



## **BIOLOGY**

# **BOOKS - FULL MARKS BIOLOGY (TAMIL ENGLISH)**

## **CHROMOSOMAL BASIS OF INHERITANCE**

### **Textual Questions Solved**

**1. An allohexaploidy contains**

**A. Six different genomes**

B. Six copies of three different genomes

C. Two copies of three different genomes

D. Six copies of one genome

**Answer: B**



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2. The A and B genes are 10 cM apart on a chromosome. If an AB/ab heterozygote is test crossed to ab/ab, how many of each progeny class would you expect out of 100 total progeny?

A. 25 AB, 25 ab, 25 Ab, 25 aB

B. 10 AB , 10 ab

C. 45 AB , 45 ab

D. 45 AB, 45 ab, 5 Ab , 5aB

**Answer: B**



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### 3. Match list I with list II

#### List I

- A) A pair of chromosomes extra with diploid
- B) One chromosome extra to diploid
- C) One chromosome loses from diploid
- D) Two individual chromosomes lose from diploid

#### List II

- (i) Monosomy
- (ii) Tetrasomy
- (iii) Trisomy
- (iv) Double monosomy

A. A - i , B - iii , C - ii , D - iv

B. A - ii , B - iii , C - iv , D - i

C. A - ii , B - iii , C - i , D - iv

D. A - iii , B - ii , C - i , D - iv

**Answer: C**



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4. Which of the following sentences are correct?

1. The offspring exhibit only parental combinations due to incomplete linkage.

2. The linked genes exhibit some crossing over in complete linkage.

3. The separation of two linked genes are possible in

incomplete linkage.

4. Crossing over is absent in complete linkage.

A. 1 and 2

B. 2 and 3

C. 3 and 4

D. 1 and 4

**Answer: C**



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5. Accurate mapping of genes can be done by three point test cross because increases

- A. Possibility of single cross over
- B. Possibility of double cross over
- C. Possibility of multiple cross over
- D. Possibility of recombination frequency

**Answer: B**



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6. Due to incomplete linkage in maize, the ratio of parental and recombinants are

- A. 50 : 50

B. 7:1:1:17

C. 96.4:3.6

D. 1:7:7:1

**Answer: B**



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7. Genes G S L H are located on same chromosome.

The recombination percentage is between Land G is

15%, Sand Lis 50%, H and S are 20%. The correct

order of genes is

A. GHSL

B. SHGL

C. SGHL

D. HSLG

**Answer: B**



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8. The point mutation sequence for transition, transition, transversion and transversion in DNA are

A. A to T, T to A, C to G and G to C

B. A to G, C to T, C to G and T to A



C. C to G , A to G , To to A and G to A

D. G to C , A to T , T to A and C to G

**Answer: B**



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9. If haploid number in a cell is 18. The double monosomic and trisomic number will be

A. 35 and 37

B. 34 and 37

C. 37 and 35

D. 17 and 19

**Answer: B**



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**10.** Changing the codon AGC to AGA represents

- A. mis - sense mutation
- B. non - sense mutation
- C. frameshift mutation
- D. deletion mutation

**Answer: A**



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11. Assertion (A) : Gamma rays are generally use to induce mutation in wheat varieties.

Reason (R) : Because they carry lower energy to non-ionize electrons from atom

A. A is correct . R is correct explanation of A

B. A is correct . R is not correct explanation of A

C. A is correct . R is wrong explanation of A

D. A and R is wrong

**Answer: C**



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12. How many map units separate two alleles A and B if the recombination frequency is 0.09?

A. 900 cM

B. 90 cM

C. 9 cM

D. 0.9 cM

**Answer: D**



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13. When two different genes came from same parent they tend to remain together.

What is the name of this phenomenon?



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14. If you cross dominant genotype PV /PV male Drosophila with double recessive female and obtain  $F_1$  hybrid. Now you cross  $F_1$  male with double recessive female.

Draw the cross with correct genotype.



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	List - I	List - II	
i.	$p \vee p \equiv p, p \wedge p \equiv p$	a)	Identity law
ii.	$p \vee (q \vee r) = (p \vee p) \vee r$	b)	Idempotent law
iii.	$p \vee (q \vee r) = (p \wedge p) \vee (p \wedge r)$	c)	Associative law
iv.	$p \vee \Pi = \Pi$	d)	Distributive law

15.

The correct match is



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16. What is the difference between missense and nonsense mutation?



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**17. A B C C B D E F G H I**

From the above figure identify the type of mutation and explain it.



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**18. Write the salient features of Sutton and Boveri concept.**



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**19. Explain the mechanism of crossing over.**



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**20.** Write the steps involved in molecular mechanism of DNA recombination.

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**21.** How is Nicotiana exhibit self-incompatibility? Explain its mechanism.

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**22.** How sex is determined in monoecious plants ?

Write their genes involved in it.



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**23.** What is gene mapping? Write its uses.



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**24.** Draw the diagram of different types of aneuploidy.



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25. Mention the name of man-made cereal. How it is developed?



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## Additional Questions 1 Mark Questions

1. Name the scientist(s) who rediscovered the Mendelian work ?

(i) Hugo de Vries (ii) Carl Correns (iii) Tschermak (iv)

T.H. Morgan

A. a) i and iv

B. b) i, ii and iv

C. c) i,ii and iii

D. d) ii, iii and iv

**Answer: C**



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2. Which is not a feature of the chromosomal theory of inheritance ?

A. Somatic cells of organisms are derived from zygote by repeated meiosis.

B. Chromosomes retain their structural uniqueness throughout the life of an organism.

C. Mendelian factors are located in chromosomes

D. Sutton and Boveri independently proposed the theory.

**Answer: A**



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**3.** The following sequence represents the location of genes in a chromosome . A - B - C - M - R - S - Y - Z .

Which of the gene pairs will have least chance of getting inherited together ?

A. A and M

B. S and Y

C. M and Z

D. A and Y

**Answer: D**



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4. Match the column I with column II :

Column I

Column II

- |                    |                                   |
|--------------------|-----------------------------------|
| (1) T.H. Morgan    | (i) Sex determination in plants   |
| (2) C.E. Allen     | (ii) Rediscovery of Mendel's work |
| (3) Hugo de varies | (iii) Sex linkage in Drosophila   |
| (4) Tschermak      | (iv) Mutation theory              |

A. a) 1 - iii, 2 - i, 3 - iv , 4 - ii

B. b) 1 - ii, 2 - i, 3 - iv , 4 - iii

C. c) 1 - iv, 2 - iii, 3 - ii , 4 - i

D. d) 1 - ii, 2 - iii, 3 - i , 4 - iv

**Answer: A**



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5. Number of chromosomes ( $2n$ ) in *Ophioglossum* is.....

A. 1126

B. 1622

C. 1262

D. 2126

**Answer: C**



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6. Identify the syntenic gene from given sequence of a chromosome

G - H - I - J - K - L - M - A - B

A. G and H

B. J, K and L

C. G and B

D. A and B

**Answer: C**



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7. Incomplete linkage was reported by Hutcinson in

.....

A. Drosophila

B. Maize

C. Neurospora

D. Lathyrus odorantus

**Answer: B**



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8. Mechanism of crossing over involves the following stages . Select the correct sequence .

A. Tetrad stage → Synapsis → Bivalent stage  
→ cross over

B. Synapsis → Tetrad → Crossing over →  
Terminalisation

C. Terminalisation → Tetrad → Bivalent →  
Cross over

D. Cross over → Bivalent → Tetrad →  
Terminalisation

**Answer: B**



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9. The locations at which crossing over occurs are known as.....

A. Sister chromatids of non - homologous chromosomes

B. Non - sister chromatids of non - homologous chromosomes

C. Non - sister chromatids of homologous chromosomes

D. Sister chromatids of homologous chromosomes

**Answer: C**

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**10.** The term crossing over was coined by

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**11.** During which stage of meiosis does crossing over take place ?

- A. Leptotene of prophase I
- B. Zygotene stage of prophase I
- C. Diplotene stage of prophase I
- D. Pachytene stage of prophase I

**Answer: D**



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**12.** Which of the following statement (s) is/are wrong respect to Recombination process ?

(i) Mitotic crossing over occurs rarely in somatic cells

.

(ii) Syndesis refers to pairing of non - homologous chromosome.

(iii) Procentric synapsis starts from telomeres.

(iv) A Bivalent has four telomeres.

A. i and iv

B. ii and i

C. ii and iii

D. All the above

**Answer: C**



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13. Recombination frequency (RF) is equal to

A. a)  $\frac{\text{No. of offsprings}}{\text{No. of recombinants}} \times 100$

B. b)  $\frac{\text{No. of recombinants}}{\text{No. of parental strains}} \times 100$

C. c)  $\frac{\text{No. of recombinants}}{\text{No. of offsprings}} \times 100$

D. d)  $\frac{\text{No. of offsprings}}{\text{No. of parental strains}} \times 100$

**Answer: C**



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14. In a population of 250 progenies produced , only 120 resemble the parental forms. calculate the

recombinant frequency .

A. a) 66 %

B. b) 52 %

C. c) 59 %

D. d) 49 %

**Answer: B**



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15. Unit of distance in a genetic map \_\_\_\_



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16. The "  $2n$  " condition of *Carica papaya* is .....



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17. Mutation theory was proposed by .....

A. a) T.H . Morgan

B. b) Hugo de Vries

C. c) Alfred Sturtevant

D. d) Sutton and Boveri

**Answer: B**



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**18.** Identify the mutant variety of castor.

A. a) Sharbathi Sonoa variety

B. b) Aruna variety

C. c) Reimei variety

D. d) Erectiferm variety

**Answer: B**



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**19.** Which is a non - ionizing radiation ?

A. a) X - rays

B. b) Gamma rays

C. c) Alpha rays

D. d) UV rays

**Answer: D**



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**20.** Transition type of gene mutation is caused when

.....

A. a) AC is replaced by GT

B. b) AG is replaced by TC

C. c) AC is replaced by TG

D. d) TC is replaced by AG

**Answer: A**



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**21. Pick out the co - mutagen from the following :**

A. Eosin

B. Mustard gas

C. Ascorbic acid

D. Nitrous acid

**Answer: C**



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**22.** Sharbati sonora is a mutant got by using\_\_\_\_\_

A. Thermal neutrons

B. Gamma radiation

C. X - rays

D. UV radiations

**Answer: B**



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23. Which one of the following ploidy is irrelevant to others ?

A. Monosomy

B. Trisomy

C. Tetrasomy

D. Pentasomy

**Answer: D**



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24. Match with correct pairs :

Column I	Column II
(1) Monosomy	(i) $2n+2$
(2) Polyploidy	(ii) $2n-1$
(3) Nullisomy	(iii) $2n+n$
(4) Tetrasomy	(iv) $2n-2$

A. 1 - ii , 2 - iii, 3 - iv , d - i

B. 1 - ii , 2 - i, 3 - iv , d - iii

C. 1 - ii , 2 - iii, 3 - iv , d - i

D. 1 - ii , 2 - iii, 3 - i , d - iv

**Answer: A**



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25. Statement 1 : Euploidy involves entire sets of chromosomes

Statement 2 : Aneuploidy involves individual chromosomes within a diploid set.

A. Statement 1 is correct and Statement 2 is incorrect

B. Statement 1 is incorrect and Statement 2 is correct

C. Both the Statements are correct

D. Both the statements are incorrect

**Answer: C**





26. Statement 1 : In transversion mutation , single purine is changed to pyrimidine.

Statement 2 : In transition mutation , a purine replaced by another purine.

A. a) Statement 1 is correct and Statement 2 is incorrect

B. b) Statement 1 is incorrect and Statement 2 is correct

C. c) Both the Statements are correct

D. d) Both the statements are incorrect

**Answer: D**



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**27. Statement 1 :** Pairing of homologous chromosome is called as syndesis.

**Statement 2 :** Proterminal syanpsis occurs from telomeres.

A. Statement 1 is correct and Statement 2 is incorrect

B. Statement 1 is incorrect and Statement 2 is correct

C. Both the Statements are correct

D. Both the statements are incorrect

**Answer: D**



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**28.** Statement 1 : The widely accepted DNA replicated model is Holliday's hybrid DNA model .

Statement 2 : The vertical cut in the DNA results in heteroduplex with non - recombinants

A. Statement 1 is correct and Statement 2 is incorrect

B. Statement 1 is incorrect and Statement 2 is correct

C. Both the Statements are correct

D. Both the statements are incorrect

**Answer: D**



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**29.** Statement 1 : Self - sterility in Nicotiana is controlled by multiple alleles.

Statement 2 : Multiple alleles are always responsible for the same character .

- A. Statement 1 is correct and Statement 2 is incorrect
- B. Statement 1 is incorrect and Statement 2 is correct
- C. Both the Statements are correct
- D. Both the statements are incorrect

**Answer: C**



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**30.** Sex determination in plants was first discovered by



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31. One of the following is not the kind of euploidy

- A. Diploidy
- B. Polyploidy
- C. Hyperploidy
- D. Autopolloidy

**Answer: C**



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**32.** The chromosomal condition  $2n - 2$  represents

.....

A. a) Monosomy

B. b) Nullisomy

C. c) Trisomy

D. d) Tetrasomy

**Answer: B**



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**33.** Identify the autotriploid plant

A. Potato

B. Coffee

C. Ground nut

D. Apple

**Answer: D**



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**34.** Assertion (A) : Polyploidy is common in plants.

Reason (R) : Polyploidy possess more than 2 basic sets of chromosomes.



A. A is true R is false

B. Both A and R are false

C. A is true, R is not correct explanation for A

D. R explains A

**Answer: D**



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**35.** Assertion (A): Complete linkage is noticed in male species of *Drosophila*.

Reason (R): Completely linked genes show some crossing over.

A. A is true R is false

B. Both A and R are false

C. A is true, R is not correct explanation for A

D. R explains A

**Answer:**



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**36.** Assertion (A) : Self - sterility is observed in Nicotiana species.

Reason (R) : Because the genes are located on chromosome.

A. A is true R is false

B. Both A and R are false

C. A is true, R is not correct explanation for A

D. R explains A

**Answer:**



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37. \_\_\_\_\_ is the first man made cereal.



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**38.** Observe the gene sequence and identify of aberration A B C B C D E F ?

- A. Tandem duplication
- B. Simple duplication
- C. Reverse tandem duplication
- D. Displaced tandem duplication

**Answer: A**



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**Additional Questions 2 Mark Questions**

1. Write any one contribution of the following scientists to the field of molecular biology

(a) Hugo de Vries

(b) Sutton and Baveri

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2. Define linkage . Mention its types.

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3. What does the condition synteny refers to ?

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4. What are linked genes ?



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5. Who coined the term crossing over \_\_\_\_\_



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6. Crossing over occurs only in germinal cells. Yes or no. Support your answer.



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7. Mention the major stages involved in crossing over.

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8. What are bivalents ? When does this condition is noticed in a cell ?

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9. What is meant by synaptonemal complex ?

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**10.** What will be the result if there is a failure in the formation of synaptotomal complex. Give one example of organism where such condition is noticed ?

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**11.** Define terminalization.

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**12.** Write the formula to calculate recombination frequency .



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**13.** What is genetic mapping?



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**14.** Define the terms (a) locus (b) centimorgan.



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**15.** What are multiple alleles?



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**16.** Does environment determines the sex of plant ?

Explain in brief with an example.



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**17.** Why do we call papaya a dimorphic plant?



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**18.** Define the term mutation . Who coined the term ?



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**19.** Compare point mutation with chromosomal mutation.



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**20.** Based on of the effect of translation, classify mutations.



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**21. What does indel mutation refers to ?**



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**22. Define mutagens and mention its types.**



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**23. Point out any four physical mutagens.**



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**24.** Write a brief note on Castor Aruna variety.



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**25.** How Sharbati Sonora was developed by Dr. M.S. Swaminathan et.al ?



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**26.** Name any four chemical mutagens.



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27. Nitrous oxide is a potent mutagen - comment.



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28. What is ploidy?



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29. Differentiate Aneuploidy and Euploidy.



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30. Comment on the chromosomal condition ,  $2n - 2$ .



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**31.** Name any 3 auto tetraploids and one natural auto triploid plant species.



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**32.** What are deficiency loops ?



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**33.** Given below are the gene sequence on the chromosome. Compare them with the normal chromosome and identify the type of structural chromosomal aberrations.

Normal Chromosome : A - B - C - D - E - F - G - H - I.

chromosome - 1 - A - B - C - B - C - D - E - F - G - H - I.

Chromosome 2 : A - B - C - D - F - G - H - I



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**Additional Questions 3 Mark Questions**



1. Point out any three salient features of chromosomal theory of inheritance.

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2. Compare Mendelian factors with chromosome.

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3. State Coupling and Repulsion theory.

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4. Who reported incomplete linkage



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5. How crossing over differs from linkage ?



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6. What is Synapsis ? Explain its types .



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7. How and where chiasma is formed?



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8. Classify cross over.



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9. The most widely accepted model of DNA is the \_\_\_\_\_ structure.



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10. Which type of test cross provides the data to construct an efficient genetic map? Explain.

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11. What are the uses of genetic mapping?

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12. List any three characteristic features of multiple allele.

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13. Explain the sex determination mechanism in Caricapapaya.

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14. What is the difference between missense and nonsense mutation?

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15. What is frameshift mutation?

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**16.** How temperature induces mutation?



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**17.** Explain co-mutagens with examples.



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**18.** Name the following chromosomal conditions .

(a)  $2n + 2 + 2$  (b)  $2n - 1 - 1$  (c)  $x$

(d)  $2n$  (e)  $2n + n + n$  (f)  $2n + 1$



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19. Give an account on colchicine.



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20. Explain the three type of duplication with necessary diagram.



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## Additional Questions 5 Mark Questios

1. Why crossing over is important?



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2. Draw a flow chart depicting the various types of ploidy.

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3. Explain hyperploidy with its types.

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4. List out the significance of ploidy.

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5. Explain the Translocation type of chromosomes aberration.



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## Higher Order Thinking Skills Hots Questions

1. Given below is a sequence of alphabets representing the genes of chromosome. Observe it and answer the questions.

A - B - C - D - E - F - G - H - I - J - K.

(a) Write the sequence of genes after the

chromosome undergoes terminal deletion of single gene.

(b) What will be the gene sequence, if the genes E and F undergoes tandem duplication ?

(c) Consider the centromere is located between the genes F and G and write a gene sequence , after paracentric inversion occurs in between the genes C, D and E.



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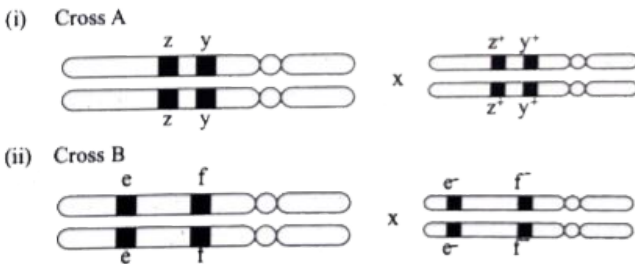
2. In *Drosophila melanogaster*, there are four pairs of chromosomes. If there occurs chromosomal aberrations resulting in trisomic and monosomic

condition , what will be the chromosomal count ?

Write correct chromosomal count against respective chromosomal aberration.

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3. Study the figures given below and answer the questions.



Which type of cross produces higher recombinant percentage ? Give reason in support of your answer.

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