What are Chromosomal Inheritance Patterns?

Worksheet

Inheritance patterns depend on chromosome location and allele interactions. Autosomal traits (on non-sex chromosomes) can be dominant or recessive; sex-linked traits (on X chromosome) show different frequencies in males vs females; multiple-allele systems (e.g. ABO blood) involve more than two allelic forms.

Questions

1. A trait appears only in males in a pedigree, never in females. This suggests:
A) autosomal dominant
B) autosomal recessive
C) X-linked
D) impossible

2. In ABO blood typing, a person with type B blood could have genotype:
A) IBi
B) IAIB
C) ii
D) IAiA

3. If both parents are heterozygous for a dominant autosomal trait (Aa), what % of children show the trait?
A) 25%
B) 50%
C) 75%
D) 100%

4. Haemophilia is X-linked recessive. A carrier female (XX) has a normal male (XY). Their daughter's probability of being affected:
A) 0%
B) 25%
C) 50%
D) 100%

5. A woman is heterozygous for cystic fibrosis (Cc), a recessive autosomal trait. Her partner is homozygous normal (CC). What is the probability their child has CF?

6. A woman is a carrier of hemophilia (XX). Her partner has normal blood (XY). What fraction of male children will have hemophilia?

7. Human ABO blood type involves three alleles (I, I, i). A person with blood type AB has which genotype?

8. Define: What is an autosomal trait?

9. Define: What is a sex-linked trait?

10. Define: Why are males more often colour-blind?

Answer Key

1. C) X-linked - X-linked recessive: males (XY) express it; females (XX) need two copies, rare.
2. A) IBi - Type B = IB_; either IBIB or IBi. iA and IAIB are wrong.
3. C) 75% - Aa Aa 75% A_ (AA + Aa) express dominant; 25% aa recessive.
4. A) 0% - Daughter gets X from mother and X from father XX carrier, not affected.
5. Cross: Cc CC Offspring: 50% CC (normal), 50% Cc (normal carrier) 0% express cystic fibrosis
6. Cross: XX (carrier) XY (normal) Sons: 50% XY (normal), 50% XY (hemophilia) 50% of males affected
7. AB phenotype = two dominant alleles Genotype = II This person can donate to AB, receive from O
8. A trait controlled by a gene on an autosome (non-sex chromosome), showing equal expression in males and females.
9. A trait controlled by a gene on the X chromosome; males need only one recessive allele to express it, females need two.
10. Colour blindness is X-linked recessive; males (XY) need only one recessive allele; females need two.