

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations July 2023

Programme: M.Sc. Microbiology

Session: 2022-23

Semester: II

Max. Time: 3 Hours

Course Title: Soil and Agriculture Microbiology

Max. Marks: 70

Course Code: SIAL MB 1201 DCEC 4004

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.
2. Question no. 2 to 5 have three parts and student are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

- a) MPN
- b) Winogradsky column
- c) Spread and pour plate techniques
- d) Four desired characteristics of biopesticides
- e) Cellulase
- f) Ammonification and denitrification
- g) Composition of Biogas and name of phases in biogas production

Q 2. (2X7=14)

- a) Discuss contributions of Martinus Beijerinck in soil microbiology
- b) Discuss at least 2 methods of studying each for culturable and un-culturable microorganisms along with advantages and disadvantages of both.
- c) Discuss role of soil enzymes in soil biogeochemical cycles?

Q3. (2X7=14)

- a) Discuss role of microorganisms in P cycle in detail along with mechanism of P solubilization by soil microorganisms.
- b) Define Composting. Discuss microbiology of composting production in detail
- c) How different enzymes carry out degradation of starch and pectic substances?

Q 4. (2X7=14)

- a) Discuss in detail with examples about free living, associative and symbiotic nitrogen fixers.
- b) Define R:S ratio and what factors affect the R:S in soil?
- c) Discuss in detail about different nitrogenases reported in N fixers.

Q 5.

(2X7=14)

- a) What is NPV? Discuss about mode of action, large scale production and difficulties in using NPV for controlling pests.
- b) Define AM fungi? Discuss classification, mode of action, advantages and disadvantages of using AM fungi.
- c) How a newly isolated microbial strain can be commercialized as biofertilizer?

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations June/July 2023

Programme: M.Sc. Microbiology

Session: 2022-23

Semester: 2nd Semester

Max. Time: 3 Hours

Course Title: The Microbiome

Max. Marks: 70

Course Code: SIAS MB 1 02 03 DCEC 4004

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.
2. Question no. 2 to 5 have three parts and student are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

- a) Outline the brief history of microbiome research.
- b) Why is small subunit rRNA gene is used for molecular identification or phylogenetic analysis.
- c) What is principal coordinate analyses? How it is used in microbiome analysis?
- d) Describe operational taxonomic unit. Enlist various methods of OUT Picking
- e) What do you understand by gut brain axis? Explain.
- f) What is glycome? Write down its significance in human microbiome?
- g) What is virome? Explain its significance on human health.
- h) Explain the term microbiome. How it differs from microbiota?

Q 2. (2X7=14)

- a) What is the difference between 16S rRNA sequencing and shotgun sequencing? Explain how shotgun sequencing approach is used for microbiome analysis?
- b) What is Next-generation sequencing? Enlist various Next-generation sequencing methods. Explain pyrosequencing method.
- c) Describe serial analysis gene expression (SAGE) for functional analysis of the microbiome.

Q3. (2X7=14)

- a) What is alpha and beta-diversity? Explain Shannon Index, Simpson Index and Sorenson's Coefficient.
- b) What is Phylogenetic tree? How it is constructed? Explain distance based and Character-based phylogenetic trees.
- c) Describe how UniFrac and the Venn diagram are employed to compare microbial communities.

Q 4. (2X7=14)

- a) What do you understand by Proteome? Explain in detail the technique used for proteome analysis.

- b) Explain the role of gut microbiome in metabolism of nutrient and other food components.
- c) What is human microbiome Project (HMP)? Write a note on distribution and diversity of human microbiome.

Q 5.

(2X7=14)

- a) What are the changes observed in Gut microbiome during obesity and diabetes?
- b) Explain the significance of gut microbiome and its implication on human health.
- c) How does the microbiome help in screening, diagnosis and monitoring of diseases?

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations July/Aug 2023

Programme: MSc Microbiology

Session: 2022-23

Semester: II

Max. Time: 3 Hours

Course Title: Microbial Genetics

Max. Marks: 70

Course Code: SIAS MB 1 2 02 C 4004

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student is required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

- | | |
|----------------------------------|-------------------|
| a) Microbial evolution | e) Transposons |
| b) Gene cloning by Marker rescue | f) Inducible gene |
| c) Ames test | g) Genome editing |
| d) Synthetic genome | |

Q 2. (2X7=14)

- Define mutation, differentiate between spontaneous and induced mutations and explain frameshift mutations that may arise from insertion or deletion.
- Name any 7 physical or chemical agents that mutagenic with their mechanism of action.
- Describe DNA repair system and explain mismatch repair and base excision repair.

Q3. (2X7=14)

- What are TT, PD and NPD for tetrad analysis? The following unordered tetrads: PD=64, NPD=16, TT=32 were produced from a cross $ab \times AB$ between two yeast strains. If the genes are linked determine the distance between them.
- Define Operon? Give example/s of Inducible operon and explain positive and negative control of that inducible operon/s.
- Describe the state of the F factor in an Hfr, F^+ , F' and F^- derivative of *E. coli* strain.

Five Hfr strains donate the following markers, shown in the order presented below:

Hfr1: F B H C Z

Hfr2: M L T D J

Hfr3: B F S N V

Hfr4: V K M L T

Hfr5: D J R Z C

All these Hfr strains are derived from the same F^+ strain. What is the order of these genetic markers on the F factor?

Q 4.

(2X7=14)

- a) List the differences between lytic and lysogenic cycle of lambda phage and explain regulation of genes expression in lambda phage?
- b) Describe the experiment used to construct phage genetic linkage map?
- c) Define gene cloning with example and describe various techniques and steps used in gene cloning?

Q 5.

(2X7=14)

- a) Discuss the method and mechanisms of sequencing of microbial genomes?
- b) Describe the CRISPR/Cas9 system and its significance in modern medical sciences?
- c) What is genome and metagenome? Describe the various types of metagenome databases?

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations 2023

Programme : M.Sc. Microbiology

Semester : 2nd

Course Title : Advanced Analytical Techniques

Course Code : SIAS MB 1 2 01 C 4004

Session: 2022-23

Max. Time: 3 Hours

Max.Marks : 70

Instructions: 1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student are required to answer any two parts of each question. Each part carries seven marks.

Q 1. Discuss briefly

(4X3.5=14)

- a) Describe how resolution-depend upon wavelength numerical aperture in Microscopy.
- b) Describe the two general types of fixations. Which method do you often employ for bacteria?
- c) What is the advantage of using Agarose in separating DNA molecules. What percentage of Agarose you would use to separate 100bp and 5kb DNA molecule.
- d) You separate proteins by SDS-PAGE. How are they separated? Where do you anticipate finding big proteins and where do you anticipate finding little proteins?
- e) Thin Layer Chromatography.
- f) Differentiate between Immunoaffinity chromatography and metal chelate Chromatography.
- g) Briefly explain the Yeast two Hybrid technique.

Q 2.

(2X7=14)

- a) Describe principles and applications of fluorescence microscopy.
- b) How does the scanning electron microscope operate and in what way does its function differ from that of the TEM? The SEM is used to study which aspects of morphology?
- c) Describe fixation and staining techniques in Microscopy.

Q3.

(2X7=14)

- a) What is the Polyacrylamide gel electrophoresis. Differentiate between native and SDS-PAGE along with their significances in research studies.
- b) What is the principle and application of centrifugation. Define differential and density gradient centrifugation.
- c) What is Isoelectric focusing (IEF). Describe the mechanism by which proteins are resolved in IEF.

Q 4.

(2X7=14)

- a) Discuss the performance parameters of chromatography in detail. Also discuss their significance.
- b) Describe the principal of anion-exchange chromatography, mentioning the working principle and instrumentation details.
- c) Name the chromatography method most suitable for the separation of volatile compounds. Also discuss the basis of separation and details of the equipment. Why conditioning of the column is useful.

Q 5.

(2X7=14)

- a) Discuss the principle and instrumentation of Nuclear Magnetic resonance Spectroscopy
- b) Describe EMSA and DNA foot printing. Briefly explain, how EMSA can be used for DNA-Protein interaction
- c) What is the Lamber Beer law and how it is useful in UV-spectroscopy. Write in depth about the double beam UV-Vis Spectrophotometer operating principles and instrumentation.

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations July 2023

Programme: M.Sc. Microbiology

Session: 2022-23

Semester: II

Max. Time: 3 Hours

Course Title: Microbial Physiology and Metabolism

Max. Marks: 70

Course Code: SIAS MB 1 2 04 C 4004

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.
2. Question no. 2 to 5 have three parts and student are required to answer any two parts of each question. Each part carries seven marks.

Q 1.

(4X3.5=14)

- a) Uniport versus Cotransport with explanation of Symport and Antiport
- b) Methanogenesis
- c) Chlorophyll and bacteriochlorophyll
- d) Biosynthesis of nucleotides
- e) "Chemiosmotic model" of ATP synthesis
- f) Nitrogen assimilation
- g) Diauxic growth curve and Pasteur effect
- h) Fatty acid synthase type I protein

Q 2.

(2X7=14)

- a) Differentiate between primary and secondary active transport with example. Explain group translocation with example?
- b) Outline the classification of microbes with definition and examples based on energy source, carbon source and source of reducing power. Differentiate between aerobic, anaerobic and fermentative metabolism.
- c) What is generation time 'g' and growth rate 'R' for bacterial growth. Derive the mathematical relationship between generation time (g) initial population (N_0) and population at time t (N_t) based on number of generation (n) and growth rate (R).

Q3.

(2X7=14)

- a) What purpose light independent reactions of photosynthesis do serve? Schematically elaborate Calvin cycle with enzymes catalyzing each step.
- b) What are the major differences between oxygenic and anoxygenic photosynthesis? Draw the schematic of electron flow and reducing power generation in cyanobacterial photosynthesis.

- c) Give 2 examples of chemolithotrophic reactions involving different sulfur and iron compounds. Schematically present the flow of electron transfer allowing generation of energy currency and reducing power for the bacterial host.

Q 4.

(2X7=14)

- a) What are substrate level phosphorylation and oxidative phosphorylation? Write down the path of electron flow (using electron carriers) during oxidative phosphorylation. What are the enzymes or their complexes that carry out the oxidative phosphorylation and where in a living cell those enzyme complexes are harboured?
- b) Describe the reactions catalyzed by the following group of enzymes: Kinase, Isomerase, Lyase, Ligase, Phosphatase, Synthase, Synthetase, Epimerase, Phosphorylase, Hydrolase, Dehydrogenase, Carboxylase, Mutase, Aldolase.
- c) Differentiate between fermentation and respiration? Show 4 possible fates of glycolysis generated Pyruvate if the organism opts for fermentative path of energy generation. Show reactions with catalyzing enzymes.

Q 5.

(2X7=14)

- a) Describe peptidoglycan biosynthesis.
- b) Point out the structural differences between maltose and cellobiose? What are the activated substrates utilized by which enzyme for the biosynthesis of cellulose and starch. What are the cellular sites of their biosynthesis?
- c) What is microbial differentiation; explain with 2 examples?

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations July 2023

Programme : M.Sc. Microbiology

Semester : 2nd

Course Title : Food and Dairy Microbiology

Course Code : SIAS MB 1205 C 4004

Session: 2022-23

Max. Time: 3 Hours

Max.Marks : 70

Instructions: 1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student are required to answer any two parts of each question. Each part carries seven marks.

Q 1. Discuss briefly (4X3.5=14)

- a) Microbial succession during food spoilage
- b) Principles of food preservation
- c) Dairy starter cultures
- d) Thermal death kinetics
- e) Cheese production
- f) Name two food borne infections caused by bacteria, fungi and viruses each.
- g) What principal gases are involved in MAP? How are their concentrations varied to prevent microbial growth?

Q 2. (2X7=14)

- a) Elaborate various intrinsic factors affecting growth and survival of microorganisms in foods.
- b) Discuss the sources of contamination and spoilage of Milk.
- c) Describe various sources of microbial contamination in foods.

Q3. (2X7=14)

- a) Define pasteurization and briefly describe its types. Also describe how pasteurization is performed.
- b) What are the various types of can defects. Elaborate the process of canning for food preservation.
- c) Write short notes on following food preservation methods (Any Two):
 - i. Pascalization
 - ii. Cold sterilization
 - iii. HACCP

Q 4.

(2X7=14)

- a) Discuss the fermentation process and microbiology of Acidophilous milk.
- b) Define probiotics, prebiotics and synbiotics giving examples of each. Discuss health benefits of probiotics along with their mode of action.
- c) Describe the fermentative production of ANY Two non-dairy fermented foods:
 - i. Sauerkraut
 - ii. Tempeh
 - iii. Wine

Q 5.

(2X7=14)

- a) Discuss the key feature of a food-borne infection in terms of how long it takes for the disease to manifest after ingesting the pathogen. Why does this occur?
- b) What are some of the main genera responsible for food-borne intoxications. What distinguishes a food-borne infection from a food-borne intoxication?
- c) Describe the methods for culture based and culture independent techniques for detection and enumeration of food borne pathogens.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations June, 2023

Program: M.Sc. Microbiology

Session: 2021-23

Semester: IV

Max. Time: 3 h

Course Title: Research methodology and Scientific communication skills

Course Code: SIAS MB 1 4 01 C 3003

Max. Marks: 70

Instructions:

- Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.
- Question no. 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Q 1. Write brief notes on:

(4x3.5=14)

- a) Thesis Mentor
- b) Open access publication
- c) Google Scholar
- d) Conclusions in research paper
- e) Verbal communication
- f) Scientific misconduct
- g) Lab notebook

Q 2.

(2x7=14)

- a) Describe the different types of research. How you will use survey-based research in the biological sciences? Explain with an example
- b) Explain the significance of controls, blanks and replications in any biological experiment with an example.
- c) You have been assigned a practical to compare the bacterial growth curve of a Gram positive and Gram-negative culture. Design a scientific experiment for this comparison

Q3.

(2x7=14)

- a) How you will select a research problem? Discuss the role of a mentor in conducting good research. Is the role of mentee plays a significant role? Justify your answer
- b) What are the different non-verbal communication skills that are required for effective communication?
- c) Explain the different barriers involved in effective communication. Which strategies you would use to remove these barriers?

Q4.

(2x7=14)

- a) Define the different components of a powerpoint slide. Describe the precautions you have to take while presenting a research presentation
- b) Effective communication skills are required to deliver a presentations. How? Justify your answer with suitable skills required.
- c) Use of web-based browsing has revolutionized the scientific research and the way the research is conducted. How? Explain with examples

Q5.

(2x7=14)

- a) What is the significance of report writing? Describe layout of report writing.
- b) What is plagiarism? Why plagiarism is an offence? Write two online tools to detect plagiarism. What are the types of peer review?
- c) Describe the layout of a scientific research paper.

(b) Explain the Herb-Drug interactions and effects on Human health.

- i. Garlic
- ii. St. John's Wort
- iii. Ginkgo biloba
- iv. Kava
- v. Ginseng

(b) Write the structure and use of the following

- i. Glucosamine
- ii. Chondroitin
- iii. Coenzyme Q10
- iv. Melatonin
- v. Procyanidin B2
- vi. S-Adenosyl methionine
- vii. Lutein

Question No. 4.

(2 X 3.5)

- (a) What do you mean by Pharmacognosy? Write down a descriptive note and the future scope of Pharmacognosy.
- (b) What are Herbal foods? Explain it.
- (c) Write down a short note on Tulsi, Indian gooseberry, Centella Asiatica.

Question No. 5.

(2 X 3.5)

- (a) Discuss the morphologic and microscopic examination of herbs.
- (b) Discuss Drug adulteration and its types.
- (c) How will you evaluate the herbal drugs by biological testing?

CENTRAL UNIVERSITY OF HARYANA

Term End Examination, June 2023

Program: Integrated B.Sc.- M.Sc. Chemistry

Session: 2022-23

Course Name: Herbal Science & Technology

Max Marks: 35

Semester: II

Max. Time: 2 Hours

Course Code: SBS CH 02012 SE 2002

Instructions:

1. Question no. 1 has four parts and students need to answer any of the two. Each part carries three and half marks.
2. Question nos. 2 to 5 have three parts and students need to answer any two parts of each question. Each sub-part carries three and half Marks.

Question No. 1.

(2 X 3.5)

Write short notes on

- (a) Homeopathy
- (b) Adulteration
- (c) Pharmacological applications of Ginger and kalmegh.
- (d) Write the biological name, family, chemical constituent, and uses of the following
Brahmi, Asafoetida, Areca palm, Turmeric, Green Tea, Tobacco, Ginger

Question No. 2.

(2 X 3.5)

- (a) Discuss the Traditional System of Medicine.
- (b) Give an overview of AYUSH.
- (c) Discuss the processing and storage of herbs and herbal products.

Question No. 3.

(2 X 3.5)

- (a) What are nutraceuticals? Classify them. Write health benefits and the role of nutraceuticals in ailments of various diseases.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations June, 2023

Program: M.Sc. Microbiology

Session: 2022

Semester: II

Max. Time: 3 h

Course Title: Biosafety, Bioethics and IPR

Course Code: SIAS MB 1 2 02 C 3003

Max. Marks: 70

Instructions:

- Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.
- Question no. 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Q 1. Write brief notes on:

(4x3.5=14)

- a) EPA
- b) RCGM
- c) FSSAI
- d) WIPO
- e) Ethics in Stem Cell research
- f) Geographical indices
- g) Royalty

Q 2.

(2x7=14)

- a) Describe the different biosafety containment levels used in the laboratory. Explain with examples of microbes to be handled in each containment level
- b) As a microbiologist, describe the safety measures in collecting a nasal sample, isolation of bacterial pathogen and further diagnosis of the bacterial pathogen.
- c) You have been assigned a project to investigate the pathogenesis of a human pathogen belonging to BSL-2 category. Describe the various regulations and approvals involved in the assigned task

Q3.

(2x7=14)

- a) Discuss the significance of informed consent and patient confidentiality while working with human samples. Which principles of bioethics are involved in the study.
- b) Discuss the bioethical concerns in euthanasia, artificial reproductive technologies. Justify your answer with examples
- c) Explain in brief: Biopiracy, Prenatal diagnosis

Q 4.

(2x7=14)

- a) What do you understand by Intellectual property? Explain different types of intellectual properties with examples in each case.
- b) Protection of an original idea as an intellectual property is challenging nowadays. Comment on the statement with proper justification and examples.
- c) Discuss the role of any two: WIPO, TRIPS agreement, Budapest treaty on microorganisms, Bern convention

(2x7=14)

Q 5.

- a) Explain the term Patent infringement and its available remedies
- b) Protection of traditional knowledge is must to reduce IPR conflicts. Justify the statement with suitable case studies.
- c) Explain in brief: Licensing and litigation

