



CBSE NCERT Based Chapter wise Questions (2025-2026)

Class-XII

Subject: Biology

Chapter Name : *Principles of Inheritance and Variation* (Chap : 4)

Total : 9 Marks (expected) [MCQ-(2)-2 Mark, A/R(1)-1 Marks, SA (1)-2 Mark, CBQ (1)-4 Marks]

Level - 1

I. MCQ (One correct Answer)

1. Which of the following is an example of polygenic inheritance?
- (A) Skin colour in humans (B) Flower colour in *Mirabilis jalapa*
(C) Production of male honey bee (D) Pod shape in garden pea

[Hints : Polygenic inheritance in humans]

2. Test cross involves—
- (A) Crossing between two genotypes with dominant traits
(B) Crossing between two genotypes with recessive traits
(C) Crossing between two F1 hybrids
(D) Crossing the F1 hybrid with a double recessive genotype.

[Hints : Mechanism of test cross]

3. Inheritance of skin colour in humans is an example of
- (A) Point mutation (B) Polygenic inheritance
(C) Co dominance (D) Chromosomal aberration

[Hints : See deviation from Mendel's Laws]

4. Distance between the genes and percentage of recombination shows—
- (A) a direct relationship (B) an inverse relationship (C) a parallel relationship (D) no relationship

[Hints : Linkage]

5. If a plant heterozygous for tallness is selfed, the F₂ generation has both tall and dwarf plants. It proves the principle of—
- (A) dominance (B) segregation (C) independence (D) incomplete dominance

[Hints : Monohybrid cross]

6. A cross between two tall plants resulted in offspring having few dwarf plants. What would be the genotypes of both the parents?
- (A) TT and Tt (B) Tt and Tt (C) TT and TT (D) Tt and tt

[Hints : Monohybrid cross]

7. Which of the following will not result in variations among siblings?
- (A) Independent assortment of genes (B) Crossing over
(C) Linkage (D) Mutation

[Hints : Linkage and recombination]

8. ZZ/ZW type of sex determination is seen in

- Ⓐ Platypus Ⓑ snails Ⓒ cockroach Ⓓ peacock

9. When a single gene expresses more than one effect, the phenomenon is called—

- Ⓐ multiple allelism Ⓑ mosaicism Ⓒ pleiotropy Ⓓ polygeny

10. Which of the following represents a pair of contrasting characters?

- Ⓐ Allele Ⓑ Phenotype Ⓒ Homozygous Ⓓ Heterozygous

[Hints : Definitions/Key words of genetics]

II. Assertion (A) and Reason (R). Of the two statements, mark the correct answer from the options given below:

- A) Both A and R are true and R is the correct explanation of A.
 B) Both A and R are true but R is not the correct explanation of A.
 C) A is true but R is false.
 D) A is false but R is true.

11. **Assertion (A) :** The law of independent assortment can be studied through dihybrid cross.

Reason (R) : Only those genes show independent assortment which are linked

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

[Hints : Linkage, dihybrid cross]

12. **Assertion (A) :** Mendel successfully conducted his hybridisation experiments.

Reason (R) : Garden pea was an ideal experimental material.

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

[Hints : Reasons for Mendel's success]

13. **Assertion (A) :** In a monohybrid cross, only dominant characters exhibit themselves in the F₁ generation.

Reason (R) : Dominant trait is expressed only in heterozygous condition.

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

[Hint : Law of Dominance, genotypes of F₁ and F₂ generations]

14. **Assertion (A) :** Sickle cell anaemia is an autosome linked recessive disorder

Reason (R) : It appears only in human males, which can be transferred to their grandsons through carrier daughter.

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

[Hints : Mendelian disorders]

15. **Assertion (A) :** People with Down's syndrome have short stature with small round head.

Reason (R) : Down's syndrome is a Chromosomal disorder.

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

[Hints : Chromosomal disorders]

III. Short Answer Questions

16. Write one difference between gene and allele.

[Hints : Basic terms used in genetics]

17. Name the respective patterns of inheritance where F1 phenotype

- (a) does not resemble either of the two parents
- (b) resembles only one of the two parents.

[Hints : Monohybrid cross]

18. A garden pea plant (A) produced inflated yellow pod, and another plant (B) of the same species produced constricted green pods. Identify the dominant traits and give a reason for your answer.

[Hints : Monohybrid cross]

19. A garden pea plant produced round green seeds. Another of the same species, produced wrinkled yellow seeds. Identify the dominant traits with a suitable reason.

[Hints : Dihybrid cross]

20. Write the types of sex determination mechanisms of the crosses given below. Give an example of each type

- (a) Female XX with male XO
- (b) Female ZW with male ZZ

[Hints : Sex determination in animals, except humans]

21. Name a human genetic disorder due to the following:

- (a) An additional X-chromosome in a male
- (b) Deletion of one X-chromosome in a female

[Hints : Chromosomal disorders]

22. Why do normal red blood cells become sickle shaped in a person suffering from sickle cell anaemia?

[Hints : Point mutation]

23. During a monohybrid cross involving a tall pea plant with a dwarf pea plant, the offspring were all tall and dwarf in equal ratio. How is it possible?

[Hints : Take parental genotypes as Tt and tt]

24. Mendel crossed plants that bred true for yellow seeds with plants that bred true for green seeds. Work out the inheritance involved in this cross by using symbols for the traits.

[Hints : Take parental genotypes as YY and yy]

25. In a typical monohybrid cross, the F2 population ratio is written as 3 : 1 for phenotype but expressed as 1 : 2 : 1 for genotype. Explain.

[Hints : Phenotypic and genotypic ratio of F2 generation of monohybrid cross]

26. What is a test cross? How can it decipher the heterozygosity of a plant?

[Hints : Why Mendel performed test cross]

27. With the help of an example, explain the phenomenon of co-dominance and multiple allelism in humans.

[Hints : Blood groups in humans]

28. Explain pleiotropy with an example.

29. Why are human females rarely haemophilic? How do haemophilic patients suffer?

[Hints : Inheritance of haemophilia]

30. A mutation in chromosome 11 leads to serious disorder in man. Name the disorder. How do these people suffer?

[Hints : B-thalassemia]

Long Answer Questions

31. A colour blind man marries a woman with normal vision, whose father was colour blind. Work out a cross to show the genotype of the couple and their respective sons.

[Hints : Take genotype of parents as $X^C Y$ and XX^C]

32. How is the inheritance pattern of flower colour in Snapdragon different from Mendelian inheritance? Explain.

[Hints : Explain incomplete dominance in Snapdragon and complete dominance in Mendelian inheritance with the help of a cross, in both cases.]

33. Differentiate between dominance, codominance and incomplete dominance, with an example of each.
34. A red eyed heterozygous female fruit fly is crossed with a red eyed male. Work out all possible genotypes and phenotypes of the progeny. Comment on the pattern of inheritance of eye colour in fruit fly.

[Hints : Red eyed female \times Red eyed male]

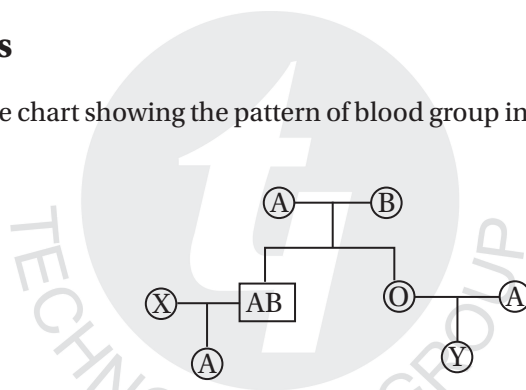


35. Explain how does trisomy of 21st chromosome occur in humans. List any four characteristic features in an individual suffering from it.

[Hints : Down's syndrome]

Case-Based Questions

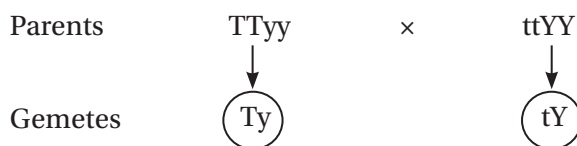
36. Study the given pedigree chart showing the pattern of blood group inheritance in a family. Answer the questions that follow.



- Structure genotype of the
 - parents
 - Individual X in the second generation
- What will be the possible blood groups of the individual Y in the third generation?
- How does the inheritance of this blood group happen in the family?

[Hint: Pedigree analysis]

37. A homozygous tall pea plant with green seeds is crossed with a dwarf pea plant with yellow seeds.



- What will be the phenotype of the F₁ individuals?
- What will be the genotype of the F₁ individuals?
- Work out the phenotypic ratio of the F₂ generation with the help of a Punnett Square.

[Hint: See Mendel's classical dihybrid cross with $RRYY$ and $rryy$]

Case Based Questions

38. Read the given passage and answer the following question:

Colour blindness is a sex linked recessive disorder. It results in defect in either red or/and green cone of eye, resulting in failure to discriminate between red and green colour.

- (i) State the cause of colour blindness.
- (ii) Why is colour blindness called a Mendelian disorder?
- (iii) 8% of human males are colour blind, whereas only 0.4% of human females are colour blind. Why is it so?

[Hint: Parents— $XX^C \times XY$ $X^C X \times X^C Y$

39. A cross is carried out between heterozygous father (of blood group B) and heterozygous mother (of blood group A) to get four children with different blood groups.

	Father	Mother
Parents	$I^B i$	$I^A i$

- (i) What will be the gametes produced by the parents?
- (ii) Work out the cross upto the F1 generation.
- (iii) Write the different phenotypes of the blood groups obtained in the F1 generation.

[Hint: F1 progenies will be $I^A I^B$, $I^B i$, $I^A i$, ii]

40. A true breeding pea plant homozygous for axial violet flowers is crossed with another pea plant with terminal white flowers.

- (i) What would be the genotype and phenotype of the F2 generation?
- (ii) Give the phenotypic ratio of the F2 generation.
- (iii) List the Mendel's generalisations that can be derived from the cross.

[Hint: Take parental genotypes as AAVV and aavv]

ANSWER

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