Class 10 Science Chapter 8: Heredity - Notes, Important Questions and MCQs (2026-27)

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These Class 10 Science Chapter 8 PDF Notes explain Heredity simply: how variation accumulates, what inherited traits are, Mendel’s experiments with pea plants, how traits are expressed, and how the sex of a child is determined.

In the 2026-27 NCERT book, this chapter is titled "Heredity" and focuses on inheritance. Mendel’s crosses and their ratios, dominant and recessive traits, and sex determination are the most frequently asked topics.

Use the table of contents below to jump to the part you need, or read top to bottom for a complete revision of the chapter.

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Chapter Overview

Every new generation looks broadly like its parents but shows small differences. Heredity is the inheritance of traits from parents to offspring through genes, while variation is the set of differences among individuals.

Gregor Mendel studied pea plants and discovered the basic rules of inheritance. The chapter explains his monohybrid and dihybrid crosses, how genes control traits through proteins, and why the father’s sex chromosome decides whether a child is a boy or a girl in humans.

Important Topics and Concepts

Accumulation of variation during reproduction

Each generation inherits the basic body design from the previous one, along with small changes caused by imperfect DNA copying and, in sexual reproduction, by mixing DNA from two parents. Some variations help organisms survive better in their environment; for example, bacteria that can withstand heat survive a heat wave.

Inherited traits

Children share the basic features of their parents but are not identical. For example, the earlobe can be free or attached; this is an inherited trait that differs among people.

Mendel’s experiments

Mendel chose garden pea plants with clear contrasting traits: tall/short, round/wrinkled seeds, yellow/green seeds, violet/white flowers. Each trait is controlled by two copies of a factor (gene), one from each parent.

Monohybrid cross (one trait)

- Parents: pure tall (TT) × pure short (tt).
- F1 generation: all tall (Tt). The tall trait is dominant; the short trait is recessive and hidden.
- F1 self-pollinated: F2 shows tall and short plants in the ratio 3 : 1 (genotype ratio 1 TT : 2 Tt : 1 tt).
- Conclusion: both parental traits are inherited; the recessive one appears again in F2.

Dihybrid cross (two traits)

- Parents: round yellow seeds (RRYY) × wrinkled green seeds (rryy).
- F1: all round and yellow (RrYy), so round and yellow are dominant.
- F2 from self-pollination: round yellow, round green, wrinkled yellow and wrinkled green in the ratio 9 : 3 : 3 : 1.
- Conclusion: the two traits are inherited independently of each other, giving new combinations.

How do these traits get expressed?

DNA in the cell is the information source for making proteins. A section of DNA that provides the information for one protein is a gene. For example, plant height depends on a growth hormone; the amount of hormone made depends on how efficient an enzyme is, which depends on its gene. An efficient gene gives a tall plant; a less efficient one gives a short plant.

Genes, chromosomes and germ cells

Genes are found on chromosomes. Each cell has two copies of each chromosome, one from each parent. Germ cells take only one copy of each chromosome pair, so when two germ cells combine, the offspring gets the normal number of chromosomes, keeping DNA content stable across generations.

Sex determination

In some animals, environmental factors such as the temperature at which eggs are kept decide sex (turtles, some reptiles). Some snails can change sex. In humans, sex is genetically decided. Women have a matched pair of sex chromosomes (XX); men have a mismatched pair (XY). All eggs from the mother carry an X. A sperm carries either X or Y. If an X-carrying sperm

Mendel’s Crosses and Ratios

Cross	F1 result	F2 phenotype ratio	What it shows
Tall (TT) × Short (tt)	All tall (Tt)	3 tall : 1 short	Dominance; recessive trait reappears
Round yellow (RRYY) × Wrinkled green (rryy)	All round yellow (RrYy)	9 : 3 : 3 : 1	Traits are inherited independently
Genotypes in monohybrid F2	–	1 TT : 2 Tt : 1 tt	Two copies of each gene, one from each parent

Important Definitions and Terms

Term	Meaning
Heredity	Transmission of traits from parents to offspring
Variation	Differences between individuals of a species
Trait	A characteristic such as height or seed colour
Gene	A section of DNA that carries information for one protein
Allele	Different forms of the same gene (e.g. T and t)
Dominant trait	Trait that shows up in the F1 generation
Recessive trait	Trait that is hidden in F1 and reappears in F2
Genotype	Genetic make-up of an organism, e.g. Tt
Phenotype	Observable characteristic, e.g. tall
Homozygous	Having two identical copies of a gene (TT or tt)
Heterozygous	Having two different copies (Tt)
Monohybrid cross	Cross involving one pair of contrasting traits
Dihybrid cross	Cross involving two pairs of contrasting traits
Sex chromosomes	X and Y chromosomes that decide sex in humans

Short Answer Questions

Q1. If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier?

Trait B. In asexual reproduction, variations are passed on and spread over generations, so a trait present in a larger part of the population is likely to have arisen earlier.

Q2. How does the creation of variations in a species promote survival?

Variations give some individuals features that help them cope with changes in the environment. If conditions change, these individuals survive and reproduce, so the species continues.

When pure tall and pure short plants were crossed, all F1 plants were tall, so tallness was dominant. When F1 plants were self-pollinated, short plants reappeared in F2 in a 3 : 1 ratio, showing that the short trait was recessive and had been hidden, not lost.

Q4. How do Mendel’s experiments show that traits are inherited independently?

In the dihybrid cross, F2 plants showed new combinations such as round green and wrinkled yellow seeds in a 9 : 3 : 3 : 1 ratio. This shows that seed shape and seed colour were inherited independently.

Q5. How is the sex of a child determined in human beings?

The mother always gives an X chromosome. The father can give either X or Y. An X from the father gives a girl (XX) and a Y gives a boy (XY). So the sex of the child depends on the father’s sperm.

Q6. Why do germ cells have only one set of chromosomes?

So that when male and female germ cells fuse, the zygote has the normal two sets. This keeps the amount of DNA constant from generation to generation.

Q7. A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this enough to tell which trait is dominant?

No. The information is not enough. The father could be AO (heterozygous) and pass on O, giving an O daughter. We would need more data from many offspring to decide dominance.

Q8. What is the difference between genotype and phenotype?

Genotype is the genetic make-up, such as TT or Tt. Phenotype is the observable trait, such as a tall plant. Plants with TT and Tt have the same phenotype (tall) but different genotypes.

Long Answer Questions

Q1. Describe Mendel’s monohybrid cross with a checkerboard and state the conclusions.

Mendel crossed a pure tall pea plant (TT) with a pure short plant (tt). All F1 plants were tall (Tt).

He then self-pollinated F1 plants. Gametes from each F1 plant were T and t. Combining them (Punnett square) gave TT, Tt, Tt and tt.

F2 result: phenotype ratio 3 tall : 1 short; genotype ratio 1 TT : 2 Tt : 1 tt.

Conclusions: (i) traits are controlled by pairs of factors (genes); (ii) one factor can be dominant over the other; (iii) the recessive factor is not lost but reappears in F2; (iv) each parent passes on one copy of each factor.

Q2. Explain Mendel’s dihybrid cross and what it shows.

Mendel crossed a plant with round yellow seeds (RRYY) and one with wrinkled green seeds (rryy). All F1 plants had round yellow seeds (RrYy), showing round and yellow are dominant.

When F1 plants self-pollinated, F2 produced four types of seeds: round yellow (9), round green (3), wrinkled yellow (3) and wrinkled green (1).

This 9 : 3 : 3 : 1 ratio shows that seed shape and seed colour are inherited independently. New combinations (round green and wrinkled yellow) not seen in the parents appeared in F2.

Humans have 23 pairs of chromosomes; one pair is the sex chromosomes. Females have XX and males have XY.

During gamete formation, every egg gets one X. Half the sperms get X and half get Y.

Fertilisation: X egg + X sperm → XX (girl); X egg + Y sperm → XY (boy). So there is a 50% chance of either sex.

This shows that the father's sperm decides the sex of the child, and the mother cannot be blamed for the sex of a baby. In some animals, like turtles, temperature decides sex instead.

MCQs with Answers

1. Mendel worked on(a) Rose plants (b) Garden pea (c) Maize (d) WheatAnswer: (b) Garden pea

2. The F2 phenotype ratio in a monohybrid cross is(a) 1 : 2 : 1 (b) 3 : 1 (c) 9 : 3 : 3 : 1 (d) 1 : 1Answer: (b) 3 : 1

3. The F2 ratio in a dihybrid cross is(a) 3 : 1 (b) 1 : 2 : 1 (c) 9 : 3 : 3 : 1 (d) 1 : 1 : 1 : 1Answer: (c) 9 : 3 : 3 : 1

4. A plant with genotype Tt is(a) Homozygous tall (b) Heterozygous tall (c) Homozygous short (d) Heterozygous shortAnswer: (b) Heterozygous tall

5. A human male has the sex chromosomes(a) XX (b) XY (c) YY (d) XOAnswer: (b) XY

6. The sex of a child is determined by the(a) Mother's egg (b) Father's sperm (c) Both equally (d) EnvironmentAnswer: (b) Father's sperm

7. A gene is a part of(a) Protein (b) DNA (c) Ribosome (d) Cell wallAnswer: (b) DNA

8. In some reptiles, sex is determined by(a) Chromosomes only (b) Incubation temperature (c) Diet (d) LightAnswer: (b) Incubation temperature

9. Which trait did Mendel find to be dominant?(a) Short stem (b) Wrinkled seed (c) Green seed (d) Round seedAnswer: (d) Round seed

10. The number of chromosome pairs in human cells is(a) 22 (b) 23 (c) 44 (d) 46Answer: (b) 23

Quick Revision Points

- Variation arises from imperfect DNA copying and mixing of DNA in sexual reproduction.
- Two copies of each gene; one from each parent.
- Monohybrid F2: 3 : 1 (phenotype), 1 : 2 : 1 (genotype).
- Dihybrid F2: 9 : 3 : 3 : 1 → independent inheritance.
- Gene → protein (enzyme/hormone) → trait.
- Females XX, males XY; father decides sex of the child.
- Turtles: temperature decides sex.

Chapter Summary

Heredity is the passing of traits from parents to offspring. Small variations accumulate over generations and help some individuals survive changing conditions. Mendel showed with pea plants that each trait is controlled by a pair of factors (genes), one from each parent, with one form often dominant over the other.

His monohybrid cross gave a 3 : 1 ratio in F2 and his dihybrid cross gave 9 : 3 : 3 : 1, showing dominance and independent inheritance. Genes act by making proteins that control traits. In humans, sex is determined by sex chromosomes, and the father’s X or Y chromosome decides whether the child is a girl or a boy.

Exam Tips and PYQ Pattern

- Expect a cross-based question: write the parents, gametes, F1 and F2 clearly in a checkerboard.
- Sex determination with a flow diagram is a common 3-mark question.
- Ratios (3 : 1, 1 : 2 : 1, 9 : 3 : 3 : 1) are often tested as MCQs or assertion-reason.
- Use the terms genotype, phenotype, dominant and recessive correctly.

Frequently Asked Questions

Is evolution in the 2026-27 syllabus for this chapter?

The 2026-27 NCERT chapter is titled Heredity and covers variation, Mendel’s experiments, expression of traits and sex determination.

Why did Mendel choose pea plants?

They have clear contrasting traits, a short life cycle, many seeds, and can be both self- and cross-pollinated easily.

Can a short plant come from two tall parents?

Yes, if both tall parents are heterozygous (Tt); there is a 25% chance of a tt (short) offspring.

Conclusion

Heredity is short but scoring. Practise drawing Mendel’s crosses, memorise the ratios, and explain sex determination clearly with a diagram. With these three skills you can answer almost every question from this chapter.

More Notes: Class 10 Science Chapter 7: How do Organisms Reproduce? notes | Class 10 Science Chapter 9: Light – Reflection and Refraction notes | All Class 10 Science notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE science educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

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