



Attempt questions first; check the separate key afterward. Show all working. Draw accurate figures where required.

A. Very short answers - 1 mark each

1. Name the basic unit of heredity.
2. Distinguish a gene and an allele.
3. What is the phenotype of Tt when T denotes dominant tallness?
4. State its genotype and whether it is homozygous.
5. Cross TT with tt. What are all F₁ genotypes?
6. What is their phenotype if T is dominant?
7. Cross Tt with Tt. State the genotypic ratio.
8. State the phenotypic ratio.

B. Short answers / practice - 2 marks each

9. What fraction of a Tt×tt cross is expected to be dwarf?
10. Draw the Punnett square and state both genotypes.
11. How many chromosome pairs are normally present in human body cells?
12. How many chromosomes are normally present in a gamete?
13. What are the usual human female sex chromosomes?
14. What are the usual human male sex chromosomes?
15. Which parent contributes X or Y sperm in the usual XX-XY system?
16. Explain why blaming the mother for a child's sex is scientifically wrong.
17. Can an acquired scar generally be inherited genetically?
18. Distinguish acquired and inherited traits with examples.
19. A Tt×Tt cross produces 400 offspring. How many dwarf plants are expected?
20. Must the observed count be exactly 100?

C. Application / reasoning - 3 marks each

21. State the expected phenotypic ratio for a standard dihybrid F₂ cross with independent assortment.

22. List gamete types from RrYy.
23. A recessive trait appears in a child of two unaffected carriers. Is this possible?
24. Demonstrate using Aa×Aa.
25. Does dominant mean more common in a population?
26. Explain dominance without equating it with strength or usefulness.
27. Cross Aa with AA. State expected offspring genotypes and ratio.
28. In Aa×Aa, what fraction of offspring are expected to be heterozygous?
29. Explain why recessive traits can reappear in F₂ despite being absent in F₁.
30. In the usual human XX-XY system, what is the approximate probability of an XX child per conception?
31. A monohybrid cross gives an expected 3:1 phenotype ratio. Among 240 offspring, find expected dominant and recessive counts.
32. In a test cross Aa×aa, what is the chance of a dominant phenotype?
33. Explain how a test cross can help determine an unknown genotype.
34. If independent events have probabilities 1/2 and 1/2, find probability of both.
35. Describe Mendel's monohybrid experiment, F₁/F₂ results and inference about segregation.

ANSWER KEY - Numerical / closed questions

- 1) Gene. 3) Tall. 4) Tt; heterozygous. 5) Tt. 6) Tall. 7) 1TT:2Tt:1tt. 8) 3 tall:1 dwarf. 9) 1/2. 10) Tt:tt=1:1. 11) 23. 12) 23. 13) XX. 14) XY. 15) Father. 17) No. 19) 100. 20) No; probabilistic expectation. 21) 9:3:3:1. 22) RY, Ry, rY, ry. 23) Yes. 24) aa probability 1/4. 25) No. 27) AA:Aa=1:1. 28) 1/2. 30) 1/2. 31) 180,60. 32) 1/2. 34) 1/4.