

17 DEC 2022

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc. II (Semester : III)
Subject: Biotechnology
Paper Title: Genomics and Proteomics
Paper Code: BTH5301
2019 Pattern (4 Credits)

[Time: 3 Hours]

[Max. Marks : 50]

Instructions to the candidates:

- All questions are compulsory.
- Neat diagrams must be drawn wherever necessary.
- Figures to the right side indicate full marks.

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|-----------|--|-----------------------|------------------------|
| Q1) | Answer the following questions (Any Five).
a) Define transcriptomics.
b) Show schematically 'ICAT'.
c) What is PRIDE?
d) Enlist the ion generation methods in MS.
e) What is IEF? Give its application in proteomics.
f) How PMF is useful in proteomics? | Two Marks Each | 10 M |
| Q2) | Answer the following questions
a) Describe the strategies applied in proteomics.
b) MS has changed the field of proteomics. True/False. Justify. | | 9 M
5M
4M |
| OR | | | |
| Q3) | Answer the following questions
a) Explain how microarrays are useful in transcriptome studies.
b) What is investigative genomics? Write a note on SAGE. | | 9 M
5M
4M |
| Q4) | Answer the following questions
a) What is physical mapping? Name the three methods used for it.
b) What are the merits and demerits of transcriptomics?
c) Enlist <i>in vitro</i> , <i>in vivo</i> and <i>in silico</i> (3 each) methods of proteomics.
d) Explain role of molecular phylogeny in proteomics. | | 9M
5M
4M |
| OR | | | |
| Q5) | Answer the following questions (Any two)
a) Discuss the chromatographic technique to isolate proteins that interact with protein of interest.
b) Enlist protein separation methods and describe any one of them. | | 8 M
5M
4M |
| Q6) | Answer the following questions (Any one)
a) How the limitations of bacterial cultivation techniques can be overcome by genomics approach?
b) How will you identify protein of your interest from a mixture?
c) Give role of pharmacogenomics in the field of personalized medicine. | | 5 M
5M
4M |
| | a) Explain the importance of bioinformatics tools in transcriptomics.
b) Design an experiment to study <i>E. coli</i> proteome under antibiotic stress. | | |

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc.-II (Semester : III) 2019 Pattern (4 Credits)
Subject: Biotechnology
Paper Code: BTH 5302

Paper Title: Stem Cell Biology, Regenerative Medicine and Applied Biotechnology

[Time: 3 Hours]

[Max. Marks : 50]

Instructions to the candidates:

- All questions are compulsory.
- Neat diagrams must be drawn wherever necessary.
- Figures to the right side indicate full marks.

- Q1) **Explain the term (Any Five).** **Two Marks Each** **10 M**
- a) Adult Stem Cell
 - b) Multipotency
 - c) Bioink in tissue engineering
 - d) Transient gene expression
 - e) Biologic
 - f) Self-renewal
- Q2) **Answer the following questions** **9 M**
- a) Write a note on different types of stem cells and their key characteristics **5M**
 - b) Describe any one method of stem cell separation **4M**
- OR**
- c) Write a note on source selection for stem cell culture **5M**
 - d) What are the advantages of embryonic stem cells over adult stem cells/ **4M**
- Q3) **Answer the following questions (Any three)** **9 M**
- a) Write the salient feature of media used to culture stem cells
 - b) Write a note on growth properties of adult and embryonic stem cells
 - c) What is teratoma assay and its need in stem cell culture?
 - d) Elaborate the term stem cell niche
- Q4) **Answer the following questions** **9 M**
- a) Write a note on use of stem cell technology in pharmaceuticals **5M**
 - b) Elaborate any one stem cell based immunotherapy method **4M**
- OR**
- c) Write a note on scaffoldless 3D culture **5M**
 - d) Add a note on different applications of tissue engineering **4M**
- Q5) **Answer the following questions (Any two)** **8 M**
- a) Write a note on iPSc reprogramming
 - b) Challenges in use of stem cells in regenerative medicine
 - c) Concept of artificial meat
- Q6) **Answer the following questions (Any one)** **5 M**
- a) Explain appropriate method of targeted gene insertion in stem cells. Add a note on its application in stem cell biology
 - b) Elaborate with appropriate example how a mouse model can be used to study neurodegenerative disorders

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
F.Y. B.Sc. (Semester: I)
Subject: Biotechnology
Paper Title: Animal Science-I
Paper Code: BTH1104
2019 Pattern (2 Credits)

[Time: 2.5 Hours]

[Max. Marks : 50]

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1)

Answer the following questions (Any Five).

- 1) Mention four important differences between chordates and non-chordates.
- 2) Describe two types of movements in honey bees and their significance.
- 3) Mention some organisms which can regenerate.
- 4) Mention how Amoebiasis can be treated.

10 M

2M

2M

2M

2M

- 5) Diagrammatically explain a true coelom.

- 6) Write some important features of mollusks.

2M

2M

Q2)

Answer the following questions (Any Four).

- 1) Draw the diagram of regeneration in *Planaria*.
- 2) How can you classify honey bees on the basis of their size?
- 3) Explain the erythrocytic phase of Plasmodium lifecycle.
- 4) Draw a Langstroth Hive and label its parts.
- 5) Write a note on structural adaptations in parasites.

12 M

3M

3M

3M

3M

3M

Answer the following questions.

- 1) Why are model organisms important? Explain.
- 2) Describe any five animal model organisms.

9 M

5M

4M

OR

- 1) Outline the considerations for choosing an animal for its economic manipulation.
- 2) Describe the process flow for the production of any animal product.

5M

Answer the following questions (Any Two).

- 1) Mention three important criteria for animal classification with suitable examples.
- 2) Write a note on aquaculture.
- 3) Differentiate between the queen and the worker bee.

4M

6 M

3M

3M

3M

Q4)

Q5)

Answer the following questions

- 1) What features of *Drosophila melanogaster* make it an efficient model organism? **8 M**
- 2) Explain any study carried out using fruit flies. **4M**

OR

- 1) Describe the steps and considerations while establishing apiculture. **4M**
- 2) Explain any four products of apiculture and their significance for honey bees and humans. **4M**

Q6)

Answer the following questions (Any One)

- 1) Describe the ecological and economic importance of arthropods. **5 M**
- 2) Illustrate the lifecycle of *Taenia solium*. **5 M**

5 M

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University

M.Sc. I (Semester : 1)

Subject: Biotechnology

Paper Title: Developmental Biology and Human Population Genetics

Paper Code: BTH 4104

2019 Pattern (4 Credits)

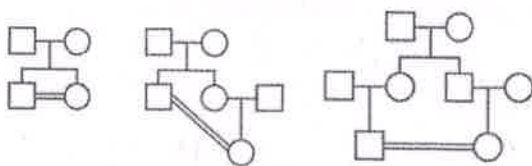
[Time: 3 Hours]

[Max. Marks : 50]

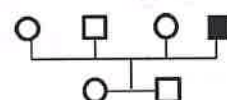
Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

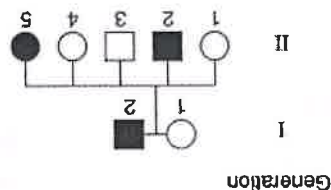
- Q1) Answer the following questions (Any Five) Two Marks Each 10 M**
- a) What is calcium wave and its consequences in the egg? 2M
 - b) What techniques can be used to study developmental genes? 2M
 - c) Describe the key event in week 3 of human embryonal development. 2M
 - d) What is fast block to polyspermy? 2M
 - e) A male affected with an X-linked dominant trait will have what proportion of offspring affected with the trait? 2M
 - f) Describe G banding. Explain the nomenclature for the chromosome position proximal p21.1 2M
- Q2) Answer the following questions. Nine Marks Each 9 M**
- a) Describe the organogenesis of the vertebrate eye. 5M
 - b) Briefly describe four early developmental abnormalities. 4M
- OR**
- c) Write a note on implantation of mammalian embryo. 5M
 - d) Describe in detail the changes which occur during sperm capacitation. 4M
- Q3) Answer the following questions (Any Three) Three Marks Each 9 M**
- a) Describe the significance of cell junctions in animal development. 3M
 - b) Explain early brain development. 3M
 - c) Write a note on changes during egg metabolic activation. 3M
 - d) Comment on the use of cell transplantation approaches in understanding animal development. 3M
- Q4) Answer the following questions Nine Marks Each 9M**
- a) What is consanguinity and inbreeding? What are the advantages and disadvantages of inbreeding in a population? Write down the coefficient of relationship (R) and inbreeding (I) for the following consanguineous marriages 5M



- b) Explain the three kinds of sex-linked inheritance patterns with examples. Which sex linked inheritance pattern best describes the following pedigree? 4M

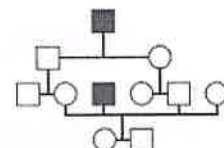


- c) Consider the following pedigree, in which the allele responsible for the trait (a) is recessive to the normal allele (A)



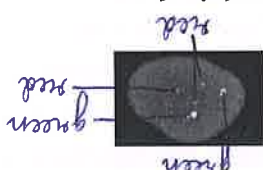
- A. What is the genotype of the mother?
 B. What is the genotype of the father?
 C. What are the genotypes of the children?
 D. Given the mechanism of inheritance involved, does the ratio of children with the trait to children without the trait match what would be expected?

- d) Is the trait that is segregating in the following pedigree due to a dominant or a recessive allele?



- Answer the following questions (Any Two) Four Marks Each
- a) What features of a pedigree would distinguish between a Y-linked trait and a trait that is rare, autosomal dominant, and sex-limited to males?

- b) Look at the image of an uncultured cell from a patient, hybridized to probes for chromosomes 18 (green) and 21 (red) and answer the following questions:



- a. Write down the name of the syndrome and the chromosomal abnormality of the patient. Also, write down the karyotype of the patient.

- b. What is the karyotyping technique used to look at the cells? Explain the principle.

- c) Describe the following terms: Polyploidy, Duplication, Mosaicism, QF-PCR

Q6)

- Answer the following questions (Any One) Five Marks Each
- a) From the A-B-O blood types of 1000 people, estimate the frequencies of the I^A , I^B , and i alleles

Blood Type	Number of People
A	42
B	672
AB	36
O	250

- b) What is translocation? Draw and explain Reciprocal and Robertsonian translocation.

OR

5M

4M

8 M
4M

4M

4 M

5 M
5 M

5 M

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc. I (Semester: I)
Subject: Biotechnology
Paper Title: Biochemistry and Bacteriology
Paper Code: BTH4103
2019 Pattern (4 Credits)

[Time: 3 Hours]

[Max. Marks : 50]

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1) **Answer the following questions (Any Five).** **Two Marks Each** **10 M**
- a) What is molecular phylogeny? Give its significance.
 - b) What is the role of Protein Disulfide Isomerase?
 - c) Show schematically 'reductive denaturation and oxidative renaturation of RNase A.
 - d) Define: Specific activity. If an enzyme catalyzes conversion of 500 μmol per minute per ml, what will be the enzyme units if reaction volume is 1.5 ml?
 - e) What is Myristoylation? Give its significance.
 - f) What is UniProt? Name ANY TWO protein structure determination techniques
- Q2) **Answer the following questions (Any one set)** **9 M**
- a) Discuss body's response to diabetes mellitus. **5 M**
 - b) Describe role of Ghrelin and PYY₃₋₃₆. **4 M**
- OR**
- c) Derive Michaelis Menten equation based on 'rapid equilibrium' approach. **5 M**
 - d) Explain change in kinetics in presence of 'un-competitive inhibitor'. **4 M**
- Q3) **Answer the following questions (Any Three)** **Three Marks Each** **9 M**
- a) Explain in brief Alzheimer's disease.
 - b) Explain how AMP-dependent protein kinase (AMPK) regulates metabolic homeostasis?
 - c) What is CD? Give its application.
 - d) Discuss different metabolic functions and pathways in muscle.
- Q4) **Answer the following questions (Any one set)** **9 M**
- a) Compare and contrast the following aspects of endotoxins and exotoxins: bacterial source, chemistry, toxicity, and pharmacology. Give an example of each toxin. **5 M**
 - b) Justify, "Plasmid curing a possible approach for overcoming drug resistance". **4 M**
- OR**
- c) Why is *Staphylococcus aureus* known as golden child of human pathogens? **5 M**
 - d) Discuss Molecular techniques for characterization of bacterial genotype. **4 M**

Q5)

Answer the following (Any Two):

Four Marks Each

8 M

- a) With the help of a diagram explain the structure of an endospore and its significance in imparting resistance to overcome unfavourable environmental conditions.
- b) Define fed batch culture. What are the different strategies used to establish fed batch culture? Give applications and advantages this mode.
- c) What are compatible solutes? Explain giving examples their significance in adaptations of halophiles.

Q6)

Answer the following questions (Any One)

Five Marks Each

5 M

- a) What is quorum sensing? Discuss the role of quorum sensing in virulence and pathogenicity of *Pseudomonas aeruginosa*
- b) With the help of a suitable example explain about pathogenicity islands.

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc.-I (Semester: I)
Subject: Biotechnology
Paper Title: Cell Biology
Paper Code: BTH 4102
2019 Pattern (4 Credits)

[Time: 3 Hours]

[Max. Marks : 50]

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1) **Answer the following questions (Any Five)** **10 M**
- a) Define: lipid rafts and Peripheral proteins
 - b) Enlist the electron carriers working in Electron Transport Chain
 - c) Give one important feature of Ras.
 - d) State the difference between active and passive transport across the membrane.
 - e) Differentiate between Compound microscope and electron microscope.
 - f) Briefly state about signal transduction mechanism.
- Q2) **Answer the following questions.** **9 M**
- a) How does DNA damage arrest the cells in G1 phase of the cell cycle? **5 M**
 - b) Elaborate the use of FRAP to assess the mobility of proteins in cancer. **4 M**
- OR**
- c) Describe about the chloride – bicarbonate exchange mechanism in the erythrocytes. **5 M**
 - d) Explain with a suitable diagram about GPCRs in signaling pathways **4 M**
- Q3) **Answer the following questions (Any Three)** **9 M**
- a) Explain the Q cycle.
 - b) Write a note on assembly of Microtubules.
 - c) What is the difference between antiport and symport.
 - d) Cystic fibrosis (CF) is caused due to defective ion channel. Explain in brief about the role of ion channel in CF
- Q4) **Answer the following questions** **9M**
- a) How does rotational catalysis work in energy production? **5 M**
 - b) Explain the binding change mechanism in mitochondria. **4 M**
- OR**
- c) Explain the mechanism involved in cell sorting with a suitable diagram. **5 M**
 - d) Describe the signaling process in MAP kinase pathway. **4 M**
- Q5) **Answer the following questions (Any Two)** **8 M**
- a) Elaborate the working of cyclin-cdks for regulation of cell cycle.
 - b) Give the detailed classification of Anchoring junctions.
 - c) Importance of cyclic AMP as a second messenger. Explain in detail

Q6)

Answer the following questions (Any One)

5 M

- a) Explain the three ways in which extra cellular survival factors can inhibit apoptosis.
- b) Describe about the different STATs and their role cellular signaling.

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc. I (Semester: I)
Subject: Biotechnology
Paper Title: Molecular Biology
Paper Code: BTH-4101
2019 Pattern (4 Credits)

[Time: 3 Hours]

[Max. Marks : 50]

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1) **Answer the following questions (Any Five)** **Two Marks Each** **10 M**
- a) Mention the DNA polymerases present in eukaryotes.
 - b) Differentiate between Euchromatin and Heterochromatin.
 - c) What are the components of the RNA Pol holozyme in prokaryotes?
 - d) What is DNase hypersensitivity?
 - e) What are the effects of UV and X-rays on DNA?
 - f) Mention the proteins involved in NER.
- Q2) **Answer the following questions.** **9 M**
- a) Differentiate between IS and Transposon in bacteria. **5M**
 - b) Describe SOS activation and response in prokaryotes. **4M**
- OR**
- c) Briefly explain DNA replication in prokaryotes. **5M**
 - d) Explain homologous recombination in *E. coli*. **4M**
- Q3) **Answer the following questions (Any Three)** **Three Marks Each** **9 M**
- a) Differentiate between composite and non-composite transposons.
 - b) Write short notes on Ty element in yeast.
 - c) Describe briefly RecA nucleoprotein filament formation in *E. coli*.
 - d) Explain nucleotide excise repair in prokaryotes.
- Q4) **Answer the following questions** **9M**
- a) Explain the formation of elongation complex during transcription **5M**
 - b) Describe the major classes of histones in Eukaryotes. **4M**
- OR**
- c) Based on the mechanism of movement, how are mobile genetic elements classified in eukaryotes? Explain the individual mechanism. **5M**
 - d) Explain the mechanism of any two antibiotics against bacteria. **4M**

Q5)

Answer the following questions (Any Two)

Four Marks Each

8 M

a)

Describe DNA replication in prokaryotes.

b)

Explain C-value paradox and Tm to determine complexity.

c)

Describe Organization and structure-function of ribonucleoproteins.

Q6)

Answer the following questions (Any One)

Five Marks Each

5 M

a)

How is translation regulated in prokaryotes?

b)

Explain degeneracy of genetic code.

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University

M.Sc.-II (Semester: III)

Subject: Biotechnology

Paper Title: Industrial Biotechnology II and Bioinformatics

Paper Code: BTH5303

2019 Pattern (4 Credits)

[Time: 3 Hours]

[Max. Marks : 50]

Instructions to the candidates:

- All questions are compulsory.
- Neat diagrams must be drawn wherever necessary.
- Figures to the right side indicate full marks.

Q1) Answer the following questions (Any Five).

10 M

a) Define Molecular Phylogenetics.

b) Write an account on Dot Plot.

c) ACATGCATGC

ACATCGATCG

***** : * . . .

From the given output find out the conservation, consensus and somewhat similarity and explain it in brief.

d) Define Copyright.

e) What is GI?

f) Define Trademark.

Q2) Answer the following questions (Any one set)

9 M

a) Write detail account on Neighbor joining method.

5M

b) What is homology Modeling? Explain steps involved in it in detail.

4M

OR

c) What is Dynamic Programming? Explain it in detail.

5M

d) What short note on

4M

1)PDB

2)UniProtKB

Q3) Answer the following questions (Any Three)

9 M

a) Explain the detailed process for the patent filling in India.

b) What is Trade Secret? Write a detailed account on it.

c) What is Infringement? State and explain various types of Infringements.

d) State and explain various types of patent searches.

Q4) Answer the following questions (Any one set)

9M

a) Illustrate the flow diagram of the industrial scale brewing of Beer and explain in detail the Malting and Mashing steps of the process.

5M

b) What are hops? What is its role in the brewing process?

4M

OR

c) Describe different methods of altering the cell permeability of production strain during glutamic acid production? What are the benefits of this technique?

5M

d) Give the flow diagram of glutamic acid production and add a note on its recovery process.

4M

Q5)

Write short notes on (Any Two) :

- a) Microbial flavours
- b) Bioplastics
- c) Freezing techniques used in Probiotic production

8 M

Q6)

Answer the following questions (Any One)

- a) Which test will you perform if you have to check the presence of endotoxin in a product sample? Give the principle and method of this test.
- b) What are the roles and responsibilities of a quality control department in a pharma industry?

5 M

Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc.-II (Semester: III)
Subject: Biotechnology
Paper Title: Emerging Trends and Technologies
Paper Code: BTH5313
2019 Pattern (2 Credits)

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[15 DEC 2022]

[Time: 1.5 Hours]

[Max. Marks: 25]

Instructions to the candidates:

- All questions are compulsory.
- Neat diagrams must be drawn wherever necessary.
- Figures to the right side indicate full marks.

Q1) Answer the following questions (Any Five). One Marks Each 5 M

- a) Define focal length.
- b) Why is alkylation of the proteins required in proteomics sample preparation?
- c) Differentiate between elastic and inelastic electrons in terms of their energy.
- d) Different isotopic peaks of a same peptide in a mass spectrum are very important in determining the charge on the peptide. A particular peptide has isotopic peaks at the following m/z values in the mass spectrum; 432.93, 433.26 and 433.58. What is the charge on this peptide?
- e) Name different electrons that emit during TEM.
- f) *In silico* strategy of drug development although advantageous has one major disadvantage. What is the limitation of *in silico* strategy?

Q2) Answer the following questions (Any Three). Two Marks Each 6 M

- a) What are some of the advantages of using nano-LC over conventional HPLC technique?
- b) Briefly explain the role of guide RNA (gRNA) in CRISPR-Cas9 gene editing tool.
- c) Write down any three characteristics of the targeted approach in omics studies.
- d) Mention any two genome editing techniques other than CRISPR-Cas tool.

Q3) Answer the following questions.(Any Three). Three Marks Each 9 M

- a) What are the different lysis methods used in extracting proteins from the cells/tissue samples?
- b) Why is there a need for vacuum in electron microscope?
- c) Answer the following
 - (i) What is tandem mass spectrometry?
 - (ii) Why are fragmentation mass spectra of a precursor peptide ion important?
 - (iii) Give an example of technique used for fragmenting a peptide precursor ion in mass spectrometry.
- d) Write any three applications and limitations of transmission electron microscope.

Q4) Answer the following questions (Any One). Five Marks Each 5 M

- a) Discuss the working mechanism of FT-ICR mass analyser with a neat labelled diagram
- b) With the help of a neat diagram, explain the differences in working principle of SEM and TEM.

17.4 DEC 2022

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Deccan Education Society's
FERGUSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc.-II (Semester :III)
Subject: Biotechnology
Paper Title: Food technology
Paper Code: BTH5307
2019 Pattern (2 Credits)

[Time: 1.5 Hour]

[Max. Marks : 25]

Instructions to the candidates:

- All questions are compulsory.
- Neat diagrams must be drawn wherever necessary.
- Figures to the right side indicate full marks.

- Q1) **Answer the following questions (Any Five). One Mark Each** **5 M**
- a) Enlist the sources of microorganisms in raw food.
 - b) What are polysaccharides?
 - c) Define in one sentence – “ Dehydration of food”.
 - d) What is Nutraceuticals?
 - e) What are “Sources of Starch”?
 - f) What is QA?
- Q2) **Answer the following questions (Any Three). Two Marks Each** **6 M**
- a) Enlist physical properties of food?
 - b) What is the role of proteins in food.?
 - c) Explain food poisoning caused by fungi.
 - d) Give one example of GM food with its importance.
- Q3) **Answer the following questions. (Any Three). Three Marks Each** **9 M**
- a) What is Health Food?
 - b) Explain methods of Non Enzymatic Browning.
 - c) Differentiate between Monosaccharides, Oligosaccharides and Polysaccharides.
 - d) Explain in detail any one intrinsic factor affecting growth of microorganisms.
- Q4) **Answer the following questions (Any One). Five Marks Each** **5 M**
- a) Comment on adulteration with one example .
 - b) Comment on Food Laws and Standards in India and relate it with food security.

