



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) Internal Examination - 2026
US04MABOT02 : SUBJECT NAME: GENETICS AND BIOINFORMATICS

Date: 9/03/26, MONDAY

Time: 2:45 PM TO 4:15 PM

Total marks : 30

Note: Figures to the right indicate marks of the question.

Q-1 Write the most appropriate answer from the following multiple-choice questions. [06]

- 1 The "One Gene, One Enzyme" hypothesis was formulated using which organism?
 (a) *E. coli* (b) *Neurospora crassa*
 (c) *Arabidopsis thaliana* (d) Bacteriophage
- 2 Which organism is known as the "fruit fly of the plant world" due to its small genome and rapid life cycle?
 (a) *Saccharomyces cerevisiae* (b) *Arabidopsis thaliana*
 (c) *Chlamydomonas* (d) *Zea mays*
- 3 In a monohybrid cross between two heterozygous (Aa) individuals, what is the expected phenotypic ratio?
 (a) 1:2:1 (b) 9:3:3:1
 (c) 3:1 (d) 1:1
- 4 A cross between a red flower and a white flower produces all pink offspring. This is an example of:
 (a) Codominance (b) Epistasis
 (c) Pleiotropy (d) Incomplete Dominance
- 5 During which stage of Prophase I does the actual exchange of genetic material (Crossing Over) occur?
 (a) Zygotene (b) Pachytene
 (c) Diplotene (d) Leptotene
- 6 Which of the following is considered a multidisciplinary component of Bioinformatics?
 (a) Computer Science (b) Statistics
 (c) Molecular Biology (d) All of these

Q-2 Compare the life cycles and genetic significance of Maize (*Zea mays*) and *Arabidopsis thaliana*. Why is *Arabidopsis* referred to as the "Drosophila of the plant world"? [06]

OR

Q-2 What features make an organism suitable for genetic research? Compare the advantages of using Prokaryotes (like *E. coli*) versus Eukaryotes (like *Arabidopsis*) in laboratory studies. [06]

Q-3 Define and discuss Mendel's Laws of Inheritance. Explain why his work remained unrecognized for 34 years and how it was eventually rediscovered. [06]

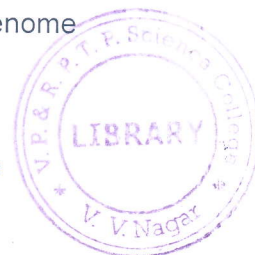
OR

Q-3 What is Epistasis? Explain Dominant and Recessive Epistasis with appropriate genetic crosses and phenotypic ratios. [06]

Q-4 Define Linkage. Discuss the various kinds of linkage (Complete and Incomplete) and explain the factors that affect the strength of linkage. [06]

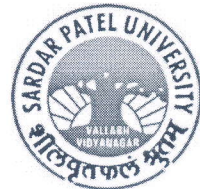
OR

Q-4 Explain the phenomenon of maternal effects using the shell coiling pattern in the [06]





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



snail *Limnaea peregra* as a model.

Q-5 Provide a detailed classification of biological databases. Differentiate [06]
between Primary, Secondary, and Composite databases with two examples of each.

OR

Q-5 Define Bioinformatics. Discuss its multidisciplinary nature, scope, and its flourishing [06]
status in the Indian biotechnology sector.





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

BSC (Semester-4) Quiz - 2026

US04MABOT02 : GENETICS AND BIOINFORMATICS



Date: 9/3/26 ,MONDAY

Time: Maximum 20 minutes

Total marks :15

Q-1 Fill in the blanks with appropriate answer given in the bracket.

[08]

- (i) The phenotypic ratio of a Mendelian dihybrid cross is (9:3:3:1/1:1:1:1).
- (ii) When one gene masks the expression of another gene at a different locus, it is known as ____ (Epistasis/Codominance)
- (iii) The number of linkage groups in an organism is equal to its(Haploid/diploid) chromosome number.
- (iv) Crossing over occurs during the (Pachytene/Diplotene) stage of Prophase I in meiosis.
- (v) A virus that infects and replicates within a bacterium is called a (Bacteriophage/TMV).
- (vi) The "Father of Genetics" is (Mendel/Morgan).
- (vii) GenBank is an example of a (primary/secondary)biological database.
- (viii) Fasta/File is the most commonly used file format for representing biological sequences.

Q-2 Whether the following statement is true or false. Write your answer in the box

[07]

- (i) In a test cross, an individual with an unknown genotype is crossed with a homozygous dominant individual. []
- (ii) DNA is the genetic material in all known viruses. []
- (iii) Crossing over occurs between sister chromatids of the same chromosome. []
- (iv) Humans have 23 linkage groups in a somatic cell of a female. []
- (v) *Arabidopsis thaliana* is widely used in genetics because it has a very large and complex genome. []
- (vi) *Escherichia coli* (E. coli) is a common model for studying eukaryotic RNA processing. []
- (vii) The "One Gene-One Enzyme" hypothesis was formulated by Watson and Crick. []