

GENETICS TERMINOLOGY



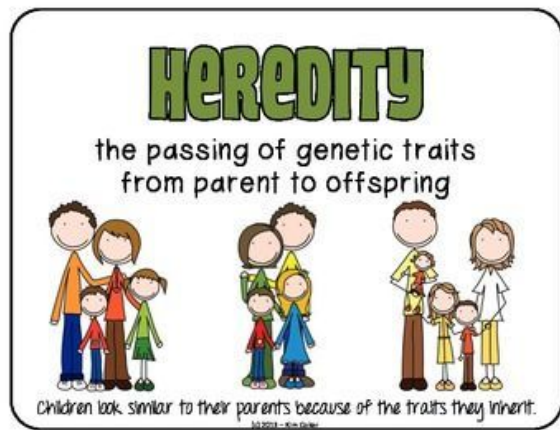
Topic:

Element of genetics and
Variation

MENDELIAN GENETICS

INTRODUCTION

- ❑ **GENETICS** – branch of biology that deals with heredity and variation of organisms
- ❑ **Heredity** – Transmission of Characters from parents to offspring
- ❑ **Variation-** Differences between living things of the same species is called variation.
 - ❑ Your classmates may have different – Eye colour – Hair colour. – Some will be boys and some will be girls. – Some will be tall – Some will be shorter.



GENETIC TERMINOLOGY

- **Trait:** Trait is a specific characteristic of an individual that can be passed from parent to offspring. For example, their hair color or their blood type.
- **Heredity:** The process of passing of traits from one generation to another.
- **Genetics:** According to WHO “ the study of heredity is called genetics.

GENETIC TERMINOLOGY

- **Hybrid:** an offspring resulting from the mating between individuals of two different genetic constitutions
- **Mono hybrid cross:** A cross between two individuals differing in one characteristic
- **Di hybrid cross:** A cross between two individuals differing in two characteristics.
- **Alleles:** the alternative form of gene is called alleles

Genotype vs Phenotype

GENOTYPE

The genotype is an organism's genetic information.

BB

homozygous dominant

Bb

heterozygous

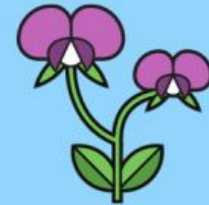
bb

homozygous recessive

PHENOTYPE

The phenotype is the set of observable physical traits.

purple



purple



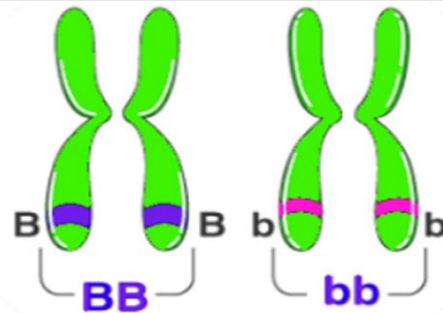
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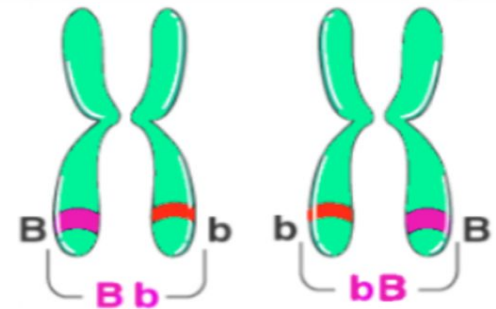
GENETIC TERMINOLOGY

- **Locus:** The location of allelic genes on the chromosome, e.g., A, B, and O genes occur at the ABO locus. (*Plural = loci*)
- **Homozygous:** Possessing a pair of identical alleles for a particular locus (TT / tt)
- **Heterozygous:** possessing a pair of different alleles for a particular locus (Tt)

Homozygous vs Heterozygous in genetics



Homozygous = Same Alleles



Heterozygous = Different Alleles

Gametes

- A gamete is the **mature reproductive or sex cell** that contains a haploid number of chromosomes
- Gametes are **haploid cells**, and each cell carries only one copy of each chromosome.
- A **zygote** is formed due to the **fusion of a male and female gamete** by a process called fertilization.

Determining the number of gametes

$$2^n = G$$

n= number of heterozygous pairs or hybrid pairs

G= the number of different **gametes** the parent can produce.

The value of G will inform how many “slots” each parent must have within the Punnett square.

RRYY

$$2^0 = 1$$

1 combo. possible

RRYy

$$2^1 = 2$$

2 combos possible

RrYy

$$2^2 = 4$$

4 combos possible

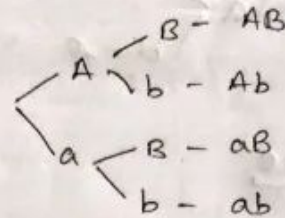
POSSIBLE COMBINATIONS = 2^m

m = HAPLOID NUMBER OR
HETEROZYGOUS (DISSIMILAR) ALLELE
PAIRS PRESENT IN GENOTYPE.

Now.

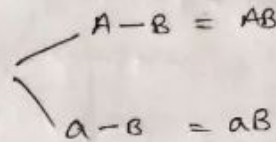
(a) AaBb

$$2^2 = 4$$



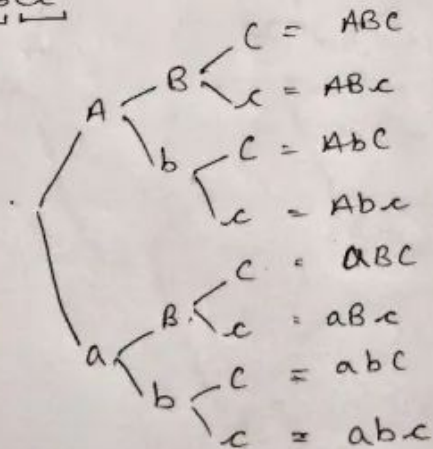
(b) AaBB

$$2^1 = 2$$



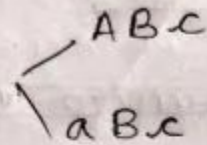
(c) AaBbCc

$$2^3 = 8$$



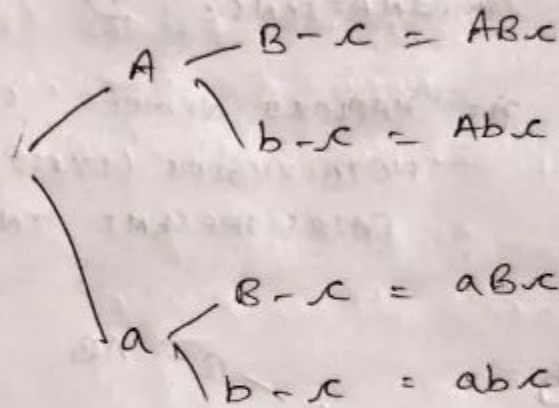
(d) $\underline{Aa} \underline{BB} \underline{cc}$

$$2^1 = 2$$



(e) $\underline{Aa} \underline{Bb} \underline{cc}$

$$2^2 = 4$$



(f) $\underline{Aa} \underline{Bb} \underline{Cc} \underline{Dd} \underline{Ee}$

$$2^5 = 32 \text{ TYPES OF GAMETES} \rightarrow$$

Exercises

1. For the following genotypes, tell how many gametes will be produced
 - a) BB
 - b) Ss
 - c) DDRr

Solution

Use this formula:

$$\# \text{ gametes} = 2^n$$

where n is number of heterozygous genes.

- a) BB, $n=0$, $2^0=1$ gamete: B
- b) Ss, $n=1$, $2^1=2$ gametes: S, s
- c) DDRr, $n=1$, $2^1=2$ gametes: DR, Dr

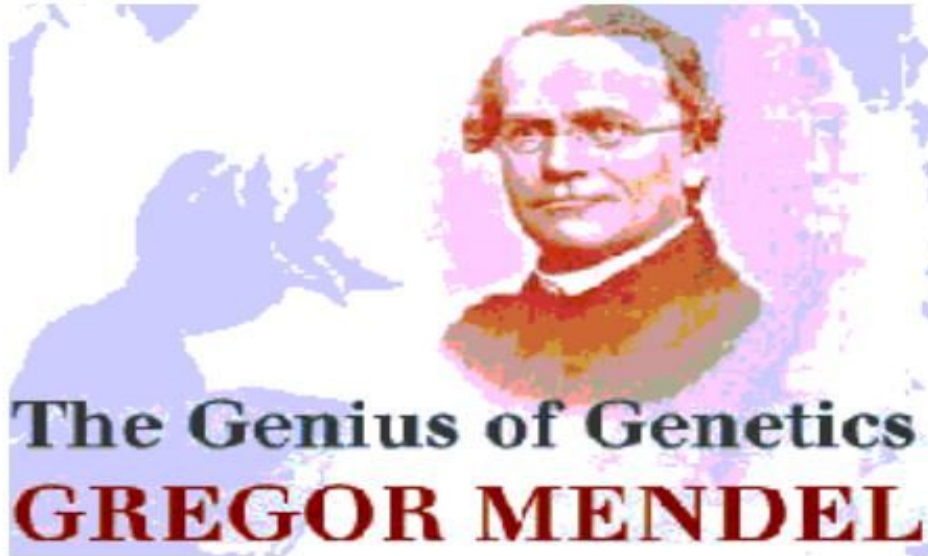
Exercises

2. List all possible gametes produced by
- a) aabbcc
 - b) kkLLMm
 - c) PpQQRr
 - d) RrSsTt

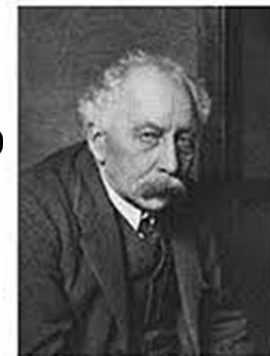
Solution:

- a) aabbcc: 1 gametes: abc
- b) kkLLMm: 2 gametes: kLM and kLm
- c) PpQQRr: 4 gametes: PQR, PQr, pQR, pQr
- d) RrSsTt: 8 gametes: RST, RSt, RsT, Rst, rST, rSt, rsT, rst

Mendelian Genetics



- **Father of genetics : Gregor Mendel (1822-1884)**
- **William Bateson** Coins the Term "**Genetics**" in 1906.
- The word '**gene**' coined by Danish botanist **Willhelm Johannsen** in 1906 to describe fundamental physical and functional units of heredity



William Bateson



Johanson

