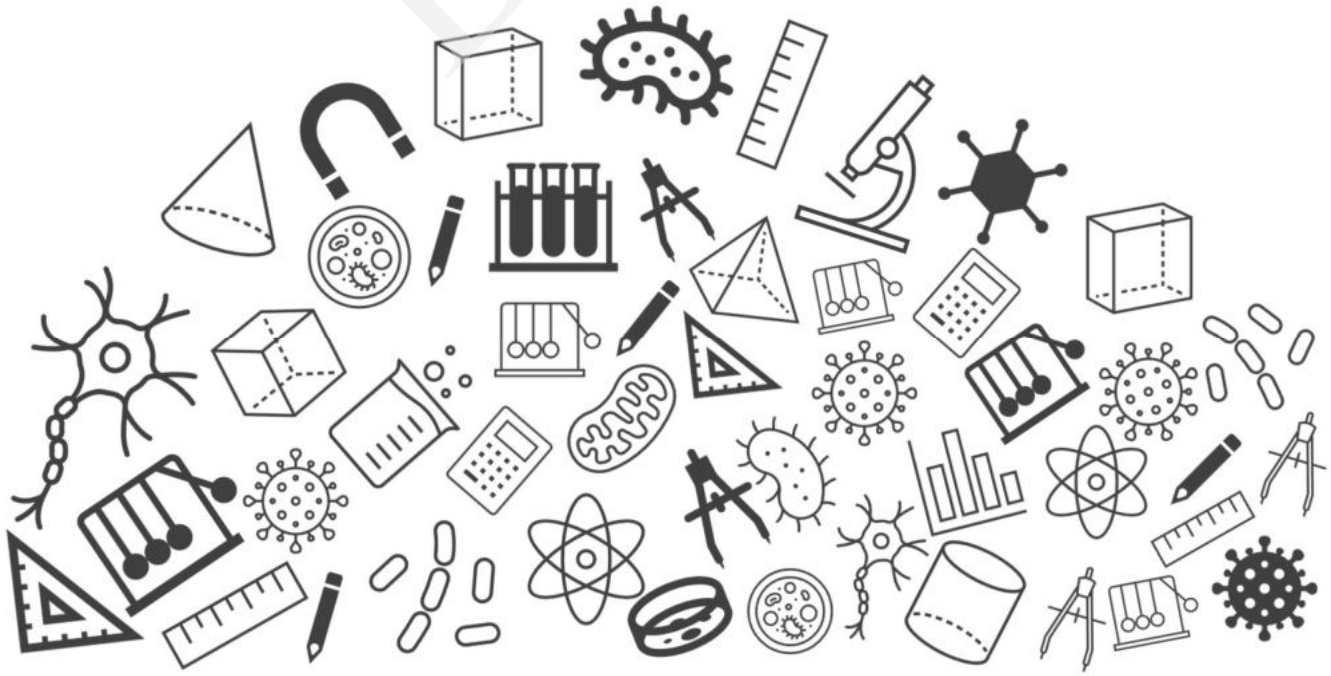
Grade 10: Science
Chapter Notes



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CHAPTER NOTES

Heredity

Topics

1. Basics of Heredity
2. Mendel's Experiments
3. Sex determination

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Important terms

Heredity

Transmission of characters from one generation to the next.

Chromosomes

Rod-like structures containing genetic information. They are visible at the time of cell division.

Gene

Functional segment of DNA that contains necessary information for synthesising proteins.

Alleles

Alternative forms of genes that occupy the same position on a particular chromosome.

Homozygous

The two alleles for a particular character are same (TT or tt).

Heterozygous

The two alleles for a particular character are different (Tt).

Dominant allele

In heterozygous condition, the allele which express itself physically.

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Important terms

Recessive allele:

In heterozygous condition, the allele which remains unexpressed physically.

Phenotype

Expressed visible character which are genetically controlled (Tall, Dwarf).

Genotype

Genetic constitution of a character (TT, Tt, tt).

F1 Generation

Generation of hybrids produced from a cross between genetically different individuals.

F2 Generation

Generation of hybrids produced from a cross amongst individuals of F1 generation.

Sex Chromosomes

Chromosomes that determine whether the individual is male or female.

Autosomes

Chromosomes other than that of sex chromosomes.

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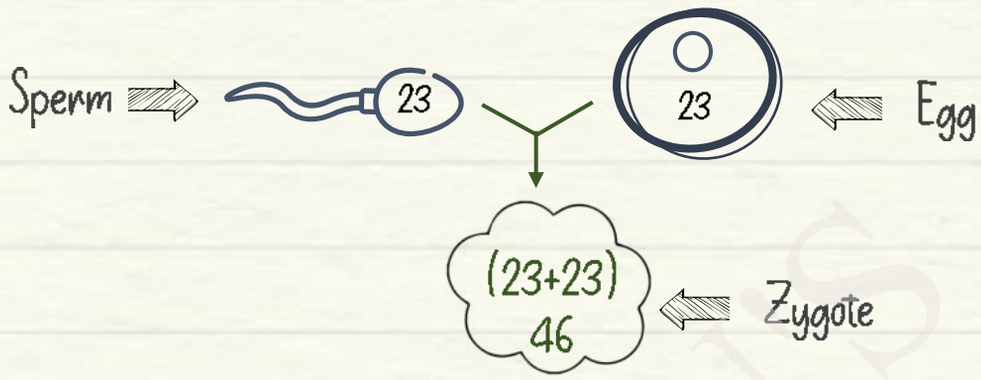
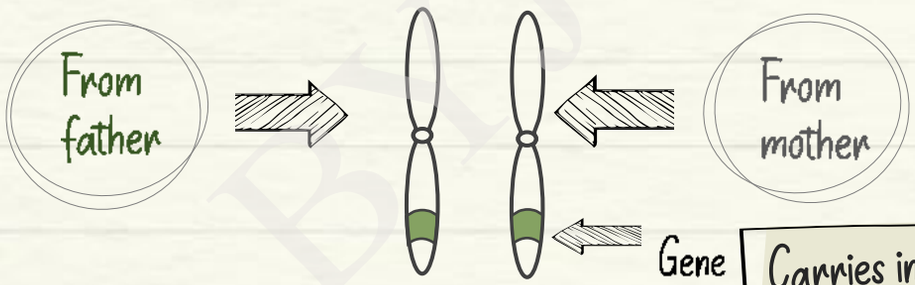
1. Basics of Heredity

- Chromosomes present in the nucleus carry genetic information.
- Humans have 46 chromosomes.

1.1. In sexual reproduction



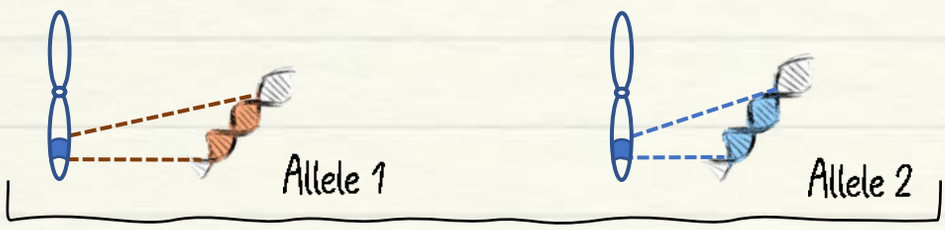
- Chromosomes exists in pairs, one coming from each parent.



Carries information for a particular Character.
e.g., Eye colour gene

Character → Eye colour

Traits → Brown colour, Blue colour



Alleles: Alternative forms / variants of a gene

2. Mendel's Experiments

Gregor Johan Mendel

- Father of genetics
- Studied inheritance in pea plants
- Put forth 3 laws of inheritance

Why pea plants?

- Smaller life cycle
- Many contrasting characters
- Bisexual flowers
- Can be cross-pollinated

7 contrasting characters of pea plant

	Height	Seed shape	Seed colour	Flower colour	Pod shape	Pod colour	Flower position
Dominant	 Tall	 Round	 Yellow	 Purple	 Inflated	 Green	 Axial
Recessive	 Short	 Wrinkled	 Green	 White	 Constricted	 Yellow	 Terminal

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Monohybrid Cross

2.1. Monohybrid cross

When a cross is made considering a single character.

Phenotype → Tall Plant × Dwarf Plant

Genotype → TT × tt

Gametes → T × t

F1 generation → Tt

Tall Plant

Law of dominance

In heterozygous condition, the factor or gene which expresses itself physically is called dominant and the other which remain unexpressed is called recessive.

Law of segregation

The two alleles for a character will segregate from each other during gamete formation.

Phenotype → Tall Plant × Tall Plant

Genotype → Tt × Tt

Gametes → T, t × T, t

F2 generation

	T	t
T	TT	Tt
t	Tt	tt

Phenotypic ratio in F_2 generation : Tall : dwarf

3 : 1

Genotypic ratio in F_2 generation :

TT	:	Tt	:	tt
1	:	2	:	1

Dihybrid Cross

2.2. Dihybrid cross

When a cross is made considering two characters.

Phenotype → Yellow, round seed × Green, Wrinkled seed

Genotype → YY RR × yyrr

Gametes → YR × yr

F1 generation → YyRr

Yellow, round seed

Yellow, round seed × Yellow, round seed

YyRr × YyRr

YR Yr yR yr × YR Yr yR yr

	YR	Yr	yR	yr
YR	YY RR	YY Rr	yY RR	yY rR
Yr	YY Rr	YY rr	yY Rr	yY rr
yR	YyRR	YyrR	yyRR	yyrR
yr	YyRr	Yyrr	yyRr	yyrr

← F2 generation

Law of independent assortment

It states that the alleles of two different characters/traits segregate independently.

Phenotypic ratio in F_2 generation:

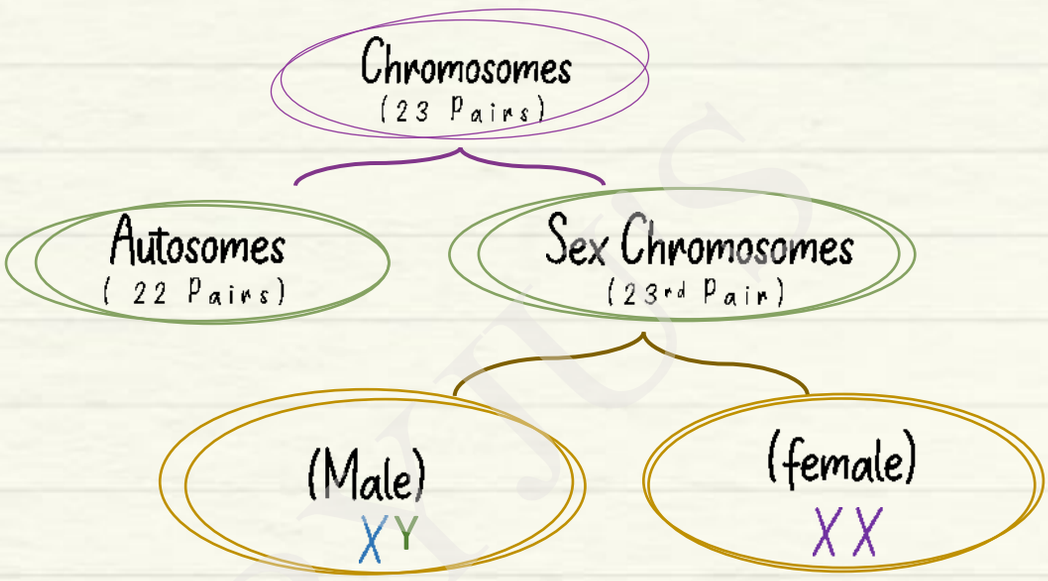
9 : 3 : 3 : 1

3. Sex Determination

Sex determination

The process of determining the sex of an organism, based on the composition of the genetic material or environmental factors such as temperature.

Sex determination in humans



Segregation by meiosis

	X	Y
X	XX	XY
X	XX	XY

Conclusion

In humans, the chances of offspring being male is 50% and being female is 50%