

Genetics
Problem Set 3
March 10, 2013
Extensions of Mendelian Genetics

Suggested chapter 4 problems: (Try relevant problems)

~~7, 10, 15, 16, 17, 18, 20, 24, 26, 30, 31, 32, 34, 37.~~

Additional problems

1. A particular exotic bean plant has been shown to have 4 distinct strains.
 - Strain a produces green beans
 - Strain b produces yellow beans
 - Strain c produces blue beans
 - Strain d produces colorless beans (white)

When 2 green strains are crossed, the plants produced are in approximate ratios of:

9 green : 3 yellow: 3 blue: 1 white.

- A) How many genes likely control bean color in these plants?
 - B) Describe a mechanism to explain *how* bean color is controlled in these plants.
 - C) What 2 strains of different bean color could produce the green strains that were crossed ?
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2. In mice, you are told the T^L allele for long tails is dominant over the T^S allele for short-tailed mice. You, as a pet store owner wish to begin breeding your own strain of long-tailed mice. You note however, whenever you breed 2 long-tailed mice you get always get approximately 2 long to 1 short. In other words you cannot seem to identify any true-breeding long tailed mice.
Give a plausible explanation for your results. Use the gene symbols in your explanation.

3. Mice found in Cyril Moore Science building have 3 coat colors, black, brown and white. You adopt a litter of mice you find abandoned in the corner of classroom 333. The baby mice are all brown. After a month, 2 litter mates mate and produce the following offspring: 18 brown: 6 black: 8 white. How might you explain the genetic control of coat color in these mice? (be specific, use gene symbols in your explanation) What would the genotypes and phenotypes of the parents of your original litter be?

4. A student interested in the genetic transmission scale color in catfish noted true breeding fish with silver scales crossed with true-breeding fish with gold scales showed a pattern of interspersed gold and silver scales. Discuss a possible explanation. What types of offspring would 2 fish with both gold and silver scales produce?

5. A man with blood type AB marries a woman with blood type O. Their children have the following blood types:

Daughter 1 AB

Son 1 B

Son 2 O

Daughter 2 A

Which of the children are the biological offspring of the man and woman described above?

Which child is likely the offspring of a previous marriage of the father? (give the mother's possible genotypes)

Which child is likely the offspring of a previous marriage of the mother? (give the father's possible genotypes)

6. You are a breeder of white rabbits, which are in high demand during the Easter season. A mysterious virus spreads through your colony wiping out your male breeders. As the orders for white baby bunnies pour in you are forced to borrow a true-breeding white male from another breeder in Canada. To your dismay your first litter of bunnies produced from your females and the Canadian male are pink! You are curious about this and allow the pink bunnies to interbreed. The offspring consist of 90 pink and 70 white bunnies.

Explain the outcome of your breeding experiments. Include genotypes for the parents and offspring.

7. In *Drosophila*, white eyes are caused by an X-linked, recessive mutation. In a cross between a white-eyed female and a red-eyed male 100 offspring are produced (50 males and 50 females). What are the expected phenotypes of the offspring?

8. A second cross of a female fly of unknown genotype and a male white-eyed fly produced approximately equal numbers of white-eyed males, white-eyed females, red-eyed males and red-eyed females. What was the genotype of the female? Did she have red or white eyes?

9. A married pregnant woman (who was adopted as an infant) undergoes testing and finds she is carrying a girl baby. In an amazing set of coincidences she finds out her biological mother AND her husband's maternal grandfather both had hemophilia, an X-linked disorder. If this couple sought you out as their genetic counselor, what would you tell them about their unborn baby?

Support your answer by showing the pedigree, including genotypes for this family---assuming all other individuals are not hemophiliacs.