CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations August-September 2022

Program: M.Sc. Microbiology **Session: 2022**

Semester: II **Max. Time: 3 h**

Course Title: Biosafety, Bioethics and IPR

Course Code: SIAL MB 1 2 03 C2002 **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) IBSC
b) Biocontainment levels
c) Codex Alimentarius
d) Principle of Justice
e) Indian Patent Act
f) Cartagena protocol

Q 2. (2x7=14)

a) A person is having symptoms of Covid-19. As a clinician which safety precautions you will use for the sampling and isolation of Virus in the laboratory. Discuss your answer with details
b) You are working with BSL-2 category pathogen from human samples. Your work is subjected to which ethical committees. Explain
c) Explain in brief: EPA act, Types of biosafety cabinets

Q3. (2x7=14)

a) Gene editing is the need of the hour. Comment on the statement with justification to your answer
b) Elaborate on the principles of Bioethics
c) Explain in brief: Informed consent, Biopiracy

Q 4. (2x7=14)

a) Define the term 'invention'? Enlist the basic requirements for an invention to be patentable. Explain with an example

b) What are the different criteria for patentability? Why it is important to patent an invention? Is protection of IPR essential for commercial success of a product or a process?

c) Explain in brief: TRIPS agreement, Budapest treaty

Q 5. (2x7=14)

a) Explain in brief: litigation, royalty

b) What do you understand by patent infringement? What are the remedies available in suit for infringement of patent?

c) Explain in brief: Copyright, Trademark

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations August-September 2022

Programme:	**M.Sc. Microbiology**	**Session: 2021-22**
Semester:	**II**	**Max. Time: 3 Hours**
Course Title:	**Soil and Agriculture Microbiology**	**Max. Marks: 70**
Course Code:	**SIAL MB 1 2 01 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) PLFA

b) Contribution of Beijerinck in soil microbiology

c) Great plate anomaly

d) Characteristics of green manuring crops

e) Oxygen paradox

f) Rhizosphere vs phyllosphere

g) Ecto and endo mycorrhiza

Q 2. (2X7=14)

a) Discuss about Winogradsky column and its importance in development of soil microbiology

b) Discuss at least 3 methods of studying culturable microorganisms along with advantages and disadvantages

c) How soil properties affect microbial diversity of soil?

Q3. (2X7=14)

a) Discuss role of microorganisms in S and Fe cycle

b) Define biogas. Discuss microbiology of biogas production in detail

c) How different enzymes carry out degradation of lignin?

Q 4. (2X7=14)

a) What are different requirements for biological nitrogen fixation in plants. Discuss in detail

b) How composition and quantity of root exudates shape the rhizosphere microflora?

c) Discuss in detail about 3 nitrogenase protection mechanisms operating in N fixers.

Q 5. (2X7=14)

a) What are desirable properties of microorganisms to be used as biopesticides. Discuss about mode of action of Bt in detail

b) Classify Biofertilizers as per microorganisms and nutrients they provide to plants with examples

c) How a newly isolated microbial strain can be commercialized as biofertilizer

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations August-September 2022

Programme: M.SC Microbiology **Session: 2021-22**
Semester: Second **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) Write a short note on principal coordinate analyses.
c) Describe operational taxonomic unit?
d) Differentiate between 16S rRNA sequencing and shotgun metagenomics.
e) What are proteome and glycome? What is their significance in human microbiome?
f) Explain the significance of gut microbiome and its implication on human health.
g) Explain the term microbiome. How it differs from microbiota?

Q 2. (2X7=14)

a) What are the various omic techniques used to study microbiome? Explain genomic approach to study microbial communities.
b) What is Next-generation sequencing? Enlist various Next-generation sequencing methods. Explain illumina sequencing.
c) Describe subtractive hybridization methods 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) Write a note on UniFrac and Venn diagram.

Q 4. (2X7=14)

a) What is mass spectroscopy (MS)? Explain the principle, working and application of LC-MS.
b) Explain the role of gut microbiome in metabolism of nutrient and other food components.
c) Write a note on distribution and diversity of human microbiome.

Q 5. (2X7=14)

a) What are the changes observed in Gut microbiome during liver diseases such as obesity and diabetes?
b) What is the direct impact of gut microbiome on human health? Explain.
c) Explain the role of microbiome in screening, diagnosis and monitoring of diseases.

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations August- September 2022

Programme: M.Sc. Microbiology **Session: 2021-22**

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 are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a) Cloning gene by Marker rescue
b) Microbial evolution
c) Natural transformation
d) Tetrad analysis
e) Transposons and their types
f) Housekeeping gene
g) CRISPR/Cas9 system

Q 2. (2X7=14)

a) What is a point mutation? What are missense, nonsense and silent mutations? What are transition and transversion for base substitution in DNA? Explain frameshift mutations that may arise from insertion or deletion.
b) What is an induced mutation? Name any 6 agents (physical or chemical) that can induce mutation with their mechanism of action.
c) What do you understand by DNA repair system? Briefly explain mismatch repair and base excision repair.

Q3. (2X7=14)

a) 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 x AB between two yeast strains. If the genes are linked determine the distance between them.

b) What do you understand by Operon? Give example/s of Inducible operon and explain positive and negative control of that inducible operon/s.

c) 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) Describe mechanism of lytic and lysogenic cycle of lambda phage. Write the names of genes involve in the both cycles?

b) Discuss the mechanism of transposition in detail?

c) Describe the method of gene cloning and discuss various techniques used in gene transformation?

Q 5. (2X7=14)

a) Discuss the methods of sequencing of microbial genomes?

b) Describe the CRISPR/Cas9 system and its significance in modern medical sciences?

c) What is the difference between genome and metagenome? Describe the various types of metagenome databases?

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations August-September 2022

Programme : M.Sc. Microbiology
Semester : Second **Session: 2021-22**
Course Title : Food and Dairy Microbiology *Max. Time:* ***3 Hours***
Course Code : SIAL MB 1 2 05 C 4004 *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) Implicit factors affecting microbial growth in food
b) Thermoduric bacteria
c) Probiotics
d) Thermal death kinetics
e) Mycotoxins
f) HACCP
g) Differentiate food borne infections from food intoxications with suitable examples.

Q 2. (2X7=14)

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

Q3. (2X7=14)

a) Define pasteurization. Discuss different methods and techniques employed.
b) Elaborate how low temperature can be used to preserve the foods.
c) Discuss any one advanced method for the preservation of the foods.

Q 4. (2X7=14)

a) Discuss the fermentation process and microbiology of Tempeh.
b) Discuss probiotics and their health benefits along with their mode of action.
c) Describe the fermentative production of kefir or kumiss in detail.

Q 5. (2X7=14)

a) Elaborate methods for detection of food-borne pathogens.
b) Write a detailed note on microbial food intoxications.
c) Discuss the causative agents, foods involved, symptoms and preventive measures of listeriosis.

CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations August-September 2022

Programme: MSc Microbiology **Session: 2021-22**

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) Rhodopsin versus Carotenoids

d) "Chemiosmotic model" of ATP synthesis

e) Nitrogen assimilation

f) Diauxic growth curve and Pasteur effect

g) Peptidoglycan biosynthesis

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.

b) Describe the reactions catalyzed byany seven of 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 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) Write down the name of different domains of fatty acid synthase type I protein with their roles (with the mention of catalytic or non-catalytic) in fatty acid synthesis?

b) Point out the structural differences between maltose and cellobiose? What are the activated substrates utilized by the 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 August-September 2022

Programme : M.Sc. Microbiology
Semester : 2nd **Session: 2021-22**
Course Title : Advanced Analytical Techniques *Max. Time: **3 Hours***
Course Code : SIAL MB 1 2 01 C4004 *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) TLC
b) Differential Staining
c) Differentiate between dark and bright field microscopy
d) What is isoelectric point
e) What types of blotting membranes are used in western blot, explain.
f) Briefly explain, how EMSA can be used for DNA-Protein interaction
g) If you run uncut DNA on an agarose gel electrophoresis how many bands do you expect to see and why?

Q 2. (2X7=14)

a) Describe principles and applications of dark field microscopy.
b) Differentiate between SEM and TEM in detail.
c) Elaborate how AFM works.

Q3. (2X7=14)

a) What is Polyacrylamide gel electrophoresis? In PAGE, before running the sample, we boil them with SDS and BME. What is the purpose of this step? How Native gel is different than the SDS-PAGE, explain.
b) What is the use of density gradient centrifugation? What is the Principle of Differential 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 gel filtration or ion exchange chromatography in detail.
b) Write the working principle and instrumentation details of HPLC.
c) Describe gas liquid chromatography along with its application.

Q 5. (2X7=14)

a) What is Yeast two and three Hybrid techniques. Elaborate yeast two hybrid technique in detail.

b) What is the Lamber Beer law and how it is useful in UV-spectroscopy. Explain the difference between Single-beam and double beam spectrophotometer

c) What is tandem mass spectrometry? What is the difference between MALDI and ESI in MS for analyzing small molecules?