

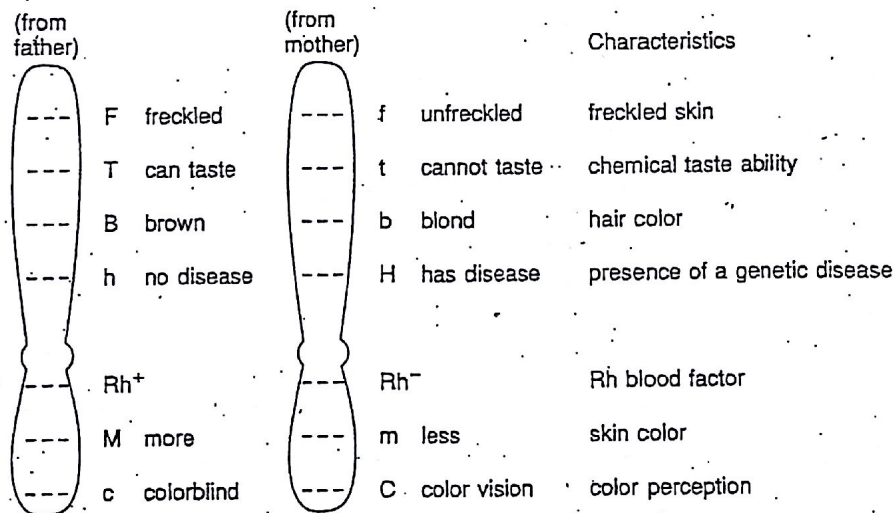
Human Characteristics

As you know, chromosomes work in pairs. The members of each chromosome pair are called homologous chromosomes, and the two chromosomes of each pair are approximately the same length, the same shape, and carry alleles for the same genes. Each chromosome of a pair comes from a different parent: one from the mother through the egg and the other from the father through the sperm. Humans have 23 pairs of chromosomes, or a total of 46 chromosomes, per cell. Only 22 of these pairs are truly homologous. The twenty-third pair, the sex chromosomes, may or may not match, depending on whether the individual is female (XX) or male (XY).

The diagram below shows a generalized view of one pair of homologous chromosomes from an individual human. Assume the chromosome on the left is from the father and the one on the right is from the mother.

You should be aware that any two alleles of a gene have different effects on the trait that they control. For example, the M allele causes more melanin to be made in the skin, giving it a darker color; the m allele causes less melanin, resulting in a lighter skin color. Even though the effects are different, the two alleles in an allele pair control the same trait—in this case, skin color.

Sample Problem



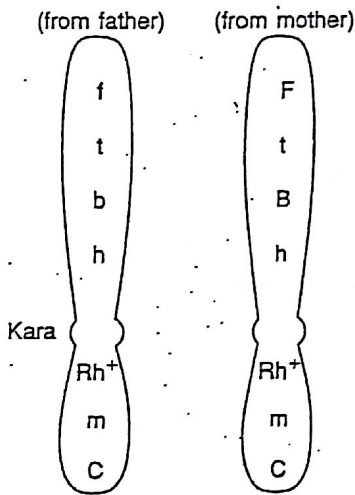
Determine the genotypes and corresponding phenotypes of the person whose chromosomes are shown above.

Genotypes	Phenotypes
Ff	freckled
Tt	taste ability
Bb	brown hair
Hh	has disease
Rh ⁺ Rh ⁻	Rh ⁺ (positive is dominant)
Mm	darker skin
Cc	normal vision

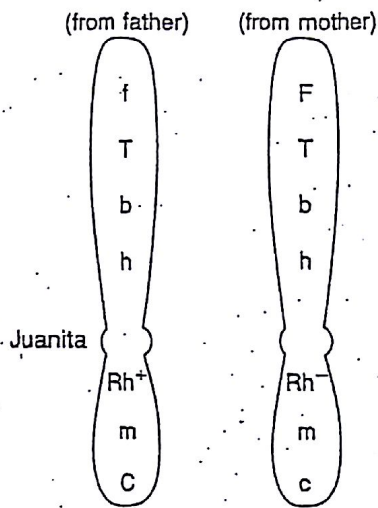
- Which parent donated a blond hair allele? mother
- Was that parent blond? possibly—no way to know for sure from information given
- Is this person blond? no
- Is this person colorblind? no
- Can this person taste the chemical? yes
- Is this person freckled? yes
- From the information provided, can you determine this person's eye color or sex? no—these are not the sex chromosomes and the genes shown do not control eye color

Exercises

Determine the genotypes and corresponding phenotypes of the people whose chromosomes appear below and on the following page. Then answer the questions that follow.



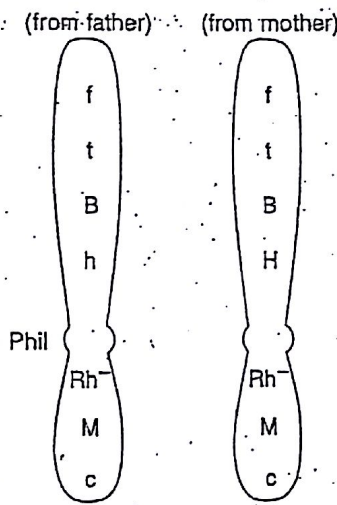
Genotypes	Phenotypes
I. a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
e. _____	_____
f. _____	_____
g. _____	_____



Genotypes

Phenotypes

2. a. _____
 b. _____
 c. _____
 d. _____
 e. _____
 f. _____
 g. _____



Genotypes

Phenotypes

3. a. _____
 b. _____
 c. _____
 d. _____
 e. _____
 f. _____
 g. _____

4. Was Kara's father freckled?
5. Was Kara's mother freckled?
6. Which of the two genotypes, Ff or FF, would have more freckles?
7. Did either of Kara's parents have taste ability?
8. Are all of Juanita's brothers and sisters blond?
9. When Juanita has children of her own, will they have taste ability?
10. What color is Phil's hair?
11. Is Phil's skin color light or dark?
12. Were both Phil's parents colorblind?

4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____