Chapter 01 Principles of Inheritance and Variation

RANKER'S STUFF

Q.1 On crossing red and white flowered plants the ratio of red and white flowered plants in F_2 - generation was 60:20, then on selfing the heterozygous red flowered plants. The offsprings would be :
(1) 72:24 (2) 40:60 (3) 52:48 (4) 84: 16

Q.2 What is the probability of homozygous plants for both dominant characters in F_2 generation of a dihybrid cross?
(1) 1/16 (2) 3/16 (3) 4/16 (4) 9/16

Q.3 Which of the following is significance of dominance:
(1) Organisms with dominant genes are more vital
(2) Harmful mutations are not expressed due to dominant gene
(3) Heterosis is due to dominant gene
(4) All the above

Q.4 Consider the following statements.
(A) 100% parental combinations are found in F_2-generation
(B) F_2 phenotypic ratio is 3 : 1 in dihybrid cross.
(C) Dihybrid test cross ratio is 1 : 1 in F_2-generation.
(D) Linked genes tends to separate frequently.
Which of the statement given above are incorrect?
(1) (A), (B) and (D) (2) (A), (C) and (D)
(3) (B), (C) and (D) (4) All of these

Q.5 Cross AABb X aaBb yields AaBB AaBb Aabb:aabb offspring in the ratio of :
(1) 0:3:1:1 (2) 1:2:1:0
(3) 1:1:1:1 (4) 1:2:1:1

Q.6 Mrs. Verma has an autosomal gene pair 'Bb' and she contains x-linked gene 'd' on both of her X-chromosome. What is the percentage of gamete which contain 'bd' genes :
(1) 1/2 or 50% (2) 1/4 or 25%
(3) 3/4 or 75% (4) 1 or 100%

Q.7 Independent assortment of genes does not takes place when :
(1) Genes are located on homologous chromosomes
(2) Genes are linked and located on same chromosome
(3) Genes are located on non-homologous chromosome
(4) All of the above

Q.8 A dihybrid plant on self pollination, produced 400 phenotypes with 9 types of genotype. How many seeds will have genotype TtRr:
(1) 200 (2) 100 (3) 50 (4) 150

Q.9 If two pea plants having red (dominant) coloured flowers with unknown genotypes are crossed, 75% of the flowers are red and 25% are white. The genotypic constitution of the parents having red coloured flowers will be:
(1) Both homozygous
(2) One homozygous and other heterozygous
(3) Both heterozygous
(4) Both hemizygous

Q.10 In a dihybrid cross where two parents differ in two pairs of contrasting traits like seed colour yellow (YY) and seed colour green (yy) with seed shape round (RR) and seed shape wrinkled (rr). The number of green coloured seeds (yy) among sixteen products of F_2 generation will be:
(1) 2 (2) 4 (3) 6 (4) 8

Q.11 Select the incorrect statement for Gregor Mendel:
(1) He conducted hybridization experiment on garden pea for seven years.
(2) He applied statistical analysis and mathematical logic for the first time to the problems in biology
(3) His experiments had a small sampling size
(4) He conducted artificial cross-pollination experiments using several true-breeding pea lines.

Q.12 Which of the following is not observed in a monohybrid cross :
(1) Recessive parental trait is expressed without any blending in the F_2-generation
(2) Recessive parental trait is expressed without any blending in the F_1-generation
(3) Dominance also explains the proportion of 3 : 1 obtained at the F_2
(4) Genotype ratio is 1 : 2 : 1

Q.13 Which statement is true :
(1) Characters segregate during formation of gametes
(2) All characters show true dominance
(3) The characters always blend in heterozygous condition
(4) Mendelian disorder are determined by or absence or excess of one or more chromosome

Q.14 Identify the set of correct statement :
(a) Mendel investigated inheritance with usage of statistical analysis and mathematical logics.
(b) Mendel studied inheritance of characters upto F_1 generation
(c) Mendel conducted artificial pollination for the hybridisation experiment.
(d) Mendel selected 14 true-breeding pea plant varieties.
Choose the correct answer from the option given below :
(1) (a) and (c) only
(2) (b), (c) and (d) only
(3) (a), (c) and (d) only
(4) (a), (b), (c) and (d) all

Q.15 In a plant, red fruit (R) is dominant over yellow fruit (r) and tallness (T) is dominant over shortness (t). If a plant with RRTt genotype is crossed with a plant that is rrtt :
(1) All the offsprings will be tall with red fruit
(2) 25% will be tall with red fruit
(3) 50% will be tall with red fruit
(4) 75% will be tall with red fruit

Q.16 Identify the set of correct statement :
(a) Mendel conducted test cross for the first time between a tall plant from F_2 with a dwarf plant.
(b) Test cross can easily predict the genotype of the test organism.
(c) Law of dominance explains the proportion of 3 : 1 obtained at the F_2.
(d) Alleles show blending and that both the characters are not recovered as such in F_2 in pea.
(e) Factors occur in pairs.
Choose the correct answer from the option given below:
(1) (a) and (e) only
(2) (b), (c) and (d) only
(3) (a), (b) and (c) only
(4) (a), (b), (c) and (e) only

Q.17 In a plant gene 'A' is responsible for tallness and its recessive allele 'a' for dwarfness and 'B' is responsible for red flower colour and it's recessive allele 'b' for white flower colour. A tall and red flowered plant with genotype AaBb crossed with dwarf and red flowered (aaBb). What is the percentage of dwarf-white flowered offspring of above cross:
(1) 50% (2) 6.25%
(3) 12.5% (4) 50%

Q.18 Identify the set of correct statement/s.
(a) Grasshopper is an example of female heterogamety.
(b) In birds, total number of chromosomes is same in both male and female.
(c) In honey bee, fertilized egg develops queen and unfertilized egg develops drone.
(d) Haplo-diploid sex-determination system found in Honey bee.
Choose the correct answer from the option given below :
(1) (a) and (d) only (2) (b), (c) and (d) only
(3) (a), (b), (c) and (d) (4) (a), (b) and (c) only

Q.19 Which of the following points further strengthened Mendelism :
(1) Law of independent assortment which was based on monohybrid cross
(2) Law of independent assortment which could be stated on the basis of segregation of gametes
(3) Incomplete dominance gave a new way to mendelism
(4) A character is controlled by a pair of unit factors

Q.20 Identify the set of incorrect statement/s.
(a) Colour blindness is a sex-linked dominant disorder.
(b) Colour blindness occurs in about 0.4 per cent of males and 8 per cent of females.
(c) Male are in heterozygous condition for haemophilia and colour blindness.

(d) Colour blindness is due to absence of some specific proteins which forms cones.

Choose the correct answer from the option given below:

(1) only (a) (2) (a), (b) and (c) only
(3) (a) and (b) only (4) only (d)

Q.21 Identify the set of incorrect statement/s :

(a) Gene which code for a pair of contrasting traits are known as Alleles.
(b) Mendelian factors are discrete units.
(c) A large sample size is required to make any quantitative conclusion.
(d) Graphical representation to calculate the probability of all possible genotypes of offsprings developed by Morgan.

Choose the correct answer from the option given below:

(1) (a) and (c) only
(2) (d) only
(3) (a), (b) and (d) only
(4) (b) and (d) only

Q.22 A person with unknown blood group under ABO system, has suffered much blood loss in an accident and needs immediate blood transfusion. His one friend who has a valid certificate of his own blood type, offers for blood donation without delay. What would have been the type of blood group of the donor friend?

(1) Type B (2) Type AB
(3) Type O (4) Type A

Q.23 Identify the set of incorrect statement/s.

(a) Sometime, F_1 do not resemble either of two parents for flower colour in some plants.
(b) Occasionally a single gene product may produce more than one phenotype.
(c) After maturation of seeds, BB seeds are round and Bb seeds are wrinkled.
(d) Dominance is an autonomous feature of a gene.

Choose the correct answer from the option given below :

(1) (c) only (2) (a), (c) and (d) only
(3) (c) and (d) only (4) (b) and (c) only

Q.24 In a family, father has a blood group 'A' and mother has a blood group 'B'. Their children show 50% probability for a blood group 'AB' indicating that :

(1) Father is heterozygous
(2) Mother is heterozygous
(3) Either of parent is heterozygous
(4) Mother is homozygous

Q.25 In man, gene producing the disease phenyl ketonuria also produces a number of abnormal phenotypic traits, which are collectively called as syndrome. This gene results mental retardation, widely spaced incisors, pigmented patches on the skin and excessive sweating such type of gene is called:

(1) Polygene (2) Pleiotropic gene
(3) Lethal gene (4) Supplementary gene

Q.26 Which one of the following conditions though harmful in itself, is also a potential saviour from a mosquito borne infectious disease :

(1) Thalassemia (2) Sickle cell anamia
(3) Pernicius anaemia (4) Leukemia

Q.27 Which among four couples claiming the baby with O^+ blood type are possibly the biological parents of it?

(1) AB^- and A^+ (2) A^+ and O^-
(3) O^+ and AB^+ (4) B^- and O^-

Q.28 In a plant flower colour is the example of quantitative trait and controlled by one gene pair. How many plants show parental phenotype in F_2 generation:

(1) $\frac{2}{16}$ (2) $\frac{2}{4}$ (3) $\frac{2}{64}$ (4) $\frac{2}{256}$

Q.29 Grain colour in wheat is determined by three pairs of polygenes. Following cross AABBCC (dark colour) x aabbcc (light colour), in F_2 generation what proportion of the progeny is likely to resemble either parent ?

(1) None (2) Less then 5 per cent
(3) One third (4) Half

Q.30 The weight of fruit in a plant is determined by the number of dominant alleles of a certain number of genes. If seven weight categories are noticed, how many gene sites would be involved?

(1) Two (2) Three (3) Four (4) Five

Q.31 A scientist performed the gene mapping experiments in maize. He mapped the genes on chromosomes on the basis of % crossing over between different genes. One map unit corresponds to one % crossing over or recombination. The genes showing more than 50% recombination were not supposed to be linked on same chromosome. In crossing over studies on maize, scientist observed the following % crossing over between genes A, B, C, D -

between. A and D 10%, between A and C 3%, between genes C and D 7%, between genes A and B 5%, and between genes C and B 8%. On the basis of above observation find out the correct sequence of genes A, B, C and D on chromosomes :

(1) BCDA (2) ABCD
(3) BACD (4) DACB

Q.32 A man and a woman, who do not show any apparent signs of a certain inherited disease, have seven children (2 daughters and 5 sons). Three of the sons suffer from the given disease but none of the daughters are affected. Which of the following mode of inheritance do you suggest for this disease

(1) Sex-limited recessive
(2) Autosomal dominant
(3) Sex-linked recessive
(4) Sex-linked dominant

Q.33 A test cross of F_1 flies +a/+b produced the following offspring

++/ab = 9 ab/ab = 9
+b/ab = 41 a+/ab = 41

What will be distance between linked gene:

(1) 82 cM (2) 18 cM (cis)
(3) 20 cM (4) 18 cM (trans)

Q.34 Identify the set of incorrect statement/s.

(a) In 1902, De vries, Correns and T. Schermark independently rediscovered Mendel's result on inheritance.
(b) By 1902, the chromosome movement during meiosis had been worked out by Sutton and Boveri.
(c) Two Alleles of a gene pair are located on different loci of homologus chromosomes.
(d) Chromosome segregate at the time of gamete formation which occurs in pairs in an individual.

Choose the correct answer from the options given below :

(1) (a) and (c) only (2) (a) only
(3) (c) only (4) (a), (c) and (d) only

Q.35  This symbol represents

(1) Normal female (2) Normal male
(3) Affected female (4) Affected male

Q.36 Depending upon the distance between any two genes which is inversely proportional to the strength of linkage, cross overs will vary from :

(1) 50-100% (2) 0-50%
(3) 75-100% (4) 100-150%

Q.37 A and B genes are linked. What shall be genotype of progeny in a cross between AB/ab and ab/ab :

(1) AAbb and aabb (2) AaBb and aabb
(3) AABB and aabb (4) None

Q.38 Mendelian dihybrid and dihybrid with linkage are respectively related with how many chromosomes:

(1) 1 pair and 2 pair (2) 2 pair and 1 pair
(3) 2 pair and 2 pair (4) 1 pair and 1 pair

Q.39 In *Drosophila* the XXY condition leads to femaleness whereas in human beings the same condition leads to Klinefelter's syndrome in male. It proves:

(1) In human beings Y chromosome is active in sex determination
(2) Y chromosome is active in sex determination in both human beings and *Drosophila*
(3) In *Drosophila* Y - chromosome decides femaleness
(4) Y chromosome of man has genes for syndrome

Q.40 Based on observation on monohybrid crosses Mendel draw some conclusion. Which of the following is not correct :

(1) Characters are controlled by discrete units called factors
(2) Factors occur in pairs
(3) In a similar pair of factors one member of the pair dominates the other
(4) The postulate of dominance also explains the proportion of 3 : 1 obtained at the F_2

Q.41 Which is/are incorrect:

(i) ABO blood groups are controlled by the gene I
(ii) Gene I has four alleles
(iii) I^A and I^B produce same type of sugar
(iv) I or I° produce different type of sugar
(v) I^A and I^B are incomplete dominant

(1) i, ii (2) v, ii
(3) ii, iii, iv (4) ii, iii, iv, v

Q.42 Theoretically a normal phenotype is expressed when a particular substrate transform into product but in which of following condition phenotype may be affected :

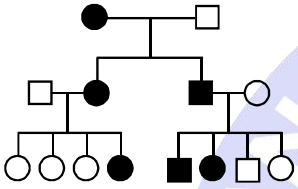
(1) When the modified allele produce normal enzyme
(2) When the modified allele produce a nonfunctional enzyme
(3) When the unmodified allele produce no enzyme
(4) All the above

Q.43 Identify the set of incorrect statement/s.

(a) *Drosophila* complete their life span in about two weeks.

(b) *Drosophila* has heteromorphic sex chromosomes in male.
(c) Morgan carried out test cross in *Drosophila*.
(d) Morgan attributed linkage as physical association of two genes.
(e) Morgan et al. found in *Drosophila* that the genes white and yellow were loosely linked.
(1) (e) only
(2) (a), (b) and (c) only
(3) (a), (c) and (e) only
(4) (a), (b), (c) and (e) only

Q.44 A pedigree is shown below for a disease that is autosomal dominant. The genetic make up of the first generation is :



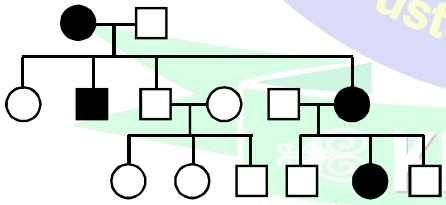
(1) AA, Aa (3) Aa, AA
(2) Aa, aa (4) Aa, Aa

Q.45 An organism is able to live on a culture medium containing nutrient A, by the enzyme catalysed reactions :

$A \xrightarrow{X} B \xrightarrow{Y} C$

A mutant failed to survive on this medium but grew when nutrient B was added to it. Which gene of this mutant was defective :
(1) Only X (2) Only Y
(3) X and Y both (4) Neither X or Y

Q.46 Given below is the pedigree of an autosomal dominant disorder-Myotonic dystrophy :



In this pedigree the genotype of all affected children will be :
(1) AA (2) Aa
(3) AA or Aa (4) aa

Q.47 Morgan hybridised yellow-bodied, white-eyed females to brown-bodied, red-eyed males and intercrossed their F_1 progeny. He observed that
(a) F_2 ratio was deviated very significantly from the 9 : 3 : 3 : 1 ratio
(b) Both genes did not segregate independently of each other
(c) Recombinant types are not obtained in F_2 generation
(d) Both genes segregate independently of each other
Select the correct set of statements:
(1) (a) and (b) only (2) (b) and (c) only
(3) (b) and (d) only (4) (c) and (d) only

Q.48 Match the following Columns A & B

Column A		Column B	
I.	Linkage	A.	Recombination of genes
II.	Mutation	B.	More than two sets of chromosomes
III.	Crossing over	C.	Morgan
IV.	Polyploidy	D.	Hugo de Vries

(1) I – B, II – C, III – A, IV – D
(2) I – C, II – D, III – A, IV – B
(3) I – B, II – D, III – C, IV – A
(4) I – B, II – D, III – A, IV – C

Q.49 Match the following Columns A & B

Column A		Column B	
I.	Removal of anther	A.	Human blood group
II.	Laws of inheritance	B.	Emasculation
III.	Multiple allelism	C.	Blood group O
IV.	Universal donor	D.	Mendel

(1) I – B, II – D, III – A, IV – C
(2) I – C, II – D, III – A, IV – B
(3) I – B, II – D, III – C, IV – A
(4) I – B, II – A, III – D, IV – C

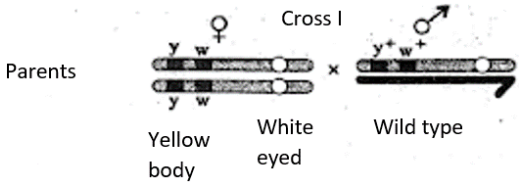
Q.50 Match the following Columns A & B

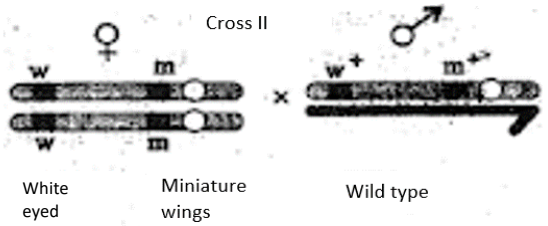
Column A		Column B	
I.	ABO blood groups	A.	Dihybrid cross
II.	Law of segregation	B.	Monohybrid cross
III.	Law of Independent assortment	C.	Base pairs substitution
IV.	Gene mutation	D.	Multiple allelism

(1) I – B, II – A, III – D, IV – C
(2) I – D, II – A, III – B, IV – C
(3) I – D, II – B, III – A, IV – C
(4) I – B, II – C, III – D, IV – A

Q.51 The experiment shown in the figure has been carried out by Morgan to show the phenomenon

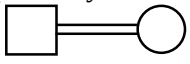
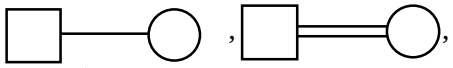
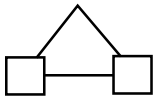
of linkage and recombination. If in Cross I, genes are tightly linked and in Cross II, genes are loosely linked then what will be the percentage of recombinants produced in Cross I & II respectively?



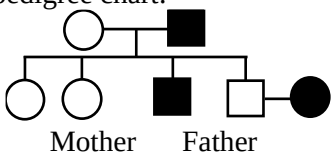


(1) 98. 7% and 62.8%
(2) 1. 3% and 37. 2%
(3) 37. 2% and 1. 3%
(4) 62. 8% and 98. 7%

Q.52 Identify the set of correct statement/s.
(a) Now a days genetic maps are extensively used as a starting point in genome sequencing in HGP.
(b) In Morgan's experiments, wild type allele and mutant type allele are represented with (+) and (–) sign in superscript, respectively.
(c) Strength of linkage between y and w is higher than w and m.
(d) Pleiotropy in most cases is the effect of a gene on metabolic pathways.
Choose the correct answer from the option given below:
(1) (a), (b) and (d) only
(2) (b), (c), (d) only
(3) (a) and (d) only
(4) (a), (b), (c) and (d) only

Q.53 In pedigree analysis, symbol given for consanguineous marriage and normal parents respectively is :-
(1)  ,
(2)  ,
(3) 
(4) 

Q.54 Find out the genotype of father and mother in the given pedigree chart:



(1) AA Aa
(2) Aa Aa
(3) AA aa
(4) aa Aa

Q.55 Match the items of Column-I with Column-II :

Column-I		Column-II	
(A)	XX-XO method	(i)	Turner's Syndrome
(B)	XX-XY method	(ii)	Female of Sex-Heterogametic
(C)	Karyotype-45	(iii)	Grasshopper
(D)	ZW-ZZ method	(iv)	Female of Sex-homogametic

Select the correct option from the following :
(1) (A) – (iv), (B) – (ii), (C) – (i), (D) – (iii)
(2) (A) – (ii), (B) – (iv), (C) – (i), (D) – (iii)
(3) (A) – (i), (B) – (iv), (C) – (ii), (D) – (iii)
(4) (A) – (iii), (B) – (iv), (C) – (i), (D) – (ii)

Direction (Q.56-Q.62): In the light of the above statements, choose the correct answer from the options given below:
(A) Both Statement-I and Statement-II are incorrect.
(B) Both Statement-I and Statement-II are correct.
(C) Statement-I is incorrect but Statement-II is correct.
(D) Statement-I is correct but statement-II is incorrect

Q.56 Given below are two statements:
Statement-I: Heterozygous female for haemophilia may transmit the disease to sons.
Statement-II: Sickle-cell anaemia is caused by the substitution of valine (val) by glutamic acid (Glu) of β-globin chain
In the light of the above statements, choose the correct answer from the options given below:
(1) A (2) B (3) C (4) D

Q.57 Given below are two statements:
Statement-I : Dominant disorder in human cause due to formation of any undesired chemical/protein.
Statement-II : Recessive disorder occurs due to lack of protein in animals

In the light of the above statements, choose the most appropriate answer from the options given below:
(1) A (2) B (3) C (4) D

Q.58 Given below are two statements:
Statement-I : Mendel's study found that the factors independently assort and combine in all permutations and combinations.
Statement-II : Later, it was found that Mendel's law of independent assortment does not hold true for the genes located on the same chromosomes

In the light of the above statements, choose the most appropriate answer from the options given below:
(1) A (2) B (3) C (4) D

Q.59 Given below are two statements:
Statement-I: One gene affects many characters called pleiotropic gene.
Statement-II: Dominance is an autonomous feature of a gene or the gene product.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) A (2) B (3) C (4) D

Q.60 Given below are two statements:
Statement-I: Behaviour of chromosome is parallel to the behaviour of genes
Statement-II: Sutton and Boveri used chromosomal movement to explain Mendel's laws.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) A (2) B (3) C (4) D

Q.61 Given below are two statements:
Statement-I: ABO blood group system provide a good example of multiple alleles.
Statement-II: Multiple Alleles can be found in an individual of Human population.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) A (2) B (3) C (4) D

Q.62 Given below are two statements:
Statement-I: Modified allele could be responsible for production of normal enzyme.
Statement-II: Normal/unmodified allele is responsible for production of normal enzyme.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) A (2) B (3) C (4) D

Direction: In each of the following questions, a statement of Assertion (A) is given followed by corresponding statement of Reason (R). Of the statements, mark the correct answer as
(A) If both A and R are true and R is the correct explanation of A
(B) If both A and R are true, but R is not the correct explanation of A
(C) If A is true, but R is false
(D) If A is false, but R is true

Q.63 **Assertion:** When the two genes in a dihybrid cross are situated on the same chromosome, the proportion of parental gene combinations is much higher than non-parental type.
Reason: Higher parental gene combination can be attributed to crossing over between two genes.
(1) A (2) B (3) C (4) D

Q.64 **Assertion:** Genes are not passed on from one generation to the next.
Reason: Genes serves as the units of inheritance.
(1) A (2) B (3) C (4) D

Q.65 **Assertion:** In codominance, the F_1-generation resembles both the parents.
Reason: An example is different type of red blood cells that determine ABO blood grouping in humans.
(1) A (2) B (3) C (4) D

Q.66 **Assertion**: Down's syndrome, Klinefelter's syndrome and Turner's syndrome are chromosome disorders.
Reason: In Klinefelter's syndrome females are sterile.
(1) A (2) B (3) C (4) D

Q.67 **Assertion:** Down's syndrome is Mendelian disorder.
Reason: It is caused due to the presence of an additional copy of chromosome 21.
(1) A (2) B (3) C (4) D

Q.68 **Assertion (A) :** Phenylketonuria is an example of pleiotropy.
Reason (R) : Phenylketonuria manifests mental retardation and a reduction in hair and skin

pigmentation besides too much phenylalanine in the body
(1) A (2) B (3) C (*4) D

Q.69. **Assertion (A) :** Law of segregation is based on the fact that the alleles do not show any blending.
Reason (R) : Factor or alleles of a pair segregate from each other such that a gamete receives only one of the two factor.
(1) A (2) B (3) C (4) D

Q.70 **Assertion (A) :** Maximum 50% non-parental gene combinations are possibly produces during gamete formation.
Reason (R) : Maximum frequency of crossing over could be 100% because all four chromatids of tetrad are involves in crossing over.
(1) A (2) B (3) C (4) D

Q.71 **Assertion (A) :** Unmodified Allele, which represents the original phenotype is the dominant allele.
Reason (R) : A dominant allele could modified into recessive allele by only crossing over.
(1) A (2) B (3) C (4) D

ANSWER KEY

RANKER'S STUFF

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	1	1	2	4	2	1	2	2	3	2	3	2	1	3	3
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	4	3	2	4	2	2	3	3	3	2	2	2	2	2	2
Que.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
Ans.	3	3	4	1	4	2	2	2	1	3	4	2	1	2	1
Que.	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ans.	2	1	2	1	3	2	4	1	4	4	4	2	2	4	2
Que.	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**				
Ans.	4	2	3	4	1	3	4	1	1	3	3				