

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

If you wish to keep your grade hidden from others, you must write your name above and also on the back of the last sheet.

1. Define: codominance, incomplete dominance, epistasis, independent assortment and locus.
2. What is it called when diploid organisms with the dominant phenotype for a trait but an unknown genotype are crossed with the ones with the recessive phenotype for that trait?
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. In chickens, the Leghorn variety has white feathers due to a dominant allele. In Silkies, white feathers are due to a recessive allele in a second (different) gene. If a true-breeding white Leghorn is crossed to a true-breeding white Silkies, what is the expected phenotype(s) of the F1? If members of the F1 are mated to each other, what is the expected phenotypic outcome of the F2 generation? Assume that all non-white birds are brown. What would be the phenotypic ratio if F1 were crossed to the true-breeding white Leghorns?

5. True-breeding plants with tall height, yellow seed pods, pink flowers and orange fruit are crossed with true-breeding plants that are short, green, white flowered, and have yellow fruit. The F1 plants are crossed back to the short true-breeding parent above. Among the progeny are observed: 20 tall, yellow, pink, yellow; 31 short, yellow, pink, yellow; 32 tall, green, pink, yellow; 23 short, green, pink, yellow; 25 tall, yellow, white, yellow; 34 short, yellow, white, yellow; 35 tall, green, white, yellow; and, 20 short, green, white, yellow.  
For each of the genes, which are the dominant alleles?

What was the phenotype of the F1, assuming the dominant/recessive mode of inheritance?

6. What is the probability of a woman giving birth to 6 brown-eyed girls if she is heterozygous and her husband has blue eyes?
7. a) How many ways can you arrange 5 individuals?  
b) How many ways can 3 women and 2 men be arranged in a row?
8. What component has a cyclic change in concentration during the cell cycle and has been associated with regulation of the cell cycle and cell division?  
(Extra credit): What observation led to its discovery?
9. a) 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, if she is heterozygous and her husband has blue eyes?  
b) What would be the probability for the events of question 11 happening in any order?
10. Describe the cell cycle in sequential order including important milestones.

(Extra Credit:) Billy Bragger claims he can make a die land on the number 3, his lucky number, more often than would be expected by chance alone, due to his hidden mental powers. You observe him rolling the die and see the following: 1, 5, 3, 5, 2, 3, 5, 6, 4, 3, 2, 3, 4, 1, 5, 3, 2, 4, 3, 6, 3, 2, 2, 1, 3, 3, 4, 5, 3, 2, 3, 6, 4, 3. Use your knowledge of chi square analysis to answer the following questions:

- a) How many degrees of freedom would there be for this analysis?
- b) What is the expected proportion for landing on the number 3?
- c) What are the values for the expected?
- c) What is the calculated chi square value?
- d) Conclude with your argument of whether Mr. Bragger is influencing outcomes with his mind, based on your knowledge, calculations, and the P value from the chi square table.