

SELF ASSESSMENT TEST – ANSWERS

(Chapter 3 : Inheritance and variations)

SECTION – A

Q. 1. Multiple Choice Questions (MCQ) :

(1 mark each)

- (i) (a) 0%
- (ii) (a) 2:1
- (iii) (d) Telocentric- S-shaped
- (iv) (b) $2n + 1$

Q. 2. Very Short Answer Questions (VSA) :

(1 mark each)

- (i) Linkage is defined as the tendency of the genes to be inherited together because they are present in the same chromosome.
- (ii) When a character is controlled by two or more than two pairs of genes, the genes are called polygenes.

SECTION – B

Q. 3. Short Answer Questions (SA - I) :

(2 marks each)

- (i) (1) According to the law of segregation, the members of the allelic pair remain together without mixing with each other.
 - (2) They segregate or separate when the gametes are formed.
 - (3) Thus the gametes that are formed receive only one of the two factors.
 - (4) Now it is known that the organisms are diploid and the gametes produced by them are haploid.
 - (5) The law of segregation therefore is universally applicable.
- (ii) *Drosophila* is most suitable organism because of the following reasons :
 - (1) *Drosophila* can easily be cultured under laboratory conditions.
 - (2) Life span of *Drosophila* is short for about two weeks.
 - (3) *Drosophila* has high rate of reproduction and hence newer organisms can be obtained rapidly.

SECTION – C

Q. 4. Short Answer Questions (SA - II) :

(3 marks each)

- (i) (1) Turner's syndrome is a genetic disorder caused due to monosomy of X chromosome.
 - (2) It was first described by H. H. Turner.
 - (3) Turner's syndrome is caused due to nondisjunction of sex chromosomes which takes place during gamete formation.
 - (4) Chromosomal complement of Turner's syndrome is $44+ XO$, having a total of 45 chromosomes.
 - (5) Symptoms of Turner's syndrome are as follows : (i) Female phenotype. (ii) Short stature with webbing of neck. (iii) Low posterior hair line. (iv) Secondary sexual characters fail to develop. (v) Mental retardation.

(ii) Chromosomal theory of inheritance was put forth by Sutton and Boveri after studying parallel behaviour of genes and chromosomes during meiotic division. This theory states following points :

- (1) Chromosomal theory identifies chromosomes as the carrier of genetic material.
- (2) All the hereditary characters are transmitted by gametes. Nucleus of gametes, i.e. sperms and ova of the parents contain chromosomes which transmit the heredity to offspring.
- (3) Chromosomes are found in pairs in somatic or diploid cells.
- (4) During gamete formation, homologous chromosomes pair and segregate independently at meiosis. The diploid condition is converted into haploid condition. Thus each gamete contains only one chromosome of a pair.
- (5) During fertilization, the union of sperm and egg restores the diploid number of chromosomes.

SECTION – D

Q. 5. Long Answer Questions (LA) :

(4 marks)

- (1) A cross which involves two pairs of alleles is called a dihybrid cross. A phenotypic ratio of 9 : 3 : 3 : 1 obtained in the F_2 generation of a dihybrid cross is called a dihybrid ratio.
- (2) Thus for example, when we cross a true breeding pea plant bearing round and yellow seeds with a true breeding pea plant bearing wrinkled and green seeds we get pea plants bearing round and yellow seeds in the F_1 generation.
- (3) When F_1 plants are selfed, we get a ratio of 9 : 3 : 3 : 1 in the F_2 generation, where 9 plants bear yellow round seeds, 3 plants bear yellow wrinkled seeds, 3 plants bear green round seeds and 1 plant bears green wrinkled seeds.
- (4) **Parents (P_1) :** $RRYY \times rryy$

Gametes of P_1 RY and ry

F_1 generation : $RrYy$ (Yellow round)

On selfing F_1 : $RrYy \times RrYy$

Gametes of F_1 : RY, Ry, rY, ry

P_2 generation :

	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
Ry	RrYy	Rryy	rrYy	rryy

Round Yellow : 9 Round green : 3 Wrinkled yellow : 3 Wrinkled green : 1

Phenotypic ratio : 9 : 3 : 3 : 1

Genotypic ratio : 1 : 2 : 1 : 2 : 4 : 2 : 1 : 2 : 1