

Multiple alleles :-

- * More than two alternative forms (alleles) of a gene in a population occupying the same locus on a chromosome or its homologue are known as multiple alleles
- * Multiple alleles are produced due to repeated mutation of the same gene but in different directions.
- * Example :- **Human ABO blood grp.**
ABO blood group controlled by the gene I located on 9th chromosome that has 3 multiple allele I^A, I^B, I^O , out of which any of two are found in a person.
- * Since in an individual only two allele can be present, multiple alleles can be found only when population studies are made.

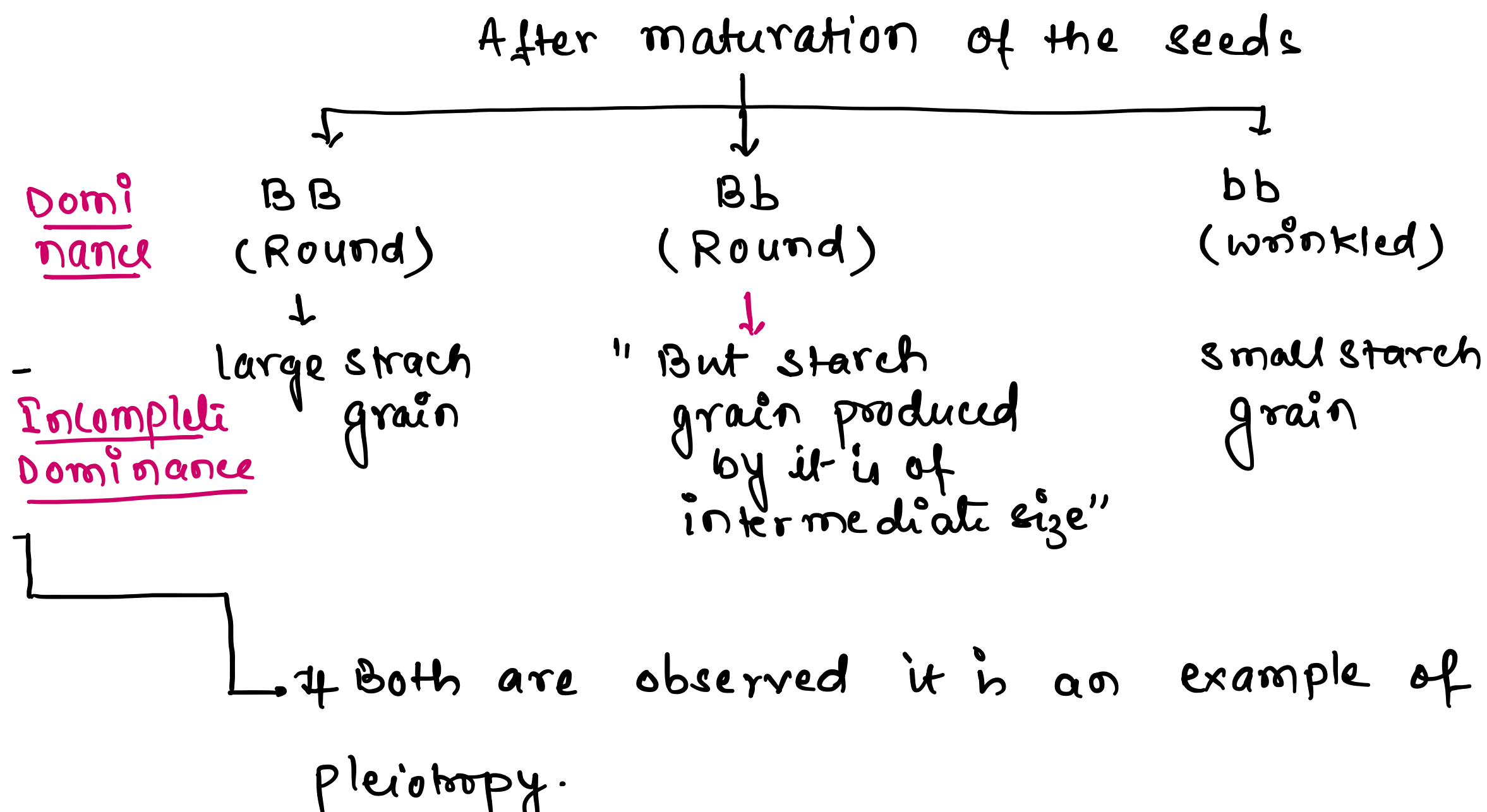
- * Example 2 :- **Eye color in Drosophila (fruit fly)**

Pleiotropy (Pleiotropic Genes) :-

- * A condition in which a single gene product may produce more than one effect
- or
- * Multiple traits are affected by single gene.
* such a gene is called a pleiotropic gene.
- * For example -

Starch synthesis is controlled by in pea seeds is controlled by one gene. It has two alleles (B and b). Starch is synthesized effectively by BB homozygotes and therefore, large starch grains are produced.

In contrast bb homozygotes have lesser efficiency in starch synthesis and produce smaller starch grains.



Therefore, dominance is not an autonomous feature of a gene or the product that it has information for. It depends as much on the gene product as it does on the particular phenotype that we choose to examine.

- * The underlying mechanism of pleiotropy in most cases is the effect of a gene on metabolic pathways which contribute towards different phenotypes.

Example → PKU → occur in human. The disease is caused by (CH-12)

mutation in the gene that codes for the enzyme phenyl alanine hydroxylase (single gene mutation). This manifests itself through phenotypic expression characterised by mental retardation ^① and a reduction in hair and skin pigmentation. ^②

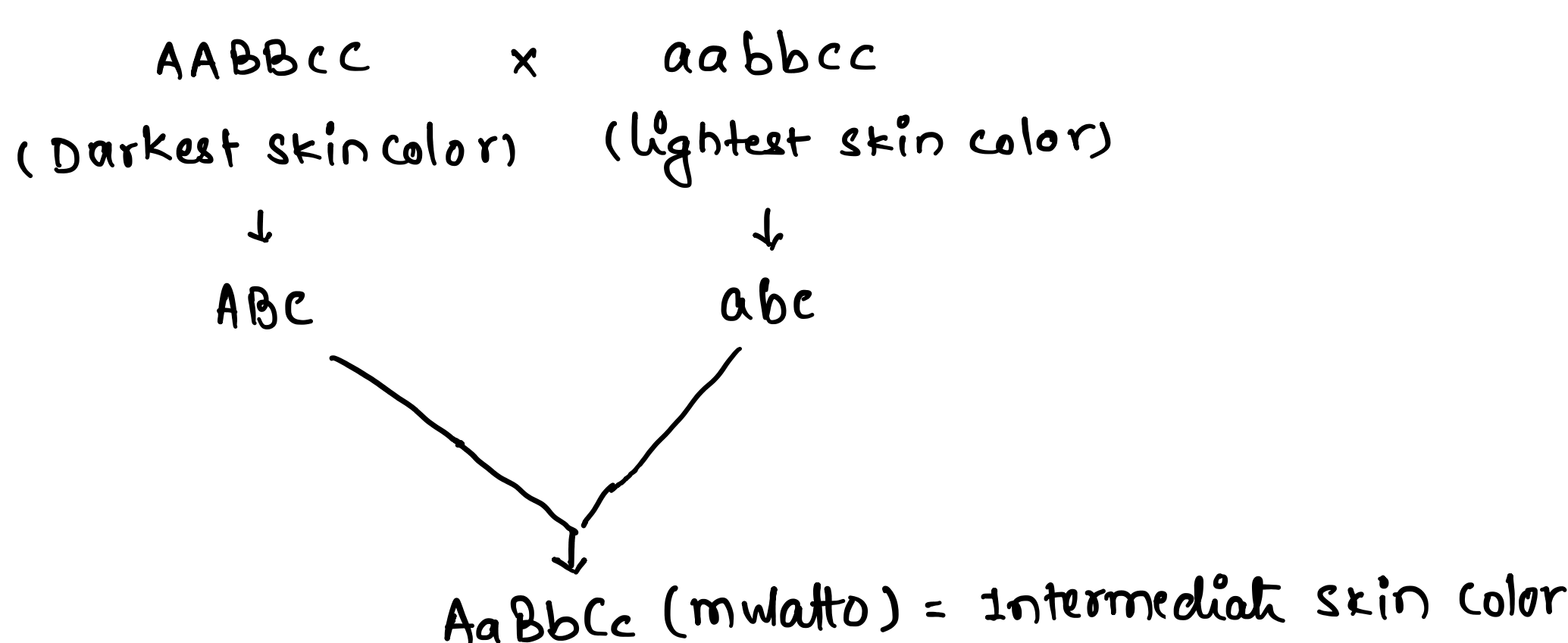
Eg. Sickle cell anaemia

POLYGENIC INHERITANCE (Quantitative inheritance)

- It is a type of inheritance controlled by generally three or more genes in which the dominant alleles have cumulative effect with each dominant allele expressing a part or unit of the trait.
- Traits like intelligence, height and skin color in humans are generally controlled by three or more genes and are thus called as polygenic traits.

**** Besides the involvement of multiple genes polygenic inheritance also takes into account the influence of environment.**

- Skin color in human is controlled by three polygene pair



1:6:15:20:15:6:1 (Bell shape curve is obtained)