



A Charutar Vidya Mandal's Institution
V.P. & R.P.T.P. SCIENCE COLLEGE
 (AUTONOMOUS) (Grant-in-Aid)
 Affiliated to Sardar Patel University
 VALLABH VIDYANAGAR-388120



Bachelor of Science (Semester- IV) External Examination –MARCH- 2026
US04MABOT02: GENETICS AND BIOINFORMATICS.

Date: 25-03-2026, WEDNESDAY

Time: 01:45 PM to 04:15 PM (2.5 hrs)

Total marks: 50

Que-1 MCQ

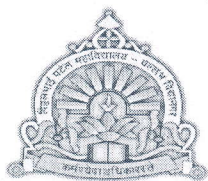
(10)

- Which organism is frequently used as a model system in plant genetics for its small genome and short life cycle?
 - Zea mays* (Maize)
 - Arabidopsis thaliana*
 - Neurospora crassa*
 - Chlamydomonas reinhardtii*
- In a case of incomplete dominance, what is the expected phenotypic ratio of the F₂ generation?
 - 3:1
 - 9:3:3:1
 - 1:2:1
 - 1:1
- The phenomenon where a single gene influences multiple, seemingly unrelated phenotypic traits is known as:
 - Epistasis
 - Polygenic inheritance
 - Pleiotropy
 - Codominance
- Cytoplasmic inheritance of plastids in *Mirabilis jalapa* (Four o'clock plant) is primarily determined by the phenotype of:
 - The pollen grain
 - The ovule
 - Both parents equally
 - The environment
- The study of the entire set of proteins expressed by a genome is a branch of bioinformatics known as:
 - Genomics
 - Proteomics
 - Transcriptomics
 - Phylogenetics
- A cross between F₁ individual and its homozygous recessive parent is known as a:
 - Back cross
 - Test cross
 - Reciprocal cross
 - Monohybrid cross
- What is the term for an interaction where one gene masks or modifies the expression of another non-allelic gene?
 - Dominance
 - Epistasis
 - Pleiotropy
 - Polygenic inheritance
- The frequency of crossing over between two genes is directly proportional to:
 - The size of the chromosome
 - The distance between the genes
 - The age of the organism
 - The number of mitochondria
- Coiling of the shell in the snail *Limnaea peregra* is determined by:
 - The genotype of the snail itself
 - The environment
 - The genotype of the mother
 - The phenotype of the father
- A database that contains curated data derived from the analysis of primary sequences is called a:
 - Primary database
 - Secondary database
 - Composite database
 - Literature database

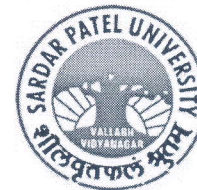


No of printed pages: 02

Seat No.:



A Charutar Vidya Mandal's Institution
V.P. & R.P.T.P. SCIENCE COLLEGE
(AUTONOMOUS) (Grant-in-Aid)
Affiliated to Sardar Patel University
VALLABH VIDYANAGAR-388120



Que-2 Compare and contrast the life cycles of Bacteriophage and *E. coli*. Explain why organisms (10)
like *Arabidopsis thaliana* and *Neurospora* are preferred in genetic research.

OR

Que-2 Define the various branches of genetics. Discuss the modern applications of genetics. (10)

Que-3 Define and explain Epistasis and Polygenic Inheritance with suitable examples. How do these phenomena differ from simple Mendelian inheritance? (10)

OR

Que-3 Define Epistasis. Using suitable genetic crosses, explain the difference between (12:3:1) and (9:3:4) ratios. (10)

Que-4 Provide a detailed account of the Mechanism of Crossing Over. Describe the four main stages and Explain the genetic significance of this process in creating recombinants. (10)

OR

Que-4 Define Linkage and explain the concept of Linkage Groups. Discuss the historical experiments of T.H. Morgan on *Drosophila melanogaster* that proved genes do not always assort independently. Distinguish between Complete and Incomplete Linkage. (10)

Que-5 Provide an in-depth classification of Biological Databases. Distinguish between Primary, Secondary, and Composite databases with at least two examples of each. Discuss the importance of Database Retrieval Systems in accessing this data. (10)

OR

Que-5 What is bioinformatics? Discuss its multidisciplinary approach, Branches, History, Aim, Scope and Research areas and applications of bioinformatics. (10)

