

Genetics - Form 4 Biology Notes

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Introduction

- Genetics is the study of inheritance.
- The fact that the offspring of any species resemble the parents indicates that the characters in the parents are passed on to the offspring.
- Factors that determine characters (genes) are passed on from parent to offspring through gametes or sex cells.
- In fertilisation the nucleus of the male gamete fuses with the nucleus of the female gamete.
- The offspring show the characteristics of both the male and the female.
- Genetics is the *study of how this heritable material operates in individuals and their offspring.*

Variations within Plant and Animal Species

Variation

- The term variation means to differ from a standard.
- Genetics also deals with the study of differences between organisms belonging to one species.
- Organisms belonging to higher taxonomic groups e.g. phyla or classes are clearly different.
- Although organisms belonging to the same species are similar, they show a number of differences or variations such that no two organisms are exactly the same in every respect.
- Even identical twins, though similar in many aspects, are seen to differ if they grow in different environments.
- Their differences are as a result of the environment which modifies the expression of their genetic make-up or genotype.
- The two causes of variations are the genes and the environment.
- Genes determine the character while the environment modifies the expression of that character.

Continuous and Discontinuous Variation

Continuous Variations

- The differences between the individual are not clear-cut.
- There are intermediates or gradations between any two extremes.
- Continuous variations are due to action of many genes e.g. skin complexion in humans.
- In continuous variation, the environment has a modifying effect in that it may enhance or suppress the expressions of the genes.
- Continuous variation can be represented in form of a histogram.
- Example of continuous variation in humans is weight, height and skin complexion.
- Linear measurements:
- In humans, height shows gradation from tall, to tallest.
- So does the length of mature leaves of a plant.
- In most cases, continuous variation is as a result of the environment.

Discontinuous Variations

- These are distinct and clear cut differences within a species.
- Examples include:
 - Ability to roll the tongue.
 - An individual can either roll the tongue or not.
 - Ability to taste phenylthiourea (PTC); some individuals can taste this chemical others cannot.
 - Blood groups - and individual has one of the four blood groups A, B AB or O. There are no intermediates.
 - Albinism - one is either an albino or not.
- Discontinuous variations is determined by the action of a single gene present in an individual.

Structure and Properties of Chromosomes

- These are threadlike structures found in the nucleus.
- They are normally very thin and coiled and are not easily visible unless the cell is dividing.
- When a cell is about to divide, the chromosomes uncoil and thicken.
- Their structure, number and behaviour is clearly observed during the process of cell division.
- The number of chromosomes is the same in all the body cells of an organism.