Genetics 410-01; Summer 1998; Exam 1; July 7, 1998

Print Your Name

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Please write legibly. If it takes me too long to decipher your handwriting, I won't be able to give credit for your answer.

1. Define: genotype, phenotype, allele, telomere, centromere, and epistasis.

2. A species of plant with the phenotype corresponding to the presence of a dominant allele but with an unknown genotype is crossed to a plant with the recessive phenotype. What is this type of cross referred to as?

3. AaBbCcDdEeFfGgHh plants are crossed to AabbccDdeeffGGHh plants. How many different genotypic types or classes would you expect to find in the progeny assuming that all genes assort independently? How many phenotypic classes would you expect to find if all genes are of the dominant/recessive style of inheritance?

4. (Extra credit) How many different genotypic classes would you expect if the genes in question 3 where all completely linked?

5. What would be the phenotypic ratio for the above problem 3?

6. A bald woman with blue eyes marries a man with hair and brown eyes. What proportion of their male children will have hair? What proportion of their female children will have hair? Two sons are born, one with brown eyes and the other with blue. What was the genotype of the father for both baldness and for eye color?

7. Purebred tall, yellow, broad-leafed plants are crossed to purebred short, green, narrow-leafed plants. The F1 is then crossed back to the parental short, green, narrow-leafed plants. Among the progeny there are found tall, broad, green; tall, narrow, green; short, broad, green; and, short, narrow, green plants. Which alleles were dominant?

8. What is the probability of a woman giving birth to 5 brown-eyed girls if she is heterozygous and her husband has blue eyes?

9. How many ways can you arrange 5 people?

10. How many ways can 3 women and 2 men be arranged in a row?

11. A man heterozygous for baldness and sickle cell anemia marries a woman with sickle cell anemia and blue eyes. What is the chance that if she has 4 children, 2 will be boys with blue eyes and sickle cell anemia?

12. From the above question 11, what would be the probability of the woman having 3 children who are not boys with blue eyes born and then one boy who does have blue eyes born last?

13. A horse is found that has six legs and feet. Socks are bought for all six feet. How many degrees of freedom does the horse have for sox?

14. Describe the cell cycle in sequential order including important milestones.

15. Purebred black mice are mated to purebred white mice. The F1 progeny are crossed and among their F2 progeny are counted 90 black mice and 70 white mice. What would be the expected ratio if the F1 mice were crossed to the white mice?

16. In *Drosophila*, the three gene pairs for red eyes (cn+) vs. cinnabar (cn), normal bristle number (rd+) vs. reduced (rd), and long wings (vg+) vs. vestigial (vg) are known to have their loci on chromosome II. Suppose that a three-point testcross yields the following offspring:

Cinnabar, reduced, vestigial	406
Cinnabar, reduced, long	46
Cinnabar, normal, vestigial	28
Cinnabar, normal, long	3
Red, normal, long	438
Red, normal, vestigial	45
Red, reduced, long	33

(a). Calculate the map distances between the genes and construct a linkage map of these loci.
(b). Give the genotype of the trihybrid parent, indicating the proper linkage phase on the pair of chromosomes.