

Chapter 5 Principles of Inheritance and Variation

1. When 'Aa' is crossed with 'aa', (A is dominant over a)

- (a) all the offspring will have dominant phenotype.
 - (b) all the offspring will have recessive phenotype.
 - (c) 50% of offspring will have dominant phenotype and 50% will have recessive phenotype.
 - (d) 75% of offspring will have dominant phenotype and 50% will have recessive phenotype.
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2. A heterozygous violet-flowered pea plant is crossed to another homozygous violet-flowered pea plant. What percent of the progeny plants will have the recessive trait, i.e., white flowers?

- (a) 0%
 - (b) 25%
 - (c) 50%
 - (d) 75%
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3. From a cross AABb x aaBb, the genotypes AaBB : AaBb : Aabb will be obtained in the ratio

- (a) 1:1:2
 - (b) 1:2:1
 - (c) 2:1:1
 - (d) 2:1:2
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4. The possibility of all genotypes of offspring in a genetic cross is calculated by a graphical representation which was developed by

- (a) Komberg
 - (b) T.H. Morgan
 - (c) Gregor Mendel
 - (d) Reginald Punnett
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5. A woman with normal vision has a colorblind father. She marries a colourblind man. What proportion of their children will be colourblind?

- (a) 0%
 - (b) 25%
 - (c) 50%
 - (d) 100%
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6. Study the pedigree chart given

Select the correct option about the conclusion.

- (a) It is a sex-linked recessive trait.
 - (b) It is an autosomal recessive trait.
 - (c) It is an autosomal dominant trait.
 - (d) It is a sex-linked dominant trait.
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7. Mother and father of a person with 'O' blood group have 'A' and 'B' blood group respectively. What would be the genotype of both mother and father? [NCERT Exemplar]

- (a) Mother is homozygous for 'A' blood group and father is heterozygous for 'B'.
 - (b) Mother is heterozygous for 'A' blood group and father is homozygous for 'B'.
 - (c) Both mother and father are heterozygous for 'A' and 'B' blood group, respectively.
 - (d) Both mother and father are homozygous for 'A' and 'B' blood group, respectively.
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8. The inheritance pattern of a gene over generations among humans is studied by the pedigree analysis. Character studied in the pedigree analysis is equivalent to: [NCERT Exemplar]

- (a) Quantitative trait.
 - (b) Mendelian trait.
 - (c) Polygenic trait.
 - (d) Maternal trait.
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9. Occasionally, a single gene may express more than one effect. The phenomenon is called: [NCERT Exemplar]

- (a) multiple allelism
 - (b) mosaicism
 - (c) pleiotropy
 - (d) polygeny.
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10. Conditions of a karyotype $2n \pm 1$ and $2n \pm 2$ are called: [NCERT Exemplar]

- (a) Aneuploidy
 - (b) Polyploidy
 - (c) Allopolyploidy
 - (d) Monosomy.
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11. If a genetic disease is transferred from a phenotypically normal but carrier female to only some of the male progeny, the disease is: [NCERT Exemplar]

- (a) Autosomal dominant
 - (b) Autosomal recessive
 - (c) Sex-linked dominant
 - (d) Sex-linked recessive.
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12. In a dihybrid cross, if you get 9:3:3:1 ratio it denotes that: [NCERT Exemplar]

- (a) The alleles of two genes are interacting with each other.
 - (b) It is a multigenic inheritance.
 - (c) It is a case of multiple allelism.
 - (d) The alleles of two genes are segregating independently.
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13. In sickle cell anaemia glutamic acid is '» replaced by valine. Which one of the following triplets codes for valine? [NCERT Exemplar]

- (a) G G G
- (b) A A G

(c) G A A

(d) G U G

14. Which of the following traits studied by Mendel in garden pea is a dominant trait?

(a) Terminal flowers.

(b) Inflated pod.

(c) Green colour of seed.

(d) Yellow colour of pod.

15. If a haemophilic woman marries a normal man,

(a) all their children will be normal.

(b) all their sons will be haemophilic.

(c) all their daughters will be haemophilic.

(d) 50% sons and 50% daughters will be haemophilic.

16. Trisomy of 21 st chromosome in a male, leads to _____ syndrome.

17. Sex chromosome complement of a female bird is _____ .

18. If three children in a family have blood groups O, AB and A, the genotypes of the parents must be _____ and _____ .

19. Mendel's law of _____ explains the expression of only one form of the trait in F₂ hybrid.

20. XO chromosomal abnormality in humans _____ causes syndrome.

21. _____ was the first to observe the X-chromosome in a few insects.

22. The physical association between two genes on a chromosome, is termed as _____ by Morgan.

23. Female heterogamety is observed in _____

24. Cystic fibrosis and haemophilia are examples of disorders.

25. In sickle-cell anaemia, the amino acid, glutamic acid is substituted by _____ in the beta chain of haemoglobin.

26. Match the items in Column I with those in Column II.

Column I	Column II
A. ABO blood group in humans.	1. Polygenic inheritance.
B. Flower colour snapdragon.	2. Mendelian genetic disorder.
C. Human skin colour.	3. Sex-linked Mendelian disorder
D. Phenyl – ketonuria.	4. Incomplete dominance
	5. Multiple allelism.

27. Match the sex-chromosome complements in Column I with the male/female organisms in Column II.

Column I	Column II
A. XO	1. Human male
B. XX	2. Male bird
C. XY	3. Male grasshopper
D. ZZ	4. Female Drosophila
	5. Female bird

28. The recessive trait appears only under homozygous condition. [True/False]

29. The phenotype of the F₁ hybrid resembles the dominant parent, when there is incomplete dominance. [True/False]

30. The cross between the F₁ hybrid with a homozygous dominant individual, is called a test cross. [True/False]

31. Mendel could not have framed the law of independent assortment, if the genes he had studied, showed linkage. [True/False]

32. 9:3 :3 :1 is the genotypic ratio of a Mendelian dihybrid cross. [True/False]

Directions (Q33 to Q35): Mark the odd one in each of the following groups.

33. Phenyl ketonuria, Sickle-cell anaemia, Cystic fibrosis, Colourblindness

34. Inflated pods, Terminal flowers, Yellow seeds, Green pods (all in garden pea).

35. Turner's syndrome, Klinefelter's syndrome, Down's syndrome, Haemophilia.

36. Define inheritance.

37. What is genetics?

38. What are true-breeding lines that are used to study inheritance pattern of traits in plants? [Delhi 2014]

39. List any two characters of pea plants used by Mendel in his experiments, other than height of the plant and colour of the seed. [Delhi 2017C]

40. Name two contrasting pod-related traits studied by Mendel, in pea plant experiments. [AI 2011C]

41. Mention two contrasting flower-related traits studied by Mendel in pea plant experiments. [AI 2011C]

42. Mention any two contrasting traits with respect to seeds in pea plants that were studied by Mendel. [AI 2014]

43. What is the proof for or what indicates that the characters Mendel studied did not show blending? [HOTS]

44. What is meant by blending inheritance?

45. State a difference between a gene and an allele. [Delhi 2016]

46. What is meant by genotype?

47. What is phenotype?

48. Mention the type of allele which expresses itself only in homozygous condition in an organism. [Foreign 2011]

49. What is a monohybrid cross?

50. Why is a plant with genotype Tt referred to as heterozygous? [HOTS]

51. State the fate of a pair of autosomes during gamete formation. [Delhi 2017]

52. British geneticist R.C. Punnett developed a graphical representation of a genetic cross called 'Punnett Square'. Mention the possible result this representation predicts of the genetic cross carried. [Delhi 2019]

53. Write the percentage of the pea plants that would be homozygous recessive in the F_2 generation, when tall F_1 heterozygous pea plants are selfed. [Delhi 2012C]

54. Write the percentage of the pea plants that would be heterozygous tall in the F_2 generation, when the tall heterozygous F_1 pea plants are selfed. [Delhi 2012C]

55. Write the percentage of F_2 homozygous and heterozygous populations in a typical monohybrid cross. [Foreign 2010]

56. When a tall pea plant was self-pollinated, one-fourth of the progeny were dwarf. Give the genotype of the parent and the dwarf progenies. [HOTS]

57. A garden pea plant
(A) produced inflated, yellow pods and another plant
(B) of the same species produced constricted, green pods. Identify the dominant traits. [Delhi 2012]

58. A garden pea plant produced axial violet flowers. Another of the same species produced terminal violet flowers. Identify the dominant traits. [AI2012]

59. A garden pea plant produced round, green seeds. Another of the same species produced wrinkled, yellow seeds. Identify the dominant traits. [Foreign 2012]

60. Write the possible genotypes Mendel got, when he crossed F_1 tall pea plant with a dwarf pea plant. [Foreign 2012; HOTS]

61. Mendel observed two kinds of ratios, 3 : 1 and 1 : 2 : 1, in the F_2 generation in his experiments on garden pea. Name these two ratios respectively.

62. Name the type of cross that would help to find the genotype of a pea plant bearing violet flowers. [AI 2017]

63. In a test cross progeny of pea plants, all were bearing violet flowers. Give the genotypes of the parent pea plants. [AI 2012 C; HOTS]

64. Why in a test cross, did Mendel cross a tall pea plant with a dwarf pea plant only? [Foreign 2012; HOTS]
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65. A cross was carried out between two pea plants showing the contrasting traits of height of the plant. The result of the cross showed 50% of parental characters. Name the type of cross. [CBSE Sample Paper 2018]
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66. Name and state the law of Mendel, which explains the expression of only one of the parental characters in the F₂ progeny of a monohybrid cross. [HOTS]
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67. Which law of inheritance of Mendel, is universally acceptable without any exception? State the law. [CBSE Sample Paper 2010; HOTS]
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68. Name the type of inheritance in which the genotypic ratio is the same as the phenotypic ratio. Also give the ratio.
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69. Name any one plant and its feature that shows the phenomenon of incomplete dominance.
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70. Give an example of a plant, where the F₂ progeny of a monohybrid cross has the same genotypic and phenotypic ratios. [Delhi 2016C]
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71. Name the respective pattern of inheritance, where F₁ phenotype
(a) does not resemble either of the two parents and is in between the two;
(b) resembles only one of the two parents. [AI 2012]
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72. Write the technical term used in human ABO blood groups for I^A, I^B and i. [Delhi 2016C]
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73. The gene I that controls the ABO blood grouping in human beings, has three alleles, I^A, I^B and i.
(a) How many different genotypes are likely to be present in the human population?
(b) Also, how many phenotypes are possibly present? [CBSE Sample Paper 2016]
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74. Write the codominant alleles in the ABO blood group characteristic of humans.
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75. How many kinds of phenotypes would you expect in the F₂ generation in a monohybrid cross, exhibiting codominance? [Delhi 2014]
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76. Multiple allelism can be investigated only in populations. Justify. [HOTS]
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77. How is pleiotropy exemplified in *Drosophila*?

78. What is a dihybrid cross?

79. AaBb was crossed with aabb. What would be the phenotypic ratio of the progeny? Mention the term used to denote this kind of cross. [CBSE Sample Paper 2010]

80. A geneticist interested in studying variations and patterns of inheritance in living beings prefers to choose organisms for experiments with shorter life cycle. Provide a reason. [Delhi 2015]

81. Define linkage.

82. In a dihybrid cross carried out by T.H. Morgan in *Drosophila*, the F_2 ratio deviated from that of Mendel's dihybrid F_2 ratio. Give a reason. [AI 2016C]

Or

Why do certain genes tend to be inherited together in a cell at the time of cell division? [HOTS]

Or

If the frequency of a parental form is higher than 25% in a dihybrid test cross, what does that indicate about the two genes involved? [HOTS]

83. Morgan et al found that even on the same chromosome, recombination between some gene pairs was higher than that between some other gene pairs. Give reason for this observation.

84. If two genes are located far apart from each other, on a chromosome, how will the frequency of recombination get affected? [CBSE Sample Paper 2017,15]

85. Mention any two traits present on the X-chromosome of *Drosophila*.

86. Mention the contribution of genetic maps in human genome project. [AI 2011]

87. Do you think Mendel's laws of inheritance would have been different if the characters he chose were located on the same chromosome? Why? [HOTS]

88. Give an example of a polygenic trait in humans. [Delhi 2016C]

89. Who suggested polygenic inheritance for the first time?

90. Give two examples of polygenic inheritances from plants.

91. Write the phenotypic ratio of the F₂ progeny of a cross, involving polygenic trait controlled by three separate genes.

92. On what basis is skin colour in humans considered polygenic? [AI 2015C]

93. Who first observed the X-chromosome? What was it called then?

94. What are autosomes?

95. Why is X-chromosome called sex chromosome?

96. Give an example where

(a) males are XO and

(b) females are ZW.

97. Theeggofan animal contains 10 chromosomes, of which one is X-chromosome. How many autosomes would there be, in the karyotype of this animal? [HOTS]

98. Give an example of an organism that exhibits haplodiploid sex determination system. [AI 2016C]

99. In a certain group of insects, some have 17 chromosomes and some have 18 chromosomes. Write about the gender of these two types of insects.

100. How many chromosomes do drones of honeybee possess? Name the type of cell division involved in the production of sperms by them. [AI 2015]