

6

**(a)**

In the given pedigree chart only males are affected. So, it can be easily inferred that the given trait is connected to Y-chromosome. The genes, which are present on the Y-chromosome are called holoandric genes

7

**(a)**

In the gametogenesis meiosis occur. The diploid chromosome become haploid, so the probability of side is sperm lacking one recessive autosomal allele and holandric gene is half

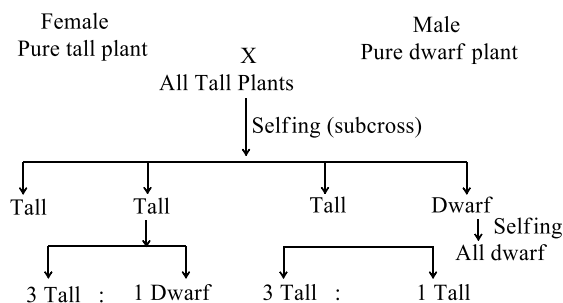
8

**(b)**

F<sub>3</sub>-generation obtained by selfing of F<sub>2</sub>-generation.

Mendel cross-pollinated a pure tall pea plant (100-120 cm high) and a pure dwarf pea plant. (only 22 to 44 cm high). He called them parental generation, expressed now-a-days by symbol P.

This hybridization popularly called as monohybrid cross



This three generations of pea plants after crossing a pure tall plant with a dwarf one. The plants of F<sub>1</sub>-generation are all tall, of F<sub>2</sub>-generation three tall and one dwarf. One third of the tall plants are pure, while the remaining behave as hybrids

**F<sub>1</sub>-generation** Seeds collected from the parental generation called first filial generation or F<sub>1</sub>-generation

**F<sub>2</sub>-generation** F<sub>1</sub>-plants pollinated among them self (self breeding or inbreeding) and seed produced by F<sub>1</sub>-plants called F<sub>2</sub>-generation. They were in ratio 3:1 (three tall and one dwarf).

**F<sub>3</sub>-generation** Mendel allowed F<sub>2</sub>-plant to form seed by self-pollination called F<sub>3</sub>-generation. Mendel observed that tall and dwarf plant behave differently

(i) Dwarf plant produced dwarf plant on self-pollinated

(ii) In tall plants one third plants breed true so they were pure

(iii) Other two third plant behave like parents and give tall to dwarf plants 3 : 1 indicate that their parents have dwarf genes also

9 **(d)**

**W Bateson and R C Punnett** observed complementary gene interaction for flower colour in sweet pea (*Lathyrus odoratus*). In complementary interaction, two separate pairs of genes interact to produce the phenotype in such a way that neither of the dominant genes is expressive unless the other one is present. In F<sub>2</sub> generation, complementary genes produce a ratio of 9 : 7.

10 **(a)**

Occasionally a single gene product may produce more than one effect. For example starch synthesis in pea seeds is controlled by one gene. It has two allele (B and b). Starch is synthesized effectively by BB and have bigger grains. In contrast bb homozygous have lesser efficiency in starch synthesis and produce smaller grains

11 **(c)**

In *Drosophila*, sex is determined by the ratio number of X-chromosomes to the set of autosomes.

12 **(c)**

The genotypic and phenotypic ratio of **1 : 2 : 1** with **red, pink** and **white** flowers are produced in *Mirabilis jalapa*, when red flowered plants (RR) are crossed with white flowered (rr). It occurs due to allelic gene interactions, called, **incomplete dominance**. In which, both of the allelomorphic genes will have partial or incomplete dominance and F<sub>1</sub>-hybrid will show mixture of characters of two parents.

13 **(a)**

**Meiosis** is an important stage in sexual reproduction. During meiosis, genetic recombination occurs as a result of crossing over.

14 **(d)**

Blood group of children may be A, B, AB and O.

15 **(d)**

The genes, which are present very far from each other tend to get unlinked and they are the most chances for crossing over

16 **(a)**

Given diagram depicts the sex linked inheritance in given options haemophilia is the sex-linked character

17 **(b)**

Incomplete dominance or blending inheritance is the phenomenon, in which the two genes of allelomorphic pair are not related as dominant or recessive but each of them expresses itself partially, thus the  $F_1$  hybrids exhibit a mixture or blending of characters of both the parents. In  $F_2$  generation, the phenotypic ratio obtained is 1 : 2 : 1.

18 **(c)**

Haemophilia is a disease, which is caused due to lack of blood clotting factor. It appears only in human male which can be transferred to their grandson through his carrier daughter.

19 **(a)**

In the given option only codominance does not obey Mendel's laws.

The phenomenon of expression of both the alleles in heterozygote is called codominance.

As the result the phenotype is different from both homozygous genotype.

#### Examples

1. Blood group is the good example codominance
2. ABO blood groups are controlled by gene I. The gene (I) has three allele  $I^A, I^B, i$ ,  $I^A, I^B$  produce slightly different form of sugar while  $i$  does not produce any kind of sugar.
3.  $I^A, I^B$  are dominant alleles where as  $i$  is recessive alleles
4. Since, there are three different allele, there are six different combination of these three alleles are possible and four phenotypes (A, B, AB and O)

#### Genetic Basis of Blood Groups in Human Population

Allele from Parent 1	Allele from Parent 2	Genotype of Offspring	Blood Types of Offspring
$I^A$	$I^A$	$I^A I^A$	A
$I^A$	$I^B$	$I^A I^B$	AB
$I^A$	$i$	$I^A i$	A
$I^B$	$I^A$	$I^A I^B$	AB
$I^B$	$I^B$	$I^B I^B$	B
$I^B$	$i$	$I^B i$	B
$i$	$i$	$ii$	O

When  $I^A$  and  $I^B$  are present together they both express their own types of sugars this is because of co-dominance. ABO blood grouping also provides a good example of multiple alleles.

Here, you can see that there are more than two, *i.e.*, three alleles governing the same character. Since, in an individual only two alleles can be present multiple alleles can be found only when population studies care made. Dominance is not an autonomous features of a gene. It depends on much on the gene product

20 **(d)**

11th.

**Thalassaemia**

- (i) It is an autosome-linked recessive disease
- (ii) It occurs due to either mutation or deletion resulting in reduced rate of synthesis of one of globin chains of haemoglobin
- (iii) Anaemia is the characteristic of this disease
- (iv) Thalassaemia is classified into two types
- $\alpha$ -thalassaemia** Production of  $\alpha$ -globin chain is affected. It is controlled by the closely linked genes HBA1 and HBA2 on chromosome 16. It occurs due to mutation or deletion of one or more of the four genes.
  - $\beta$ -thalassaemia** Production of  $\beta$ -globin chain is affected. It occurs due to mutation of one or both HBB genes on chromosome 11

ANSWER-KEY										
<b>Q.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>A.</b>	<b>C</b>	<b>B</b>	<b>C</b>	<b>C</b>	<b>C</b>	<b>A</b>	<b>A</b>	<b>B</b>	<b>D</b>	<b>A</b>
<b>Q.</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
<b>A.</b>	<b>C</b>	<b>C</b>	<b>A</b>	<b>D</b>	<b>D</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>A</b>	<b>D</b>

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