

Codominance

CD1) In cattle, roan coat color (mixed red and white hairs) occurs because of codominance of the red (R) and white (r) alleles. For each cattle cross described below, list all possible genotypes (and the phenotypes that go with them) and the percent of offspring with those genotypes.

- a) $RR \times rr$ *100% Roan*
- b) $Rr \times Rr$ *25% Red, 50% Roan, 25% white*
- c) $Rr \times rr$ *50% Roan, 50% white*

CD2) A man and a woman, both AB blood type have a child.

The probability that the child is blood type A is: 25%

The probability that the child is blood type AB is: 50%

Incomplete dominance

IDA) In snapdragons, the allele for red flower color (R) is incompletely dominant over the allele for white flower color (r).

For each cross below, state the colors and the % of each color in the offspring.

- a) $RR \times rr$ *100% Pink*
- b) $Rr \times Rr$ *25% Red, 50% Pink, 25% white*
- c) $Rr \times rr$ *50% Pink, 50% white*

IDB) In human beings, it is thought that several genes contribute to skin color. To simplify the problem, let us suppose that there are only two genes (A and B) that contribute to skin color. For each

gene, the dominant allele (for making the brown pigment melanin) is incompletely dominant over the recessive allele (no melanin).

Robert and Melissa are both genotype AaBb.

a) Their skin color is (circle one of the following 5 answers)

Very dark Dark Medium Light Very light

b) What is the probability that their child will have medium skin?

6/16

Explanation of 6/16 answer:

a) Construct a 4x4 punnet square with these gametes at the top and at the side: AB, Ab, aB, ab.

b) Fill in the punnet square to find the genotypes of the offspring. The offspring with any two dominant alleles are the offspring with medium skin. In other words, the medium skin offspring are the offspring with genotypes AaBb, AAbb, or aaBB.

Out of the 16 offspring squares, there are 6 offspring squares with genotypes AaBb, AAbb, or aaBB.

Sex-linked traits

SL1) A woman who is red-green color blind (a sex-linked recessive trait) marries a man with normal vision. What phenotypes and genotypes might their children be expected to have? Make separate answers for the male and female children.

Male: 100% YX^c (colorblind)

Female: 100% $X^C X^c$ (Normal color vision but carrier)

SL2) A man marries a woman. Half of their daughters are color blind and half of their sons are color blind. Color blindness is a sex-linked recessive trait.

a) What is the genotype and phenotype of the father?

YX^c (colorblind)

b) What is the genotype and phenotype of the mother?

$X^C X^c$ (Normal color vision but carrier)

Chromosomal aneuploidy

CA1) After each chromosomal aneuploidy listed below, state how many chromosomes would you expect to find in their karyotype and which chromosomes are not in their correct number.

a) Turner's syndrome? 45 (only one sex chromosome: X)

b) Down's syndrome? 47 (three chromosome 21)

c) Klinefelter's syndrome? 47 (three sex chromosomes:
XXY)

d) Jacob's syndrome? 47 (three sex chromosomes: XYY)

CA2) What sex is a person with...

a) Turner's syndrome? Female

b) Klinefelter's syndrome? Male

c) Jacob's syndrome? Male