

Genetics Problems Assignment (30 points)

Use Punnett squares to show your work for each of these questions. Be sure to indicate what symbol (letter) you are using for each allele of the genetic traits. Write out what the results are for each of the crosses. An answer that just says 3:1 or 1:2:1 is not a complete answer. Chi squares are discussed in the Laboratory Exercise on Inheritance.

- Diagram and identify the complete inheritance pattern for the parental (P), first (F_1) and second-generation (F_2) offspring of a cross between a tomato that has homozygous round-shaped fruit and a tomato that has oval-shaped fruit. Round fruit is a dominant allele. What is the expected second-generation **phenotypic** inheritance ratio for this cross? (6 points)
- A woman whose blood type is A has a child with a man whose blood type is B. The child's blood type is O. (4 points)
 - What are the genotypes of the woman, the man and the child?
 - If the man and woman decide to have more children, what additional genotype(s) is(are) possible?
- A palomino horse breeder did a number of matings at his horse farm in Kentucky. The offspring that resulted from mating two palomino horses were 32 chestnut horses, 32 cream-colored horses and 65 palomino (golden-colored) horses. (5 points)
 - What type of inheritance pattern is the coat-color variation in these horses?
 - Calculate the chi square number for this cross.
 - Using the chi square table below, does the chi-square number for this inheritance cross validate the predicted inheritance ratio for this inheritance pattern?

Df (C-1)	Probability							Reason to Doubt Hypothesis		
	Deviation Insignificant - No Reason to Doubt Hypothesis							Deviation Significant		
	.99	.95	.80	.50	.30	.20	.10	.05	.02	.01
1	.00016	.0039	.064	.455	1.074	1.642	2.706	3.841	5.412	6.635
2	.0201	.103	.446	1.386	2.408	3.219	4.605	5.991	7.824	9.210
3	.115	.352	1.005	2.366	3.665	4.642	6.251	7.815	9.837	11.341
4	.297	.711	1.649	3.357	4.878	5.989	7.779	9.488	11.668	13.277
5	.554	1.145	2.343	4.351	6.064	7.289	9.236	11.070	13.388	15.086

- Hemophilia is a sex-linked recessive trait. Diagram and list the possible inheritance pattern(s) for the children of a normal male (with respect to hemophilia), and a female who is a hemophilia carrier. Be sure that the sex chromosome of the children as well as the hemophilia inheritance alleles are shown in your work. (4 points)
- In peas, tall plants are dominant over dwarf plants and purple flowers are dominant over white flowers. Students did an inheritance test in BCC's greenhouse crossing homozygous tall purple-flowered pea plants with dwarf white-flowered pea plants. The F_1 offspring were 100% tall plants with purple flowers. The F_1 offspring were crossed with each other. Of the 800 F_2 plants grown, 457 were tall plants with purple flowers, 148 were dwarf plants with purple flowers, 51 were dwarf plants with white flowers and 144 were tall plants with white flowers. (9 points)
 - Diagram all generations and explain the inheritance results for this cross.
 - What type of inheritance pattern is shown in this cross?
 - Calculate the chi square number for this cross.
 - Using the chi square table above, does the chi-square number for this inheritance cross validate the predicted inheritance ratio for this inheritance pattern?
- The Siamese cat has a melanin pigment production gene that is expressed only when the temperature is below "X" degrees. A Siamese cat owner chooses to leave the thermostat low in winter, and its cat is exposed daily to a very cool home (as is the owner). To compensate for the cat being left in a cold house, the cat's owner purchases a heating pad, on which the cat snoozes 21 hours each day. After several weeks, the owner rushes the cat to the vet and asks the vet what is "wrong" with the cat – it has lost all the pigmentation in its legs and in much of its tail. The vet refers the cat's owner to BCC Biology students to respond. How do you explain the loss of pigment in the cat's fur? (2 points)