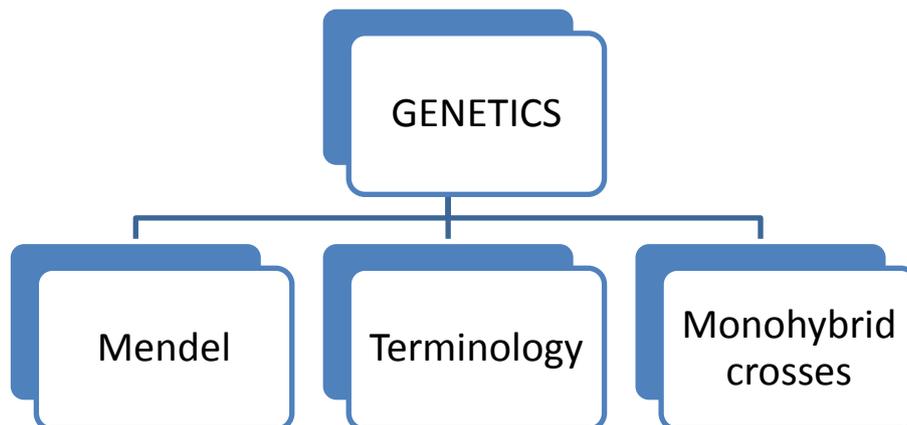


GENETICS & INHERITANCE**09 APRIL 2014** **Lesson Description**

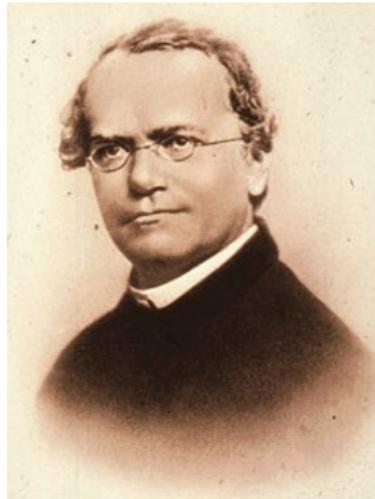
In this lesson we:

- Define each of the following:
 - Genetics
 - Inheritance
 - Variation
 - Outline the experiments conducted by Mendel
- Differentiate between each of the following:
 - Chromatin and chromosomes
 - Genes and alleles
 - Phenotype and genotype
 - Dominant and recessive alleles
 - State Mendel's Law of Dominance
 - Homozygous (pure-breeding) and heterozygous (hybrid)
 - Monohybrid cross and dihybrid cross
 - Write down the format for representing a genetics cross
 - State Mendel's principle of segregation
 - Solve monohybrid genetics problems
 - Determine proportion and ratio of genotypes and phenotypes

 **Summary**

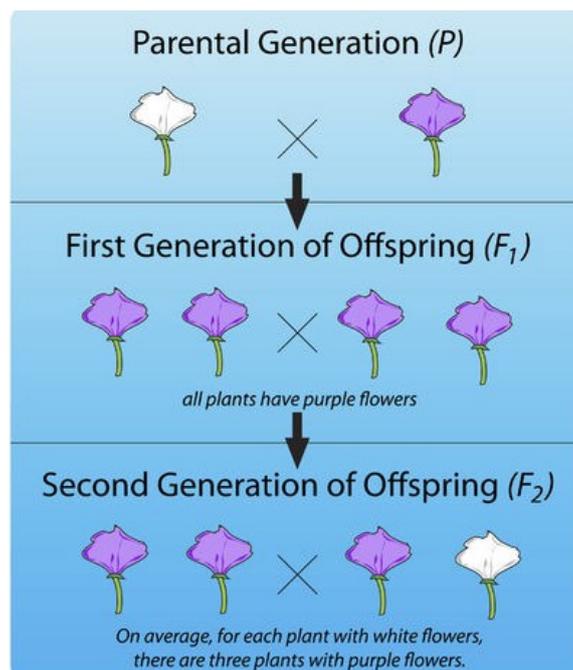
notes for...

Gregor Mendel



Seed		Flower	Pod		Stem	
Form	Cotyledons	Color	Form	Color	Place	Size
Grey & Round	Yellow	White	Full	Yellow	Axial pods, Flowers along	Long (6-7ft)
White & Wrinkled	Green	Violet	Constricted	Green	Terminal pods, Flowers top	Short (1ft)
1	2	3	4	5	6	7

An example of a cross





Test Yourself

Select the most correct answer from the options given. Write down only the correct letter

Question 1

The probability that two parents who are heterozygous for an inherited trait will have a homozygous dominant offspring is ...%.

- A 50
- B 75
- C 25
- D 33

Question 2

In guinea pigs, black hair colour is dominant (B) and white hair colour is recessive (b). Use the punnet square to state what hair colour the guinea pigs' offspring are

	B	b
B	BB	Bb
b	Bb	bb

- A All black
- B All white
- C 75% black and 25% white
- D 75% white and 25% black

Question 3

Who is considered the father of genetics?

- A. Charles Darwin
- B. Gregor Mendel
- C. James Watson
- D. Francis Crick

Question 4

In one species of guinea pig, the gene for black fur is dominant while the gene for brown fur is recessive. A male guinea pig with black fur and a female guinea pig with black fur produce an offspring with brown fur. Which most likely describes the genes of the guinea pigs?

- A Both parent guinea pigs carry the recessive gene
- B The male parent guinea pig carries the recessive gene, but the female parent does not
- C The female parent guinea pig carries the recessive gene, but the male parent does not
- D Neither parent guinea pig carries the recessive gene. The brown fur was a spontaneous mutation

Question 5

Indicate whether each of the statements in COLUMN I applies to **A only**, **B only**, **both A and B** or **none** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number.

	COLUMN I	COLUMN II
1	One of the possible forms of a given gene	A: Allele B: Locus
2	When the two alleles of a gene at given locus are identical	A: Heterozygous B: Homozygous
3	The observable characteristics of an organism	A: Genotype B: Phenotype
4	Mendelian law that states that, for any particular trait, the pair of genes of each parent separate and only one gene from each parent passes on to an offspring.	A: Law of dominance B: Law of segregation
5	Mass of genetic material composed of DNA and proteins	A: Chromosomes B: Chromatin

Question 6

Give the correct biological term for each of the following descriptions. Write only the term next to the question number.

- The study of gene structure and action and the patterns of inheritance of traits from parent to offspring
- An allele that masks the presence of its corresponding allele in the phenotype
- The molecular unit of inheritance of a living organism
- The principle stating that one factor in a pair of traits masks or shadows the other in inheritance



Improve your Skills

Question 1

- A plant with red flowers is crossed with a white-flowered plant of the same species. All the seeds, when grown, produce plants with red flowers. Assuming that the flower colour is controlled by a single pair of alleles, which allele is dominant and which is recessive? (2)
- If a dominant allele for tall plants is represented by the letter D, what letter should represent the corresponding recessive allele? (1)
- Distinguish between the terms homozygous and heterozygous (2)
- Explain why Mendel chose pea plants for his investigation on inheritance. (4)
- How did he ensure that the plants he used were true breeding?
- How did he ensure that his results were reliable?

Question 2

Gregor Mendel conducted breeding experiments with pea plants to study the inheritance patterns of four different traits (plant height, seed shape, seed colour and seed coat colour). For each trait, for example plant height, he crossed homozygous tall plants with homozygous dwarf plants. The offspring obtained in the F₁-generation were then interbred to form the F₂-generation. He did the same for each of the other traits. The results obtained for the F₂-generation are shown in the table below:

TRAIT	RESULTS OF F ₂ -CROSSING	RATIO
Plant height (Tall or dwarf)	Tall: 787	2,84 : 1
	Dwarf: 277	
Seed shape (Round or wrinkled)	Round: 5 474	X
	Wrinkled: 1 850	
Seed colour (Yellow or green)	Yellow: 6 022	Y
	Green: 2 001	
Seed coat colour (Grey or white)	Grey: 705	3,15 : 1
	White: 224	

[Adapted from *Basic Concepts in Biology*, 3rd edition., C Starr, 1997]

- 2.1 What is the expected phenotypic ratio for a trait involving two heterozygous parents? (1)
- 2.2 From the results, calculate X and Y. Also state which trait provided a ratio closest to the expected phenotypic ratio mentioned in QUESTION 2.1. Show ALL working. (3)
- 2.3 Give a possible reason why the ratio selected in QUESTION 2.2 was closest to the theoretical ratio. (2)
- 2.4 Using the results, state whether the allele for round seeds or for wrinkled seeds is dominant. (1)
- 2.5 State TWO factors that Mendel controlled during these breeding experiments. (2)
- 2.6 Write down Mendel's law of segregation. (2)

Question 3

Sheep homozygous for white wool are crossed with sheep homozygous for black wool. All the offspring are white. Use the letters **B** and **b** to represent a genetic cross to show the results and show the expected results if the F₁ were to interbreed. (6)



Links

- **Learn Xtra Gr 12 Lesson:** <https://www.youtube.com/watch?v=AXQiN-bolzA&list=PLOaNAktW5HLQOqIIPY7QGcEGHpCm9RgtY>
- <http://www.sciencechannel.com/tv-shows/greatest-discoveries/videos/100-greatest-discoveries-shorts-genetics.htm>