      F=(F5*F5)*(CT-2.)/(F3*E1)
      RETURN
      END
```

```
      SUBROUTINE RSUR(  NOUT,ID,ITIT,NS,NQ)
      COMMON/BULK/Q,B
      EQUIVALENCE(Q(1,13),LAMB(1,1))
      DIMENSION B(500,27),LAMB(500,15)
      DIMENSION Q(500,27),ITIT(14),NOW(2),NS(50)
      DIMENSION LIST(15)
      CALL IDAY(NOW)
      PRINT 88,ITIT,NOW
   88 FORMAT('1',14A4,T90,2A4//)
      PRINT 77
   77 FORMAT('0','RELATIVE SURVIVAL'//)
      PRINT 55
   55 FORMAT('0EXP DES TRT  DOSE',T25,'OBSERVED',T41,'LOWER LIMIT',
     * T57,'UPPER LIMIT')
      REWIND 17
      ICT=0
      IF(Q(1,9).NE.0.) GO TO 99
      IF(NS(NQ).EQ.0) GO TO 3
      Z=(Q(1,10)*Q(1,7)*Q(1,11))/(Q(1,6)*Q(1,12))
      CALL CONF(Q(1,10),Q(1,12),Q(1,11),Q(1,7),Q(1,6),ZL,ZU)
      GO TO 4
    3 Z=(Q(1,8)*Q(1,7))/(Q(1,3)*Q(1,6))
      R=Q(1,8)/(Q(1,3)*Q(1,6))
      ZL=Z-R*1.96*SQRT(Q(1,7))
      ZU=Z+R*1.96*SQRT(Q(1,7))
    4 CONTINUE
      DO 1 I=1,NOUT
      IF(Q(I,5).EQ.0.) GO TO 1
      ICT=ICT+1
      IF(NS(NQ).EQ.0) GO TO 5
      RS=(Q(I,10)*Q(I,7)*Q(I,11))/(Q(I,6)*Q(I,12)*Z)
      CALL CONF(Q(I,10),Q(I,12),Q(I,11),Q(I,7),Q(I,6),TL,TU)
      GO TO 6
    5 RS=(Q(I,8)*Q(I,7))/(Q(I,3)*Q(I,6)*Z)
      R=Q(I,8)/(Q(I,3)*Q(I,6))
      A=R*Q(I,7)
      TL=A-R*1.96*SQRT(Q(I,7))
      TU=A+R*1.96*SQRT(Q(I,7))
    6 CONTINUE
      XL=TL/ZU
      XU=TU/ZL
      IE=Q(I,1)
      IF(I.NE.1) GO TO 7
      XL=1.
      RS=1.
      XU=1.
    7 CONTINUE
      WRITE(17)       IE,ID,        RS,XL,XU,Q(I,9)
      DO 2 JB=1,15
    2 LIST(JB)=LAMB(I,JB)
      L1=Q(I,1)
      L2=Q(I,2)
      PRINT 66,L1,ID,L2,Q(I,9),RS,XL,XU,LIST
   66 FORMAT('0',I3,I3,I4,F7.0,3X,3E16.8,3X,15A4)
    1 CONTINUE
      END FILE 17
      IF(ICT.LT.3) GO TO 99
      CALL REGQ(NOW,ITIT)
   99 RETURN
      END
```

```
      SUBROUTINE REGQ (NOW,ITIT)
C**** PLOTS SEMILOG PLOT FOR RELATIVE SURVIVAL DOSE EFFECT CURVE
      INTEGER TITLE
      DIMENSION ITIT(14)
      DIMENSION QP(16)
      DIMENSION E(50),JCHAR(3),TITLE(19)
      DIMENSION NOW(2),LIST(15),A(50),B(50),C(50),X(50)
      DIMENSION LAMB(3)
      DATA JCHAR/5,24,24/
      DO 151 I=1,14
  151 LIST(I)=ITIT(I)
      LIST(15)=4H
      ISW=0
      REWIND 17
    1 READ(17,END=999) IE,IVY,   SUM,XLOW,XUPP,XYZ
  998 CONTINUE
      I=1
   99 X(I)=XYZ
      A(I)=SUM
      B(I)=XLOW
      C(I)=XUPP
    2 READ(17,END=10 ) IX,IZY,   SUM,XLOW,XUPP,XYZ
      IF(IX.NE.IE) GO TO 3
      IF(IZY.NE.IVY) GO TO 3
      IF(SUM.EQ.0.) GO TO 2
      I=I+1
      GO TO 99
    3 IF(I.LT.3) GO TO 988
      CALL STAT3(X,A,SL,CL,SENS,F,SE,I)
   98 PRINT 5
    5 FORMAT(//)
      IJ=I-2
      PRINT 6,SL,CL,SENS,F,IJ,SE
    6 FORMAT(//,'0',T05,'SLOPE=',E16.8,' +-',E16.8,5X,'INTERCEPT'F11.5,
     *5X,'F=',F10.5,5X,'DF='I5,5X,'SE=',E16.8//)
      PRINT 8
      DO 7 J=1,I
      D=X(J)
      O=A(J)
      IF(D.EQ.0.) GO TO 61
      E(J)=EXP(SL*D)
      GO TO 62
   61 E(J)=1.
   62 CONTINUE
      PRINT 9,D,O,B(J),C(J),E(J)
    9 FORMAT('0',F9.0,T15,E16.8,T40,E16.8,T60,E16.8,T80,E16.8)
    8 FORMAT('0',2X,' DOSE',T18,'OBSERVED',T42,'LOWER LIMIT', T62,
     *'UPPER LIMIT',T84,'EXPECTED')
    7 CONTINUE
      CALL SLPLOT(-I,-3,X,JCHAR,.07,A,B,C)
      DO 14 MP=1,I
      CALL GRCORD(X(MP),B(MP),XG,YG)
      CALL GRCORD(X(MP),C(MP),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
   14 CONTINUE
      CALL SYMBOL(5.5,.1,.14,4HDOSE,0.0,4)
      CALL SYMBOL(0.0,4.5,.14,17HRELATIVE SURVIVAL,90.0,17)
      CALL SYMBOL(0.0,10.0,.14,NOW,90.0,8)
      DO 11 M=1,15
```

```
 11 TITLE(M)=LIST(M)
    TITLE(16)=4HEXP
    ENCODE(10,12,TITLE(17))IE
    ENCODE(10,13,TITLE(18)) IVY
 12 FORMAT(I4)
    TITLE(19)=4H
    CALL SYMBOL(1.5,10.6,.14,TITLE(1),0.0,76)
 13 FORMAT('-',I3)
    ENCODE(15,15,LAMB(1)) SL
 15 FORMAT('K=',F10.6)
    CALL SYMBOL(8.5,.1,.14,LAMB(1),0.0,12)
    CALL PLOT(13.0,.0,-3)
988 IF(ISW.EQ.1) GO TO 999
    IE=IX
    IVY=IZY
    GO TO 998
 10 ISW=1
    IF(I.LT.3) GO TO 999
    GO TO 3
999 RETURN
    END
```

```
      SUBROUTINE STAT3(X,A,B1,F7,F8,F,F6,I)
C**** COMPUTES REGRESION OF LOG RELATIVE SURVIVAL ON DOSE
      DIMENSION X(1),A(1),Z(50),Q(50),T(30)
      DATA T/12.706,4.303,3.182,2.776,2.571,2.447,2.365,2.306,2.262,
     *2.228,2.201,2.179,2.160,2.145,2.131,2.120,2.110,2.101,2.093,2.086,
     *2.080,2.074,2.069,2.064,2.060,2.056,2.052,2.048,2.045,2.042/
      S1=0.
      S2=0.
      S3=0.
      S4=0.
      S5=0.
      S6=0.
      DO 1 J=2,I
      X1=X(J)
      Y1=ALOG(A(J))
      S1=S1+X1
      S2=S2+Y1
      S3=S3+X1*X1
      S4=S4+Y1*Y1
    1 S5=S5+X1*Y1
      CT=I-1
      F1=S1/CT
      F2=S2/CT
      F3=S3
      F4=S4
      F5=S5
      E1=F4-(F5*F5)/F3
      F6=SQRT(E1/((CT-1.)*F3))
      B1=F5/F3
      J=I
      IF(I.GT.31) J=31
      F7=T(J-1)*F6
      F8=1.0
      F=(F5*F5)*(CT-1.)/(F3*E1)
      RETURN
      END
```

```
      SUBROUTINE SORT(L)
      COMMON/BULK/B,Z
      DIMENSION Z(500,27),Q(1,27),B(500,27)
      K=1
   88 A=Z(K,9)
      DO 1 I=K,L
      C=Z(I,9)
      IF(C.GE.A) GO TO 1
      DO 2 M=1,27
    2 Q(1,M)=Z(I,M)
      DO 3 M=1,27
    3 Z(I,M)=Z(K,M)
      DO 4 M=1,27
    4 Z(K,M)=Q(1,M)
      A=C
    1 CONTINUE
      K=K+1
      IF(K.LT.L) GO TO 88
      RETURN
      END
```

```
      SUBROUTINE BICONF(TN,TM,P1,P2)
C*****COMPUTES BINOMIAL CONFIDENCE LIMITS  XN=OBSERVED NUMBER OUT OF TM
C*****  P1=LOWER LIMIT, P2= UPPER LIMIT  95 PER CENT
      DATA E/.0001/
      Q=TM+1.
      P1=TN/TM
      P5=P1
      IF(P1.LT.1.) GO TO 50
      P1=.99
   50 IF(TN.EQ.0.) GO TO 260
      P3=0.
      CT=1.
   90 X=TM*ALOG(1.-P1)
      Z=ALOG(P1)-ALOG(1.-P1)
      S=EXP(X)
      Y=1.
  110 IF(Y.GE.TN)    GO TO 170
      X=  X+Z+ALOG(Q-Y)-ALOG(Y)
      S=S+EXP(X)
      Y=Y+1.
      GO TO 110
  170 IF(ABS(S-.975).LT.E) GO TO 260
      IF(CT.GT.20.) GO TO 260
      IF(S-.975.LT.0.) GO TO 240
      P3=P1
      P1=(P3+P5)/2.
      CT=CT+1.
      GO TO 90
  240 P5=P1
      P1=(P3+P5)/2.
      CT=CT+1.
      GO TO 90
  260 P2=TN/TM
      P5=P2
      IF(P2.GT.0.) GO TO 280
      P2=.01
  280 IF(TN.EQ.TM) GO TO 440
      P3=1.
      CT=1.
  290 X=TM*ALOG(P2)
      S=EXP(X)
      Z=ALOG(1.-P2)-ALOG(P2)
      Y=1.
  310 IF(Y.GE.TM-TN) GO TO 365
      X=  X+Z+ALOG(Q-Y)-ALOG(Y)
      S=S+EXP(X)
      Y=Y+1.
      GO TO 310
  365 IF(ABS(S-.975).LT.E) GO TO 440
      IF(CT.GT.20.) GO TO 440
      IF(S-.975.GT.0.) GO TO 420
      P5=P2
      P2=(P5+P3)/2.
      CT=CT+1.
      GO TO 290
  420 P3=P2
      P2=(P5+P3)/2.
      CT=CT+1.
      GO TO 290
  440 RETURN

      END
```

```
/*
//LINK.SYSIN DD *




        HEX DECK FOR EZPLOT GOES HERE




/*
//GO.FT10F001 DD UNIT=SYSDA,SPACE=(TRK,(50))
//GO.FT11F001 DD UNIT=SYSDA,SPACE=(TRK,(50))
//GO.FT13F001 DD UNIT=SYSDA,SPACE=(TRK,(50))
//GO.FT14F001 DD UNIT=SYSDA,SPACE=(TRK,(50))
//GO.FT17F001 DD UNIT=SYSDA,SPACE=(TRK,(50))
//GO.SORTLIB DD DSNAME=SYS1.SORTLIB,DISP=(OLD,KEEP)
//GO.SYSOUT    DD SYSOUT=A
//GO.SORTWK01    DD UNIT=2311,SPACE=(TRK,(100))
//GO.SORTWK02    DD UNIT=2311,SPACE=(TRK,(100))
//GO.SORTWK03    DD UNIT=2311,SPACE=(TRK,(100))
//GO.FT30F001 DD UNIT=2314,DCB=(RECFM=FB,LRECL=80,BLKSIZE=3520),        X
//              SPACE=(TRK,(300,30))
//GO.SORTIN DD VOLUME=REF=*.FT30F001,DSNAME=*.FT30F001,                  X
//              DISP=(OLD,PASS)
//GO.SORTOUT DD VOLUME=REF=*.FT30F001,DSNAME=*.FT30F001,                 X
//              DISP=(OLD,PASS)
//GO.PLOTTAPE DD UNIT=TAPE7,VOL=SER=25,LABEL=(,NL),DISP=OLD
//GO.FT50F001 DD *
```

```
INSERT DATA HERE



END
/*
//
```

LISTING OF JUG HARVESTING DATA DATE 01-29-69

EXPERIMENT			JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES		95 PC CONFIDENCE	
12	54	0	2	10.00	60.	7064.	9250.	0.0	1089033.	0.0	0	0		
12	54	0	3	10.00	60.	6192.	9400.	0.0	970080.	0.0	0	0		
12	54	0	4	10.00	60.	6418.	9300.	1.	994790.	0.100524E-05	10	10		
12	54	0	5	10.00	60.	6162.	9500.	1.	978816.	0.102164E-05	11	11		
12	54	0	6	10.00	60.	8064.	8950.	0.0	1202880.	0.0	0	0		
12	54	0	7	10.00	60.	6123.	9450.	0.0	964372.	0.0	0	0		
12	54	0	8	10.00	60.	6849.	9100.	0.0	1038765.	0.0	0	0		
**********				70.00	420.	46892.	64950.	2.	7251512.	0.275804E-06			0.489553E-07	0.922015E-06
12	54	1	9	13.00	60.	7705.	9225.	15.	1184643.	0.126620E-04	1100	1114		
12	54	1	10	13.00	60.	7503.	9150.	8.	1144207.	0.699174E-05	1115	1122		
12	54	1	11	13.00	60.	7854.	9350.	6.	1223914.	0.490230E-05	1123	1128		
12	54	1	12	13.00	60.	6814.	9400.	7.	1067526.	0.655722E-05	1129	1135		
12	54	1	13	13.00	60.	7621.	9350.	9.	1187605.	0.757828E-05	1136	1144		
12	54	1	15	13.00	60.	7147.	9275.	0.0	1104806.	0.0	0	0		
12	54	1	16	13.00	60.	7062.	9480.	6.	1115796.	0.537733E-05	1145	1150		
**********				91.00	420.	51706.	65230.	51.	8030434.	0.635084E-05			0.469090E-05	0.831337E-05
12	54	2	17	17.00	60.	8787.	9225.	25.	1351001.	0.185048E-04	2100	2124		
12	54	2	18	17.00	60.	9671.	9450.	19.	1523182.	0.124739E-04	2125	2143		
12	54	2	20	17.00	60.	7155.	9500.	16.	1132874.	0.141234E-04	2144	2159		
12	54	2	22	17.00	60.	8223.	9250.	26.	1267712.	0.205094E-04	2160	2185		
12	54	2	24	17.00	50.	2993.	9300.	11.	556698.	0.197594E-04	2186	2196		
**********				85.00	290.	36829.	46725.	97.	5933913.	0.163467E-04			0.132678E-04	0.197054E-04
12	54	3	26	19.00	60.	8244.	9225.	43.	1267514.	0.339247E-04	3100	3142		
12	54	3	28	19.00	60.	8928.	9275.	32.	1380120.	0.231864E-04	3143	3174		
12	54	3	29	19.00	60.	8789.	9350.	36.	1369618.	0.262847E-04	3175	3210		
12	54	3	30	19.00	60.	8814.	9300.	32.	1366169.	0.234232E-04	3211	3242		
**********				76.00	240.	34775.	37150.	143.	5382880.	0.265657E-04			0.223598E-04	0.310967E-04
12	54	4	32	33.00	60.	9327.	9275.	52.	1441798.	0.360661E-04	4100	4151		
12	54	4	33	33.00	60.	12068.	9125.	82.	1835341.	0.446783E-04	4152	4233		

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EXPERIMENT	JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES		95 PC CONFIDENCE	
12 54 4	34	33.00	60.	11652.	9325.	76.	1810914.	0.419678E-04	4234	4309		
12 54 4	35	33.00	60.	10168.	9275.	75.	1574894.	0.476222E-04	4310	4384		
**********		132.00	240.	43235.	37000.	285.	6665395.	0.427582E-04			0.377939E-04	0.477224E-04
12 54 10	36	9.00	60.	6670.	9325.	2.	1036629.	0.192933E-05	20	21		
12 54 10	37	9.00	60.	6762.	9300.	1.	1048110.	0.954098E-06	22	22		
12 54 10	38	9.00	60.	6643.	9175.	1.	1015825.	0.984421E-06	23	23		
12 54 10	39	9.00	60.	7548.	9235.	1.	1161762.	0.860761E-06	24	24		
12 54 10	40	9.00	60.	4897.	9125.	0.0	744752.	0.0	0	0		
**********		45.00	300.	32520.	46160.	5.	5003743.	0.999252E-06			0.393705E-06	0.223373E-05
12 54 11	42	14.00	60.	6076.	9175.	9.	929122.	0.968657E-05	1500	1508		
12 54 11	43	14.00	60.	6144.	9200.	13.	942080.	0.137993E-04	1509	1521		
12 54 11	44	14.00	60.	5992.	9175.	20.	916276.	0.218275E-04	1522	1541		
12 54 11	45	14.00	60.	6174.	9150.	11.	941535.	0.116831E-04	1542	1552		
12 54 11	46	14.00	60.	6524.	9275.	16.	1008502.	0.158651E-04	1553	1568		
12 54 11	47	14.00	60.	7191.	9050.	10.	1084642.	0.921963E-05	1569	1578		
**********		84.00	360.	38101.	55025.	79.	5823631.	0.135654E-04			0.107854E-04	0.167490E-04
12 54 12	49	18.00	60.	7593.	9000.	33.	1138949.	0.289741E-04	2500	2532		
12 54 12	50	18.00	60.	7528.	9225.	23.	1157429.	0.198716E-04	2533	2555		
12 54 12	51	18.00	60.	7621.	9375.	22.	1190781.	0.184753E-04	2556	2577		
12 54 12	52	18.00	60.	7925.	9375.	31.	1238281.	0.250347E-04	2578	2608		
12 54 12	53	18.00	60.	8297.	9225.	26.	1275663.	0.203816E-04	2609	2634		
12 54 12	54	18.00	60.	5211.	9150.	15.	794677.	0.188756E-04	2635	2649		
**********		108.00	360.	44175.	55350.	150.	6791906.	0.220851E-04			0.185898E-04	0.258366E-04
12 54 13	55	20.00	60.	6934.	9375.	38.	1083437.	0.350736E-04	3500	3537		
12 54 13	56	20.00	60.	6361.	9150.	34.	970052.	0.350497E-04	3538	3571		
12 54 13	57	20.00	60.	6197.	9375.	44.	968281.	0.454413E-04	3572	3615		
12 54 13	58	20.00	60.	6839.	9275.	41.	1057195.	0.387819E-04	3616	3656		
12 54 13	59	20.00	60.	7466.	9325.	35.	1160340.	0.301636E-04	3657	3691		
**********		100.00	300.	33797.	46500.	192.	5238534.	0.366515E-04			0.314267E-04	0.418361E-04

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EXPERIMENT	JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES		95 PC CONFIDENCE	
12 54 14	63	31.00	60.	9962.	9300.	82.	1544109.	0.531050E-04	4500	4581		
**********		31.00	60.	9962.	9300.	82.	1544109.	0.531050E-04			0.420631E-04	0.649695E-04
12 54 20	65	6.00	60.	6810.	9200.	1.	1044200.	0.957671E-06	1	1		
12 54 20	66	6.00	60.	6722.	9200.	0.0	1030707.	0.0	0	0		
12 54 20	67	6.00	60.	7364.	9425.	0.0	1156761.	0.0	0	0		
12 54 20	69	6.00	60.	7422.	9075.	0.0	1122577.	0.0	0	0		
**********		24.00	240.	28318.	36900.	1.	4353892.	0.229680E-06			0.117137E-07	0.122258E-05
12 54 30	71	10.00	60.	8669.	9250.	1.	1336470.	0.748240E-06	5010	5010		
12 54 30	72	10.00	60.	8137.	9315.	1.	1263269.	0.791597E-06	5011	5011		
12 54 30	73	10.00	60.	7324.	9240.	5.	1127896.	0.443303E-05	5012	5016		
12 54 30	74	10.00	60.	7060.	9150.	1.	1076649.	0.928808E-06	5017	5017		
12 54 30	75	10.00	60.	7604.	9425.	3.	1194461.	0.251159E-05	5018	5020		
**********		50.00	300.	38754.	46380.	11.	5997551.	0.183408E-05			0.887529E-06	0.317630E-05
12 54 31	77	11.00	60.	9479.	9325.	87.	1473194.	0.590554E-04	5100	5186		
12 54 31	78	11.00	60.	9052.	9250.	87.	1395516.	0.623425E-04	5187	5273		
12 54 31	79	11.00	60.	10011.	9375.	72.	1564218.	0.460294E-04	0	0		
12 54 31	80	11.00	60.	10809.	9345.	72.	1683501.	0.427680E-04	0	0		
12 54 31	81	11.00	60.	9151.	9160.	67.	1397052.	0.479581E-04	5274	5340		
12 54 31	82	11.00	60.	8965.	9200.	58.	1374633.	0.421931E-04	5341	5398		
**********		66.00	360.	57467.	55655.	443.	8884238.	0.498636E-04			0.452202E-04	0.545070E-04
12 54 32	83	11.00	60.	7237.	9175.	115.	1106657.	0.103917E-03	0	0		
12 54 32	84	11.00	60.	7629.	9425.	111.	1198388.	0.926244E-04	0	0		
12 54 32	85	11.00	60.	6046.	9125.	116.	919496.	0.126156E-03	0	0		
12 54 32	86	11.00	60.	7134.	9225.	106.	1096852.	0.966402E-04	6100	6205		
12 54 32	87	11.00	50.	6702.	9325.	138.	1249922.	0.110407E-03	0	0		
12 54 32	88	11.00	60.	7962.	9200.	142.	1220840.	0.116313E-03	6206	6347		
12 54 32	89	11.00	60.	8414.	9150.	116.	1283134.	0.904036E-04	6348	6463		
**********		77.00	410.	51124.	64625.	844.	8058264.	0.104737E-03			0.976710E-04	0.111803E-03
12 54 33	90	13.00	60.	7776.	9290.	221.	1203984.	0.183557E-03	7100	7254		

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EXPERIMENT	JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES		95 PC CONFIDENCE	
12 54 33	91	13.00	50.	6633.	9150.	246.	1213838.	0.202663E-03	0	0		
12 54 33	92	13.00	60.	7860.	9200.	207.	1205200.	0.171756E-03	0	0		
12 54 33	93	13.00	60.	8849.	9150.	249.	1349472.	0.184517E-03	7255	7407		
12 54 33	94	13.00	60.	7263.	9200.	181.	1113660.	0.162527E-03	0	0		
**********		65.00	290.	38381.	45990.	1104.	6086696.	0.181379E-03			0.170680E-03	0.192079E-03
12 54 34	97	14.00	60.	6901.	9250.	204.	1063904.	0.191747E-03	0	0		
12 54 34	98	14.00	60.	6775.	9525.	251.	1075531.	0.233373E-03	0	0		
12 54 34	99	14.00	60.	6041.	9350.	226.	941389.	0.240071E-03	0	0		
12 54 34	100	14.00	60.	6285.	9350.	230.	979412.	0.234835E-03	8100	8250		
12 54 34	101	14.00	60.	7251.	9240.	241.	1116653.	0.215824E-03	8251	8406		
12 54 34	102	14.00	60.	7312.	9275.	273.	1130313.	0.241526E-03	0	0		
12 54 34	103	14.00	60.	6417.	9175.	281.	981266.	0.286365E-03	0	0		
**********		98.00	420.	46982.	65165.	1706.	7289480.	0.234036E-03			0.222930E-03	0.245142E-03
12 54 40	104	10.00	60.	9246.	9250.	0.0	1425424.	0.0	0	0		
12 54 40	105	10.00	60.	8986.	9300.	0.0	1392829.	0.0	0	0		
12 54 40	106	10.00	60.	9360.	9275.	1.	1446900.	0.691133E-06	5021	5021		
12 54 40	107	10.00	60.	7669.	9225.	3.	1179108.	0.254430E-05	5022	5024		
12 54 40	108	10.00	60.	8484.	9350.	1.	1322089.	0.756379E-06	5025	5025		
**********		50.00	300.	43745.	46400.	5.	6765893.	0.739001E-06			0.291166E-06	0.165196E-05
12 54 41	109	10.00	60.	6769.	9230.	66.	1041298.	0.633825E-04	5500	5565		
12 54 41	110	10.00	60.	7563.	9275.	74.	1169113.	0.632958E-04	0	0		
12 54 41	111	10.00	60.	6952.	9400.	60.	1089146.	0.550890E-04	5566	5625		
12 54 41	112	10.00	60.	8138.	9200.	79.	1247826.	0.633101E-04	5626	5704		
12 54 41	113	10.00	60.	7706.	9150.	61.	1175164.	0.519076E-04	5705	5765		
12 54 41	114	10.00	60.	8057.	9275.	76.	1245477.	0.610208E-04	5766	5841		
**********		60.00	360.	45185.	55530.	416.	6969785.	0.596862E-04			0.539505E-04	0.654218E-04
12 54 42	115	12.00	60.	9282.	9225.	165.	1427107.	0.115619E-03	6500	6664		
12 54 42	116	12.00	60.	8079.	9175.	155.	1235413.	0.125464E-03	6665	6819		
12 54 42	117	12.00	60.	8742.	9300.	181.	1355009.	0.133578E-03	0	0		

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EXPERIMENT	JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES		95 PC CONFIDENCE	
12 54 42	118	12.00	60.	8495.	9250.	180.	1309645.	0.137442E-03	0	0		
12 54 42	119	12.00	60.	8790.	9600.	161.	1406400.	0.114477E-03	0	0		
12 54 42	120	12.00	60.	8023.	9225.	150.	1233536.	0.121602E-03	0	0		
12 54 42	121	12.00	60.	7900.	9225.	149.	1214624.	0.122672E-03	0	0		
**********		84.00	420.	59311.	65000.	1141.	9179082.	0.124304E-03			0.117092E-03	0.131517E-03
12 54 43	122	14.00	60.	7758.	9200.	178.	1189560.	0.149635E-03	0	0		
12 54 43	123	14.00	60.	8399.	9240.	230.	1293445.	0.177820E-03	7500	7601		
12 54 43	124	14.00	60.	8496.	9525.	249.	1348740.	0.184617E-03	0	0		
12 54 43	125	14.00	60.	7584.	9025.	202.	1140760.	0.177075E-03	7602	7702		
12 54 43	126	14.00	60.	7247.	9150.	200.	1105167.	0.180968E-03	7703	7807		
12 54 43	127	14.00	60.	6832.	9250.	207.	1053266.	0.196532E-03	0	0		
12 54 43	128	14.00	60.	7412.	9275.	208.	1145771.	0.181537E-03	0	0		
**********		98.00	420.	53728.	64665.	1474.	8272192.	0.178187E-03			0.169091E-03	0.187284E-03
12 54 44	129	14.00	60.	5060.	9200.	220.	775867.	0.283554E-03	0	0		
12 54 44	130	14.00	60.	4912.	9240.	170.	756448.	0.224735E-03	8500	8603		
12 54 44	131	14.00	60.	6391.	9100.	222.	969302.	0.229031E-03	0	0		
12 54 44	132	14.00	60.	5933.	9450.	194.	934447.	0.207609E-03	8604	8711		
12 54 44	133	14.00	60.	5832.	9075.	183.	882090.	0.207462E-03	8712	8825		
12 54 44	135	14.00	60.	6462.	9110.	242.	981147.	0.246650E-03	0	0		
**********		84.00	360.	34590.	55175.	1231.	5301397.	0.232203E-03			0.219231E-03	0.245174E-03
12 54 50	136	7.00	60.	6337.	9150.	1.	966392.	0.103478E-05	5001	5001		
12 54 50	137	7.00	60.	7687.	9150.	0.0	1172267.	0.0	0	0		
12 54 50	138	7.00	60.	6404.	9250.	2.	987283.	0.202576E-05	5002	5003		
12 54 50	139	7.00	60.	6493.	9210.	0.0	996675.	0.0	0	0		
12 54 50	140	7.00	60.	6076.	9375.	0.0	949375.	0.0	0	0		
**********		35.00	300.	32597.	46135.	3.	5074388.	0.591204E-06			0.161202E-06	0.159665E-05

SUSPENSIONS COUNTED, JUG HARVEST DATA DATE 01-29-69

EXP	TRT	B.U.	DIL	VOL	COUNT	SUSPENSION	SURVIVAL FRACTION	LIMITS	
54	0	13.	1.000E0.0	150.	548.	0.91333312E 06	0.11342	0.10456	0.12391
54	1	13.	1.000E0.0	150.	558.	0.92999981E 06	0.09489	0.08754	0.10357
54	2	13.	1.000E0.0	150.	522.	0.86999987E 06	0.08024	0.07381	0.08788
54	3	13.	1.000E0.0	150.	631.	0.10516660E 07	0.06735	0.06238	0.07315
54	4	13.	1.000E0.0	150.	549.	0.91499994E 06	0.05519	0.05087	0.06029
54	10	13.	1.000E0.0	150.	557.	0.92833325E 06	0.11978	0.11044	0.13081
54	11	13.	1.000E0.0	150.	515.	0.85833306E 06	0.08077	0.07426	0.08851
54	12	13.	1.000E0.0	175.	596.	0.85142850E 06	0.07386	0.06830	0.08040
54	13	13.	1.000E0.0	150.	585.	0.97499987E 06	0.05373	0.04963	0.05855
54	14	13.	1.000E0.0	150.	582.	0.96999975E 06	0.05135	0.04727	0.05616
54	30	13.	1.000E0.0	150.	423.	0.70499987E 06	0.17014	0.15518	0.18826
54	31	13.	1.000E0.0	150.	458.	0.76333331E 06	0.17634	0.16143	0.19426
54	32	13.	1.000E0.0	175.	557.	0.79571412E 06	0.13152	0.12133	0.14356
54	33	13.	1.000E0.0	150.	445.	0.74166650E 06	0.12626	0.11540	0.13934
54	34	13.	1.000E0.0	150.	458.	0.76333331E 06	0.09744	0.08919	0.10736
54	40	13.	1.000E0.0	150.	452.	0.75333331E 06	0.17963	0.16431	0.19806
54	41	13.	1.000E0.0	150.	432.	0.71999975E 06	0.16134	0.14730	0.17830
54	42	13.	1.000E0.0	150.	425.	0.70833325E 06	0.15427	0.14078	0.17059
54	43	13.	1.000E0.0	150.	452.	0.75333331E 06	0.11205	0.10251	0.12352
54	44	13.	1.000E0.0	150.	452.	0.75333331E 06	0.08378	0.07661	0.09240
54	20	13.	1.000E0.0	150.	650.	0.10833330E 07	0.16746	0.15523	0.18172
54	50	13.	1.000E0.0	150.	601.	0.10016665E 07	0.14474	0.13383	0.15755

32P GEMINI XI SUSPENSION FLIGHT 01-29-69

FORWARD MUTATION

EXP	DES	TRT	DOSE	N1	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	1	0	0.0	2.	0.27580450E-06	0.48955307E-07	0.92201458E-06	FLIGHT BOX CONTROL SUSP
54	1	1	2300.	51.	0.63508396E-05	0.46909036E-05	0.83133727E-05	FLT SUSP
54	1	2	4000.	97.	0.16346705E-04	0.13267803E-04	0.19705374E-04	FLT SUSP
54	1	3	6200.	143.	0.26565700E-04	0.22359774E-04	0.31096730E-04	FLT SUSP
54	1	4	9000.	285.	0.42758154E-04	0.37793914E-04	0.47722380E-04	FLT SUSP

SLOPE= 1.38028 +- 0.41798 SENS= 0.15552047E-09 F= 201.91002 DF= 2 SE= 0.09714

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
2300.	0.63508396E-05	0.46909036E-05	0.83133727E-05	0.67905494E-05
4000.	0.16346705E-04	0.13267803E-04	0.19705374E-04	0.14575738E-04
6200.	0.26565700E-04	0.22359774E-04	0.31096730E-04	0.26689508E-04
9000.	0.42758154E-04	0.37793914E-04	0.47722380E-04	0.44641623E-04

32P GEMINI XI SUSPENSION FLIGHT 01-29-69

SURVIVAL FRACTION

EXP	DES	TRT	DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	1	0	0.0	0.11342293E 00	0.10455775E 00	0.12390846E 00	FLIGHT BOX CONTROL SUSP
54	1	1	2300.	0.94888628E-01	0.87540209E-01	0.10356694E 00	FLT SUSP
54	1	2	4000.	0.80242157E-01	0.73812485E-01	0.87878585E-01	FLT SUSP
54	1	3	6200.	0.67347646E-01	0.62384706E-01	0.73150694E-01	FLT SUSP
54	1	4	9000.	0.55186186E-01	0.50872110E-01	0.60287960E-01	FLT SUSP

SLOPE= -0.81102815E-04 +- 0.77800769E-05 INTERCEPT 0.11291492E 00 F=1100.28320 DF= 3 SE= 0.24450273E-05

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
0.0	0.11342293E 00	0.10455775E 00	0.12390846E 00	0.11291492E 00
2300.	0.94888628E-01	0.87540209E-01	0.10356694E 00	0.93700051E-01
4000.	0.80242157E-01	0.73812485E-01	0.87878585E-01	0.81632197E-01
6200.	0.67347646E-01	0.62384706E-01	0.73150694E-01	0.68292320E-01
9000.	0.55186186E-01	0.50872110E-01	0.60287960E-01	0.54418776E-01

32P GEMINI XI SUSPENSION FLIGHT 01-29-69

RELATIVE SURVIVAL

EXP	DES	TRT	DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	1	0	0.0	0.10000000E 01	0.10000000E 01	0.10000000E 01	FLIGHT BOX CONTROL SUSP
54	1	1	2300.	0.83659160E 00	0.70649093E 00	0.99052382E 00	FLT SUSP
54	1	2	4000.	0.70746011E 00	0.59570169E 00	0.84047890E 00	FLT SUSP
54	1	3	6200.	0.59377491E 00	0.50347412E 00	0.69961995E 00	FLT SUSP
54	1	4	9000.	0.48655242E 00	0.41056198E 00	0.57659960E 00	FLT SUSP

SLOPE= -0.81788763E-04 +- 0.40518180E-05 INTERCEPT 1.00000 F=3139.97192 DF= 3 SE= 0.14595889E-05

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
0.0	0.10000000E 01	0.10000000E 01	0.10000000E 01	0.10000000E 01
2300.	0.83659160E 00	0.70649093E 00	0.99052382E 00	0.82852018E 00
4000.	0.70746011E 00	0.59570169E 00	0.84047890E 00	0.72097200E 00
6200.	0.59377491E 00	0.50347412E 00	0.69961995E 00	0.60224539E 00
9000.	0.48655242E 00	0.41056198E 00	0.57659960E 00	0.47897887E 00

32P GEMINI XI SUSPENSICN GROUND 01-29-69

FORWARC MUTATICN

EXP	DES	TRT	DOSE	N1	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	2	10	0.0	5.	0.99925182E-06	0.39370531E-06	0.22337272E-05	GND BOX CONTROL SUSP
54	2	11	2300.	79.	0.13565419E-04	0.10785367E-04	0.16748992E-04	GND SUSP
54	2	12	4200.	150.	0.22085107E-04	0.18589766E-04	0.25836634E-04	GND SUSP
54	2	13	5600.	192.	0.36651472E-04	0.31426724E-04	0.41836131E-04	GND SUSP
54	2	14	8200.	82.	0.53105046E-04	0.42063082E-04	0.64969499E-04	GND SUSP

SLCPE= 1.09830 +- 0.50409 SENS= 0.26287841E-08 F= 87.89519 DF= 2 SE= 0.11715

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
2300.	0.13565419E-04	0.10785367E-04	0.16748992E-04	0.12940179E-04
4200.	0.22085107E-04	0.18589766E-04	0.25836634E-04	0.25070869E-04
5600.	0.36651472E-04	0.31426724E-04	0.41836131E-04	0.34386627E-04
8200.	0.53105046E-04	0.42063082E-04	0.64969499E-04	0.52275325E-04

32P GEMINI XI SUSPENSION GROUND 01-29-69

SURVIVAL FRACTION

EXP	DES	TRT	DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	2	10	0.0	0.11977822E 00	0.11043638E 00	0.13081235E 00	GND BOX CONTROL SUSP
54	2	11	2300.	0.80771506E-01	0.74263275E-01	0.88510275E-01	GND SUSP
54	2	12	4200.	0.73861659E-01	0.68298399E-01	0.80396354E-01	GND SUSP
54	2	13	5600.	0.53728521E-01	0.49631260E-01	0.58548428E-01	GND SUSP
54	2	14	8200.	0.51350482E-01	0.47266599E-01	0.56156643E-01	GND SUSP

SLOPE= -0.10521746E-03 +- 0.58567064E-04 INTERCEPT 0.11078584E 00 F= 32.67900 DF= 3 SE= 0.18405743E-04

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
0.0	0.11977822E 00	0.11043638E 00	0.13081235E 00	0.11078584E 00
2300.	0.80771506E-01	0.74263275E-01	0.88510275E-01	0.86973131E-01
4200.	0.73861659E-01	0.68298399E-01	0.80396354E-01	0.71213782E-01
5600.	0.53728521E-01	0.49631260E-01	0.58548428E-01	0.61459713E-01
8200.	0.51350482E-01	0.47266599E-01	0.56156643E-01	0.46750110E-01

32P GEMINI XI SUSPENSION GROUND 01-29-69

RELATIVE SURVIVAL

EXP	DES	TRT	DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	2	10	0.0	0.10000000E 01	0.10000000E 01	0.10000000E 01	GND BOX CONTROL SUSP
54	2	11	2300.	0.67434233E 00	0.56770843E 00	0.80145937E 00	GND SUSP
54	2	12	4200.	0.61665398E 00	0.52210969E 00	0.72798795E 00	GND SUSP
54	2	13	5600.	0.44856673E 00	0.37940806E 00	0.53015524E 00	GND SUSP
54	2	14	8200.	0.42871332E 00	0.36133128E 00	0.50849766E 00	GND SUSP

SLOPE= -0.11825352E-03 +- 0.32371943E-04 INTERCEPT 1.00000 F= 102.83232 DF= 3 SE= 0.11661363E-04

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
0.0	0.10000000E 01	0.10000000E 01	0.10000000E 01	0.10000000E 01
2300.	0.67434233E 00	0.56770843E 00	0.80145937E 00	0.76186717E 00
4200.	0.61665398E 00	0.52210969E 00	0.72798795E 00	0.60855699E 00
5600.	0.44856673E 00	0.37940806E 00	0.53015524E 00	0.51570535E 00
8200.	0.42871332E 00	0.36133128E 00	0.50849766E 00	0.37920481E 00

32P GEMINI XI FILTER GROUND 01-29-69

FORWARD MUTATION

EXP	DES	TRT	DOSE	N1	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	3	30	0.0	11.	0.18340816E-05	0.88752887E-06	0.31762966E-05	FLT BOX CONTROL FILTER
54	3	31	3375.	443.	0.49863578E-04	0.45220164E-04	0.54506978E-04	FLT FILTER
54	3	32	5900.	844.	0.10473719E-03	0.97671000E-04	0.11180337E-03	FLT FILTER
54	3	33	9200.	1104.	0.18137919E-03	0.17067981E-03	0.19207856E-03	FLT FILTER
54	3	34	14100.	1706.	0.23403589E-03	0.22293012E-03	0.24514156E-03	FLT FILTER

SLOPE= 1.10458 +- 0.51996 SENS= 0.67681682E-08 F= 83.55873 DF= 2 SE= 0.12084

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
3375.	0.49863578E-04	0.45220164E-04	0.54506978E-04	0.53422176E-04
5900.	0.10473719E-03	0.97671000E-04	0.11180337E-03	0.99007375E-04
9200.	0.18137919E-03	0.17067981E-03	0.19207856E-03	0.16172603E-03
14100.	0.23403589E-03	0.22293012E-03	0.24514156E-03	0.25918102E-03

32P GEMINI XI FILTER GROUND 01-29-69

SURVIVAL FRACTION

EXP	DES	TRT	DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	3	30	0.0	0.17014319E 00	0.15517819E 00	0.18826097E 00	FLT BOX CONTROL FILTER
54	3	31	3375.	0.17634439E 00	0.16143113E 00	0.19426483E 00	FLT FILTER
54	3	32	5900.	0.13152045E 00	0.12132567E 00	0.14356208E 00	FLT FILTER
54	3	33	9200.	0.12625808E 00	0.11540002E 00	0.13934076E 00	FLT FILTER
54	3	34	14100.	0.97444177E-01	0.89188874E-01	0.10736412E 00	FLT FILTER

SLOPE= -0.42432104E-04 +- 0.26075577E-04 INTERCEPT 0.18084061E 00 F= 26.81152 DF= 3 SE= 0.81947146E-05

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
0.0	0.17014319E 00	0.15517819E 00	0.18826097E 00	0.18084079E 00
3375.	0.17634439E 00	0.16143113E 00	0.19426483E 00	0.15671194E 00
5900.	0.13152045E 00	0.12132567E 00	0.14356208E 00	0.14078981E 00
9200.	0.12625808E 00	0.11540002E 00	0.13934076E 00	0.12239355E 00
14100.	0.97444177E-01	0.89188874E-01	0.10736412E 00	0.99417150E-01

32P GEMINI XI FILTER GROUND 01-29-69

RELATIVE SURVIVAL

EXP	DES	TRT	DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	3	30	0.0	0.10000000E 01	0.10000000E 01	0.10000000E 01	FLT BOX CONTROL FILTER
54	3	31	3375.	0.10364466E 01	0.85748589E 00	0.12518816E 01	FLT FILTER
54	3	32	5900.	0.77299893E 00	0.64445466E 00	0.92514336E 00	FLT FILTER
54	3	33	9200.	0.74206978E 00	0.61297894E 00	0.89794034E 00	FLT FILTER
54	3	34	14100.	0.57271880E 00	0.47375125E 00	0.69187629E 00	FLT FILTER

SLOPE= -0.36406898E-04 +- 0.15360027E-04 INTERCEPT 1.00000 F= 43.29338 DF= 3 SE= 0.55331548E-05

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
0.0	0.10000000E 01	0.10000000E 01	0.10000000E 01	0.10000000E 01
3375.	0.10364466E 01	0.85748589E 00	0.12518816E 01	0.88437575E 00
5900.	0.77299893E 00	0.64445466E 00	0.92514336E 00	0.80670226E 00
9200.	0.74206978E 00	0.61297894E 00	0.89794034E 00	0.71537858E 00
14100.	0.57271880E 00	0.47375125E 00	0.69187629E 00	0.59849495E 00

32P GEMINI XI FILTER FLIGHT 01-29-69

FORWARD MUTATION

EXP	DES	TRT	DOSE	N1	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	4	40	0.0	5.	0.73900071E-06	0.29116632E-06	0.16519616E-05	GND BOX CONTROL FILTER
54	4	41	3650.	416.	0.59686194E-04	0.53950527E-04	0.65421846E-04	GND FILTER
54	4	42	6800.	1141.	0.12430437E-03	0.11709164E-03	0.13151708E-03	GND FILTER
54	4	43	10080.	1474.	0.17818734E-03	0.16909064E-03	0.18728404E-03	GND FILTER
54	4	44	14000.	1231.	0.23220293E-03	0.21923130E-03	0.24517439E-03	GND FILTER

SLOPE= 1.01509 +- 0.29672 SENS= 0.15032807E-07 F= 216.70465 DF= 2 SE= 0.06896

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
3650.	0.59686194E-04	0.53950527E-04	0.65421846E-04	0.62100458E-04
6800.	0.12430437E-03	0.11709164E-03	0.13151708E-03	0.11678546E-03
10080.	0.17818734E-03	0.16909064E-03	0.18728404E-03	0.17414878E-03
14000.	0.23220293E-03	0.21923130E-03	0.24517439E-03	0.24307542E-03

32P GEMINI X1 FILTER FLIGHT 01-29-69

SURVIVAL FRACTION

EXP	LES	TRT	DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	4	40	0.0	0.17962533E 00	0.16430682E 00	0.15805551E 00	GND BOX CONTROL FILTER
54	4	41	3650.	0.16133755E 00	0.14730155E 00	0.17829651E 00	GND FILTER
54	4	42	6800.	0.15427023E 00	0.14078063E 00	0.17059451E 00	GND FILTER
54	4	43	10080.	0.11204875E 00	0.10251135E 00	0.12352341E 00	GND FILTER
54	4	44	14000.	0.83776712E-01	0.76612890E-01	0.92395723E-01	GND FILTER

SLOPE= -0.55119424E-04 +- 0.30154464E-04 INTERCEPT 0.19493949E 00 F= 33.83037 DF= 3 SE= 0.94765755E-05

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
0.0	0.17962533E 00	0.16430682E 00	0.15805551E 00	0.19493949E 00
3650.	0.16133755E 00	0.14730155E 00	0.17829651E 00	0.15941393E 00
6800.	0.15427023E 00	0.14078063E 00	0.17059451E 00	0.13400513E 00
10080.	0.11204875E 00	0.10251135E 00	0.12352341E 00	0.11184192E 00
14000.	0.83776712E-01	0.76612890E-01	0.92395723E-01	0.90108812E-01

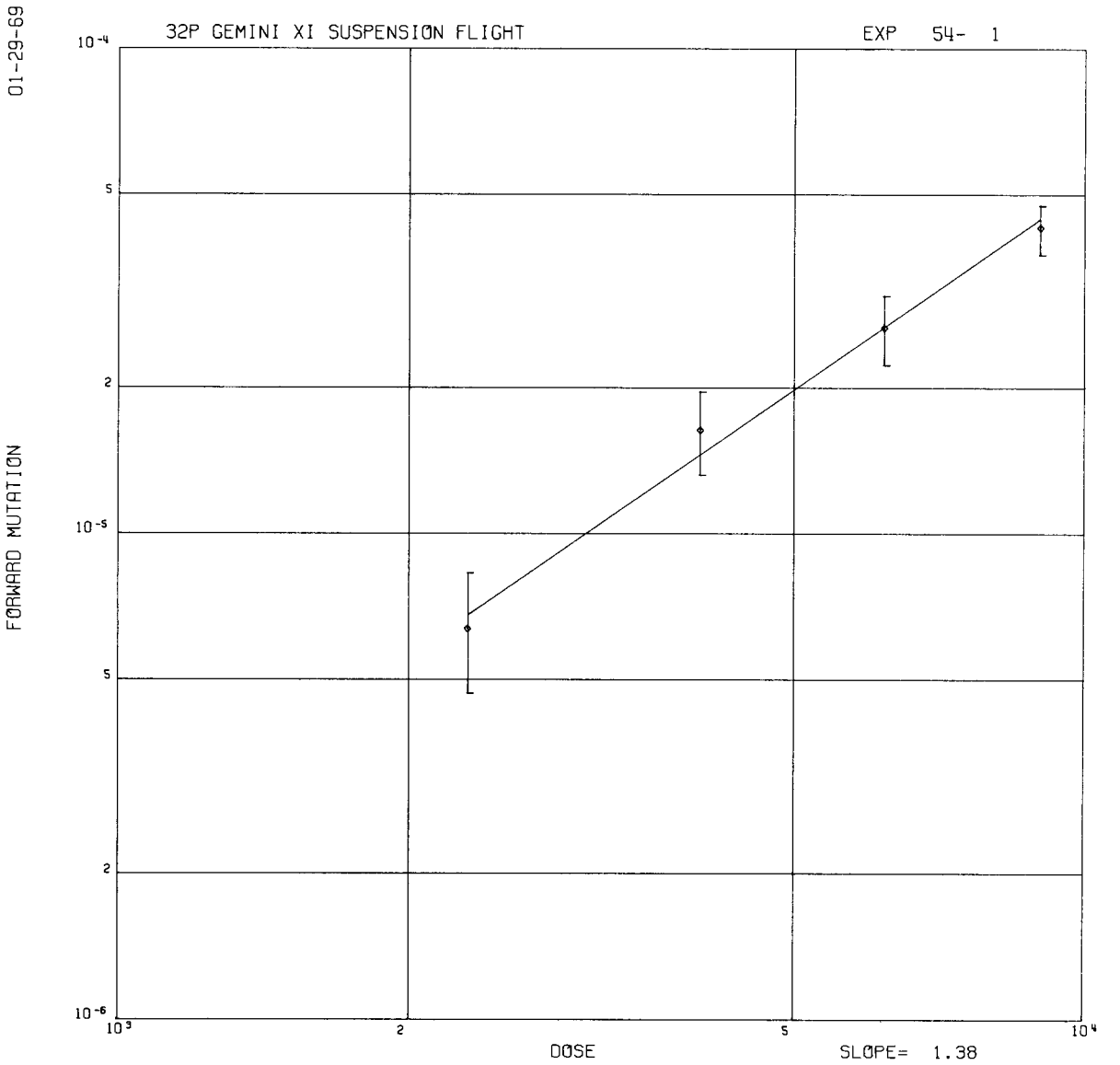
32P GEMINI XI FILTER FLIGHT 01-29-69

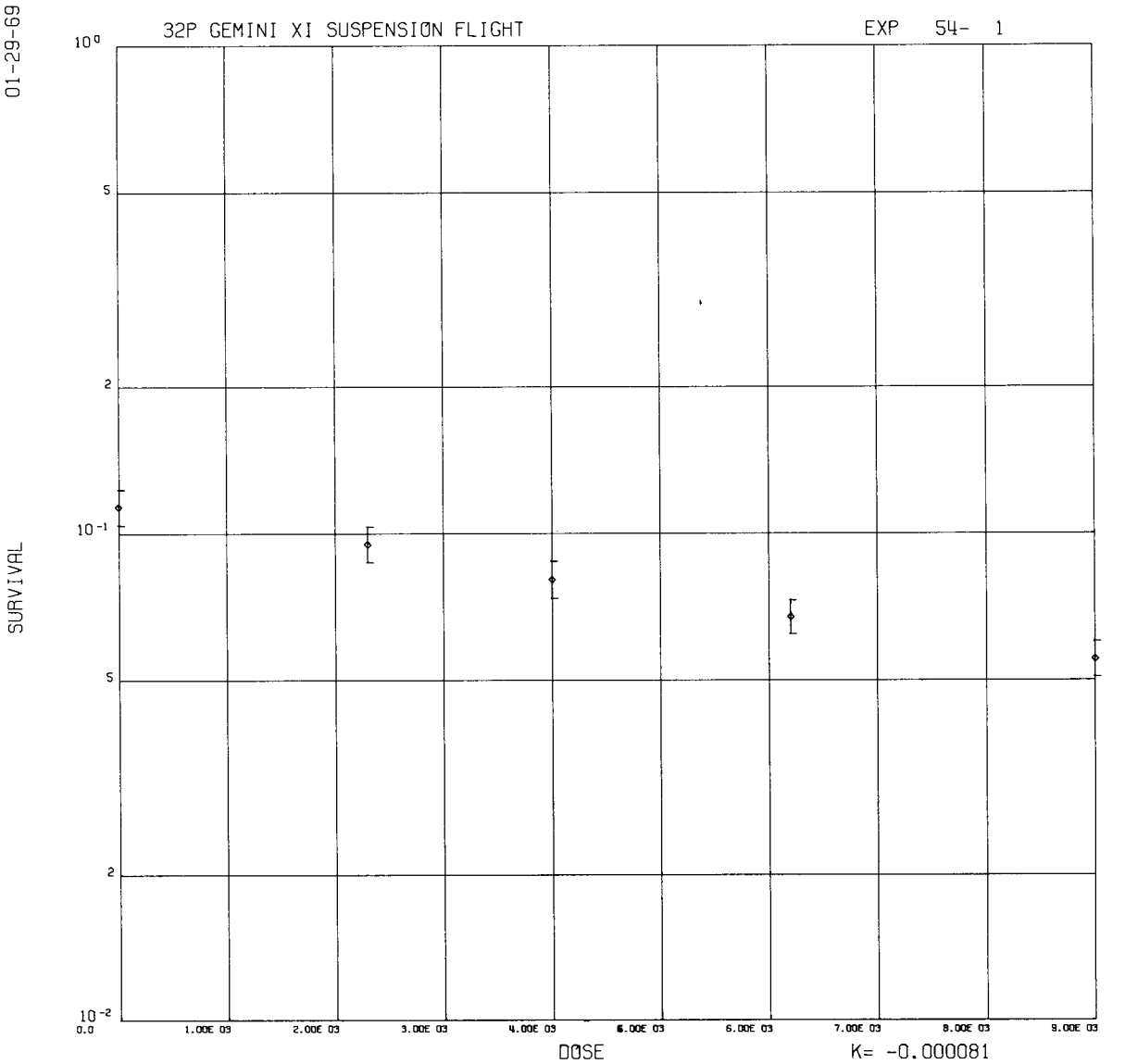
RELATIVE SURVIVAL

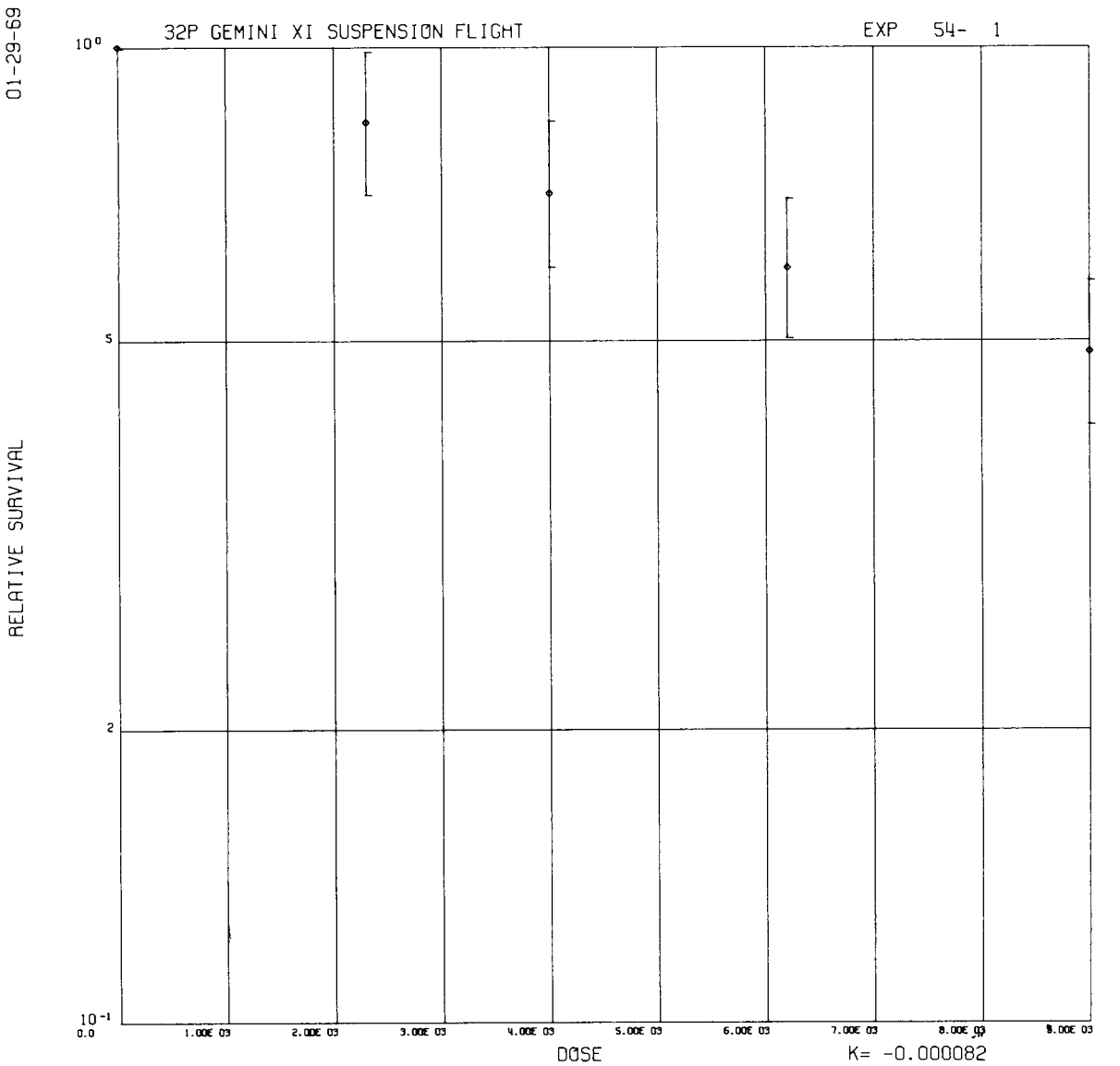
EXP	DES	TRT	DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	
54	4	40	0.0	0.10000000E 01	0.10000000E 01	0.10000000E 01	GND BOX CONTROL FILTER
54	4	41	3650.	0.89818949E 00	0.74373871E 00	0.10851431E 01	GND FILTER
54	4	42	6800.	0.85884458E 00	0.71081400E 00	0.10382671E 01	GND FILTER
54	4	43	10080.	0.62379175E 00	0.51758897E 00	0.75178504E 00	GND FILTER
54	4	44	14000.	0.46639729E 00	0.38682532E 00	0.56233650E 00	GND FILTER

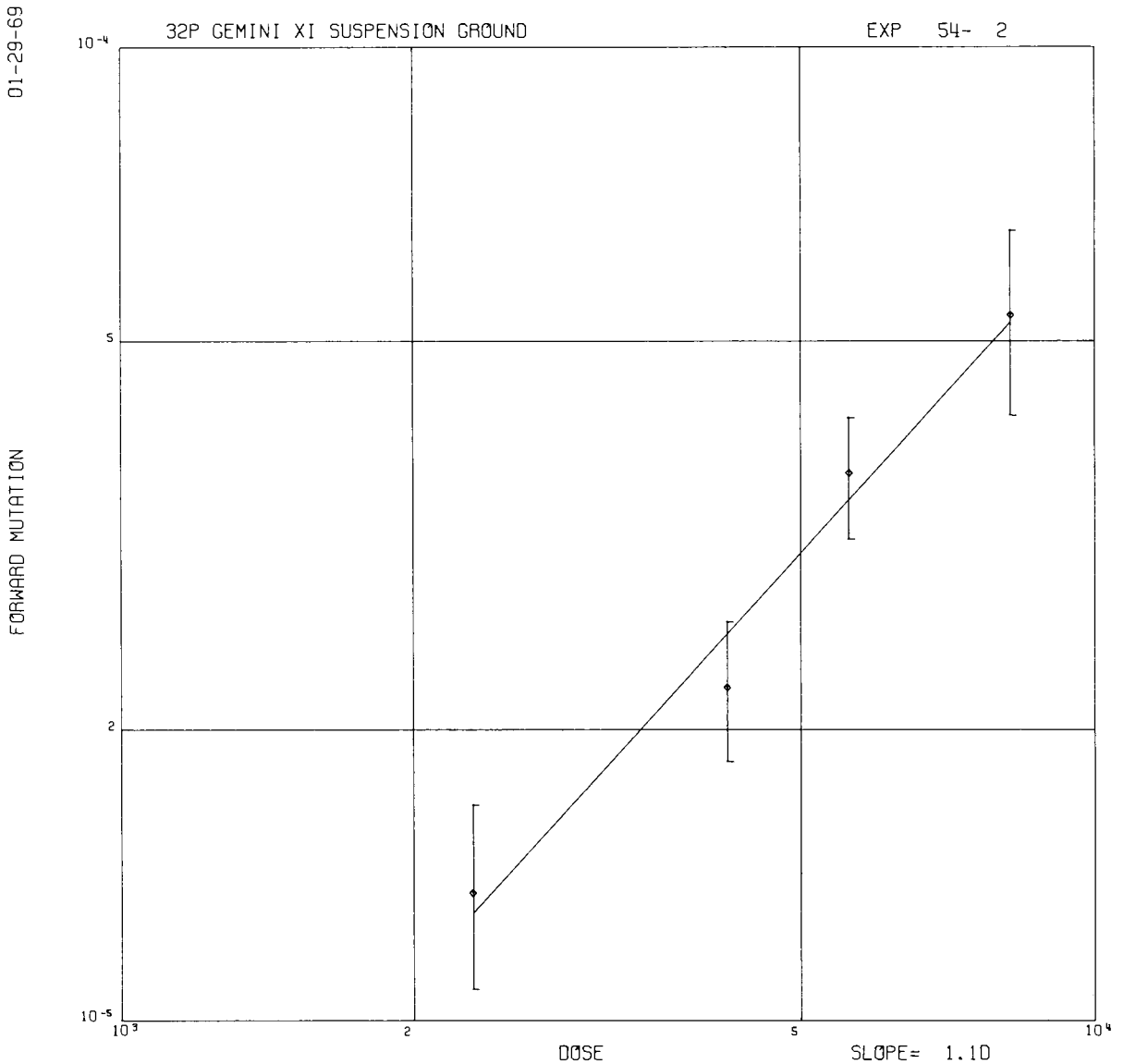
SLOPE= -0.47209687E-04 +- 0.17607366E-04 INTERCEPT 1.00000 F= 55.40027 DF= 3 SE= 0.63427133E-05

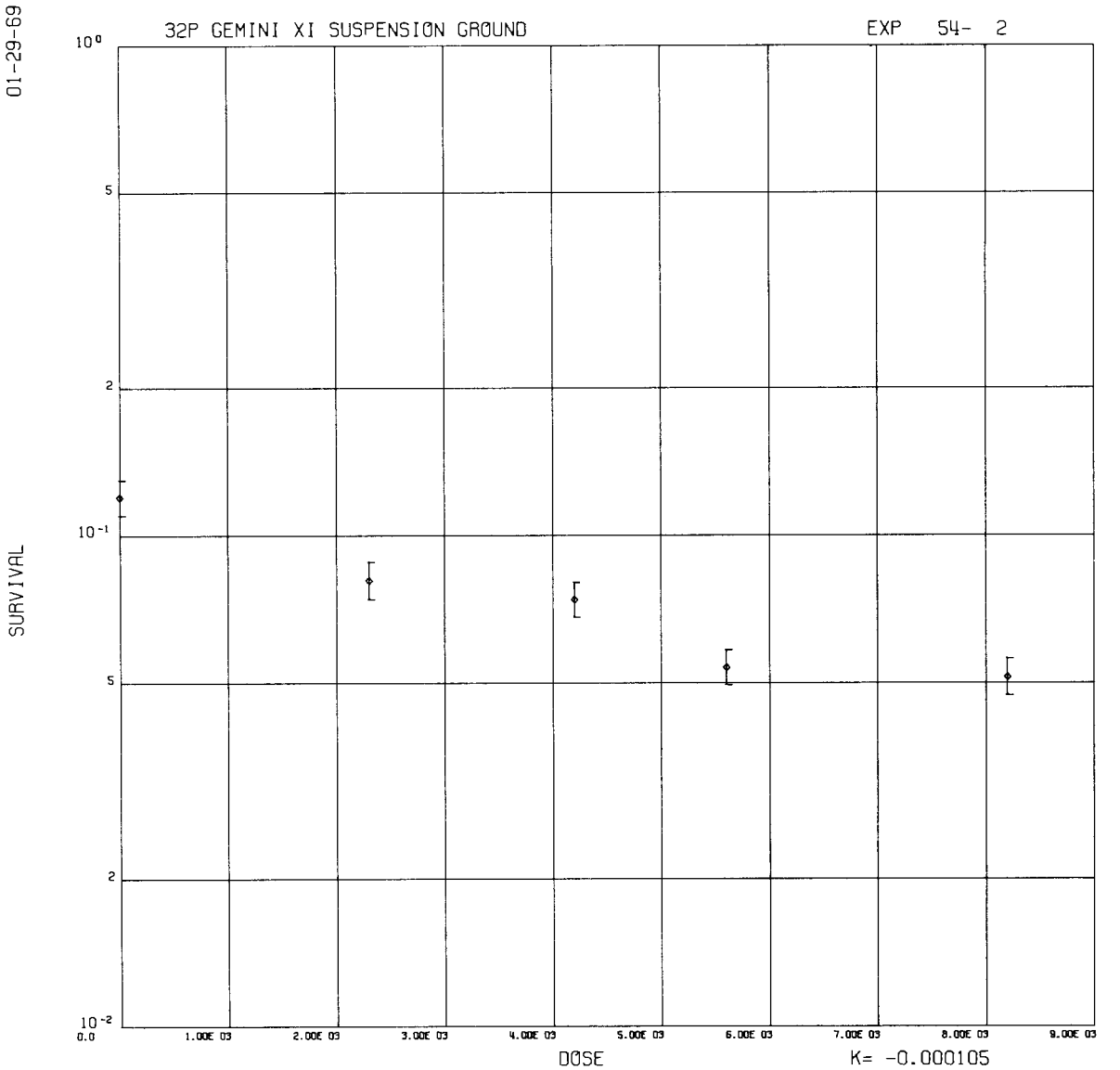
DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
0.0	0.10000000E 01	0.10000000E 01	0.10000000E 01	0.10000000E 01
3650.	0.89818949E 00	0.74373871E 00	0.10851431E 01	0.84171373E 00
6800.	0.85884458E 00	0.71081400E 00	0.10382671E 01	0.72540450E 00
10080.	0.62379175E 00	0.51758897E 00	0.75178504E 00	0.62134200E 00
14000.	0.46639729E 00	0.38682532E 00	0.56233650E 00	0.51636803E 00

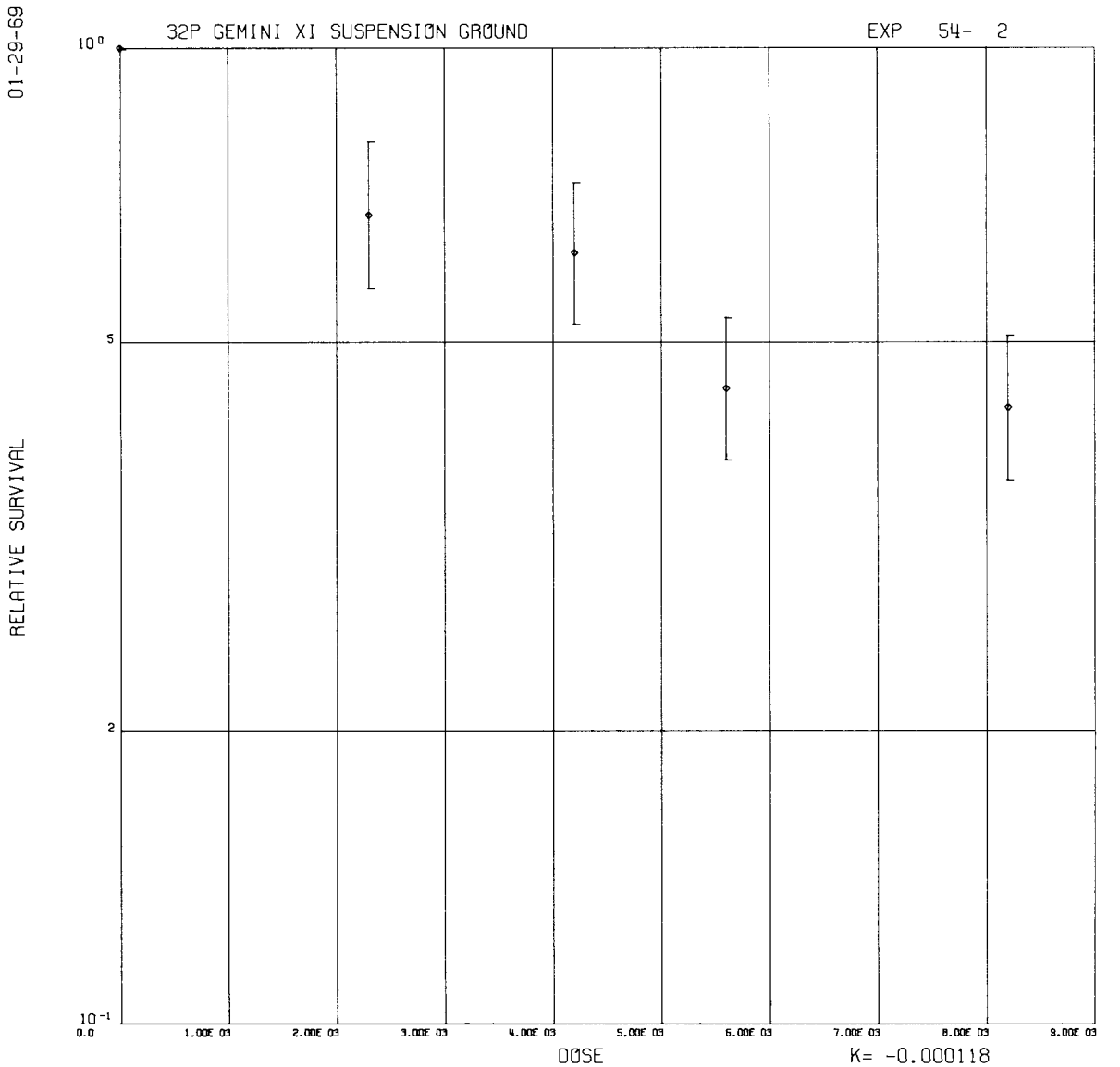

01-29-69
32P GEMINI XI SUSPENSION FLIGHT
EXP 54- 1
FORWARD MUTATION
10-4
5
2
10-5
5
2
10-6
10 3
2
5
10 4
DOSE
SLOPE= 1.38

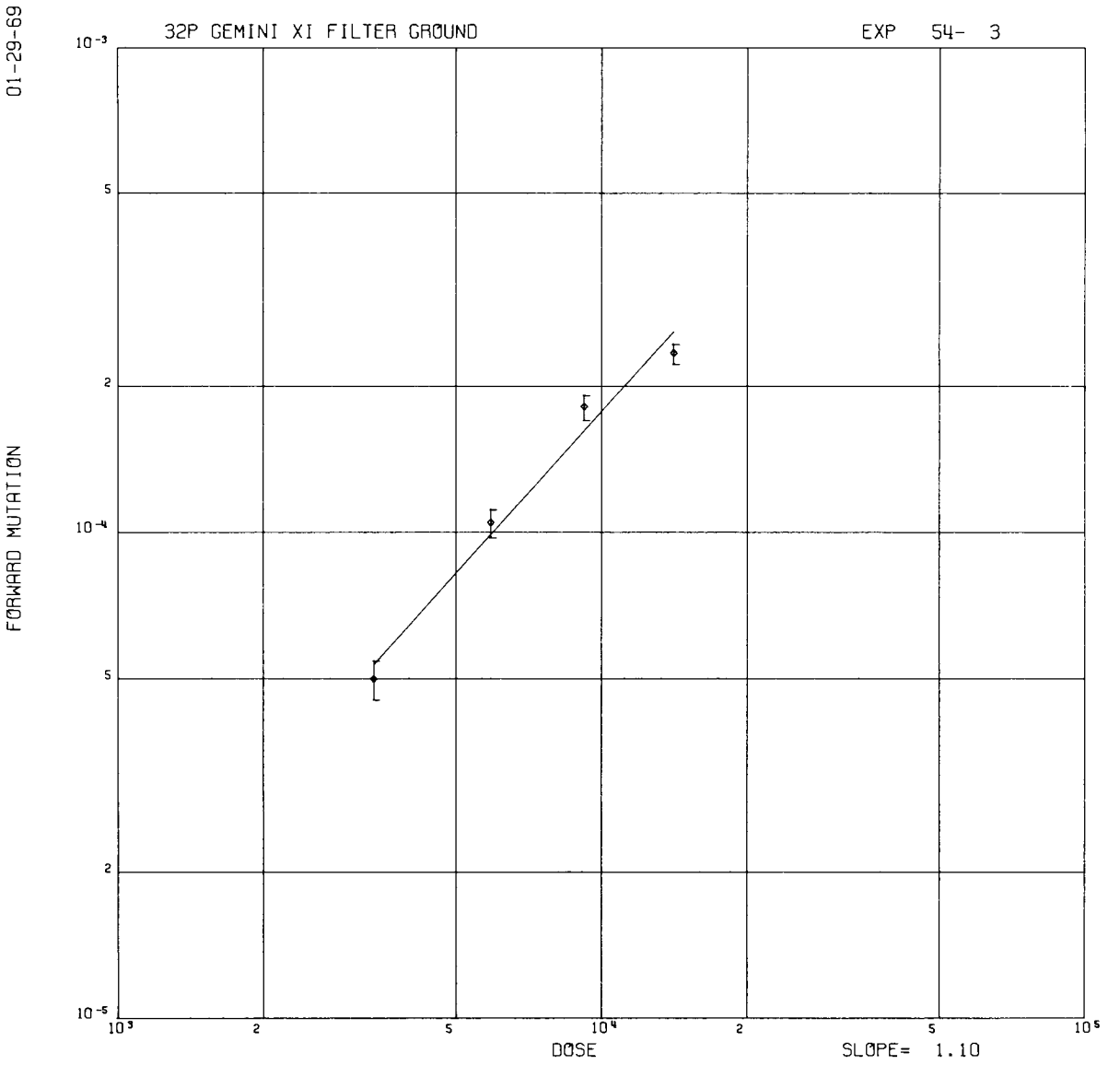

01-29-69
32P GEMINI XI SUSPENSION FLIGHT
EXP 54- 1
SURVIVAL
10⁰
5
2
10⁻¹
5
2
10⁻²
0.0
1.00E 03
2.00E 03
3.00E 03
4.00E 03
5.00E 03
6.00E 03
7.00E 03
8.00E 03
9.00E 03
DOSE
K= -0.000081

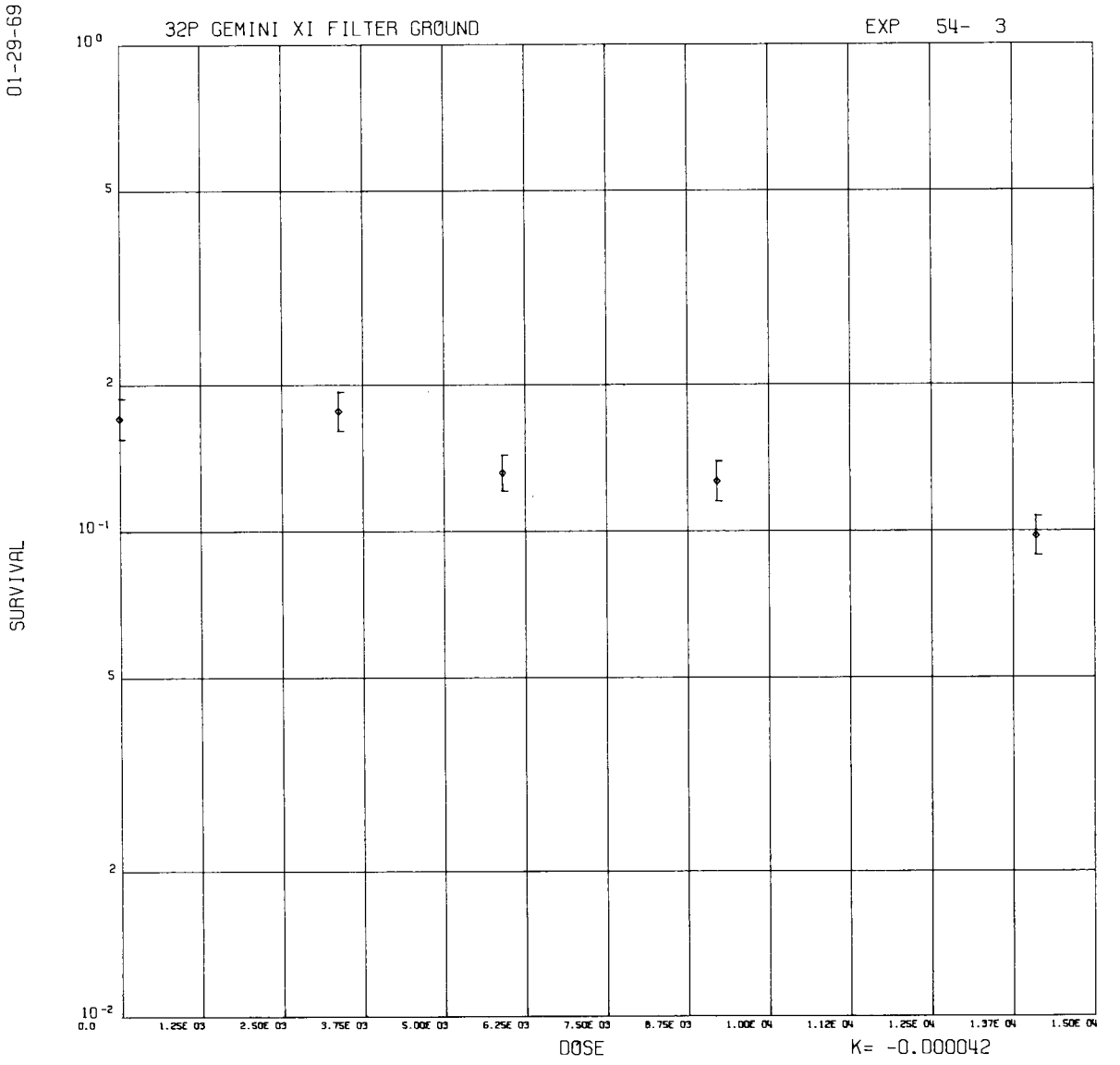

01-29-69
32P GEMINI XI SUSPENSION FLIGHT
EXP 54- 1
RELATIVE SURVIVAL
10⁰
5
2
10⁻¹
0.0
1.00E 03
2.00E 03
3.00E 03
4.00E 03
5.00E 03
6.00E 03
7.00E 03
8.00E 03
9.00E 03
DOSE
K= -0.000082

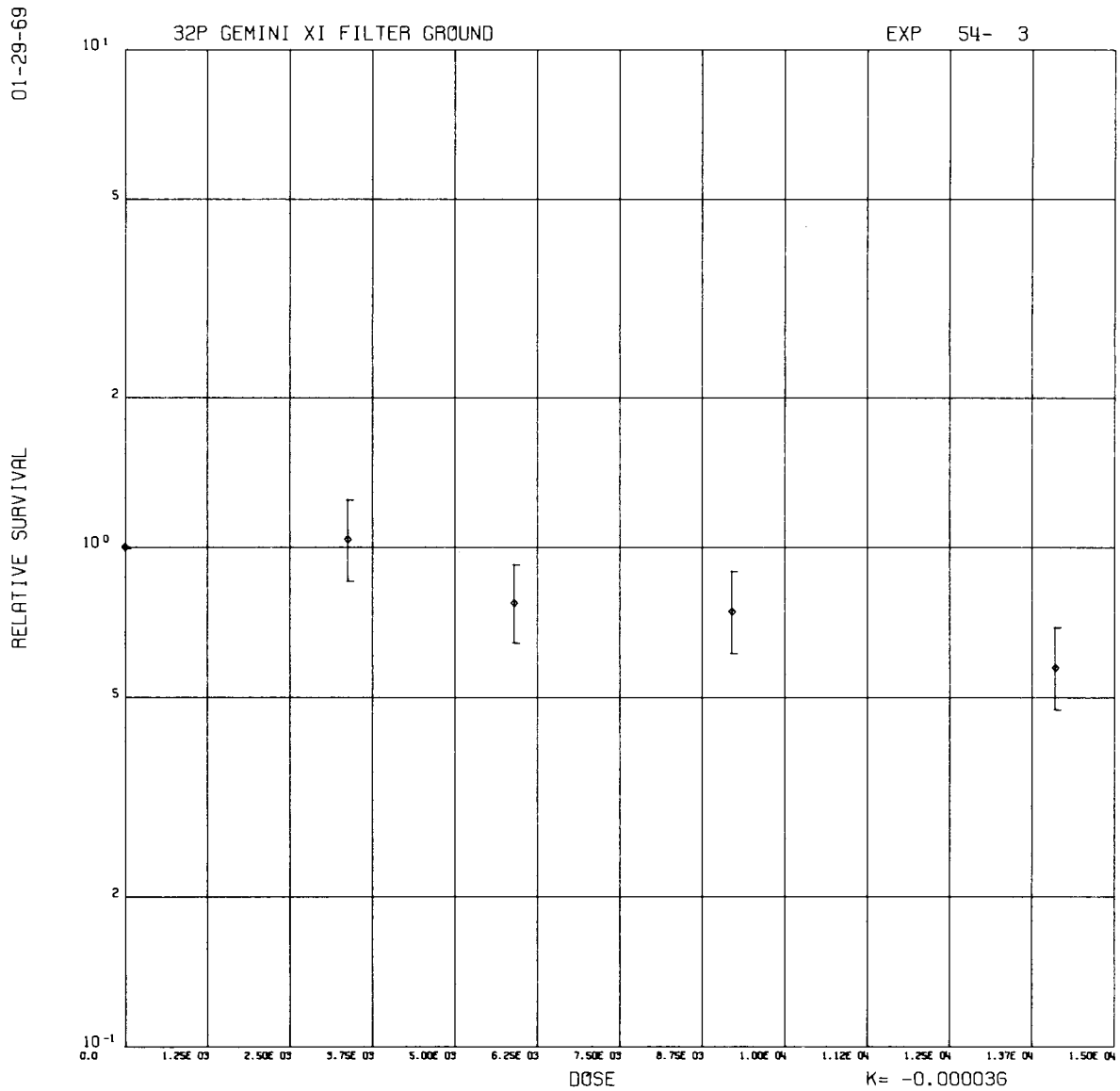

01-29-69
32P GEMINI XI SUSPENSION GROUND
EXP 54- 2
FORWARD MUTATION
10⁻⁴
5
2
10⁻⁵
10³
2
5
10⁴
DOSE
SLOPE= 1.10

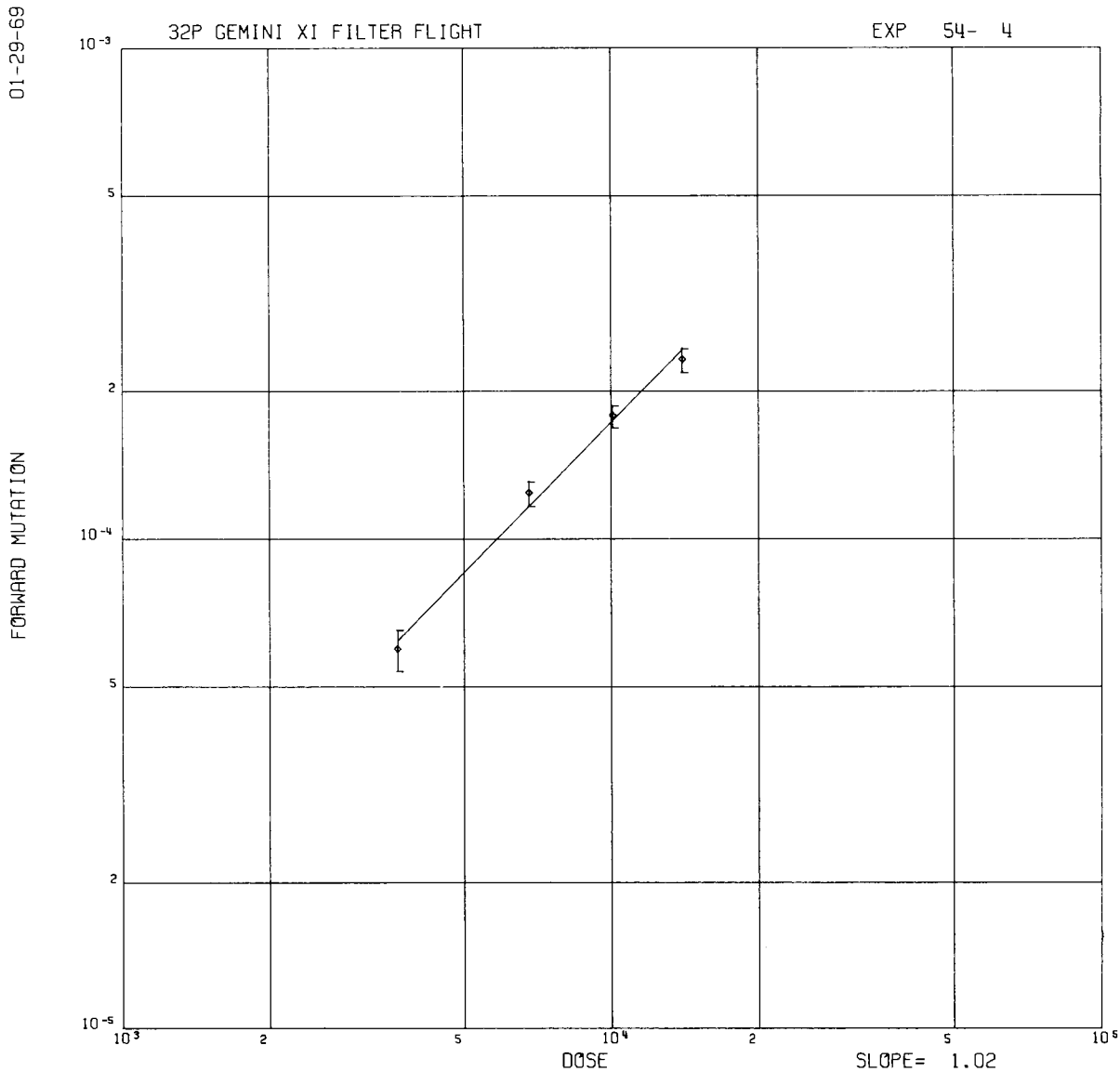

01-29-69
32P GEMINI XI SUSPENSION GROUND
EXP 54- 2
SURVIVAL
10⁰
5
2
10⁻¹
5
2
10⁻²
0.0
1.00E 03
2.00E 03
3.00E 03
4.00E 03
5.00E 03
6.00E 03
7.00E 03
8.00E 03
9.00E 03
DOSE
K= -0.000105

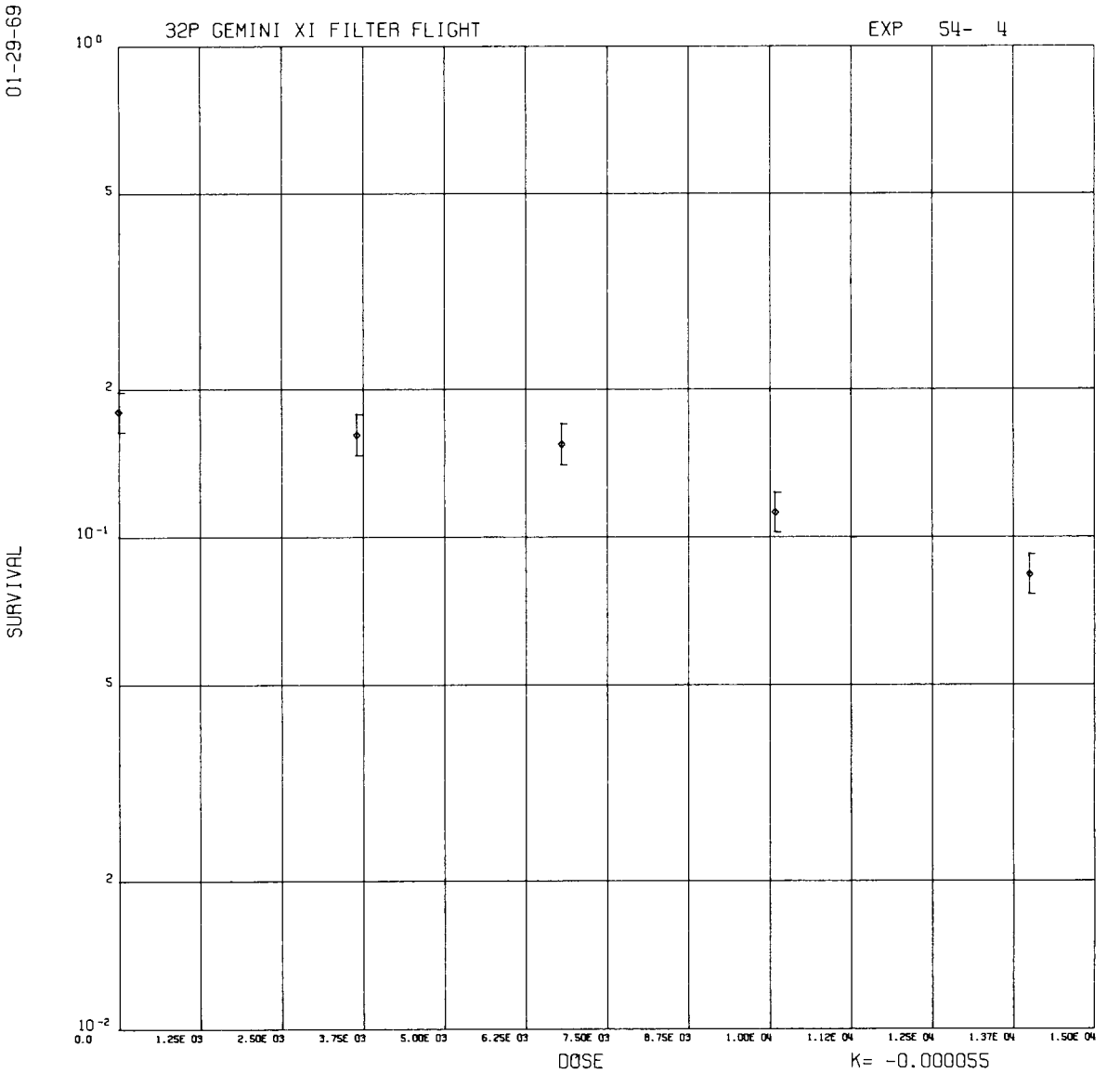

01-29-69
32P GEMINI XI SUSPENSION GROUND
EXP 54- 2
RELATIVE SURVIVAL
10⁰
5
2
10⁻¹
0.0
1.00E 03
2.00E 03
3.00E 03
4.00E 03
5.00E 03
6.00E 03
7.00E 03
8.00E 03
9.00E 03
DOSE
K= -0.000118

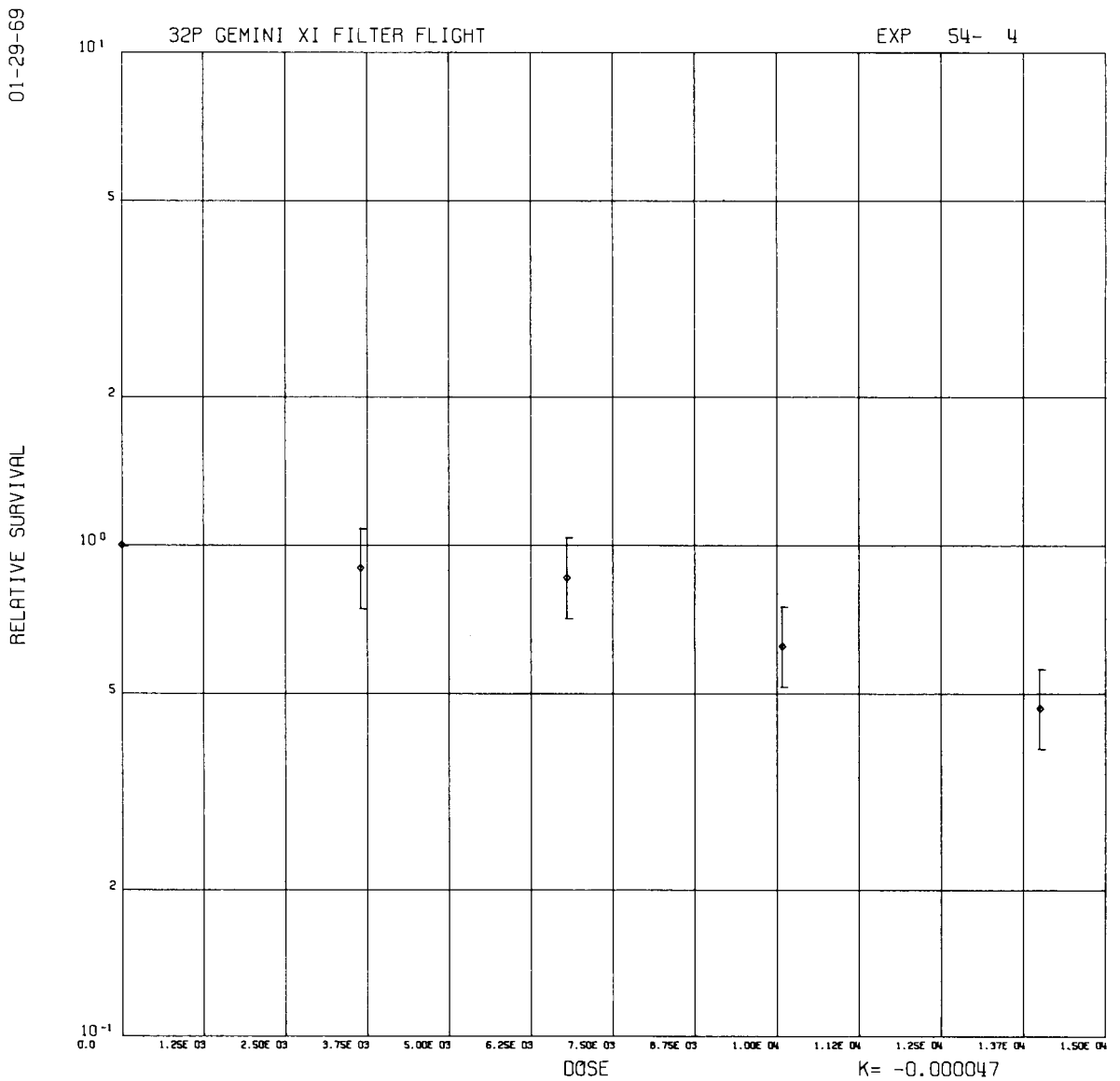

01-29-69
32P GEMINI XI FILTER GROUND
EXP 54- 3
FORWARD MUTATION
10⁻³
5
2
10⁻⁴
5
2
10⁻⁵
10³
2
5
10⁴
2
5
10⁵
DOSE
SLOPE= 1.10


01-29-69
32P GEMINI XI FILTER GROUND
EXP 54- 3
SURVIVAL
10⁰
5
2
10⁻¹
5
2
10⁻²
0.0
1.25E 03
2.50E 03
3.75E 03
5.00E 03
6.25E 03
7.50E 03
8.75E 03
1.00E 04
1.12E 04
1.25E 04
1.37E 04
1.50E 04
DOSE
K= -0.000042


01-29-69
32P GEMINI XI FILTER GROUND
EXP 54- 3
RELATIVE SURVIVAL
10¹
5
2
10⁰
5
2
10⁻¹
0.0
1.25E 03
2.50E 03
3.75E 03
5.00E 03
6.25E 03
7.50E 03
8.75E 03
1.00E 04
1.12E 04
1.25E 04
1.37E 04
1.50E 04
DOSE
K= -0.000036


01-29-69
32P GEMINI XI FILTER FLIGHT
EXP 54- 4
FORWARD MUTATION
10⁻³
5
2
10⁻⁴
5
2
10⁻⁵
10³
2
5
10⁴
2
5
10⁵
DOSE
SLOPE= 1.02


01-29-69
32P GEMINI XI FILTER FLIGHT
EXP 54- 4
SURVIVAL
10⁰
5
2
10⁻¹
5
2
10⁻²
0.0
1.25E 03
2.50E 03
3.75E 03
5.00E 03
6.25E 03
7.50E 03
8.75E 03
1.00E 04
1.12E 04
1.25E 04
1.37E 04
1.50E 04
DOSE
K= -0.000055


01-29-69
32P GEMINI XI FILTER FLIGHT
EXP 54- 4
RELATIVE SURVIVAL
10¹
5
2
10⁰
5
2
10⁻¹
0.0
1.25E 03
2.50E 03
3.75E 03
5.00E 03
6.25E 03
7.50E 03
8.75E 03
1.00E 04
1.12E 04
1.25E 04
1.37E 04
1.50E 04
DOSE
K= -0.000047

B. Special Plotting Program and Output

This program is identical to the Compare Program except that special titles are read into the computer. Data is handled in one of two ways:

(1) The first method is used mainly to compare overall mutation curves for two experiment-designs or to compare to different summary curves for the same experiment-design (code "design" as summary number for this latter problem), such as ad-3^{R} vs. ad-3^{IR}. The data is punched from special plotting data sheet and should be in order as punched.

(2) The second method is used to compare the same summaries for two different experiment-designs and is exactly like the Compare Program results except for the titles. These titles are punched from the special plotting data sheet and the rest of the data is already punched as mutant analysis output (cols. 1-2 will be plot number = summary number). The title or a note should indicate which experiment-designs are to be compared. Omit any extra mutant analysis output cards from the run if they do not have a title card.

Order of input:

(1) Program

(2) Data in order by cols. (1-8)

(3) /* and // cards (cols. 1-2)

360 job card:

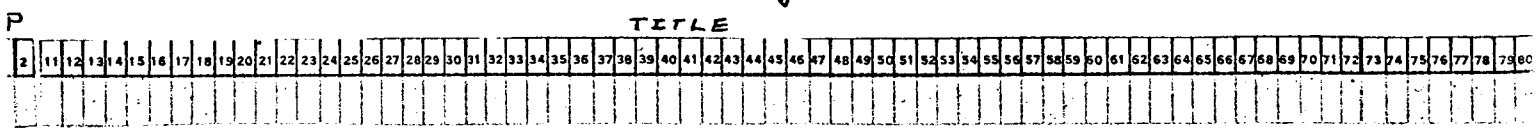
Tape 25 pool plot (7)

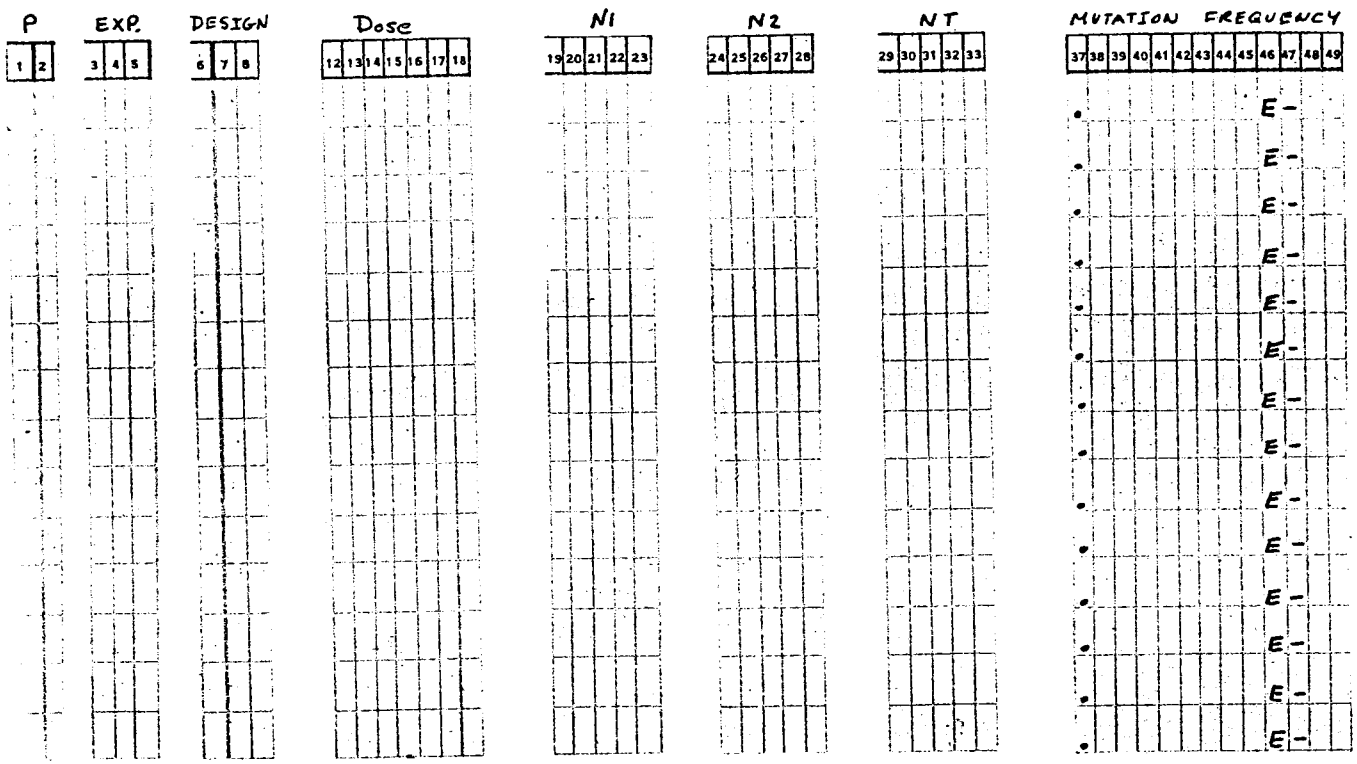
Calcomp card:

Black ink, plain paper

Number of plots = number of changes in cols. 1-2 of data cards

Special Plotting Data Sheet





P = plot or summary number, plot is drawn by the computer on change in this number with a curve for each change in experiment-design (cols 3-8)
N1 = N2 = NT for overall induction curves

IF MORE than one data sheet per plot then punch title card only once.

```
//                10847,MSGLEVEL=1  DIANA SMITH 9704-1 Y12
// EXEC COMPANGO,PARM.GO='EU=-1,DUMP=G'
//FT63.FT50F001 DD *
```

```
**FTN,L,G,E,P.
C**** SPECIAL PLOTTING PROGRAM,READS IN TITLES, DATA IN MUTANT ANALYSIS
C****  OUTPUT FORMAT,DOES LOG-LOG PLOT
      INTEGER TITLE
      DATA IBL/4H    ,4H    /
      DATA JCHAR/64,24,24/
      DIMENSION NOW(2)
      DIMENSION LAMB(46)
      DIMENSION LOX(4)
      DIMENSION Y1(20),Y2(20),Y3(20),X(20)
      DIMENSION JCHAR(3),IX(20)
      DIMENSION TITLE(18),LIST(18),A(1000),IBL(2)
      CALL IDAY(NOW)
      ISW=0
      CALL PLOTS(A,1000,1)
      READ(50,1) J,IG,N,TITLE
    1 FORMAT(I2,I3,A3,17A4,A2)
  999 IF(ICOMPARE(IBL,N,3).NE.0) GO TO 18
      M=0
   99 READ(50,1,END=4) K,IE,L,LIST
      IF(K.NE.J) GO TO 13
      M=M+1
      DECODE(4,5,L) ID
    5 FORMAT(I3)
      IX(M)=ID+1000*IE
      DECODE(10,2,LIST) X(M)
    2 FORMAT(3X,F7.0)
      DECODE(70,3,LIST(1))XN,Y1(M)
    3 FORMAT(10X,F5.0,10X,E16.8)
      CALL POIS(XN,Y1(M),Y2(M),Y3(M))
      GO TO 99
    4 ISW=1
   13 CALL LLPLOT(-M,-3,X,JCHAR,.105,Y1,Y2,Y3)
   20 CALL SYMBOL(1.5,10.6,.14,TITLE(1),0.0,70)
      CALL SYMBOL(5.5,.1,.14,4HDOSE,0.0,4)
      CALL SYMBOL(0.0,4.5,.14,16HFORWARD MUTATION,90.0,16)
      CALL SYMBOL(0.0,10.5,.14,NOW,90.0,8)
      N1=0
      IE=IX(1)
      DO 22 I=1,M
      IF(IE.NE.IX(I)) GO TO 23
   22 N1=N1+1
   23 N2=M-N1
      XLOW=X(N1)
      XHIG=0.
      DO 24 I=1,N1
      IF(X(I).LT.XLOW) XLOW=X(I)
      IF(X(I).GT.XHIG) XHIG=X(I)
      CALL GRCORD(X(I),Y1(I),XX,YY)
      CALL SYMBOL(XX,YY,.105,2,0.0,-1)
      CALL GRCORD(X(I),Y2(I),XX,YY)
      CALL GRCORD(X(I),Y3(I),XZ,YZ)
      CALL PLOT(XX,YY,4)
      CALL PLOT(XZ,YZ,2)
   24 CONTINUE
      IF(N2.EQ.0) GO TO 26
      LX=N1+1
      XLOX=X(M)
      XHIX=0.
      DO 25 I=LX,M
      IF(X(I).LT.XLOX) XLOX=X(I)
```

```
      IF(X(I).GT.XHIX) XHIX=X(I)
      CALL GRCORD(X(I),Y1(I),XX,YY)
      CALL SYMBOL(XX,YY,.105,5,0.0,-1)
      CALL GRCORD(X(I),Y2(I),XX,YY)
      CALL GRCORD(X(I),Y3(I),XZ,YZ)
      CALL PLOT(XX,YY,4)
      CALL PLOT(XZ,YZ,2)
   25 CONTINUE
   26 CONTINUE
      CALL STAT(N1,N2,X,Y1,A1,B1,A2,B2,T,F,B,SE)
      YL1=A1*XLOW**B1
      YH1=A1*XHIG**B1
      CALL GRCORD(XLOW,YL1,XX,YY)
      CALL GRCORD(XHIG,YH1,XZ,YZ)
      CALL PLOT(XX,YY,4)
      CALL PLOT(XZ,YZ,2)
      IF(N2.EQ.0) GO TO 27
      YL2=A2*XLOX**B2
      YH2=A2*XHIX**B2
      CALL GRCORD(XLOX,YL2,XX,YY)
      CALL GRCORD(XHIX,YH2,XZ,YZ)
      CALL PLOT(XX,YY,4)
      CALL PLOT(XZ,YZ,2)
   27 CONTINUE
      IM=IE/1000
      ID=IE-1000*IM
      IE=IM
      ENCODE(10,30,LAMB(1)) IE
   30 FORMAT('=',I3)
      CALL SYMBOL(12.,10.,.105,2,0.0,-1)
      CALL SYMBOL(12.1,10.,.14,LAMB(1),0.0,4)
      ENCODE(10,33,LAMB(1)) ID
   33 FORMAT('-',I3)
      CALL SYMBOL(12.7,10.,.14,LAMB(1),0.0,4)
      IF(N2.EQ.0) GO TO 25
      CALL SYMBOL(12.,8.5,.105,5,0.0,-1)
      IG=IX(LX)
      IM=IG/1000
      ID=IG-1000*IM
      IG=IM
      ENCODE(10,30,LAMB(2)) IG
      CALL SYMBOL(12.1,8.5,.14,LAMB(2),0.0,4)
      ENCODE(10,33,LAMB(2)) ID
      CALL SYMBOL(12.7,8.5,.14,LAMB(2),0.0,4)
      LAMB(3)=4HT BE
      LAMB(4)=4HTWEE
      LAMB(5)=4HN SL
      LAMB(6)=4HOPES
      LAMB(7)=4H =
      ENCODE(20,40,LAMB(8))T
   40 FORMAT(F8.2)
      LAMB(10)=4HF
      LAMB(11)=4HDIST
      LAMB(12)=4HANCE
      LAMB(13)=4H =
      LF=M-4
      LZ=M-3
      CALL PTVAL(T,LF,P1,I1)
      IF(F.LE.0.) GO TO 80
      T=SQRT(F)
      GO TO 81
   80 F=0.
```

```
      T=0.
   81 CONTINUE
      CALL PTVAL(T,L2,P2,I2)
      IF(I1) 83,84,85
   83 LAMB(43)=4HP GT
      GO TO 86
   84 LAMB(43)=4HP =
      GO TO 86
   85 LAMB(43)=4HP LT
   86 ENCODE(10,87,LAMB(44))P1
      IF(I2) 93,94,95
   93 LAMB(45)=4HP GT
      GO TO 96
   94 LAMB(45)=4HP =
      GO TO 96
   95 LAMB(45)=4HP LT
   96 ENCODE(10,87,LAMB(46))P2
   87 FORMAT(F4.3)
      ENCODE(20,40,LAMB(14))F
   31 CONTINUE
      LAMB(16)=4HA =
      ENCODE(20,50,LAMB(17))A1
   50 FORMAT(E16.8)
      LAMB(21)=4HB =
      ENCODE(20,50,LAMB(22))B1
      IF(N2.EQ.0) GO TO 32
      LAMB(26)=4HA =
      ENCODE(20,50,LAMB(27)) A2
      LAMB(31)=4HB =
      ENCODE(20,50,LAMB(32)) B2
      LAMB(36)=4HWITH
      ENCODE(10,60,LAMB(37)) LF
   60 FORMAT(I4)
      LAMB(38)=4H DF
      LAMB(40)=4HI AN
      ENCODE(10,70,LAMB(41))L2
   70 FORMAT('D',I3)
      LAMB(39)=4HWITH
      LAMB(42)=4H DF
  996 FORMAT(I4)
      CALL SYMBOL(12.,3.0,.14,10HCOVARIANCE,0.0,10)
      CALL SYMBOL(12.,2.8,.14,LAMB(21),0.0,4)
      ENCODE(20,50,LOX) B
      CALL SYMBOL(12.5,2.5,.14,LOX,0.0,16)
      LOX(1)=4HSE =
      CALL SYMBOL(12.,2.6,.14,LOX,0.0,4)
      ENCODE(20,50,LOX) SE
      CALL SYMBOL(12.6,2.6,.14,LOX,0.0,16)
      CALL SYMBOL(12.,2.4,.14,4HDF =,0.0,4)
      ENCODE(20,996,LOX) L2
      CALL SYMBOL(12.6,2.4,.14,LOX,0.0,4)
   32 CONTINUE
      CALL SYMBOL(12.,9.5,.14,LAMB(16),0.0,20)
      CALL SYMBOL(12.,9.0,.14,LAMB(21),0.0,20)
      CALL SYMBOL(12.,8.0,.14,LAMB(26),0.0,20)
      CALL SYMBOL(12.,7.5,.14,LAMB(31),0.0,20)
      CALL SYMBOL(12.,7.0,.14,LAMB(3) ,0.0,16)
      CALL SYMBOL(12.,6.8,.14,LAMB(7) ,0.0,12)
      CALL SYMBOL(12.,6.6,.14,LAMB(36),0.0,12)
      CALL SYMBOL(12.,6.4,.14,LAMB(43),0.0,8)
      CALL SYMBOL(12.,6.0,.14,LAMB(10),0.0,12)
      CALL SYMBOL(12.,5.8,.14,LAMB(13),0.0,12)
```

```
      CALL SYMBOL(12.,5.6,.14,LAMB(39),0.0,16)
      CALL SYMBOL(12.,5.4,.14,LAMB(45),0.0,8)
      CALL PLOT(16.0,.0,-3)
      IF(ISW.EQ.1) GO TO 18
      J=K
      N=L
      DO 21 I=1,18
   21 TITLE(I)=LIST(I)
      GO TO 999
   28 DO 29 I=3,46
   29 LAMB(I)=4H
      GO TO 31
   18 PRINT 123
  123 FORMAT('1 JOB COMPLETED')
      END
```

```
      SUBROUTINE STAT(N1,N2,X,Y,A1,B1,A2,B2,T,F,B,SE)
C**** PROGRAM TO COMPUTE LOG-LOG REGRESSIONS FOR TWO SETS OF DATA
C****  AND TEST SLOPES AND DISTANCE APART.
C**** N1 IS NUMBER OF OBSERVATIONS IN FIRST DATA SET,N2 IN SECOND.
C**** X IS X AXIS VALUES, Y IS Y AXIS VALUES,A1 AND A2 ARE ANTILOGS OF
C**** INTERCEPTS,B1 AND B2 ARE SLOPES,T IS T VALUE BETWEEN SLOPES,
C**** F IS F TEST OF DISTANCE, B IS COMMON COVARIANCE ESTIMATE
C**** OF SLOPE, SE IS STANDARD ERROR OF B.
      DIMENSION X(1), Y(1)
      S1=0.
      S2=0.
      S3=0.
      S4=0.
      S5=0.
      S6=0.
      Z1=0.
      Z2=0.
      Z3=0.
      Z4=0.
      Z5=0.
      Z6=0.
      DO 1 I=1,N1
      IF(X(I).EQ.0.) GO TO 1
      IF(Y(I).EQ.0.) GO TO 1
      X1=ALOG(X(I))
      Y1=ALOG(Y(I))
      S1=S1+X1
      S2=S2+Y1
      S3=S3+X1*X1
      S4=S4+Y1*Y1
      S5=S5+X1*Y1
      S6=S6+1.
    1 CONTINUE
      F1=S1/S6
      F2=S2/S6
      F3=S3-S1*F1
      F4=S4-S2*F2
      F5=S5-S2*F1
      E1=F4-(F5*F5)/F3
      F6=SQRT(E1/((S6-2.)*F3))
      B1=F5/F3
      F8=F2-B1*F1
      A1=EXP(F8)
      IF(N2.EQ.0) GO TO 99
      M=N1+N2
      L=N1+1.
      DO 2 I=L,M
      IF(X(I).EQ.0.) GO TO 2
      IF(Y(I).EQ.0.) GO TO 2
      X1=ALOG(X(I))
      Y1=ALOG(Y(I))
      Z1=Z1+X1
      Z2=Z2+Y1
      Z3=Z3+X1*X1
      Z4=Z4+Y1*Y1
      Z5=Z5+X1*Y1
      Z6=Z6+1.
    2 CONTINUE
      G1=Z1/Z6
      G2=Z2/Z6
```

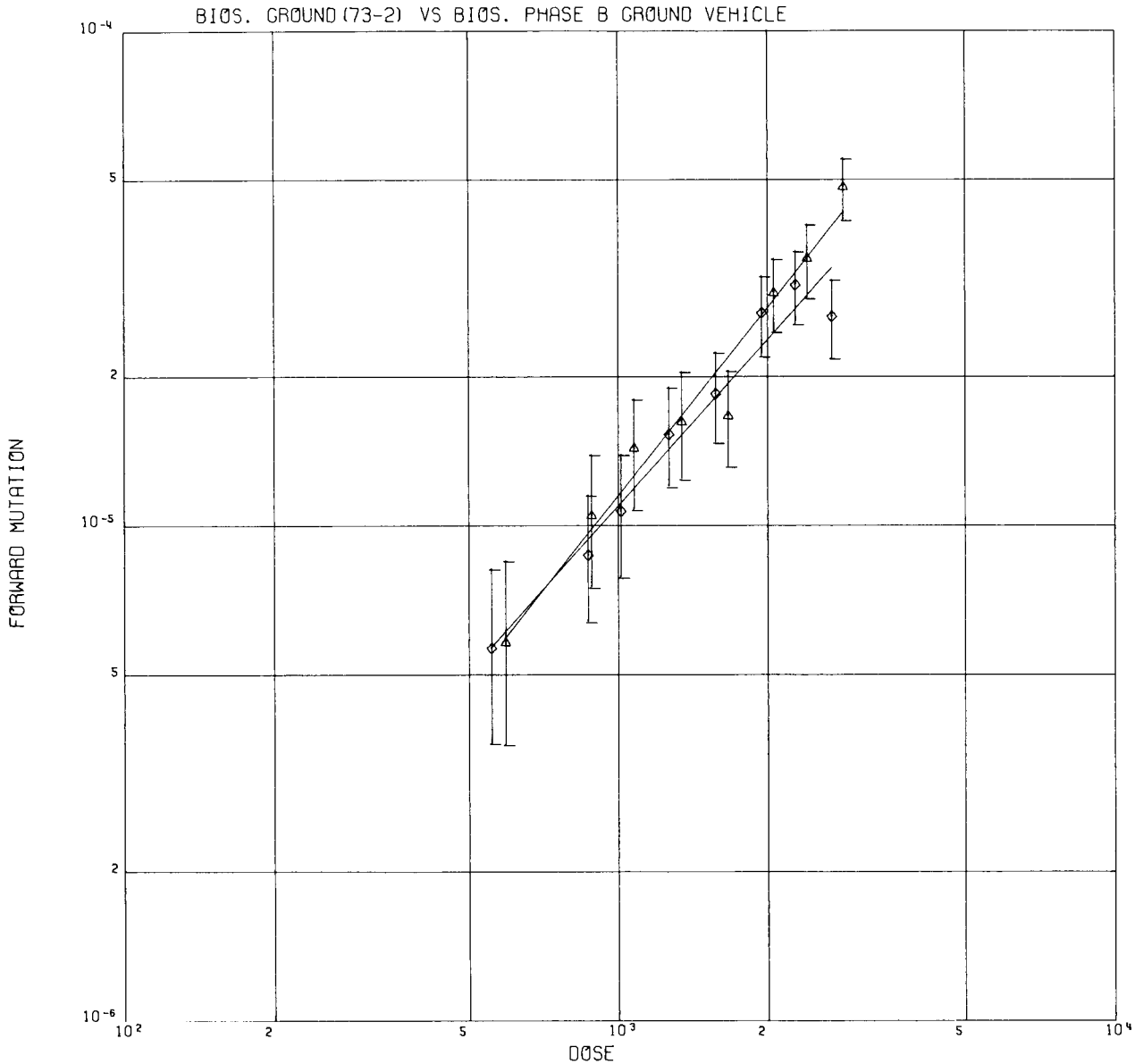
```
      G3=Z3-Z1*G1
      G4=Z4-Z2*G2
      G5=Z5-Z2*G1
      E2=G4-(G5*G5)/G3
      G6=SQRT(E2/((Z6-2.)*G3))
      B2=G5/G3
      G8=G2-B2*G1
      A2=EXP(G8)
      XN=S6+Z6-4.
      Q=(E1+E2)/XN
      T=ABS(B1-B2)/SQRT(Q*(1./F3+1./G3))
      C0=S6+Z6
      C1=S1+Z1
      C2=S2+Z2
      C3=S3+Z3
      C4=S4+Z4
      C5=S5+Z5
      YY=A1
      YX=A2
      A1=C1/C0
      A2=C2/C0
      A3=C3-C1*A1
      A4=C4-C2*A2
      A5=C5-C2*A1
      D1=S1*S1/S6+Z1*Z1/Z6-(C1*C1)/C0
      D2=S2*S1/S6+Z1*Z2/Z6-(C1*C2)/C0
      D3=S2*S2/S6+Z2*Z2/Z6-(C2*C2)/C0
      H1=A3-D1
      H2=A4-D3
      H3=A5-D2
      H4=A4-A5*A5/A3
      H5=H2-H3*H3/H1
      H6=H5/(S6+Z6-3.)
      H7=H4-H5
      H8=H3/H1
      H9=SQRT(H6/H1)
      F=H7/H6
      A1=YY
      A2=YX
      B=H3/H1
      SE=SQRT(H6/H1)
   99 RETURN
      END
```

```
      SUBROUTINE POIS(XX,FR,XL,XU)
C**** COMPUTES POISSON CONFIDENCE LIMITS FOR NON-ZERO FREQUENCY(FR).
C****   WHEN XX IS OBSERVED NUMBER.
      DIMENSION A(200),B(100),A1(200),B1(100)
      EQUIVALENCE (A(101),B(1)),
     *            (A1(101),B1(1))
      DATA A/ 00000, 0.051, 0.355, 0.818, 1.366, 1.970, 2.613, 3.285,
     *        3.285, 4.460, 5.323, 5.323, 6.686, 6.686, 8.102, 8.102,
     *        9.598, 9.598,11.177,11.177,12.817,12.817,13.765,14.921,
     *       14.921,16.768,16.770,17.630,19.050,19.050,20.330,22.360,
     *       21.360,22.940,23.760,23.760,25.400,26.310,26.310,27.730,
     *       28.970,28.970,30.020,31.670,31.670,32.280,34.050,34.660,
     *       34.660,36.030,37.670,37.670,38.160,39.760,40.940,40.940,
     *       41.750,43.450,44.260,44.260,45.280,47.020,47.690,47.690,
     *       48.740,50.420,51.290,51.290,52.150,53.720,54.990,54.990,
     *       55.510,56.990,58.720,58.720,58.840,60.240,61.900,62.810,
     *       62.810,63.490,64.950,66.760,66.760,66.760,68.100,69.620,
     *       71.090,71.090,71.280,72.660,74.220,75.490,75.490,75.780,
     *       77.160,78.730,79.980,79.980/
      DATA B/ 80.25, 81.61, 83.14, 84.57, 84.57, 84.67, 86.01, 87.48,
     *        89.23, 89.23, 89.23, 90.37, 91.78, 93.48, 94.23, 94.23,
     *        94.70, 96.06, 97.54, 99.17, 99.17, 99.17,100.32,101.71,
     *       103.31,104.40,104.40,104.58,105.90,107.32,109.11,109.61,
     *       109.61,110.11,111.44,112.87,114.84,114.84,114.84,115.60,
     *       116.93,118.35,120.36,120.36,120.36,121.06,122.37,123.77,
     *       125.46,126.26,126.26,126.48,127.78,129.14,130.68,132.03,
     *       132.03,132.03,133.14,134.48,135.92,137.79,137.79,137.79,
     *       138.49,139.79,141.16,142.70,144.01,144.01,144.01,145.08,
     *       146.39,147.80,149.53,150.19,150.19,150.36,151.63,152.96,
     *       154.39,156.32,156.32,156.32,156.87,158.15,159.48,160.92,
     *       162.79,162.79,162.79,163.35,164.63,165.96,167.39,169.33,
     *       169.33,169.33,169.80,171.07/
      DATA A1/ 3.285, 5.323, 6.686, 8.102, 9.598,11.177,12.817,13.765,
     *         14.921,16.768,17.633,19.050,20.335,21.364,22.945,23.762,
     *         25.400,26.306,27.735,28.966,30.017,31.675,32.277,34.048,
     *         34.665,36.030,37.670,38.160,39.760,40.940,41.750,43.450,
     *         44.260,45.280,47.020,47.690,48.740,50.420,51.290,52.150,
     *         53.720,54.990,55.510,56.990,58.720,58.840,60.240,61.900,
     *         62.810,63.490,64.950,66.760,66.760,68.100,69.620,71.090,
     *         71.280,72.660,74.220,75.490,75.780,77.160,78.730,79.980,
     *         80.250,81.610,83.140,84.570,84.670,86.010,87.480,89.230,
     *         89.230,90.370,91.780,93.480,94.230,94.700,96.060,97.540,
     *         99.170,99.170,100.32,101.71,103.31,104.40,104.58,105.90,
     *         107.32,109.11,109.61,110.11,111.44,112.87,114.84,114.84,
     *         115.60,116.93,118.35,120.36/
      DATA B1/ 120.36,121.06,122.37,123.77,125.46,126.26,126.48,127.78,
     *          129.14,130.68,132.03,132.03,133.14,134.48,135.92,137.79,
     *          137.79,138.49,139.79,141.16,142.70,144.01,144.01,145.08,
     *          146.39,147.80,149.53,150.19,150.36,151.63,152.96,154.39,
     *          156.32,156.32,156.87,158.15,159.48,160.92,162.79,162.79,
     *          163.35,164.63,165.96,167.39,169.33,169.33,169.80,171.07,
     *          172.38,173.79,175.48,176.23,176.23,177.48,178.77,180.14,
     *          181.67,183.05,183.05,183.86,185.13,186.46,187.89,189.83,
     *          189.83,190.21,191.46,192.76,194.11,195.65,197.09,197.09,
     *          197.78,199.04,200.35,201.73,203.35,204.36,204.36,205.31,
     *          206.58,207.90,209.30,211.03,211.69,211.69,212.82,214.09,
     *          215.40,216.81,218.56,219.16,219.16,220.29,221.56,222.86,
     *          224.26,225.93,226.81,226.81/
      DEN=XX/FR
      NUM=XX+1.
```

```
      IF(NUM.GT.200) GO TO 1
      XL=A(NUM)/DEN
      XU=A1(NUM)/DEN
      GO TO 2
    1 XL=FR-1.96*SQRT(XX)/DEN
      XU=FR+1.96*SQRT(XX)/DEN
    2 RETURN
      END
```

```
      SUBROUTINE PTVAL(T,NDF,P,I)
C**** FOR A GIVEN T VALUE WITH NDF DEGREES OF FREEDOM THIS SUBROUTINE
C**** RETURNS A PVALUE, I=0 IF EQUAL TO,I=-1 IF LESS THAN,I=1 IF
C**** GREATER THAN, IF NDF GREATER THAN 30 T INFINITY USED
      EQUIVALENCE(X(1,1),A(1,1)),(X(1,12),B(1,1))
      DIMENSION A(31,11),B(31,2)
      DIMENSION X(31,13),Z(13)
      DATA Z/.9,.8,.7,.6,.5,.4,.3,.2,.1,.05,.02,.01,.001/
      DATA A/.158,.142,.137,.134,.132,.131,2*.130,3*.129,6*.128,13*.127,
     *   .126,.325,.289,.277,.271,.267,.265,.263,.262,.261,2*.260,2*.259
     *,3*.258,5*.257,9*.256,.253,.510,.445,.424,.414,.408,.404,.402,.399
     *,.398,.397,.396,.395,.394,2*.393,3*.392,3*.391,5*.390,4*.389,.385,
     * .727,.617,.584,.569,.559,.553,.549,.546,.543,.542,.540,.539,.538,
     * .537,.536,.535,2*.534,2*.533,3*.532,4*.531,3*.530,.524,1.,.816,
     * .765,.741,.727,.718,.711,.706,.703,.700,.697,.695,.694,.692,.691,
     * .690,.689,2*.688,.687,2*.686,2*.685,3*.684,3*.683,.674,1.376,
     *1.061,.978,.941,.920,.906,.896,.889,.883,.879,.876,.873,.870,.868,
     * .866,.865,.863,.862,.861,.860,.859,3*.258,   2*.856,2*.855,2*.854
     *,.842,1.963,1.386,1.250,1.190,1.156,1.134,1.119,1.108,1.100,1.093,
     * 1.088,1.083,1.079,1.076,1.074,1.071,1.069,1.067,1.066,1.064,1.063
     *,1.061,1.060,1.059,1.058,1.058,1.057,1.056,1.055,1.055,1.036,3.078
     *,1.886,1.638,1.533,1.476,1.440,1.415,1.397,1.383,1.372,1.363,1.356
     *,1.350,1.345,1.341,1.337,1.333,1.330,1.328,1.325,1.323,1.321,1.319
     *,1.318,1.316,1.315,1.314,1.313,1.311,1.310,1.282,6.314,2.920,2.353
     *,2.132,2.015,1.943,1.895,1.860,1.833,1.812,1.796,1.782,1.771,1.761
     *,1.753,1.746,1.740,1.734,1.729,1.725,1.721,1.717,1.714,1.711,1.708
     *,1.706,1.703,1.701,1.699,1.697,1.645,12.706,4.303,3.182,2.776,
     * 2.571,2.447,2.365,2.306,2.262,2.228,2.201,2.179,2.160,2.145,2.131
     *,2.120,2.110,2.101,2.093,2.086,2.080,2.074,2.069,2.064,2.060,2.056
     *,2.052,2.048,2.045,2.042,1.960,31.821,6.965,4.541,3.747,3.365,
     *3.143,2.998,2.896,2.821,2.764,2.718,2.681,2.650,2.624,2.602,2.583,
     *2.567,2.552,2.539,2.528,2.518,2.508,2.500,2.492,2.485,2.479,2.473,
     *2.467,2.462,2.457,2.326/
      DATA B/63.657,9.925,5.841,4.604,4.032,3.707,3.499,3.355,3.250,3.16
     *9,3.106,3.055,3.012,2.977,2.947,2.921,2.898,2.878,2.861,2.845,02.8
     *31,2.819,2.807,2.797,2.787,2.779,2.771,2.763,2.756,2.750,2.576,636
     *.62,31.598,12.942,8.610,6.869,5.959,5.408,5.041,4.781,4.587,4.437,
     *4.318,4.221,4.140,4.073,4.015,3.965,3.922,3.883,3.850,3.819,3.792,
     *3.767,3.745,3.725,3.707,3.690,3.674,3.659,3.646,3.291/
      I=0
      J=NDF
      IF(NDF.GT.30) J=31
      IF(T.LT.X(J,1)) GO TO 4
      IF(T.GT.X(J,13)) GO TO 5
      DO 1 M=1,13
      IF(T.LE.X(J,M))GO TO 2
    1 CONTINUE
      M=13
    2 IF(T.EQ.X(J,M))GO TO 3
      P=Z(M-1)-(T-X(J,M-1))/(X(J,M)-X(J,M-1))*(Z(M-1)-Z(M))
      GO TO 99
    3 P=Z(M)
      GO TO 99
    4 I=-1
      P=Z(1)
      GO TO 99
    5 I=1
      P=Z(13)
   99 RETURN
      END
```

```
/*
//LINK.SYSIN DD *



          INSERT HERE HEX DECK FOR EZPLOT



/*
//GO.FT52F001 DD UNIT=SYSCP
//GO.PLOTTAPE DD UNIT=TAPE7,VOL=SER=25,LABEL=(,NL),DISP=OLD
//GO.FT50F001 DD *



          INCLUDE DATA HERE



/*
//
```



△ = 73 - 2

A = 0.18598254E-08

B = 0.12634354E 01

◇ = 89 - 2

A = 0.48635620E-08

B = 0.11175451E 01

T BETWEEN SLOPES
= 1.09
WITH 12 DF
P = .298

F DISTANCE
= 1.95
WITH1 AND 13 DF
P = .189

COVARIANCE
B = 0.11907187E 01
SE = 0.67448199E-01
DF = 13

C. Mutant Analysis Program and Output

Order of input to 360:

(1) Program

(2) S cards in order by cols. 2-3

(3) 80222 cards for experiment (isolate range cards)

(4) Deck 02 Cards 3, 4, 5, 6 in any order

(5) END card (cols. 1-3)

(6) Repeat of (3), (4), (5) for as many experiments or designs as necessary

(7) /* and // cards at end of all data

360 job card:

Tape 25 pool plot (7), program disk = 666666

Calcomp request card:

Black ink, plain paper

Maximum no. of plots = (no. of experiment-designs) X 40.

REQUEST FOR MUTANT ANALYSIS

Date Submitted _____

Date Returned _____

TO:

FROM:

SUBJECT: Mutant Analysis

For Experiment No. _____

Deck 02, Cards _____ , _____ , _____ , _____.

PLEASE SEND

- ☐ Listing, One Copy _____ ; Two Copies _____ .
- ☐ Listing plus Analysis, One Copy _____ ; Two Copies _____ .
- ☐ No Listing.

DECK 02 DATA IF ENCLOSED IS

- ☐ New
- ☐ Corrections

IF ANALYSIS IS REQUESTED, ISOLATE RANGE DATA SHEET(S) ARE

- ☐ Enclosed
- ☐ Already Punched

UCN-8621
(3 4-68)

ISOLATE RANGE DATA SHEET

1-5	Wild Type 6-8	Experiment 9-11	Date Compiled 73-80
8 0 2 2 2			– –

DESIGN NUMBER 12-14	TREAT-MENT 15-17	DOSE 18-22	FIRST ISOLATE 23-26	LAST ISOLATE 27-30	NUMBER OF MUTANTS OBSERVED 31-35	MUTATION FREQUENCY 36-48
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –
						• E –

UCN-8619
(3 9-68)

MUTANT ISOLATION AND STORAGE DATA WORKSHEET

DECK NUMBER 0 2 CARD NUMBER 0 3

	6-8	9-11	12-15	16-17	27	28-29	30-31	32-33	34-35	36	37	38-39	41-43	44-45
	MUTANT NUMBER					PLATING ANALYSIS						STOCK NUMBER		
	WILD TYPE STRAIN	EXPERI-MENT NO.	ISOLATE NUMBER	MUTAGEN	COLONY COLOR	MIN. / COMPL.	MIN. / COMPL.	MIN. / COMPL.	MIN. / COMPL.	LEAKINESS	IN STOCK	TYPE	BOX NUMBER	BOX POSITION
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														

UCN-6121
(3 8-67)

MUTANT CHARACTERIZATION: GENOTYPE AND COMPLEMENTATION TESTS

DECK NUMBER 0 2 [2 - 3] CARD NUMBER 0 4 [4 - 5]

	38-39	41-43	44-45	16-27										28-29	30-32			33	34-36
	STOCK NUMBER			COMPLEMENTATION TESTS											AD-3B TYPE				
	TYPE	BOX NUMBER	BOX POSITION	TESTER SET	TESTER STRAINS									AD-3 TYPE	NP	P	NC	DILUTION	HET. EXPT. NO.
					1	2	3	4	5	6	7	8	9	10					
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

UCN-6601
(3 1-66)

MUTANT CHARACTERIZATION: DIKARYON TEST

DECK NUMBER 0 2 [2-3]

CARD NUMBER 0 5 [4-5]

	38-39	41-43	44-45	16
	STOCK NUMBER			
	TYPE	BOX NUMBER	BOX POSITION	DIKARYON
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

UCN-6600
(3 1-66)

MUTANT CHARACTERIZATION: TRIKARYON TEST

DECK NUMBER 0 2 [2-3] CARD NUMBER 0 6 [4-5]

	38-39	41-43	44-45	18-20	21	22-24	25	26-28	29	30-32	33	34-36	37
	STOCK NUMBER			TRIKARYON TESTS									
	TYPE	BOX NUMBER	BOX POSITION	TESTER NO.	MIN.	TESTER NO.	MIN.	TESTER NO.	MIN.	TESTER NO.	MIN.	TESTER NO.	MIN.
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

UCN-7245
(3 1-66)

CARD LAYOUT

Title S cards

Card No _____ Card Color _____

Source _____

Edition _____

1.	ALPHABETIC S	41.	TITLE CONTINUED
2.		42.	
3.	Summary number	43.	
4.	not used	44.	
5.	AD-3 code	45.	
6.		46.	
7.	AD-3B IF NOT IGNORED	47.	
8.	ELSE BLANK	48.	
9.	DIKARYON	49.	
10.		50.	
11.	TRIKARYON	51.	
12.		52.	
13.		53.	
14.		54.	
15.		55.	
16.		56.	
17.		57.	
18.		58.	
19.	NOT USED	59.	
20.		60.	
21.		61.	
22.		62.	
23.		63.	
24.		64.	
25.		65.	
26.	TITLE BEGINS	66.	
27.	HERE	67.	
28.		68.	
29.		69.	
30.		70.	
31.		71.	
32.		72.	
33.		73.	
34.		74.	
35.		75.	
36.		76.	
37.		77.	
38.		78.	
39.		79.	
40.		80.	

TY-111 (2-60)
(8-60)

CARD LAYOUT

Title MUTANT ANALYSES OUTPUT

Card No _____ Card Color _____

Source _____

Edition _____

1.	Summary number	41.	Numeric
2.		42.	
3.		43.	
4.	Experiment	44.	
5.		45.	
6.		46.	E
7.	Design	47.	–
8.		48.	Exponent
9.		49.	
10.	Treatment	50.	NOT USED
11.		51.	
12.		52.	
13.		53.	
14.		54.	
15.	Dose	55.	
16.		56.	
17.		57.	
18.		58.	
19.		59.	
20.		60.	
21.	N1	61.	
22.		62.	
23.		63.	
24.		64.	
25.		65.	
26.	N2	66.	
27.		67.	
28.		68.	
29.		69.	
30.		70.	
31.	NT	71.	
32.		72.	
33.		73.	DATE
34.	Blank	74.	
35.		75.	
* 36.	0 zero	76.	
37.	• decimal	77.	
38.		78.	
39.	numeric	79.	
40		80	

TY-111 (2-60)
(8-60)

* Cols 36-44 contain mutation frequency in E format

```
//              10847,MSGLEVEL=1 DIANA SMITH 9704-1 Y12
//JOBLIB DD DSNAME=SYS1.LINKLIB,VOLUME=REF=LKCBSMPL,DISP= OLD,PASS)
//STEP EXEC ACGT,PARM.GO='EU=-1'
//ASSEMBLE.SYSIN DD *
SORTER   START
         USING *,12
         STM   14,12,12(13)
         LR    5,13
         LR    12,15
         LA    13,AREA
         ST    13,8(0,5)
         ST    5,AREA+4
         LA    1,PARLIST
         ATTACH EP=SORT,MF=(E,(1))
         L     13,AREA+4
         LM    14,12,12(13)
         BR    14
         LTORG
AREA     DS    18F
         CNOP   0,8
* PARAMETER LIST
PARLIST  DC     X'80'
         DC     AL3(ADLST)
         DC     X'0000'
ADLST    DC     X'0018'
         DC     A(SORTCD)
         DC     A(STCDED)
         DC     A(RCDCD)
         DC     A(RDCDED)
         DC    F'0'
```

```
         DC     F'0'
SORTCD   DC      C' SORT FIELDS=(38,8,CH,A,9,7,CH,A),'
         DC      C'SIZE=E2000'
STCDED   DC      C' '
RCDCD    DC      C' RECORD TYPE=F,LENGTH=80'
RDCDED   DC      C' '
         END
/*
```

```
**FTN,L,P,E.
C**** MUTANT ANALYSIS PROGRAM
      INTEGER STB1,STB2
      LOGICAL*1 IPRINT
      LOGICAL*1 LOGIC
      EQUIVALENCE (IREC,LOGIC)
      DATA ICOX/4HS   /
      DATA ICON/4H8022/
      DATA IEND/4HEND /
      DATA IBL/4H    /
      DIMENSION LOGIC(320)
      DIMENSION MIST(15)
      DIMENSION STB1(2),STB2(2)
      DIMENSION LIST(20),IREC(80),IPRINT(320),NOW(2)
      DIMENSION A(1000)
      CALL PLOTS(A,1000,25)
      ISW=0
      CALL IDAY(NOW)
   21 REWIND 11
      REWIND 10
      REWIND 16
      REWIND 15
    1 READ(50,2,END=20)LIST
    2 FORMAT(20A4)
      IF(ICOMPARE(LIST(1),IEND,3).EQ.0) GO TO 3
      IF(ICOMPARE(LIST(1),ICON,4).NE.0) GO TO 30
      DECODE(80,40,LIST(1)) IE,ID,IT,DS,IS1,IS2,TN,FREQ
   40 FORMAT(8X,3I3,F5.0,2I4,F5.0,E13.8)
      WRITE(15)IE,ID,IT,DS,IS1,IS2,TN,FREQ
      GO TO 1
   30 CONTINUE
      IF(ICOMPARE(LIST(2),ICOX,1).NE.0)GO TO 31
      DECODE(80,32,LIST(1)) I,IAD3,IAD3B,IDIK,ITRI,MIST,IST
   32 FORMAT(1X,I2,I2,A3,I1,I3,15A4,T6,I3)
      LIND=IST+1000*ITRI+1000000*IDIK+10000000*IAD3
      IF(ICOMPARE(IAD3B,IBL,3).NE.0) GO TO 33
      IS=0
      LIND=LIND/1000
      GO TO 34
   33 IS=1
   34 WRITE(16) I,LIND,MIST,IS
      GO TO 1
   31 CONTINUE
      WRITE(10,2) LIST
      GO TO 1
    3 END FILE 10
      IF(ISW.NE.0) GO TO 333
      END FILE 16
  333 CONTINUE
      END FILE 15
      PRINT 12345
12345 FORMAT('1')
      REWIND 10
      CALL SORTER
      REWIND 10
      PRINT 88,NOW
      LINE=0
   88 FORMAT(1H0,T30,'DUPLICATE CARDS'T90,'DATE',1X,2A4)
    4 READ(10,5) NCD,STB1,LIST
    5 FORMAT(4X,I1,T38,2A4,T1,20A4)
  999 DO 6 I=1,80
```

```
    6 IREC(I)=IBL
  100 IF(NCD.EQ.3) GO TO  8
      IF(NCD.EQ.4) GO TO 10
      IF(NCD.EQ.5) GO TO 12
      IF(NCD.EQ.6) GO TO 122
   99 PRINT 7,LIST
    7 FORMAT('0',20A4)
      LINE=LINE+1
      IF(LINE.LT.30) GO TO 14
      LINE=0
      PRINT 88,NOW
      GO TO 14
    8 IF(ICOMPARE(IREC(3),LIST(3),7).EQ.0) GO TO 99
      IF(ICOMPARE(IREC( 2),IBL,1).NE.0) GO TO 15
      DO 9 I=1,20
    9 IREC(I)=LIST(I)
      GO TO 14
   10 IF(ICOMPARE(IREC(22),IBL,1).NE.0) GO TO 99
      DO 11 I=1,20
   11 IREC(I+20)=LIST(I)
      GO TO 14
   12 IF(ICOMPARE(IREC(42),IBL,1).NE.0) GO TO 99
      DO 13 I=1,20
   13 IREC(I+40)=LIST(I)
      GO TO 14
  122 IF(ICOMPARE(IREC(62),IBL,1).NE.0) GO TO 99
      DO 123 I=1,20
  123 IREC(I+60)=LIST(I)
   14 READ(10,5,END=16) NCD,STB2,LIST
      IF(ICOMPARE(STB1,STB2,8).NE.0) GO TO 15
      GO TO 100
   15 CONTINUE
      NBOX=80
      IF(ICOMPARE(LOGIC(45),IBL,1).NE.0) GO TO 1500
 1300 IF(ICOMPARE(LOGIC(45+NBOX),IBL,1).NE.0) GO TO 1400
      NBOX=NBOX+80
      IF(NBOX.LT.320) GO TO 1300
      GO TO 1500
 1400 DO 1401 IBOX=38,45
 1401 LOGIC(IBOX)=LOGIC(IBOX+NBOX)
 1500 WRITE(11)IREC
      STB1(1)=STB2(1)
      STB1(2)=STB2(2)
      GO TO 999
   16 CONTINUE
      NBOX=80
      IF(ICOMPARE(LOGIC(45),IBL,1).NE.0) GO TO 1600
 1700 IF(ICOMPARE(LOGIC(45+NBOX),IBL,1).NE.0) GO TO 1800
      NBOX=NBOX+80
      IF(NBOX.LT.320) GO TO 1700
      GO TO 1600
 1800 DO 1801 IBOX=38,45
 1801 LOGIC(IBOX)=LOGIC(IBOX+NBOX)
 1600 WRITE(11)IREC
      END FILE 11
      REWIND 11
 2000 PRINT 124,NOW
  124 FORMAT(1H1,T30,'LISTING OF ALL MUTANTS',T90,'DATE '2A4)
      PRINT 17
   17 FORMAT('0',T2,'EXP',1X,'ISOLATE',1X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-3',2X,'AD-3B',1X,'DIL',1X,'HET',2X,'DIK'
```

```
     * ,6X,'TRIKARYON TESTS')
      LINE=0
9999  READ(11,END=19) IPRINT
      PRINT 18,(IPRINT(J),J=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,2X,4A1,2X,2A1,1X,3A1,1X,2A1,1X,2A1,1X,A1,2X,2A1,1X,
     *2A1,
     * 1X,2A1,1X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,3X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,1X,4A1,1X,4A1)
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 9999
      GO TO 2000
   19 CONTINUE
      CALL LIST1(NOW)
      CALL LIST2(NOW)
      CALL LIST5(NOW)
      CALL LIST6(NOW)
      CALL LIST7(NOW)
      CALL LIST3(NOW)
      CALL LIST4(NOW)
      CALL CONSIS(MOM)
      CALL LIST8(MOM,NOW)
      CALL TALLY(MOM,NOW)
      CALL SUMMRY(NOW)
      ISW=1
      GO TO 21
   20 PRINT 1515
 1515 FORMAT('1  JOB COMPLETED')
      CALL EXIT
      END
```

```
      SUBROUTINE LIST1(NOW)
C*****THIS PROGRAM LISTS MUTANTS NOT IN STOCK--'0' IN COL.37 OF CARD 3
      LOGICAL*1 IPRINT
      DIMENSION NOW(2),IPRINT(320)
      DATA IZERO/4H0   /
      REWIND 11
 2000 LINE=0
      PRINT 88,NOW
   88 FORMAT(1H1,T30,'MUTANTS NOT IN STOCK',T90,'DATE',2A4)
      PRINT 17
   17 FORMAT('0',T2,'EXP',1X,'ISOLATE',1X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-3',2X,'AD-3B',1X,'DIL',1X,'HET',2X,'DIK'
     * ,6X,'TRIKARYON TESTS')
 9999 READ(11,END=19) IPRINT
      IF(ICOMPARE(IPRINT(37),IZERO,1).NE.0) GO TO 9999
      PRINT 18,(IPRINT(J),J=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,2X,4A1,2X,2A1,1X,3A1,1X,2A1,1X,2A1,1X,A1,2X,2A1,1X,
     *2A1,
     * 1X,2A1,1X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,3X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,1X,4A1,1X,4A1)
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 9999
      GO TO 2000
   19 RETURN
      END
```

```
      SUBROUTINE LIST2(NOW)
C*****THIS PROGRAM LIST INCOMPLETE CARD 3'S
      LOGICAL*1 IPRINT
      DIMENSION NOW(2),IPRINT(320)
      DATA IBL/4H    /
      REWIND 11
 2000 LINE=0
      PRINT 88,NOW
   88 FORMAT(1H1,T30,'INCOMPLETE CARD THREES',T90,'DATE ',2A4)
      PRINT 17
   17 FORMAT('0',T2,'EXP',1X,'ISOLATE',1X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-3',2X,'AD-3B',1X,'DIL',1X,'HET',2X,'DIK'
     * ,6X,'TRIKARYON TESTS')
 9999 READ(11,END=19) IPRINT
      IF(ICOMPARE(IPRINT(5),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(9 ),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(10),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(11),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(12),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(13),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(14),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(15),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(36),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(37),IBL,1).NE.0) GO TO 9999
   99 CONTINUE
      PRINT 18,(IPRINT(J),J=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,2X,4A1,2X,2A1,1X,3A1,1X,2A1,1X,2A1,1X,A1,2X,2A1,1X,
     *2A1,
     * 1X,2A1,1X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,3X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,3X,4A1,1X,4A1)
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 9999
      GO TO 2000
   19 RETURN
      END
```

```
      SUBROUTINE LIST3(NOW)
C*****THIS PROGRAM LISTS MUTANTS IN STOCK BUT MISSING CARD 4,5,OR 6
      LOGICAL*1 IPRINT
      DIMENSION NOW(2),IPRINT(320)
      DATA IBL/4H    /
      DATA IZERO/4H0   /
      REWIND 11
 2000 LINE=0
      PRINT 88,NOW
   88 FORMAT(1H1,T30,'MISSING 3,4,5,OR 6 CARD',T90,'DATE ',2A4)
      PRINT 17
   17 FORMAT('0',T2,'EXP',1X,'ISOLATE',2X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-2',2X,'AD-3B',1X,'DTL',1X,'HET',2X,'DIK'
     * ,6X,'TRIKARYON TESTS')
 9999 READ(11,END=19) IPRINT
      IF(ICOMPARE(IPRINT(5),IBL,1).EQ.0)GO TO 99
      IF(ICOMPARE(IPRINT(37),IZERO,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(85),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(165),IBL,1).EQ.0) GO TO 99
      IF(ICOMPARE(IPRINT(176),IZERO,1).NE.0) GO TO 9999
      IF(ICOMPARE(IPRINT(245),IBL,1).NE.0) GO TO 9999
   99 CONTINUE
      PRINT 18,(IPRINT(J),J=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,2X,4A1,2X,2A1,1X,3A1,1X,2A1,1X,2A1,1X,A1,2X,2A1,1X,
     *2A1,
     * 1X,2A1,1X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,3X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,1X,4A1,1X,4A1)
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 9999
      GO TO 2000
   19 RETURN
      END
```

```
      SUBROUTINE LIST4(NOW)
C*****THIS PROGRAM LIST COMPLETELY TESTED MUTANTS
      DATA IBL /4H    /
      DATA IZERO/4HC   /
      LOGICAL*1 IPRINT
      DIMENSION NOW(2),IPRINT(320)
      REWIND 13
      REWIND 11
 2000 LINE=0
      PRINT 88,NOW
   88 FORMAT(1H1,T30,'COMPLETELY TESTED DATA',T90,'DATA ',2A4)
      PRINT 17
   17 FORMAT('0',T2,'EXP',1X,'ISOLATE',1X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-3',2X,'AD-3B',1X,'DIL',1X,'HET',2X,'DIK'
     * ,6X,'TRIKARYON TESTS')
 9999 READ(11,END=19) IPRINT
      IF(ICOMPARE(IPRINT(5),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(09),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(10),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(11),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(12),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(13),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(14),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(15),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(36),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(37),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(37),IZERO,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(85),IBL,1).EQ.0) GO TO 9999
      DO 1 J=96,112
      IF(ICOMPARE(IBL,IPRINT(J),1).EQ.0) GO TO 9999
    1 CONTINUE
      IF(ICOMPARE(IPRINT(165),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(176),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(176),IZERO,1).NE.0) GO TO 99
      IF(ICOMPARE(IPRINT(245),IBL,1).EQ.0) GO TO 9999
      DO11 J=258,269
      IF(ICOMPARE(IPRINT(J),IBL,1).EQ.0) GO TO 9999
   11 CONTINUE
   99 CONTINUE
      PRINT 18,(IPRINT(J),J=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,2X,4A1,2X,2A1,1X,3A1,1X,2A1,1X,2A1,1X,A1,2X,2A1,1X,
     *2A1,
     * 3X,2A1,2X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,3X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,1X,4A1,1X,4A1)
      WRITE(13)IPRINT
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 9999
      GO TO 2000
   19 END FILE 13
      RETURN
      END
```

```
      SUBROUTINE LIST5(NOW)
C*****THIS PROGRAM LISTS INCOMPLETE CARD FOURS
      DATA IBL/4H    /
      LOGICAL*1 IPRINT
      DIMENSION NOW(2),IPRINT(320)
      REWIND 11
 2000 LINE=0
      PRINT 88, NOW
   88 FORMAT(1H1,T30,'INCOMPLETE CARD FOURS',T90,'DATE ',2A4)
      PRINT 17
   17 FORMAT('0',T2,'EXP',1X,'ISOLATE',1X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-3',2X,'AD-3B',1X,'DIL',1X,'HET',2X,'DIK'
     * ,6X,'TRIKARYON TESTS')
 9999 READ(11,END=19) IPRINT
      IF(ICOMPARE(IPRINT(85),IBL,1).EQ.0) GO TO 9999
      DO 1 J=96,112
      IF(ICOMPARE(IBL,IPRINT(J),1).EQ.0) GO TO 2
    1 CONTINUE
      GO TO 9999
    2 CONTINUE
      PRINT 18,(IPRINT(J),J=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,2X,4A1,2X,2A1,1X,3A1,1X,2A1,1X,2A1,1X,A1,2X,2A1,1X,
     *2A1,
     * 1X,2A1,1X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,3X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,1X,4A1,1X,4A1)
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 9999
      GO TO 2000
   19 RETURN
      END
```

```
      SUBROUTINE LIST6(NOW)
C*****THIS PROGRAM LISTS INCOMPLETE CARD FIVES
      DATA IBL/4H    /
      LOGICAL*1 IPRINT
      DIMENSION NOW(2),IPRINT(320)
      REWIND 11
 2000 LINE=0
      PRINT 88, NOW
   88 FORMAT(1H1,T30,'INCOMPLETE CARD FIVES',T90,'DATE ',2A4)
      PRINT 17
   17 FORMAT('0',T2,'EXP',1X,'ISOLATE',1X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-3',2X,'AD-3P',1X,'DIL',1X,'HET',2X,'DIK'
     * ,6X,'TRIKARYON TESTS')
 9999 READ(11,END=19) IPRINT
      IF(ICOMPARE(IPRINT(165),IBL,1).EQ.0) GO TO 9999
      IF(ICOMPARE(IPRINT(176),IBL,1).EQ.0) GO TO 2
      GO TO 9999
    2 CONTINUE
      PRINT 18,(IPRINT(J),J=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,2X,4A1,2X,2A1,1X,3A1,1X,2A1,1X,2A1,1X,A1,2X,2A1,1X,
     *2A1,
     * 1X,2A1,1X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,3X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,1X,4A1,1X,4A1)
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 9999
      GO TO 2000
   19 RETURN
      END
```

```
      SUBROUTINE LIST7(NOW)
C*****THIS PROGRAM LISTS INCOMPLETE CARD SIXES
      DATA N2/4H2   /
      DATA N0,N1,N3,N8/4H0   ,4H1   ,4H3   ,4H8   /
      DATA IBL/4H    /
      LOGICAL*1 IPRINT
      DIMENSION NOW(2),IPRINT(320)
      REWIND 11
 2000 LINE=0
      PRINT 88, NOW
   88 FORMAT(1H1,T30,'INCOMPLETE CARD SIXES',T90,'DATE ',2A4)
      PRINT 87
   87 FORMAT('0',T2,'EYD',1X,'ISOLATE',1X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-3',2X,'AD-3B',1X,'DIL',1X,'HET',2X,'DIK'
     * ,6X,'TRIKARYON TESTS')
 9999 READ(11,END=19) IPRINT
      IF(ICOMPARE(IBL,IPRINT(245),1).EQ.0) GO TO 9999
      DO 1 J=258,269
      IF(ICOMPARE(IBL,IPRINT(  J),1).EQ.0) GO TO 2
    1 CONTINUE
      IF(ICOMPARE(IPRINT(258),N2,1).NE.0) GO TO 2
      IF(ICOMPARE(IPRINT(259),N0,1).NE.0) GO TO 2
      IF(ICOMPARE(IPRINT(260),N8,1).NE.0) GO TO 2
      IF(ICOMPARE(IPRINT(262),N0,1).NE.0) GO TO 2
      IF(ICOMPARE(IPRINT(263),N2,1).NE.0) GO TO 2
      IF(ICOMPARE(IPRINT(264),N1,1).NE.0) GO TO 2
      IF(ICOMPARE(IPRINT(266),N0,1).NE.0) GO TO 2
      IF(ICOMPARE(IPRINT(267),N2,1).NE.0) GO TO 2
      IF(ICOMPARE(IPRINT(268),N8,1).NE.0) GO TO 2
      GO TO 9999
    2 CONTINUE
      PRINT 18,(IPRINT(J),J=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,3X,4A1,4X,2A1,1X,2A1,1X,2A1,2X,A1,2X,2A1,1X,2A1,
     * 2X,2A1,1X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,2X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,1X,4A1,1X,4A1)
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 9999
      GO TO 2000
   19 RETURN
      END
```

```
      SUBROUTINE CONSIS(I)
C**** THIS PROGRAM CHECKS CONSISTENCY OF COMPLETELY TESTED MUTANTS
C**** COMPLETED MUTANTS ARE ON UNIT 13
      DIMENSION I(5),IC(10),IPRINT(80)
      INTEGER AD3,AD3B,COMP1,COMP2,DIK,T1,T2,T3,TRI
      REWIND 13
      REWIND 14
      DO 1 J=1,5
    1 I(J)=0
    2 READ(13,END=99) IPRINT
      DECODE(280,80,IPRINT(1)) IC,AD3,AD3B,DIK,T1,T2,T3
   80 FORMAT(97X,10I1,I2,I3,63X,I3,84X,I1,3X,I1,3X,I1)
      DO 3 J=1,10
      IF(IC(J).EQ.0) GO TO 3
      IC(J)=1
    3 CONTINUE
      COMP1=IC(5)+10*IC(4)+100*IC(3)+1000*IC(2)+10000*IC(1)
      COMP2=IC(10)+10*IC(9)+100*IC(8)+1000*IC(7)+10000*IC(6)
      TRI=T3+10*T2+100*T1
C*****IS COMPLEMENTATION TEST INCONSISTENT WITH AD3 TYPE
      IF(AD3.NE.0) GO TO 4
      IF(COMP2.EQ.01110) GO TO 9
      IF(IC(10).NE.1) GO TO 991
      IF(IC(6).NE.1)  GO TO 991
      GO TO 9
    4 IF(AD3.NE.1) GO TO 5
      IF(COMP2.EQ.10110) GO TO 9
      IF(IC(10).NE.1) GO TO 991
      IF(IC(7).NE.1)  GO TO 991
      GO TO 9
    5 IF(AD3.NE.2) GO TO 6
      IF(COMP2.EQ.00110) GO TO 9
      GO TO 991
    6 IF(AD3.NE.3) GO TO 7
      IF(COMP2.EQ.11110) GO TO 9
      IF(COMP2.EQ.11110) GO TO 9
      GO TO 991
    7 IF(AD3.NE.4) GO TO 8
      IF(COMP2.EQ.00010) GO TO 9
      GO TO 992
    8 IF(AD3.NE.5) GO TO 9
      IF(COMP2.EQ.10010) GO TO 9
      IF(IC(10).NE.1) GO TO 991
      IF(AD3B.NE.100) GO TO 995
      IF(TRI.NE.444) GO TO 995
      IF(DIK.NE.0) GO TO 994
      GO TO 32
C*****IS AD-3B INCONSISTENT WITH AD-3 TYPE
    9 IF(AD3.NE.0) GO TO 10
      IF(AD3B.NE.0) GO TO 992
      GO TO 15
   10 IF(AD3.NE.2) GO TO 11
      IF(AD3B.NE.1) GO TO 992
      GO TO 15
   11 IF(AD3.NE.3) GO TO 12
      IF(AD3B.NE.0) GO TO 992
      GO TO 15
   12 IF(AD3.NE.4) GO TO 13
      IF(AD3B.NE.1) GO TO 992
      GO TO 15
```

```
   13 IF(AD3.NE.5) GO TO 14
      IF(AD3B.NE.1) GO TO 992
      GO TO 15
   14 IF(AD3.NE.6) GO TO 15
      IF(AD3B.NE.0) GO TO 992
C*****DOES AD3B TYPE AGREE WITH COMPLEMENTATION TESTS
   15 IF(COMP1.NE.0) GO TO 16
      IF(AD3B.NE.1) GO TO 993
      GO TO 21
   16 IF(COMP1.NE.111) GO TO 17
      GO TO 19
   17 IF(COMP1.NE.11) GO TO 18
      GO TO 19
   18 IF(COMP1.NE.1) GO TO 20
   19 IF(AD3B.NE.10) GO TO 993
      GO TO 21
   20 IF(AD3B.NE.000) GO TO 212
      IF(COMP1.NE.11111) GO TO 993
      GO TO 21
  212 IF(AD3B.NE.100) GO TO 993
C**** DOES DIKARYON AGREE WITH AD3 TYPE
   21 IF(AD3.EQ.2) GO TO 22
      IF(AD3.EQ.4) GO TO 22
      IF(AD3.EQ.5) GO TO 22
      GO TO 23
   22 IF(DIK.NE.0) GO TO 994
C*****DOES TRIKARYON TEST AGREE WITH AD-3 AND/OR AD-3B TYPE
   23 IF(TRI.EQ.0) GO TO 24
      IF(TRI.EQ.20) GO TO 25
      IF(TRI.EQ.2) GO TO 26
      IF(TRI.EQ.22) GO TO 26
      IF(TRI.EQ.222) GO TO 26
      IF(TRI.EQ.040) GO TO 28
      IF(TRI.EQ.042) GO TO 29
      IF(TRI.EQ.242) GO TO 29
      IF(TRI.EQ.4)   GO TO 31
      IF(TRI.EQ.24)  GO TO 31
      IF(TRI.EQ.224) GO TO 31
      IF(TRI.NE.444) GO TO 995
      IF(AD3.NE.3) GO TO 995
      IF(AD3B.EQ.0) GO TO 32
      GO TO 995
   24 IF(DIK.NE.0) GO TO 32
   25 IF(AD3B.NE.1) GO TO 995
      IF(AD3.EQ.2) GO TO 32
      IF(AD3.NE.4) GO TO 995
      GO TO 32
   26 IF(AD3B.EQ.1) GO TO 27
      IF(AD3B.EQ.10)GO TO 27
      IF(AD3B.NE.100)GO TO 995
   27 IF(AD3.EQ.2) GO TO 32
      IF(AD3.NE.4) GO TO 995
      GO TO 32
   28 IF(AD3B.NE.1) GO TO 995
      IF(AD3.EQ.1)  GO TO 32
      IF(AD3.NE.5)  GO TO 995
      GO TO 32
   29 IF(AD3B.EQ.1) GO TO 30
      IF(AD3B.EQ.10)GO TO 30
      IF(AD3B.EQ.100)GO TO 30
      GO TO 995
   30 IF(AD3.EQ.1) GO TO 32
```

```
      IF(AD3.NE.5) GO TO 995
      GO TO 32
   31 IF(AD3B.NE.0) GO TO 995
      IF(AD3.EQ.0) GO TO 32
      IF(AD3.NE.6) GO TO 995
   32 GO TO 2
  991 I(1)=I(1)+1
      IPRINT(80)=4H    1
      GO TO 999
  992 I(2)=I(2)+1
      IPRINT(80)=4H    2
      GO TO 999
  993 I(3)=I(3)+1
      IPRINT(80)=4H    3
      GO TO 999
  994 I(4)=I(4)+1
      IPRINT(80)=4H    4
      GO TO 999
  995 I(5)=I(5)+1
      IPRINT(80)=4H    5
  999 WRITE(14) IPRINT
      GO TO 2
   99 END FILE 14
      RETURN
      END
```

```
      SUBROUTINE LIST8(I,NOW)
      LOGICAL*1 IPRINT
      DIMENSION I(5),NOW(2),IPRINT(320)
      DO 100 J=1,5
      IF(I(J).EQ.0) GO TO 100
      REWIND 14
   44 LINE=0
      GO TO (1,2,3,4,5) J
    1 PRINT 6,NOW
    6 FORMAT(1H1,T30,'COMPLEMENTATION TEST INCONSISTENT WITH AD-3 TYPE',
     * T90,'DATE ',2A4)
      GO TO 11
    2 PRINT 7,NOW
    7 FORMAT(1H1,T30,'AD-3B TYPE INCONSISTENT WITH AD-3 TYPE',
     * T90,'DATE ',2A4)
      GO TO 11
    3 PRINT 8,NOW
    8 FORMAT(1H1,T30,'COMPLEMENTATION TEST INCONSISTENT WITH AD-3B TYPE'
     *,T90,'DATE ',2A4)
      GO TO 11
    4 PRINT 9,NOW
    9 FORMAT(1H1,T30,'DIKARYON TEST INCONSISTENT WITH AD-3 TYPE',
     * T90,'DATE ',2A4)
      GO TO 11
    5 PRINT 10,NOW
   10 FORMAT(1H1,T30,'TRIKARYON TEST INCONSISTENT WITH AD-3 AND/OR AD-3B
     * TYPE',
     * T90,'DATE ',2A4)
   11 PRINT 17
   17 FORMAT('0',T2,'EXP',1X,'ISOLATE',1X,'STOCK NO  M C'  ,3X,
     * 'PLATING',5X,'L',2X,'IN',2X,'TEST',1X,'COMPLEMENTATION',2X,
     * 'AD-3',2X,'AD-3B',1X,'DIL',1X,'HET',2X,'DIK'
     * ,6X,'TRIKARYON TESTS')
   33 READ(14,END=100) IPRINT
      DECODE(4,1111,IPRINT(320)) K
 1111 FORMAT(I1)
      IF(K.NE.J) GO TO 33
      PRINT 18,(IPRINT(K),K=9,15),IPRINT(38),IPRINT(39),
     *(IPRINT(N),N=41,45),IPRINT(16),IPRINT(17),
     *(IPRINT(L),L=27,37),(IPRINT(M),M=96,116),
     * IPRINT(176),(IPRINT(JK),JK=258,277)
   18 FORMAT('0',3A1,2X,4A1,2X,2A1,1X,3A1,1X,2A1,1X,2A1,1X,A1,2X,2A1,1X,
     *2A1,
     * 1X,2A1,1X,2A1,2X,A1,3X,A1,3X,2A1,4X,10A1,6X,2A1,3X,A1,1X,A1,
     * 1X,A1,2X,A1,2X,3A1,3X,A1,6X,3A1,' ',A1,1X,3A1,' ',A1,1X,3A1,' ',
     * A1,3X,4A1,1X,4A1)
      LINE=LINE+1
      IF(LINE.LT.29) GO TO 33
      GO TO 44
  100 CONTINUE
      NT=I(1)+I(2)+I(3)+I(4)+I(5)
      PRINT 200,NT,NOW
  200 FORMAT(1H1,'END OF CONSISTENCY TEST WITH',I5,' ERRORS',T90,'DATE '
     *,2A4)
      RETURN
      END
```

```
      SUBROUTINE TALLY(MOM,NOW)
C**** THIS PROGRAM TALLIES MUTANTS WITHIN EACH TREATMENT
C**** TALLY CONTROL CARDS ARE ON  UNIT 15
C**** TALLY IS WRITTEN ON UNIT 14
C**** COMPLETED MUTANTS ARE ON UNIT 13
      LOGICAL*1 IPRINT
      INTEGER AD3,AD3B,DIK,T1,T2,T3,TRI
      DIMENSION NOW(2)
      DIMENSION IAD3B(3),ITRI(3)
      DIMENSION MOM(5),LIST(1000),IPRINT(320)
      REWIND 15
      REWIND 14
      NT=MOM(1)+MOM(2)+MOM(3)+MOM(4)+MOM(5)
    1 READ(15,END=999)IA,ID,IT,XS,IS1,IS2,DS,FREQ
      N=0
      REWIND 13
    2 READ(13,END=3) IPRINT
      DECODE(320,14,IPRINT(1))IE,ISOL,AD3,AD3B,DIK,T1,T2,T3
   14 FORMAT(8X,I3,I4,92X,I2,I3,T161,15X,I1,84X,I1,3X,I1,3X,I1)
      IF(IE.NE.IA) GO TO 2
      IF(ISOL.LT.IS1) GO TO 2
      IF(ISOL.GT.IS2) GO TO 3
      N=N+1
      IF(DIK.NE.0) DIK=1
      TRI=T3+10*T2+100*T1
      LIST(N)=TRI+ 1000*DIK+   10000*AD3B+   10000000*AD3
      GO TO 2
    3 J=1
      IF(N.EQ.0) GO TO 1
    5 DO 4 I=J,N
      IF(LIST(I).GE.LIST(J)) GO TO 4
      L=LIST(J)
      LIST(J)=LIST(I)
      LIST(I)=L
    4 CONTINUE
      J=J+1
      IF(J.LT.N) GO TO 5
      PRINT 88,IA,IS1,IS2,ID,IT,XS,NOW
   88 FORMAT(1H1,'EXPERIMENT',I5,5X,'ISOLATES',I5,' TO',I5,5X,'DESIGN=',
     *I5,5X,'TREATMENT=',I3,5X,'DOSE=',F10.4,T118,'DATE ',2A4)
  100 FORMAT(1H0,T11,I2,T16,3I2,T26,I1,T30,3I3,T42,I4,6X,3F8.5,2X,3E17.8
     *)
  300 FORMAT(1H0,T11,I2,T16,3I2,T26,I1,        T42,I4,6X,3F8.5,2X,3E17.8
     *)
      PRINT 99
   99 FORMAT(1H0,T10,'AD-3',3X,'AD-3B',3X,'DIK',3X,'TRIKARYON',4X,'N',
     * 6X,'FRACTION',7X,'LIMITS',11X,'FREQUENCY',18X,'LIMITS')
      I=1
    7 NUM=0
      IND=LIST(I)
      DO 6 J=I,N
      IF(LIST(J).NE.IND) GO TO 8
      I=I+1
      NUM=NUM+1
    6 CONTINUE
    8 AD3=IND/10000000
      AD3B=IND/10000
      DIK=IND/1000
      TRI=IND-1000*DIK
      DIK=DIK-10*AD3B
```

```
      AD3B=AD3B-1000*AD3
      X=N
      XX=NUM
      F=XX/X
      CALL BICONF(XX,X,P1,P2)
      FR=F*FREQ
      CALL PCIS(XX,FR,XL,XU)
      IAD3B(1)=AD3B/100
      IAD3B(2)=AD3B/10 -10*IAD3B(1)
      IAD3B(3)=AD3B-100*IAD3B(1)-10*IAD3B(2)
      ITRI(1)=TRI/100
      ITRI(2)=TRI/10-10*ITRI(1)
      ITRI(3)=TRI-100*ITRI(1)-10*ITRI(2)
      IF(DIK.NE.0) GO TO 200
  500 CONTINUE
      PRINT 100,AD3,IAD3B,DIK,ITRI,NUM,F,P1,P2,FR,XL,XU
      GO TO 400
  200 CONTINUE
      IF(TRI.NE.0) GO TO 500
      PRINT 300,AD3,IAD3B,DIK,      NUM,F,P1,P2,FR,XL,XU
  400 CONTINUE
      WRITE(14) INC,NUM,F,FR,IS1,IS2,IA,DS,XX,X,XS,ID,IT
      IF(I.LE.N) GO TO 700
      PRINT 600,X
  600 FORMAT(    '0',T90,'TOTAL MUTANTS ='F7.0)
      7X=DS-X
      PRINT 650,7X
  650 FORMAT('0',T90,'OTHER MUTANTS ='F7.0)
      PRINT 660,FREQ
  660 FORMAT('0',T90,'TOTAL FREQUENCY'E18.8)
      GO TO 1
  700 CONTINUE
      I=J
      GO TO 7
  999 END FILE 14
      RETURN
      END
```

```
      SUBROUTINE SORT(IPUT,IGET,IPUL,XLOV,XHAT,XBAT,XBIX,Q1,M1,M2,M)
C**** THIS PROGRAM SORTS MUTANTS ACCORDING TO TYPE FOR TALLY
      REAL IGET,I2
      DIMENSION Q1(1),M1(1),M2(1)
      DIMENSION IPUT(1),IGET(1),IPUL(1),XLOV(1),XHAT(1)
      DIMENSION XBAT(1),XBIX(1)
      I=1
    1 L=IPUT(I)
      DO 2 J=I,M
      IF(IPUT(J).GE.L) GO TO 2
      I1=IPUT(J)
      I2=IGET(J)
      I3=IPUL(J)
      X1=XLOV(J)
      S1=XHAT(J)
      T1=XBAT(J)
      U1=XBIX(J)
      K2=M1(J)
      K3=M2(J)
      XX=Q1(J)
      IPUT(J)=L
      IGET(J)=IGET(I)
      IPUL(J)=IPUL(I)
      XLOV(J)=XLOV(I)
      XHAT(J)=XHAT(I)
      XBAT(J)=XBAT(I)
      XBIX(J)=XBIX(I)
      M1(J)=M1(I)
      M2(J)=M2(I)
      Q1(J)=Q1(I)
      IPUT(I)=I1
      IGET(I)=I2
      IPUL(I)=I3
      XLOV(I)=X1
      XHAT(I)=S1
      XBAT(I)=T1
      XBIX(I)=U1
      M1(I)=K2
      M2(I)=K3
      Q1(I)=XX
      L=I1
    2 CONTINUE
      I=I+1
      IF(I.LT.M) GO TO 1
      RETURN
      END
```

```
      SUBROUTINE SUMMRY(NOW)
C**** READS SUMMRY CARDS ON UNIT 16
C**** READS TALLY OUTPUT ON UNIT 14
C**** PRINTS TOTAL FREQUENCIES FOR EACH TYPE OF SUMMARY PER TREATMENT
      INTEGER SW2
      REAL IGET
      DIMENSION XRAT(200),XBIX(200)
      DIMENSION NOW(2),LIST(35),IPUT(200),IPUL(200),IGET(200)
      DIMENSION X1(200),L1(200),L2(200),XLOV(200),XHAT(200),MIST(35)
      SW1=0
      REWIND 14
      REWIND 16
      READ(16,END=99) IN,LIND,LIST,IS
  200 PRINT 2,IN,LIST,NOW
    2 FORMAT('1',I2,T20,16A4,T90,'DATE ',2A4//)
      PRINT 22
   22 FORMAT(1H0,T59,'ISOLATES',T78,'TYPE',T91,'FRACTION',T103,
     * 'FREQUENCY')
      REWIND 17
      I=0
      S1=0.
      SUM=0.
      TN=0.
      TM=0.
    3 READ(14,END=7) IND,NUM,F,FR,IS1,IS2,IE,XS,XM,XP,XA,IO,IR
      IS2=IS2+10000*IS1
      I1=IND/100000000
      I2=IND/10000
      I3=IND/1000
      I4=IND-1000*I3
      I5=I2-1000*I1
      I6=I3-10*I2
      IND=I5+1000*I4+1000000*I6+10000000*I1
      IF(IS.EQ.0) IND=IND/1000
      IF(IND.NE.LIND)GO TO 3
      IDO=IS1
      ID=IS2
      J1=I5
      J2=I4
      J3=I6
      J4=I1
      XX=XS
   30 SUM=FR
      S1=F
      TN=XM
      TM=XP
    4 READ(14,END=6) IND,NUM,F,FR, N1, N2,IE,XS,XZ,XO,XB,LO,LR
      N2=N2+10000*N1
      I1=IND/100000000
      I2=IND/10000
      I3=IND/1000
      I4=IND-1000*I3
      I5=I2-1000*I1
      I6=I3-10*I2
      IND=I5+1000*I4+1000000*I6+10000000*I1
      IF(IS.EQ.0) IND=IND/1000
      IF(IND.NE.LIND) GO TO 4
      IF(N2.NE.ID) GO TO 5
      IF(N1.NE.IDO) GO TO 5
      SUM=SUM+FR
```

```
      S1=S1+F
      TN=TN+XZ
      GO TO 4
    5 I=I+1
      X1(I)=XA
      L1(I)=IQ
      L2(I)=IR
      IPUL(I)=IDO
      IPUT(I)=ID
      IGET(I)=SUM
      XLOV(I)=S1
      XHAT(I)=XX
      XBAT(I)=TN
      XBIX(I)=TM
      J21=J2/100
      J22=(J2-100*J21)/10
      J23=J2-100*J21-10*J22
      J11=J1/100
      J12=(J1-100*J11)/10
      J13=J1-100*J11-10*J12
      IV=ID/10000
      IW=ID-10000*IV
      IF(IS.EQ.0) GO TO 889
      PRINT 888,IDO,IW,J4,J3,J21,J22,J23,J11,J12,J13,S1,SUM
  888 FORMAT(1H0,T55,I5,5X,I5,5X,8I2,F8.5,2X,E16.8)
      GO TO 900
  889 PRINT 999,IDO,IW,J4,J3,J21,J22,J23,S1,SUM
  999 FORMAT(1H0,T55,I5,5X,I5,5X,5I2,6X,F8.5,2X,E16.8)
  900 CONTINUE
      J1=I5
      J2=I4
      J3=I6
      J4=I1
      IDO=N1
      ID=N2
      XX=XS
      XM=X7
      XR=XQ
      XA=XB
      IQ=LQ
      IR=LR
      GO TO 30
    6 I=I+1
      X1(I)=XA
      L1(I)=IQ
      L2(I)=IR
      IPUL(I)=IDO
      IPUT(I)=ID
      IGET(I)=SUM
      XLOV(I)=S1
      XHAT(I)=XX
      XBAT(I)=TN
      XBIX(I)=TM
      J21=J2/100
      J22=(J2-100*J21)/10
      J23=J2-100*J21-10*J22
      J11=J1/100
      J12=(J1-100*J11)/10
      J13=J1-100*J11-10*J12
      IV=ID/10000
      IW=ID-10000*IV
      IF(IS.EQ.0) GO TO 989
```

```
      PRINT 888,IDO,IW,J4,J3,J21,J22,J23,J11,J12,J13,S1,SUM
      GO TO 909
  989 PRINT 999,IDO,IW,J4,J3,J21,J22,J23,S1,SUM
  909 CONTINUE
   13 FORMAT(//,'0',T4,'EXP  DES.  TRT. DOSE  N1   N2   NT  ',T40,
     *'FRACTION   LOW  LIM. UPPER LIM.   FREQUENCY',T93,'LOW LIM.',T109,
     *'UPPER LIM.')
    7 REWIND 14
      READ(16,END=10) ID,LIND,MIST,IS
      IF(ID.EQ.DN) GO TO 3
   88 IF(I.EQ.0) GO TO 3000
      PRINT 13
      CALL SORT(IPUT,ICET,IPUL,XLOV,XHAT,XBAT,XBIX,X1,L1,L2,I)
      N=I
      J=1
      ICT=0
  122 ID=IPUT(J)
      IDO=IPUL(J)
      FRACT=0.
      XN=XHAT(J)
      SUM=0.
      TN=0.
      TM=XBIX(J)
      IVY=L1(J)
      IQY=L2(J)
      XY7=X1(J)
   12 DO 8 I=J,N
      IF(IPUT(I).NE.ID) GO TO 11
      SUM=SUM+ICET(I)
      FRACT=FRACT+XLOV(I)
      TN=TN+XBAT(I)
      K=I
    8 CONTINUE
   11 CONTINUE
      CALL PICONF(TN,TM,XB,XC)
      CALL POIS(TN,SUM,XLOW,XUPP)
      PRINT 9,IE,IVY,IQY,XY7,TN,TM,XN,FRACT,XB,XC,SUM,XLOW,XUPP
    9 FORMAT(    '0',3I5,F7.0,3F5.0,3E10.5,3E18.8)
      IY7=XY7
      WRITE(52,15) IN,IE,IVY,IQY,IY7,TN,TM,XN,SUM,NOW
   15 FORMAT(I2,3I3,I7,3F5.0,E16.8,T73,2A4)
      WRITE(17) IE,IVY,IQY,XY7,SUM,XLOW,XUPP
      J=K+1
      IF(K.LT.N) GO TO 122
      END FILE 17
      IF(I.LT.3) GO TO 3000
      CALL REGR(NOW,LIST,IN)
 3000 CONTINUE
      IF(SW1.EQ.1) GO TO 99
      DO 14  I=1,15
   14 LIST(I)=MIST(I)
      IN=IO
      GO TO 200
   10 SW1=1
      GO TO 88
   99 RETURN
      END
```

```
      SUBROUTINE BICONF(TN,TM,P1,P2)
C**** COMPUTES BINOMIAL CONFIDENCE LIMITS TN=OBSERVED NUMBER OUT OF TM
C*****  P1=LOWER LIMIT, P2= UPPER LIMIT  95 PER CENT
      DATA E/.00017
      Q=TM+1.
      P1=TN/TM
      P5=P1
      IF(P1.LT.1.) GO TO 50
      P1=.99
   50 IF(TN.EQ.0.) GO TO 260
      P3=0.
      CT=1.
   90 X=TM*ALOG(1.-P1)
      Z=ALOG(P1)-ALOG(1.-P1)
      S=EXP(X)
      Y=1.
  110 IF(Y.GE.TN)     GO TO 170
      X=  X+Z+ALOG(Q-Y)-ALOG(Y)
      S=S+EXP(X)
      Y=Y+1.
      GO TO 110
  170 IF(ABS(S-.975).LT.E) GO TO 260
      IF(CT.GT.20.) GO TO 260
      IF(S-.975.LT.0.) GO TO 240
      P3=P1
      P1=(P3+P5)/2.
      CT=CT+1.
      GO TO 90
  240 P5=P1
      P1=(P3+P5)/2.
      CT=CT+1.
      GO TO 90
  260 P2=TN/TM
      P5=P2
      IF(P2.GT.0.) GO TO 280
      P2=.01
  280 IF(TN.EQ.TM) GO TO 440
      P3=1.
      CT=1.
  290 X=TM*ALOG(P2)
      S=EXP(X)
      Z=ALOG(1.-P2)-ALOG(P2)
      Y=1.
  310 IF(Y.GE.TM-TN) GO TO 365
      X=  X+Z+ALOG(Q-Y)-ALOG(Y)
      S=S+EXP(X)
      Y=Y+1.
      GO TO 310
  365 IF(ABS(S-.975).LT.E) GO TO 440
      IF(CT.GT.20.) GO TO 440
      IF(S-.975.GT.0.) GO TO 420
      P5=P2
      P2=(P5+P3)/2.
      CT=CT+1.
      GO TO 290
  420 P3=P2
      P2=(P5+P3)/2.
      CT=CT+1.
      GO TO 290
  440 RETURN

      END
```

```
      SUBROUTINE POIS(XX,FR,XL,XU)
C**** COMPUTES POISSON CONFIDENCE LIMITS FOR NON-ZERO FREQUENCY(FR).
C****   WHEN XX IS OBSERVED NUMBER.
      DIMENSION A(200),B(100),A1(200),B1(100)
      EQUIVALENCE (A(101),B(1)),
     *            (A1(101),B1(1))
      DATA A/ 00000, 0.051, 0.355, 0.818, 1.366, 1.970, 2.613, 3.285,
     *        3.285, 4.460, 5.323, 5.323, 6.686, 6.686, 8.102, 8.102,
     *        9.598, 9.598,11.177,11.177,12.817,12.817,13.765,14.921,
     *       14.921,16.768,16.770,17.630,19.050,19.050,20.330,22.360,
     *       22.360,22.940,23.760,23.760,25.400,26.310,26.310,27.730,
     *       28.970,28.970,30.020,31.670,31.670,32.280,34.050,34.660,
     *       34.660,36.030,37.670,37.670,38.160,39.760,40.940,40.940,
     *       41.750,43.450,44.260,44.260,45.280,47.020,47.690,47.690,
     *       48.740,50.420,51.290,51.290,52.150,53.720,54.990,54.990,
     *       55.510,56.990,58.720,58.720,58.840,60.240,61.900,62.810,
     *       62.810,63.490,64.950,66.760,66.760,66.760,68.100,69.620,
     *       71.090,71.090,71.280,72.660,74.220,75.490,75.490,75.780,
     *       77.160,78.730,79.980,79.980/
      DATA B/ 80.25, 81.61, 83.14, 84.57, 84.57, 84.67, 86.01, 87.48,
     *        89.23, 89.23, 89.23, 90.37, 91.78, 93.48, 94.23, 94.23,
     *        94.70, 96.06, 97.54, 99.17, 99.17, 99.17,100.32,101.71,
     *       103.31,104.40,104.40,104.58,105.90,107.32,109.11,109.61,
     *       109.61,110.11,111.44,112.87,114.84,114.84,114.84,115.60,
     *       116.93,118.35,120.36,120.36,120.36,121.06,122.37,123.77,
     *       125.46,126.26,126.26,126.48,127.78,129.14,130.68,132.03,
     *       132.03,132.03,133.14,134.48,135.92,137.79,137.79,137.79,
     *       138.49,139.79,141.16,142.70,144.01,144.01,144.01,145.08,
     *       146.39,147.80,149.53,150.19,150.19,150.36,151.63,152.96,
     *       154.39,156.32,156.32,156.32,156.87,158.15,159.48,160.92,
     *       162.79,162.79,162.79,163.35,164.63,165.96,167.39,169.33,
     *       169.33,169.33,169.80,171.07/
      DATA A1/ 3.285, 5.323, 6.686, 8.102, 9.598,11.177,12.817,13.765,
     *        14.921,16.768,17.633,19.050,20.335,21.364,22.945,23.762,
     *        25.400,26.306,27.735,28.966,30.017,31.675,32.277,34.048,
     *        34.665,36.030,37.670,38.160,39.760,40.940,41.750,43.450,
     *        44.260,45.280,47.020,47.690,48.740,50.420,51.290,52.150,
     *        53.720,54.990,55.510,56.990,58.720,58.840,60.240,61.900,
     *        62.810,63.490,64.950,66.760,66.760,68.100,69.620,71.090,
     *        71.280,72.660,74.220,75.490,75.780,77.160,78.730,79.980,
     *        80.250,81.610,83.140,84.570,84.670,86.010,87.480,89.230,
     *        89.230,90.370,91.780,93.480,94.230,94.700,96.060,97.540,
     *        99.170,99.170,100.32,101.71,103.31,104.40,104.58,105.90,
     *        107.32,109.11,109.61,110.11,111.44,112.87,114.84,114.84,
     *        115.60,116.93,118.35,120.36/
      DATA B1/ 120.36,121.06,122.37,123.77,125.46,126.26,126.48,127.78,
     *         129.14,130.68,132.03,132.03,133.14,134.48,135.92,137.79,
     *         137.79,138.49,139.79,141.16,142.70,144.01,144.01,145.08,
     *         146.39,147.80,149.53,150.19,150.36,151.63,152.96,154.39,
     *         156.32,156.32,156.87,158.15,159.48,160.92,162.79,162.79,
     *         163.35,164.63,165.96,167.39,169.33,169.33,169.80,171.07,
     *         172.38,173.79,175.48,176.23,176.23,177.48,178.77,180.14,
     *         181.67,183.05,183.05,183.86,185.13,186.46,187.89,189.83,
     *         189.83,190.21,191.46,192.76,194.11,195.63,197.09,197.09,
     *         197.78,199.04,200.35,201.73,203.35,204.36,204.36,205.31,
     *         206.58,207.90,209.30,211.03,211.69,211.69,212.82,214.09,
     *         215.40,216.81,218.56,219.16,219.16,220.29,221.56,222.86,
     *         224.26,225.90,226.81,226.81/
      DEN=XX/FR
      NUM=XX+1.
```

```
      IF(NUM.GT.200) GO TO 1
      XL=A(NUM)/DEN
      XU=A1(NUM)/DEN
      GO TO 2
    1 XL=FR-1.96*SQRT(XX)/DEN
      XU=FR+1.96*SQRT(XX)/DEN
    2 RETURN
      END
```

```
      SUBROUTINE REGR(NOW,LIST,IN)
C**** PROGRAM TO PRINT AND PLOT LOG-LOG REGRESSION ANALYSIS FOR
C****  EACH SUMMARY; USES EZPLOT PACKAGE FOR CALCOMP PLOTTER.
      INTEGER TITLE
      DIMENSION E(50),JCHAR(3),TITLE(19)
      DIMENSION NOW(2),LIST(15),A(50),B(50),C(50),X(50)
      DIMENSION LAMB(3)
      DATA JCHAR/5,24,24/
      ISW=0
      CALL ARRANG
      REWIND 17
    1 READ(17,END=999) IE,IVY,IQY,XYZ,SUM,XLOW,XUPP
  998 IF(XYZ.EQ.0.) GO TO 1
      I=1
   99 X(I)=XYZ
      A(I)=SUM
      B(I)=XLOW
      C(I)=XUPP
    2 READ(17,END=10) IX,IZY,IPY,XYZ,SUM,XLOW,XUPP
      IF(IX.NE.IE) GO TO 3
      IF(IZY.NE.IVY) GO TO 3
      IF(XYZ.EQ.0.) GO TO 2
      IF(SUM.EQ.0.) GO TO 2
      I=I+1
      GO TO 99
    3 IF(I.LT.3) GO TO 988
      CALL STAT(X,A,SL,CL,SENS,F,SE,I)
   98 PRINT 5,IE,IN,LIST,NOW
    5 FORMAT('1','EXPERIMENT',I5,5X,I3,5X,15A4,T100,'DATE',1X,2A4)
      PRINT 88,IVY
   88 FORMAT('0','DESIGN',I5)
      IJ=I-2
      PRINT 6,SL,CL,SENS,F,IJ,SE
    6 FORMAT(//,'0',T05,'SLOPE=',F10.5,' +-',F10.5,5X,'SENS=',E16.8,
     *5X,'F=',F10.5,5X,'DF=',I5,5X,'SE=',F10.5//)
      PRINT 8
      DO 7 J=1,I
      D=X(J)
      C=A(J)
      E(J)=SENS*D**SL
      PRINT 9,D,C,B(J),C(J),E(J)
    9 FORMAT('0',F9.0,T15,E16.8,T40,E16.8,T60,E16.8,T80,E16.8)
    8 FORMAT('0',2X,' DOSE',T18,'OBSERVED',T42,'LOWER LIMIT', T62,
     *'UPPER LIMIT',T84,'EXPECTED')
    7 CONTINUE
      CALL LLPLOT(-1,-3,X,JCHAR,.105,A,B,C)
      CALL GRCORD(X(1),E(1),XG,YG)
      CALL GRCORD(X(I),E(I),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
      DO 14 MP=1,I
      CALL GRCORD(X(MP),B(MP),XG,YG)
      CALL GRCORD(X(MP),C(MP),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
   14 CONTINUE
      CALL SYMBOL(5.5,.1,.14,4HDOSE,0.0,4)
      CALL SYMBOL(0.0,4.5,.14, 9HFREQUENCY,90.0,9)
      DO 11 M=1,15
   11 TITLE(M)=LIST(M)
```

```
      TITLE(16)=4HEXP
      ENCODE(10,12,TITLE(17))IE
      ENCODE(10,13,TITLE(18)) IVY
   12 FORMAT(I4)
      ENCODE(10,12,TITLE(19))IN
      CALL SYMBOL(1.5,10.6,.14,TITLE(1),0.0,76)
   13 FORMAT('-',I3)
      ENCODE(15,15,LAMB(1)) SL
   15 FORMAT('SLOPE=',F6.2)
      CALL SYMBOL(8.5,.1,.14,LAMB(1),0.0,12)
      CALL PLOT(13.0,.0,-3)
  988 IF(ISW.EQ.1) GO TO 999
      IE=IX
      IVY=IZY
      GO TO 998
   10 ISW=1
      IF(I.LT.3) GO TO 999
      GO TO 3
  999 RETURN
      END
```

```
      SUBROUTINE STAT(X,A,B1,F7,F8,F,F6,I)
C**** PROGRAM TO COMPUTE SIMPLE LOG-LOG REGRESSION
C****  X=X AXIS VALUES,A=Y AXIS,B1=SLOPE,F7=9.5 PC CONFIDENCE,
C****  F8=INTERCEPT(ANTILOG),F=F VALUE TO TEST NON-ZERO SLOPE,
C****  F6=STANDARD ERROR,I=NUMBER OF OBSERVATIONS
      DIMENSION X(1),A(1),Z(50),Q(50),T(30)
      DATA T/12.706,4.303,3.182,2.776,2.571,2.447,2.365,2.306,2.262,
     *2.228,2.201,2.179,2.160,2.145,2.131,2.120,2.110,2.101,2.093,2.086,
     *2.080,2.074,2.069,2.064,2.060,2.056,2.052,2.048,2.045,2.042/
      S1=0.
      S2=0.
      S3=0.
      S4=0.
      S5=0.
      S6=0.
      DO 1 J=1,I
      X1=ALOG(X(J))
      Y1=ALOG(A(J))
      S1=S1+X1
      S2=S2+Y1
      S3=S3+X1*X1
      S4=S4+Y1*Y1
    1 S5=S5+X1*Y1
      CT=I
      F1=S1/CT
      F2=S2/CT
      F3=S3-S1*F1
      F4=S4-S2*F2
      F5=S5-S2*F1
      E1=F4-(F5*F5)/F3
      F6=SQRT(E1/((CT-2.)*F3))
      B1=F5/F3
      J=I
      IF(I.GT.32) J=32
      F7=T(J-2)*F6
      F8=F2-B1*F1
      F8=EXP(F8)
      F=(F5*F5)*(CT-2.)/(F3*E1)
      RETURN
      END
```

```
      SUBROUTINE ARRANG
      DIMENSION L1(200),L2(200),L3(200),X1(200),X2(200),X3(200),X4(200)
      REWIND 17
      I=1
88    READ(17,END=99) L1(I),L2(I),L3(I),X1(I),X2(I),X3(I),X4(I)
      X1(I)=X1(I)+100000*L2(I)
      I=I+1
      GO TO 88
99    N=I-1
      L=1
77    D=X1(L)
      DO 1 J=L,N
      IF(X1(J).GE.D) GO TO 1
      M1=L1(L)
      M2=L2(L)
      M3=L3(L)
      Z1=X1(L)
      Z2=X2(L)
      Z3=X3(L)
      Z4=X4(L)
      L1(L)=L1(J)
      L2(L)=L2(J)
      L3(L)=L3(J)
      X1(L)=X1(J)
      X2(L)=X2(J)
      X3(L)=X3(J)
      X4(L)=X4(J)
      L1(J)=M1
      L2(J)=M2
      L3(J)=M3
      X1(J)=Z1
      X2(J)=Z2
      X3(J)=Z3
      X4(J)=Z4
      D=X1(L)
    1 CONTINUE
      L=L+1
      IF(L.LT.N) GO TO 77
      REWIND 17
      DO 4 I=1,N
      X1(I)=X1(I)-100000*L2(I)
      WRITE(17)L1(I),L2(I),L3(I),X1(I),X2(I),X3(I),X4(I)
    4 CONTINUE
      END FILE 17
      RETURN
      END
```

```
//FT63.FT50F001 DD *
/*
//LINK.SYSIN DD *



        HEX DECK FOR EZPLOT GOES HERE



/*
//GO.SORTLIB DD DSNAME=SYS1.SORTLIB,DISP=(OLD,KEEP)
//GO.SYSOUT    DD SYSOUT=A
//GO.SORTWK01    DD UNIT=2311,SPACE=(TRK,(300))
//GO.SORTWK02    DD UNIT=2311,SPACE=(TRK,(300))
//GO.SORTWK03    DD UNIT=2311,SPACE=(TRK,(300))
//GO.FT10F001 DD UNIT=2314,DCB=(RECFM=FB,LRECL=80,BLKSIZE 3520),       X
//             SPACE=(TRK,(300,30))
//GO.SORTIN DD VOLUME=REF=*.FT10F001,DSNAME=*.FT10F001,                X
//             DISP=(OLD,PASS)
//GO.SORTOUT DD VOLUME=REF=*.FT10F001,DSNAME=*.FT10F001,               X
//             DISP=(OLD,PASS)
//GO.FT11F001 DD UNIT=SYSDA,SPACE=(TRK,(300,30)),                      X
//             DCB=(RECFM=V,LRECL=320,BLKSIZE=3520)
//GO.FT13F001 DD UNIT=SYSDA,SPACE=(TRK,(300,30)),                      X
//             DCB=(RECFM=V,LRECL=320,BLKSIZE=3520)
//GO.FT14F001 DD UNIT=SYSDA,SPACE=(TRK,(300,30)),                      X
//             DCB=(RECFM=V,LRECL=320,BLKSIZE=3520)
```

```
//GO.FT15F001 DD UNIT=SYSDA,SPACE=(TRK,(300,30))
//GO.FT16F001 DD UNIT=SYSDA,SPACE=(TRK,(300,30))
//GO.FT17F001 DD UNIT=SYSDA,SPACE=(TRK,(300,30))
//GO.FT52F001 DD UNIT=SYSCP
//GO.PLOTTAPE DD UNIT=TAPE7,VOL=SER=25,LABEL=(,NL),DISP=O D
//GO.FT50F001 DD *
S01 0   1000            AD-3A(R)
S01 0   1224            AD-3A(R)
S02 0   0224            AD-3A(R)+RL
S03 0   0024            AD-3A(R)+RL(CL)
S03 0   0020            AD-3A(R)+RL(CL)
S04 2   0022            AD-3A(R) AD-3B(R)+RL
S04 2   0222            AD-3A(R) AD-3B(R)+RL
S05 2   1000            AD-3A(R) AD-3B(R)
S05 2   1222            AD-3A(R) AD-3B(R)
S06 2   0020            AD-3A(R) AD-3B(IR)
S07 4   0020            AD-3A(R) AD-3B(IR)NIC-2
S08 4   0222            AD-3A(R) AD-3B(R)NIC-2+RL
S08 4   0022            AD-3A(R) AD-3B(R)NIC-2+RL
S09 4   1000            AD-3A(R) AD-3B(R)NIC-2(R)
S09 4   1222            AD-3A(R) AD-3B(R)NIC-2(R)
S10 0   0004            SUM AD-3A(IR)(I+II)
S10 0   0000            SUM AD-3A(IR)(I+II)
S11 2   0000            SUM AD-3A(IR) AD-3B(IR)
S12 2   0002            AD-3A(IR) AD-3B(R)
S13 4   0002            AD-3A(IR) AD-3B(R)NIC-2
S14 4   0000            SUM AD-3A(IR) AD-3B(IR)NIC-2
S15 1   1000            AD-3B(R)
S15 1   1242            AD-3B(R)
S16 1   0242            AD-3B(R)+RL
S17 1   0042            AD-3B(R)+RL(CL)
```

S17 1	0002	AD-3B(R)+RL(CL)
S18 1	0040	SUM AD-3B(IR)(II+III)
S18 1	0000	SUM AD-3B(IR)(II+III)
S19 5	1000	AD-3B(R)NIC-2
S19 5	1242	AD-3B(R)NIC-2
S20 5	0242	AD-3B(R)NIC-2+RL
S21 5	0042	AD-3B(R)NIC-2+RL(CL)
S21 5	0002	AD-3B(R)NIC-2+RL(CL)
S22 5	0040	AD-3B(1R)NIC-2
S22 5	0000	AD-3B(1R)NIC-2
S23 3	1000	UNKNOWN
S23 3	0444	UNKNOWN
S24 0	1000	SUM AD-3A(R)
S24 0	1224	SUMAD-3AR
S24 0	0224	SUMAD-3AR
S24 0	0024	SUMAD-3AR
S24 0	0020	SUMAD-3AR
S24 2	0022	SUMAD-3AR
S24 2	0222	SUMAD-3AR
S24 2	1000	SUMAD-3AR
S24 2	1222	SUMAD-3AR
S24 2	0020	SUMAD-3AR
S24 4	0020	SUMAD-3AR
S24 4	0222	SUMAD-3AR
S24 4	0022	SUMAD-3AR
S24 4	1000	SUMAD-3AR
S24 4	1222	SUM AD-3A(R)
S25 0	0224	SUM AD-3A(R)+RL
S25 0	0024	SUMAD-3AR+RL
S25 0	0020	SUMAD-3AR+RL
S25 2	0022	SUMAD-3AR+RL

```
S25 2   0222          SUMAD-3AR+RL
S25 2   1000          SUMAD-3AR+RL
S25 2   1222          SUMAD-3AR+RL
S25 2   0020          SUMAD-3AR+RL
S25 4   0020          SUMAD-3AR+RL
S25 4   0222          SUMAD-3AR+RL
S25 4   0022          SUMAD-3AR+RL
S25 4   1000          SUMAD-3AR+RL
S25 4   1222          SUM AD-3A(R)+RL
S26 0   0024          SUM AD-3A(R)+RL(CL)
S26 0   0020          SUMAD-3AR+RL(CL)
S26 2   0022          SUMAD-3AR+RL(CL)
S26 2   0222          SUMAD-3AR+RL(CL)
S26 2   1000          SUMAD-3AR+RL(CL)
S26 2   1222          SUMAD-3AR+RL(CL)
S26 2   0020          SUMAD-3AR+RL(CL)
S26 4   0020          SUMAD-3AR+RL(CL)
S26 4   0222          SUMAD-3AR+RL(CL)
S26 4   0022          SUMAD-3AR+RL(CL)
S26 4   1000          SUMAD-3AR+RL(CL)
S26 4   1222          SUM AD-3A(R)+RL(CL)
S27 0   0004          SUM AD-3A(IR)(I+II,I+III,I+IV)
S27 0   0000          SUMAD-3A(IR)(I+II,I+III,I+IV)
S27 2   0000          SUMAD-3A(IR)(I+II,I+III,I+IV)
S27 2   0002          SUMAD-3A(IR)(I+II,I+III,I+IV)
S27 4   0002          SUMAD-3A(IR)(I+II,I+III,I+IV)
S27 4   0000          SUM AD-3A(IR)(I+II,I+III,I+IV)
S28 1   1000          SUM AD-3B(R)
S28 1   1242          SUMAD-3BR
S28 1   0242          SUMAD-3BR
S28 1   0042          SUMAD-3BR
```

S28 1	0002	SUMAD-3BR
S28 5	1000	SUMAD-3BR
S28 5	1242	SUMAD-3BR
S28 5	0242	SUMAD-3BR
S28 5	0042	SUMAD-3BR
S28 5	0002	SUMAD-3BR
S28 2	0022	SUMAD-3BR
S28 2	0222	SUMAD-3BR
S28 2	1000	SUMAD-3BR
S28 2	1222	SUMAD-3BR
S28 4	0222	SUMAD-3BR
S28 4	0022	SUMAD-3BR
S28 4	1000	SUMAD-3BR
S28 4	1222	SUMAD-3BR
S28 2	0002	SUMAD-3BR
S28 4	0002	SUM AD-3B(R)
S29 1	0242	SUM AD-3B(R)+RL
S29 1	0042	SUMAD-3BR+RL
S29 1	0002	SUMAD-3BR+RL
S29 5	1000	SUMAD-3BR+RL
S29 5	1242	SUMAD-3BR+RL
S29 5	0242	SUMAD-3BR+RL
S29 5	0042	SUMAD-3BR+RL
S29 5	0002	SUMAD-3BR+RL
S29 2	0022	SUMAD-3BR+RL
S29 2	0222	SUMAD-3BR+RL
S29 2	1000	SUMAD-3BR+RL
S29 2	1222	SUMAD-3BR+RL
S29 4	0222	SUMAD-3BR+RL
S29 4	0022	SUMAD-3BR+RL
S29 4	1000	SUMAD-3BR+RL

```
S29 4   1222          SUMAD-3BR+RL
S29 2   0002          SUMAD-3BR+RL
S29 4   0002          SUM AD-3B(R)+RL
S30 1   0042          SUM AD-3B(R)+RL(CL)
S30 1   0002          SUMAD-3BR+RL(CL)
S30 5   1000          SUMAD-3BR+RL(CL)
S30 5   1242          SUMAD-3BR+RL(CL)
S30 5   0242          SUMAD-3BR+RL(CL)
S30 5   0042          SUMAD-3BR+RL(CL)
S30 5   0002          SUMAD-3BR+RL(CL)
S30 2   0022          SUMAD-3BR+RL(CL)
S30 2   0222          SUMAD-3BR+RL(CL)
S30 2   1000          SUMAD-3BR+RL(CL)
S30 2   1222          SUMAD-3BR+RL(CL)
S30 4   0222          SUMAD-3BR+RL(CL)
S30 4   0022          SUMAD-3BR+RL(CL)
S30 4   1000          SUMAD-3BR+RL(CL)
S30 4   1222          SUMAD-3BR+RL(CL)
S30 2   0002          SUMAD-3BR+RL(CL)
S30 4   0002          SUM AD-3B(R)+RL(CL)
S31 1   0040          SUM AD-3B(IR)(II+III,II+IV,I+III I+IV)
S31 1   0000          SUMAD-3B(IR)(II+III,II+IV,I+III, +IV)
S31 5   0040          SUMAD-3B(IR)(II+III,II+IV,I+III, +IV)
S31 5   0000          SUMAD-3B(IR)(II+III,II+IV,I+III, +IV)
S31 2   0000          SUMAD-3B(IR)(II+III,II+IV,I+III, +IV)
S31 4   0000          SUMAD-3B(IR)(II+III,II+IV,I+III, +IV)
S31 2   0020          SUMAD-3B(IR)(II+III,II+IV,I+III, +IV)
S31 4   0020          SUM AD-3B(IR)(II+III,II+IV,I+III I+IV)
S32 2   0000          SUM AD-3A(IR) AD-3B(IR)(I+III,I+ V)
S32 4   0000          SUM AD-3A(IR) AD-3B(IR)(I+III,I+ V)
S33 10011000          AD-3B(R-NC)
```

S33 10011242	AD-3B(R-NC)
S33 10010242	AD-3B(R-NC)
S33 10010042	AD-3B(R-NC)
S33 10010002	AD-3B(R-NC)
S33 50011000	AD-3B(R-NC)
S33 50011242	AD-3B(R-NC)
S33 50010242	AD-3B(R-NC)
S33 50010042	AD-3B(R-NC)
S33 50010002	AD-3B(R-NC)
S33 20010022	AD-3B(R-NC)
S33 20010222	AD-3B(R-NC)
S33 20011000	AD-3B(R-NC)
S33 20011222	AD-3B(R-NC)
S33 40010222	AD-3B(R-NC)
S33 40010022	AD-3B(R-NC)
S33 40011000	AD-3B(R-NC)
S33 40011222	AD-3B(R-NC)
S33 20010002	AD-3B(R-NC)
S33 40010002	AD-3B(R-NC)
S34 10101000	AD-3B(R-P)
S34 10101242	AD-3B(R-P)
S34 10100242	AD-3B(R-P)
S34 10100042	AD-3B(R-P)
S34 10100002	AD-3B(R-P)
S34 50101000	AD-3B(R-P)
S34 50101242	AD-3B(R-P)
S34 50100242	AD-3B(R-P)
S34 50100042	AD-3B(R-P)
S34 50100002	AD-3B(R-P)
S34 20100022	AD-3B(R-P)
S34 20100222	AD-3B(R-P)

```
S34 20101000          AD-3B(R-P)
S34 20101222          AD-3B(R-P)
S34 40100222          AD-3B(R-P)
S34 40100022          AD-3B(R-P)
S34 40101000          AD-3B(R-P)
S34 40101222          AD-3B(R-P)
S34 20100002          AD-3B(R-P)
S34 40100002          AD-3B(R-P)
S35 11001000          AD-3B(R-NP)
S35 11001242          AD-3B(R-NP)
S35 11000242          AD-3B(R-NP)
S35 11000042          AD-3B(R-NP)
S35 11000002          AD-3B(R-NP)
S35 51001000          AD-3B(R-NP)
S35 51001242          AD-3B(R-NP)
S35 51000242          AD-3B(R-NP)
S35 51000042          AD-3B(R-NP)
S35 51000002          AD-3B(R-NP)
S35 21000022          AD-3B(R-NP)
S35 21000222          AD-3B(R-NP)
S35 21001000          AD-3B(R-NP)
S35 21001222          AD-3B(R-NP)
S35 41000222          AD-3B(R-NP)
S35 41000022          AD-3B(R-NP)
S35 41001000          AD-3B(R-NP)
S35 41001222          AD-3B(R-NP)
S35 21000002          AD-3B(R-NP)
S35 41000002          AD-3B(R-NP)
S36 1   0040          SUM AD-3B(IR)(II+III,II+IV)
S36 1   0000          SUMAD-3B(IR)(II+III,II+IV)
S36 5   0040          SUMAD-3B(IR)(II+III,II+IV)
```

```
S36 5   0000          SUM AD-38(IR)(II+III,II+IV)
S37 0   1000          SUM AD-3 R
S37 0   1224          SUMAD-3 R
S37 0   0224          SUMAD-3 R
S37 0   0024          SUMAD-3 R
S37 0   0020          SUMAD-3 R
S37 2   0022          SUMAD-3 R
S37 2   0222          SUMAD-3 R
S37 2   1000          SUMAD-3 R
S37 2   1222          SUMAD-3 R
S37 2   0020          SUMAD-3 R
S37 4   0020          SUMAD-3 R
S37 4   0222          SUMAD-3 R
S37 4   0022          SUMAD-3 R
S37 4   1000          SUMAD-3 R
S37 4   1222          SUMAD-3 R
S37 1   1000          SUMAD-3 R
S37 1   1242          SUMAD-3 R
S37 1   0242          SUMAD-3 R
S37 1   0042          SUMAD-3 R
S37 1   0002          SUMAD-3 R
S37 2   0002          SUMAD-3 R
S37 2   0022          SUMAD-3 R
S37 2   0222          SUMAD-3 R
S37 2   1000          SUMAD-3 R
S37 2   1222          SUMAD-3 R
S37 4   0222          SUMAD-3 R
S37 4   0022          SUMAD-3 R
S37 4   1000          SUMAD-3 R
S37 4   1222          SUMAD-3 R
S37 4   0002          SUMAD-3 R
```

S37 5	1000	SUMAD-3 R
S37 5	1242	SUMAD-3 R
S37 5	0242	SUMAD-3 R
S37 5	0042	SUMAD-3 R
S37 5	0002	SUM AD-3 R
S38 0	0004	SUM AD-3 (IR)
S38 0	0000	SUMAD-3 (IR)
S38 2	0000	SUMAD-3 (IR)
S38 4	0000	SUMAD-3 (IR)
S38 1	0040	SUMAD-3 (IR)
S38 1	0000	SUMAD-3 (IR)
S38 5	0040	SUMAD-3 (IR)
S38 5	0000	SUM AD-3 (IR)
S39	10101000	AD-3B(R-C)
S39	10101242	AD-3B(R-C)
S39	10100242	AD-3B(R-C)
S39	10100042	AD-3B(R-C)
S39	10100002	AD-3B(R-C)
S39	50101000	AD-3B(R-C)
S39	50101242	AD-3B(R-C)
S39	50100242	AD-3B(R-C)
S39	50100042	AD-3B(R-C)
S39	50100002	AD-3B(R-C)
S39	20100022	AD-3B(R-C)
S39	20100222	AD-3B(R-C)
S39	20101000	AD-3B(R-C)
S39	20101222	AD-3B(R-C)
S39	40100222	AD-3B(R-C)
S39	40100022	AD-3B(R-C)
S39	40101000	AD-3B(R-C)
S39	40101222	AD-3B(R-C)

```
S39 20100002          AD-3B(R-C)
S39 40100002          AD-3B(R-C)
S39 11001000          AD-3B(R-C)
S39 11001242          AD-3B(R-C)
S39 11000242          AD-3B(R-C)
S39 11000042          AD-3B(R-C)
S39 11000002          AD-3B(R-C)
S39 51001000          AD-3B(R-C))
S39 51001242          AD-3B(R-C)
S39 51000242          AD-3B(R-C)
S39 51000042          AD-3B(R-C)
S39 51000002          AD-3B(R-C)
S39 21000022          AD-3B(R-C)
S39 21000222          AD-3B(R-C)
S39 21001000          AD-3B(R-C)
S39 21001222          AD-3B(R-C)
S39 41000222          AD-3B(R-C)
S39 41000022          AD-3B(R-C)
S39 41001000          AD-3B(R-C)
S39 41001222          AD-3B(R-C)
S39 21000002          AD-3B(R-C)
S39 41000002          AD-3B(R-C)
S40 0   0224         SUM AD-3(R)+RL
S40 0   0024         SUM AD-3(R)+RL
S40 0   0020         SUM AD-3(R)+RL
S40 2   0022         SUM AD-3(R)+RL
S40 2   0222         SUM AD-3(R)+RL
S40 2   1000         SUM AD-3(R)+RL
S40 2   1222         SUM AD-3(R)+RL
S40 2   0020         SUM AD-3(R)+RL
S40 4   0020         SUM AD-3(R)+RL
```

```
S40 4    0222              SUM AD-3(R)+RL
S40 4    0022              SUM AD-3(R)+RL
S40 4    1000              SUM AD-3(R)+RL
S40 4    1222              SUM AD-3(R)+RL
S40 2    0002              SUM AD-3(R)+RL
S40 4    0002              SUM AD-3(R)+RL
S40 1    0242              SUM AD-3(R)+RL
S40 1    0042              SUM AD-3(R)+RL
S40 1    0002              SUM AD-3(R)+RL
S40 5    1000              SUM AD-3(R)+RL
S40 5    1242              SUM AD-3(R)+RL
S40 5    0242              SUM AD-3(R)+RL
S40 5    0042              SUM AD-3(R)+RL
S40 5    0002              SUM AD-3(R)+RL


          INSERT DATA HERE


END
/*
//
```

LISTING OF ALL MUTANTS DATE 11-25-68

EXP	ISOLATE	STOCK NO	M	C	PLATING	L	IN	TEST	COMPLEMENTATION	AD-3	AD-38	DIL	HET	DIK	TRIKARYON TESTS
021	0022	D 134 22	13	1	C1	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0023	D 134 23	13	1	C1	0	1	02	0505210110	01	1 0 0	5	16	2	
021	0024	D 134 24	13	1	01	0	1	02	1111110110	01	1 0 0	5	16	2	
021	0025	D 134 25	13	1	C1	0	1	02	1111121112	00	0 0 0	5	16	2	
021	0027	D 134 27	13	1	33 01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0028	D 134 28	13	1	C1	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0029	D 134 29	13	0	33 11	1	1	02	1111121112	00	0 0 0	3	25	2	
021	0030	D 134 30	13	1	C1	0	1	02	1011110110	01	1 0 0	5	16	2	
021	0031	D 134 31	13	1	C1	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0032	D 134 32	13	1	11	1	1	02	1111121112	00	0 0 0	3	25	2	
021	0033	D 134 33	13	1	C1	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0034	D 134 34	13	0	C1	0	1	02	2322213122	01	1 0 0	3	25	2	
021	0035	D 134 35	13	1	01	0	1	02	1111121112	00	0 0 0	5	16	2	
021	0036	D 134 36	13	0	33 01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0037	D 134 37	13	1	C1	0	1	02	1111101110	00	0 0 0	5	16	2	
021	0038	D 134 38	13	0	33 33 01	0	1								
021	0040	D 134 40	13	1	C1	0	1	02	1111131112	00	0 0 0	5	16	2	
021	0041	D 134 41	13	1	11	1	1	02	1111131112	00	0 0 0	3	25	2	
021	0042	D 134 42	13	1	01	0	1	02	1111101110	00	0 0 0	5	16	2	
021	0043	D 134 43	13	1	C1	0	1	02	1115115114	01	1 0 0	5	16	2	
021	0044	D 134 44	13	1	C1	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0045	D 134 45	13	1	01	0	1	02	0000310110	01	0 1 0	5	16	2	
021	0046	D 134 46	13	1	C1	0	1	02	1111101110	00	0 0 0	5	16	2	
021	0047	D 134 47	13	1	01	0	1	02	1111101110	00	0 0 0	5	16	2	
021	0048	D 134 48	13	1	01	0	1	02	1111118118	01	1 0 0	5	16	2	
021	0049	D 134 49	13	1	C1	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0050	D 134 50	13	1	01	0	1	02	1111101110	00	0 0 0	5	16	2	
021	0051	D 134 51	13	1	C1	0	1	02	0000310110	01	0 1 0	5	16	2	
021	0052	D 134 52	13	0	33 33 01	0	1	02	1111111111	03	0 0 0			2	

MUTANTS NOT IN STOCK DATE11-25-68

EXP	ISOLATE	STOCK NO	M	C	PLATING	L	IN	TEST	COMPLEMENTATION	AD-3	AD-3B	DIL	HET	DIK	TRIKARYON TESTS
021	0002		01	0	33 33	0	0								
021	0003		13	0	33 33	0	0								
021	0005		13	0	33 23 01 22	0	0								
021	0039		13	0	33 33 01 22	0	0								
021	0239		13	0	11 22	0	0								
021	0262		13	0	23 22	0	0								
021	0264		13	0	23 22	0	0								
021	0414		13	0	33 22	0	0								
021	0466		13	0	33 22	0	0								
021	0475		13	0	33 22	0	0								
021	0481		13	1	33 23 01 33	0	0								
021	0483		13	0	22 00	0	0								

INCOMPLETE CARD FIVES DATE 11-25-68

EXP	ISOLATE	STOCK NO	M C	PLATING	I	IN	TEST	COMPLEMENTATION	AD-3	AD-3B	DIL	HET	DIK	TRIKARYON TESTS
021	0173	D 125 83	12 1	01	0	1	02	0002110110	01	0 1	0 5	34		

MISSING 3,4,5,OR 6 CARD DATE 11-25-68

EXP	ISOLATE	STOCK NO	M	C	PLATING	L	IN	TEST COMPLEMENTATION	AD-3	AD-3B	DIL	HET	DIK	TRIKARYON TESTS
021	0011	D 134 11	13	1	33 33 01	0	1							
021	0014	D 134 14	13	1	02 01	0	1							
021	0038	D 134 38	13	0	33 33 01	0	1							
021	0059	D 134 59	13	1	01 01	0	1							
021	0100	D 135 10	13	1	01	0	1							
021	0101	D 135 11	13	1	01	0	1							
021	0102	D 135 12	13	1	01	0	1							
021	0103	D 135 13	13	1	01	0	1							
021	0104	D 135 14	13	1	01	0	1							
021	0105	D 135 15	13	1	01	0	1							
021	0106	D 135 16	13	1	01	0	1							
021	0107	D 135 17	13	1	01	0	1							
021	0108	D 135 18	13	1	01	0	1							
021	0109	D 135 19	13	1	01	0	1							
021	0110	D 135 20	13	1	01	0	1							
021	0111	D 135 21	13	1	01 01	0	1							
021	0112	D 135 22	13	1	00	0	1							
021	0113	D 135 23	13	1	01	0	1							
021	0114	D 135 24	13	1	01	0	1							
021	0115	D 135 25	13	1	01	0	1							
021	0116	D 135 26	13	1	01	0	1							
021	0117	D 135 27	13	1	01	0	1							
021	0118	D 135 28	13	0	01 01	0	1							
021	0119	D 135 29	13	1	01	0	1							
021	0120	D 135 30	13	1	01	0	1							
021	0121	D 135 31	13	1	01	0	1							
021	0122	D 135 32	13	1	01	0	1							
021	0123	D 135 33	13	1	01	0	1							
021	0124	D 135 34	13	1	01	0	1							

COMPLETELY TESTED DATA DATA 11-25-68

EXP	ISOLATE	STOCK NO	M C	PLATING	L	IN	TEST	COMPLEMENTATION	AD-3	AD-38	DIL	HET	DIK	TRIKARYON TESTS
021	0377	D 138 17	13 1	01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0378	D 138 18	13 1	01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0379	D 138 19	13 1	11	1	1	02	0000010110	01	0 0 1	5	16	2	
021	0380	D 138 20	13 1	01	0	1	02	3132110110	01	1 0 0	5	16	2	
021	0381	D 138 21	13 1	11	1	1	02	2200210110	01	1 0 0	5	16	2	
021	0382	D 138 22	13 1	11	1	1	02	1011110110	01	1 0 0	5	16	2	
021	0383	D 138 23	13 1	23 01	0	1	02	6101110110	01	1 0 0	5	16	2	
021	0384	D 138 24	13 1	01	0	1	02	2271117117	01	1 0 0	5	16	2	
021	0385	D 138 25	13 1	01	0	1	02	1101110110	01	1 0 0	5	16	2	
021	0386	D 138 26	13 1	23 01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0387	D 138 27	13 1	01	0	1	02	1111101110	00	0 0 0	5	16	2	
021	0388	D 138 28	13 1	01	0	1	02	0002110110	01	0 1 0	5	16	2	
021	0389	D 138 29	13 1	01	0	1	02	1111101110	00	0 0 0	5	16	0	308 2 021 2 038 4
021	0390	D 138 30	13 1	01	0	1	02	1111121112	00	0 0 0	5	16	2	
021	0391	D 138 31	13 1	01	0	1	02	1111101110	00	0 0 0	5	16	2	
021	0392	D 138 32	13 1	01	0	1	02	1111101110	00	0 0 0	5	16	0	308 2 021 2 038 4
021	0393	D 138 33	13 1	01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0394	D 138 34	13 1	01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0395	D 138 35	13 1	11	1	1	02	1111101110	00	0 0 0	5	16	2	
021	0396	D 138 36	13 1	01	0	1	02	1111101110	00	0 0 0	5	16	2	
021	0397	D 138 37	13 1	11 01	0	1	02	1211112112	01	1 0 0	5	16	2	
021	0398	D 138 38	13 1	01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0399	D 138 39	13 1	01	0	1	02	0000010110	01	0 0 1	5	16	2	
021	0400	D 138 40	13 1	23 01	0	1	02	0003310110	01	0 1 0	5	16	0	308 0 021 4 038 2
021	0401	D 138 41	13 1	01	0	1	02	1111171116	00	0 0 0	5	16	2	
021	0402	D 138 42	13 1	01	0	1	02	1111141114	00	0 0 0	5	16	2	
021	0403	D 138 43	13 1	11	1	1	02	1111131122	00	0 0 0	3	25	2	
021	0404	D 138 44	13 1	01	0	1	02	0000010110	01	0 0 1	5	16	0	308 0 021 4 038 0
021	0405	D 138 45	13 1	01	0	1	02	0001110110	01	0 1 0	5	16	0	308 2 021 4 038 2

EXPERIMENT 21 ISOLATES 224 TO 518 DESIGN= 1 TREATMENT= 12 DOSE= 12.0000 DATE 11-25-68

AD-3	AD-3B	DIK	TRIKARYON	N	FRACTION	LIMITS		FREQUENCY	LIMITS	
0	0 0 0	0	2 2 4	3	0.04478	0.00934	0.12453	0.12189039E-05	0.33235455E-06	0.32918533E-05
0	0 0 0	1		23	0.34328	0.23148	0.46898	0.93449307E-05	0.60624225E-05	0.13833752E-04
1	0 0 1	0	0 4 0	1	0.01493	0.00038	0.07986	0.40630135E-06	0.20721370E-07	0.21627420E-05
1	0 0 1	0	2 4 2	2	0.02985	0.00363	0.10304	0.81260276E-06	0.14423699E-06	0.27165306E-05
1	0 0 1	1		16	0.23881	0.14307	0.35793	0.65008217E-05	0.38996805E-05	0.10320053E-04
1	0 1 0	0	0 4 2	1	0.01493	0.00038	0.07986	0.40630135E-06	0.20721370E-07	0.21627420E-05
1	0 1 0	0	2 4 2	1	0.01493	0.00038	0.07986	0.40630135E-06	0.20721370E-07	0.21627420E-05
1	0 1 0	1		1	0.01493	0.00038	0.07986	0.40630135E-06	0.20721370E-07	0.21627420E-05
1	1 0 0	1		18	0.26866	0.16765	0.39043	0.73134242E-05	0.45412307E-05	0.11268769E-04
3	0 0 0	0	4 4 4	1	0.01493	0.00038	0.07986	0.40630135E-06	0.20721370E-07	0.21627420E-05

TOTAL MUTANTS = 67.

OTHER MUTANTS = 314.

TOTAL FREQUENCY 0.27222195E-04

ISOLATES		TYPE	FRACTION	FREQUENCY
3	10	0 1 0 0 0	0.60000	0.72436171E-06
11	43	0 1 0 0 0	0.39286	0.28859986E-05
44	99	0 1 0 0 0	0.30909	0.29562680E-05
100	223	0 1 0 0 0	0.30612	0.57518528E-05
224	518	0 1 0 0 0	0.34328	0.93449307E-05
224	518	0 0 2 2 4	0.04478	0.12189039E-05
11	43	0 0 0 2 4	0.03571	0.26236353E-06
1	2	1 1 0 0 0	1.00000	0.62217697E-06
3	10	1 1 0 0 0	0.40000	0.48290781E-06
11	43	1 1 0 0 0	0.57143	0.41978155E-05
44	99	1 1 0 0 0	0.65455	0.62603331E-05
100	223	1 1 0 0 0	0.61224	0.11503704E-04
224	518	1 1 0 0 0	0.52239	0.14220547E-04
100	223	1 0 2 4 2	0.06122	0.11503698E-05
224	518	1 0 2 4 2	0.04478	0.12189039E-05
224	518	1 0 0 4 2	0.01493	0.40630135E-06

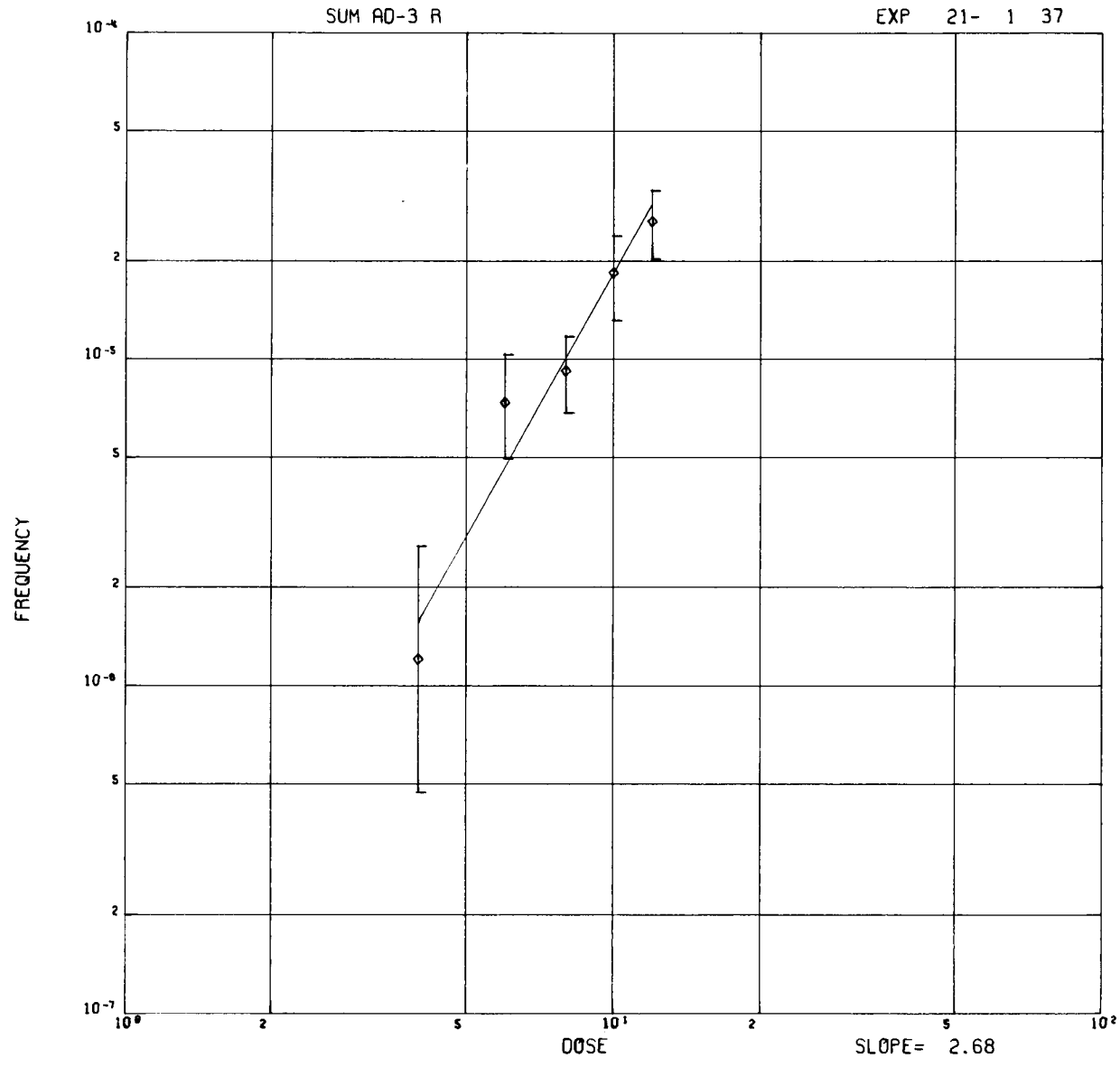
EXP	DES.	TRT.	DOSE	N1	N2	NT	FRACTION	LOW LIM.	UPPER LIM.	FREQUENCY	LOW LIM.	UPPER LIM.
21	1	0	0.0	1.	1.	2.	1.00000	0.02502	1.00000	0.62217697E-06	0.31731037E-07	0.33118495E-05
21	1	4	4.	5.	5.	9.	1.00000	0.47808	1.00000	0.12072687E-05	0.47566402E-06	0.26987291E-05
21	1	6	6.	29.	28.	34.	1.00000	0.87688	1.00000	0.73461770E-05	0.49980245E-05	0.10431570E-04
21	1	8	8.	53.	55.	57.	0.96364	0.87541	0.99556	0.92166010E-05	0.69141888E-05	0.11842463E-04
21	1	10	10.	48.	49.	129.	0.97959	0.89206	0.99948	0.18405903E-04	0.13290597E-04	0.24084889E-04
21	1	12	12.	65.	67.	381.	0.97015	0.89696	0.99637	0.26409558E-04	0.20485677E-04	0.33158212E-04

EXPERIMENT 21 37 SUM AD-3 R DATE 11-25-68

DESIGN 1

SLOPE= 2.68276 +- 1.16082 SENS= 0.37943856E-07 F= 54.07930 DF= 3 SE= 0.36481

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
4.	0.12072687E-05	0.47566402E-06	0.26987291E-05	0.15643072E-05
6.	0.73461770E-05	0.49980245E-05	0.10431570E-04	0.46422883E-05
8.	0.92166010E-05	0.69141898E-05	0.11842463E-04	0.10044126E-04
10.	0.18405903E-04	0.13290597E-04	0.24084889E-04	0.18276711E-04
12.	0.26409558E-04	0.20485677E-04	0.33158212E-04	0.29807270E-04


SUM AD-3 R
EXP 21- 1 37
FREQUENCY
DOSE
SLOPE= 2.68

D. Compare Program and Output

The Compare Program takes two experiment-designs, plots them together, and tests the difference between the two. There is no printer output except the words "JOB COMPLETED."

Input to 360:

(1) Program

(2) Two experiment-designs to be compared (cards are mutant analysis output)

(3) END card (cols. 1-3)

(4) Repeat of (2) and (3) for more comparisons

(5) /* and // cards last of all

360 job card:

Tape pool plot (7)

Calcomp request card:

Black ink, plain paper

Maximum no. of plots = (no. of comparisons) X 40.

CARD LAYOUT

Title S CARDS

Card No _____ Card Color _____

Source _____

Edition _____

1.	ALPHABETIC S	41.	TITLE CONTINUED
2.		42.	
3.	Summary number	43.	
4.	not used	44.	
5.	AD-3 code	45.	
6.		46.	
7.	AD-3B IF NOT IGNORED	47.	
8.	ELSE BLANK	48.	
9.	DIKARYON	49.	
10.		50.	
11.	TRIKARYON	51.	
12.		52.	
13.		53.	
14.		54.	
15.		55.	
16.		56.	
17.		57.	
18.		58.	
19.	NOT USED	59.	
20.		60.	
21.		61.	
22.		62.	
23.		63.	
24.		64.	
25.		65.	
26.	TITLE BEGINS	66.	
27.	HERE	67.	
28.		68.	
29.		69.	
30.		70.	
31.		71.	
32.		72.	
33.		73.	
34.		74.	
35.		75.	
36.		76.	
37.		77.	
38.		78.	
39.		79.	
40.		80.	

TY-111 (2-60)
(8-60)

1st ~~54~~ 50 cards after Compare program are of this type. The program gets titles this way. Cols 5-12 are ignored.

input to compare program

CARD LAYOUT

Title MUTANT ANALYSES OUTPUT

Card No _____ Card Color _____

Source _____

Edition _____

1.	Summary number	41.	Numeric
2.		42.	
3.		43.	
4.	Experiment	44.	
5.		45.	
6.		46.	E
7.	Design	47.	–
8.		48.	Exponent
9.		49.	
10.	Treatment	50.	
11.		51.	
12.		52.	
13.		53.	
14.		54.	
15.	Dose	55.	
16.		56.	
17.		57.	
18.		58.	
19.		59.	
20.		60.	
21.	N1	61.	NOT USED
22.		62.	
23.		63.	
24.		64.	
25.		65.	
26.	N2	66.	
27.		67.	
28.		68.	
29.		69.	
30.		70.	
31.	NT	71.	
32.		72.	
33.		73.	
34.	Blank	74.	
35.		75.	
* 36.	0 zero	76.	DATE
37.	• decimal	77.	
38.		78.	
39.	numeric	79.	
40.		80	

TY-111 (2-60)
(8-60)

* cols 36-44 contain mutation frequency in E format

```
//              12182,MSGLEVEL=1  DIANA SMITH 9704-1 Y12  EXT.3-5048
//JOBLIB DD DSNAME=SYS1.LINKLIB,VOLUME=REF=LKCBSMPL,DISP=(OLD,PASS)
// EXEC ACGT,PARM.GO='EU=-1,DUMP=G,FD=-1'
//ASSEMBLE.SYSIN DD *
SORTER   START
         USING *,12
         STM    14,12,12(13)
         LR     5,13
         LR     12,15
         LA     13,AREA
         ST     13,8(0,5)
         ST     5,AREA+4
         LA     1,PARLIST
         ATTACH EP=SORT,MF=(E,(1))
         L      13,AREA+4
         LM     14,12,12(13)
         BR     14
         LTORG
AREA     DS.    18F
         CNOP   0,8
* PARAMETER LIST
PARLIST  DC      X'80'
         DC      AL3(ADLST)
         DC      X'0000'
ADLST    DC      X'0018'
         DC      A(SORTCD)
         DC      A(STCDED)
         DC      A(RCDCD)
         DC      A(RDCDED)
         DC     F'0'
```

```
         DC     F'0'
SORTCD   DC      C' SORT FIELDS=(1,2,CH,A,12,7,CH,A),'
         DC      C'SIZE=E2000'
STCDED   DC      C' '
RCDCD    DC      C' RECORD TYPE=F,LENGTH=80'
RDCDED   DC      C' '
         END
/*
//FT63.FT50F001 DD *
```

```
**FTN,L,P,E.
C      PROGRAM TO COMPARE AND PLOT
C**** PROGRAM TO PRINT AND PLOT TWO LOG-GOG REGRESSIONS FOR
C****  EACH SUMMARY, USES EZPLOT PACKAGE FOR CALCOMP PLOTTER.
       INTEGER END
       DIMENSION ILOT(50,16),LIST(20),NOW(2),A(1000)
       DATA END/4HEND /
       CALL PLOTS(A,1000)
       CALL IDAY(NOW)
       DO 3 I=1,50
       READ(50,1) M,(ILOT(I,L),L=1,16)
     1 FORMAT(1X,I2,T19,15A4,A2)
       IF(M.EQ.I) GO TO 3
       PRINT 2
     2 FORMAT('1 TITLE CARDS OUT OF ORDER')
       GO TO   7
     3 CONTINUE
     4 REWIND 10
    99 READ(50,5,END=7) LIST
     5 FORMAT(20A4)
       IF(ICOMPARE(LIST(1),END,3).NE.0) GO TO 6
       PRINT 1010
  1010 FORMAT('1')
       END FILE 10
       REWIND 10
       CALL SORTER
       REWIND 10
       CALL COMPAR(ILOT,NOW)
       GO TO 4
     6 WRITE(10,5) LIST
       GO TO 99
     7 PRINT 8
     8 FORMAT('1','JOB COMPLETED')
       CALL EXIT
       END
```

```
      SUBROUTINE COMPAR(ILOT,NOW)
      INTEGER TITLE
      DATA IBL/4H    ,4H    /
      DATA JCHAR/64,24,24/
      DIMENSION LOX(4)
      DIMENSION MAMB(2),IAMB(2)
      DIMENSION ILOT(50,16),NOW(2)
      DIMENSION LAMB(46)
      DIMENSION Y1(20),Y2(20),Y3(20),X(20)
      DIMENSION JCHAR(3),IX(20)
      DIMENSION TITLE(16),LIST(16),     A(1000),N(2),IBL(2),L(2)
      M=0
      ISW=0
   88 READ(10,1,END=18) J,IG,ID,N,LIST
    1 FORMAT(I2,2I3,3X,A4,A3,15A4,A2)
  999 DECODE(8,2,N) ZA
      IF(ZA.EQ.0.)GO TO 88
      M=1
      X(M)=ZA
      IX(M)=IG+1000*ID
      DECODE(70,3,LIST(1)) XNUM,Y1(M)
      CALL POIS(XNUM,Y1(M),Y2(M),Y3(M))
   99 READ(10,1,END=4) K,IE,IZ,L,LIST
      IF(K.NE.J) GO TO 13
      DECODE(8,2,L) ZA
      IF(ZA.EQ.0.) GO TO 99
      M=M+1
      X(M)=ZA
      IX(M)=IE+1000*IZ
    2 FORMAT(F7.0)
      DECODE(70,3,LIST(1))       XNUM,Y1(M)
    3 FORMAT(F5.0,10X,E16.8)
      CALL POIS(XNUM,Y1(M),Y2(M),Y3(M))
      GO TO 99
    4 ISW=1
   13 N1=0
      IF(M.EQ.0) GO TO 188
      IL=IX(1)
      DO 22 I=1,M
      IF(IL.NE.IX(I)) GO TO 23
   22 N1=N1+1
   23 N2=M-N1
      IF(N1.LT.3) GO TO 188
      IF(N2.LT.3) GO TO 188
      CALL LLPLOT(-M,-3,X,JCHAR,.105,Y1,Y2,Y3)
      DO 133 I=1,16
  133 TITLE(I)=ILOT(J,I)
      CALL SYMBOL(1.5,10.6,.14,TITLE(1),0.0,62)
      CALL SYMBOL(5.5,.1,.14,4HDOSE,0.0,4)
      CALL SYMBOL(0.0,4.5,.14,16HFORWARD MUTATION,90.0,16)
      CALL SYMBOL(0.0,10.0,.14,NOW,90.0,8)
      XLOW=X(N1)
      XHIG=0.
      DO 24 I=1,N1
      IF(X(I).LT.XLOW) XLOW=X(I)
      IF(X(I).GT.XHIG) XHIG=X(I)
      CALL GRCORD(X(I),Y1(I),XX,YY)
      CALL SYMBOL(XX,YY,.105,2,0.0,-1)
      CALL GRCORD(X(I),Y2(I),XX,YY)
      CALL GRCORD(X(I),Y3(I),XZ,YZ)
```

```
      CALL PLOT(XX,YY,4)
      CALL PLOT(XZ,YZ,2)
   24 CONTINUE
      LX=N1+1
      XLOX=X(M)
      XHIX=0.
      DO 25 I=LX,M
      IF(X(I).LT.XLOX) XLOX=X(I)
      IF(X(I).GT.XHIX) XHIX=X(I)
      CALL GRCORD(X(I),Y1(I),XX,YY)
      CALL SYMBOL(XX,YY,.105,5,0.0,-1)
      CALL GRCORD(X(I),Y2(I),XX,YY)
      CALL GRCORD(X(I),Y3(I),XZ,YZ)
      CALL PLOT(XX,YY,4)
      CALL PLOT(XZ,YZ,2)
   25 CONTINUE
   26 CONTINUE
      CALL STAT(N1,N2,X,Y1,A1,B1,A2,B2,T,F,B,SE)
      YL1=A1*XLOW**B1
      YH1=A1*XHIG**B1
      CALL GRCORD(XLOW,YL1,XX,YY)
      CALL GRCORD(XHIG,YH1,XZ,YZ)
      CALL PLOT(XX,YY,4)
      CALL PLOT(XZ,YZ,2)
      YL2=A2*XLOX**B2
      YH2=A2*XHIX**B2
      CALL GRCORD(XLOX,YL2,XX,YY)
      CALL GRCORD(XHIX,YH2,XZ,YZ)
      CALL PLOT(XX,YY,4)
      CALL PLOT(XZ,YZ,2)
   27 CONTINUE
      IW=IL/1000
      IL=IL-1000*IW
      ENCODE(10,30,MAMB(1)) IL,IW
   30 FORMAT('=',I3,'-',I3)
      CALL SYMBOL(12.,10.,.105,2,0.0,-1)
      CALL SYMBOL(12.1,10.,.14,MAMB(1),0.0,8)
      CALL SYMBOL(12.,8.5,.105,5,0.0,-1)
      IG=IX(LX)
      IW=IG/1000
      IG=IG-1000*IW
      ENCODE(10,30,IAMB(1)) IG,IW
      CALL SYMBOL(12.1,8.5,.14,IAMB(1),0.0,8)
      LAMB(3)=4HT BE
      LAMB(4)=4HTWEE
      LAMB(5)=4HN SL
      LAMB(6)=4HOPES
      LAMB(7)=4H =
      ENCODE(20,40,LAMB(8))T
   40 FORMAT(F8.2)
      LAMB(10)=4HF
      LAMB(11)=4HDIST
      LAMB(12)=4HANCE
      LAMB(13)=4H =
      LAMB(16)=4HA =
      ENCODE(20,50,LAMB(17))A1
   50 FORMAT(E16.8)
      LAMB(21)=4HB =
      ENCODE(20,50,LAMB(22))B1
      LAMB(26)=4HA =
      ENCODE(20,50,LAMB(27)) A2
      LAMB(31)=4HB =
```

```
      ENCODE(20,50,LAMB(32)) B2
      LAMB(36)=4HWITH
      LF=M-4
      ENCODE(10,60,LAMB(37)) LF
   60 FORMAT(I4)
      LAMB(38)=4H DF
      LAMB(40)=4H1 AN
      LZ=M-3
      ENCODE(10,70,LAMB(41))LZ
   70 FORMAT('D',I3)
      LAMB(39)=4HWITH
      LAMB(42)=4H DF
      CALL PTVAL(T,LF,P1,I1)
      IF(F.LE.0.) GO TO 80
      T=SQRT(F)
      GO TO 81
   80 F=0.
      T=0.
   81 CONTINUE
      CALL PTVAL(T,LZ,P2,I2)
      IF(I1) 83,84,85
   83 LAMB(43)=4HP GT
      GO TO 86
   84 LAMB(43)=4HP =
      GO TO 86
   85 LAMB(43)=4HP LT
   86 ENCODE(10,87,LAMB(44))P1
      IF(I2) 93,94,95
   93 LAMB(45)=4HP GT
      GO TO 96
   94 LAMB(45)=4HP =
      GO TO 96
   95 LAMB(45)=4HP LT
   96 ENCODE(10,87,LAMB(46))P2
   87 FORMAT(F4.3)
      ENCODE(20,40,LAMB(14))F
  996 FORMAT(I4)
      CALL SYMBOL(12.,3.0,.14,10HCOVARIANCE,0.0,10)
      CALL SYMBOL(12.,2.8,.14,LAMB(21),0.0,4)
      ENCODE(20,50,LOX) B
      CALL SYMBOL(12.5,2.8,.14,LOX,0.0,16)
      LOX(1)=4HSE =
      CALL SYMBOL(12.,2.6,.14,LOX,0.0,4)
      ENCODE(20,50,LOX) SE
      CALL SYMBOL(12.6,2.6,.14,LOX,0.0,16)
      CALL SYMBOL(12.,2.4,.14,4HDF =,0.0,4)
      ENCODE(20,996,LOX) LZ
      CALL SYMBOL(12.6,2.4,.14,LOX,0.0,4)
   31 CONTINUE
   32 CONTINUE
      CALL SYMBOL(12.,9.5,.14,LAMB(16),0.0,20)
      CALL SYMBOL(12.,9.0,.14,LAMB(21),0.0,20)
      CALL SYMBOL(12.,8.0,.14,LAMB(26),0.0,20)
      CALL SYMBOL(12.,7.5,.14,LAMB(31),0.0,20)
      CALL SYMBOL(12.,7.0,.14,LAMB(3) ,0.0,16)
      CALL SYMBOL(12.,6.8,.14,LAMB(7) ,0.0,12)
      CALL SYMBOL(12.,6.6,.14,LAMB(36),0.0,12)
      CALL SYMBOL(12.,6.4,.14,LAMB(43),0.0,8)
      CALL SYMBOL(12.,6.0,.14,LAMB(10),0.0,12)
      CALL SYMBOL(12.,5.8,.14,LAMB(13),0.0,12)
      CALL SYMBOL(12.,5.6,.14,LAMB(39),0.0,16)
      CALL SYMBOL(12.,5.4,.14,LAMB(45),0.0,8)
```

```
      CALL PLOT(16.0,.0,-3)
  188 CONTINUE
      IF(ISW.EQ.1) GO TO 18
      J=K
      N(1)=L(1)
      N(2)=L(2)
      ID=IZ
      IG=IE
      M=0
      GO TO 999
   18 RETURN
      END
```

```
      SUBROUTINE STAT(N1,N2,X,Y,A1,B1,A2,B2,T,F,B,SE)
C**** PROGRAM TO COMPUTE LOG-LOG REGRESSIONS FOR TWO SETS OF DATA
C****  AND TEST SLOPES AND DISTANCE APART.
C**** N1 IS NUMBER OF OBSERVATIONS IN FIRST DATA SET,N2 IN SECOND.
C**** X IS X AXIS VALUES, Y IS Y AXIS VALUES, A1 AND A2 ARE ANTILOGS OF
C**** INTERCEPTS,B1 AND B2 ARE SLOPES,T IS T VALUE BETWEEN SLOPES,
C**** F IS F TEST OF DISTANCE, B IS COMMON COVARIANCE ESTIMATE
C**** OF SLOPE, SE IS STANDARD ERROR OF B.
      DIMENSION X(1), Y(1)
      S1=0.
      S2=0.
      S3=0.
      S4=0.
      S5=0.
      S6=0.
      Z1=0.
      Z2=0.
      Z3=0.
      Z4=0.
      Z5=0.
      Z6=0.
      DO 1 I=1,N1
      IF(X(I).EQ.0.) GO TO 1
      IF(Y(I).EQ.0.) GO TO 1
      X1=ALOG(X(I))
      Y1=ALOG(Y(I))
      S1=S1+X1
      S2=S2+Y1
      S3=S3+X1*X1
      S4=S4+Y1*Y1
      S5=S5+X1*Y1
      S6=S6+1.
    1 CONTINUE
      F1=S1/S6
      F2=S2/S6
      F3=S3-S1*F1
      F4=S4-S2*F2
      F5=S5-S2*F1
      E1=F4-(F5*F5)/F3
      F6=SQRT(E1/((S6-2.)*F3))
      B1=F5/F3
      F8=F2-B1*F1
      A1=EXP(F8)
      IF(N2.EQ.0) GO TO 99
      M=N1+N2
      L=N1+1.
      DO 2 I=L,M
      IF(X(I).EQ.0.) GO TO 2
      IF(Y(I).EQ.0.) GO TO 2
      X1=ALOG(X(I))
      Y1=ALOG(Y(I))
      Z1=Z1+X1
      Z2=Z2+Y1
      Z3=Z3+X1*X1
      Z4=Z4+Y1*Y1
      Z5=Z5+X1*Y1
      Z6=Z6+1.
    2 CONTINUE
      G1=Z1/Z6
      G2=Z2/Z6
```

```
      G3=Z3-Z1*G1
      G4=Z4-Z2*G2
      G5=Z5-Z2*G1
      E2=G4-(G5*G5)/G3
      G6=SQRT(E2/((Z6-2.)*G3))
      B2=G5/G3
      G8=G2-B2*G1
      A2=EXP(G8)
      XN=S6+Z6-4.
      Q=(E1+E2)/XN
      T=ABS(B1-B2)/SQRT(Q*(1./F3+1./G3))
      C0=S6+Z6
      C1=S1+Z1
      C2=S2+Z2
      C3=S3+Z3
      C4=S4+Z4
      C5=S5+Z5
      YY=A1
      YX=A2
      A1=C1/C0
      A2=C2/C0
      A3=C3-C1*A1
      A4=C4-C2*A2
      A5=C5-C2*A1
      D1=S1*S1/S6+Z1*Z1/Z6-(C1*C1)/C0
      D2=S2*S1/S6+Z1*Z2/Z6-(C1*C2)/C0
      D3=S2*S2/S6+Z2*Z2/Z6-(C2*C2)/C0
      H1=A3-D1
      H2=A4-D3
      H3=A5-D2
      H4=A4-A5*A5/A3
      H5=H2-H3*H3/H1
      H6=H5/(S6+Z6-3.)
      H7=H4-H5
      H8=H3/H1
      H9=SQRT(H6/H1)
      F=H7/H6
      A1=YY
      A2=YX
      B=H3/H1
      SE=SQRT(H6/H1)
   99 RETURN
      END
```

```
      SUBROUTINE POIS(XX,FR,XL,XU)
C**** COMPUTES POISSON LIMITS FOR NON-ZERO FREQUENCY(FR) WHERE
C****  XX IS OBSERVED NUMBER.
      DIMENSION A(200),B(100),A1(200),B1(100)
      EQUIVALENCE (A(101),B(1)),
     *            (A1(101),B1(1))
      DATA A/ 00000, 0.051, 0.355, 0.818, 1.366, 1.970, 2.613, 3.285,
     *        3.285, 4.460, 5.323, 5.323, 6.666, 6.686, 8.102, 8.102,
     *        9.598, 9.598,11.177,11.177,12.817,12.817,13.765,14.921,
     *       14.921,16.768,16.770,17.633,19.050,19.050,20.330,22.360,
     *       21.360,22.940,23.760,23.760,25.400,26.310,26.310,27.730,
     *       28.970,28.970,30.020,31.670,31.670,32.280,34.050,34.660,
     *       34.660,36.030,37.670,37.670,38.160,39.760,40.940,40.940,
     *       41.750,43.450,44.260,44.260,45.280,47.020,47.690,47.690,
     *       48.740,50.420,51.290,51.290,52.150,53.720,54.990,54.990,
     *       55.510,56.990,58.720,58.720,58.840,60.240,61.900,62.810,
     *       62.810,63.490,64.950,66.760,66.760,66.760,68.100,69.620,
     *       71.090,71.090,71.280,72.660,74.220,75.490,75.490,75.780,
     *       77.160,78.730,79.980,79.980/
      DATA B/ 80.25, 81.61, 83.14, 84.57, 84.57, 84.67, 86.01, 87.48,
     *        89.23, 89.23, 89.23, 90.37, 91.78, 93.48, 94.23, 94.23,
     *        94.70, 96.06, 97.54, 99.17, 99.17, 99.17,100.32,101.71,
     *       103.31,104.40,104.40,104.58,105.90,107.32,109.11,109.61,
     *       109.61,110.11,111.44,112.87,114.84,114.84,114.84,115.60,
     *       116.93,118.35,120.36,120.36,120.36,121.06,122.37,123.77,
     *       125.46,126.26,126.26,126.48,127.78,129.14,130.68,132.03,
     *       132.03,132.03,133.14,134.48,135.92,137.79,137.79,137.79,
     *       138.49,139.79,141.16,142.70,144.01,144.01,144.01,145.08,
     *       146.39,147.80,149.53,150.19,150.19,150.36,151.63,152.96,
     *       154.39,156.32,156.32,156.32,156.87,158.15,159.48,160.92,
     *       162.79,162.79,162.79,163.35,164.63,165.96,167.39,169.33,
     *       169.33,169.33,169.80,171.07/
      DATA A1/ 3.285, 5.323, 6.686, 8.102, 9.598,11.177,12.817,13.765,
     *        14.921,16.768,17.633,19.050,20.335,21.364,22.945,23.762,
     *        25.400,26.306,27.735,28.966,30.017,31.675,32.277,34.048,
     *        34.665,36.030,37.670,38.160,39.760,40.940,41.750,43.450,
     *        44.260,45.280,47.020,47.690,48.740,50.420,51.290,52.150,
     *        53.720,54.990,55.510,56.990,58.720,58.840,60.240,61.900,
     *        62.810,63.490,64.950,66.760,66.760,68.100,69.620,71.090,
     *        71.280,72.660,74.220,75.490,75.780,77.160,78.730,79.980,
     *        80.250,81.610,83.140,84.570,84.670,86.010,87.480,89.230,
     *        89.230,90.370,91.780,93.480,94.230,94.700,96.060,97.540,
     *        99.170,99.170,100.32,101.71,103.31,104.40,104.58,105.90,
     *        107.32,109.11,109.61,110.11,111.44,112.87,114.84,114.84,
     *        115.60,116.93,118.35,120.36/
      DATA B1/ 120.36,121.06,122.37,123.77,125.46,126.26,126.48,127.78,
     *         129.14,130.68,132.03,132.03,133.14,134.48,135.92,137.79,
     *         137.79,138.49,139.79,141.16,142.70,144.01,144.01,145.08,
     *         146.39,147.80,149.53,150.19,150.36,151.63,152.96,154.39,
     *         156.32,156.32,156.87,158.15,159.48,160.92,162.79,162.79,
     *         163.35,164.63,165.96,167.39,169.33,169.33,169.80,171.07,
     *         172.38,173.79,175.48,176.23,176.23,177.48,178.77,180.14,
     *         181.67,183.05,183.05,183.86,185.13,186.46,187.89,189.83,
     *         189.83,190.21,191.46,192.76,194.11,195.63,197.09,197.09,
     *         197.78,199.04,200.35,201.73,203.35,204.36,204.36,205.31,
     *         206.58,207.90,209.30,211.03,211.69,211.69,212.82,214.09,
     *         215.40,216.81,218.56,219.16,219.16,220.29,221.56,222.86,
     *         224.26,225.90,226.81,226.81/
      DEN=XX/FR
      NUM=XX+1.
```

```
      IF(NUM.GT.200) GO TO 1
      XL=A(NUM)/DEN
      XU=A1(NUM)/DEN
      GO TO 2
    1 XL=FR-1.96*SQRT(XX)/DEN
      XU=FR+1.96*SQRT(XX)/DEN
    2 RETURN
      END
```

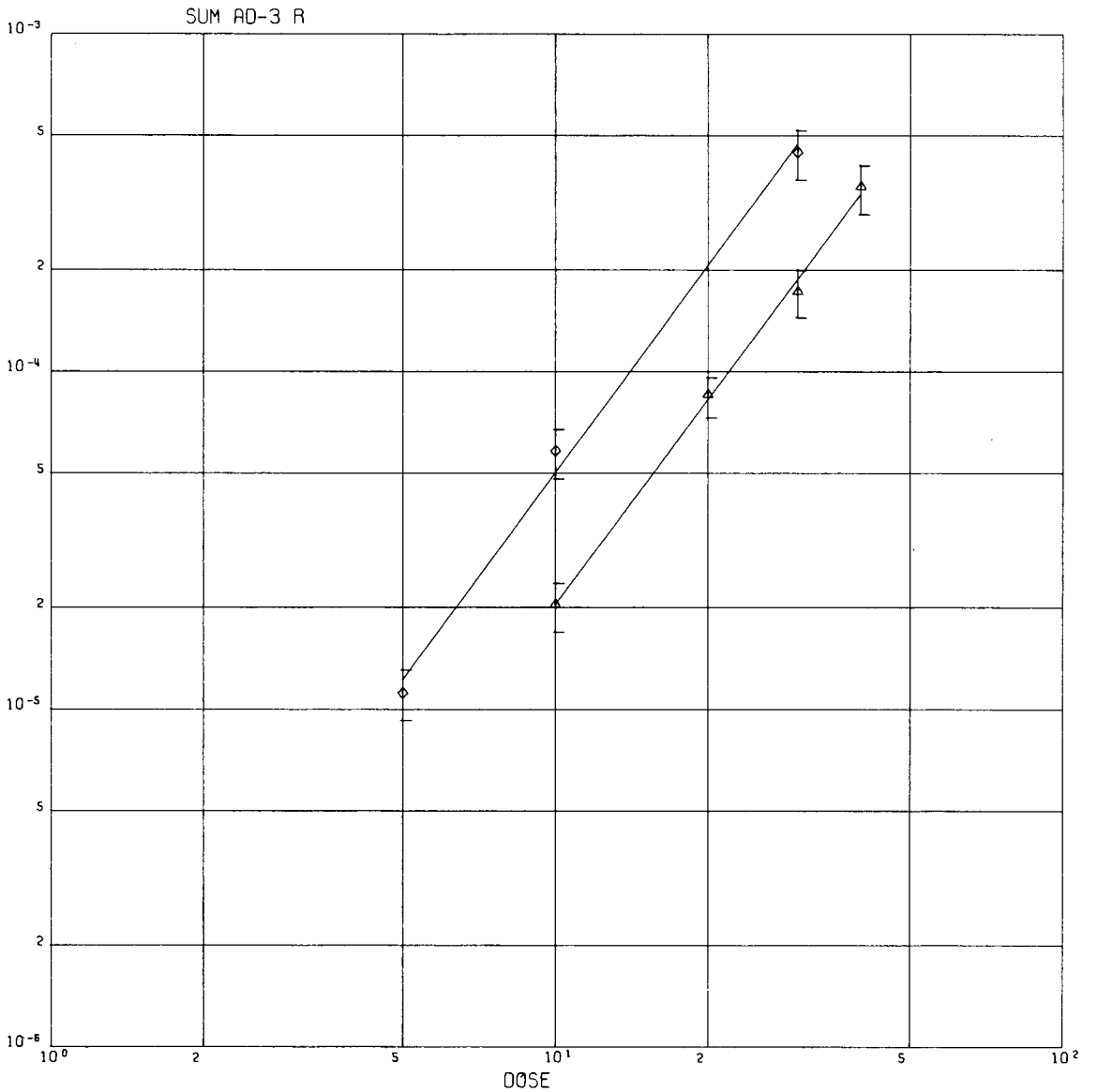
```
      SUBROUTINE PTVAL(T,NDF,P,I)
C**** FOR A GIVEN T VALUE WITH NDF DEGREES OF FREEDOM THIS SUBROUTINE
C**** RETURNS A PVALUE, I=0 IF EQUAL TO,I=-1 IF LESS THAN,I=1 IF
C**** GREATER THAN, IF NDF GREATER THAN 30 T INFINITY USED
      EQUIVALENCE(A(1,1),A(1,1)),(A(1,12),B(1,1))
      DIMENSION A(31,11),B(31,2)
      DIMENSION A(31,13),Z(13)
      DATA Z/.9,.8,.7,.6,.5,.4,.3,.2,.1,.05,.02,.01,.001/
      DATA A/.158,.142,.137,.134,.132,.131,2*.130,3*.129,6*.128,13*.127,
     *   .126,.325,.289,.277,.271,.267,.265,.263,.262,.261,2*.260,2*.259
     *,3*.258,5*.257,9*.256,.253,.510,.445,.424,.414,.408,.404,.402,.399
     *,.398,.397,.396,.395,.394,2*.393,3*.392,3*.391,5*.390,4*.389,.385,
     * .727,.617,.584,.569,.559,.553,.549,.546,.543,.542,.540,.539,.538,
     * .537,.536,.535,2*.534,2*.533,3*.532,4*.531,3*.530,.524,1.,.816,
     * .765,.741,.727,.718,.711,.706,.703,.700,.697,.695,.694,.692,.691,
     * .690,.689,2*.688,.687,2*.686,2*.685,3*.684,3*.683,.674,1.376,
     *1.061,.978,.941,.920,.906,.896,.889,.883,.879,.876,.873,.870,.868,
     * .866,.865,.863,.862,.861,.860,.859,3*.258,   2*.856,2*.855,2*.854
     *,.842,1.963,1.386,1.250,1.190,1.156,1.134,1.119,1.108,1.100,1.093,
     * 1.088,1.083,1.079,1.076,1.074,1.071,1.069,1.067,1.066,1.064,1.063
     *,1.061,1.060,1.059,1.058,1.058,1.057,1.056,1.055,1.055,1.036,3.078
     *,1.886,1.638,1.533,1.476,1.440,1.415,1.397,1.383,1.372,1.363,1.356
     *,1.350,1.345,1.341,1.337,1.333,1.330,1.328,1.325,1.323,1.321,1.319
     *,1.318,1.316,1.315,1.314,1.313,1.311,1.310,1.282,6.314,2.920,2.353
     *,2.132,2.015,1.943,1.895,1.860,1.833,1.812,1.796,1.782,1.771,1.761
     *,1.753,1.746,1.740,1.734,1.729,1.725,1.721,1.717,1.714,1.711,1.708
     *,1.706,1.703,1.701,1.699,1.697,1.645,12.706,4.303,3.182,2.776,
     * 2.571,2.447,2.365,2.306,2.262,2.228,2.201,2.179,2.160,2.145,2.131
     *,2.120,2.110,2.101,2.093,2.086,2.080,2.074,2.069,2.064,2.060,2.056
     *,2.052,2.048,2.045,2.042,1.960,31.821,6.965,4.541,3.747,3.365,
     *3.143,2.998,2.896,2.821,2.764,2.718,2.681,2.650,2.624,2.602,2.583,
     *2.567,2.552,2.539,2.528,2.518,2.508,2.500,2.492,2.485,2.479,2.473,
     *2.467,2.462,2.457,2.326/
      DATA B/63.657,9.925,5.841,4.604,4.032,3.707,3.499,3.355,3.250,3.16
     *9,3.106,3.055,3.012,2.977,2.947,2.921,2.898,2.878,2.861,2.845,02.8
     *31,2.819,2.807,2.797,2.787,2.779,2.771,2.763,2.756,2.750,2.576,636
     *.62,31.598,12.942,8.610,6.869,5.959,5.408,5.041,4.781,4.587,4.437,
     *4.318,4.221,4.140,4.073,4.015,3.965,3.922,3.883,3.850,3.819,3.792,
     *3.767,3.745,3.725,3.707,3.690,3.674,3.659,3.646,3.291/
      I=0
      J=NDF
      IF(NDF.GT.30) J=31
      IF(T.LT.A(J,1)) GO TO 4
      IF(T.GT.A(J,13)) GO TO 5
      DO 1 M=1,13
      IF(T.LE.A(J,M))GO TO 2
    1 CONTINUE
      M=13
    2 IF(T.EQ.A(J,M))GO TO 3
      P=Z(M-1)-(T-A(J,M-1))/(A(J,M)-A(J,M-1))*(Z(M-1)-Z(M))
      GO TO 99
    3 P=Z(M)
      GO TO 99
    4 I=-1
      P=Z(1)
      GO TO 99
    5 I=1
      P=Z(13)
   99 RETURN
      END
```

```
/*
//LINK.SYSIN DD *




        INSERT HERE HEX DECK FOR EZPLOT




/*
//GO.FT52F001 DD UNIT=SYSCP
//GO.FT17F001 DD UNIT=SYSDA,SPACE=(TRK,(300,30))
//GO.SORTLIB DD DSNAME=SYS1.SORTLIB,DISP=(OLD,KEEP)
//GO.SYSOUT    DD SYSOUT=A
//GO.SORTWK01    DD UNIT=2311,SPACE=(TRK,(100))
//GO.SORTWK02    DD UNIT=2311,SPACE=(TRK,(100))
//GO.SORTWK03    DD UNIT=2311,SPACE=(TRK,(100))
//GO.FT10F001 DD UNIT=2314,DCB=(RECFM=FB,LRECL=80,BLKSIZE=3520),        X
//              SPACE=(TRK,(300,30))
//GO.SORTIN DD VOLUME=REF=*.FT10F001,DSNAME=*.FT10F001,                 X
//              DISP=(OLD,PASS)
//GO.SORTOUT DD VOLUME=REF=*.FT10F001,DSNAME=*.FT10F001,                X
//              DISP=(OLD,PASS)
//GO.PLOTTAPE DD UNIT=TAPE7,VOL=SER=25,LABEL=(,NL),DISP=OLD
//GO.FT50F001 DD *
S01                     AD-3A(R)
S02                     AD-3A(R)+RL
S03                     AD-3A(R)+RL(CL)
```

S04	AD-3A(R) AD-3B(R)+RL
S05	AD-3A(R) AD-3B(R)
S06	AD-3A(R) AD-3B(1R)
S07	AD-3A(R) AD-3B(1R)NIC-2
S08	AD-3A(R) AD-3B(R)NIC-2+RL
S09	AD-3A(R) AD-3B(R)NIC-2(R)
S10	SUMAD-3A(IR)(I+II)
S11	SUMAD-3A(IR) AD-3B(IR)
S12	AD-3A(IR) AD-3B(R)
S13	AD-3A(IR) AD-3B(R)NIC-2
S14	SUMAD-3A(IR) AD-3B(IR)NIC-2
S15	AD-3B(R)
S16	AD-3B(R)+RL
S17	AD-3B(R)+RL(CL)
S18	SUMAD-3B(IR)(II+III)
S19	AD-3B(R)NIC-2
S20	AD-3B(R)NIC-2+RL
S21	AD-3B(R)NIC-2+RL(CL)
S22	AD-3B(1R)NIC-2
S23	UNKNOWN
S24	SUM AD-3A(R)
S25	SUMAD-3A(R)+RL
S26	SUM AD-3A(R)+RL(CL)
S27	SUM AD-3A(IR)(I+II,I+III,I+IV)
S28	SUM AD-3B(R)
S29	SUM AD-3B(R)+RL
S30	SUM AD-3B(R)+RL(CL)
S31	SUM AD-3B(IR)(II+III,II+IV,I+III,I+IV)
S32	SUM AD-3A(IR) AD-3B(IR)(I+III,I+IV)
S33	AD-3B(R-NC)
S34	AD-3B(R-P)

```
S35                    AD-3B(R-NP)
S36                    SUM AD-3B(IR)(II+III,II+IV)
S37                    SUM AD-3 R
S38                    SUM AD-3 (IR)
S39                    AD-3B(R-C)
S40                   SUM AD-3(R)+RL
S41                    NO TITLE
S42                    NO TITLE
S43                    NO TITLE
S44                    NO TITLE
S45                    NO TITLE
S46                    NO TITLE
S47                    NO TITLE
S48                    NO TITLE
S49                    NO TITLE
S50                    NO TITLE            LAST CARD


        INSERT DATA HERE


END
/*
//
```

01-21-69



△= 32- 1

A = 0.19468752E-06

B = 0.20197029E 01

◇= 32- 2

A = 0.45975889E-06

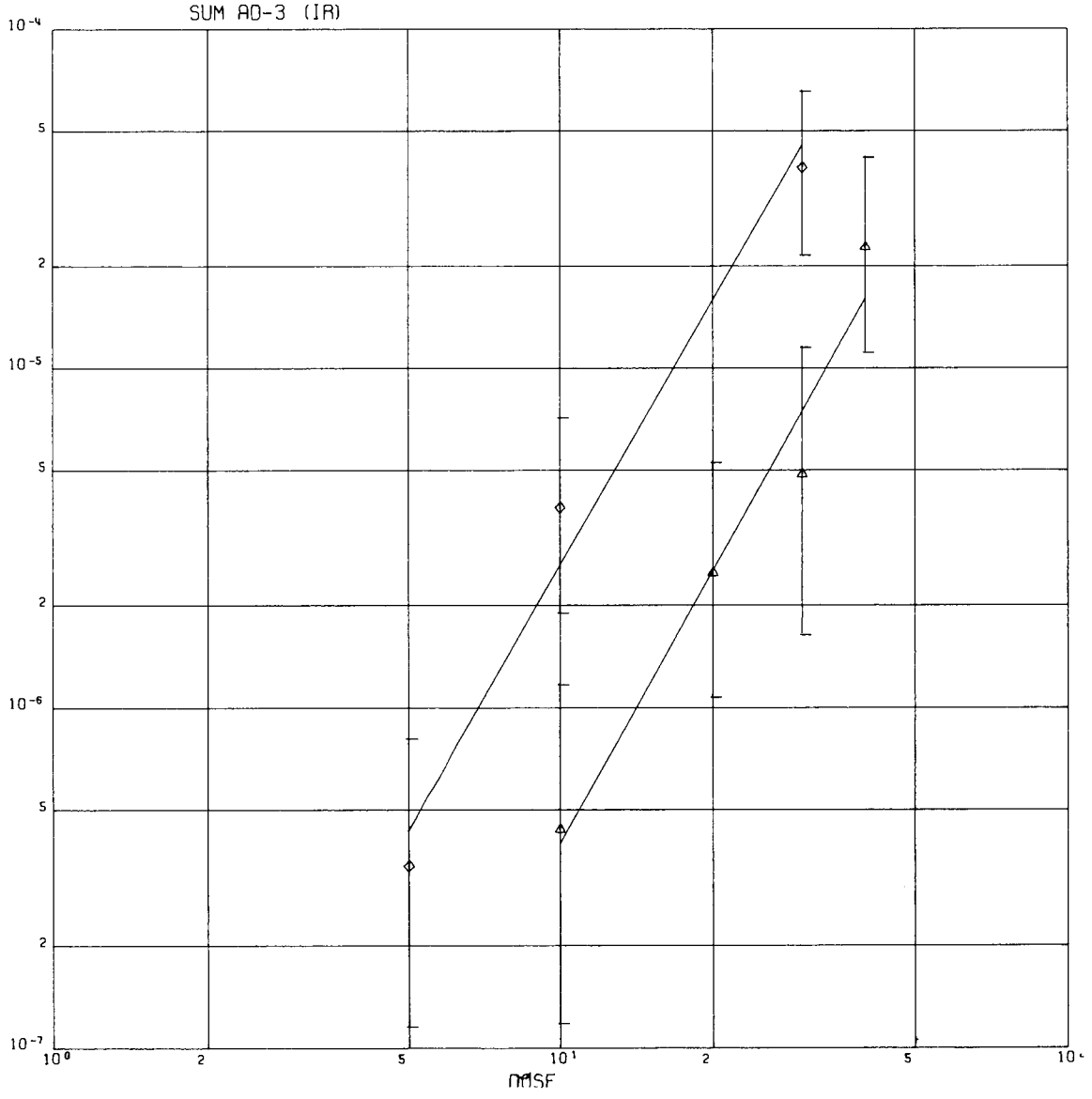
B = 0.20379543E 01

T BETWEEN SLOPES
= 0.12
WITH 3 DF
P GT.900

F DISTANCE
= 102.12
WITH1 AND 4 DF
P LT.001

COVARIANCE
B = 0.20307112E 01
SE = 0.63463330E-01
DF = 4

01-21-69



△= 32- 1

A = 0.85411878E-09

B = 0.26673460E 01

◇= 32- 2

A = 0.66522681E-08

B = 0.25951958E 01

T BETWEEN SLOPES
= 0.14
WITH 3 OF
P GT.900

F DISTANCE
= 33.42
WITH1 AND 4 OF
P = .007

COVARIANCE
B = 0.26240158E 01
SE = 0.22497463E 00
OF = 4

E. Combine Program and Output

The Combine Program takes mutant analysis output for two or more experiment-designs, plots the combined data, prints statistics, and punches new mutant analysis output with a new experiment-design number. This program can also be run with just one experiment-design to get a copy of the same output as given by the Mutant Analysis Program.

Requests for running this program should specify the new experiment-design numbers.

Order of input to 360:

(1) Program, followed by forty S cards

(2) Card with new experiment punched in cols. 3-5 and new design in cols 6-8

(3) Data to be combined

(4) END card, cols 1-3

(5) Repeat of (2), (3), and (4) for additional problems, if any

(6) /* and // cards last

360 job card:

Tape 25 pool plot (7)

Calcomp request card:

Black ink, plain paper

Maximum no. of plots = (no. of problems) X 40.

CARD LAYOUT

Title S cards

Card No _____ Card Color _____

Source _____

Edition _____

1.	ALPHABETIC S	41.	TITLE CONTINUED
2.		42.	
3.	Summary number	43.	
4.	not used	44.	
5.	AD-3 code	45.	
6.		46.	
7.	AD-3B IF NOT IGNORED	47.	
8.	ELSE BLANK	48.	
9.	DIKARYON	49.	
10.		50.	
11.	TRIKARYON	51.	
12.		52.	
13.		53.	
14.		54.	
15.		55.	
16.		56.	
17.		57.	
18.		58.	
19.	NOT USED	59.	
20.		60.	
21.		61.	
22.		62.	
23.		63.	
24.		64.	
25.		65.	
26.	TITLE BEGINS	66.	
27.	HERE	67.	
28.		68.	
29.		69.	
30.		70.	
31.		71.	
32.		72.	
33.		73.	
34.		74.	
35.		75.	
36.		76.	
37.		77.	
38.		78.	
39.		79.	
40.		80.	

TY-111 (2-60)
(8-60)

1st ~~38~~ 40 cards after combine program are of this type. The program gets titles this way. Cols 5-12 are ignored.

CARD LAYOUT

Title New Experiment-Design Assignment Card

Card No _____ Card Color _____

Source Punched by Data Setup

Edition _____

1.	Must be blank
2.	
3.	
4.	Experiment number
5.	
6.	
7.	Design number
8.	
9.	
10.	
11.	
12.	
13.	not used
14.	
15.	
16.	
17.	
18.	
19.	
20.	
21.	
22.	Title if any
23.	such as
24.	'chronic combined'
25.	
26.	
27.	
28.	
29.	
30.	
31.	
32.	fill in only if
33.	
34.	
35.	specified
36.	
37.	
38.	
39.	
40	

41.	
42.	
43.	
44.	
45.	
46.	
47.	
48.	
49.	
50.	
51.	
52.	
53.	
54.	
55.	
56.	
57.	
58.	
59.	
60.	
61.	
62.	
63.	
64.	
65.	
66.	
67.	
68.	
69.	
70.	
71.	
72.	
73.	
74.	
75.	
76.	
77.	
78.	
79.	
80	

TY-111 (2-60)
(8-60)

input to combine program and form of output from Combine program.

CARD LAYOUT

Title MUTANT ANALYSES OUTPUT

Card No _____ Card Color _____

Source _____

Edition _____

1.	Summary number	41.	Numeric
2.		42.	
3.		43.	
4.	Experiment	44.	
5.		45.	
6.		46.	E
7.	Design	47.	–
8.		48.	Exponent
9.		49.	
10.	Treatment	50.	NOT USED
11.		51.	
12.		52.	
13.		53.	
14.	Dose	54.	
15.		55.	
16.		56.	
17.		57.	
18.		58.	
19.		59.	
20.		60.	
21.	N1	61.	
22.		62.	
23.		63.	
24.		64.	
25.		65.	
26.	N2	66.	
27.		67.	
28.		68.	
29.		69.	
30.		70.	
31.	NT	71.	
32.		72.	
33.		73.	
34.	Blank	74.	
35.		75.	
* 36.	0 zero	76.	DATE
37.	• decimal	77.	
38.		78.	
39.	numeric	79.	
40		80	

TY-111 (2-60)
(8-60)

* cols 36-44 contain mutation frequency in E format

```
//              12182,MSGLEVEL=1  DIANA SMITH 9704-1 Y12  5XT.3-5048
//JOBLIB DD DSNAME=SYS1.LINKLIB,VOLUME=REF=LKCBSMPL,DISP=(OLD,PASS)
// EXEC ACGT,PARM.GO='EU=-1,DUMP=-G'
//ASSEMBLE.SYSIN DD *
SORTER   START
         USING *,12
         STM   14,12,12(13)
         LR    5,13
         LR    12,15
         LA    13,AREA
         ST    13,8(0,5)
         ST    5,AREA+4
         LA    1,PARLIST
         ATTACH EP=SORT,MF=(E,(1))
         L     13,AREA+4
         LM    14,12,12(13)
         BR    14
         LTORG
AREA     DS    18F
         CNOP   0,8
* PARAMETER LIST
PARLIST  DC     X'80'
         DC     AL3(ADLST)
         DC     X'0000'
ADLST    DC     X'0018'
         DC     A(SORTCD)
         DC     A(STCDED)
         DC     A(RCDCD)
         DC     A(RDCDED)
         DC    F'0'
```

```
         DC     F'0'
SORTCD   DC      C' SORT FIELDS=(1,2,CH,A,3,6,CH,A,12,7,CH,A),'
         DC      C'SIZE=E2000'
STCDED   DC      C' '
RCDCD    DC      C' RECORD TYPE=F,LENGTH=80'
RDCDED   DC      C' '
         END
/*
//FT63.FT50F001 DD *
```

```
**FTN,L,P,G,E.
C       PROGRAM TO COMBINE AND PLOT
        INTEGER END
        DIMENSION ILOT(50,16),LIST(20),NOW(2),A(1000)
        DATA END/4HEND /
        CALL PLOTS(A,1000)
        CALL IDAY(NOW)
        DO 3 I=1,50
        READ(50,1) M,(ILOT(I,L),L=1,16)
      1 FORMAT(1X,I2,T19,15A4,A2)
        IF(M.EQ.I) GO TO 3
        PRINT 2
      2 FORMAT('1 TITLE CARDS OUT OF ORDER')
        GO TO   7
      3 CONTINUE
      4 REWIND 10
     99 READ(50,5,END=7) LIST
      5 FORMAT(20A4)
        IF(ICOMPARE(LIST(1),END,3).NE.0) GO TO 6
        END FILE 10
        REWIND 10
        CALL SORTER
        REWIND 10
        CALL COMBINE(ILOT)
        GO TO 4
      6 WRITE(10,5) LIST
        GO TO 99
      7 PRINT 8
      8 FORMAT('1','JOB COMPLETED')
        CALL EXIT
        END
```

```
      SUBROUTINE COMBINE(ILOT)
      DIMENSION ILOT(50,16)
      DIMENSION LIST(20),IARR(17),NOW(2)
      DATA ITREA/999/
      CALL IDAY(NOW)
   99 READ(10,3,END=999) IEXP,IDES,IARR
    3 FORMAT(2X,2I3,T16,16A4,A1)
      ISW=0
      READ(10,1,END=999)LIST
    1 FORMAT(20A4)
   77 INUM=0
      REWIND 17
      PRINT 4,IEXP,IDES,IARR,NOW
    4 FORMAT('1','EXPERIMENT'I5,5X,'DESIGN',I5,10X,16A4,A1,T100,2A4)
      DECODE(80,2,LIST) IN,IE,ID,XZ,XN,XT,XO,SUM
      PRINT 9,(ILOT(IN,J),J=1,15)
    9 FORMAT('0',15A4)
      PRINT 8
    8 FORMAT('0','S',T10,'DOSE',T24,'N1',T30,'N2',T37,'NT',
     *T44,'FRACTION',T59,'LOWER LIMIT',T74,'UPPER LIMIT',
     *T089,'FREQUENCY',T104,'LOWER LIMIT',T119,'UPPER LIMIT')
    2 FORMAT(I2,2I3,3X,F7.0,3F5.0,E16.8)
  777 CONTINUE
      SUM1=XN
      SUM2=XN/SUM
      SUM3=XT
      SUM4=XO
   88 READ(10,1,END=222) LIST
      DECODE(80,2,LIST)IA,IE,ID,XD,XN,XT,XO,SUM
      IF(XD.NE.XZ) GO TO 111
      IF(IA.NE.IN) GO TO 111
      SUM1=SUM1+XN
      SUM2=SUM2+XN/SUM
      SUM3=SUM3+XT
      SUM4=SUM4+XO
      GO TO 88
  111 FR=SUM1/SUM2
      CALL POIS(SUM1,FR,XL,XU)
      FRACT=SUM1/SUM3
      CALL BICONF(SUM1,SUM3,P1,P2)
      INUM=INUM+1
      PRINT 5,IN,XZ,SUM1,SUM3,SUM4,FRACT,P1,P2,FR,XL,XU
    5 FORMAT('0',I2,5X,F7.0,5X,3F7.0,6E15.8)
      WRITE(17) IEXP,IDES,ITREA,XZ,FR,XL,XU
      WRITE(52,6) IN,IEXP,IDES,XZ,SUM1,FR,NOW
    6 FORMAT(I2,2I3,'999',F7.0,F5.0,10X,E16.8,T73,2A4)
      IF(ISW.EQ.1) GO TO 444
      IF(IA.EQ.IN) GO TO 333
  444 CONTINUE
      END FILE 17
      IF(INUM.LT.3) GO TO 333
      CALL REGR(NOW,ILOT,IN)
  333 CONTINUE
      IF(ISW.EQ.1) GO TO 999
      XZ=XD
      IF(IN.EQ.IA) GO TO 777
      IN=IA
      GO TO 77
  222 ISW=1
      GO TO 111

  999 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE REGR(NOW,ILOT,IN)
      INTEGER TITLE
      DIMENSION ILOT(50,16)
      DIMENSION E(50),JCHAR(3),TITLE(19)
      DIMENSION NOW(2),LIST(15),A(50),B(50),C(50),X(50)
      DIMENSION LAMB(3)
      DATA JCHAR/ 5,60,60/
      DO 151 I=1,15
  151 LIST(I)=ILOT(IN,I)
      ISW=0
      REWIND 17
    1 READ(17,END=999) IE,IVY,IQY,XYZ,SUM,XLOW,XUPP
  998 IF(XYZ.EQ.0.) GO TO 1
      I=1
   99 X(I)=XYZ
      A(I)=SUM
      B(I)=XLOW
      C(I)=XUPP
    2 READ(17,END=10) IX,IZY,IPY,XYZ,SUM,XLOW,XUPP
      IF(IX.NE.IE) GO TO 3
      IF(IZY.NE.IVY) GO TO 3
      IF(XYZ.EQ.0.) GO TO 2
      IF(SUM.EQ.0.) GO TO 2
      I=I+1
      GO TO 99
    3 IF(I.LT.3) GO TO 988
      CALL STAT(X,A,SL,CL,SENS,F,SE,I)
   98 PRINT 5
    5 FORMAT(//)
      IJ=I-2
      PRINT 6,SL,CL,SENS,F,IJ,SE
    6 FORMAT(//,'0',T05,'SLOPE=',F10.5,' +-',F10.5,5X,'SENS=',E16.8,
     *5X,'F=',F10.5,5X,'DF='I5,5X,'SE=',F10.5//)
      PRINT 8
      DO 7 J=1,I
      D=X(J)
      O=A(J)
      E(J)=SENS*D**SL
      PRINT 9,D,O,B(J),C(J),E(J)
    9 FORMAT('0',F9.0,T15,E16.8,T40,E16.8,T60,E16.8,T80,E16.8)
    8 FORMAT('0',2X,'DOSE',T18,'OBSERVED',T42,'LOWER LIMIT', T62,
     *'UPPER LIMIT',T84,'EXPECTED')
    7 CONTINUE
      CALL LLPLOT(-I,-3,X,JCHAR,.07,A,B,C)
      CALL GRCORD(X(1),E(1),XG,YG)
      CALL GRCORD(X(I),E(I),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
      DO 14 MP=1,I
      CALL GRCORD(X(MP),B(MP),XG,YG)
      CALL GRCORD(X(MP),C(MP),XF,YF)
      CALL PLOT(XG,YG,4)
      CALL PLOT(XF,YF,2)
   14 CONTINUE
      CALL SYMBOL(5.5,.1,.14,4HDOSE,0.0,4)
      CALL SYMBOL(0.0,4.5,.14, 9HFREQUENCY,90.0,9)
      DO 11 M=1,15
   11 TITLE(M)=LIST(M)
      TITLE(16)=4HEXP
      ENCODE(10,12,TITLE(17))IE
```

```
      ENCODE(10,13,TITLE(18)) IVY
   12 FORMAT(I4)
      ENCODE(10,12,TITLE(19))IN
      CALL SYMBOL(1.5,10.6,.14,TITLE(1),0.0,76)
   13 FORMAT('-',I3)
      ENCODE(15,15,LAMB(1)) SL
   15 FORMAT('SLOPE=',F6.2)
      CALL SYMBOL(8.5,.1,.14,LAMB(1),0.0,12)
      CALL PLOT(13.0,.0,-3)
  988 IF(ISW.EQ.1) GO TO 999
      IF=IX
      IVY=IZY
      GO TO 998
   10 ISW=1
      IF(I.LT.3) GO TO 999
      GO TO 3
  999 RETURN
      END
```

```
      SUBROUTINE STAT(X,A,B1,F7,F8,F,F6,I)
C**** PROGRAM TO COMPUTE SIMPLE LOG-LOG REGRESSION
C****  X=X AXIX VALUES,A=Y AXIS,B1=SLOPE,F7=95 PC CONFIDENCE,
C****  F8=INTERCEPT(ANTILOG),F=F VALUE TO TEST NON-ZERO SLOPE,
C****  F6=STANDARD ERROR,I=NUMBER OF OBSERVATIONS
      DIMENSION X(1),A(1),Z(50),Q(50),T(30)
      DATA T/12.706,4.303,3.182,2.776,2.571,2.447,2.365,2.306,2.262,
     *2.228,2.201,2.179,2.160,2.145,2.131,2.120,2.110,2.101,2.093,2.086,
     *2.080,2.074,2.069,2.064,2.060,2.056,2.052,2.048,2.045,2.042/
      S1=0.
      S2=0.
      S3=0.
      S4=0.
      S5=0.
      S6=0.
      DO 1 J=1,I
      X1=ALOG(X(J))
      Y1=ALOG(A(J))
      S1=S1+X1
      S2=S2+Y1
      S3=S3+X1*X1
      S4=S4+Y1*Y1
    1 S5=S5+X1*Y1
      CT=I
      F1=S1/CT
      F2=S2/CT
      F3=S3-S1*F1
      F4=S4-S2*F2
      F5=S5-S2*F1
      F1=F4-(F5*F5)/F3
      F6=SQRT(F1/((CT-2.)*F3))
      B1=F5/F3
      J=I
      IF(I.GT.32) J=32
      F7=T(J-2)*F6
      F8=F2-B1*F1
      F8=EXP(F8)
      F=(F5*F5)*(CT-2.)/(F3*F1)
      RETURN
      END
```

```
      SUBROUTINE BICONF(TN,TM,P1,P2)
C**** COMPUTES BINOMIAL CONFIDENCE LIMITS TN=OBSERVED NUMBER OUT OF TM
C*****  P1=LOWER LIMIT, P2= UPPER LIMIT  95 PER CENT
      DATA E/.0001/
      Q=TM+1.
      P1=TN/TM
      P5=P1
      IF(P1.LT.1.) GO TO 50
      P1=.99
   50 IF(TN.EQ.0.) GO TO 260
      P3=0.
      CT=1.
   90 X=TM*ALOG(1.-P1)
      Z=ALOG(P1)-ALOG(1.-P1)
      S=EXP(X)
      Y=1.
  110 IF(Y.GE.TN)     GO TO 170
      X=  X+Z+ALOG(Q-Y)-ALOG(Y)
      S=S+EXP(X)
      Y=Y+1.
      GO TO 110
  170 IF(ABS(S-.975).LT.E) GO TO 260
      IF(CT.GT.20.) GO TO 260
      IF(S-.975.LT.0.) GO TO 240
      P3=P1
      P1=(P3+P5)/2.
      CT=CT+1.
      GO TO 90
  240 P5=P1
      P1=(P3+P5)/2.
      CT=CT+1.
      GO TO 90
  260 P2=TN/TM
      P5=P2
      IF(P2.GT.0.) GO TO 280
      P2=.01
  280 IF(TN.EQ.TM) GO TO 440
      P3=1.
      CT=1.
  290 X=TM*ALOG(P2)
      S=EXP(X)
      Z=ALOG(1.-P2)-ALOG(P2)
      Y=1.
  310 IF(Y.GE.TM-TN) GO TO 365
      X=  X+Z+ALOG(Q-Y)-ALOG(Y)
      S=S+EXP(X)
      Y=Y+1.
      GO TO 310
  365 IF(ABS(S-.975).LT.E) GO TO 440
      IF(CT.GT.20.) GO TO 440
      IF(S-.975.GT.0.) GO TO 420
      P5=P2
      P2=(P5+P3)/2.
      CT=CT+1.
      GO TO 290
  420 P3=P2
      P2=(P5+P3)/2.
      CT=CT+1.
      GO TO 290
  440 RETURN

      END
```

```
      SUBROUTINE POIS(XX,FR,XL,XU)
C**** COMPUTES POISSON CONFIDENCE LIMITS FOR NON-ZERO FREQUENCY(FR).
C****   WHERE XX IS OBSERVED NUMBER.
      DIMENSION A(200),B(100),A1(200),B1(100)
      EQUIVALENCE (A(101),B(1)),
     *            (A1(101),B1(1))
      DATA A/ 00000, 0.051, 0.355, 0.818, 1.366, 1.970, 2.613, 3.285,
     *        3.285, 4.460, 5.323, 5.323, 6.686, 6.686, 8.102, 8.102,
     *        9.598, 9.598,11.177,11.177,12.817,12.817,13.765,14.921,
     *       14.921,16.768,16.770,17.630,19.050,19.050,20.330,22.360,
     *       21.360,22.940,23.760,23.760,25.400,26.310,26.310,27.730,
     *       28.970,28.970,30.020,31.670,31.670,32.280,34.050,34.660,
     *       34.660,36.030,37.670,37.670,38.160,39.760,40.940,40.940,
     *       41.750,43.450,44.260,44.260,45.280,47.020,47.690,47.690,
     *       48.740,50.420,51.290,51.290,52.150,53.720,54.990,54.990,
     *       55.510,56.990,58.720,58.720,58.840,60.240,61.900,62.810,
     *       62.810,63.490,64.950,66.760,66.760,66.760,68.100,69.620,
     *       71.090,71.090,71.280,72.660,74.220,75.490,75.490,75.780,
     *       77.160,78.730,79.980,79.980/
      DATA B/ 80.25, 81.61, 83.14, 84.57, 84.57, 84.67, 86.01, 87.48,
     *        89.23, 89.23, 89.23, 90.37, 91.78, 93.48, 94.23, 94.23,
     *        94.70, 96.06, 97.54, 99.17, 99.17, 99.17,100.32,101.71,
     *       103.31,104.40,104.40,104.58,105.90,107.32,109.11,109.61,
     *       109.61,110.11,111.44,112.87,114.84,114.84,114.84,115.60,
     *       116.93,118.35,120.36,120.36,120.36,121.06,122.37,123.77,
     *       125.46,126.26,126.26,126.48,127.78,129.14,130.68,132.03,
     *       132.03,132.03,133.14,134.48,135.92,137.79,137.79,137.79,
     *       138.49,139.79,141.16,142.70,144.01,144.01,144.01,145.08,
     *       146.39,147.80,149.53,150.19,150.19,150.36,151.63,152.96,
     *       154.39,156.32,156.32,156.32,156.87,158.15,159.48,160.92,
     *       162.79,162.79,162.79,163.35,164.63,165.96,167.39,169.33,
     *       169.33,169.33,169.80,171.07/
      DATA A1/ 3.285, 5.323, 6.686, 8.102, 9.598,11.177,12.817,13.765,
     *        14.921,16.768,17.633,19.050,20.335,21.364,22.945,23.762,
     *        25.400,26.306,27.735,28.966,30.017,31.675,32.277,34.048,
     *        34.665,36.030,37.670,38.160,39.760,40.940,41.750,43.450,
     *        44.260,45.280,47.020,47.690,48.740,50.420,51.290,52.150,
     *        53.720,54.990,55.510,56.990,58.720,58.840,60.240,61.900,
     *        62.810,63.490,64.950,66.760,66.760,68.100,69.620,71.090,
     *        71.280,72.660,74.220,75.490,75.780,77.160,78.730,79.980,
     *        80.250,81.610,83.140,84.570,84.670,86.010,87.480,89.230,
     *        89.230,90.370,91.780,93.480,94.230,94.700,96.060,97.540,
     *        99.170,99.170,100.32,101.71,103.31,104.40,104.58,105.90,
     *        107.32,109.11,109.61,110.11,111.44,112.87,114.84,114.84,
     *        115.60,116.93,118.35,120.36/
      DATA B1/ 120.36,121.06,122.37,123.77,125.46,126.26,126.48,127.78,
     *         129.14,130.68,132.03,132.03,133.14,134.48,135.92,137.79,
     *         137.79,138.49,139.79,141.16,142.70,144.01,144.01,145.08,
     *         146.39,147.80,149.53,150.19,150.36,151.63,152.96,154.39,
     *         156.32,156.32,156.87,158.15,159.48,160.92,162.79,162.79,
     *         163.35,164.63,165.96,167.39,169.33,169.33,169.80,171.07,
     *         172.38,173.79,175.48,176.23,176.23,177.48,178.77,180.14,
     *         181.67,183.05,183.05,183.86,185.13,186.46,187.89,189.83,
     *         189.83,190.21,191.46,192.76,194.11,195.63,197.09,197.09,
     *         197.78,199.04,200.35,201.73,203.35,204.36,204.36,205.31,
     *         206.58,207.90,209.30,211.03,211.69,211.69,212.82,214.09,
     *         215.40,216.81,218.56,219.16,219.16,220.29,221.56,222.86,
     *         224.26,225.90,226.81,226.81/
      DEN=XX/FR
      NUM=XX+1.
```

```
      IF(NUM.GT.200) GO TO 1
      XL=A(NUM)/DEN
      XU=A1(NUM)/DEN
      GO TO 2
    1 XL=FR-1.96*SQRT(XX)/DEN
      XU=FR+1.96*SQRT(XX)/DEN
    2 RETURN
      END
```

```
/*
//LINK.SYSIN DD *




        HEX DECK FOR EZPLOT GOES HERE




/*
//GO.PLOTTAPE DD UNIT=TAPE7,VOL=SER=25,LABEL=(,NL),DISP=OLD
//GO.SORTLIB DD DSNAME=SYS1.SORTLIB,DISP=(OLD,KEEP)
//GO.SYSOUT    DD SYSOUT=A
//GO.SORTWK01    DD UNIT=2311,SPACE=(TRK,(100))
//GO.SORTWK02    DD UNIT=2311,SPACE=(TRK,(100))
//GO.SORTWK03    DD UNIT=2311,SPACE=(TRK,(100))
//GO.FT10F001 DD UNIT=2314,DCB=(RECFM=FB,LRECL=80,BLKSIZE=3520),        X
//             SPACE=(TRK,(300,30))
//GO.SORTIN DD VOLUME=REF=*.FT10F001,DSNAME=*.FT10F001,                 X
//             DISP=(OLD,PASS)
//GO.SORTOUT DD VOLUME=REF=*.FT10F001,DSNAME=*.FT10F001,                X
//             DISP=(OLD,PASS)
//GO.FT50F001 DD *
S01                     AD-3A(R)
S02                     AD-3A(R)+RL
S03                     AD-3A(R)+RL(CL)
S04                     AD-3A(R) AD-3B(R)+RL
S05                     AD-3A(R) AD-3B(R)
```

S06	AD-3A(R) AD-3B(1R)
S07	AD-3A(R) AD-3B(1R)NIC-2
S08	AD-3A(R) AD-3B(R)NIC-2+RL
S09	AD-3A(R) AD-3B(R)NIC-2(R)
S10	SUMAD-3A(IR)(I+II)
S11	SUMAD-3A(IR) AD-3B(IR)
S12	AD-3A(IR) AD-3B(R)
S13	AD-3A(IR) AD-3B(R)NIC-2
S14	SUMAD-3A(IR) AD-3B(IR)NIC-2
S15	AD-3B(R)
S16	AD-3B(R)+RL
S17	AD-3B(R)+RL(CL)
S18	SUMAD-3B(IR)(II+III)
S19	AD-3B(R)NIC-2
S20	AD-3B(R)NIC-2+RL
S21	AD-3B(R)NIC-2+RL(CL)
S22	AD-3B(1R)NIC-2
S23	UNKNOWN
S24	SUM AD-3A(R)
S25	SUMAD-3A(R)+RL
S26	SUM AD-3A(R)+RL(CL)
S27	SUM AD-3A(IR)(I+II,I+III,I+IV)
S28	SUM AD-3B(R)
S29	SUM AD-3B(R)+RL
S30	SUM AD-3B(R)+RL(CL)
S31	SUM AD-3B(IR)(II+III,II+IV,1+III,I+IV)
S32	SUM AD-3A(IR) AD-3B(IR)(I+III,I+IV)
S33	AD-3B(R-NC)
S34	AD-3B(R-P)
S35	AD-3B(R-NP)
S36	SUM AD-3B(IR)(II+III,II+IV)

```
S37                    SUM AD-3 R
S38                    SUM AD-3 (IR)
S39                    AD-3B(R-C)
S40                   SUM AD-3(R)+RL
S41                    NO TITLE
S42                    NO TITLE
S43                    NO TITLE
S44                    NO TITLE
S45                    NO TITLE
S46                    NO TITLE
S47                    NO TITLE
S48                    NO TITLE
S49                    NO TITLE
S50                    NO TITLE          LAST CARD


          INSERT DATA HERE


END
/*
//
```

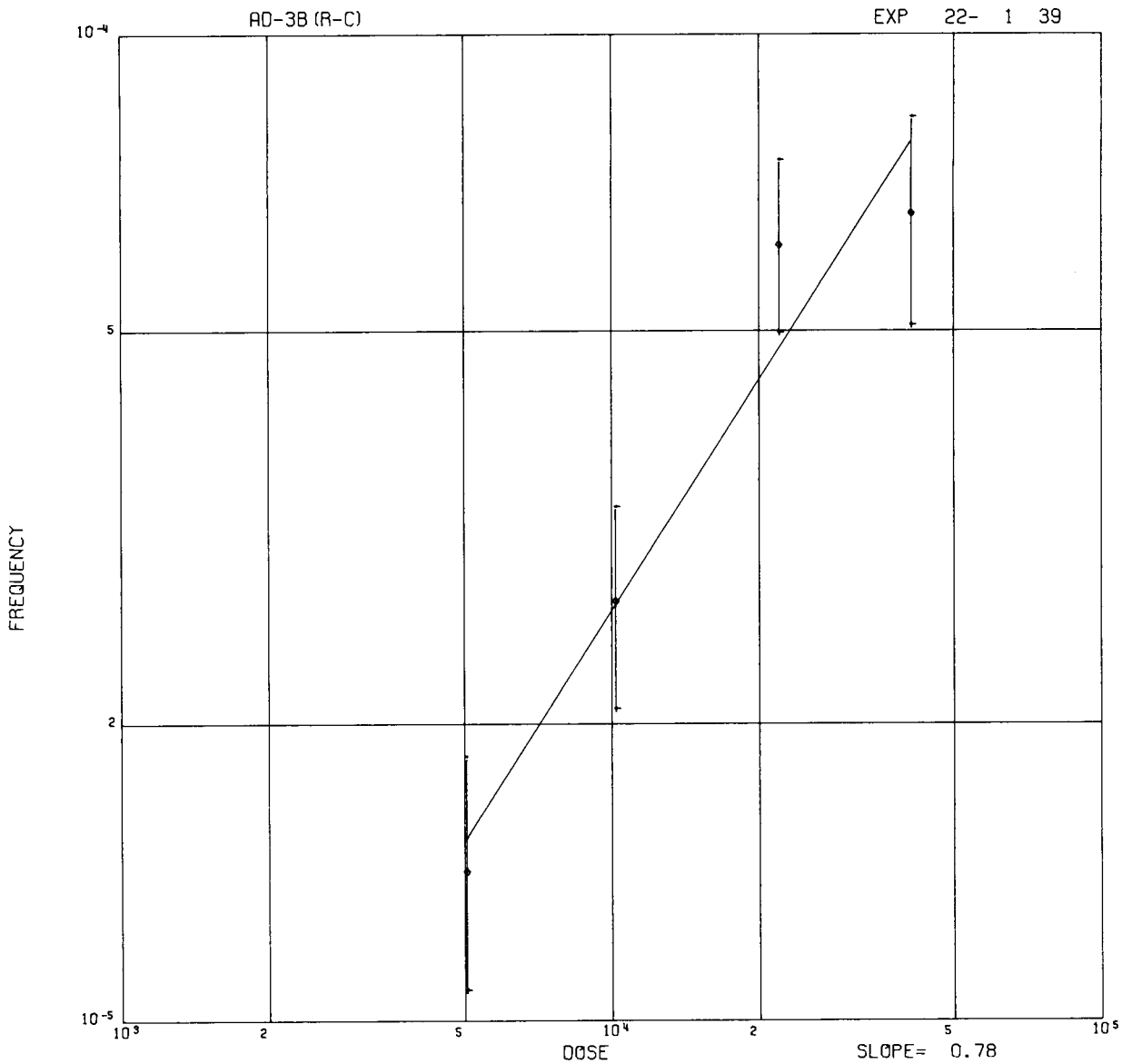
EXPERIMENT 22 DESIGN 1 050 52 295 471 0.12417718E-04 12-09-68

AD-3B(R-C)

S	DOSE	N1	N2	NT	FRACTION	LOWER LIMIT	UPPER LIMIT	FREQUENCY	LOWER LIMIT	UPPER LIMIT
39	5050.	50.	299.	550.	0.16722405E 00	0.12680602E 00	0.20747942E 00	0.14178223E-04	0.10681872E-04	0.18417501E-04
39	10200.	76.	600.	1725.	0.12666667E 00	0.10118479E 00	0.14347804E 00	0.26603899E-04	0.20597014E-04	0.32985321E-04
39	22000.	93.	590.	2606.	0.15762711E 00	0.12939960E 00	0.17715722E 00	0.60976716E-04	0.49496055E-04	0.74004754E-04
39	41000.	68.	599.	1644.	0.11352253E 00	0.89299142E-01	0.12950319E 00	0.65641652E-04	0.50341347E-04	0.81733509E-04

SLOPE= 0.77684 +- 0.58738 SENS= 0.20314843E-07 F= 32.38626 DF= 2 SE= 0.13651

DOSE	OBSERVED	LOWER LIMIT	UPPER LIMIT	EXPECTED
5050.	0.14178223E-04	0.10681872E-04	0.18417501E-04	0.15299636E-04
10200.	0.26603899E-04	0.20597014E-04	0.32985321E-04	0.26415422E-04
22000.	0.60976716E-04	0.49496055E-04	0.74004754E-04	0.47993788E-04
41000.	0.65641652E-04	0.50341347E-04	0.81733509E-04	0.77841745E-04


AD-3B (R-C)
EXP 22- 1 39
FREQUENCY
DOSE
SLOPE= 0.78

F. Chi-Square Program and Output

This program computes chi-squares within experiment-designs and, if more than one experiment-design, then between experiment-designs. Cards used are mutant analysis output which have experiment cols. 3-5 and design in cols. 6-8.

Order of input:

(1) Program

(2) Data for chi-squares (does not have to be sorted)

(3) END card

(4) Repeat of (2), (3) for each problem

(5) /* and // card

Example: Request for chi-squares for (1) Exp. 59-1 and (2) Exps. 32-1 and 32-2 would be run as two problems.

360 job card:

No tapes used

Calcomp card:

Not needed

Input for χ^2 program

CARD LAYOUT

Title MUTANT ANALYSES OUTPUT

Card No _____ Card Color _____

Source _____

Edition _____

1.	Summary number	41.	Numeric
2.		42.	
3.		43.	
4.	Experiment	44.	
5.		45.	
6.		46.	E
7.	Design	47.	–
8.		48.	Exponent
9.		49.	
10.	Treatment	50.	
11.		51.	
12.		52.	
13.		53.	
14.	Dose	54.	
15.		55.	
16.		56.	
17.		57.	
18.		58.	
19.		59.	
20.		60.	
21.	N1	61.	NOT USED
22.		62.	
23.		63.	
24.		64.	
25.		65.	
26.	N2	66.	
27.		67.	
28.		68.	
29.		69.	
30.		70.	
31.	NT	71.	
32.		72.	
33.		73.	
34.	Blank	74.	
35.		75.	
* 36.	0 zero	76.	DATE
37.	• decimal	77.	
38.		78.	
39.	Numeric	79.	
40.		80.	

TY-111 (2-60)
(8-60)

* cols 36-44 contain mutation frequency in E format

```
//              10847,MSGLEVEL=1 DIANA SMITH
//JOBLIB DD DSNAME=SYS1.LINKLIB,VOLUME=REF=LKCBSMPL,DISP=(OLD,PASS)
// EXEC ACGT,PARM.GO='EU=-1,DUMP=-G'
//ASSEMBLE.SYSIN DD *
SORTER   START
         USING *,12
         STM    14,12,12(13)
         LR     5,13
         LR     12,15
         LA     13,AREA
         ST     13,8(0,5)
         ST     5,AREA+4
         LA     1,PARLIST
         ATTACH EP=SORT,MF=(E,(1))
         L      13,AREA+4
         LM     14,12,12(13)
         BR     14
         LTORG
AREA     DS     18F
         CNOP    0,8
* PARAMETER LIST
PARLIST  DC      X'80'
         DC      AL3(ADLST)
         DC      X'0000'
ADLST    DC      X'0018'
         DC      A(SORTCD)
         DC      A(STCDED)
         DC      A(RCDCD)
         DC      A(RDCDED)
         DC     F'0'
```

```
         DC     F'0'
SORTCD   DC      C' SORT FIELDS=(3,6,CH,A,12,7,CH,A,1,2,CH,A),'
         DC      C'SIZE=E2000'
STCDED   DC      C' '
RCDCD    DC      C' RECORD TYPE=F,LENGTH=80'
RDCDED   DC      C' '
         END
/*
//FT63.FT50F001 DD *
```

```
**FTN,L,G,P,F.
C**** PROGRAM CHI-SQUARE FOR P,NP,NC AND NC,C
      DIMENSION NAME(2)
      DIMENSION NOW(2),LIST(20),Z(100,10),X(100,10),TC(10),TR(100)
      DATA IEND/4HEND /
      CALL IDAY(NOW)
   10 REWIND 10
   20 READ(50,212,END=110) LIST,DS
  212 FORMAT(20A4,T12,F7.0)
   21 FORMAT(20A4)
      IF(ICOMPARE(IEND,LIST,3).EQ.0) GO TO 23
      IF(DS.EQ.0.) GO TO 20
      DECODE(4,22,LIST) IS
   22 FORMAT(I2)
      IF(IS.LT.33) GO TO 20
      IF(IS.GT.35) GO TO 20
      WRITE(10,21) LIST
      GO TO 20
   23 END FILE 10
      PRINT 1234
 1234 FORMAT('1')
      REWIND 10
      CALL SORTER
      REWIND 10
      PRINT 24,NOW
      PRINT 25
   24 FORMAT('1 CHI-SQUARE ANALYSIS',T90,'DATE ',2A4)
   25 FORMAT('0',T6,'EXPERIMENT',T18,'DESIGN',T28,'DOSE',T40,'P',T44,
     * 'NP',T49,'NC',T55,'C',T75,'P',T85,'NP',T95,'NC',T105,'C'//)
      L=0
      ISW=0
      READ(10,26,END=10) IS,IE,ID,BD,XN1
   26 FORMAT(I2,I3,I3,T12,F7.0,T19,F5.0)
   30 I=0
   40 I=I+1
      Z(I,1)=0.
      Z(I,2)=0.
      Z(I,3)=0.
      IF(IS.NE.33) GO TO 60
      Z(I,3)=XN1
   50 READ(10,26,END=51) IS,IG,IX,XD,XN1
      GO TO 52
   51 ISW=1
      GO TO 90
   52 IF(IE.NE.IG) GO TO 90
      IF(ID.NE.IX) GO TO 90
      IF(BD.EQ.XD) GO TO 60
      Z(I,4)=Z(I,1)+Z(I,2)
      T=Z(I,4)+Z(I,3)
      P1=Z(I,1)/T
      P2=Z(I,2)/T
      P3=Z(I,3)/T
      P4=Z(I,4)/T
      PRINT 53,IE,ID,BD,Z(I,1),Z(I,2),Z(I,3),Z(I,4),P1,P2,P3,P4
   53 FORMAT('0',2I10,F10.0,5X,4F5.0,10X,4F10.5)
      BD=XD
      GO TO 40
   60 IF(IS.NE.34) GO TO 80
      Z(I,1)=XN1
   70 READ(10,26,END=51) IS,IG,IX,XD,XN1
      IF(IE.NE.IG)GO TO 90
```

```
      IF(ID.NE.IX)GO TO 90
      IF(BD.EQ.XD) GO TO 80
      Z(I,4)=Z(I,1)+Z(I,2)
      T=Z(I,4)+Z(I,3)
      P1=Z(I,1)/T
      P2=Z(I,2)/T
      P3=Z(I,3)/T
      P4=Z(I,4)/T
      PRINT 53,IF,ID,BD,Z(I,1),Z(I,2),Z(I,3),Z(I,4),P1,P2,P3,P4
      BD=XD
      GO TO 40
   80 IF(IS.EQ.35) GO TO 83
   81 PRINT 82,LIST
   82 FORMAT('1 DUPLICATE CARD ',20A4)
      GO TO 10
   83 Z(I,2)=XN1
      Z(I,4)=Z(I,1)+Z(I,2)
      T=Z(I,4)+Z(I,3)
      P1=Z(I,1)/T
      P2=Z(I,2)/T
      P3=Z(I,3)/T
      P4=Z(I,4)/T
      PRINT 53,IF,ID,BD,Z(I,1),Z(I,2),Z(I,3),Z(I,4),P1,P2,P3,P4
      READ(10,26,END= 89) IS,IF,ID,BD,XN1
      IF(IF.NE.IG) GO TO 100
      IF(ID.NE.IX) GO TO 100
      IF(BD.NE.XD) GO TO 40
      GO TO 81
   89 ISW=1
      GO TO 100
   90 CONTINUE
      Z(I,4)=Z(I,1)+Z(I,2)
      T=Z(I,4)+Z(I,3)
      P1=Z(I,1)/T
      P2=Z(I,2)/T
      P3=Z(I,3)/T
      P4=Z(I,4)/T
      PRINT 53,IF,ID,BD,Z(I,1),Z(I,2),Z(I,3),Z(I,4),P1,P2,P3,P4
  100 IF(I.LE.1) GO TO 10
      LOOP=1
      NAME(1)=4HP NP
      NAME(2)=4H NC
      CALL CHISQ(Z,1,I,1,3,CS,NDF,IERR,TR,TC,P,IRE)
      L=L+1
      X(L,1)=TC(1)
      X(L,2)=TC(2)
      X(L,3)=TC(3)
      X(L,4)=TC(1)+TC(2)
      T=X(L,1)+X(L,2)+X(L,3)
      P1=X(L,1)/T
      P2=X(L,2)/T
      P3=X(L,3)/T
      P4=X(L,4)/T
      PRINT 1009,(X(L,J),J=1,4),P1,P2,P3,P4
 1009 FORMAT('0','TOTALS',T37,4F5.0,10X,4F10.5)
 1000 IF(IRE)101,102,103
  101 LZ=4HLT
      GO TO 104
  102 LZ=4H=
      GO TO 104
  103 IF(IRE.GT.1) GO TO 106
      LZ=4HGT
```

```
  104 PRINT 105,NAME,CS,NDF,LZ,P
  105 FORMAT(//,' CHI-SQUARE '2A4,'=' ,E16.8,' WITH',I3,' DF',10X,
     * 'P ',A4,F4.3//)
      GO TO 108
  106 PRINT 107,NAME,CS,NDF
  107 FORMAT(//,' CHI-SQUARE '2A4,'=' ,E16.8,' WITH',I3,' DF'//)
  108 IF(LOOP.NE.1) GO TO 109
      CALL CHISQ(Z,1,I,3,4,CS,NDF,IERR,TR,TC,P,IRE)
      LOOP=2
      NAME(1)=4H NC
      NAME(2)=4H C
      GO TO 1000
  109 CONTINUE
      I=0
      IF(ISW.NE.1) GO TO 30
      IF(L.LE.1) GO TO 10
      LOOP=1
      NAME(1)=4HP NP
      NAME(2)=4H NC
      CALL CHISQ(X,1,L,1,3,CS,NDF,IERR,TR,TC,P,IRE)
      T1=TC(1)
      T2=TC(2)
      T3=TC(3)
      T4=TC(1)+TC(2)
      T=T1+T2+T3
      P1=T1/T
      P2=T2/T
      P3=T3/T
      P4=T4/T
      PRINT 3009,T1,T2,T3,T4,P1,P2,P3,P4
 3009 FORMAT('0','GRAND TOTALS',T37,4F5.0,10X,4F10.5)
 2000 IF(IRE) 2001,2002,2003
 2001 LZ=4HLT
      GO TO 2004
 2002 LZ=4H=
      GO TO 2004
 2003 IF(IRE.GT.1) GO TO 2006
      LZ=4HGT
 2004 PRINT 2005,NAME,CS,NDF,LZ,P
 2005 FORMAT(//,'  BETWEEN   ',2A4,'=',E16.8,' WITH',I3,' DF',10X,
     * 'P ',A4,F4.3//)
      GO TO 2008
 2006 PRINT 2007,NAME,CS,NDF
 2007 FORMAT(//,'  BETWEEN   ',2A4,'=',E16.8,' WITH',I3,' DF'//)
 2008 IF(LOOP.NE.1) GO TO 2009
      CALL CHISQ(X,1,L,3,4,CS,NDF,IERR,TR,TC,P,IRE)
      LOOP=2
      NAME(1)=4H NC
      NAME(2)=4H C
      GO TO 2000
 2009 CONTINUE
      GO TO 10
  110 PRINT 111
  111 FORMAT('1 JOB COMPLETED')
      CALL EXIT
      END
```

```
      SUBROUTINE CHISQ(A,N1,N,M1,M,CS,NDF,IERR,TR,TC,P,IRE)
      DIMENSION A(100,10),TR(100),TC(10)
C
C       FIND DEGREES OF FREEDOM
C
      IER=0
      CS=0.
      NR=N+1-N1
      NC=M+1-M1
      NM=NR*NC
      NDF=(NR-1)*(NC-1)
      IF(NDF) 5,5,10
    5 IERR=3
      RETURN
C
C       COMPUTE TOTALS OF COLUMNS
C
   10 DO 90 I=N1,N
      TR(I)=0.
      DO 90 J=M1,M
   90 TR(I)=TR(I)+A(I,J)
C
C       COMPUTE TOTALS OF ROWS
C
      DO 100 J=M1,M
      TC(J)=0.
      DO 100 I=N1,N
  100 TC(J)=TC(J)+A(I,J)
C
C       COMPUTE GRAND TOTAL
C
      GT=0.
      DO 110 I=N1,N
  110 GT=GT+TR(I)
C
C       COMPUTE CHI SQUARE FOR 2 BY 2 TABLE (SPECIAL CASE)
C
      IF(NM-4) 130,120,130
  120 CS=GT*(ABS(A(N1,M1) *  A(N,M)-A(N1,M)*A(N,M1))-GT/2.0)**2/(TC(M1)*
     X TC(M)*TR(N1)*TR(N))
      CALL PCHI(NDF,CS,P ,IRE)
      RETURN
C
C       COMPUTE CHI SQUARE FOR OTHER CONTINGENCY TABLES
C
  130 DO 140 J=M1,M
      DO 140 I=N1,N
      E=TR(I)*TC(J)/GT
      IF(E-1.0)135,140,140
  135 IERR=1
  140 CS=CS+(A(I,J)-E)*(A(I,J)-E)/E
      CALL PCHI(NDF,CS,P,IRE)
      RETURN
      END
```

```
      SUBROUTINE PCHI(NDF,CS,P,IRE)
      DIMENSION X(30,13),A(30,7),B(30,6),Z(13)
      EQUIVALENCE(X(1,1),A(1,1)),(X(1,8),B(1,1))
C****    PROBABILITY VALUES FOR CHISQUARE(CS) WITH DEGREES OF FREEDOM(NDF)
C***   IRE=-1FOR LESS,0 FOR =,1 FOR GREATER,2 FOR NDF TOO LARGE(31 UP)
      DATA A/.0000393,.01,.0717,.207,.412,.676,.989,1.34,1.73,2.16,
     * 2.6,3.07,3.57,4.07,4.6,5.14,5.7,6.26,6.84,7.43,8.03,8.64,9.26,
     * 9.89,10.5,11.2,11.8,12.5,13.1,13.8,  .000157,.0201,.115,.297,
     * .554,.872,1.24,1.65,2.09,2.56,3.05,3.57,4.11,4.66,5.23,5.81,6.41,
     * 7.01,7.63,8.26,8.90,9.54,10.2,10.9,11.5,12.2,12.9,13.6,14.3,15.,
     * .000982,.0506,.216,.484,.831,1.24,1.69,2.18,2.7,3.25,3.82,4.4,
     * 5.01,5.63,6.26,6.91,7.56,8.23,8.91,9.59,10.3,11.,11.7,12.4,13.1,
     * 13.8,14.6,15.3,16.,16.8,  .00393,.103,.352,.711,1.15,1.64,2.17,
     * 2.73,3.33,3.94,4.57,5.23,5.89,6.57,7.26,7.96,8.67,9.39,10.1,10.9,
     * 11.6,12.3,13.1,13.8,14.6,15.4,16.2,16.9,17.7,18.5,  .0158,.211,
     * .584,1.06,1.61,2.20,2.83,3.49,4.17,4.87,5.58,6.3,7.04,7.79,8.55,
     * 9.31,10.1,10.9,11.7,12.4,13.2,14.,14.8,15.7,16.5,17.3,18.1,18.9,
     * 19.8,20.6,  .102,.575,1.21,1.92,2.67,3.45,4.25,5.07,5.90,6.74,
     * 7.58,8.44,9.30,10.2,11.0,11.9,12.8,13.7,14.6,15.5,16.3,17.2,18.1,
     * 19.0,19.9,20.8,21.7,22.7,23.6,24.5,  .455,1.39,2.37,3.36,4.35,
     * 5.35,6.35,7.34,8.34,9.34,10.3,11.3,12.3,13.3,14.3,15.3,16.3,17.3,
     * 18.3,19.3,20.3,21.3,22.3,23.3,24.3,25.3,26.3,27.3,28.3,29.3/
      DATA B/1.32,2.77,4.11,5.39,6.63,7.84,9.04,10.2,11.4,12.5,13.7,
     * 14.8,16.0,17.1,18.2,19.4,20.5,21.6,22.7,23.8,24.9,26.,27.1,28.2,
     * 29.3,30.4,31.5,32.6,33.7,34.8,  2.71,4.61,6.25,7.78,9.24,10.6,
     * 12.,13.4,14.7,16.,17.3,18.5,19.8,21.1,22.3,23.5,24.8,26.0,27.2,
     * 28.4,29.6,30.8,32.0,33.2,34.4,35.6,36.7,37.9,39.1,40.3,
     * 3.84,5.99,7.81,9.49,11.1,12.6,14.1,15.5,16.9,18.3,19.7,21.,22.4,
     * 23.7,25.0,26.3,27.6,28.9,30.1,31.4,32.7,33.9,35.2,36.4,37.7,38.9,
     * 40.1,41.3,42.6,43.8,5.02,7.38,9.35,11.1,12.8,14.4,16.0,17.5,19.,
     * 20.5,21.9,23.3,24.7,26.1,27.5,28.8,30.2,31.5,32.9,34.2,35.5,36.8,
     * 38.1,39.4,40.6,41.9,43.2,44.5,45.7,47.0,  6.63,9.21,11.3,13.3,
     * 15.1,16.8,18.5,20.1,21.7,23.2,24.7,26.2,27.7,29.1,30.6,32.0,33.4,
     * 34.8,36.2,37.6,38.9,40.3,41.6,43.0,44.3,45.6,47.0,48.3,49.6,50.9,
     * 7.88,10.6,12.8,14.9,16.7,18.5,20.3,22.,23.6,25.2,26.8,28.3,29.8,
     * 31.3,32.8,34.3,35.7,37.2,38.6,40.,41.4,42.8,44.4,45.6,46.9,48.3,
     * 49.6,51.0,52.3,53.7/
      DATA Z/.995,.990,.975,.950,.900,.750,.500,.250,.100,.050,.025,
     * .010,.005/
      IRE=0
      IF(NDF.GT.30) GO TO 11
      IF(X(NDF,1)-CS) 7,6,5
    7 IF(X(NDF,13)-CS)4,9,8
    8 DO 1 J=2,13
      IF(CS-X(NDF,J))2,10,1
    1 CONTINUE
    2 P=Z(J-1)-(CS-X(NDF,J-1))/(X(NDF,J)-X(NDF,J-1))*(Z(J-1)-Z(J))
      RETURN
    6 P=Z(1)
      RETURN
    9 P=Z(13)
      RETURN
    5 IRE=1
      GO TO 6
    4 IRE=-1
      GO TO 9
   10 P=Z(J)
      RETURN
   11 IRE=2
      P=0.

      RETURN
      END
```

```
/*
//GO.SORTLIB DD DSNAME=SYS1.SORTLIB,DISP=(OLD,KEEP)
//GO.SYSOUT DD SYSOUT=A
//GO.SORTWK01 DD UNIT=2311,SPACE=(TRK,(100))
//GO.SORTWK02 DD UNIT=2311,SPACE=(TRK,(100))
//GO.SORTWK03 DD UNIT=2311,SPACE=(TRK,(100))
//GO.FT10F001 DD UNIT=2314,DCB=(RECFM=FB,LRECL=80,BLKSIZE=3520),
//              SPACE=(TRK,(300,30))
//GO.SORTIN DD VOLUME=REF=*.FT10F001,DSNAME=*.FT10F001,DISP=(OLD,PASS)
//GO.SORTOUT DD VOLUME=REF=*.FT10F001,DSNAME=*.FT10F001,DISP=(OLD,PASS)
//GO.FT50F001 DD *




          INSERT DATA HERE




END
/*
//
```

CHI-SQUARE ANALYSIS DATE 12-09-68

EXPERIMENT	DESIGN	DOSE	P	NP	NC	C	P	NP	NC	C
22	3	5050.	30.	31.	114.	61.	0.17143	0.17714	0.65143	0.34857
22	3	10200.	22.	28.	123.	50.	0.12717	0.16185	0.71098	0.28902
22	3	22000.	27.	34.	163.	61.	0.12054	0.15179	0.72768	0.27232
22	3	41000.	27.	30.	117.	57.	0.15517	0.17241	0.67241	0.32759
TOTALS			106.	123.	517.	229.	0.14209	0.16488	0.69303	0.30697

CHI-SQUARE P NP NC = 0.37474985E 01 WITH 6 DF P = .711

CHI-SQUARE NC C = 0.32974482E 01 WITH 3 DF P = .367

22	4	5050.	44.	58.	196.	102.	0.14765	0.19463	0.65772	0.34228
22	4	10200.	35.	41.	160.	76.	0.14831	0.17373	0.67797	0.32203
22	4	22000.	27.	66.	142.	93.	0.11489	0.28085	0.60426	0.39574
22	4	41000.	20.	48.	140.	68.	0.09615	0.23077	0.67308	0.32692
TOTALS			126.	213.	638.	339.	0.12897	0.21801	0.65302	0.34698

CHI-SQUARE P NP NC = 0.12088959E 02 WITH 6 DF P = .063

CHI-SQUARE NC C = 0.35127859E 01 WITH 3 DF P = .336

GRAND TOTALS			232.	336.	1155.	568.	0.13465	0.19501	0.67034	0.32966

BETWEEN P NP NC = 0.76756020E 01 WITH 2 DF P = .023

BETWEEN NC C = 0.28858843E 01 WITH 1 DF P = .092

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