

# Dominant-Recessive Inheritance Problems

1. Define: (a) gene (b) chromosome (c) genetics.
2. How many chromosomes are in: (a) human body cells such as skin and muscle (b) human reproductive cells such as sperm and ova?
3. What are the sex chromosomes of a human male, and of a human female?
4. What is meant by the term "pure-bred"?
5. Distinguish between a genotype and a phenotype.
6. If two organisms have the same phenotype, does this mean they have the same genotype?
7. In peas, yellow colour is dominant to green. What will the colours of the offspring of: (a) a homozygous yellow and a green pea plant (b) a heterozygous yellow and a green pea plant (c) a heterozygous yellow and a homozygous yellow pea plant (d) two plants that are hybrid for the yellow pea seed?
8. Could two brown-eyed parents have a blue-eyed child? Explain.
9. Could two blue-eyed parents have a brown-eyed child?
10. A blue-eyed man, both of whose parents were brown-eyed, marries a brown-eyed woman whose father was blue-eyed and whose mother was brown-eyed. This man and this woman have a blue-eyed child. What are the genotypes of all the individuals mentioned?
11. If two animals heterozygous for a single pair of genes are mated and have 200 offspring, about how many have the dominant phenotype?
12. Mrs. Smith and Mrs. Jones had babies at the same maternity hospital at the same time. Mrs. Smith took home a girl and named her Sue. Mrs. Jones took home a boy and named him Jim. However she was sure she had a girl and brought suit against the hospital. Blood tests showed that Mr. Jones had blood type O, Mrs. Jones was type AB, both Mr and Mrs Smith were type B, Sue was type A and Jim was type O. Had a swap occurred?



### ANSWERS

1. (a) A gene is a biological unit of genetic information which is located in a definite position on a particular chromosome. (b) A chromosome is a threadlike body in the nucleus, which contains the genes. (c) Genetics is the study of heredity.
2. (a) 46 (b) 23
3. Human male has XY sex chromosomes, and the human female has XX.
4. 'Pure-bred' or homozygous means that the phenotype for a particular characteristic has both alleles or genes the same, e.g. BB, bb.
5. A genotype is the pair of alleles or genes for a particular characteristic e.g. BB. A phenotype is the characteristic which is determined by the genotype e.g. brown eyes.
6. No. For example, the genotypes BB and Bb both determine the same phenotype of brown eye colour.
7. Let Y = yellow and y = green (a) All offspring would have genotype of Yy and phenotype of yellow pea colour. (b) Half of the offspring would have the genotype Yy with phenotype of yellow colour, and the other half would be yy with green colour. (c) Half would be YY with yellow colour, and the other half would be Yy also with yellow colour. (d) This is called a monohybrid cross where each parent is hybrid or heterozygous for certain characteristic. The parents will both be Yy. The ratio of the offspring's genotypes will be 1 YY: 2 Yy: 1 yy. The ratio of the offspring's phenotype will be 3 yellow : 1 green.
8. Yes. If both parents were heterozygous or hybrid for brown eye colour (i.e. Bb), then 1 out of 4 possible children could inherit the genotype bb which determines blue eye colour.
9. No. The 2 blue-eyed parents with genotypes bb and bb do not possess the allele B for brown eye colour.
10. Paternal grandfather - Bb ; paternal grandmother - Bb ; maternal grandfather - bb ; maternal grandmother - BB or Bb ; father - bb; mother - Bb ; child - bb.
11. This is a monohybrid cross where the offspring genotype ratio is 3 dominant : 1 recessive. Hence about 150 offspring will have the dominant trait. (a) The genotype ratio is about 3:1, so it is probably a monohybrid cross. The short-winged condition is probably recessive. (b) Probably Ll and Ll where L = long-winged and l = short-winged.
12. A swap has probably occurred because neither Mr nor Mrs Smith had Sue's A allele, and Mr and Mrs Jones could not have had a baby with blood type O.