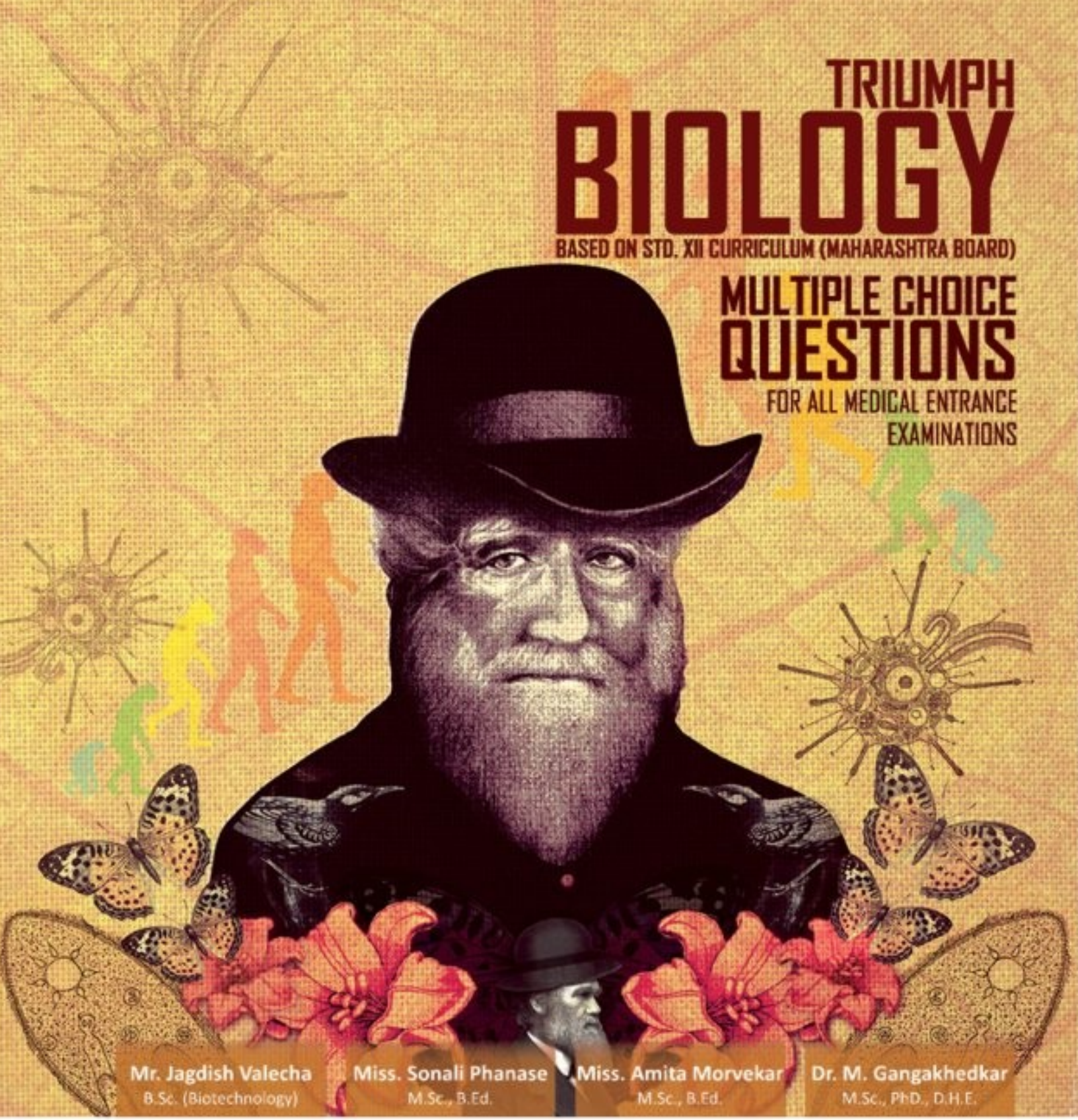
TRIUMPH BIOLOGY

BASED ON STD. XII CURRICULUM (MAHARASHTRA BOARD)

MULTIPLE CHOICE QUESTIONS

FOR ALL MEDICAL ENTRANCE EXAMINATIONS



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STD. XII Sci.

Triumph Biology

Based on Maharashtra Board Syllabus

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Preface

"Std. XII: Sci. Triumph Biology" is a complete and thorough guide to prepare students for a competitive level examination. The book will not only assist students with MCQs of Std. XII, but will also help them to prepare for AIIMS, AIPMT, CET and various other competitive examinations.

Quick review in the form of charts are provided at the beginning of every chapter. Topic – wise classification of the MCQ's has been done to help the students understand each concept thoroughly.

MCQs in each chapter are divided into three sections:


Classical Thinking : consists of straight forward questions including knowledge based questions.


Critical Thinking : consists of questions that require some understanding of the concept.


Competitive Thinking : consists of questions from various competitive examinations like AIIMS, AIPMT, CET, CPMT, etc.

Hints have been provided to the MCQs which are broken down to the simplest form possible.

An **Evaluation Test** has been provided at the end of each chapter to assess the level of preparation of the student at a competitive level.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

Please write to us on : mail@targetpublications.org

Best of luck to all the aspirants!

Yours faithfully

Authors

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01 Genetic Basis of Inheritance

Syllabus

Gregor Johann Mendel (1822 – 1884)

Gregor Mendel was the first to give the hypothesis of existence of a factor (Mendelian factor; gene) which shows continuity and variation. He conducted several hybridization experiments on Garden pea plant (Pisum sativum). His work of experiments and their results were published in the Natural History Society of Bruno in 1866.

Quick Review

- **7 Pairs of contrasting characters studied by Mendel in pea plant:**

No.	Character	Contrasting form / traits	
		Dominant	**Recessive**
i.	Height of stem	Tall (TT)	Dwarf (tt)
ii.	Colour of flower	Coloured (CC)	White (cc)
iii.	Position of flower	Axial (AA)	Terminal (aa)
iv.	Pod shape	Inflated (II)	Constricted (ii)
v.	Pod colour	Green (GG)	Yellow (gg)
vi.	Seed shape	Round (RR)	Wrinkled (rr)
vii.	Seed colour (cotyledon)	Yellow (YY)	Green (yy)

- **Result of monohybrid cross experiments:**

No.	Cross	F_1	F_2	Ratio
i.	Tall × dwarf	Tall	787 Tall, 277 dwarf	2.84:1
ii.	Yellow × green seeds	Yellow seed	6022 Yellow, 2001 green	3.01:1
iii.	Round × wrinkled seeds	Round seed	5474 Round, 1850 wrinkled	2.96:1
iv.	Green × yellow pods	Green pods	428 Green, 152 yellow	2.82:1
v.	Inflated × constricted pods	Inflated pods	882 Inflated, 299 constricted	2.95:1
vi.	Axial × terminal flower	Axial flower	651 Axile, 207 terminal	3.14:1
vii.	Violet × white flower	Violet flower	705 Violet, 224 white	3.15:1
viii.	Grey × white seed coat	Grey seed coat	705 Grey, 224 white	3.15:1

* Monohybrid Phenotypic ratio = 3 : 1

Monohybrid Genotypic ratio = 1 : 2 : 1

* Dihybrid Phenotypic ratio = 9 : 3: 3 : 1

Dihybrid Genotypic ratio = 1 : 2 : 2 : 4 : 1 : 2 : 1 : 2 : 1

* Back cross : F_1 hybrid × parent (Dominant /Recessive)

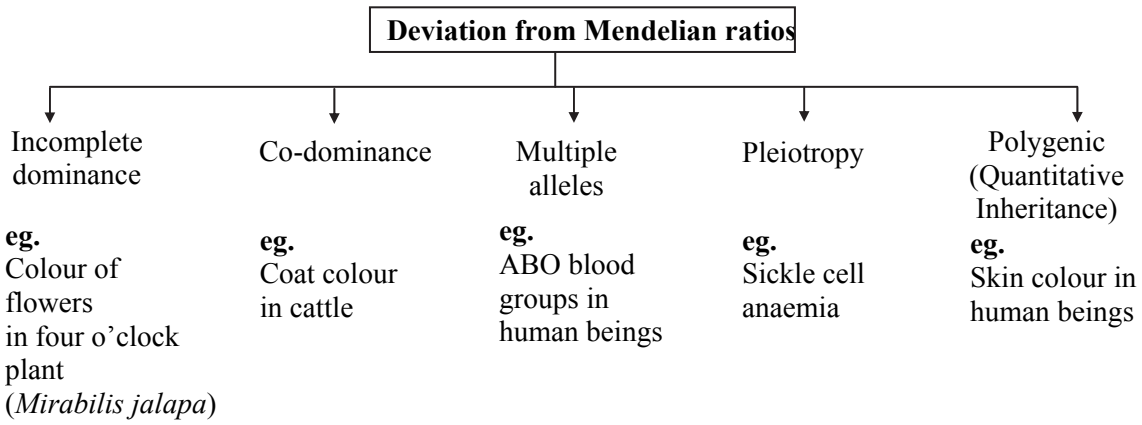
* Test cross : F_1hybrid × parent (Recessive)
* Mendel's 1st Law : Law of dominance

  Mendel's 2nd Law : Law of segregation

  Mendel's 3rd Law : Law of independent assortment

- **Blood group and its inheritance**:

Father		**Mother**		**Children**
Phenotype	Genotype	Phenotype	Genotype	Phenotype
A	$I^A I^A$ $I^A I^O$	A	$I^A I^A$ $I^A I^O$	A, O
B	$I^B I^B$ $I^B I^O$	B	$I^B I^B$ $I^B I^O$	B, O
A	$I^A I^A$ $I^A I^O$	B	$I^B I^B$ $I^B I^O$	A, B, AB, O
A	$I^A I^A$ $I^A I^O$	O	$I^O I^O$	A, O
B	$I^B I^B$ $I^B I^O$	O	$I^O I^O$	B, O
AB	$I^A I^B$	A	$I^A I^A$ $I^A I^O$	A, AB, B
AB	$I^A I^B$	B	$I^B I^B$ $I^B I^O$	B, AB, A
O	$I^O I^O$	O	$I^O I^O$	O



Classical Thinking

1.0 Introduction

1. The phenomenon of 'like begets like' is due to
   (A) genetics (B) heredity
   (C) germplasm (D) variation
2. Transmission of characters from one generation to the next or from parents to offsprings is called
   (A) heredity (B) variation
   (C) recombination (D) mutation
3. Variation is
   (A) differences between parents and offsprings.
   (B) differences between individuals of same species.
   (C) differences among the offsprings of the same parents.
   (D) all of the above.
4. The term "genetics" was coined by
   (A) Morgan
   (B) William Bateson
   (C) Johannsen
   (D) Karl Correns
5. The greek word which means 'to grow into' is
   (A) genetics (B) genesis
   (C) inheritance (D) factor
6. The first scientific explanation regarding inheritance was given by
   (A) William Bateson
   (B) Gregor Johann Mendel
   (C) Griffith
   (D) Johannsen
7. Who is known as "Father of Genetics"?
   (A) Theophrastus (B) Stephen Hales
   (C) Mendel (D) Aristotle

1.1 Mendelian inheritance

8. Organisms produced by asexual reproduction are called
   (A) clones
   (B) offsprings
   (C) factors
   (D) both (A) and (B)
9. Organisms produced by sexual reproduction are called
   (A) offsprings (B) clones
   (C) characters (D) genes
10. Offsprings are
    (A) exactly identical to either of their parents.
    (B) not exactly identical to either of their parents.
    (C) show intermediate characters inherited from both the parents.
    (D) both (B) and (C)
11. The term "factor" for gene was coined by
    (A) William Bateson
    (B) Johann Mendel
    (C) Johannsen
    (D) F. Griffith
12. Gregor Mendel was born in
    (A) U.K (B) Austria
    (C) Russia (D) Czechoslovakia
13. Mendel was a
    (A) physiologist (B) mathematician
    (C) cytologist (D) taxonomist
14. The first scientific study leading to the formulation of laws of inheritance was carried out by
    (A) Darwin (B) Hugo De Vries
    (C) Lemarck (D) Mendel
15. Under which title was Mendel's work published in Natural History Society of Brunn?
    (A) Mendel's Laws of Inheritance
    (B) Experiments in Plant Hybridization
    (C) Experiment on Heredity and Variation
    (D) Origin of Species
16. Mendel's laws were first published in the year
    (A) 1875 (B) 1890
    (C) 1928 (D) 1866
17. The year 1900 A.D. is highly significant for geneticists due to
    (A) chromosome theory of heredity
    (B) discovery of genes
    (C) rediscovery of Mendelism
    (D) principle of linkage
18. The Mendelian principles of inheritance were rediscovered by
    (A) Sutton and Boveri
    (B) Hugo de Vries, Tschermark and Correns
    (C) Lederberg and Tatum
    (D) Morgan

19. Mendel's work was rediscovered by three biologists from which of the following countries?
(A) Holland, France and England
(B) Holland, England and Austria
(C) Germany, France and England
(D) Austria, Holland and Germany

20. Mendel selected pea plant because of
(A) its short life span.
(B) it produced many seeds and large flowers.
(C) many contrasting characters.
(D) all of these

21. The botanical name of garden pea is
(A) *Pisum sativum*
(B) *Lathyrus odoratus*
(C) *Mangifera indica*
(D) *Solanum tuberosum*

22. Which of the following is a dominant character in pea?
(A) Wrinkled seeds
(B) Inflated pod
(C) Terminal flower
(D) Dwarf plant

23. Which of the following character was not considered by Mendel?
(A) Seed coat colour
(B) Wrinkled or round leaves
(C) Tallness or dwarfness
(D) Position of flower

24. An inherited character and its detectable variant is called
(A) allele
(B) trait
(C) gene
(D) both (A) and (B)

25. Which one of the following best describes a gene?
(A) A triplet of nucleotide bases.
(B) A specific length of DNA responsible for the inheritance and expression of the character.
(C) A specific length of single stranded RNA.
(D) Both (B) and (C)

26. Mendel's "factors" are in fact
(A) units (B) chromosomes
(C) genes (D) none of these

27. Who coined the term 'gene' for 'factor'?
(A) Mendel (B) Morgan
(C) Johannsen (D) Punnett

28. Alleles or allelomorphs occupy
(A) same position on homologous chromosomes.
(B) same position on heterozygous chromosomes.
(C) different position on homologous chromosomes.
(D) different position on heterozygous chromosomes.

29. Who proposed the term 'Allelomorph'?
(A) Hugo De Vries (B) Morgan
(C) Tschermak (D) Bateson

30. Dominant allele means
(A) an allele whose effect is masked by another allele.
(B) an allele that prevents the expression of the other allele.
(C) an allele without any effect.
(D) an allele which cannot express in presence of other.

31. The external appearance of an individual for any trait is called as
(A) phenotype (B) karyotype
(C) morphology (D) physique

32. Genotype is
(A) genetic constitution of an organism.
(B) genetic constitution of somatic cells.
(C) genetic constitution of plastids.
(D) genetic constitution of germ cells.

33. Homozygous individuals
(A) breed true to the trait.
(B) does not breed true to the trait.
(C) produce only one type of gamete.
(D) both (A) and (C)

34. Which of the following term indicates a pair of dissimilar alleles?
(A) Homozygous
(B) Heterozygous
(C) Homologous
(D) All of these

35. A cross between two pure individuals, differing in atleast one set of characters, is called
(A) monohybrid (B) polyploid
(C) mutant (D) variant

36. F_1 generation means
(A) first flowering generation
(B) first fertile generation
(C) first filial generation
(D) first seed generation

37. Filial means
(A) offsprings produced in sexual reproduction.
(B) offsprings produced in asexual reproduction.
(C) offsprings produced in vegetative reproduction.
(D) both (B) and (C)

38. F_2 generation is produced by
(A) crossing F_1 progeny with one of the parents.
(B) selfing the heterozygous progeny.
(C) selfing the parents.
(D) a cross between recessive parents.

39. In genetics, the use of checkerboard was done by
(A) Mendel (B) Correns
(C) Punnet (D) Darwin

40. Mendel, in his experiments
(A) maintained qualitative records.
(B) maintained quantitative records.
(C) conducted ample crosses and reciprocal crosses.
(D) all of the above

41. To eliminate chance factor, Mendel performed
(A) monohybrid cross
(B) dihybrid cross
(C) reciprocal cross
(D) trihybrid cross

42. Mendel always started his experiment (Monohybrid and Dihybrid cross) with
(A) any pea plant
(B) a heterozygous plant
(C) a pure line plant
(D) a fresh new plant

43. Mendel carried out artificial cross by
(A) emasculation of selected female parent plant
(B) emasculation of selected male parent plant
(C) dusting of pollen grains from selected male plant over selected female plant
(D) both (A) and (C)

44. Emasculation means
(A) removal of stamens before anthesis.
(B) removal of stigma before anthesis.
(C) removal of petals before anthesis.
(D) removal of sepals before anthesis.

45. In pea flower, how many stamens are free and how many are fused?
(A) 1, 9 (B) 2, 8
(C) 5, 5 (D) 4, 6

46. F_3 generation was obtained by
(A) selfing F_1 hybrids
(B) selfing F_2 hybrids
(C) crossing F_1 with either parent
(D) none of these

47. What result did Mendel obtained after monohybrid cross between tall and dwarf pea plant?
(A) All new plants were dwarf.
(B) All new plants were tall.
(C) 50% plants were dwarf and 50% plants were tall.
(D) 75% plants were tall and 25% plants were dwarf.

48. When Mendel allowed natural selfing of F_1 hybrids during monohybrid cross between pure tall and pure dwarf pea plant, he found
(A) all plants were tall.
(B) all plants were dwarf.
(C) dwarfness reappeared in some plants.
(D) tallness reappeared in some plants.

49. During monohybrid cross experiments, Mendel performed reciprocal cross by selecting
(A) tall plant as male and dwarf plant as female.
(B) tall plant as female and dwarf plant as male.
(C) both male and female plant as tall.
(D) both male and female plant as dwarf.

50. After performing reciprocal cross between tall and dwarf plants, the ratio of tall and dwarf plants obtained was
(A) 1:2 (B) 3:1
(C) 1:3 (D) 2:1

51. Mendel grouped all contrasting characteristics in _____ pairs.
(A) 15 (B) 14
(C) 7 (D) 6

52. The conclusion drawn by Mendel based on monohybrid cross was
(A) each factor exist in two contrasting or alternative forms.
(B) one of the forms is dominant and other is recessive.
(C) inheritance of each character is controlled by a pair of factors.
(D) all of the above

53. From the reappearance of recessive trait in F_2 generation, Mendel concluded that
(A) factors do not mix with each other in F_1 generation.
(B) factors remain together in F_1 generation.
(C) factor mix with each other in F_1 generation.
(D) both (A) and (B)

54. During gamete formation,
(A) diploid gametes are formed.
(B) each gamete receives only one factor.
(C) factors do not segregate.
(D) all offsprings show recessive characters.

55. The crossing of a homozygous tall pea plant and homozygous dwarf pea plant would yield plants in the ratio of
(A) 2 tall : 2 dwarf.
(B) all homozygous dwarf.
(C) all heterozygous tall.
(D) one homozygous tall : one homozygous dwarf : two heterozygous tall.

56. Mendel crossed a pure white flowered pea plant with pure red flowered plant. The first generation of hybrids from the cross should show
(A) 75% red flowered and 25% white flowered plants.
(B) 50% white flowered and 50% red flowered plants.
(C) all red flowered plants.
(D) all white flowered plants.

57. In monohybrid cross between pure tall and pure dwarf pea plant, how many types of genotypes are found in F_2 generation ?
(A) 4 (B) 3
(C) 8 (D) 9

58. Out of the four progenies obtained in F_2 generation by crossing pure tall and pure dwarf, how many of them will receive only recessive trait from both parents?
(A) all four (B) one
(C) two (D) three

59. The monohybrid ratio is defined as
(A) phenotypic ratio obtained in F_2 generation of monohybrid cross.
(B) phenotypic ratio obtained in F_1 generation of monohybrid cross.
(C) genotypic ratio obtained in F_2 generation of monohybrid cross.
(D) genotypic ratio obtained in F_1 generation of monohybrid cross.

60. Which of the following is phenotypic ratio of Mendel's monohybrid cross ?
(A) 1:2:1 (B) 3:1
(C) 1:1:2 (D) 1:3

61. The law of dominance is illustrated in the garden pea by
(A) heterozygous tall × heterozygous tall
(B) homozygous tall × homozygous tall
(C) pure short × pure dwarf
(D) homozygous tall × pure dwarf

62. Which of the following Mendel's laws has not been proved to be true in all cases?
(A) Law of segregation
(B) Mendel's second law of inheritance
(C) Law of dominance
(D) Law of purity of gametes

63. The second law of inheritance proposed by Mendel deals with
(A) dominance
(B) independent assortment
(C) segregation
(D) epistasis

64. Reappearance of recessive trait in F_2 generation is due to
(A) Law of independent assortment
(B) Law of dominance
(C) Law of codominance
(D) Law of purity of gametes

65. Which of the Mendel's laws will always prove to be universally true in all cases?
(A) All three laws
(B) Only the 2^{nd} law
(C) 2^{nd} and 3^{rd} laws
(D) 1^{st} and 2^{nd} laws

66. Mendel formulated the law of dominance and law of purity of gametes on the basis of
(A) test cross
(B) back cross
(C) monohybrid cross
(D) dihybrid cross

67. A cross between two pure individuals differing in two sets of characters is called
(A) dihybrid cross
(B) monohybrid cross
(C) trihybrid cross
(D) reciprocal cross

68. The phenotype of plant with genotype YyRr must be
(A) Yellow wrinkled (B) Green round
(C) Yellow round (D) green wrinkled

69. Dihybrid ratio is defined as
(A) phenotypic ratio obtained in F_2 generation of dihybrid cross.
(B) phenotypic ratio obtained in F_1 generation of dihybrid cross.
(C) genotypic ratio obtained in F_2 generation of dihybrid cross.
(D) genotypic ratio obtained in F_1 generation of dihybrid cross.

70. While performing dihybrid cross, Mendel
(A) selected a variety of pea plant having yellow and round seed as female parent and another variety having green and wrinkled seeds as a male parent.
(B) obtained pure lines by selfing
(C) performed artificial cross by emasculation
(D) all of the above

71. Out of the four phenotypes obtained in F_2 generation of dihybrid cross between yellow round and green wrinkled seeds of pea plant,
(A) two were parental and two were new combination
(B) all were parental combination
(C) all were with recessive trait
(D) all were new combination

72. The statement – "Probability of two independent events occurring simultaneously is the product of their individual probabilities" is
(A) law of dominance
(B) principle of probability
(C) law of segregation
(D) law of new combinations

73. $(3 : 1) \times (3 : 1) = 9 : 3 : 3 : 1$
This signifies
(A) trihybrid ratio
(B) two monohybrid ratio
(C) dihybrid ratio is a product of two monohybrid ratios
(D) none of the above

74. Mendel's pattern of inheritance systematically showed the progeny in
(A) checker board (B) square board
(C) cross board (D) all of these

75. The conclusions made by Mendel based on dihybrid cross was
(A) when a dihybrid or polyhybrid forms gametes, each gamete receives only one allele from each pair
(B) the assortment of alleles of different traits is totally independent of their parental combination
(C) both (A) and (B)
(D) none of the above

76. When Mendel crossed pea plants with yellow round seed and green wrinkled seed, the seeds obtained in F_1 hybrid were,
(A) yellow wrinkled (B) yellow round
(C) green wrinkled (D) green round

77. The phenotypic ratio of F_2 progeny in a dihybrid cross is
(A) 9 : 3 : 3 : 1: 1
(B) 9 : 3 : 3 : 1
(C) 9 : 1 : 3 : 3 : 1
(D) 1 : 2 : 2 : 4 : 1 : 2 : 1 : 2 : 1

78. The genotypic ratio obtained in a Mendelian dihybrid cross is
(A) 1 : 2 : 2 : 4 : 1 : 2 : 1 : 2 : 1
(B) 9 : 3 : 3 : 1
(C) 1 : 4 : 4 : 1 : 2 : 2 : 1 : 1
(D) 9 : 7

79. New character combinations appear in F_2 generation of a dihybrid cross mainly because of
(A) dominance
(B) recessiveness
(C) principle of unit character
(D) independent assortment

80. Law of independent assortment can be explained by
(A) monohybrid cross and monohybrid ratio
(B) dihybrid cross and dihybrid ratio
(C) trihybrid cross and trihybrid ratio
(D) all of the above

81. _____ occurs due to crossing over taking place during meiosis.
(A) Linkage (B) Recombination
(C) Segregation (D) Mutation

82. Law of independent assortment is applicable for the traits which
(A) are located on different chromosomes.
(B) are located on same chromosome.
(C) are located on homologous.
(D) both (B) and (C)

83. The three important laws of heredity proposed by Mendel relate to
(A) gene linkage, character segregation and independent assortment.
(B) gene linkage, dominance and segregation.
(C) segregation, independent assortment and dominance–recessiveness.
(D) segregation, independent assortment and codominance.

84. Mendel did not propose law of
(A) segregation
(B) dominance
(C) incomplete dominance
(D) independent assortment

85. The reason behind the success of Mendel was
(A) choice of material.
(B) use of pure line.
(C) maintenance of qualitative and quantitative record.
(D) all of the above

86. A test cross
(A) is used to investigate whether the dominant expression is homozygous or heterozygous.
(B) involves mating of F_1 hybrid with homozygous recessive parent.
(C) both (A) and (B)
(D) none of these

87. In F_2 hybrid, to check the tall plant is homozygous or heterozygous, which cross is performed?
(A) test cross (B) back cross
(C) monohybrid cross (D) both (A) and (B)

88. Which of the following ratio refers to back cross?
(A) AA × Aa (B) Aa × Aa
(C) Aa × AA (D) AA × AA

89. A cross between individual with unknown genotype for a particular trait with a recessive plant for that trait is called
(A) back cross (B) test cross
(C) monohybrid cross (D) dihybrid cross

1.2 Deviations from Mendelian ratios

90. Interaction between two alleles which are present on the same gene locus of two homologous chromosomes is called
(A) intragenic interaction
(B) interallelic interaction
(C) intergenic interaction
(D) both (A) and (B)

91. Interaction between the alleles of different genes on the same or different chromosome is called
(A) intergenic
(B) nonallelic
(C) intragenic
(D) both (A) and (B)

92. RR (red) flowered plant of *Mirabilis* is crossed with rr (white) flowered plant of *Mirabilis*. All the Rr offsprings are pink. This is an indication that the R gene is
(A) codominant
(B) recessive
(C) incompletely dominant
(D) linked

93. In incomplete dominance, one could get 1 : 2 : 1 ratio in
(A) test cross (B) F_2 generation
(C) F_1 generation (D) R cross

94. Co-dominance differs from incomplete dominance as in co-dominance
(A) the hybrid is intermediate
(B) both the genes are expressed equally
(C) dominant gene is expressed in F_1 generation
(D) genotypic ratio is 1 : 1

95. Multiple alleles of a gene always occupy
(A) the same locus on a chromosome
(B) the same position on different chromosome
(C) different loci on a chromosome
(D) different loci on different chromosomes

96. In *Drosophila*, the genotype of normal wings
(A) vg^{ni} (B) Vg^{+}
(C) vg^{no} (D) vg

97. ABO blood grouping is based on
(A) codominance
(B) incomplete dominance
(C) epistasis
(D) multiple allelism

98. Blood grouping in humans is controlled by
(A) 4 alleles in which A is dominant.
(B) 3 alleles in which AB is codominant.
(C) 3 alleles in which none is dominant.
(D) 3 alleles in which A is dominant.

99. In pleiotropic inheritance, different traits are controlled by
(A) many genes (B) one or two genes
(C) single gene (D) mutation

100. Which of the following is an example of pleiotropy?
(A) Haemophilia
(B) Thalassemia
(C) Sickle cell anaemia
(D) Colour blindness

101. The genotype of a carrier carrying a gene for sickle-cell anaemia is
(A) Hb^s (B) Hb^A/Hb^s
(C) Hb^A (D) Hb^o

102. In which disease, does the RBC of a person becomes half moon-shaped?
(A) haemophilia
(B) sickle – cell anaemia
(C) thalesemia
(D) leukemia

103. A marriage between two carriers of sickle – cell anaemic gene will result into
(A) 1 normal and 2 carriers
(B) 1 sickle-cell anaemic
(C) 2 normal and 2 sickle – cell anaemic
(D) both (A) and (B)

104. When single character is controlled by two or more genes is called
(A) pleiotropy
(B) multiple allelism
(C) polygenic inheritance
(D) co-dominance

105. The additive or cumulative effect is shown by
(A) Pleiotropic gene
(B) Monogene
(C) Polygenes
(D) Complementary genes

106. Who discovered polygenic inheritance?
(A) H. Nilsson -Ehle (B) Davenport
(C) Johannsen (D) Bateson

107. The phenotypic ratio of red (AABB) and white (aabb) kernel in F_2 generation showing polygenic inheritance is
(A) 1:2:1 (B) 1:4:6:4:1
(C) 1:6:4:4:1 (D) 1:6:15:20:15:6:1

108. When red wheat kernel is crossed with white wheat kernel, the probability of getting red darkest plant is
(A) 1/16 (B) 4/16
(C) 6/16 (D) 2/16

109. The phenotypic ratio of polygenes representing skin colour in humans is
(A) 1 : 4 : 6 : 4 : 1
(B) 1 : 2 : 1
(C) 1 : 6 : 15 : 20 : 15 : 6 : 1
(D) 1 : 3 : 1

110. Who studied the inheritance of skin colour in negro and white population in USA ?
(A) Hugo De Vries
(B) Karl Correns
(C) Davenport and Davenport
(D) Mendel

111. Skin colour is controlled by
(A) 2 pairs of genes
(B) single gene
(C) 3 pairs of genes
(D) 2 pairs of genes with an intragene

112. When a negro marries white, how many phenotypes are obtained?
(A) 7 (B) 10
(C) 16 (D) 8

113. AaBbCc is the genotype of
(A) fair
(B) mulatto
(C) pure black (negro)
(D) albino

Miscellaneous

114. The science dealing with heredity and variation is known as
(A) cytology (B) cytohistology
(C) embryology (D) genetics

115. The peculiar characteristic of pea flowers is
(A) papilionaceous corolla
(B) blue coloured petals
(C) round petals
(D) long petals

116. To avoid the birth of child with fatal sickle-cell anaemia,
(A) marriage between two homozygotes is discouraged
(B) marriage between two heterozygotes is discouraged
(C) both (A) and (B)
(D) none of the above

Critical Thinking

1.1 Mendelian inheritance

1. During dihybrid cross, the ratio of yellow : green and round : wrinkled in F_2 generation is
   (A) 1 : 3 (B) 3 : 1
   (C) 9 : 3 (D) 3 : 9

2. Which of the following terms represent a pair of contrasting characters?
   (A) Allelomorphs
   (B) Homozygous
   (C) Hemizygous
   (D) Complementary genes

3. An allele is dominant if it is expressed in
   (A) both homozygous and heterozygous conditions
   (B) second generation
   (C) back cross and test cross
   (D) homozygous combination

4. The gene which codes for a complete functional polypeptide that fully expresses itself is called as
   (A) recessive gene
   (B) dominant gene
   (C) complementary gene
   (D) supplementary gene

5. The allele which does not express in the F_1 generation in presence of another allele is
   (A) dominant
   (B) recessive
   (C) codominant
   (D) incompletely dominant

6. If organisms resemble dominant parent but are genetically different, they are
   (A) heterozygous (B) homozygous
   (C) hemizygous (D) heterologous

7. Which of the following is heterozygous for two pairs of alleles?
   (A) TtRR (B) TtRr
   (C) TTRR (D) TTRr

8. A pure line is a
   (A) population of plants and animals which are with pure blood.
   (B) group of individuals which are morphologically similar
   (C) population of homozygous plants raised from homozygous plant.
   (D) haploid individual.

9. The offsprings obtained by mating two pure strains having contrasting characters are called as
   (A) hybrids (B) mutants
   (C) P–generation (D) F_2–generation

10. Homologous chromosomes
    (A) are morphologically similar
    (B) are structurally similar
    (C) have identical gene loci bearing alleles
    (D) all of these

11. Mendel obtained true breeding plant for dominant character by
    (A) continuous cross–pollination
    (B) self pollination for many generations
    (C) by making cross between hybrid and pure plant
    (D) alternate self and cross–pollination

12. The technique of hybridisation used by Mendel was
    (A) back cross (B) double cross
    (C) single cross (D) emasculation

13. Mendelism was based on
    (A) concept of factors
    (B) concept of dominance
    (C) experimental, quantitative, qualitative and evaluative study of *Pisum sativum*
    (D) all of these

14. According to Mendel, plants of F_1 generation show
    (A) law of dominance
    (B) purity of gametes
    (C) independent assortment of genes
    (D) all of these

15. The types of gametes formed by a pure line is/are
    (A) 1 (B) 16
    (C) 32 (D) 4

16. In a cross between tall heterozygous pea plants, what would be the phenotypic ratio in the F_1 generation?
    (A) 1 : 2 : 1 (B) 3 : 1
    (C) 4 : 1 (D) 1 : 4

17. Identify a cross in which $1/4^{th}$ of the offsprings show recessive trait?
    (A) Rr × RR
    (B) Rr × rr
    (C) Rr × Rr
    (D) Both (B) and (C)

18. When dominant AA and recessive aa is crossed, the percentage ratio of the hybrid showing the parental genotypes is
(A) 0% (B) 25%
(C) 50% (D) 75%

19. 190 grains of Jowar from single plant when sown produce 140 tall and 50 dwarf plants. The genotypes of these offsprings may be
(A) TT, tt (B) TT, Tt
(C) Tt, Tt (D) TT, Tt, tt

20. In a cross between axial and terminal flowered pea plants, F_2 progeny show
(A) axial flowers
(B) terminal flowers
(C) both (A) and (B)
(D) none of these

21. Which of the following cross will produce terminal flower in garden pea?
(A) AA × Aa (B) Aa × Aa
(C) Aa × AA (D) AA × aa

22. When homozygous dominant parent is crossed with heterozygous parent, the percentage of offsprings with different phenotype than either parent is
(A) 0 (B) 25
(C) 50 (D) 75

23. A plant is heterozygous for tallness (Tt). The possibility of 't' gamete fertilizing either T or 't' is
(A) $\frac{1}{8}$ (B) $\frac{1}{2}$
(C) $\frac{1}{4}$ (D) $\frac{1}{6}$

24. Mendel's principle of segregation is based on separation of alleles during
(A) gamete formation
(B) seed formation
(C) pollination
(D) embryonic development

25. When a pure tall plant (TT) having rounded seeds (RR) is crossed with dwarf plant (tt) having wrinkled seeds (rr) and their F_1 progeny are crossed among themselves to produce F_2 generation, how many phenotypes will be observed?
(A) 16 (B) 9
(C) 4 (D) 2

26. In a cross between a pure tall pea plant with yellow pod and a pure short plant with green pod, how many double recessive plants would you expect in F_2 generation?
(A) 1 (B) 3
(C) 4 (D) 9

27. In Mendel's dihybrid cross, the number of plants which are homozygous for one character are
(A) 7 (B) 8
(C) 6 (D) 5

28. Find the odd one out.
(A) TtRr (B) TTRR
(C) Ttrr (D) TtRR

29. In a Mendelian dihybrid cross when tall and yellow seeded plant was crossed with dwarf and green seeded plant, in F_2 generation, 36 tall and green plants were obtained. What is the total number of progeny obtained in the cross?
(A) 224 (B) 192
(C) 144 (D) 186

30. If T (tallness), Y (yellow colour) are dominant, when a plant heterozygous for both traits is selfed, then the ratio of pure homozygous dwarf and green would be
(A) $\frac{3}{16}$ (B) $\frac{1}{3}$
(C) $\frac{1}{16}$ (D) $\frac{1}{4}$

31. Probability of genotype TTrr in F_2 generation of a dihybrid cross is
(A) $\frac{1}{16}$ (B) $\frac{3}{16}$
(C) $\frac{9}{16}$ (D) $\frac{6}{16}$

32. When AA BB and aa bb are crossed, in the F_2 generation, the ratio of Aa Bb will be
(A) 4/16 (B) 1/16
(C) 2/16 (D) 8/16

33. If a F_1 plant in a dihybrid ratio is crossed with a recessive plant, the ratio obtained will be
(A) 1 : 1 : 1 : 1
(B) 1 : 1 : 1 : 2
(C) 9 : 3 : 3 : 1
(D) 1 : 1

34. What should be the genotype of a round seeded tall plant which when crossed with a plant of similar genotype produces the following percentage of phenotypes?
(tall round = 56.25 %, tall wrinkled = 18.75 %, dwarf round=18.75 %, dwarf wrinkled = 6.25 %.)
(A) Tt RR (B) TT Rr
(C) Tt Rr (D) TTrr

35. How many genetically different gametes will be produced by a heterozygous plant having the genotype Aa Bb Cc?
(A) 4 (B) 8
(C) 12 (D) 16

36. A cross between yellow round and green wrinkled pure line plants yield _____ yellow wrinkled plants in F_1 generation.
(A) 9 (B) 3
(C) 0 (D) 16

37. How many types of gametes are expected from the organism with genotype AA BB CC?
(A) One (B) Two
(C) Four (D) Eight

38. Genetically identical progeny is produced when the individual
(A) performs cross fertilization.
(B) produces identical gametes.
(C) practices inbreeding without meiosis.
(D) undergoes mutation

39. Some individuals with blood group A may inherit the genes for black hair, while other individuals with blood group A may inherit the genes for brown hair. This can be explained by the principle of
(A) independent assortment.
(B) incomplete dominance.
(C) dominance.
(D) multiple alleles.

40. Mendel may not be able to establish the law of independent assortment, if both characters were located on
(A) separate on homologous chromosomes.
(B) same homologous chromosomes.
(C) separate chromosome but at different loci.
(D) sex chromosomes.

41. A test cross distinguishes between
(A) two heterozygous plants.
(B) two homozygous plants.
(C) homozygous recessive and heterozygous recessive.
(D) homozygous dominant and heterozygous dominant.

42. Which of the following cross produces tall and dwarf in equal proportion?
(A) TT × Tt (B) Tt × Tt
(C) TT × rr (D) Tt × tt

43. When a tall pea plant is crossed with a short pea plant to obtain a ratio 1 : 1, the genotype of the tall pea plant is
(A) TT
(B) Tt
(C) tt
(D) any of the previous three

44. Back cross is
(A) $F_1 \times F_1$
(B) F_1 × recessive parent only
(C) F_1 × dominant parent only
(D) F_1 × any parent.

45. F_1 hybrid obtained from pure inflated pod and pure constricted pod variety of pea was crossed back with the pure variety of inflated pods. The progeny thus obtained will be
(A) all inflated. (B) all constricted.
(C) 3 : 1. (D) 1 : 1.

46. The percentage of 'yr' gametes produced by a YyRr parents will be
(A) 75 (B) 25
(C) 50 (D) 12.5

47. A tall pea plant with red flowers was crossed with a dwarf white flowered plant and four kinds of offsprings were produced in equal proportions. The genotype of the tall red parent was
(A) TTRr (B) TtRr
(C) TTRR (D) TtRR

1.2 Deviations from Mendelian ratios

48. F_1 hybrid is intermediate between the two parents. The phenomenon is called
(A) codominance
(B) dominance
(C) blending inheritance
(D) incomplete dominance

49. In case of incomplete dominance, the monohybrid F_2 generation will show
(A) identical genotypic and phenotypic ratio of 3 : 1.
(B) genotypic ratio of 1 : 2 : 1 and phenotypic ratio of 3 : 1.
(C) identical genotypic and phenotypic ratio of 1 : 2 : 1.
(D) genotypic ratio of 3 : 1 and phenotypic ratio of 1 : 2 : 1.

50. In cattles, when red one is crossed with white, an intermediate roan coloured offspring is formed in F_1 generation. When selfing of F_1 generation was carried, the result obtained was
(A) 2 Red, 1 Roan, 1 White
(B) 1 Red, 2 Roan, 1 White
(C) 1 Red, 2 Roan, 2 White
(D) 1 Red, 1 Roan, 1 White

51. Genotype of blood group 'A' will be
(A) I^AI^a (B) I^BI^B
(C) I^AI^A or I^Ai (D) I^AI^c

52. Marriage between two sickle-cell carriers results into normal and sickle-cell carrier progenies in the ratio of
(A) 2 : 1 (B) 3 : 1
(C) 1 : 2 : 1 (D) 1 : 2

53. In humans, height is an example of
(A) co–dominance
(B) polygenic inheritance
(C) jumping genes
(D) dominant genes

54. Lethal genes are
(A) recessive homozygous
(B) recessive heterozygous
(C) dominant heterozygous
(D) codominant

55. In humans, albinism is determined by
(A) dominant gene
(B) codominant gene
(C) recessive gene
(D) none of these

Miscellaneous

56. When Mendel crossed plants with a pair of contrasting characters, he derived the
(A) law of dominance
(B) law of genes
(C) law of incomplete dominance
(D) law of co-dominance

57. If a tall pea plant having red coloured flowers are crossed, they produce four types of plants in the ratio of 9 : 3 : 3 : 1. The genotype of the parents are (R–red flowered ; T – tall) is
(A) RRTT × RRTT
(B) RrTT × RrTT
(C) RrTt × RrTt
(D) RRTt × RRTt

Competitive Thinking

1.0 Introduction

1. The resemblance of individuals to their progenitors is called **[AMU 1990]**
(A) heredity
(B) genetics
(C) evolution
(D) none of these

2. Mendel formulated some laws which are known as **[AMU 1990]**
(A) Laws of germplasm
(B) Laws of origin of species
(C) Laws of recapitulation
(D) Laws of inheritance

1.1 Mendelian inheritance

3. Which of the following is dominant character according to Mendel? **[AFMC 2000]**
(A) Dwarf plant and yellow fruit
(B) Terminal fruit and wrinkled seed
(C) White testa and yellow pericarp
(D) Green coloured pod and rounded seed

4. The alleles are **[KCET 1994; MH CET 2004]**
(A) a pair of genes governing a specific character such as tallness or dwarfness
(B) multiple forms of genes
(C) genes governing eye characters
(D) genes present in allosomes

5. When a true breeding pea plant that has yellow seeds is pollinated by a plant that has green seeds, all the F_1 plants have yellow seeds. This means that the allele for yellow is **[MP PMT 1993]**
(A) heterozygous
(B) dominant
(C) recessive
(D) lethal

6. In Mendel's experiment, nature of seed coat, flower colour, position of flower, pod colour, stem height, etc. are referred to as **[RPMT 1997]**
(A) alleles
(B) genotypes
(C) phenotypes
(D) all of above

7. An organism with two identical alleles for a given trait is **[MP PMT 1993; CPMT 1994]**
   (A) homozygous
   (B) segregating
   (C) dominant
   (D) a hermaphrodite

8. Organisms phenotypically similar but genotypically different are said to be **[KCET 1994]**
   (A) heterozygous
   (B) monozygous
   (C) multizygous
   (D) homozygous

9. Which of the following cross will give recessive progeny in F_1 generation ? **[MH CET 2014]**
   (A) TT × tt
   (B) Tt × TT
   (C) tt × tt
   (D) TT × TT

10. When Mendel crossed true breeding white-flowered strain of peas with a true breeding red-flowered strain, individuals in the F_2 represented **[DPMT 1976]**
   (A) white-flowered plants
   (B) red-flowered plants
   (C) red-flowered and white-flowered plants in the ratio 3 : 1
   (D) red and white-flowered individuals in the ratio 1 : 1

11. Which of the following is genotypic ratio of Mendel's monohybrid cross? **[Bihar MDAT 1991; KCET 1994; EAMCET 1993; MP PMT 1996; MP PMT 2005; J & K CET 2010; Orissa JEE 2010]**
   (A) 1 : 3
   (B) 3 : 1
   (C) 1 : 2 : 1
   (D) 1 : 1 : 1 : 1

12. In a monohybrid cross, when F_1 is crossed with homozygous dominant parent then which type of offsprings will be obtained? **[RPMT 2002]**
   (A) Dominant: recessive 3 : 1
   (B) Only recessive
   (C) Dominant : recessive 1 : 1
   (D) No recessive

13. In Mendelian monohybrid cross, phenotypic ratio in F_2 is 3:1. How many types of gametes are formed in F_1 generation? **[Bihar MDAT 1995]**
   (A) Only one type
   (B) Two types
   (C) Four types
   (D) Eight types

14. In pea, hybrids between red flowered and white flowered strains were crossed back to pure red flowered strain. The progeny of this cross will have **[MP PMT 1990]**
   (A) red flowers only
   (B) white flowers only
   (C) equal number of red and white flowers
   (D) mostly red flowers

15. The percentage of heterozygous individuals obtained in F_2 generation from selfing the plants with genotype Rr would be **[AIIMS 1994]**
   (A) 24 (B) 50
   (C) 75 (D) 100

16. Which genotype represents a true dihybrid condition? **[CBSE PMT 1991]**
   (A) TtRr (B) ttrr
   (C) Ttrr (D) TtRR

17. Mendel's law of segregation is applicable to **[Wardha 2005]**
   (A) dihybrid cross only
   (B) monohybrid cross only
   (C) both dihybrid and monohybrid cross
   (D) dihybrid but not monohybrid cross

18. In dihybrid cross, out of 16 plants obtained, the number of genotypes shall be **[MP PMT 2001]**
   (A) 4 (B) 9
   (C) 16 (D) 12

19. What type of gametes will be formed by genotype RrYy? **[RPMT 2002]**
   (A) RY, Ry, rY, ry
   (B) RY, Ry, ry, ry
   (C) Ry, Ry, Yy, ry
   (D) Rr, RR, Yy, YY

20. From a cross AABb × aaBb, the genotypes AaBB : AaBb : Aabb : aabb will be obtained in the following ratio **[BHU 1994]**
   (A) 1 : 1 : 1 : 1
   (B) 1 : 2 : 1 : 0
   (C) 0 : 3 : 1 : 0
   (D) 1 : 1 : 1 : 0

21. A cross between a homozygous recessive and a heterozygous plant is called **[BHU 1995; MH CET 2003]**
(A) monohybrid cross
(B) dihybrid cross
(C) test cross
(D) back cross

22. In hybridization, Tt × tt give rise to the progeny of ratio **[CBSE PMT 1999; RPMT 1999; BVP 2000; Pb. PMT 2000; BHU 2003]**
(A) 1 : 1
(B) 1 : 2
(C) 2 : 1
(D) 1 : 2: 1

1.2 Deviations from Mendelian ratios

23. Incomplete dominance is found in **[MP PMT 2001]**
(A) *Pisum sativum*
(B) *Antirrhinum majus*
(C) both (A) and (B)
(D) None of these

24. Phenotypic ratio in plant Snapdragon in F_2 is **[AMU 2010]**
(A) 1:1 (B) 2:1
(C) 3:1 (D) 1:2:1

25. Complete dominance is absent in **[JIPMER 2002]**
(A) *Pisum sativum*
(B) *Mirabilis jalapa*
(C) *Lathyrus odoratus*
(D) *Oenothera lamarckiana*

26. When dominant and recessive alleles express themselves together, it is called **[CBSE PMT 2001]**
(A) dominance
(B) co-dominance
(C) amphidominance
(D) pseudodominance

27. Alleles which show independent effect are called **[CBSE PMT 1996]**
(A) supplementary alleles
(B) co-dominant alleles
(C) epistatic alleles
(D) complementary alleles

28. In shorthorn cattle, genes for red colour coat are (r_1) and white colour coat are (r_2). Crosses between red (r_1r_1) and white (r_2r_2) produced (r_1r_2) roan. This is an example of **[BHU 2003]**
(A) complementary genes
(B) epistasis
(C) codominance
(D) incomplete dominance

29. Which of the following genotypes does not produce a sugar polymer on the surface of the RBC? **[Kerala PMT 2010]**
(A) I^AI^B (B) I^AI^A
(C) I^Ai (D) ii

30. ABO blood grouping is controlled by gene I which has three alleles and show co-dominance. There are six genotypes. How many phenotypes in all are possible? **[CBSE PMT 2010]**
(A) six (B) Three
(C) Four (D) Five

31. If two persons with 'AB' blood group marry and have sufficiently large number of children, these children could be classified as 'A' blood group : 'AB' blood group : 'B' blood group in 1 : 2 : 1 ratio. Modern technique of protein electrophoresis reveals presence of both 'A' and 'B' type proteins in 'AB' blood group individuals. This is an example of **[NEET 2013]**
(A) Codominance
(B) Incomplete dominance
(C) Partial dominance
(D) Complete dominance

32. A couple, both carriers for the gene sickle cell anaemia planning to get married, want to know the chances of having anaemic progeny ? **[MH CET 2014]**
(A) 100% (B) 75%
(C) 50% (D) 25%

33. Which of the following pair of feature is a good example of polygenic inheritance? **[AIIMS 2008]**
(A) Human height and skin colour
(B) ABO blood group in humans and flower colour of *Mirabilis jalapa*
(C) Hair pigment of mouse and tongue rolling in humans
(D) Human eye colour and sickle cell anaemia.

34. The total number of types of gametes produced in a cross between a negro and albino parent is **[MH CET 2014]**
(A) 64 (B) 16
(C) 08 (D) 04

Miscellaneous

35. Mendel enunciated **[MP PMT 1995, 98]**
(A) two principles of inheritance
(B) three principles of inheritance
(C) four principles of inheritance
(D) five principles of inheritance

36. A tall plant was grown in nutrient deficient soil and remained dwarf. When it is crossed with dwarf plant then **[DPMT 2007]**
(A) all hybrid plants are dwarf
(B) all hybrid plants are tall
(C) 50% tall and 50% dwarf
(D) 75% tall and 25% dwarf

37. A male rabbit of genotype '***AABBDDEE***' is crossed with a female rabbit of genotype '***aabbddee***' to produce F_1 hybrid offspring. How many genetically different gametes can be produced by this F_1 hybrid? **[WB JEEM 2015]**
(A) 4 (B) 8
(C) 16 (D) 32

38. How many pairs of contrasting characters in pea plants were studied by Mendel in his experiments? **[AIPMT 2015]**
(A) Five
(B) Six
(C) Eight
(D) Seven

39. Multiple alleles are present **[AIPMT 2015]**
(A) on different chromosomes.
(B) at different loci on the same chromosome.
(C) at the same locus of the chromosome.
(D) on non-sister chromatids.

40. Alleles are **[AIPMT 2015]**
(A) different phenotype.
(B) true breeding homozygotes.
(C) different molecular forms of a gene.
(D) heterozygotes.

41. A man with blood group 'A' marries a woman with blood group 'B'. What are all the possible blood groups of their offsprings? **[AIPMT 2015]**
(A) A and B only
(B) A, B and AB only
(C) A, B, AB and O
(D) O only

42. In the first step of Monohybrid cross experiment, Mendel selected pea plants which were **[MH CET 2015]**
(A) pure tall as male and pure dwarf as female.
(B) pure tall as female and pure dwarf as male.
(C) heterozygous tall as male and pure dwarf as female.
(D) heterozygous tall as female and pure dwarf as male.

43. In a cross between red kernelled and white kernelled varieties of wheat showing polygenic inheritance, the phenotypic ratio in F_2 generation will be **[MH CET 2015]**
(A) 1 : 6 : 15 : 20 : 15 : 6 : 1
(B) 1 : 4 : 6 : 4 : 1
(C) 1 : 2 : 1
(D) 2 : 1

44. Human skin colour is an example of **[MH CET 2015]**
(A) Intragenic interaction
(B) Interallelic interaction
(C) Quantitative inheritance
(D) Pleiotropy

45. How many types of gametes will be produced by an individual having genotype AaBbcc? **[MH CET 2015]**
(A) four
(B) three
(C) two
(D) one

Answers Key

Classical Thinking

1. (B)	2. (A)	3. (D)	4. (B)	5. (B)	6. (B)	7. (C)	8. (A)	9. (A)	10. (D)
11. (B)	12. (B)	13. (B)	14. (D)	15. (B)	16. (D)	17. (C)	18. (B)	19. (D)	20. (D)
21. (A)	22. (B)	23. (B)	24. (B)	25. (B)	26. (C)	27. (C)	28. (A)	29. (D)	30. (B)
31. (A)	32. (A)	33. (D)	34. (B)	35. (A)	36. (C)	37. (A)	38. (B)	39. (C)	40. (D)
41. (C)	42. (C)	43. (D)	44. (A)	45. (A)	46. (B)	47. (B)	48. (C)	49. (A)	50. (B)
51. (C)	52. (D)	53. (D)	54. (B)	55. (C)	56. (C)	57. (B)	58. (B)	59. (A)	60. (B)
61. (D)	62. (C)	63. (C)	64. (D)	65. (B)	66. (C)	67. (A)	68. (C)	69. (A)	70. (D)
71. (A)	72. (B)	73. (C)	74. (A)	75. (C)	76. (B)	77. (B)	78. (A)	79. (D)	80. (B)
81. (B)	82. (A)	83. (C)	84. (C)	85. (D)	86. (C)	87. (D)	88. (C)	89. (B)	90. (D)
91. (D)	92. (C)	93. (B)	94. (B)	95. (A)	96. (B)	97. (D)	98. (B)	99. (C)	100. (C)
101. (B)	102. (B)	103. (D)	104. (C)	105. (C)	106. (A)	107. (B)	108. (A)	109. (C)	110. (C)
111. (C)	112. (A)	113. (B)	114. (D)	115. (A)	116. (C)				

Critical Thinking

1. (B)	2. (A)	3. (A)	4. (B)	5. (B)	6. (A)	7. (B)	8. (C)	9. (A)	10. (D)
11. (B)	12. (D)	13. (C)	14. (A)	15. (A)	16. (B)	17. (C)	18. (A)	19. (D)	20. (C)
21. (B)	22. (A)	23. (B)	24. (A)	25. (C)	26. (A)	27. (B)	28. (C)	29. (B)	30. (C)
31. (A)	32. (A)	33. (A)	34. (C)	35. (B)	36. (C)	37. (A)	38. (B)	39. (A)	40. (B)
41. (D)	42. (D)	43. (B)	44. (D)	45. (A)	46. (B)	47. (B)	48. (D)	49. (C)	50. (B)
51. (C)	52. (D)	53. (B)	54. (A)	55. (C)	56. (A)	57. (C)			

Competitive Thinking

1. (A)	2. (D)	3. (D)	4. (A)	5. (B)	6. (C)	7. (A)	8. (A)	9. (C)	10. (C)
11. (C)	12. (D)	13. (B)	14. (A)	15. (B)	16. (A)	17. (C)	18. (B)	19. (A)	20. (B)
21. (C)	22. (A)	23. (B)	24. (D)	25. (B)	26. (B)	27. (B)	28. (C)	29. (D)	30. (C)
31. (A)	32. (D)	33. (A)	34. (C)	35. (B)	36. (B)	37. (C)	38. (D)	39. (C)	40. (C)
41. (C)	42. (B)	43. (B)	44. (C)	45. (A)					

Hints

Classical Thinking

4. Morgan gave the function of chromosomes in transmitting heredity. Johannsen coined the term 'gene'. Karl Correns explained incomplete dominance.

7. Theophrastus – Father of botany
Stephen Hales – Father of physiology
Aristotle – Father of biology

13. Mendel was sent to University of Vienna for higher studies in physics, mathematics and natural sciences.

16. Mendel published his findings in 1866 in the journal "Annual Proceedings of Natural History Society".

17. In the year 1900, Hugo De Vries, Karl Correns and Erich Tschermark independently rediscovered the research carried out by Mendel, his experiments on heredity and variations and laid the basis of modern genetics.

18. Sutton (1902) showed importance of reduction division and proposed chromosomal theory of heredity. Boveri (1888) described centriole.

Lederberg and Tatum discovered conjugation in bacteria (1944). Morgan (1933) gave the function of chromosomes in transmission of heredity.

19. Mendel's work was re-discovered by Hugo De Vries (Holland), Correns (Germany) and Tschermark (Austria).

20. Mendel observed many variable characters in pea plant like short life span so that he could study more generations in a short duration. Pea plant produced many seeds, so he could grow thousands of pea plants. There were no intermediate characters. Large flowers would help in easy hybridization.

21. *Lathyrus odoratus* is sweet pea. *Mangifera indica* is mango and *Solanum tuberosum* is potato.

23. Out of the 7 pairs of characters, wrinkled or round character was restricted to seeds and not to the leaves. Mendel did not consider any leaf character.

25. Gene is a particular segment of DNA which is responsible for the inheritance and expression of a particular character.

26. The characters that Mendel chose for experiments were passed down to next generations. Mendel suggested that these characters are governed by factors, which are passed on to next generations. These hereditary factors are now known as genes.

29. Alleles, the abbreviated form of term allelomorphs indicates alternative forms of the same gene.

31. Karyotype is the physical appearance of chromosomal set of an organism as seen in metaphase. Morphology is the study of form and structure of organisms without consideration of function .

32. Genotype designates the genetic make–up or genetic constitution of an organism.

34. Heterozygous is a condition, where one of the genes of an allelic pair is dominant and the other is recessive, i.e. heterozygous, it indicates a pair of dissimilar alleles.

35. A polyploid organism has more than the normal diploid number of chromosomes. A mutant is an organism which shows a sudden genetic change due to a natural or induced mutation. Variant is deviation in characters in an individual from the group to which it belongs or deviation in characters of the offspring from those of its parents.

36. The 1st generation obtained from crossing two parents is called as first filial generation or F_1 generation.

39. Punnet Square (British geneticist, R.C. Punnet,1927) is a checkerboard used to show the result of a cross between two organisms.

45. Pea flower shows diadelphous condition of stamens, where stamens are arranged to form two bundles of 9 fused stamens and 1 free stamen.

49. Mendel thought that reappearance of dwarfness may be due to female dominance, i.e. tall plants were females and dwarf plants were male. So, he performed the reciprocal cross.

55. Homozygous tall : TT
Homozygous dwarf : tt
P generation : TT × tt
Gametes : T t
F_1 generation : Tt
(Heterozygous tall)

56. The dominant trait is expressed in F_1 generation.
P generation : RR(Red) × rr (white)
Gametes : R r
F_1 generation: Rr
(Heterozygous red flower)

57. The three genotypes – TT (pure tall), Tt (hybrid tall) and tt (dwarf).

58. Only one progeny will receive recessive trait and therefore it is dwarf (tt).

62. In some cases, there is incomplete dominance or no dominance. Law of dominance could not support such cases. Hence, it is not universally acceptable.

63. Mendel's first law is the law of dominance. Law of independent assortment is the third law. Epistasis is a drawback in Mendel's studies, where intergenic suppression of characters is observed.

71. The two parental combinations were yellow round and green wrinkled. The two new combinations were yellow wrinkled and green round.

74. In Mendel's experiments of inheritance, the progeny was systematically shown in the checker board or Punnet's square.

76. Parents : YYRR × yyrr

(yellow round) (green wrinkled)

Gametes : YR yr

F_1 generation : YyRr
(Yellow Round)

77. **Phenotypic ratio** Yellow round : Yellow wrinkled : Green round : Green wrinkled
9 : 3 : 3 : 1

78. Parent : Yellow Round × green wrinkled
YYRR yyrr

Gametes : YR yr

F_1 generation : YyRr
Yellow round

Selfing of F_1 generation to get F_2 generation.

F_2 generation:

	YR	**Yr**	**yR**	**yr**
YR	YYRR	YYRr	YyRR	YyRr
Yr	YYRr	YYrr	YyRr	Yyrr
yR	YyRR	YyRr	yyRR	yyRr
yr	YyRr	Yyrr	yyRr	yyrr

Phenotypic ratio:

Yellow round : Yellow wrinkled : Green round : Green wrinkled
9 : 3 : 3 : 1

Genotypic ratio:

YYRR : YYRr : YyRR : YyRr : YYrr : Yyrr : yyRR : yyRr : yyrr
1 : 2 : 2 : 4 : 1 : 2 : 1 : 2 : 1

86. When F_1 hybrid is crossed with homozygous recessive parents, it is called a test cross.

88. The cross between F_1 hybrid (Aa) with homozygous dominant (AA) is a back cross.

92. The offsprings Rr are pink due to partial expression of both alleles, i.e. incomplete dominance.

93. P generation : RR (Red) × rr (white)

Gametes : R × r

F_1 generation: Rr (all pink)

F_2 generation:

	R	**r**
R	RR (Red)	Rr (Pink)
r	Rr (Pink)	rr (white)

∴ 1 Red : 2 Pink : 1 White

95. More than two alternative forms (alleles) of a gene in a population occupying the same locus on a chromosome or its homologue are known as multiple alleles.

96. vg^{ni} = Nicked wings
vg^{no} = Notched wings
vg = Vestigial wings

98. The three alleles of ABO blood group – I^A, I^B and i. In this, I^A and I^B are co-dominant.

99. When a single gene controls two or more different traits, it is called pleiotropic genes and the inheritance is called pleiotropic inheritance.

100. **Pleiotropy:** Influencing more than one trait by a single gene.
Haemophilia: A metabolic disorder characterized by free bleeding from slight wound due to lack of formation of clotting substances. It is sex-linked recessive gene.
Sickle cell anaemia: It is a hereditary disease caused by a recessive mutant gene that controls haemoglobin structure, usually lethal in homozygotes.
Thalassemia: It is a group of hereditary haemolytic anemias.
Colour blindness: It is a sex-linked disease.

107. Parents : Red kernels AABB × White kernels aabb

Gametes : (AB) (ab)

F_1 generation : AaBb

F_1 generation : Intermediate red

Selfing of F_1 generation : AaBb × AaBb

Gametes : (AB) (Ab) (aB) (ab) × (AB) (Ab) (aB) (ab)

F_2 generation :

	AB	Ab	aB	ab
AB	AABB ●●●●	AABb ●●●○	AaBB ●●●○	AaBb ●●○○
Ab	AABb ●●●○	AAbb ●●○○	AaBb ●●○○	Aabb ●○○○
aB	AaBB ●●●○	AaBb ●●○○	aaBB ●●○○	aaBb ●○○○
ab	AaBb ●●○○	Aabb ●○○○	aaBb ●○○○	aabb ○○○○

●●●● Darkest Red ●●●○ Medium red ●●○○ Intermediate red ●○○○ Light red ○○○○ White

Phenotypic ratio : 1 : 4 : 6 : 4 : 1

110. Hugo De Vries and Karl Correns rediscovered the Mendel's work.

111. Skin colour in humans is controlled by three pairs of genes: Aa, Bb, Cc

112. The phenotypes are
- Pure black (negro)
- Black (less dark than negro parent)
- Lesser black or brown
- Mulatto (intermediate – sanwla)
- Fair
- Very fair
- Pure white (albino)

113. The genotype of negro = AABBCC
The genotype of albino = aabbcc

114. Genetics is the branch of science that is concerned or deals with the phenomenon of heredity and variation. Cytohistology is the study of structure and life processes of cells and their components along with cellular details of a tissue or organ. Embryology is the study of development of embryo. Cytology is the study of cells.

115. The peculiar characteristic of pea flower is papilionaceous corolla, i.e. butterfly like, having five petals.

Critical Thinking

1. Yellow round = 9
Yellow wrinkled = 3
Green round = 3
Green wrinkled = 1
From above,
   i. Yellow coloured seeds = 9 + 3 = 12
   Green coloured seeds = 3 + 1 = 4
   ∴ Yellow : Green = 12:4 = 3:1
   ii. Similarly,
   Round seeds = 9 + 3 = 12
   Wrinkled seeds = 3 + 1 = 4
   ∴ Round wrinkled = 12:4 = 3:1

2. Alleles are various forms of a gene or Mendelian factors, which occur on the same locus on homologous chromosomes and control the same trait (e.g. Tallness and dwarfness in Pea).

4. When a gene expresses itself fully and codes for a complete functional polypeptide irrespective of the presence or absence of a recessive gene, is called as a dominant gene.

5. In F_1 generation, only dominant characters are expressed by dominant genes, whereas recessive genes and their expressions are suppressed.

7. 'Tt' and 'Rr' are the two pairs of heterozygous alleles.

8. A pure line is the organism which is homozygous for a particular character.

9. Mutants are organisms which are produced due to mutations. F_2 is the second filial generation. P is parental generation.

12. Hybridisation is a process in which plants belonging to different species are artificially cross pollinated. The important step in this is emasculation, which means removal of anthers or stamens before anthesis to prevent self–pollination in bisexual flowers.

14. The character which is expressed in F_1 generation is dominant and the recessive character is suppressed in F_1 generation.

17. Rr × Rr

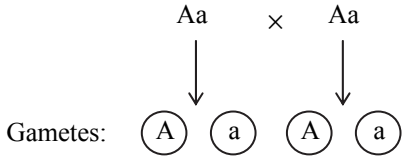
	R	**r**
R	RR tall	Rr tall
r	Rr tall	rr dwarf

18. When a homozygous dominant (AA) is crossed with homozygous recessive (aa) in F_1 generation heterozygous dominant (Aa) is obtained which does not resemble any of the parents genotypically.

19. The phenotypes obtained from growing 190 grains of Jowar are 140 tall and 50 dwarf. This approximately equal to 3 : 1 ratio. Hence, this will be F_2 generation and there will be 3 genotypes and two phenotypes. The genotypes will be homozygous tall, heterozygous tall and homozygous dwarf, i.e. TT, Tt, tt respectively.

20. In F_2 generation, both the dominant and recessive characters are expressed and hence it will show both the types of flowers.

21. Axillary position (A) is dominant over terminal (a) position. When Aa × Aa is crossed, we get 3 : 1 ratio, i.e. three axillary flower and one terminal.



	A	**a**
A	AA	Aa
a	Aa	aa

3 Axillary : 1 terminal

22. When homozygous dominant parent (TT) crossed with heterozygous parent (Tt), the offspring produced is of same phenotype as that of parents.

	T	**T**
T	TT	TT
t	Tt	Tt

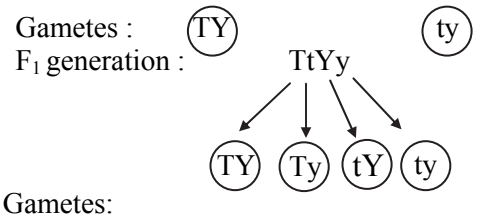
Hence, the percentage of offsprings with different phenotype is '0'.

23. Plant heterozygous for tallness has two alleles, one governing tallness and other governing dwarfness. This plant will produce two types of gametes during gamete formation because of segregation. The gametes produced are T and t. Hence, the possibility of 't' gamete fertilizing either 'T' or 't' is $\frac{1}{2}$, i.e. 50 %.

24. The law of segregation states that when a pair of allelomorphs are brought together in the F_1 hybrid they co-exist or remain together in the hybrid without blending or in any way contaminating each other and they separate completely and remain pure during the formation of gametes.

25. The four phenotypes: Tall round, Tall wrinkled, Dwarf round, Dwarf wrinkled.

26. Parents : TTYY (Tall Yellow) × ttyy (Dwarf green)



Gametes:

F_2 generation:

	TY	**Ty**	**tY**	**ty**
TY	TTYY	TTYy	TtYY	TtYy
Ty	TTYy	TTyy	TtYy	Ttyy
tY	TtYY	TtYy	ttYY	ttYy
ty	TtYy	Ttyy	ttYy	ttyy

There is only one double recessive plant = ttyy

27. The single homozygous plants are YYRr (2), YyRR (2), Yyrr (2) and yyRr (2).

28. Phenotype of TtRr, TTRR and TtRR is Tall Round, but phenotype of Ttrr is tall wrinkled.

29. The dihybrid phenotypic ratio is 9 : 3 : 3 : 1.
9 – Tall yellow
3 – Tall green
3 – Dwarf yellow
1 – Dwarf green
∴ If there are 36 tall and green plants there will be 36 dwarf yellow, 12 dwarf green and 108 tall yellow plants. Thus the total number of progeny will be 192.

30. When a plant heterozygous for tallness and yellow colour are selfed, they will produce F_2 generation with 16 different genotypes. Out of these, only one will be homozygous recessive genotype. Hence, the ratio of pure homozygous dwarf and green is 1 : 16.

31. Parents : TTRR × ttrr
↓
F_1 generation : TtRr
F_2 generation : TtRr × TtRr
Gametes : (TR) (Tr) (tR) (tr) ×
(TR) (Tr) (tR) (tr)

	TR	**Tr**	**tR**	**tr**
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTRr	**TTrr**	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

∴ In F_2 generation, TTrr is 1/16.

32. Four double heterozygous individuals (AaBb) are formed in a typical Mendelian dihybrid cross.

33. When the F_1 dihybrid is crossed with a recessive plant, it is called dihybrid test cross.

Parents: Yellow Round Yy Rr × Green Wrinkled yy rr
↓ ↓
Gametes : (YR) (Yr) (yR) (yr) × (yr)

	YR	**Yr**	**yR**	**yr**
yr	YyRr	Yyrr	yyRr	yyrr

1 : 1 : 1 : 1
Yellow Round : Yellow Wrinkled : Green round : Green wrinkled

34. The ratio given is → 9: 3: 3: 1 (56.25 : 18.75 : 18.75 : 6.25)
This ratio occurs due to the F_1 hybrid which is heterozygous for both the genes, i.e. TtRr.

35. The eight gametes produced will be – ABC, ABc, AbC, Abc, aBC, aBc, abC, abc

36. A cross between yellow round and green wrinkled pure line plants, yields all yellow round plants in F_1 generation as this character is dominant. No recessive character is expressed in F_1 plants so, the number of yellow wrinkled plants produced is 0.

37. In AABBCC, there is no heterozygous allele. So, only one type of gamete can be formed.

39. Law of independent assortment can also be stated as "If the inheritance of more than one pair of characters (two pairs or more) is studied simultaneously, the factors or genes for each pair of characters assort independently of the other pairs".
In the example given above, the two allelomorphic pairs for characters – blood group and colour of hair are taken into consideration, which can be expressed by Law of Independent Assortment.

40. The law of independent assortment is applicable only for the traits which are located on different chromosomes.

41. When F_1 offsprings are crossed with recessive parent it is called as test cross and it produces recessive and dominant in equal proportion and hence used to distinguish between homozygous or heterozygous dominant characters.

42. Parents: Tt × tt
Gametes : (T) (t) (t) (t)

	T	**t**
t	Tt	tt
t	Tt	tt

Equal number of tall and dwarf plants are produced.

44. In Mendelian inheritance, the F_2 offsprings are obtained by self-pollination in the F_1 hybrids. But, the F_1 hybrids can be crossed with either of the two parents. Such a cross between offspring and parents is known as back cross.

45. The genotype of pure inflated pod variety = II
The genotype of pure constricted pod variety = ii
The cross will be;
Parents : II × ii
Gametes: (I) (i)
F_1 generation : Ii
(F_1 hybrid)
Ii × II
(F_1 hybrid) (pure inflated)
Gametes: (I) (i) (I) (I)
II II Ii Ii
(All inflated pods)

46. The gametes produced by parents YyRr will be YR, Yr, yR, yr. Hence, the percentage of yr will be 25.

47. This is a dihybrid test cross, so the tall pea plant with red flowers has to be TtRr, i.e. heterozygous.

TtRr × ttrr
(Tall Red) (dwarf white)
Gametes: (TR) (Tr) (tR) (tr) × (tr)

	TR	**Tr**	**tR**	**tr**
tr	TtRr	Ttrr	ttRr	ttrr

49. Parents: Red White
RR rr
Gametes : (R) (r)
F_1 generation: Rr
(All pink)
F_2 generation:

	R	**r**
R	RR (Red)	Rr (Pink)
r	Rr (Pink)	rr (white)

Phenotypic ratio: Red : Pink : White
1 : 2 : 1
Genotypic ratio: RR : Rr : rr
1 : 2 : 1

50. RR (Red) × WW (White)
Gametes : (R) (W)
F_1 generation: RW (Roan)
F_2 generation: RW × RW

	R	**W**
R	RR (red)	RW (roan)
W	RW (roan)	WW (white)

Phenotypic ratio: 1 Red : 2 Roan : 1 White
Genotypic ratio : RR : RW : WW
1 : 2 : 1

51. The homozygous and heterozygous genotypic condition for blood group A will be I^AI^A and I^Ai respectively.

52. Three types of progenies which result from marriage between sickle-cell carriers are one normal, two sickle-cell carriers and one sickle-cell anaemic. The one sickle-cell anaemic dies leaving behind one normal and two sickle-cell carriers. Hence, the ratio is 1 : 2.

54. The disease sickle-cell anaemia is caused by a gene Hb^S which is recessive. A marriage between two carriers of sickle-cell anaemia (Hb^A Hb^S) will produce – normal children with genotype (Hb^AHb^A), sickle cell carriers with genotype (Hb^AHb^S) and sickle-cell anaemic with genotype Hb^SHb^S. Sickle-cell anaemic dies leaving behind carriers and normal. Thus, the gene for sickle-cell anaemia (recessive gene) is lethal in homozygous condition.

55. Genotype of albino person is aabbcc (pure white, melanin is not produced at all).

56. Whenever any organism consisting of two contrasting alleles of a gene or trait, the one which expresses itself phenotypically is known as dominant, whereas other allele or trait which fails to express itself is recessive. On the basis of his experiments, Mendel formulated this law of dominance when a pair of contrasting characters were crossed.

57. The ratio produced is 9 : 3 : 3 : 1 which is also called the "dihybrid" ratio. Therefore, the genotype of the parents should be RrTt. (i.e. heterozygous for both the genes.)

Competitive Thinking

1. Heredity is the transmission of genetic characters from parents to the offspring.

2. Law of dominance, law of segregation and law of independent assortment come under Mendel's laws of inheritance.

7. The homozygote is pure for the character and breeds true, i.e. it gives rise to offsprings having the same character on self-breeding. e.g. TT or tt.

8. Heterozygous is not pure and is called hybrid. Heterozygote does not breed true on self fertilization. e.g. Tt.

9. Recessive character will be expressed only in presence of recessive alleles. A dominant allele will not allow the expression of a recessive allele.

10. Parents: RR × rr
(red) (white)
Gametes: (R) × (r)

F_1 generation: Rr
F_2 generation:

	R	**r**
R	RR	Rr
r	Rr	rr

∴ 3 red coloured (RR, Rr, Rr): 1 White coloured (rr)

11. 1 : 2 : 1; one homozygous dominant, two heterozygous dominant and one homozygous recessive.

12. Tt × TT
(F_1 hybrid) (homozygous dominant)

	T	**T**
T	TT	TT
t	Tt	Tt

No recessive combination is obtained.

13. Parents: RR × rr
Gametes: (R) (r)
F_1 generation: Rr
F_2 generation: Rr × Rr

	R	**r**
R	RR	Rr
r	Rr	rr

∴ Red : white = 3 : 1

14. Parents : Rr (Hybrid red) × RR (Pure red)

Gametes: (R) (r) × (R) (R)

RR RR Rr Rr
(All red)

15. 50; because after selfing of Rr, 2 homozygous and 2 heterozygous individuals are formed in F_2 generation.

	R	**r**
R	RR	Rr
r	Rr	rr

17. Law of segregation is universally applicable.

18. The nine different genotypes obtained from dihybrid cross between – Yellow round (YYRR) and green wrinkled (yyrr) are YYRR, YYRr, YyRR, YyRr, YYrr, Yyrr, yyRR, yyRr and yyrr.

19. RrYy is a dihybrid, so four types of gametes are formed – RY, Ry, rY, ry

20. AABb × aaBb

	AB	**Ab**
aB	AaBB	AaBb
ab	AaBb	Aabb

∴ AaBB : AaBb : Aabb : aabb
1 : 2 : 1 : 0

25. *Mirabilis jalapa* shows incomplete dominance.

26. Codominance is a condition in which both members of an allelic pair contribute to phenotype. In cattles, the cross between red and white produces roan offspring whose coat consist of both red and white hair.

27. In codominance, both the genes of an allelomorphic pair express themselves equally and independently in F_1 hybrids. In co-dominance, the phenotypic and genotypic ratio is identical, i.e. 1: 2 : 1

29. The allele I^A and I^B produce a sugar and allele i does not produce any sugar.

30. The six genotypes are -I^A I^A or I^Ai, $I^B I^B$ or I^Bi, $I^A I^B$, ii.

The four phenotypes are – A, B, AB, O.

31. In Co-dominance, both alleles of a gene pair in heterozygote are fully expressed, with neither one being dominant or recessive to the other. Allele I^A and I^B when present together in AB blood group, express their own type of sugar on the surface of RBC. Thus, it is an example of Co-dominance.

32. A marriage between two carriers of sickle cell anaemia will produce normal, carrier and anaemic progeny in 1:2:1 ratio.

33. Human characters such as height, skin showing gradations (continous variations) in expression. These characters are determined by two or more gene pairs and they have additive or cumulative effect. These genes are called cumulative genes or polygenes or multiple factors.

34. The F_1 generation has mullatoes with 8 types of gametes. The genetic combination is AaBbCc. As there are three pairs of heterozygous alleles, it will form 8 types of gametes.

35. Mendel enunciated three major principles of inheritance, i.e. Law of dominance, law of segregation and law of independent assortment.

37. P : ♂ AABBDDEE X ♀ aabbddee
↓
F_1 : AaBbDdEe
Types of gametes formed = 2^n
(tetrahybrid)$2^4 = 2\times2\times2\times2 = 16$ gametes

41.

Possible genotype of man with blood group A	×	Possible genotype of woman with blood group B
$I^A I^A$, $I^A I^O$	×	$I^B I^B$, $I^B I^O$
If the genotype is $I^A I^O$	×	$I^B I^O$

The possible blood groups can be A, B, AB and O.

45. Genotype → AaBbcc
No. of gametes produced = 2^n (n = no. of heterozygous alleles)
Here, n = 2 (Aa, Bb)
∴ No. of gametes produced = $2^2 = 4$
(ABc, Abc, aBc, abc)

Evaluation Test

1. The percentage of 'ab' gametes produced by 'AaBb' parent will be
   (A) 50% (B) 25%
   (C) 12.5% (D) 75%

2. Match the column I with column II and select the correct option.

	Column I		Column II
a.	Incomplete dominance	i.	Unexpressed
b.	Roan coat colour of cattle	ii.	Dihybrid cross
c.	Recessive allele	iii.	1 : 2 : 1
d.	Tall red × Dwarf white	iv.	Co-dominance
		v.	Expressed

   (A) a – iii, b – ii, c – v, d – iv
   (B) a – iii, b – iv, c – i, d – ii
   (C) a – v, b – ii, c – i, d – iv
   (D) a – ii, b – iv, c – v, d – iii

3. Dwarf plants of F_2 population of monohybrid cross
   (A) breed true for dwarfness
   (B) breed true for tallness
   (C) segregate into 3 tall and 1 dwarf
   (D) show incomplete dominance

4. In peas, if 50% of the offsprings are short and 50% are tall, the probable genotypes of the parents are
   (A) Tt × Tt
   (B) TT × tt
   (C) Tt × tt
   (D) tt × tt

5. In which of the following cross do $3/4^{th}$ of the offsprings appear dominant?
   (A) Tt × Tt
   (B) TT × Tt
   (C) TT × tt
   (D) Tt × tt

6. When Mendel selfed F_1 generation, he obtained 1064 seeds. In F_2 generation, out of 1064 seeds, _____ were tall and _____ were dwarf.
   (A) 882, 299 (B) 787, 277
   (C) 787, 277 (D) 651, 207

7. Which of the following statements are true about dihybrid?
   (i) It is homozygous for two traits.
   (ii) It is heterozygous for two traits.
   (iii) It is produced in a cross between two pure parents differing in two pairs of contrasting characters.
   (iv) It is produced in a cross between two pure parents differing in one pair of contrasting characters.
   (A) (i) and (ii) are true
   (B) (ii) and (iii) are true
   (C) (iii) and (iv) are true
   (D) (i) and (iv) are true

8. When Mendel performed dihybrid cross by crossing yellow round seed of pea plant with green wrinkled seed of pea plant, what result did he obtained in F_2 generation?
   (A) All yellow round seeds.
   (B) 75% yellow round and 25% green wrinkled seeds.
   (C) Yellow round, yellow wrinkled, green round, green wrinkled seeds.
   (D) All green wrinkled seeds.

9. During a cross between yellow round (YYRR) and green wrinkled (yyrr), which of the following statement is true?
   (i) A gamete which receives 'Y' for colour, may receive 'R' or 'r' for shape.
   (ii) A gamete which receives 'Y' for colour will receive only 'R' for shape.
   (iii) A gamete which receives 'y' for colour may receive 'R' or 'r' for shape.
   (iv) A gamete which receives 'y' for colour will receive only 'r' for shape.
   (A) (i) and (iii) are true
   (B) (i), (ii) are true
   (C) (i), (ii), (iii) and (iv) are true
   (D) only (iv) is true

10. Find out the wrong statement.
    (A) Test cross ratio is 1:1
    (B) Test cross is a back cross.
    (C) Back cross is always a test cross.
    (D) Test cross is done between F_1 hybrid and homozygous recessive parent.

11. Carina is
    (A) outermost two petals of pea flower.
    (B) the innermost two petals that are appressed together.
    (C) a boat shaped structure of petals.
    (D) both (B) and (C)

12. What is not true about alleles?
    (A) Two or more alternative forms of gene are called alleles or allelomorphs.
    (B) Round and wrinkled form of genes are alleles of each other.
    (C) Alleles occupy same loci on homologous chromosomes.
    (D) Only recessive allele express in hybrids.

13. F_2 progeny of monohybrid cross shows
    (A) two phenotypes and two genotypes.
    (B) two phenotypes and three genotypes.
    (C) two genotypes and three phenotypes.
    (D) one phenotype and two genotypes.

14. When a heterozygous pea plant with inflated pods is crossed with a plant with homozygous constricted pods, the offspring are
    (A) 75% inflated 25% constricted
    (B) all inflated
    (C) 50% inflated 50% constricted
    (D) all constricted

15. Mendel's laws of inheritance are applicable in
    (A) plants raised through tissue culture.
    (B) only sexually reproducing plants.
    (C) only on garden plants.
    (D) both sexually as well as apomictic plants.

Answers to Evaluation Test

1.	(B)	2.	(B)	3.	(A)	4.	(C)
5.	(A)	6.	(C)	7.	(B)	8.	(C)
9.	(A)	10.	(C)	11.	(D)	12.	(D)
13.	(B)	14.	(C)	15.	(B)		