Linkage

- Human have thousands pair of the genes. But contain only 23 pair of chromoso-mes.
- So each chromosome have many genes.
- all the genes in a chromosome passed together parses to another generenations.

24 SUNDAY

these genes determining characters expresses in each generations.

Linked genes

Eg: [illegible]

This linked genes are same linkage group.

The same linkage group of linked genes transfer to inherited together called linkage

MONDAY 25

Linkage is defined as the tendency of two or more genes to remain together in the original combination in the same chromosome during the process of inheritance for a number of generations.

— All the genes on a chromosome are said to be linked to one another.

— Linkage was discovered by T.H. Morgan. — found in Drosophila, sweet peas, maize, man etc.

TUESDAY 26

— In Drosophila, the genes of body colour and nature of wings are linked and located on the same chromosome.

— Maize - the genes for colour and the seed shape are linked.

— In man, the genes for haemophilia and colour blindness are linked.

27 WEDNESDAY

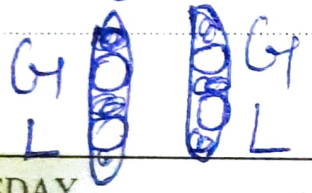
Linkage in Drosophila

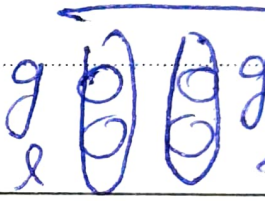
grey colour (G) - dominant
Black " (g) - recessive

Long wing (L) - dominant
Vestigial wing (l) - recessive

GGLL × ggll [Complete Linkage]

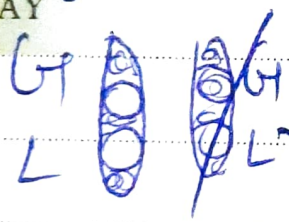
Parents grey long × Black vestigial

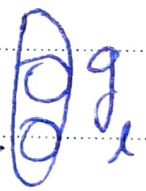




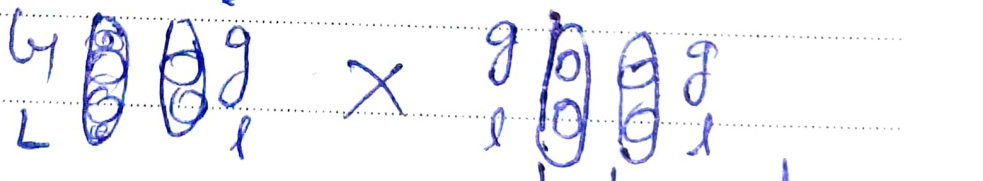
28 THURSDAY

Gametes



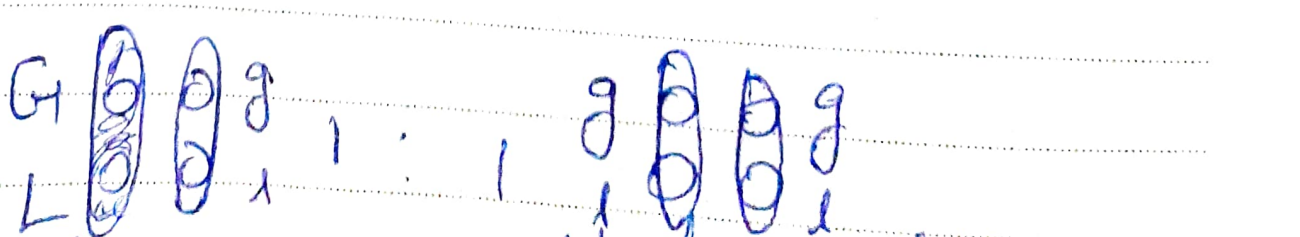


F1 generation



Grey long × Black vestigial

Gametes



Grey long 50% Black vestigial 50%

FRIDAY 1

The resulting offspring resembling the grand parents. This is because gene 'a' is linked with 'L' and the gene 'g' is linked with 'l'.

Types of Linkage:

① Complete linkage and incomplete linkage

- male Drosophila

Eg

- only two types of offspring are produced.
- no linkage in chromosomes
- no new characters

SATURDAY 2

② Incomplete Linkage

The separation of linked genes during inheritance is called incomplete linkage.

↘

L. genes are separated due to C.O, ~~and~~ ~~ors~~, chromosomal breaks, etc.

Eg. Body colour and wing shape in female Drosophila

Seed colour & seed shape in maize

Flower colour & pollen grain shape in sweet pea

3 SUNDAY

— Incomplete linkage (crossing over, C.O.S chromosomal breaks etc)
— due to breakage of chromosome during gametogenesis
— in female Drosophila
— This breakage in chromo lead to the separation of linked genes so new combinations appear.
— So F2 generation are different from their parent in their phenotype & genotype.

4 MONDAY

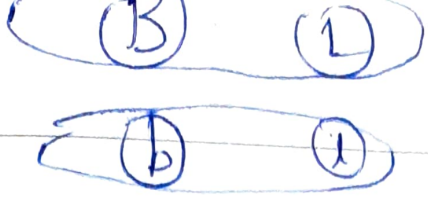
Arrangement of linked Genes

Sturtevant in 1913 - genes arranged in the chromosome in a linear manner.

Based on the arrangements of the genes in the chromo the linkage can be classified into 2 types.

1). Cis arrangement:

One chromo - 2 dominant genes (B and L)
another chromo - 2 recessive
(bbll)



Cis heterozygote

MARCH 2013

17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
SUN MON TUE WED THU FRI SAT SUN MON TUE WED THU FRI SAT SUN

(2). Trans arrangement: TUESDAY 5

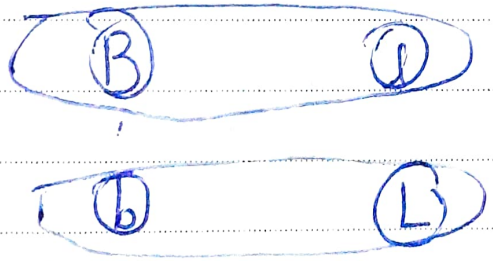
one pair genes — B & L
another " " — b & l

— The dominant gene of one pair and the recessive gene of the pair (B & l) are located on one chromo,

the recessive gene of the first pair and and dominant gene of the second pair located in the second chromosome.

Trans heterozygote

WEDNESDAY 6



Chromosom theory of Linkage:

Morgan & Castle proposed the chromo theory of Linkage

(1). The genes — in a linear fashion on the chromosome.

7 THURSDAY

(2). The genes on a chromo are linked
(3). Linked genes are located on the same chromose.
(4). " "
Linked genes will remain together during inheritance.

(5). The distance between the genes will determine the strength of linkage.
The closely located genes — show strong linkage
Distantly located genes show weak linkage

Importance of linkage.

8 FRIDAY

(1). Linkage prevents variation in evolution.

linkage groups.
All the linked genes in a chromose join together to form linkage group.
— In Drosophila, — 4 linkage groups - 4 pairs of chromosome
— In pea plant — 7 pairs of chromo. — 7 linkage group.
— Man has 23 linkage group — 23 pair

SATURDAY 9

— Each linkage group has a particular no of genes.
— the no. of genes is proportional to the length of the chromo.

— In Drosophila the smallest chromo has the shortest linkage group of 12 linked ~~12 linked~~ genes
the largest chromo has the longest linkage grop of 150 linked genes.

SUNDAY 10

Factors affecting linkage

(1). Distance — closely located genes show strong linkage while genes widely located show weak linkage.

(2). Age with increasing age the strength of linkage decreased

(3). Temp — increasing temp decreased the strength of linkage

(4) X rays: x-ray treatment reduced reduced the strength of the