

Inheritance

Mendel's first experiments

- ▶ Parents: Pea plant with red flowers X
Pea plant with white flowers
- ▶ Offspring (F1): All pea plants have red flowers
- ▶ Conclusion
- ▶ Red is dominant; white is recessive
- ▶ When F1 % is 100, this means that the parents are (were) pure (homozygous).

Genetic diagram

- ▶ Symbols (for alleles)
- ▶ Red flower (R) ; White flower (r);
- ▶ Parental phenotype: Red flower x white flower
- ▶ Parental genotype: RR x rr
- ▶ Gametes:
- ▶ Offspring genotype:
- ▶ Offspring phenotype:

Mendel's second step

- ▶ Then he crossed two plants from the Offspring
- ▶ Pea plant with red flowers X Pea plant with red flowers
Heterozygous Heterozygous
- ▶ Offspring
- ▶ 2nd generation (F2): 75% red flower; 25% White Flower
- ▶ Or ratio (3 red:1 white)
- ▶ Conclusion: parents were (are) Heterozygous (hybrids)
- ▶ Heterozygous is dominant.

Genetic diagram

- ▶ Parental phenotype: red flowerXred flower
- ▶ Parental genotypes: X
- ▶ Gametes:
- ▶ Offspring genotype
- ▶ Offspring phenotype
- ▶ Ratio

Genetic diagram

- ▶ Parental Phenotype :red flower X white flower
(Heterozygous) (Homozygous)
- ▶ Parental Genotype
- ▶ Gametes
- ▶ Offspring Genotype
- ▶ Offspring Phenotype
- ▶ Offspring Ratio

Test cross/Back Cross

- ▶ It is a cross used to find whether the dominant parent is homozygous or heterozygous for its genotype;
- ▶ The dominant parent is always crossed by the homozygous recessive;

Test cross analysis and conclusions

- | ▶ <u>Parents</u> | <u>Offspring</u> |
|---|--------------------------|
| ▶ Black mouse x white mouse; (homozygous) | 100% black; |
| ▶ Black mouse X white mouse; (Heterozygous) | 50% black;
50% white; |

SOME GENETIC TERMS

- ▶ Monohybrid cross

When one gene is considered at a time in a genetic cross

- ▶ Alleles: alternative forms of a gene, occupying the same place on homologous chromosomes and affecting same characteristic, but sometimes in different way;

It is represented by chosen symbol or letter.

- ▶ Genotype: is the set of genes (genetic makeup) present in an organism with reference to a single trait or set of traits.

- ▶ Phenotype: is an inherited feature in an individual's appearance.

SOME GENETIC TERMS

- ▶ Homozygous (pure)

The genotype is made of two identical alleles e.g
BB, bb, ...

- ▶ Heterozygous (hybrid)

The genotype is made of two different alleles.
e.g Aa, Bb, ...

SOME GENETIC TERMS

► Dominant

A dominant is a one that has a strong control on the development of a characteristic. It is the allele that is able to show itself.

Note: In case of dominance, the heterozygous offspring look like one of the parents of pure race. One of the genes is dominant and is expressed alone masking the other allele which is recessive. The dominant gene is given a capital letter.

► Recessive gene

It is a gene which has a weak control on a characteristic, and unable to show itself when it is masked by the dominant allele.

It is given a small letter.

APPLICATION (1)

- ▶ We crossed two varieties of maize, the 1st with pale seeds and the 2nd with dark seeds, we obtained offspring with only black seeds.
Use a genetic diagram to explain the result.

APPLICATION (2)

- We crossed pea plants having round seeds among themselves. We obtained in a sample of 39 seeds, 29 seeds which are round and 10 seeds which are wrinkled.

A which is the dominant gene? The recessive?

B Find the phenotypic ratio of the offspring. Show your working.

C Choose symbols for the alleles

D Use a genetic diagram to explain the heredity.

APPLICATION (3)

- ▶ A man with myopic eye married a woman with normal sight . They got a normal child. Knowing that myopic eye dominates normal eye, Use a genetic diagram to explain the heredity.

Co dominance

- ▶ Both genes have same dominancy; no one is dominant over the other. Both genes show themselves in the phenotype, no matter what the combination is going to be.

The alleles are always given capital letters.

Application (4)

- ▶ Parents phenotype: Red flower X White flower.
- ▶ Offspring: Pink flowers (a new Phenotype).
- ▶ Symbols for Alleles :
- ▶ Parental phenotype: red flower X white flower
- ▶ Parental Genotype:
- ▶ Gametes:
- ▶ Offspring genotype:
- ▶ Offspring phenotype :

Blood Heredity

- ▶ The blood shows an example of co dominance It is between blood group A and blood group B.
- ▶ It also gives an example of dominancy because blood group O is recessive.
- ▶ Blood group A dominates blood group O
- ▶ Blood group B dominates blood group O
- ▶ Alleles for blood groups are represented as I^A , I^B , I^O
- ▶ *Note: for blood O, we use either I^O or i (because blood O is recessive).*

Blood Heredity

Blood Group	Genotype	
(Phenotype)	Homozygous	Heterozygous
A	$I^A I^A$	$I^A I^O$
B	$I^B I^B$	$I^B I^O$
AB	-	$I^A I^B$
O	$I^O I^O$	-

Application (5)

- ▶ Parental phenotype : blood group AB X blood group O
- ▶ Parental genotype:
- ▶ Gametes:
- ▶ Offspring genotype:
- ▶ Offspring phenotype:

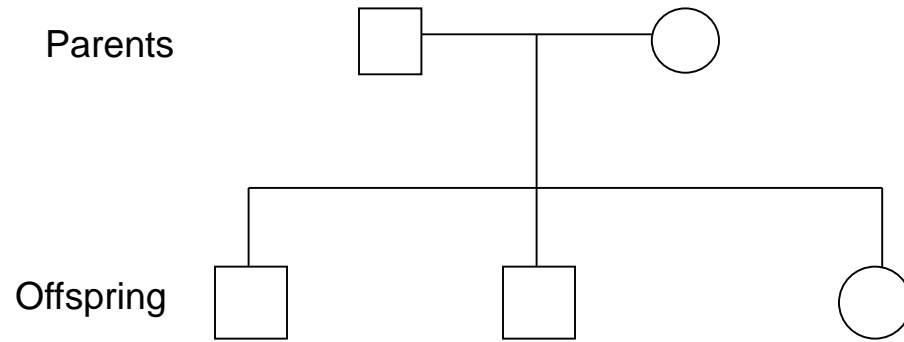
Application (5)

- ▶ A man of blood group A and a woman of the same blood group have a child of blood group O . Use a genetic diagram to explain the heredity.

Application (6)

- ▶ Parents of which none of them have blood group O, they got two children, one with blood group O, and the second child with blood group AB. Use a genetic diagram to explain the heredity.

PEDIGREE OR FAMILY TREE



DETERMINATION OF SEX

- ▶ The sex of a child depends on one particular pair of chromosomes called the sex chromosomes.
- ▶ In females, the two sex chromosomes, called the X chromosomes, are the same size as each other.
- ▶ In males, the two sex chromosomes are of different sizes. One corresponds to the female sex chromosomes and is called the X chromosome. The other is smaller and is called Y chromosome.
- ▶ The female genotype is XX and the male genotype is XY

Application (7)

- ▶ Parental phenotype: Female x Male
- ▶ Parental genotypes:
- ▶ Gametes:
- ▶ Offspring genotype:
- ▶ Offspring phenotype: