**MATRIX TO TEST TRANSDUCTION MAP SEQUENCES**

<table>
<thead>
<tr>
<th>Sequence operators</th>
<th>Codes for multiple exchange types</th>
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<td></td>
<td>(Operators on donor genotype)</td>
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</table>

3-point test:

| 123                | b                                |
| 132                | c                                |
| 213                | a                                |

4-point test:

| 1234               | b c ac bc bd                      |
| 1243               | b d ad bd bc                      |
| 1324               | c b ab bc cd                      |
| 1342               | c d ad cd bc                      |
| 1423               | d b ab bd cd                      |
| 1432               | d c ac cd bd                      |
| 2134               | a c bc ac ad                      |
| 2143               | a d bd ad ac                      |
| 2314               | c a ab ac cd                      |
| 2413               | d a ab ad cd                      |
| 3124               | a b bc ab ad                      |
| 3214               | b a ac ab bd                      |

The complete table can be generated as the permutations of \((a'b', cd')\) where \(a'b'=bb, bc, bd,\) and \(bb=b.\)

**Instructions:**

1. Write down the donor genotype (differential markers only) in any arbitrary sequence, e.g., \(W^+X^+Y^+Z^-.\)
2. Group the experimental results into the rare and frequent classes.
3. Code these classes as transformations of the donor genotype. The code "a" means "reverse the sign of the first locus written", "b" the same for the second, etc. Thus, \((ad)(W^+X^+Y^+Z^-)\) would be \(W^+X^+Y^+Z^+.\)
4. The table gives the codes for the multiple exchange classes (mec) corresponding to each sequence. These models are excluded where frequently found types are included in the mec codes, and vice versa.
5. The sequence codes can be translated into maps by writing the donor genotype as \(W^XY^YZ\) and transposing accordingly. Thus, \(2314\) would be the map \(XYZ.\)
6. For the reciprocal transduction, superimpose the operation abcd, so that, e.g., ac becomes bd; c becomes abd in the mec codes.

J. Lederberg
# Index to Some Topics in Vol. II

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Subject

HET enterobioi

2 - x 4 - colony clear

1 - x 4 -

4 - x 1 -

1 - x 7 - 7 - x 7 -

+ - x 2 / 6 - 2

1 - x 7 -

1 - x 6 - 6 - x 2 -

Trich clone 5 4 / 5

From pure clone 4, 6, 7

2 - x 1 - 2 - x 4 - 1 - x 2 -

2 - x 1 -

Gel - x 3A14 - 4 - x 2 -

+ - x 4 - 4 2 -

usual of 4 / 5

287, 371.

Some other clones P. E. Blevins

HET x unknown

Early + 209. In trich clone

232, 77, 281, 302, 309, 352, 364, 384

353, 357


\[ \chi \text{ comes from } \chi^0 \]

\[ \text{Hagu Phala method} \]

\[ \text{For the NMR of RCI diphenyl} \]

\[ \text{Ehric Indium} \]

\[ \begin{align*}
\text{Sapyami} & + - x 8^\circ \\
\text{1-} & - x 8^\circ \\
\text{4-} & - x 8^\circ \\
\text{8-} & - x 8^\circ \\
\text{8-} & - x 4^\circ \\
\text{1-2-} & - x 6^\circ \\
\text{1-2-} & - x 12^\circ \\
\text{+} & - x 1^\circ \\
\text{4-} & - x 1^\circ \\
\text{1} & - x 4^\circ \\
\text{From } \text{hr/pc}^0 \\
\text{1-} & - x 4^\circ \\
\text{4-} & - x 1^\circ \\
\text{1-2-} & - x 8^\circ \\
\text{7-} & - x 1^\circ \\
\text{4-} & - x 1^\circ \\
\text{1-7-} & - x 6^\circ \\
\text{1-} & - x 2^\circ \\
\end{align*} \]
Subject

Genotype

Col^+ x Col^- (Staphy)

Col^+ x Gem-

undil. Col^- x Col^- x r

x Gem-

x Gem+ x Gem-

Gal^- x Gal^+

ETH: Col^- x Gem-

Gal^- x Col^- x Gem-

Gal^- x Col^+ x Gem-

Gal^+ x Gem-

Het Col^- x Gem-

Het Gem^- x Col-

194/1 x 194/

--- CONTINUED ---

Gal^-

Lyhe i

Het i lyhe genotypes

Lincoln:

UV, Htt

Do mutagen in Col^- females, Col^+

Effect of dry density

Multiple effects

Segregation ratio

Page

219a

228

226

226

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250A, 250B

257

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267, 308

286, 337, 338

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224, 231, 330, 232, 233

26, 322, 323, 325

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Curing Cent.

Cure, 4p to 50 km, 4t

Cure - 4p x Cure - 4t and 

Cure - 4p x Cure + 4p

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Page 474

Cort

Separation

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## Position Effect

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<th>E1</th>
<th>Stock</th>
<th>E1'</th>
<th>E2</th>
<th>E2'</th>
<th>Chi-sq</th>
<th>P.E.</th>
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<td>12/24</td>
<td>12</td>
<td>0</td>
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<td>4-</td>
<td>1-</td>
<td>7/24</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4'</td>
<td>1+</td>
<td>0/24</td>
<td>24</td>
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<td>1-</td>
<td>6-</td>
<td>16/24</td>
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<td>4</td>
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<td>1-</td>
<td>5/24</td>
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<td>14-</td>
<td>1</td>
<td>12</td>
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<td>4</td>
<td>3</td>
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<td>24</td>
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<td>6'</td>
<td>1+</td>
<td>7'</td>
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<td>6'</td>
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<td>edit gene: 360-0, 024-0, 844</td>
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<td>W 2868</td>
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<td>4</td>
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<td>—</td>
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<td>(a+b=20+26)</td>
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<td>360-1, 360-2</td>
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<td>368</td>
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<td>2 different histogens</td>
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<td>3 different histogens</td>
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77 18 different histogens
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<th>Endo Exo</th>
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<td>364</td>
<td>4 2</td>
<td>20</td>
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<td>(w1)</td>
<td>4 5</td>
<td>57</td>
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<td>359 B (w1)</td>
<td>2 7</td>
<td>73</td>
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<td>7</td>
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<tr>
<td></td>
<td>1 0 0</td>
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</table>
Ref. F Eudo Hpt Epl Ipl Stbl Endo Eko Amphi P.E.

(28.1) 318 + 4 - 5 s 7/24 12 0 0 0
341 - 4 - s 8/5 13/22 3 0 0 0 1

(28.2) 331 + 4 - s 2/5 13/22 6 1 0 0 1
368 - 1 s + 9/15 3 2 0 0 0 1
52/83 (0.63) 24 3 0 3

366 - 1 F - 4 - s + 11/24 6 1 1 2
379 F + 4 - s + 17/24 10 1 2 2
360 - 2 F + 4 - P + 17/24 4 4 3 1
366 - 2 F - 4 - s 7/5 6/20 3 4 2 2
360 - 3 F + 4 - R 8/20 9/19 1 3 3 3
45/111 (0.41) 24 13 11 10

4p = 1po

AA x AA

\begin{array}{c|c|c|}
A & A & A \\
B & b & B \\
\end{array}

\begin{array}{c|c|}
a & A \\
b & B \\
\end{array}

\begin{array}{c}
\Lambda \Lambda \\
\Lambda \Lambda \\
b B B \\
\end{array}

\begin{array}{c}
AA \\
AA \\
AA \\
\end{array}
Kersarn Shulz

\[ \text{Fe}^3+ \text{Cu}^- \rightarrow \text{Fe}^2+ \text{Cu}^2+ \]

257e-6  \( 4-2^+ \gamma^2 / 4^+2^- \beta^4 \)

257e-6  \( 5-2^+ \gamma^2 \) (ionised)  - 1 MM sec.

257e-6  \( 2 \gamma^2 \) (uncal.)  - 0.5 MM sec.

257e-6  \( 2 \gamma^2 \) (uncal.)  - 15/2 sec.

285-2  \( 14^+1^- \gamma^2 / 1^-4^+ \beta^2 \)

277-2  \( \text{H}^+ \text{Fe}^- \)

\[ \text{Fe}^3+ \text{Cu}^- \rightarrow \text{Fe}^2+ \text{Cu}^2+ \]

1 \( \gamma^2 / \beta^2 \) 6 MM sec.

1 \( \gamma^2 / \beta^2 \) 12 MM sec.

9 \( \gamma^2 / \beta^2 \) were dead sec.

3 \( \gamma^2 / \beta^2 \) were not dead sec.
Remains - Osten lace - Diplody

2541  \( \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \)

To see if diploidy for \( V \) has occurred, \( \frac{V_2^2}{V^2} \) would be

reasonable Osten \( V^2 \) for 2741, if diploidy for \( \frac{V}{2} \), all

\( V^2 \) would be \( \frac{1}{2} \).

241-19 \( \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \).

241-14 \( \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \). were found unstable.

241-19 \( \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \) \( \frac{1}{8} \) would not be possible.

241-19 \( \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \) 241-14

2307 \( \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \) were unstable.

2350 \( \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \) 241-14

\( \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \) were unstable.

2350 \( \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \) 241-14

\( \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \) were unstable.
\[ \begin{array}{cccc}
4^2 & 4^3 & 4^4 & 4^5 \\
39/1312 & 7/25 & 1 & 7
\end{array} \]

\[ \begin{array}{cccc}
4^2 & 4^3 & 4^4 \\
28/1101 & 3 & 23
\end{array} \]

\[ \begin{array}{cccc}
4^2 & 4^3 \\
\frac{7}{142} & 1 & 1
\end{array} \]

\[ \begin{array}{cccc}
26 & 1870 \\
\{ \text{high mult.} \}
\end{array} \]

\[ \begin{array}{cccc}
108/1279 & 117/556 & 140/140 & 1/426
\end{array} \]

\[ \begin{array}{cccc}
18/130 & 10/215 & 1
\end{array} \]

\[ \begin{array}{cccc}
1 & 2/52 & 1 & 1
\end{array} \]

\[ \begin{array}{cccc}
2/408 & 1 & 1
\end{array} \]

\[ \begin{array}{cccc}
1 & 2/336 & 1 & 1
\end{array} \]

\[ \begin{array}{cccc}
1 & 3/267 & 1
\end{array} \]

\[ \begin{array}{cccc}
18/428 & 2
\end{array} \]

\[ \begin{array}{cccc}
7 & 6 & 9/423 & 1 & 1
\end{array} \]

\[ \begin{array}{cccc}
1 & 2
\end{array} \]

\[ \begin{array}{cccc}
4/1331 & 37c
\end{array} \]

\[ \begin{array}{cccc}
9/150 & 31c
\end{array} \]

\[ \begin{array}{cccc}
\frac{3}{18.5} & \text{(37c)}
\end{array} \]

\[ \begin{array}{cccc}
\frac{3}{827} & \text{(37c)}
\end{array} \]

\[ \begin{array}{cccc}
\frac{3}{161} & \text{(30c)}
\end{array} \]
\[
\begin{align*}
\text{Exo} & \quad \text{End} & \quad \text{End} & = & \quad \text{End} & = & \quad \text{End} & = & \quad \text{End} \\
1 & - & 2 & = & 1/311 & 0 & 1 & \text{(heavily)} \\
+ & 2 & - & ? & i & \text{research for } y & \\
+ & 1 & - & ? & 1 & \text{researched from } y & \\
+ & 4 & - & ? & 0 & 1 & \text{heavily} \\
& 2 & + & 9/595 & 0 & 8 & 13 & 45
\end{align*}
\]
Homogenate Summary

[Handwritten notes and equations]

Also known as 2-242

[More handwritten notes]
ALSO KNOWN AS 202-16

2

516, 902, 481 \text{ Gru} - (202) \times 1434, 902, (202) \text{ Fornax} (300) \text{ Her} (294)

3

Heq \times 322 \text{ UMa} - 1 \text{ Her} (306)

4

518 \text{ 902, 481 Gru} (202) \text{ Her} (294), 4 \text{ Cas} (204), \text{ Gru} (214)

Also Known As 2314

1

\text{ NGC} \times 733 (236) \text{ NGC} \times 1761 (241) \times 2252 (214) (244) \text{ NGC} \times 86 (267) \text{ NGC} \times 86 (270)

2

(241-14) \text{ in } 773 \times 263 (241) \text{ NGC Galaxies HR} (270) \text{ in } 66 \text{ Cas} \times 686 (270) \text{ Fornax} \text{ Gru} (270)

2

Heq \times 322 (270) \text{ NGC} \times 1761 (316) \text{ in } 1761 \text{ Her} (270) \text{ in } 1761 \text{ Her} (270) \text{ NGC} \times 86 (270)

\text{ UV} \times 770 (316) \text{ in } 770 (316) \text{ in } 770 \text{ Her} (270) \text{ in } 770 \text{ Her} (270) \text{ NGC} \times 86 (270) \text{ Fornax} (270)

1

\text{ Heq} (316)

2

\text{ UV} (770)

3

\text{ Her} (270)

4

\text{ Cas} (270)

\text{ Fornax} (270)

5

\text{ NGC} (270)

One Step (374)
(309-1) 242 $\times$ 2307 (302) Atwood (309) W 147 kg 9 m/s (317) (319A) (319B)

\[ \text{HP} \]

(311-2) 2070 $\times$ 2175 (311) 2H $\text{C}_{6}H_{12}$ (319B) 6 - (763D) 9.5 sec (390)

(341-7) 211 $\times$ 2180 (372) 1/6 C$_{6}$H$_{12}$ water (341)

(371-12) 84 $\times$ 2380 (333)

(364A) 217 $\text{C}_{6}H_{12}$ (364) 1/2 C$_{6}$H$_{12}$ water (364)

(364B) 2342 $\times$ 2518 (364) 1/2 C$_{6}$H$_{12}$ water (364) 1/6 C$_{6}$H$_{12}$ $\rightarrow$ C$_{6}$H$_{12}$ (364)
Observations on Homogenthi cultures.

### Table 8

<table>
<thead>
<tr>
<th>Phenotype Derived from</th>
<th>Fraction Cod.</th>
<th>Reversion Segregating</th>
<th>Phenotype</th>
<th>Fraction of Cod.</th>
<th>Reversion Segregating</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'1 2'-4' 4-2' 1'2' 1'-2'</td>
<td>4/6</td>
<td>6'2-</td>
<td>1/4</td>
<td>0/8</td>
<td>0/6</td>
</tr>
<tr>
<td>2'1 2'2 6'2</td>
<td>4/3</td>
<td>6'2-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2' 6'1 2'-4' 4-2' 1'2'</td>
<td>6/6</td>
<td>6'2-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3' 3'1 2'-4' 4-2' 1'2'</td>
<td>4/4</td>
<td>6'2-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3' 6'2</td>
<td>4/4</td>
<td>6'2-</td>
<td>0/1</td>
<td>0/1 (minimum)</td>
<td></td>
</tr>
<tr>
<td>1'-2' 11'-2' 12'-2'</td>
<td>10/12</td>
<td>6'2-</td>
<td>0/1</td>
<td>0/1 (minimum)</td>
<td></td>
</tr>
<tr>
<td>2'4' 4'4' 2'2' 1'2'</td>
<td>4/4</td>
<td>6'2-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2'4' 4'4' 2'2' 1'2'</td>
<td>10/10</td>
<td>6'2-</td>
<td>0/1</td>
<td>0/1 (minimum)</td>
<td></td>
</tr>
<tr>
<td>2'4' 4'4' 2'2' 1'2'</td>
<td>4/4</td>
<td>6'2-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>(1) 2'4' 4'4' 2'2' 1'2'</td>
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<td>-</td>
</tr>
<tr>
<td>(2) 2'4' 4'4' 2'2' 1'2'</td>
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<td>-</td>
</tr>
<tr>
<td>(3) 2'4' 4'4' 2'2' 1'2'</td>
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</tr>
<tr>
<td>(3)</td>
<td>( \frac{3}{4} )</td>
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<tr>
<td>(4)</td>
<td>( \frac{1}{1} )</td>
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</tr>
<tr>
<td>(5)</td>
<td>( \frac{1}{4} )</td>
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</tr>
</tbody>
</table>

\[
\begin{align*}
6a_{1} & = \frac{3}{4} \quad 6a_{1} - d \quad - 0 \frac{3}{4} \\
6a_{4} & = 3a_{1} \quad 2^{4-1} / 2^{4-1} \quad 0 \frac{3}{4} \\
6a_{8} & = 6a_{4} \quad 2^{8-4} / 2^{8-4} \quad - \\
\end{align*}
\]
Table 5

The frequency of transductions unstable for galactose fermentation

<table>
<thead>
<tr>
<th>Recipient cells</th>
<th>Gal (+)</th>
<th>Gal₁⁻</th>
<th>Lysates</th>
<th>Gal₂⁻</th>
<th>Gal₄⁻</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gal₁⁻ Lp⁺⁵</td>
<td>9/22(41)</td>
<td>-</td>
<td>0/11(0)</td>
<td>0/29(0)</td>
<td></td>
</tr>
<tr>
<td>Lp⁺(1)</td>
<td>23/24(96)</td>
<td>-</td>
<td>23/24(96)</td>
<td>0/27(0)</td>
<td></td>
</tr>
<tr>
<td>Lp⁺(2)</td>
<td>17/24(71)</td>
<td>-</td>
<td>24/24(100)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Gal₂⁻ Lp⁺⁵</td>
<td>28/48(58)</td>
<td>63/72(88)</td>
<td>-</td>
<td>64/72(89)</td>
<td></td>
</tr>
<tr>
<td>Lp⁺(1)</td>
<td>22/24(92)</td>
<td>19/24(79)</td>
<td>-</td>
<td>16/24(67)</td>
<td></td>
</tr>
<tr>
<td>Lp⁺(2)</td>
<td>16/24(67)</td>
<td>21/24(88)</td>
<td>-</td>
<td>22/24(92)</td>
<td></td>
</tr>
<tr>
<td>Gal₄⁻ Lp⁺⁵</td>
<td>13/24(54)</td>
<td>0/72(0)</td>
<td>21/24(88)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Lp⁺</td>
<td>20/24(83)</td>
<td>0/76(0)</td>
<td>19/24(79)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Lp⁻</td>
<td>29/48(60)</td>
<td>-</td>
<td>18/24(67)</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

The figures shown are the fraction of cultures unstable for galactose fermentation. Percentages are shown in parenthesis.
Locus

Caulfield and Matha— The protein occupied by a gene on a chromosome, with
regard to its linear order.

Waddington (21) ... a class of allelosophic factors (the protein they
occupy in their "locus"); ... .

Smythe, D. 1/0 (217) ... the term locus is used both to indicate the loci
of a gene on a chromosome map and also to designate the
unit, i.e. an allele, which are alleles.

Caldwell (11) "The name of a mutant and its symbol represent
the locus name and the locus symbol, respectively.

(35) "The chromosome theory of heredity states that the genes
are situated at definite loci in linear order on the chromosome."

Knight (90) "The first position of a gene on its chromosome:"

Colin (217) "the protein on a chromosome occupied by a gene or any
of its alleles.

Reid (17) In other words, on each homologous chromosome there
is a gene at a particular place or locus.

Valentine (146) protein occupied by a gene on a chromosome.

Strickland & Davies (97) ... every gene occupies a fixed place on a chromosome...

... such a position is known as a locus."

Jenning (140) "the position of a gene on the map or in the
chromosome is known as its locus."