SHIKSHA CLASSES

Subject : Biology **BOARD ANSWER PAPER** **Total Marks : 20**

Class : XII **Ch. 3. Inheritance and Variation**

Q.1 : Select & write the most appropriate answer from the given alternatives for each sub-question. **(3)**

i) Mendel performed experiments on …….

Ans : c) **Garden pea**

ii) Sex determination in man is ……

Ans : (A) XY-XX type

iii) The genotypic ratio of monohybrid cross will be ..……..

Ans : d) 1:2:1

Q. 2. A) Write the answer in ONE sentence: **(6)**

1) What is Phenotype?

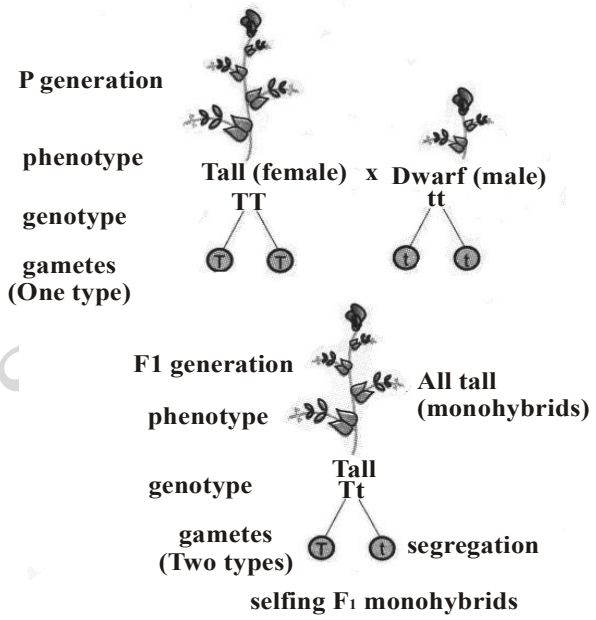
Ans : A phenotype is the composite of an organism's observable characteristics or traits, such as its morphology, development.

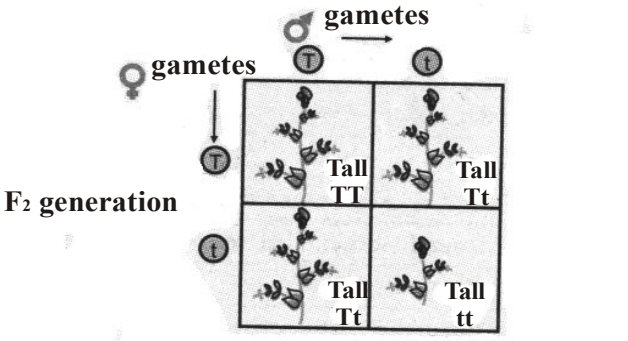
2) Define: Linkage.

Ans : Linkage - The Tendency of the genes on the same chromosome to link together is called linkage.

B) Give graphic representation of monohybrid cross.

Ans :





Phenotypic ration : tall : dwarf
3 : 1

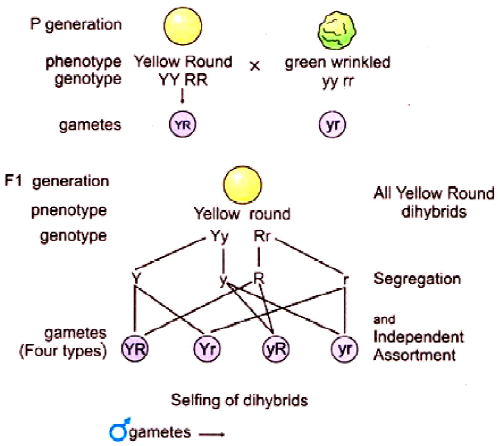
Genotypic ratio : TT : Tt : tt
1 : 2 : 1

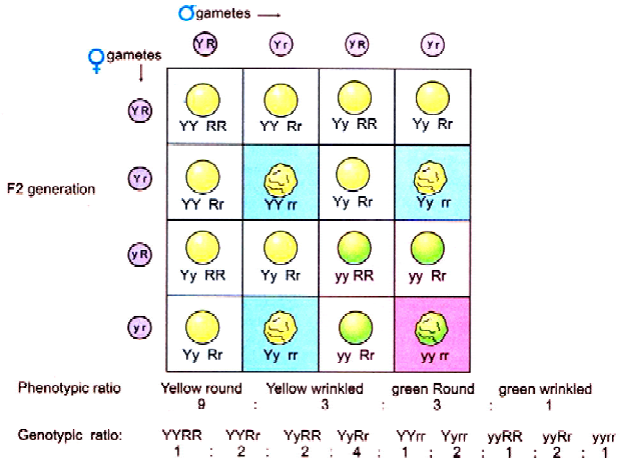
CLASSES, BHANDARA

Graphic representation of a monohybrid cross.

C) Give graphic representation of Dihybrid cross

Ans :





Q. 3.A) Attempt any ONE of the following : (3)

1) Write a note on Haemophilia

Ans :

i) Haemophillia is a hereditary blood disease in which blood fails to clot or clots very slowly.

ii) It is a mendelian disorder caused by a recessive allele in Humans.

iii) Haemophilic person show deficiency of clotting factors in blood, so minor injuries cause continuous bleeding.

iv) The genes for this disease are located on x - Chromosome.

v) The males usually suffer from this disease because the recessive gene is present on x - chromosome. The corresponding gene on y is not present so the males suffer from this disease even when one gene of haemophilia is present.

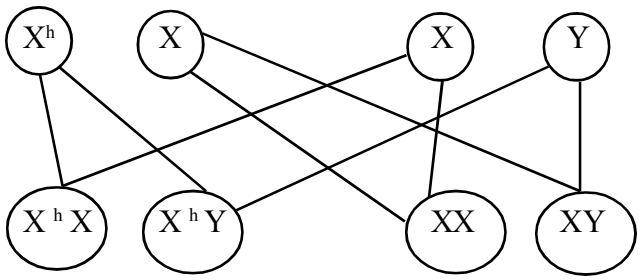
vi) The females usually do not suffer from this disease as the recessive gene is present on one of the two x's they become haemophilic when both the x - chromosomes have recessive genes.

1. When carrier woman marries normal man :

Parents : $x^h x$ x 2 xy

(carrier woman) (Normal Man)

Gametes :



2) If a haemophilic male (XhY) marries a female with normal clotting of blood (xx). Then all the offsprings will show normal clotting of blood. The sons will have normal

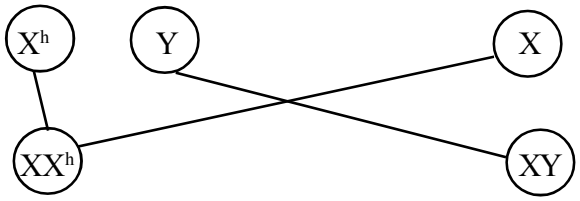
SHIKSHA CLASSES BHA

clotting of blood but daughters will be carriers for the disease. The carriers have normal clotting of blood.

Parents : X^hY XX

Haemophilic male x normal female

Gametes :



F1 :

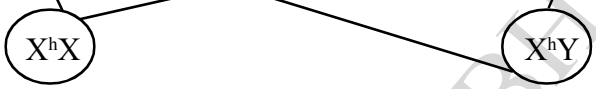
3) When haemophilic woman marries normal man :

Parents : X^h X^h x XY

Haemophilic women Normal Man

Gametes :

F1 :



2) Write a note on pleiotropy.

Ans :

i) When a single gene controls two (or more) different traits, it is called pleiotropic gene and this phenomenon is called pleiotropy or pleiotropism.
The ratio is 2:1 instead of 3:1.

ii) According to Mendel's principle of unit character, one gene (factor) controls one character (trait) but sometimes single gene produces two related or unrelated phenotypic expressions.

iii) For example, the disease, sickle cell anaemia is caused by a gene Hb^s. Normal or healthy gene is Hb^A and is dominant.

iv) The carriers (heterozygotes - Hb^A/Hb^s) show signs of mild anaemia as their RBCs become sickle shaped (half-moon-shaped) in oxygen deficiency. They are said to have sickle -cell trait and are normal in normal conditions.

v) The homozygotes with recessive gene Hb^s however, die of fatal anaemia.

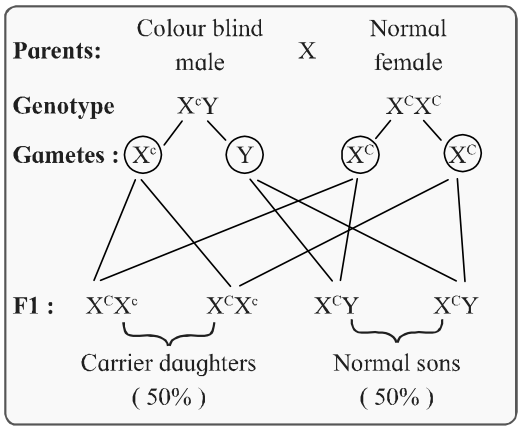
vi) Thus the gene for sickle -cell anaemia is lethal in homozygous condition and produces sickle cell trait in heterozygous carrier.

vii) Two different expressions are produced by a single gene.

Q. 3.B) Give graphic representation of colour blindness $X^C Y \times X^C X^C$.

SHIKSHA CLASSES BHANDARA

Ans :



Sex linked inheritance (colour blindness)

Q.4 : State and explain Mendel's 3rd law of inheritance. (5)

Ans : Mendel's 3rd law of inheritance : The law of independent assortment states that "when two parents differing from each other in two or more pairs of contrasting characters are crossed, then the inheritance of one pair of character is independent of the other pair of character."

For example, when we cross a pure tall, red flowered pea plant with a pure dwarf white flowered pea plant, we get 9 tall red, 3 tall white, 3 dwarf red and 1 dwarf white plants in the F_2 generation. A cross between two homozygous individuals differing in two characters is called dihybrid cross.

Phenotype of parents — Tall Red x Dwarf White

Genotype — TTRR x ttrr

Gametes → (TR) (tr)

F_1 generation → TtRr (Tall Red)

Selfing of F_1 generation → TtRr x TtRr

Gametes — (TR) (Tr) (tR) (tr) (TR) (Tr) (tR) (tr)

F_2 generatioon

♀ \ ♂	TR	Tr	tR	tr
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTRr	TTrr	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

Result : Tall red = 9; Tall white = 3; Dwarf red = 3; Dwarf white = 1

Phenotypic ratio = 9 : 3 : 3 : 1

Genotypic ratio :

1 : 2 : 2 : 4 : 1 : 2 : 1 : 2 : 1

TTRR TTRr TtRR TtRr ttRR ttRr Ttrr Ttrr ttrr

From the above results, it is obvious that the inheritance of character of tallness is no way linked with the red colour of the flower. Similarly, the character of dwarfness is not linked with the white

SHIKSHA CLASSES, BHATINDA

colour of the flower. This is due to the fact that in the above cross, the two pairs of characters segregate independently. In other words. there is independent assortment of characters during inheritance.

OR

Explain sex determination in humans and honey bees.

Ans : a) Sex Determination in human beings :

The chromosomal mechanism of sex determination in human beings is XX-XY type. In human beings, the nucleus of each somatic cell contains 46 chromosomes or 23 pairs of chromosomes. Out of these, 22 pairs are autosomes and one pair of sex chromosomes.

Human female has a pair of XX, homomorphic sex chromosomes while male has XY, heteromorphic sex chromosomes.

Thus genotype of :

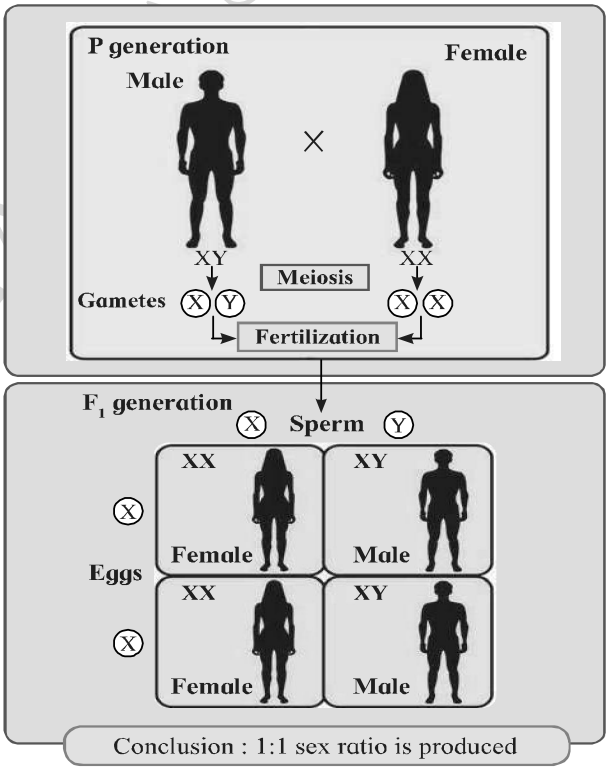
Female = 44 Autosomes + XX

Male = 44 Autosomes + XY

During gamete formation in male, the diploid germ cells in testis undergo spermatogenesis to produce two types of haploid sperms, 50% sperms contain 22 autosomes and X chromosome while, 50% sperms contain 22 autosomes and Y chromosome.

In Female, the diploid germ cells in ovaries undergo oogenesis to produce only one type of egg. All eggs contain 22 autosomes and X chromosome. Thus human male is heterogametic and female is homogametic.

If sperm containing X chromosome fertilizes egg (ovum), then diploid zygote is formed, that grows into a female child. If sperm containing Y chromosome fertilizes the egg, then diploid zygote is formed that grows into a male child.



Sex determination in human beings

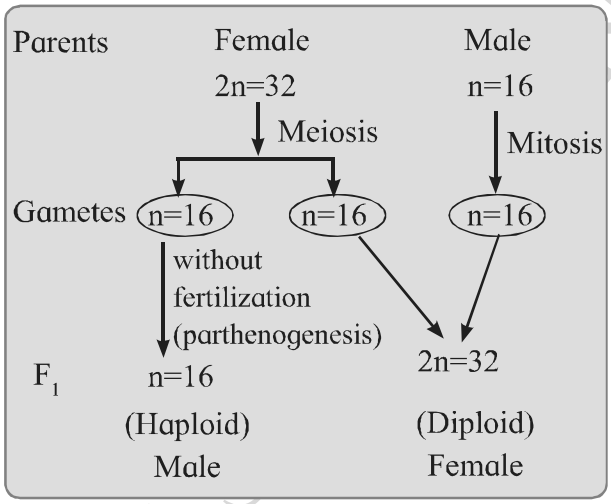
SHIKSHA CLASSES, BHANDARA

This indicates that the sex of a child depends on the type of sperm fertilizing the egg and hence the father is responsible for determination of sex of child and not the mother. Due to lack of knowledge, women are often blamed for giving birth to female child.

b) Sex Determination in honey bees :

In honey bees, chromosomal mechanism of sex determination is haplo-diploid type. In this type, sex of individual is determined by the number of set of chromosomes received. Females are diploid (2n =32) and males are haploid (n =16). The female produces haploid eggs (n =16) by meiosis and male produces haploid sperms (n =16) by mitosis. If the egg is fertilized by sperm, the zygote develops into a diploid female (2n =32) (queen and worker) and unfertilised egg develops into haploid male (n =16) (Drone) by way of parthenogenesis.

The diploid female gets differentiated into either worker or queen depending on the food they consume during their development. Diploid larvae which get royal jelly as food develops into queen (fertile female) and other develops into workers (sterile females).



Sex determination in honey bee

* * *

SHIKSHA CLASSES, NANDARA

BECOME AN ACE IN JEE & NEET

SHIKSHA CLASSES

Believe & Achieve

JEE | NEET | Previse (8-10)

8625055707 | 8623085707 shikshaclasses.co.in

M-19, MHADA Colony, Khat Road, Bhandara

Learn with Jaiswal sir