NEET- 2020- 45 Days Crash Course

Date :19th August 2020

Chapter Name : PRINCIPLES OF INHERITANCE

QUIZ

1

If a homozygous tall plant is crossed with homozygous dwarf plant, the offsprings will be

(A) All tall plants

(B) All dwarf plants

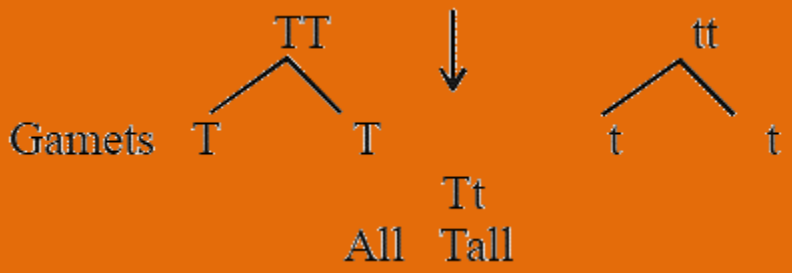
(C) Half tall plants

(D) Half dwarf plants

Solution

Ans [A]

Homozygous Tall × Homozygous dwarf



2

XO chromosomal abnormality in humans causes

(A) Turner's syndrome

(B) Down's syndrome

(C) Patau's syndrome

(D) Klinefelter's syndrome

Solution

Ans [A]

XO chromosomal abnormality in humans is due to monosomy of sex chromosome. Their total number of chromosomes are 45. This condition is found in Turner's syndrome.

3

Polygenic genes show

(A) Similar genotype

(B) Different phenotype

(C) Different karyotype

(D) Different genotype

Solution

Ans [B]

A group of genes that govern the same trait are collectively referred to as polygenic genes and the trait is called as a polygenic trait. A polygenic trait is governed by more than one gene where dominant allele of each gene express only a part of trait and the full trait is expressed only in presence of dominant alleles of all multiple genes. Therefore, depending on the genotype these genes exhibit multiple phenotypes.

4

Which disease has XXY chromosome constitution?

(A) Down's syndrome

(B) Turner's syndrome

(C) Klinefelter's syndrome

(D) None

Solution

Ans [C]

Down's syndrome is due to trisomy of 21st chromosome; Turner's syndrome having XO genotype is caused by the absence of X chromosome in females; klinefelter's syndrome (XXY) is due to trisomy of sex chromosome.

6

Discontinuous variations are

(A) Essential features

(B) Acquired characters

(C) Non-essential changes

(D) Mutations

Solution

Ans [D]

Discontinuous variations are where individuals fall into a number of distinct classes or categories and are based on features that cannot be measured across a complete range. You either have the characteristic or you don't.

Discontinuous variation is controlled by alleles of a single gene or a small number of genes. As variations caused by mutations affect DNA in such a way that either organism has a certain characteristic resulting from mutation or not, it is an example of discontinuous variations.

7

Mirabilis jalapa shows

(A) Codominance

(B) Incomplete dominance

(C) Dominance

(D) Complementary genes

Solution

Ans [B]

Mirabilis jalapa (4O' clock plant) shows incomplete dominance because the genes for red and white colour do not mix in the F_1 pink hybrids as both the pure characters reappear in the F_2 plants.

8

Frame shift mutation occurs when

(A) Base is added

(B) Base is deleted

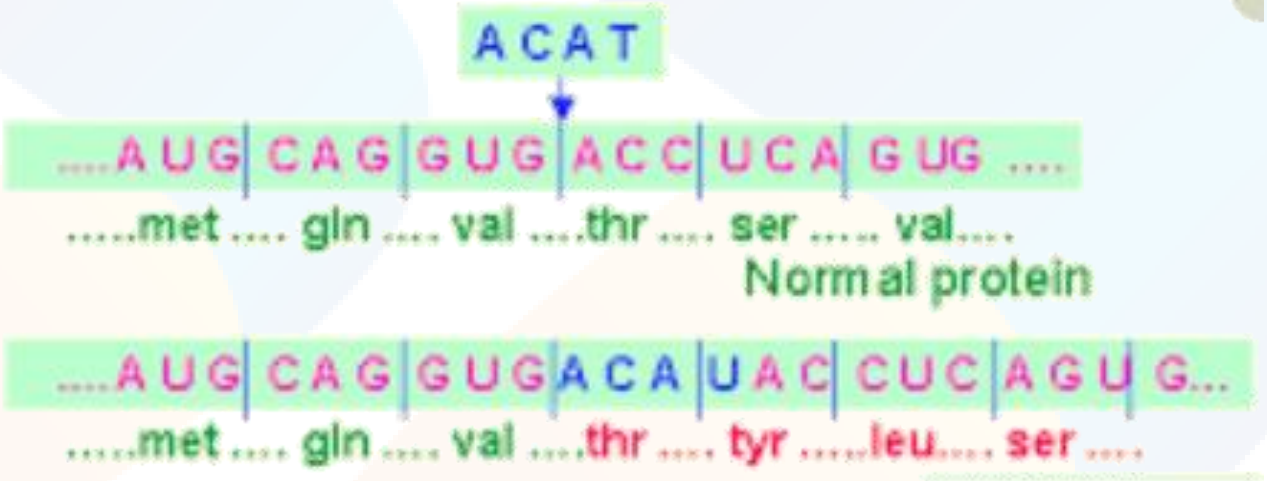
(C) Base is added or deleted

(D) None of the above

Solution

Ans [C]

A **frameshift mutation** is a mutation caused by an insertion or deletion, which causes a shift in the translational reading frame.



9

Pure line breed refers to

(A) Homozygosity

(B) Heterozygosity

(C) Linkage

(D) Both b & c

Solution

Ans [A]

Pure line breed refers to a group of identical individuals that always produce offspring of the same phenotype when intercrossed. This occurs only when they are homozygous.

10

If a homozygous red flowered plant is crossed with a homozygous white flowered plant, the offsprings would be

(A) All red flowered

(B) Half red flowered

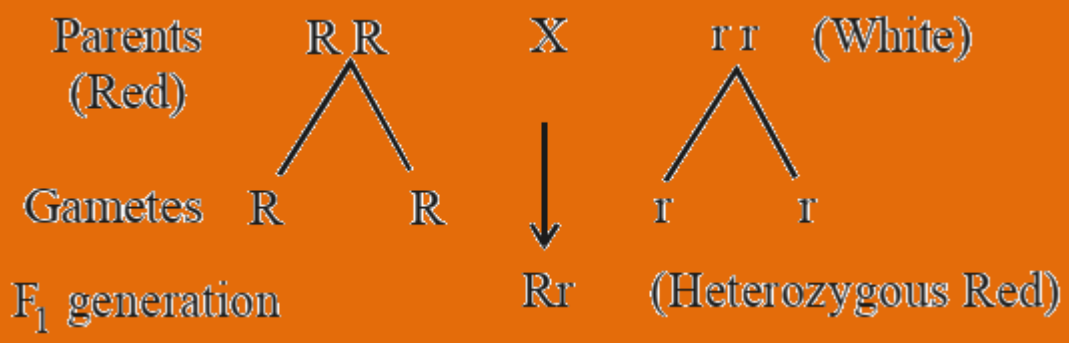
(C) Half white flowered

(D) All white flowered

Solution

Ans [A]

As per Mendel's law in F_1 generation only dominant phenotypes appear.



11

Genes of which one of the following is present exclusively on the X-chromosome in humans?

(A) Baldness

(B) Red-green colour blindness

(C) Facial hair/moustaches in males

(D) Night blindness

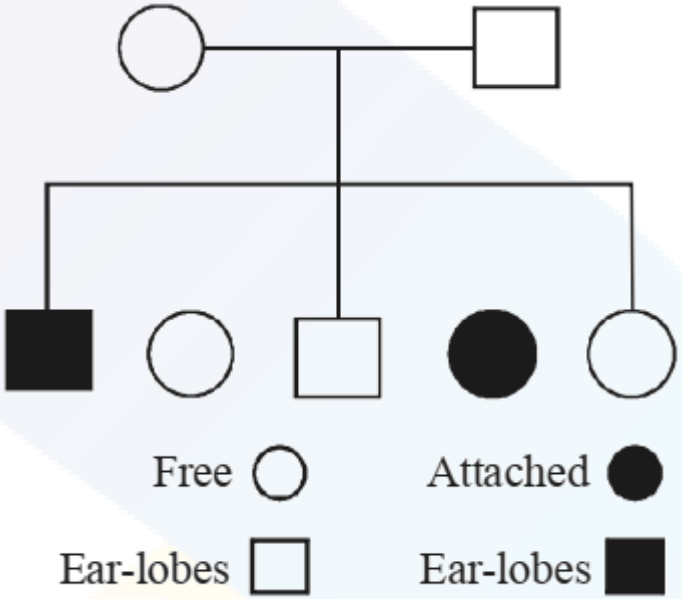
Solution

Ans [B]

Red and green colour blindness is a sex linked inheritance. Its genes are present on X-chromosome.

12

Given below is a pedigree chart of a family with five children. It shows the inheritance of attached earlobes as opposed to the free ones. The squares represent the male individuals and circles the female individuals. Which one of the following conclusions drawn is correct?



(A) The parents are homozygous recessive.

(B) The trait is Y-linked.

(C) The parents are homozygous dominant.

(D) The parents are heterozygous.

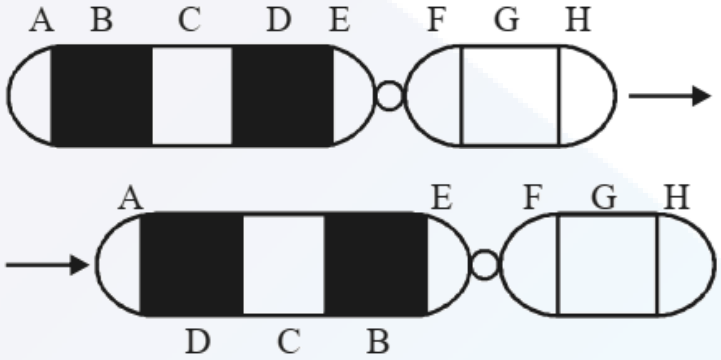
Solution

Ans [D]

As is visible trait skips generations; the unaffected parents have diseased progeny which means that the trait is present in recessive condition in parents. Thus, parents are heterozygous for the recessive trait and serve as carrier for it; option B is correct. If it was a dominant trait; the parents would have expressed it. If parents were homozygous dominant, the trait would express in parents also; but parents are not showing the trait which makes option A incorrect. If the parents were homozygous recessive; the trait would express due to absence of dominant gene, option C incorrect. An almost equal number of affected males and females occur which means that trait is not dependent of sex of individual; it is an autosomal trait which makes option D wrong. Correct answer is B.

13

Given below is a representation of a kind of chromosomal mutation. What is the kind of mutation represented?



(A) Deletion

(B) Duplication

(C) Inversion

(D) Reciprocal translocation

Solution

Ans [C]

The kind of mutation is paracentric inversion. In this a segment of a chromosome separates and rejoins in an inverted position.

14

How many different types of gametes can be formed by F_1 progeny, resulting from the following cross Tt × Rr?

(A) 4

(B) 8

(C) 27

(D) 64

Solution

Ans [A]

F_1 generation is always heterozygous, e.g. TtRr, so there are 4 types of gamete formation i.e. TR, Tr, tR, tr.

15

Primary source of allelic variation is

(A) Independent assortment

(B) Recombination

(C) Mutation

(D) Polyploidy

Solution

Ans [B]

Primary source of allelic variation is recombination. Recombination is the natural process of breaking and rejoining DNA strands to produce new combinations of genes and, thus, generate genetic variation. This is the phenomenon that occurs during meiosis I.

16

The "Cri-du-Chat" syndrome is caused by change in chromosome structure involving

(A) Deletion

(B) Duplication

(C) Inversion

(D) Translocation

Solution

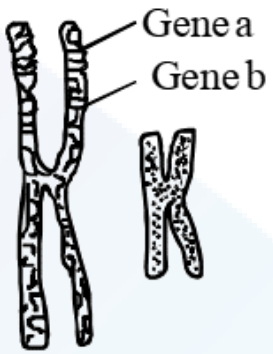
Ans [A]

Cri du chat syndrome is caused by a missing piece (deletion) of the short (p) arm of **chromosome** 5. This **chromosomal change** is written as 5p-. The size and location of the deletion varies among affected individuals but studies suggest that larger deletions tend to result in more severe symptoms than smaller deletions.

17

Given below is a highly simplified representation of the human sex chromosomes from a karyotype.

The genes a and b could be of



(A) Colour blindness and body height

(B) Attached ear lobe and rhesus blood group

(C) Haemophilia and red-green colour blindness

(D) Phenylketonuria and haemophilia

Solution

Ans [C]

Haemophilia and red-green colour blindness both are sex linked recessive gene on X chromosome. Body height is an example of polygenic inheritance.

Rhesus blood group is a base on the presence or absence of Rh-protein on the surface of the RBC

Phenyketonria is a recessive autosomal variation

18

In India, we find mangoes with different flavours, colours, fibre content, sugar content and even shelf-life. The large variation is on account of

(A) Species diversity

(B) Induced mutations

(C) Genetic diversity

(D) Hybridization

Solution

Ans [C]

Genetic diversity represents the total number of genetic characteristics in the genetic makeup of a species. Whereas, the genetic variability describes the tendency of genetic characteristics to vary. This diversity lets the population adapt to changing environments. For example, In India, we find mangoes with different flavors, colors, fiber content, sugar content and shelf life. The great variation is due to the genetic diversity.

19

Which one of the following pairs of features is a good example of polygenic inheritance?

(A) Human height and skin colour.

(B) ABO blood group in humans and flower colour of Mirabilis jalapa.

(C) Hair pigment of mouse and tonque rolling in humans.

(D) Human eye colour and sickle cell anaemia.

Solution

Ans [A]

Polygenic inheritance is the trait under the control of more than one pair of genes, e.g. skin colour (trigenic) and human height.

20

Gene which suppresses other gene's activity but does not lie on the same locus is called as

(A) Epistatic

(B) Supplementary

(C) Hypostatic

(D) Codominant

Solution

Ans [A]

When one gene masks the effect or activity of another gene which does not lie on the same locus, it is called epistasis. Epistasis refers to non- allelic interactions. Like coat colour in mice is controlled by epistatic gene.

21

XO-chromosomal abnormality in human beings causes

(A) Turner's syndrome

(B) Down's syndrome

(C) Klinefelter's syndrome

(D) None of the above

Solution

Ans [A]

Turner's syndrome is caused due to the missing X chromosome. The genotype is therefore XO instead of the normal XX and the sufferer person possesses 45 chromosomes instead of 46. Patients with this condition can best be described as incompletely developed females, although there are often no obvious external differences compared with normal females. Affected females lack ovaries so they are infertile.

22

A normal woman whose father was colour blind, is married to a normal man. The sons would be

(A) 75% colour blind

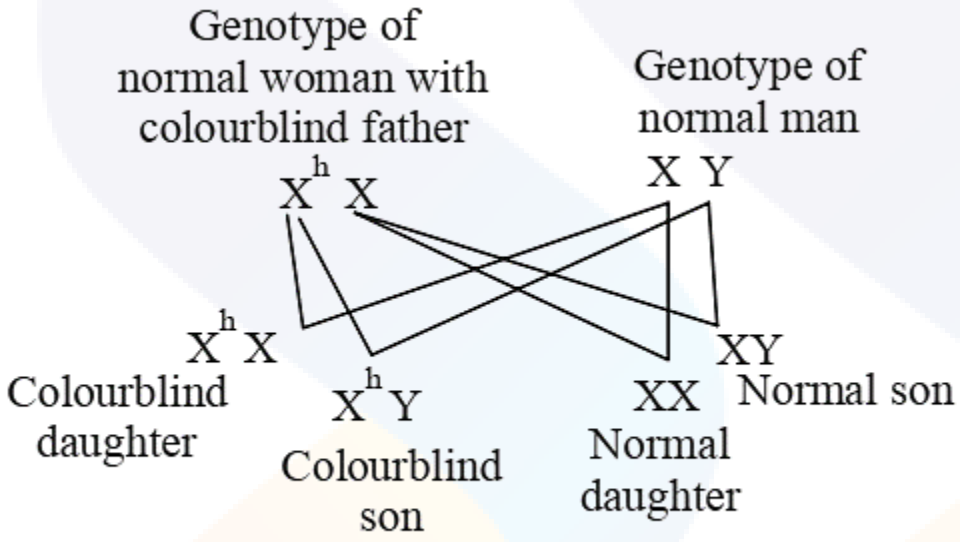
(B) 50% colour blind

(C) All normal

(D) All colour blind

Solution

Ans [B]



$\therefore$ 50% son would be colourblind.

23

Mating of an organism to a double recessive in order to determine whether it is homozygous or heterozygous for a character under consideration is called

(A) Reciprocal cross

(B) Test cross

(C) Dihybrid cross

(D) Back cross

Solution

Ans [B]

In genetics, a test cross, first introduced by Mendel, is used to determine if an individual exhibiting a dominant trait is homozygous or heterozygous for that trait. Test crosses involve breeding the individual in question with another individual that expresses a recessive version of the same trait. If all offspring display the dominant phenotype, the individual in question is homozygous dominant; if the offspring display both dominant and recessive phenotypes, then the individual is heterozygous. In some sources, the “test cross” is defined as being a type of back cross between the recessive homozygote and F_1 generation.

24

Bird females have chromosome arrangement as

(A) XY

(B) XO

(C) WZ

(D) WW

Solution

Ans [C]

In birds sex is determined by morphologically dissimilar pair of chromosomes called sex chromosomes. Z and W are two sex chromosomes of birds. A male bird has ZZ (homogenetic sex) arrangement while a female bird has ZW (heterogenetic sex) arrangement of chromosomes. Number of chromosomes in birds is 69.

25

Gene pool is referred to

(A) The genetic drift caused in a population

(B) Aggregate of all genes and their alleles in a population.

(C) Deletion of non essential genes

(D) Induce cell division

Solution

Ans [B]

Gene pool is the sum total of genes and their alleles in the reproductive gametes of a population. The gene pool is transferred from one generation to the other using gametes from genetic pool. These gametes will form zygotes of next generation. Gene pool of a population will consist of a large number of genes which vary in their frequencies.

26

Mother and father both have blood group 'A'. They have two children one with blood group 'O' and second one with blood group 'A'. They have

(A) Mother has homozygotic gene father has heterozygote $I'^{A}I^{A}$

(B) Both are homozygotic ($I^{A}I^{A}$).

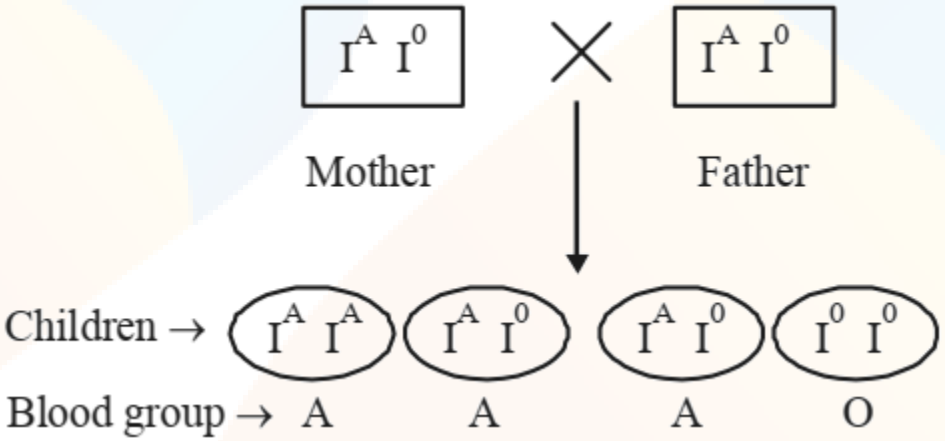
(C) Mother is heterozygotic ($I^{A}i$) and father is homozygotic ($I^{A}I^{A}$).

(D) Both are heterozygotic ($I^{A}i$).

Solution

Ans [D]

In the mentioned case, one child with blood group ‘O’ and second with blood group ‘A’ are born to parents with heterozygous condition of genes for blood group A . i.e., I^AI^0. Both mother and father have blood group A but their genotypes indicate heterozygotic condition.



27

When one gene controls two or more different characters simultaneously, the phenomenon is called

(A) Apomixis

(B) Pleiotropy

(C) Polyploidy

(D) Polyteny

Solution

Ans [B]

Pleiotropy is the condition in which a single gene influences more than one trait.
Polyploidy is a condition in which individuals have more than two complete sets of chromosomes.
Apomixis is a reproductive process in plants that superficially resembles normal sexual reproduction but there is no fusion of gametes.

28

If both parents are carriers for thalassemia, which is an autosomal recessive disorder, what are the chances of pregnancy resulting in an affected child?

(A) 50%

(B) 25%

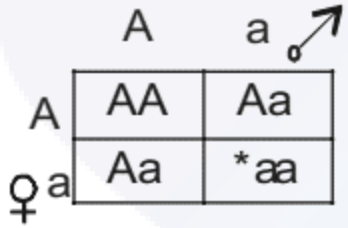
(C) 100%

(D) No chance

Solution

Ans [B]

Genotype of carrier parents is – Aa (male parent) × Aa (female parent)



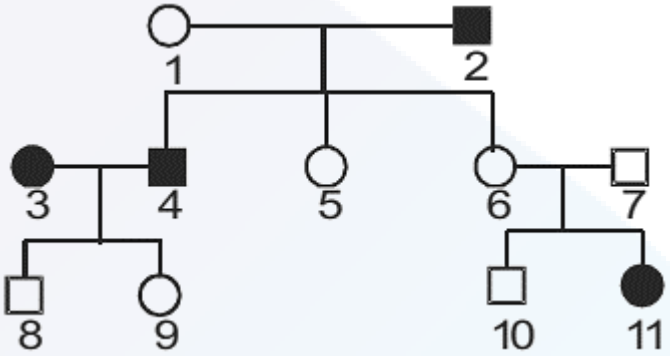
AA= normal child (25%)

Aa = carriers child (50%)

aa = affected child (25%)

29

In Huntington's disease, the unaffected persons are homozygous for normal allele h. The following is erroneous because



(A) It shows both male and female affected by Huntingtons disease

(B) Either person 6 or 7 should have the disease, if individual 11 shows the disease.

(C) At least one of the 2 children (8, 9) should have the disease

(D) All of these

Solution

Ans [B]

Since the offspring number 11 is affected (diseased) either of the two parents 6 or 7 have to be affected.

30

These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

Assertion : The genetic complement of an organism is called genotype.

Reason : Genotype is the type of hereditary properties of an organism.

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If the Assertion is incorrect but the Reason is correct

Solution

Ans [A]

Genes are composed of a sequence of nucleotides in a DNA molecule. Alternate forms of a particular gene are called alleles. Genotype is the collection of all genes that occur in an individual. Only genes i.e., genotypes inherit from parents to offsprings.

31

These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

Assertion : Phenylketonuria is a recessive hereditary disease caused by body's failure to oxidize an amino acid phenylalanine to tyrosine, because of a defective enzyme.

Reason : It results in the presence of phenylalanine acid in urine.

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If the Assertion is incorrect but the Reason is correct

Solution

Ans [B]

Phenylketonuria results when there is a deficiency of liver enzyme phenyl alanine hydroxylase that converts phenyl alanine into tyrosine.

It results with a high level of phenyl alanine in blood, tissue fluids and urine.

So, the correct answer is 'If both the assertion and reason are true but the reason is not a correct explanation of the assertion'

32

These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

Assertion : In humans, the gamete contributed by the male determines whether the child produced will be male or female.

Reason : Sex in humans is a polygenic trait depending upon a cumulative effect of some genes on X-chromosome and some on Y-chromosome.

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If the Assertion is incorrect but the Reason is correct

Solution

Ans [C]

Human females have XX chromosomes and males have XY chromosomes. The sperm may contain either X or Y chromosome. The sperm is the factor in deciding the sex of the child. If the sperm carries an X chromosome, it will fuse with the egg's X chromosome to form a female. If the sperm carries a Y chromosome, it will result in a male child. Polygenic traits are the genes which interact to have an effect on the same character. There is no such interaction between the genes on the X and Y chromosome. The presence of the chromosome decides the sex of the child.

Barr-body in mammals represents

(A) One of the two X chromosomes in somatic cells of females.

(B) All heterochromatin of male & female cells.

(C) Y chromosomes of male.

(D) All heterochromatin of female cells.

Solution

Ans [A]

Barr body is the inactive one X-chromosome in somatic cells of female (Dosage compensation). The number of Barr bodies are always one less than the total number of X-chromosome.

A Barr body is an inactive X chromosome in the female somatic cell due to the process called lyonization. The Lyon hypothesis states that, in the cell with multiple X chromosomes, all but one are inactivated during mammal embryogenesis. Thus Barr bodies are seen in the female having XX chromosome. It is also seen in chromosomal defects like Klinefelter syndrome having XXY.

33

These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

Assertion : Haemophilia is a recessive sex linked disease.

Reason : Haemophilia occurs due to mutation of a structural gene on chromosome 15.

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If the Assertion is incorrect but the Reason is correct

Solution

Ans [C]

Haemophilia also known as bleeder disease is an example of recessive sex linked inheritance in human beings. It is masked in heterozygous condition. The person suffering from this disease lack factors VIII and IX responsible for blood clotting. A small cut may lead to bleeding till death. Men are affected by this disease while women are the carriers.

Mutation of a structural gene on chromosome number 15 causes Marfan syndrome. This disease results in formation of abnormal form of connective tissues and characteristic extreme loosseness of joints.

34

Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

Assertion : Persons suffering from haemophilia fail to produce blood clotting factor VIII.

Reason : Prothrombin producing platelets in such persons are found in very low concentration.

(A) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(B) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(C) If Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

Solution

Ans [C]

Haemophilia bleeding disorder is a group of hereditary genetic disorders that impair the body's ability to control blood clotting or coagulation. In its most common form, Hemophilia A, clotting factor VIII is absent. In Haemophilia B, factor IX is deficient. Factor VIII participates in blood coagulation; it is a cofactor for factor IXa which, in the presence of Ca^{+2} and phospholipids forms a complex that converts factor X to the activated form Xa. Defects in this gene results in hemophilia A, a common recessive X-linked

coagulation disorder. Prothrombin producing platelets in such persons are not found in very low concentration.

35

Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

Assertion : In case of incomplete linkage, linked gene show new combination along with parental combination.

Reason : In case of incomplete linkage, linked genes are separated by crossing over.

(A) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(B) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(C) If Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

Solution

Ans [A]

In case of incomplete linkage, the linked gene shows new combination along with parental combination due to crossing over between chromatids.

36

Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

Assertion: Aneuploidy may be of hypoploidy or hyperploidy type.

Reason: Monosomy lacks one pair of chromosomes.

(A) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(B) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(C) If Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

Solution

Ans [C]

Aneuploidy can be either due to loss of one or more chromosomes (hypoploidy) or due to addition of one or more chromosomes to complete chromosome complement (hyperploidy). Hypopliody is mainly due to loss of a single chromosomes, monosomes (2n – 1) or due to loss of one pair of chromosomes, nullisomes (2n – 2).

37

Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

Assertion : Cross of F_1 individual with recessive homozygous parent is test cross.

Reason : No recessive individual are obtained in the monohybrid test cross.

(A) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(B) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(C) If Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

Solution

Ans [C]

In the monohybrid test-cross both dominant and recessive traits are obtained in 1 : 1 ratio.

38

Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

Assertion : In Mirabilis, selfing of F_1 pink flower plants produces same phenotypic & genotypic ratio.

Reason : Flower colour gene shows incomplete dominance.

(A) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(B) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(C) If Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

Solution

Ans [A]

F_2 phenotypic and genotypic ratio in monohybrid cross involving incomplete dominance is

1	:	2	:	1
RR		Rr		rr
(red)		(pink)		(white)

39

The formation of multivalents at meiosis in diploid organism is due to

(A) Monosomy

(B) Deletion

(C) Inversion

(D) Reciprocal translocation

Solution

Ans [D]

Translocation is the separation of a chromosome segment and its union to a non homologous chromosome. In reciprocal translocation 2 non-homologous chromosomes exchange segments among themselves. Reciprocal translocation produces multivalents

40

Grain colour in wheat is determined by three pairs of polygene. Following the cross AABBCC (dark colour) × aabbcc (light colour), in F_2 generation what proportion of the progeny is likely to resemble either parent?

(A) Half

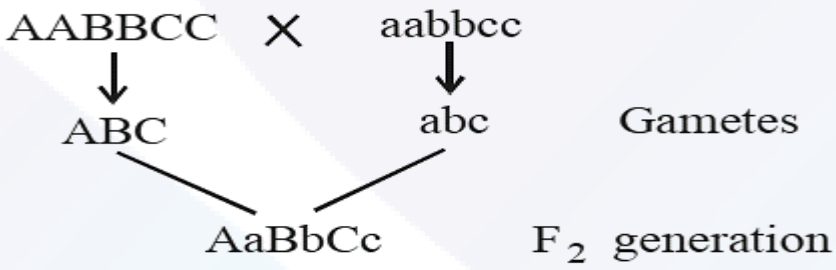
(B) Less than 5 percent

(C) One third

(D) None of these

Solution

Ans [B]

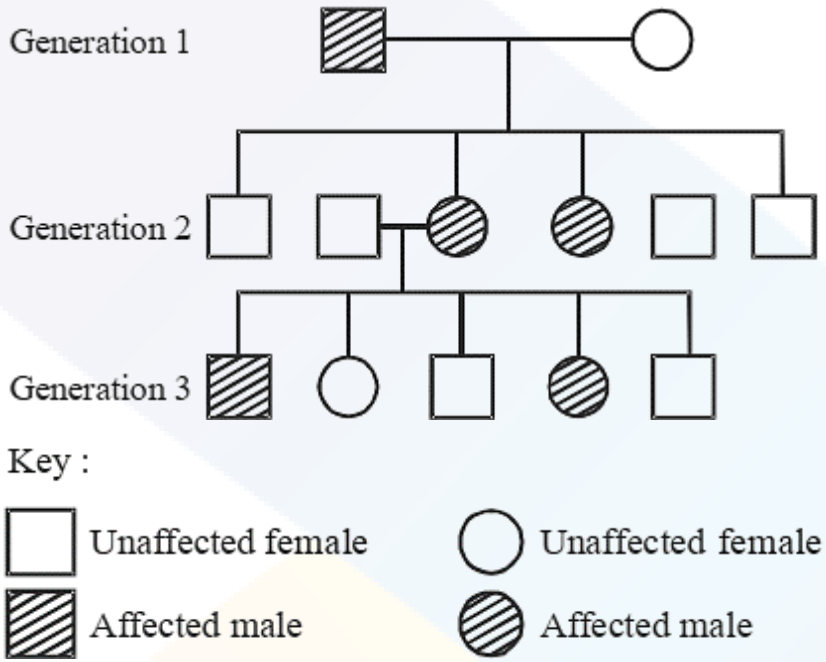


The F_2 generation will show the intermediate colour because of quantitative inheritence. In case of crossing between AA BB CC (dark colour) and aa bb cc (light colour), in F_2 generation seven phenotypes will be obtained with ratio 1 : 6 : 15 : 20 : 15 : 6 : 1. The total number of progeny is 64, out of which only two will be likely resemble with either parents. Hence, their percentage in F2 generation would be 3.12 i.e less than 5%.

41

Given below is a pedigree chart showing the inheritance of a certain sex-linked trait in humans.

The trait traced in the above pedigree chart is



(A) Dominant x-linked

(B) Recessive x-linked

(C) Dominant y-linked

(D) Recessive y-linked

Solution

Ans [A]

According to the pedigree, father is diseased and mother is normal in the first parent generation. All the daughters of first filial are diseased while sons are normal which means that daughters have inherited the disease from the diseased father; the trait is sex linked. If it would have been an autosomal trait, the father would have transmitted the disease to the sons also. Further, since the daughters are diseased, not the sons; the trait is X-linked, not Y-linked. This is due to the fact that fathers transmit their X-chromosome daughters. As shown the mother of first parent generation is normal, hence the daughter must have inherited only one copy of affected allele from father. This means that the trait is expressed in heterozygous condition in the daughters of first filial generation, thus the trait is dominant. The mother of second parent generation is heterozygous dominant while father is normal. The 1/3 sons and 1/2 daughters are diseased in second filial generation.

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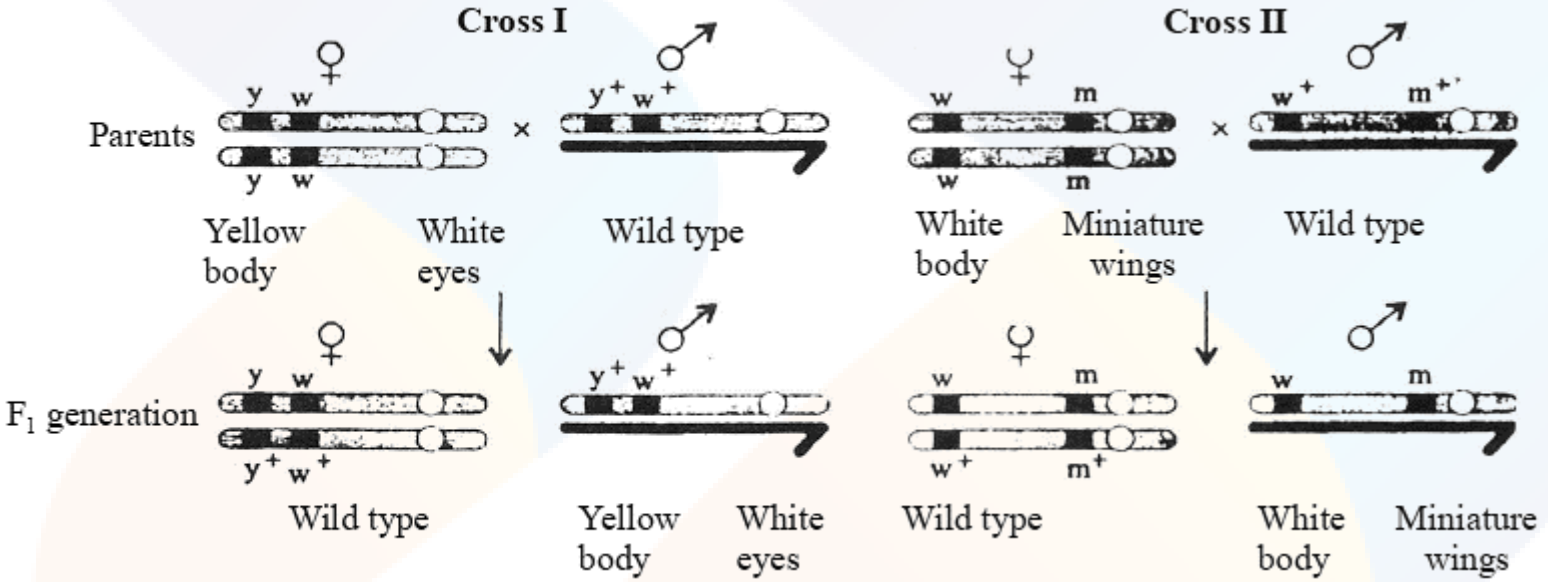
The experiment shown in the given figure has been carried out by Morgan to show the phenomenon of linkage and recombination. If in cross I, genes are tightly linked and in cross II, genes are loosely linked then what will be the percentage of recombinants produced in cross I and cross II respectively?



(A) 98.7% and 62.8%

(B) 1.3% and 37.2%

(C) 37.2 and 1.3%

(D) 62.8% and 98.7%

Solution

Ans [B]

The percentage of recombinants produced in cross I and cross II are respectively 1.3% and 37.2%.