

**Genetics 320 Problem Set Two**

**Due 11 am Friday, 2 Sept.**

**1 (1 point):** A pure-breeding red flower line is crossed with a pure-breeding white flower line. All the F<sub>1</sub> individuals are green, while the F<sub>2</sub> shows red, white, and green flowered-individuals. Crossing red and green individuals gives equal numbers of red and green-flowered offspring. Crossing white and green individuals gives equal numbers of white and green-flowered offspring. What genetic model accounts for these observations (i.e., give the genotypes and their corresponding phenotypes)?

**2 (1 point):** U of A scientists studying life on mars found that there are three sexes, with each contributing one allele at random to its offspring. The genotype *sss* gives the dreaded *sundevil* phenotype. If the three parents are *SSs*, *sSS*, and *Sss*:

- (a) What is the probability an offspring shows the *sundevil* phenotype?
- (b) What is the probability an *SSS* offspring?
- (c) What is the probability an *SSs* offspring?

**3 (1 point):** Consider the offspring in a cross of two *AaBbCcDdEe* parents. Compute the probabilities for the following offspring:

- (a) *AAbbCCee*
- (b) *aabbccdde*
- (c) *aABbccDDee*
- (d) *A-B-ccddE-* (where *A-* = *AA* or *Aa*)

**4 (2 points):** Consider nose hair color. Individuals have a single locus with two alleles (*H* for hair, and *N* for no hair). If present, nose hair is either red or green, with color controlled by a single locus with two alleles (*R* for red hair, *G* for green hair). Both loci assort independently. Given the following crosses, determine which alleles are dominant (*H* or *N*, *R* or *G*) and also determine the genotypes (as far as possible) of the parents in these crosses. *Hint:* The best way to examine problems of this sort is to consider the loci separately.

	Cross	Number of offspring		
		Green Hairs	Red hairs	no hair
(a)	Green X Red	0	100	0
(b)	Green X Red	51	53	0
(c)	Red X Red	25	76	0
(d)	Green X No Hair	0	0	103
(e)	Green X No Hair	50	53	100
(f)	Green X No Hair	98	0	102

**5 (1 point):** Several questions of *A*, *B*, *O* blood groups

- (a) What offspring are expected in a cross between *O* and *AB* parents? Give the proportions of both blood group phenotypes and genotypes.
- (b) In a cross between *A* and *B* parents; *A*, *B*, *AB*, and *O* offspring were produced. What are the possible parental genotypes?
- (c) In a cross between *A* and *B* parents, *A* and *AB* offspring were produced. What are the possible parental genotypes?

**6 (2 points):** Consider the following genetic model for coat color. *A-B-* individuals have agouti coat color, *A-bb* have cinnamon, *aaB-* have black, and *aabb* brown. Likewise, *D-* individuals have full color, *dd* have dilute color. Assume all three (*A/a*, *B/b*, *D/d*) loci are unlinked and consider a cross of *AABBDD* X *aabbdd*. What are the phenotypes and genotypes and their relative proportions in the F<sub>1</sub>? In the F<sub>2</sub>? Note that you don't have to write out ALL genotypes, but (where appropriate) can use *A-* instead of *AA*, *Aa*, etc.

**7 (2 points):** Suppose two loci (alleles *A/a* and *B/b*) interact to determine the number of nose hairs the following fashion: Each capital letter allele (*A*, *B*) that an individual carries adds 10 noses hairs, with *aabb* = zero nose hairs, *AABB* = 40 nose hairs, *AaBB* = *AABb* = 30 nose hairs, etc.

- (a) Is there dominance here? Epistasis? Explain (simply saying yes or no is NOT sufficient).
- (b) In a cross of *AABB* X *aabb*, what are the proportions of the different genotypes and phenotypes in the F<sub>1</sub>? In the F<sub>2</sub>?