

OK, OK, . . .

I HAVE HAD ENOUGH!

PART D: MULTIPLE ALLELES

- What are the possible blood types (phenotypes) of children of the following parents
 - type A mother and type A father
 - type A mother and type O father
 - type B mother and type AB father
 - type AB mother and type AB father
 - type A mother and type B father
 - type O mother and type O father
 - A man of what blood group could not be the father of a child of blood type AB?
 - Is it possible for a type B male and a type AB female to have children with:
 - type B blood
 - type A blood
 - type AB blood
 - type O blood
 - Which blood types would **not** be possible for children of a type AB mother and a type A father?
 - Both Mrs. Smith and Mrs. Jones had babies the same day in the same hospital. Mrs. Smith took home a baby girl, whom she named Shirley. Mrs. Jones also had a girl, whom she named Jane. Mrs. Jones began to suspect, however, that her child had been switched accidentally with the Smith girl in the nursery. Blood tests were performed:

Mr. Smith was type A, Mrs. Smith was type B,
Mr. Jones was type A, Mrs. Jones was type A,
Shirley was type O and Jane was type B.

Had a mixup occurred? Explain using Punnett squares.
 - Four genes determine coat colour in rabbits. C, c, c^{ch} and c^h. CC causes a normal colored coat, cc causes an albino coat (no pigment - all white), c^{ch}c^{ch} produces the light gray chinchilla coat and c^hc^h gives the Himalayan pattern - white body with color on the tips of the ears, nose, tail and legs. The genes may be considered dominant in the order:

C, c^{ch}, c^h and c

For example, in a rabbit with the genotype Cc^h, the coat is normal in colour. In a c^hc, the coat has the Himalayan pattern.
- Finally, the problem:** Rabbits with normal fur colour (purebred) were crossed with albino rabbits to produce an F₁ generation "a". Purebred chinchilla rabbits were crossed with Himalayan purebred rabbits to produce an F₁ generation "B". Illustrate the cross between the F₁ generations "A" and "B". What type of offspring could you expect?
- Two people, one with type B blood (the man) and a woman with type A blood, marry and have 5 children. Of these children, 2 are type A blood, 2 are type B, and one is type O.
 - What genotypes of the parents make these offspring possible?
 - What are the genotypes of the 5 offspring above?
 - Could these parents have had a child with type AB blood?
 - If a mother and her child belong to blood group O, what blood group could the father **not** belong to?

PART E: SEX-LINKAGE

- What is a carrier? Why is it impossible for a man to be a carrier for hemophilia?
- Suppose that a recessive mutation occurs on an X chromosome in a human egg cell. Now suppose that the egg cell is fertilized. In genetic terms, what type of sperm must fertilize the egg if the mutation is to be expressed in the F₁ generation?
- Why is it not possible for a male to be heterozygous for colour blindness?
- If a woman who is not a carrier of genes for hemophilia is married to a man who is a hemophiliac, what percentage of their male offspring could be expected to be hemophiliac?
- If a colour blind man marries a woman whose father was colour blind, what is the probability of their first child being a colourblind boy?
- Is it possible for a normal-visioned male and a heterozygous normal-visioned female to have a colour blind son? Include a Punnett square and phenotypic and genotypic ratios.
- What determines whether the sperm with the X chromosome or the sperm with the Y chromosome will fertilize the egg containing the X chromosome?
- If a unicorn had a total of 16 chromosomes in each of his/her somatic cells, how many pairs are sex chromosomes and how many pairs are autosomes?
- Is it possible for a red-green colour blind male to have normal children? Assume his wife is homozygous normal. What is the chance of the couple having daughters who are carriers?
- Suppose that a gene "b" is sex-linked, recessive and lethal. A man marries a woman who is heterozygous for this gene. If this couple had many normal children, what would be the predicted ratio of these children? (be careful)
- Red eye colour is dominant to white eye colour on the X chromosome of fruit flies (*Drosophila*). Is it possible for a red-eyed male and a white-eyed female to have red-eyed offspring? Explain. Could they have a red-eyed male offspring? Explain.
- If a father and son are both defective in green color vision, is it likely that the son inherited the trait from his father?
- In humans, hemophilia A is caused by an X-linked recessive gene. A woman who is a non-bleeder had a father who was a hemophiliac. She marries a non-bleeder and they plan to have children. Calculate the chance of hemophilia in the female and male offspring.
- A man who is red-green colour blind has four normal sons by his first wife and a colour blind daughter by his second wife. Both wives have normal vision. What is the genotype of each wife and the man?

THE END... OR IS IT???

