

Mendelian Genetics Problems

- Free earlobes is a trait that is dominant to attached earlobes, and the ability to taste the chemical phenylthiocarbamide (PTC) is dominant to the inability to taste it. Using the letter "E" for the earlobe gene and the letter "T" for the taste gene, answer the following questions:
 - What is the phenotype of a person heterozygous for both genes?
 - If a man and woman are both heterozygous for these genes, what is the probability that they will produce a child with attached earlobes and the inability to taste PTC?
- Albinism (absence of pigment in the skin, hair, and eyes) is inherited as a recessive trait. If two normally pigmented parents produce an albino offspring, what must their genotypes be (use A, a)? What proportion of their subsequent offspring are expected to have the defect?
- All ogres in OGRELAND have bright blue skin and soft brown eyes. A group of gruesome gremlins on the edge of their territory all have emerald green skin and shining yellow eyes. An exploring gremlin comes upon what he thinks is an incredibly beautiful ogre. She thinks he is extremely handsome, so they fall in love, get married and produce an odd-looking "Ogrelin" offspring. The ogrelin had emerald green skin and soft brown eyes.
 - Assuming simple Mendelian inheritance for the traits in question and no mutation, list the phenotypes and genotypes of Mama Ogre, Papa Gremlin, and Baby Ogrelin. (Use "E" and "e" for eye color and "S" and "s" for skin color.)
 - If Baby Ogrelin, a male, grows up and reproduces with another Ogre, what proportion of his offspring are expected to have emerald green skin and soft brown eyes like him?
- A child has blood type O. Which of the following parental phenotypes are possible and which are not possible? Why or why not?

a) A, B	b) A, O	c) A, AB	d) B, O	e) B, AB	f) O, AB
g) A, A	h) B, B	i) O, O	j) AB, AB		
- In a cross between two double heterozygotes (e.g. RrGg x RrGg), what proportion of offspring are expected to differ from the parental genotype (RrGg)? (Assume the loci are independent.)
- The MN blood group system is a two allele, co-dominant system. In a case of disputed parenthood the mother of a child has blood type N. The child is also blood type N. One suspected father has blood type M, another has MN. Decide the case.

- 7) A couple have four children. Two of the children are blood type A, two are blood type O. The mother's blood type is O. What are the father's ABO phenotype and genotype?
- 8) What different gamete types that can be produced by an individual who is heterozygous at two loci and homozygous at a third? Assume the loci are on different chromosomes.
- 9) Consider a locus for coat color in mice. At this locus there are two alleles which code for either white or gray color. Assume that gray is dominant over white, and represent the gray allele by "G" and the white allele by "g". Below are five examples of parental phenotypes and the numbers of progeny of different phenotypes resulting from a cross between the parent types. Give the probable genotype of the parents in each cross.

<u>Parent's phenotype</u>	<u>Progeny's phenotype:</u>	<u>Gray</u>	<u>White</u>
a) gray x white		82	78
b) gray x gray		118	39
c) white x white		0	84
d) gray x white		74	0
e) gray x gray		104	0