

WEEK 6 PROBLEMS

Problems From Chapter 4

4.1 The following classes and frequencies of ordered tetrads were obtained from the cross $a^+ b^+ \times a b$ in *Neurospora*. (Only one member of each pair of spores is shown.) What is the order of the genes in relation to the centromere?

Spore pair				Number of asci
1-2	3-4	5-6	7-8	
$a^+ b^+$	$a^+ b^+$	$a b$	$a b$	1766
$a^+ b^+$	$a b$	$a^+ b^+$	$a b$	220
$a^+ b^+$	$a b^+$	$a^+ b$	$a b$	14

4.2 The yeast *Saccharomyces cerevisiae* has unordered tetrads. In a cross made to study the linkage relationships among three genes, the tetrads in the accompanying table were obtained. The cross was between a strain of genotype $+ b c$ and one of genotype $a + +$,

Tetrad type	Genotypes of spores in tetrads				Number of tetrads
1	$a + +$	$a + +$	$+ b c$	$+ b c$	132
2	$a b +$	$a b +$	$+ + c$	$+ + c$	124
3	$a + +$	$a + c$	$+ b +$	$+ b c$	64
4	$a b +$	$a b c$	$+ + +$	$+ + c$	80
Total					400

- (a) From these data determine which, if any, of the genes are linked.
 (b) For any linked genes, determine the map distances.

Problems from Chapter 5

5.1 A chromosome has the gene sequence *ABCDEFGH*.
 What is the sequence following an inversion of genes C through E?
 After a deletion of genes C through E?

5.2 Two chromosomes with the sequences *ABCDEFGH* and *MNOPQRSTU* undergo a reciprocal translocation after breaks in E-F and S-T.
 What are the possible products?
 Which products are genetically stable?

5.3 A female cat with orange fur mates with a male with black fur. The resulting litter includes a male calico kitten that, when mature, proves to be sterile. Suggest a likely explanation.

5.4 Recessive genes *a*, *b*, *c*, *d*, *e*, and *f* are closely linked in a chromosome, but their order is unknown. Three deletions in the region are examined. One deletion uncovers *a*, *d*, and *e*; another uncovers *c*, *d*, and *f*; and the third uncovers *b* and *c*. What is the order of the genes?

5.5 In *Drosophila melanogaster*, the genes for *brown eyes* (*bw*) and *humpy thorax* (*hy*) are about 12 map units distant on the same arm of chromosome 2. A paracentric inversion spans about one-third of this region but does not include the genes mentioned. Explain what recombinant frequency between *bw* and *hy* you would expect in females that are:

- (a) Homozygous for the inversion.
- (b) Heterozygous for the inversion.