**KANNUR UNIVERSITY**
**(Abstract)**

***BSc Microbiology Programme - Revised Scheme & Syllabus of Core, Complementary and Open Courses*** under Choice Based Credit Semester System for Under Graduate Programme-implemented with effect from ***2014 admission-Orders Issued.***

**ACADEMIC BRANCH**

**No. Acad/C2/1421 /2014** **Dated, Civil Station P.O, 17- 05-2014**

Read: 1.U.O No. Acad/C2/2232/2014 dated 14-03-2014
2. Minutes of the meeting of the Board of Studies in Microbiology held on 27-01-2014
3. Minutes of the meeting of the Faculty of Science held 25-03-2014
4. Letter dated 31-03-2014 from the Chairperson, BOS in Microbiology (Cd)

**ORDER**

1. The Revised Regulations for UG Programme under Choice based Credit Semester System were implemented in this University with effect from 2014 admission as per paper read (1) above.

2. As per paper read (2) above the Board of Studies in Microbiology(Cd) finalized the Scheme , Syllabus & model Question Papers for Core, Complementary & open courses of BSc Microbiology programme to be implemented with effect from 2014 admission..

3. As per read (3) above the Faculty of Science held on 25-03-2014 approved Scheme, syllabus & model question papers for core/complementary & open courses of BSc Microbiology programme to be implemented with effect from 2014 admission.

4. The Chairperson, Board of Studies in Microbiology (Cd) vide paper read (4) above has submitted the finalized copy of Scheme, syllabus & Model question papers for core/complementary and open courses of BSc Microbiology programme for implementation with effect from 2014

5. The Vice Chancellor, after examining the matter in detail, and in exercise of the powers of the Academic Council as per section 11(1) of Kannur University Act 1996 and all other enabling provisions read together with, has accorded sanction to implement the revised scheme, syllabus& model question papers of BSc Microbiology Programme with effect from 2014 admission.

6. Orders, are therefore issued implementing the revised scheme, syllabus & model question papers for core, complementary& open courses of BSc Microbiology programme under CBCSS with effect from 2014 admission subject to report to Academic Council

7. Implemented revised Syllabus is appended.

**SD/-**
**DEPUTY REGISTRAR (ACADEMIC)**

**FOR REGISTRAR**

Contd.....2

To

1. The Principals of Affiliated Colleges offering B.Sc Microbiology Programme
2. The Examination Branch (through PA to CE)

Copy To:

1. The Chairperson, BOS Microbiology (Cd)
2. PS to VC/PA to PVC/PA to Registrar
3. DR/AR I Academic
4. Central Library
5. SF/DF/FC.

Approved/ By Order

**Section Officer**

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KANNUR UNIVERSITY

# Course Structure & Syllabus for Undergraduate Programme in

# MICROBIOLOGY

## Under the
## Kannur University Choice Based Credit and Semester System (KUCBCSS)
## *(With effect from 2014 admission)*

COURSE STRUCTURE OF B Sc MICROBIOLOGY PROGRAMME (CORE) OF KANNUR UNIVERSITY WITH EFFECT FROM 2014 ADMISSION (SEMESTERWISE)

**Semester I**

| Sl.No. | Course code | Title of the course | Hours /week | Credit | Exam Hours | CE Marks | ESE Marks | Total Marks |
|---|---|---|---|---|---|---|---|---|
| 1 | 1A 01 ENG | Common course I :English | 5 | 4 | 3 | 10 | 40 | 50 |
| 2 | 1A 02 ENG | Common Course II: English | 4 | 3 | 3 | 10 | 40 | 50 |
| 3 | 1A 07 ADL | Common Course I: Additional Language Course I | 4 | 4 | 3 | 10 | 40 | 50 |
| 4 | 1C 01 --- | Complementary Course A | 4 | 3 | 3 | 8 | 32 | 40 |
| 5 | 1C 01 --- | Complementary Course B | 4 | 3 | 3 | 8 | 32 | 40 |
| 6 | 1B 01 MCB | Core Course 1: General Microbiology | 4 | 3 | 3 | 10 | 40 | 50 |
| TOTAL | | | **25** | **20** | | **56** | **224** | **280** |

**Semester II**

| Sl.No. | Course code | Title of the course | Hours /week | Credit | Exam Hours | CE Marks | ESE Marks | Total Marks |
|---|---|---|---|---|---|---|---|---|
| 1 | 2A 03 ENG | Common course III: English | 5 | 4 | 3 | 10 | 40 | 50 |
| 2 | 2A 04 ENG | Common course IV: English | 4 | 3 | 3 | 10 | 40 | 50 |
| 3 | 2A 08 ADL | Common Course II: Additional Language Course II | 4 | 4 | 3 | 10 | 40 | 50 |
| 4 | 2C 02 --- | Complementary Course A | 4 | 3 | 3 | 8 | 32 | 40 |
| 5 | 2C 02 --- | Complementary Course B | 4 | 3 | 3 | 8 | 32 | 40 |
| 6 | 2 B02 MCB | Core Course 2: Microbial Taxonomy | 4 | 3 | 3 | 10 | 40 | 50 |
| TOTAL | | | **25** | **20** | | **56** | **224** | **280** |

| **Semester III** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sl.No. | Course code | Title of the course | Hours /week | Credit | Exam Hours | CE Marks | ESE Marks | Total Marks |
| 1 | 3A 11 MCB | General course 1 :Biochemistry for Microbiology | 4 | 4 | 3 | 10 | 40 | 50 |
| 2 | 3A 12 MCB | General course 2: Biophysics and Bioinformatics | 4 | 4 | 3 | 10 | 40 | 50 |
| 3 | 3C 03 --- | Complementary Course A | 3 | 2 | 3 | 8 | 32 | 40 |
| 4 | 4C 05 --- | Complementary Course A Practical | 2 | - | - | - | - | |
| 5 | 3C 03 --- | Complementary Course B | 3 | 2 | 3 | 8 | 32 | 40 |
| 6 | 4C 05 --- | Complementary Course B Practical | 2 | - | - | - | - | |
| 7 | 3B 03 MCB | Core Course 3: Microbial Physiology | 3 | 4 | 3 | 10 | 40 | 50 |
| 8 | 3B 04 MCB | Core Course 4: Microbiology Practical I | 4 | - | - | - | - | |
| TOTAL | | | **25** | **16** | | **46** | **184** | **230** |
| **Semester IV** | | | | | | | | |
| Sl.No. | Course code | Title of the course | Hours /week | Credit | Exam Hours | CE Marks | ESE Marks | Total Marks |
| 1 | 4A 13 MCB | General course 3 :Molecular Biology | 4 | 4 | 3 | 10 | 40 | 50 |
| 2 | 4A 14 MCB | General course 4 : Microbial Genetics and Genetic Engineering | 4 | 4 | 3 | 10 | 40 | 50 |
| 3 | 4C 04 --- | Complementary Course A | 3 | 2 | 3 | 8 | 32 | 40 |
| 4 | 4C 05 --- | Complementary Course A Practical | 2 | 2 | | 8 | 32 | 40 |
| 5 | 4C 04 --- | Complementary Course B | 3 | 2 | 3 | 8 | 32 | 40 |
| 6 | 4C 05 --- | Complementary Course B Practical | 2 | 2 | | 8 | 32 | 40 |
| 7 | 4B 05 MCB | Core Course 5: Immunology | 3 | 3 | 3 | 10 | 40 | 50 |
| 8 | 4B 06 MCB | Core Course 6: Microbiology Practical II | 4 | 4 | 3 Hrs x 2 Days | 20 | 80 | 100 |
| TOTAL | | | **25** | **23** | | **82** | **328** | **410** |
| The practical examination of 3B04MCB Microbiology Practical I is to be conducted along with that of 4B06MCB Microbiology Practical II with a total credit of 4 and 100 marks at the end of IV semester. | | | | | | | | |

**Semester V**

| Sl.No. | Course code | Title of the course | Hours /week | Credit | Exam Hours | CE Marks | ESE Marks | Total Marks |
|---|---|---|---|---|---|---|---|---|
| 1 | 5B 07 MCB | Core Course 7: Microbial Biotechnology | 3 | 4 | 3 | 10 | 40 | 50 |
| 2 | 5B 08 MCB | Core Course 8: Bacterial Diseases | 4 | 5 | 3 | 10 | 40 | 50 |
| 3 | 5 B09 MCB<br>5 B10 MCB<br>5 B11 MCB | Core Course 9 /10/11 (Elective):<br>Environmental Microbiology<br>Disaster Management<br>Ecology and Biodiversity | 3 | 4 | 3 | 10 | 40 | 50 |
| 4 | 5B12MCB | Core Course 12: Virology Mycology and Parasitology | 3 | 4 | 3 | 10 | 40 | 50 |
| 5 | 5B 13 MCB | Core Course 13: Microbiology Practical – III | 5 | - | - | - | - | - |
| 6 | 5B 14 MCB | Core Course 14: Microbiology Practical – IV | 5 | - | - | - | - | - |
| 7 | 5D 01--- | Open Course-from other Departments | 2 | 2 | 2 | 5 | 20 | 25 |
| TOTAL | | | **25** | **19** | | **45** | **180** | **225** |

**Semester VI**

| Sl.No. | Course code | Title of the course | Hours /week | Credit | Exam Hours | CE Marks | ESE Marks | Total Marks |
|---|---|---|---|---|---|---|---|---|
| 1 | 6B 15 MCB | Core Course 15: Food Microbiology | 5 | 4 | 3 | 10 | 40 | 50 |
| 2 | 6B 16 MCB | Core Course 16: Sanitation Microbiology | 4 | 3 | 3 | 10 | 40 | 50 |
| 3 | 6B 17 MCB | Core Course 17: Agricultural Microbiology and Plant Pathology | 4 | 3 | 3 | 10 | 40 | 50 |
| 4 | 6B 18 MCB | Core Course 18: Microbiology Practical – V | 5 | 5 | 3Hrs x 2Days | 20 | 80 | 100 |
| 5 | 6B19 MCB | Core Course 19: Microbiology Practical – V I | 5 | 5 | 3Hrs x 2Days | 20 | 80 | 100 |
| 6 | 6B 20 MCB | Core Course 20: Project work | 2 | 2 | - | 5 | 20 | 25 |
| TOTAL | | | **25** | **22** | | **75** | **300** | **375** |
| **GRAND TOTAL =1800 Marks (360 CE+ 1440 ESE), 120 Credits.** | | | | **120** | | **360** | **1440** | **1800** |

*****The practical examinations of 5B13MCB Microbiology Practical III and 5B14MCB Microbiology Practical IV are to be conducted along with that of 6B18 MCB Microbiology Practical V and 6B19 MCB Microbiology Practical VI with a total credit of 10 and 200 marks at the end of VI semester.

** The students should undergo any one of the elective courses and any one of the open courses during the fifth semester.

*** Each student should do a group project and submit the report. The project will be evaluated both by continuous and by end semester evaluation procedures.

**** Microbiology Practical examinations are to be conducted together at the end of semester IV and semester VI. The exam hours are 3 x 2 consecutive days per batch. The practical examination of 3B04MCB Microbiology Practical I is to be conducted along with that of 4B06MCB Microbiology Practical II with a total credit of **4** and **100** marks at the end of **IV semester**. The practical examinations of 5B13MCB Microbiology Practical III and 5B14MCB Microbiology Practical IV are to be conducted along with that of 6B18 MCB Microbiology Practical V and 6B19 MCB Microbiology Practical VI with a total credit of **10** and **200** marks at the end of **semester VI**.

Total Credits = 120. Credits for Common courses = 38 (22 for Languages +16 for General) Credits for two Complementary courses = 24, Credits for Core courses including project = 56 (54+2), Credits for Open course = 2}

Total Marks-1800 (Common -English-200, Additional -100, General -200, Complementary -400, Core including project -875(850+25), Open-25)

**COURSE STRUCTURE OF B Sc MICROBIOLOGY (COMPLEMENTARY) OF KANNUR UNIVERSITY WITH EFFECT FROM 2014 ADMISSION**

| Complementary Courses in Microbiology | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **No.** | Sem ester | Course code | Title of the course | Hours /week | Credit | Exam Hours | CE Marks | ESE Marks | Total Marks |
| **1** | I | 1C 01 MCB | Basic Microbiology I | 4 | 3 | 3 | 8 | 32 | 40 |
| **2** | II | 2C 02 MCB | Basic Microbiology II | 4 | 3 | 3 | 8 | 32 | 40 |
| **3** | III | 3C 03 MCB | Applied Microbiology I | 3 | 2 | 3 | 8 | 32 | 40 |
| **4** | III | 3C 04 MCB | Microbiology (Complementary) Practical I | 2/Batch | - | - | - | - | - |
| **5** | IV | 4C 05 MCB | Applied Microbiology II | 3 | 2 | 3 | 8 | 32 | 40 |
| **6** | IV | 4C 06 MCB | Microbiology (Complementary) Practical II | 2/Batch | 2 | 3x2/ Batch | 8 | 32 | 40 |
| **Total** | | | | | **12** | | **40** | **160** | **200** |

Microbiology (Complementary) Practical examination of 3C 04 MCB Microbiology (Complementary) Practical I is to be conducted at the end of semester IV along with 4C 06 MCB Microbiology (Complementary) Practical II with a total credit of 2 and 40 marks. The examination duration is 3 Hours x 2 consecutive days per batch.

B Sc MICROBIOLOGY PROGRAMME OF KANNUR UNIVERSITY WITH EFFECT FROM 2014 ADMISSION**: TABLE OF COURSES**

| **COMMON COURSES to be done for B Sc MICROBIOLOGY : –Total 22 Credits, 300 Marks** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. | Sem. | Course code | Title of the course | Hrs per week | Credit | Exam Hrs | Marks (CE) | Marks (ESE) | Total Marks |
| 1 | I | 1A01 ENG | Common course I :English | 5 | 4 | 3 | 10 | 40 | 50 |
| 2 | I | 1A02 ENG | Common Course II: English | 4 | 3 | 3 | 10 | 40 | 50 |
| 3 | I | 1A07 ADL | Common Course I: Additional Language | 4 | 4 | 3 | 10 | 40 | 50 |
| 4 | II | 2A03 ENG | Common course III: English | 5 | 4 | 3 | 10 | 40 | 50 |
| 5 | II | 2A04 ENG | Common course IV: English | 4 | 3 | 3 | 10 | 40 | 50 |
| 6 | II | 2A08 ADL | Common Course II: Additional Language | 4 | 4 | 3 | 10 | 40 | 50 |
| TOTAL | | | | | **22** | | **60** | **240** | **300** |
| **GENERAL COURSES to be done for B Sc MICROBIOLOGY : –Total 16 Credits, 200 Marks** | | | | | | | | | |
| No. | Sem. | Course code | Title of the course | Hrs per week | Credit | Exam Hrs | Marks (CE) | Marks (ESE) | Total Marks |
| 1 | III | 3A11 MCB | General Course: Biochemistry for Microbiology | 4 | 4 | 3 | 10 | 40 | 50 |
| 2 | III | 3A12 MCB | General Course :Biophysics and Bioinformatics | 4 | 4 | 3 | 10 | 40 | 50 |
| 3 | IV | 4A13 MCB | General Course: Molecular Biology | 4 | 4 | 3 | 10 | 40 | 50 |
| 4 | IV | 4A14 MCB | General Course: Microbial Genetics & Genetic Engineering | 4 | 4 | 3 | 10 | 40 | 50 |
| TOTAL | | | | | **16** | | **40** | **160** | **200** |

**COMPLEMENTARY COURSES to be done for B Sc MICROBIOLOGY : -Total 24 Credits, 400 Marks**

| No. | Sem. | Course code | Title of the course | Hrs per week | Credit | Exam Hrs | Marks (CE) | Marks (ESE) | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | I | 1C 01--- | Complementary Course A | 4 | 3 | 3 | 8 | 32 | 40 |
| 2 | I | 1C 01 --- | Complementary Course B | 4 | 3 | 3 | 8 | 32 | 40 |
| 3 | II | 2C 02--- | Complementary Course A | 4 | 3 | 3 | 8 | 32 | 40 |
| 4 | II | 2C 02--- | Complementary Course B | 4 | 3 | 3 | 8 | 32 | 40 |
| 5 | III | 3C 03--- | Complementary Course A | 3 | 2 | 3 | 8 | 32 | 40 |
| 6 | III | 3C 04--- | Complementary Course A Practical | 2 | - | - | - | - | - |
| 7 | III | 3C 03 -- | Complementary Course B | 3 | 2 | 3 | 8 | 32 | 40 |
| 8 | III | 3C 04--- | Complementary Course B Practical | 2 | - | - | - | - | - |
| 9 | IV | 4C 05--- | Complementary Course A | 3 | 2 | 3 | 8 | 32 | 40 |
| 10 | IV | 4C 06--- | Complementary Course A Practical | 2 | 2 | * | 8 | 32 | 40 |
| 11 | IV | 4C05 --- | Complementary Course B | 3 | 2 | 3 | 8 | 32 | 40 |
| 12 | IV | 4C05 --- | Complementary Course B Practical | 2 | 2 | * | 8 | 32 | 40 |
| TOTAL | | | | | **24** | | **80** | **320** | **400** |

I to IV Semesters: 24 credits (12 each for Complementary A and Complementary B).

* Practical examination duration will be decided by the concerned Board.

--- Indicates the respective course codes of complementary courses.

**B Sc MICROBIOLOGY : CORE COURSES-Total 56 Credits, 875 Marks**

| No | Sem | Course code | Title of core courses | Hours /week | Credit | Exam Hrs x days | Marks (CE) | Marks (ESE) | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | I | 1B 01 MCB | 1: General Microbiology | 4 | 3 | 3 | 10 | 40 | 50 |
| 2 | II | 2 B02 MCB | 2: Microbial Taxonomy | 4 | 3 | 3 | 10 | 40 | 50 |
| 3 | III | 3B 03 MCB | 3: Microbial Physiology | 3 | 4 | 3 | 10 | 40 | 50 |
| 4 | III | 3B 04 MCB | 4: Microbiology Practical I | 4 | - | - | - | - | |
| 5 | IV | 4B 05 MCB | 5: Immunology | 3 | 3 | 3 | 10 | 40 | 50 |
| 6 | IV | 4B 06 MCB | 6: Microbiology Practical II | 4 | 4 | 3 Hrs x 2 Days | 20 | 80 | 100 |
| 7 | V | 5B 07 MCB | 7: Microbial Biotechnology | 3 | 4 | 3 | 10 | 40 | 50 |
| 8 | V | 5B 08 MCB | 8: Bacterial Diseases | 4 | 5 | 3 | 10 | 40 | 50 |
| 9 | V | 5 B09 MCB<br>5 B10 MCB<br>5 B11 MCB | 9 /10/11 (Elective):<br>Environmental Microbiology<br>Disaster Management<br>Ecology and Biodiversity | 3 | 4 | 3 | 10 | 40 | 50 |
| 10 | V | 5B12MCB | 12: Virology, Mycology and Parasitology | 3 | 4 | 3 | 10 | 40 | 50 |
| 11 | V | 5B 13 MCB | 13: Microbiology Practical – III | 5 | - | - | - | - | - |
| 12 | V | 5B 14 MCB | 14: Microbiology Practical – IV | 5 | - | - | - | - | - |
| 13 | VI | 6B 15 MCB | 15: Food Microbiology | 5 | 4 | 3 | 10 | 40 | 50 |
| 14 | VI | 6B 16 MCB | 16: Sanitation Microbiology | 4 | 3 | 3 | 10 | 40 | 50 |
| 15 | VI | 6B 17 MCB | 17: Agricultural Microbiology and Plant Pathology | 4 | 3 | 3 | 10 | 40 | 50 |
| 16 | VI | 6B 18 MCB | 18: Microbiology Practical – V | 5 | 5 | 3Hrs x 2Days | 20 | 80 | 100 |
| 17 | VI | 6B19 MCB | 19: Microbiology Practical – VI | 5 | 5 | 3Hrs x 2Days | 20 | 80 | 100 |
| 18 | VI | 6B 20 MCB | 20: Project work | 2 | 2 | - | 5 | 20 | 25 |
| TOTAL | | | | | **56** | | **175** | **700** | **875** |

*The student should undergo any one of the elective courses out of the three offered in the fifth semester.

| **B Sc MICROBIOLOGY : OPEN COURSES-Total 2 Credits, 25 Marks** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. | Sem | Course code | Title of the course | Hrs per week | Credit | Exam Hrs | Marks (CE) | Marks (ESE) | Total Marks |
| 1 | V | 5D01MCB | Biosafety and Bioethics | 2 | 2 | 2 | 5 | 20 | 25 |
| 2 | V | 5D02 MCB | Food borne Diseases | 2 | 2 | 2 | 5 | 20 | 25 |
| 3 | V | 5D03MCB | Microbes and Environment | 2 | 2 | 2 | 5 | 20 | 25 |

*****The student should undergo any one of the open courses out of the three offered during the fifth semester**.**

Total Credits-120 {Common courses-38 (22 for Languages +16 for General), Complementary-24, Core including project-56, Open-2}

Total Marks: 1800. Common (English): 200 Marks, Additional: 100 Marks, General: 200 Marks, Complementary: 400 Marks, Core: 875 Marks and Open: 25 Marks.

| **B Sc MICROBIOLOGY (Complementary) -Complementary Courses in Microbiology** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. | Sem | Course code | Title of the course | Hours /week | Credit | Exam Hrs | Marks (CE) | Marks (ESE) | Total Marks |
| 1 | I | 1C01 MCB | Basic Microbiology I | 4 | 3 | 3 | 8 | 32 | 40 |
| 2 | II | 2C02 MCB | Basic Microbiology II | 4 | 3 | 3 | 8 | 32 | 40 |
| 3 | III | 3C03 MCB | Applied Microbiology I | 3 | 2 | 3 | 8 | 32 | 40 |
| 4 | III | 3C04 MCB | Microbiology (Complementary) Practical I | 2/Batch | - | - | - | - | |
| 5 | IV | 4C05 MCB | Applied Microbiology II | 3 | 2 | 3 | 8 | 32 | 40 |
| 6 | IV | 4C06 MCB | Microbiology (Complementary) Practical II | 2/Batch | 2 | 3hours x2days/Batch | 8 | 32 | 40 |
| **Total 12 Credits, 200 Marks** | | | | | **12** | | **40** | **160** | **200** |

**Syllabus for**
**Undergraduate Programme in**

**MICROBIOLOGY CORE COURSE**

**Under the**
**Kannur University Choice Based Credit and Semester System (KUCBCSS)**
***(With effect from 2014 admission)***

**CORE COURSE:**

**1B01 MCB GENERAL MICROBIOLOGY**

(50 Hours)

Hours/week-4 Credits-3

Learner Objectives

1. To gain a preliminary understanding about the history and developments in Microbiology
2. To familiarize with Microbiological techniques
3. To develop interest in control measures of pathogens and other microbes

**MODULE I-** The Historical Development of Microbiology, Spontaneous generation versus biogenesis, Germ theory of diseases, pure-culture concept. Contributions of Louis Pasteur and Robert Koch to Microbiology in detail. (5 Hours)

**MODULE II**-Microscopy and staining: Bright field, Dark field, Phase contrast and Fluorescent microscope. Electron microscope-transmission and scanning. Simple, Negative, Differential (Gram and Ziehl Neelsen), Impregnation and Special staining for endospore and flagella (8 Hours)

**MODULE III-** Morphology of bacteria. Ultra structure of Prokaryotic cell. Flagella, Pili, Glycocalyx, Cell wall, Cytoplasmic membrane. Mechanism of Gram staining, Protoplasts and Spheroplasts- Internal structures like, ribosomes, volutin granules, vacuoles, nuclear material, intracellular membrane system. Brief account on dormant forms of Prokaryotes- endospores and cysts. (10 Hours)

**MODULE IV-** Comparative study on the ultra structure of Eukaryotic cell with prokaryotic cells. Gross Morphological characteristics of Eukaryotic Microorganisms - Fungi, Algae, Protozoa - brief account. Structure of viruses – general structure of DNA and RNA viruses - (5 Hours)

**MODULE V-** Culture media-definition, classification based on (a) consistency-solid, liquid, semisolid, (b) ingredients- chemically defined, semi defined media, complex media. Special media- Enriched, Enrichment Selective, Differential, Indicator, Transport, Anaerobic and microbiological Assay media with examples. Major ingredients of media for cultivation of bacteria, fungi, protozoa and algae, Tissue culture media, brief account of Animal and Plant cell culture (8 Hours)

**MODULE VI**- Fundamentals of Microbial control- definition and classification of Antimicrobial Agents. Differences between the following- microbistatic and microbicidal agents, sterilization and disinfection. Pattern of death in a microbial population- exponential death. Conditions that affect antimicrobial agents. Mechanisms of microbial cell damage. Physical and Chemical agents for microbial control – Heat (dry and moist), filtration, and Irradiation (ionising and non ionising). Major groups of chemical antimicrobial agents-

alcohols, aldehydes, phenol, halogens, gases, surface active agents, dyes. Characters of an ideal Chemical agent. Evaluation of antimicrobial potency of disinfectants- Phenol coefficient- Rideal Walker and Chick Martin test. Major groups of antibiotics and their mode of action briefly (8 Hours)

**MODULE VII**-Isolation and cultivation and preservation of Pure Cultures- Streak plate method, Spread plate method, Pour plate method, Stab culture and Stroke culture methods. Colony forming unit-Enumeration of microbial cells, Preservation of pure cultures Refrigeration, Deep freezing and Freeze drying in vacuum (Lyophilization). (6 Hours)

**REFERENCES:**

Microbiology : Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg

Text Book of Microbiology- R Ananthanarayan, C.K.J Paniker

Prescott, Harley, and Kleins MIcrobiology –Prescott

**CORE COURSE:**

**2B02 MCB MICROBIAL TAXONOMY**

(50 Hours)

Hours/week-4 Credits-3

Learner Objectives

1. To gain a preliminary understanding about the classification methods in Microbiology
2. To familiarize with different groups of micro organisms
3. To develop interest in systematics

**MODULE I**: Classification of Microorganisms - objectives and Practical value of taxonomy. Phylogenetic relationship. Major systems of biological classification. Five kingdom And Three kingdom classification, Scientific Nomenclature, Taxonomic hierarchy, Evolutionary relationships among prokaryotic groups. (8 Hours)

**MODULE II**: Various criteria used in bacterial classification, Morphological characteristics, staining characters, Biochemical tests, serotyping and DNA hybridization. (8 Hours)

**MODULE III**: Bergey's manual of systematic bacteriology - an international reference book. Eubacteria and Archaeobacteria. Comparative account on important groups of Archaeobacteria. (4 Hours)

**MODULE IV**: Bacteria: Brief account on differentiating characters of different groups of Gram negative Eubacteria and Gram positive Eubacteria. (10 Hours)

**MODULE V** : Fungi:Classification of fungi - slime molds, flagellated lower fungi, Terrestrial fungi-brief account with examples. Classification of Algae - Green Algae, Diatoms and Golden brown Algae, Dinoflagellates - brief account with examples. Classification of Protozoa - Flagellates, Amoeba, Sporozoa and Ciliates- Brief account with examples. (10 Hours)

**MODULE VI**: Viruses: Classification of plant viruses with representing examples. Classification of animal viruses- brief account on important characteristics of each family with examples. Taxonomy of bacterial viruses with examples (10 Hours)

**REFERENCES:**

Brock Biology of Microorganisms-Michael T Madigan, John M Martinko

Prescott, Harley and Kleins Microbiology- Prescott

Alcamos Fundamentals of Microbiology- Jeffrey Pommerville

Microbiology : An Introduction-Gerard J. Totora, Berdell R. Funke ,Christine L. Case

Microbiology- Jacqulyn G Black

Microbiology: Principles and &Applications-J Black

**GENERAL COURSE:**

**3A11 MCB BIOCHEMISTRY FOR MICROBIOLOGY** (50 Hours)

Hours/week-4 Credits-4

Learner Objectives
1. To gain an understanding about essential Biochemistry required for Microbiology students
2. To develop interest in the chemistry of life.

**MODULE I:** Chemical bonds, and weak force of attractions in bio-molecules, Hydrogen bond and properties of water. Acids, bases and buffers, pH and its measurement, Preparation of buffer solutions, Chemical Reactions: Red-ox reactions, redox potentials and their role in living system. (8 Hours)

**MODULE II:** Carbohydrates –Classification, Stereoisomerism and optical activity in Monosaccharides, Structure of glucose and other important monosaccharieds. Properties of Monosaccharides. Disaccharides brief account with examples. Polysaccharides - brief account with examples. Peptidoglycan and bacterial cell wall. Glycoproteins- definition and examples, Glycolysis , Kreb cycle and Peptidoglycan biosynthesis. (8Hours)

**MODULE III:** Amino acids and proteins. Important functions of proteins- brief account. General structure of Aminoacid and Aminoacid classification. Non protein amino acids. Ionic charge of protein molecule and electrophoresis. Primary, Secondary and Tertiary structure-(mention briefly) Folding of polypeptide chains. Occurrence of secondary structures in proteins. Globular proteins and their sub structures. Immunoglobulin G. Brief account on aminoacid degradation-transamination, decarboxylation and deamination. Urea cycle. (10 Hours)

**MODULE IV:** General properties of Enzymes. Mechanism of enzyme action- Enzyme substrate interaction, Activation energy, Rate of reaction and Michaelis constant. Michaelis-Menton equation. Classification of enzymes. Regulations of enzyme catalysed reactions,Enzyme inhibitors and allosteric inhibition (8 Hours)

**MODULE V:** Nucleic acids – Components and organisation, Nucleoside di and tryphosphates, Cyclic nucleotides. Co valent structure of RNA and DNA, DNA Double helix, Denaturation and Renaturation of nucleic acids. Folding of single stranded nucleic acids. Organization of Ribosomes. (8 Hours)

**MODULE VI:** Fats and fatty acids, Nomenclature of lipids and fats. Acyl glycerols, Waxes, Phospholipids Glycolipids, Glyceryl esters, Terpenoids and Steroides. Functions of lipids. Biological membranes. Lipoproteins. Fat and phospholipid hydrolysis. β Oxidation. Fatty acid biosynthesis (6 Hours)

**MODULE VII:** Distinguish drug abuse, drug dependence and drug addiction. Route of administration of drugs. Effect of drug abuse on different organs like lungs, brain, eye and liver. Damaging effects of alcohol and Opioids. Behavioural and sociological implications of drug abuse. De addiction and de addiction centres. (2 Hours)

**REFERENCES**:

Outlines of Biochemistry - Eric E. Conn, Paul K. Stumpf, George Bruening, Roy H.Doi

Biochemistry-Horton

Lehninger Principles of Biochemistry- David L Nelson, Michael M Cox

Lowinson and Ruiz's Substance Abuse: A Comprehensive Textbook (4th edition) - Pedro Ruiz and Eric Strain

Health Psychology- Taylor (2006) McGraw Hills Inc., New Delhi.

Essentials of Psychiatry (6th edition) – Bhatia M S (2010) CBS Publishers & Distributors. Pvt. Ltd, New Delhi.

**GENERAL COURSE:**

**3A12 MCB BIOPHYSICS AND BIOINFORMATICS**

(50 Hours)

Hours/week-4 Credits-4

Learner Objectives
1. To gain an understanding about essential Biophysics required for Microbiology students
2. To develop interest in the biophysical chemistry of life.
3. To gain an understanding about introductory and applied Bioinformatics

**MODULE I:** Thermodynamics and kinetics: Open, closed and isolated systems, laws of thermodynamics, thermodynamic equilibrium, concept of enthalpy, entropy and free energy. (3 Hours)

**MODULE II:** Concepts and importance of following in Biology: surface tension, adsorption, osmosis, dialysis and colloids (2 Hours)

**MODULE III:** Basic principles of protein structure Structural hierarchy of proteins, Primary, secondary, tertiary and quaternary structure of proteins, motifs and domains structure - α a helix, β plated sheets, Omega loops, Irregular and random structures in proteins. (10 Hours)

**MODULE IV:** Structural hierarchy of nucleic acids A, B, Z DNA and their inter conversions, Watson and Crick base pairing, Triple and quadruple helical structures in nucleic acids, DNA super coiling, DNA protein assemblies (10 hours)

**MODULE V:** Basic concepts of computing machines-modern personal computer- standard specifications. Major databases in Bioinformatics-Biological database: Primary databases: Nucleotide sequence databases – Mention EMBL, DDBJ, Genbank. Protein sequence databases – Mention Swiss Prot, TrEMBL, PIR, Genome Databases at NCBI, EBI, TIGR. Secondary databases: Mention PROSITE, PRINTS, (10 Hours)

**MODULE VI**: Database Search Engines-Mention Entrez at NCBI of USA, SRS at EBI of England, STAG at DDBJ of Japan. Sequence Similarity Search: Pair wise sequence alignment- Mention BLAST, FASTA; Multiple sequence alignment – Mention CLUSTAL W, CLUSTAL X. (5 Hours**)**

**MODULE VII:** Sequence alignment: sequence identity, similarity and homology. Global and Local alignment. Database similarity searching- BLAST, FASTA. Phylogenetic analysis – PHYLIP (5 Hours)

**MODULE VIII:** A brief introduction to Genomics- DNA sequencing, applications (brief account) & Proteomics- Tools and applications (brief account) Protein Data Bank. Homology

modelling of protein, Introduction to drug discovery and designing, Drug - Receptor interactions. (5Hours)

**REFERENCES:**

Biophysics - M V Volkenstein

Essentials of Biophysics - P Narayanan

Biophysics - K Roy

Bioinformatics: Methods and applications- Rastogi,S C, Mendiratta, N and Rastogi P

Text book of Bioinformatics-Sharma, Munjal and Shankar

Bioinformatics: Databases, Tools and Algorithms- Orpita Basu et al

Bioinformatics for Beginners - K Mani and N Vijayaraj

Informatics Bioinformatics- K Vijayakumaran Nair, V S Sugunan, S S Vinod Chandra, K Shiny Sreedhar

**CORE COURSE:**

**3B03 MCB MICROBIAL PHYSIOLOGY**

(50 Hours)

Hours/week-3 Credits-4

Learner Objectives
1. To gain a preliminary understanding about the microbial nutrition.
2. To familiarize with energy production in micro organisms.

**MODULE I**: Nutritional types of microorganisms. Nutritional requirements for microbial growth - Carbon, Nitrogen. Sulfur, Oxygen, Phosphorus, Hydrogen, microelements and energy sources; Vitamins and growth factors. Factors influencing microbial growth - Temperature, Gaseous atmosphere. pH, Osmotic pressure and Hydrostatic pressure. (8 Hours)

**MODULE II**: Reproduction and growth of microorganisms, Kinetics of growth -multiplication, and death of microbial cell. Growth curve in a closed system, continuous culture and synchronous culture. Measurement of population growth**.** (8 Hours)

**MODULE III**: Microbial energetics- photosynthesis, light and dark reaction, Role of chlorophyll and bacterial chlorophyll in photosynthesis. Anoxygenic photosynthesis - Purple bacterial photosynthesis - Electron flow and ATP synthesis. Autotrophic Carbon dioxide fixation (Calvin cycle). (12 Hours)

**MODULE IV**: Chemolithotrophy- (energy from oxidation of inorganic electron donors) Hydrogen oxidizing bacteria, Sulfur bacteria, Iron-oxidizing bacteria, Ammonium and Nitrate oxidizing bacteria. ATP Production by chemolithotrophs. Anaerobic respiration, Nitrate reduction and Denitrification process Sulfate reduction, Methanogenesis and Acetogenesis. Hydrocarbon transformation- (Aliphatic and Aromatic hydrocarbons) by micro organisms-examples for each. (12 Hours)

**MODULE V**: Nitrogen fixation – Nitrogenase- Physiology and Genetics. Physiological difference in nitrogen fixing cells (Free living, symbiotic and Associative symbiotic organisms) (10 Hours)

**REFERENCES:**

Brock Biology of Microorganisms-Michael T Madigan, John M Martinko

Prescott, Harley and Kleins Microbiology- Prescott

Microbiology: Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg

**CORE COURSE:**

**3B04 MCB MICROBIOLOGY PRACTICAL- I**

Hours/week-4

List of Experiments

1) Cleaning and sterilization of glassware

2) Introduction to autoclave, hot air oven, incubator

3) Microscope and its maintenance

4) Simple staining using Methylene Blue

5) Gram's staining

6) Negative staining for Capsule- Maneval's method

7) Endospore staining-Schaeffer-Fulton method

**REFERENCES:**

Microbiology- A laboratory Manual - James G. Cappuccino, Natalie Sherman

Microbiological Applications - Harold J Benson

Manual of Microbiology: Tools and techniques - Kanika Sharma

Practical Medical Microbiology-T J Mackie and J E McCartney

**GENERAL COURSE:**

**4A13 MCB MOLECULAR BIOLOGY** (50 Hours)

Hours/week-4 Credits-4

Learner Objectives
1. To gain an understanding about essential Molecular Biology required for Microbiology students
2. To develop interest in the chemistry of life.

**Module I:** Historical background of Molecular Biology. DNA as the Genetic material- Experimental evidences. (3 Hours)

**Module II:** DNA structure. The Watson and Crick model and its importance - detail. Chemical and physical properties of DNA. Organization of bacterial and eukaryotic chromosome. DNA super coiling- chromatin and nucleoid structure. Histones- structure and function. (4 Hours )

**Module III:** DNA Replication- Semi-conservative mode of replication. Enzymes and accessory proteins involved in DNA replication and their mechanism (bi-directional, semi-discontinuous, RNA priming). Various models of DNA replication- rolling circle, D loop, θ (theta) replication. Brief account of DNA repair - Mismatch repair, Base excision repair, Direct repair and SOS repair.
(12 Hours)

**Module IV:** Chemistry of RNA-brief account - Ribosomal RNA Messenger RNA and Transfer RNA. Transcription- DNA depended synthesis of RNA, RNA polymerases and mechanism. RNA depended synthesis of RNA and DNA- Reverse transcriptase and RNA replicase- brief account. RNA processing in prokaryotes. Ribosomal structure- Prokaryotic and eukaryotic-comparative account. (12 Hours )

**Module V:** Genetic code: codon assignment, Universality, Triplet binding and reading frame, anticodons, degeneracy, and wobble hypothesis. (4 Hours )

**Module VI:** Translation- Activation of amino acids and mechanism of protein synthesis. Polysomes. Folding and post translational processing. (7 Hours)

**Module VII:** Regulation of Gene expressions in prokaryotes- Operon concept, positive and negative regulation, attenuation regulation- Lac operon and tryptophan operon as examples. Gene regulation by recombination. (8 Hours)

**REFERENCES**:

Molecular biology of the Gene - James D Watson

Cell and molecular Biology- E.D.P De Robertis, E.M.F De Robertis

Genes IX - Benjamin Lewin

Principles of Biochemistry - Lehninger

Microbial Genetics - David Freifelder

Molecular Biology- David Freifelder

Cell and Molecular Biology-Concepts and Experiments- Gerald Karp

**GENERAL COURSE:**

**4A14 MCB MICROBIAL GENETICS & GENETIC ENGINEERING**
(50Hours)

Hours/week-4 Credits-4

Learner Objectives
1. To gain a preliminary understanding about the genetic changes in micro organisms
2. To familiarize with applied aspects of genetic engineering
3. To create interest in various aspects of development of GMO

**MODULE I** : Introduction to Genetics-Mendelian laws, chromosomal theory of heredity, one gene one enzyme hypothesis. Importance of Microbial Genetics - Phenotype, Genotype Mutations and mutants, isolation of mutants. Molecular basis of mutation. Base pair substitution, Point mutation - insertion or deletion – Frame shift mutation. Back mutation, suppressor mutation. Mutagens Chemicals and Radiation. (10 Hours)

**MODULE II** : Genetic Recombination, conjugation, Transformation, Transduction, Mechanism and applications. (7 Hours)

**MODULE III** : Bacteriophages; General characteristics, Lysogenic and Lytic phage cycle. Transduction. (4 Hours)

**MODULE IV**: Plasmids, Types of plasmids, Replication of piasmids. R.Plasmid F Plasmid, Col Plasmid, Degadative piasmids, Metal resistance and pesticide resistance. Transposable elements. Molecular mechanism of DNA recombination-site specific recombination, homologous recombination and transposition (7 Hours)

**MODULE V**: Yeast Genetics: Mating types, Yeast plasmid, mitochondrial inheritance in yeast. (2 Hours)

**MODULE VI**: Brief introduction to Genetic engineering and its importance. Molecular cloning -Restriction enzymes, cloning vectors- plasmids, lamda phages, and cosmids. Introduction of recombinant DNA into host cell, detection of clone containing the desired gene. Expression of the clone gene in the host microorganism- production of insulin and interferon, production of synthetic vaccines-subunit vaccines and live recombinant vaccines. (10 Hours)

**MODULE VII**: General methods of production of transgenic plants and animals-Bt cotton. General accounts on Genetically Modified (GM) foods-advantages and apprehensions. (10 Hours)

**REFERENCES:**

Microbial Genetics- David Freifelder

Recombinant DNA technology- Jogdhant

Microbial Biotechnology :Fundamental of Applied Microbiology-Alexander N. Glazer, Hiroshi Nikaido

Microbiology : Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg

Prescott, Harley, and Kleins MIcrobiology -Prescott

Brock Biology of Microorganisms-Michael T Madigan, John M Martinko

Principles of Genetics- SNUSTAD, D. Peter SIMMONS, Michael J GARDNER, Eldon john

**CORE COURSE:**

**4B05 MCB IMMUNOLOGY** (50 Hours)

Hours/week-3 Credits-3

Learner Objectives

1. To gain a preliminary understanding about various immune mechanisms.
2. To familiarize with Immunological techniques
3. To develop interest in serodiagnosis of infectious diseases

**MODULE I** : Infection- Different types like primary, secondary, cross, nosocomial, endogenous, exogenous etc.-Definitions. Different sources of infections methods of transmission of diseases. Carriers-different types. MID, $ID_{50}$, MLD, $LD_{50}$. Bacteremia, septicemia, virulence factors of microorganism. (5 Hours)

**MODULE II** : Immunity-Different types- innate, acquired, active and passive. Mechanisms of immunity-Barriers, phagocytosis, inflammation. Immune responses-primary and secondary-Functions of immune systems- different organs and cells of immune system. central and peripheral lymphoid organs, leucocytes, lymphocytes-T and B Cells macrophages, plasma cells (15 hours)

**MODULE III**: Antigens-Different types. Haptens, antigenic determinants- definitions. Immunoglobulins: basic structure and different classes-IgG, IgA, IgM, IgD and IgE- functions. Theories of antibody synthesis-instructive and selection theory, clonal selection theory. Monoclonal antibodies. Antigen anti body reactions - precipitation, agglutination, complement fixation, Enzyme Linked Immuno Sorbent Assay (ELISA), Immuno fluorescence, Radio Immuno Assay (RIA). Clinical applications of these antigen antibody reactions- Widal test, VDRL test, Wassermann CFT, RA-Latex agglutination test, ELISA for HIV as examples. (20 Hours)

**MODULE IV:** Hypersensitivity reactions-different types of reactions and their mechanisms. Autoimmunity-different autoimmune diseases like pernicious anemia and rheumatoid arthritis. Transplantation immunity – only a brief general account on types of transplants, immunological response in rejection reactions, GVH reaction and its complications. Tumour immunity briefly-immune response to tumours-humoral and cellular, its evidences (10 Hours)

**REFERENCES:**

Immunology - Janis Kuby

Immunology- Elie Benjamin

Text book of Microbiology – R Ananthanarayan and C K J Paniker

Essential Immunology - Ivan M Roitt

Immunology-Ivan Roitt, Jonathan Brostoff, David Male

Credits: 4

**CORE COURSE:**

**4B06 MCB MICROBIOLOGY PRACTICAL: II**

Hours/week-4

List of Experiments

1) Motility test by Hanging Drop method

2) Preparation of culture media (Nutrient Broth, Nutrient Agar)

3) Isolation of pure culture (Streak plate method)

4) Enumeration of microbial cells- Total count by Breeds count

5) Fungal staining using LPCB

**REFERENCES:**

Microbiology- A laboratory Manual - James G. Cappuccino, Natalie Sherman,

Microbiological Applications - Harold J Benson

Manual of Microbiology: Tools and techniques - Kanika Sharma

Practical Medical Microbiology-T J Mackie and J E McCartney

**CORE COURSE:**

**5B07 MCB MICROBIAL BIOTECHNOLOGY**

(50 Hours)

Hours/week-3 Credits-4

Learner Objectives
1. To gain preliminary understanding about fermentation technology.
2. To familiarize with microbial products by fermentation process.
3. To develop interest in bioinsecticides.

**MODULE I**: Introduction to fermentation processes- media for industrial fermentation, sterilization, inoculum preparation (4 Hours)

**MODULE II**: Fermentation technology- isolation, screening and strain improvement of industrially important microorganisms. Design and parts of fermenter-agitation, aeration. PH, temperature, dissolved oxygen- control and monitoring, difference in fermentation process for biomass, chemicals and conversion products-brief comparative account. (10 Hours)

**MODULE III**: Techniques of Downstream processes-separation of cells- filtration, centrifugation. Purification methods-Chromatography and Distillation. A brief account on Economics of fermentation technology. (8 Hours)

**MODULE IV**: Brief account of industrial production of beer, bread, industrial alcohol, acetone, butanol, vinegar and citric acid by microorganisms. (10Hours)

**MODULE V**: Importance of amino acid fermentation- General aspects of mutant strains used for amino acid fermentation. Amino acid production by enzymes. (5 Hours)

**MODULE VI**: Production of microbial enzymes and its importance- protease, invertase, amylase - brief account of enzyme technology. Immobilization of cells and enzymes- their important applications. Biosensors. (5 Hours)

**MODULE VII**: Industrial production of pharmaceutical products- classes of antibiotics, development of beta lactams and semi synthetic penicillins. Industrial production of Penicillin G. Production of vitamin- B 12 and B2.
(5 Hours)

**MODULE VIII**: Bio insecticides-*Bacillus thuringiensis*, Baculoviruses- their importance.
(3 Hours)

**REFERENCES:**

Microbial Biotechnology: Fundamentals of Applied microbiology - Hiroshi Nikaido, Alexander N Glazer

Industrial microbiology - L E Casida

Prescott and Dunn's Industrial microbiology -Prescott

Brocks Biology of Micro organisms - Michael T Madigan, John M Martinko

**CORE COURSE:**

**5B08 MCB BACTERIAL DISEASES** (55 Hours)

Hours/week-4 Credits-5

Learner Objectives

1. To gain understanding about various pathogenic micro organisms.
2. To familiarize with symptoms of common infectious diseases and their diagnostic procedures and to develop interest in prophylactic measures of infectious diseases

**MODULE I** : *Staphylococcous aureus, Streptococcus pyogenes, Streptococcus pneumoniae, Neisseria gonorrhoea, Neisseria meningitidis* -morphology and resistance of these organisms. Symptoms, epidemiology, laboratory diagnosis, prophylaxis and chemotherapy of the diseases caused by the above bacteria. (9 Hours)

**MODULE II**: *Bacillus anthracis, Corynebacterium diphtheriae, Clostridium tetani, Clostridium welchii* –morphology and resistance. Symptoms, epidemiology, laboratory diagnosis, prophylaxis and treatment of the diseases caused by these bacteria. ( 9 Hours)

**MODULE III**: *Salmonella typhi, Shigella dysenteriae,Vibrio cholera, Klebsiella pneumoniae, E.coli* -morphology and resistance. Symptoms, epidemiology, laboratory diagnosis, prophylaxis and treatment of diseases caused by these organisms. (9 Hours)

**MODULE IV**: *Helicobacter pylori, Haemophilus influenzae, Bordetella pertussis, Brucella abortus, Yersinia pestis* -morphology and resistance. Symptoms, epidemiology, laboratory diagnosis, prophylaxis and chemotherapy of diseases caused by the above bacteria. (8Hours)

**MODULE V**: *Mycobacterium tuberculosis, Mycobacterium leprae* -morphology and resistance, symptoms, epidemiology, laboratory diagnosis, prophylaxis and treatment of the diseases caused by these bacteria. (6 Hours)

**MODULE VI**: Spirochetes – *Treponema pallidum, Borrelia recurrentis, Borrelia burgdorferii and Leptospira icterohaemmorrhagiae-* morphology of the bacteria, symptoms , epidemiology laboratory diagnosis and prophylaxis of the diseases caused by these.(8 Hours)

**MODULE VII**: A brief account on Rickettsial and Chlamydial diseases with species names and diseases caused with vectors if present. (6 Hours)

**REFERENCES:**

Text book of Microbiology – R Ananthanarayan and C K J Paniker.

Practical Medical Microbiology- T J Mackie and J E Mc Cartney

**CORE COURSE (Elective):**

**5B09 MCB ENVIRONMENTAL MICROBIOLOGY** (50 Hours)

Hours /Week-3 CREDITS-4

Learner Objectives
1. To gain a preliminary understanding about Environmental Microbiology
2. To enhance awareness about xenobiotic pollution
3. To develop interest in bioremediation

**MODULE I**: Brief account of Ecosystem- energy flow in ecosystem. Biogeochemical cycles- brief account with its importance- Carbon, Nitrogen, Sulfur and Phosphorus cycles. (8 Hours)

**MODULE II**: Interaction between microorganisms in soil- Mutualism, Commensalisms, Ammensalism, Synergism, Parasitism, Predation, Competition, Antibiosis- their significance. (10 Hours)

**MODULE III**: Microbiology of air- micro flora of air, aerosols, droplet nuclei, infectious dust, Microbiological sampling of air. (4 Hours)

**MODULE IV**: Aquatic microbiology- Aquatic environment, physical factors affecting aquatic life, distribution of microorganisms in aquatic environment- fresh water estuarine and marine water systems. Factors influencing microbial growth and distribution. Role of microorganisms in aquatic ecosystems (8 Hours)

**MODULE V**: Microbiology of Xenobiotics- Novel pollutants, persistence and Bio-magnification. Recalcitrant Halocarbons, Nitro aromatic compounds, Poly Chlorinated Biphenyls and Dioxins, Synthetic Polymers, Alkyl Benzyl Sulfonates. Petroleum Hydrocarbons -their microbial degradation. Bio remediation of polluted environment. (15 Hours)

**MODULE VI**: Microbial leaching. Corrosion of metals due to microbial growth. Microbial films (Biofilms) (5Hours)

**REFERENCES:**

Microbial Ecology : Fundamentals & Applications- Richard Bartha, Ronald M Atlas

Environmental Microbiology-Ian Pepper, Raina M Maier, Charles P Gerba

Prescott, Harley,and Kleins Microbiology- Prescott

Microbiology: Concepts and Applications- Michael J Pelczar, E C S Chan, Noel R Krieg

Microbiology- Michael J Pelczar, E C S Chan, Noel R Krieg

**CORE COURSE (Elective):**

**5B 10 MCB DISASTER MANAGEMENT** (50 Hours)

Hours/week-3 Credits-4

Learner Objectives

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
4. To enhance awareness of institutional processes in the country and
5. To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

**MODULE I**: Introduction to Disasters: Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks) (6 Hours)

**MODULE II**: Disasters: Classification, Causes, Impacts (including social,economic, political, environmental, health, psychosocial, etc. )
Differential impacts- in terms of caste, class, gender, age, location, disability. Global trends in disasteis!urban disasters, pandemics, complex emergencies,Climate change (12 Hours)

**MODULE III**: Approaches to Disaster Risk reduction: Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural nesures, roles and responsibilities of- community, Panchayati Raj Institutions/UrbanLocal Bodies (PRIs/ULBs), states, Centre, and other stake-holders. (10 Hours)

**MODULE IV**: Inter-relationship between Disasters and Development:
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources (6 Hours)

**MODULE V**: Disaster Risk Management in India Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management
Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation) (8 Hours)

**MODULE VI**: Project Work: (Field Work, Case Studies) (8Hours)

The project /fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively

based on the geographic location and hazard profile of the region where the college is located.

A few ideas or suggestions are discussed below:-
Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM Plans and community based disaster preparedness plans. Information on these would be available with the district Collector or Municipal Corporations. The scope for students to collaborate on these initiatives is immense. Teachers may explore possibilities.

Teachers could ask students to explore and map Disaster prone areas,
vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teachers could work on ways of addressing these vulnerabilities, preparing plans in consultation with local administration or NGOs. Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings) training in first aid.

Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work.

**Teaching Resources**
A range of Films- documentaries and feature films related to disasters and their impacts and on vulnerabilities of people are available which a teacher could choose with care and screen. This could form a basis for classroom discussion.

**Suggested Reading list:**

Alexander David, Introduction in 'Confronting Catastrophe', Oxford
University Press, 2000

Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute ofSocial Sciences Working Paper no. 8, 2008

Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.

Coppola P Damon, 2007. Introduction to International Disaster Management

Carter, Nick 1991.Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.

Cuny, F. 1983. Development and Disasters, Oxford University Press.

Document on World Summit on Sustainable Development 2002.

Govt. of India: Disaster Management Act 2005, Government of India, New Delhi.

Government of India, 2009. National Disaster Management Policy

Gupta Anil K, Sreeja S. Nair. 2011 Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi

Indian Journal of Social Work 2002. Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.
Kapur, Anu & others, 2005: Disasters in India Studies of grim reality, Rawat Publishers, Jaipur

Kapur Anu 2010: Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.

Parasuraman S, Acharya Niru 2000. Analysing forms of vulnerability in a disaster, The Indian Journal of Social Work, vol 61, issue 4, October

Pelting Mark, 2003 The Vulnerability of Cities: Natural Disaster and Social Resilience Earthscah publishers, London

Reducing risk of disasters in our communities, Disaster theory, Tearfund, 2006.

UNISDR, Natural Disasters and Sustainable Development: Understanding the links between Development, Environment and Natural Disasters, Background Paper No. 5. 2002.

IFRC, 2005. World Disaster Report: Focus on Information in Disaster, pp.182-225.

Publications of National Institute Of Disaster Management (NIDM) and National Disaster Management Authority (NDMA) including Various Guidelines for Disaster Management are available at:

NATIONAL INSTITUTE OF DISASTER MANAGEMENT,
(Ministry of Home Affairs, Government of India),
5-B, IIPA Campus, IP Estate, Mahatma Gandhi Marg,
New Delhi - 110002 (INDIA), Tel. - 011-23702432, 23705583, 23766146
Telefax - 011-23702442, 23702446

NATIONAL DISASTER MANAGEMENT AUTHORITY
NDMA Bhawan,
A-1, Safdarjung Enclave,
New Delhi - 110 029
Telephone : 011-26701700, Email: info@ndma.gov.in

**Control Room**
Telephone: 011-26701728, Fax: 011-26701729

**Web sites and Web Resources:**

NIDM Publications at http://nidm.gov.in (Official Website of National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India)

http://cwc.gov.in http://ekdrm.net http://www.emdat.be
http://www.nws.noaa.gov http://pubs.usgs.gov http://nidm.gov.in/
http://www.imd.gov.ini/

**CORE COURSE (Elective):**

**5B 11 MCB ECOLOGY AND BIODIVERSITY**

(50 Hours)

Hours/week-3 Credits-4

Learner Objectives

1. To gain a preliminary understanding about Ecology and Biodiversity
2. To enhance awareness about conservation Biology
3. To develop interest in Biodiversity management

**MODULE I:** The Environment: Physical environment; biotic environment; biotic and abiotic interactions. Habitat and niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. (8 Hours)

**MODULE II:** Population ecology: Characteristics of a population; population growth curves, population regulation, concept of meta population – demes and dispersal, interdemic extinctions, age structured populations. Species interactions: Types of interactions, inter specific competition, herbivory, carnivory, pollination, symbiosis. (8 Hours)

**MODULE III:** Community ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and eco tones. Ecological succession: Types; mechanisms; changes involved in succession; concept of climax. (8 Hours)

**MODULE IV:** Ecosystem: Structure and function; energy flow and mineral cycling (C, N, P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine). (8 Hours)

**MODULE V:** Biodiversity-status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches. (8 Hours)

**MODULE VI:** Conservation Biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves). (4 Hours)

**REFERENCES:**

Fundamentals of Ecology- Odum E.P. and Barret Ecology-

Principles and Applications- Chapman & Reiss

Biodiversity – Principle of Conservation- Kumar and Asija

Biodiversity- Agrawal K.C.

**CORE COURSE:**

**5B 12 MCB VIROLOGY, MYCOLOGY AND PARASITOLOGY**

(50 Hours)

Hours/week-3 Credits-4

Learner Objectives

1. To gain a preliminary understanding about viral, fungal, protozoan and helminth pathogens

2. To develop interest in noting infectious diseases other than bacterial infections

**MODULE I**: Structure of animal viruses. (DNA and RNA virus briefly). Cultivation of animal viruses- fertilized eggs, animal inoculation and tissue culture, methods of detection of viral growth. Antiviral agents- examples. (5 Hours)

**MODULE II**: Viral diseases: Influenza, Herpes Simplex, Mumps, Measles, Rubella, Infectious and serum Hepatitis , Rabies, AIDS, Polio myelitis -etiology, pathogenesis, symptoms of the diseases, laboratory diagnosis and control of these viral infections. (10 Hours)

**MODULE III**: Prevalent arboviral diseases (Chikungunya, Japanese Encephalitis , Dengue and KFD ) - Their etiology, pathogenesis, symptoms of the diseases, laboratory diagnosis and control of these viral infections. Oncogenic viruses-names of DNA and RNA viruses ,viral oncogenesis- brief account. (10 Hours)

**MODULE IV**: Fungal diseases- Superficial, sub cutaneous and deep mycoses of human beings. The disease symptoms, diagnosis and control. Brief study on important opportunistic mycoses- aspergilloses, mucormycoses, penicilliosis. Antifungal agents-examples and mode of action. Mycotoxicoses and mycetismus (10 Hours)

**MODULE V:** Parasitic diseases of man-protozoan diseases- etiology, vectors if any and life cycle , symptoms, and control of the following diseases-Amoebiasis, Malaria, Toxoplasmosis, Trichomoniasis , Leishmaniasis, Trypanosomiasis and Giardiasis. (10 Hours)

**MODULE VI:** Helminth diseases- a brief study on the morphology, life cycle, diseases caused and control of the larva (microfilaria) and the adult form of filarial worm, *Wuchereria bancroftii*.

(5Hours)

Medical Mycology- NC Dey and T K Dey

Textbook of Medical Parasitology- C K Jayaram Panicker.

Text book of Microbiology – R Ananthanarayan and C K J Paniker.

**CORE COURSE:**

**5B13 MCB MICROBIOLOGY PRACTICAL III**

Hours/week-5

List of Experiments

1) Detection of Viable count of bacteria - CFU/ml by Pour Plate method

2) Determination of phenol coefficient.

3) Use of differential and selective media (Mannitol salt agar, Mac Conkey agar)

4) Oligodynamic action of heavy metals on microbial cells.

5) Effect of temperature on growth of bacteria

7) Influence of PH on bacterial growth

8) Bacterial growth curve

**REFERENCES:**

Microbiology- A laboratory Manual - James G. Cappuccino, Natalie Sherman.

Microbiological Applications - Harold J Benson

Manual of Microbiology: Tools and techniques - Kanika Sharma

Practical Medical Microbiology-T J Mackie and J E McCartney

**CORE COURSE:**

**5B14 MCB MICROBIOLOGY PRACTICAL IV**

Hours/week-5

List of Experiments

1. Isolation of soil Microflora
2. Determination of water quality (Presumptive (MPN), confirmed, completed tests)
3. Widal tube agglutination test
4. Latex agglutination test (A S O/ R A/ HBS Ag)
5. VDRL or RPR test
6. Demonstration of AFB by Ziehl-Neelsen method

**REFERENCES:**

Microbiology- A laboratory Manual - James G. Cappuccino, Natalie Sherman

Practical Medical Microbiology- T J Mackie and J E Mc Cartney

Microbiological Applications - Harold J Benson

Manual of Microbiology: Tools and techniques - Kanika Sharma

**CORE COURSE:**

**6B15 MCB FOOD MICROBIOLOGY**

(50 Hours)

Hours/week-5 Credits-4

Learner Objectives

1. To gain a preliminary understanding about Food Microbiology
2. To enhance awareness about food borne diseases, microbial pathogens responsible and food safety
3. To develop interest in advanced food preservation techniques
4. To gain an understanding about food quality standards

**MODULE I**: Scope of food microbiology- food spoilage, food preservation, food safety and fermented foods- An overview (2 Hours)

**MODULE II** :Factors affecting the growth and survival of microorganisms in food-Nutrient content, pH and buffering capacity, Redox potential, inhibitory substances and anti-microbial barriers, water activity. Environmental factors- RH, temperature, gaseous atmosphere. (5 Hours)

**MODULE III**: Microorganisms important in food microbiology- bacteria, molds and yeasts-morphology, cultural characters and physiology of these microorganisms. Sources of contaminants of food-animals, plants, soil, air, waste water (sewage), contamination during handling and processing. (5 Hours)

**MODULE IV**: General principles underlying spoilage of food, chemical changes caused by spoilage: causes of spoilage, classification of food by ease of spoilage, factors affecting food spoilage, spoilage of milk, meat, fish, cereals, pulses, oil seeds, egg, fruits and vegetables-Brief account. (5 Hours)

**MODULE V**: Principles of food preservation- Asepsis, removal of microorganisms, maintenance of anaerobic conditions, high temperature processing and low temperature storage, drying, food additives and chemicals, irradiation. High pressure processing (Pascalization). Preservation of milk, meat, fish, cereals, pulses, oil seeds, fruits and vegetables. (10 Hours)

**MODULE VI**: Significance of food borne diseases, Important food borne illnesses. Food infections and intoxications. Pathogenesis of diarrheal diseases. *Clostridium botulinum, C. perfringens, Salmonella, Staphylococcus aureus* and *Shigella* ( different species) as

examples of food borne pathogens.- pathogeneses and clinical features. (10 Hours)

**MODULE VII**: Fermented foods- fermented milk, yoghurt, cheese, wine, soya sauce and other indigenous fermented foods ( Eg: Idli.) Yeast as food and fodder. Single cell proteins – *Spirulina*-brief account. (8 Hours)

**MODULE VIII**: Microbiology of food plant sanitation. Hazard analysis and critical control point (HACCP) Microbiological standards of food. (5 Hours)

**REFERENCES:**

Food Microbiology- William C Frazier, Dennis C Westhoff

Food Microbiology-Moss and Adams

Modern Food Microbiology-James M Jay, Martin J Loessner ,David Golden

Methods in Food Microbiology-W F Harrigan

**CORE COURSE:**

**6B16 MCB SANITATION MICROBIOLOGY** (50 Hours)

Hours/Week-4 Credits-3

Learner Objectives
1. To gain a preliminary understanding about Sanitation Microbiology.
2. To enhance awareness about waste management.
3. To develop interest in Biogas production and its use.

**MODULE I**: Introduction to Sanitation Microbiology. Importance of environmental sanitation and aesthetics- a brief account (2 Hours)

**MODULE II**: Sources of drinking water, single dwelling and municipal water supplies, water purification procedures, indicator microorganisms and their importance, microbiological examination of water, qualitative and quantitative methods, and water quality standards. Water purification methods- Different methods of disinfection of drinking water. (15 Hours)

**MODULE III**: Microbiology of sewage- Characteristics of sewage- physical, chemical and microbiological. BOD and organic content. Sewage treatment-need and importance , treatment processes-primary treatment, secondary treatment and tertiary treatment-trickling filters, activated sludge process, rotating bio disks, oxidation ponds and anaerobic sludge digester. (15 Hours)

**MODULE IV**: Solid waste management- sources and kinds of solid waste, need and importance of solid waste management. Biodegradable and non-degradable solid wastes-landfill and composting (aerobic and anaerobic), vemicomposting, anaerobic digesters. Methanogenesis and production of Biogas. Design and Management of Biogas plant. (15 Hours)

**MODULE V:** Air sanitation methods. Laminar air flow, sterilization of air in hospitals, surgical theatres, virus inoculation rooms. Air Sanitation standards in indoor and outdoor places. (3 Hours)

**REFERENCES**:

Environmental Microbiology- Ian L Pepper , Raina M Maier, Charles P Gerba Microbiology : Michael.J.Pelczar, E.C.S Chan, Noel.R.Krieg
Hand book of Environmental Microbiology -Volume I, II and III- S C Bhatia

**CORE COURSE:**

**6B17 MCB AGRICULTURAL MICROBIOLOGY AND PLANT PATHOLOGY**

(45 Hours)

Hours/week-4 Credits-3

Learner Objectives
1. To gain a preliminary understanding of Agricultural Microbiology
2. To enhance awareness about plant diseases and microbial pathogens
3. To develop interest in biofertilizers and organic farming

**MODULE I**: A brief historical perspective of Agricultural Microbiology and Plant pathology (3 Hours)

**MODULE II**: Composition of lithosphere, importance of humus –brief account. Micro flora of soil -bacteria fungi, protozoa, algae, virus. Plant- Microbe interactions. Rhizosphere, significance of rhizosphere, symbiotic and non- symbiotic association of microbes with plants and their usefulness in Agriculture**.** (8 Hours)

**MODULE III**: Nitrogen fixation and Biofertilizers- microbial inoculants, definition and importance of microbial inoculants, brief account of production and application of *Rhizobium, Azotobacter* and *Phosphobacteria*. Agricultural importance of *Azospirillum* , *Azolla -Anabaena* system. Mycorrhizae- Brief account on Ectomycorrhizae, endomycorrhizae, ectendomycorrhizae and their importance in Agriculture**.** (10 Hours)

**MODULE IV**: Plant pathology- plant pathogenesis-plant disease resistance-Morphological, functional and protoplasmic resistance, variation in disease resistance. Methods of disease transmission Mode of entry of pathogens and disease symptoms. Physiology of parasitism. Factors affecting disease incidences (8 Hours)

**MODULE V**: Microbial diseases of plants - Brief account. Diseases of (a) Cereals: Rice - blast disease, bacterial blight; Wheat - black rust disease. Maize: leaf blight (b) Vegetables: Chilly - leaf spot; (c) Fruits: Banana - bacterial leaf blight, Mango: leaf spot; Citrus - bacterial canker; Papaya – mosaic. (d) Spices: Ginger - rhizome rot; Pepper - quick wilt; Cardamom - marble mosaic disease. (e) Oil seeds: Coconut - grey leaf blight, bud rot disease. (f) Rubber plant: *Hevea braziliensis* - abnormal leaf fall, powdery mildew, pink disease. (g) Sugarcane - red rot; root knot nematode.(h) Cash crops: Areca nut –bud rot, basal stem rot. (i) Beverages: Tea - blister blight; Coffee – rust. (12 Hours)

**MODULE VI:** Plant Disease control measures – Chemical and biological control-a brief account. (4 Hours)

**REFERENCES:**

Agricultural Microbiology - G. Rangaswami, D.N Bagyaraj

Soil Microorganisms and Plant Growth - N S Subba Rao

A text book of Modern Plant Pathology- K S Bilgrami, H C Dube.

Plant Pathology- R S Mehrotra.

Diseases of crop plants in India- Rangaswamy, A Mahadevan.

Plant Pathology- B P Pandey

**CORE COURSE: 6B18 MCB MICROBIOLOGY PRACTICAL-V**

Credits: 5

Hours/week-5

List of Experiments

1. Biochemical reactions for identification of any three of the following bacterial species- *S.aureus, E.coli, Klebsiella aerogenes, Proteus vulgaris, Enterobacte aerogenesr, Salmonella typhi, Shigella dysenteriae, Vibrio cholera*
2. Antibiotic sensitivity test: Disc Diffusion method- Kirby-Bauer technique
3. Identification of bacterial pathogens from clinical samples like urine, pus
4. Examination of normal flora of skin, mouth, intestine
5. Fungal cultivation- slide culture method

**REFERENCES:**

Microbiology- A laboratory Manual - James G. Cappuccino, Natalie Sherman

Practical Medical Microbiology- T J Mackie and J E Mc Cartney

Microbiological Applications - Harold J Benson

Manual of Microbiology: Tools and techniques - Kanika SharmaLaboratory

**CORE COURSE: 6B19 MCB MICROBIOLOGY PRACTICAL-VI**

Credits: 5

Hours/week-5

List of Experiments

1. Isolation of constituent flora of fermented milk
2. Aerobic mesophilic count of fish samples
3. Aerobic mesophilic count of milk samples
4. Production of wine.
5. Methylene Blue Reductase Test.
6. Isolation of *Rhizobium* and *Azotobacter.*
7. Ammonification and nitrification of organic compounds using *Proteus vulgaris*
8. Study of antibiosis by soil microorganism, determination of antimicrobial spectrum.

**REFERENCES:**

Microbiology- A laboratory Manual - James G. Cappuccino, Natalie Sherman

Practical Medical Microbiology- T J Mackie and J E Mc Cartney

Microbiological Applications - Harold J Benson

Manual of Microbiology: Tools and techniques - Kanika SharmaLaboratory

Methods in Food Microbiology-W F Harrigan

**CORE COURSE:** **Credits: 2**

**6B20 MCB: PROJECT WORK:**

A group of 5 to 8 students shall do a combined project and submit the report individually. There will be a presentation and viva as a part of continuous and end semester evaluation. The project report must be submitted to the Head of the Department as per the regulations.

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**Dr.Sarala Gopalakrishnan,**

**Chairperson, Board of Studies**

**Pattern of Question paper for U.G Core Course (Microbiology) -Theory**

**.....Semester B Sc Degree Examination**

**Course title.....**

Maximum marks: 40 Time: 3Hours.

**Section A** (Objective type - Each carries 1 mark -Answer ***all the four*** questions)

1.
2.
3.
4.

[4x1=4]

**Section B** (Very short answer type - Each carries 2 marks -Answer ***any seven*** questions out of ten)

5.
6.
7.
8.
9.
10.
11.
12.
13.
14.

[7x2=14]

**Section C**(Short answer type - Each carries 3 marks -Answer ***any four*** questions out of six)

15.
16.
17.
18.
19.
20.

[4x3=12]

**Section D** (Long essay type - Each carries 5 marks -Answer ***any two*** questions out of four)

21.
22.
23.
24.

[2x5=10]

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Model Question paper for U.G Microbiology (Core Courses) -Theory

**I semester B Sc Microbiology degree Examination**

**1B01 MCB GENERAL MICROBIOLOGY**

Maximum Marks: 40 Time: 3 Hours.

**Section A** (Answer ***all the four*** questions)

1. Give an example for Transport media.
2. Acid fast staining is an example for …….. staining method.
3. Capsular material of most of the bacteria is composed of…….
4. Name the scientist known as the father of Microbiology

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Differentiate between Protoplast and Spheroplast
6. Comment on Pili
7. Principle of Gram staining
8. Fluorescent dyes
9. Rideal Walker Test
10. Differentiate between Enriched & Enrichment media
11. Colony Forming Unit
12. Applications of Pour plate culture method
13. Differentiate between microbistatic and microbicidal agents
14. Lyophilization [7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Characters of an ideal Chemical agent.
16. Moist heat sterilization
17. Koch's postulates
18. Contributions of Louis Pasteur to Microbiology
19. Scanning Electron microscope.
20. Ultra structure of bacterial cell wall. [4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Discuss the different culture methods.
22. Explain the different types of animal cell culture.
23. Discuss the major groups of chemical antimicrobial agents and their mode of action.
24. Classify culture media with suitable examples [2x5=10]

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Model Question paper for U.G Core Courses -Theory

**II semester B Sc Microbiology degree Examination**
**2B02 MCB MICROBIAL TAXONOMY**

Maximum marks: 40 Time: 3Hours.

**Section A** (Answer ***all the four*** questions)

1. Viruses that infect bacteria are called.....
2. The opening through which ciliates ingest food is known as.....
3. Symbiotic association between algae and fungus is called.....
4. The solidifying agent agar is obtained from.....

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Scientific nomenclature
6. Eubacteria
7. Dinoflagellates
8. Phylogenetic tree
9. Numerical taxonomy
10. Serotyping
12. Slime molds
13. Archaeobacteria
14. Amoeba

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Taxonomic hierarchy
16. Bacteriophage
17. IMViC test
18. Sporozoa
19. Three kingdom classification
20. DNA hybridisation

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. List the various criteria used in bacterial classification.
22. Classify algae giving examples.
23. Explain the major systems of biological classification
24. List the different classes of terrestrial fungi with examples. [2x5=10]

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Model Question Paper for U.G Core Courses -Theory

**III semester B Sc Microbiology degree Examination**
**3A11 MCB BIOCHEMISTRY FOR MICROBIOLOGY**

Maximum Marks: 40
Time: 3 Hours.

**Section A** (Answer ***all the four*** questions)

1. Substances that resist changes in pH is known as----------
2. Group of carbohydrates which cannot be further hydrolysed are called--------
3. Conjugated form of proteins with sugars are called----------
4. The building blocks of proteins are----------

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Polysaccharides
6. Buffers
7. pH
8. Bases
9. Michaelis-Menton equation.
10. Deamination
11. Ribosomes
12. Fats
13. Waxes
14. Terpenoids

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Redox reactions
16. Biological membranes
17. DNA Double helix
18. Globular proteins
19. Immunoglobulin G
20. Phospholipids

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Explain classification of enzymes.
22. Discuss the structure of DNA.
23. Classify amino acids giving structure and examples.
24. Explain Krebs cycle.

[2x5=10]

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Model Question paper for U.G Microbiology (Core Courses) -Theory

**III semester B Sc Microbiology degree Examination**

**3A12 MCB Biophysics and Bioinformatics**

Maximum Marks: 40

Time: 3 Hours.

**Section A** (Answer ***all the four*** questions)

1. The protein molecule can be unfolded by --------
2. Give 2 examples for secondary databases
3. The globular shape of a protein is called ----------structure
4. Expand NCBI

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Enthalpy
6. Beta sheets
7. BLAST
8. Z DNA
9. Dialysis and its importance
10. DNA super-coiling
11. PHYLIP
12. PDB
13. Irregular structure of proteins
14. Homology modelling of proteins

[7x2=14]

**Section C** (Answer briefly on ***any four*** questions out of six)

15. Docking
16. Laws of thermodynamics
17. Biological data formats
18. Explain with example the use of SRS in Bioinformatics
19. DNA Sequencing and applications
20. List out the applications of adsorption in Biology

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Discuss the different structural hierarchy of DNA
22. Explain the secondary structure of proteins
23. Discuss the applications of Bioinformatics in Microbiology and drug designing.
24. Discuss the different types of sequence alignments in Bioinformatics

[2x5=10]

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Model Question paper for U.G Microbiology (Core Courses) -Theory

**III semester B Sc Microbiology degree Examination**

**3B03 MCB MICROBIAL PHYSIOLOGY**

Maximum Marks: 40

Time: 3 Hours.

**Section A** (Answer ***all the four*** questions)

1. ---------- is a Gram negative bacilli which can fix nitrogen symbiotically.
2. *Bacillus stearothermophilus* is a ----------bacterium, which survive in high temperature.
3. The average generation time of *E.coli* is --------
4. Give two examples for chemoautotrophic bacteria. [4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Iron-oxidizing bacteria
6. ATP
7. Nutritionally fastidious organism
8. Synchronous culture
9. Carbon
10. Vitamins
11. Acetogenesis
12. Bacterial chlorophyll
13. Sulfur bacteria
14. N6if gene

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Explain the growth curve in a closed system
16. Hydrocarbon transformation
17. Microbial energetics
18. Methanogenesis
19. Anoxygenic photophosphorylation
20. Chemolithotrophy

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Explain the different factors influencing microbial growth.
22. Briefly explain the nutritional groups of bacteria.
23. Discuss the light and dark photosynthetic reactions.
24. Briefly explain nitrogen fixation.

[2x5=10]

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Model Question paper for U.G Core Courses -Theory

**IV semester B Sc Microbiology degree Examination**

**4A13 MCB MOLECULAR BIOLOGY**

Maximum marks: 40 Time: 3Hours.

**Section A** (Answer ***all the four*** questions)

1. Units of DNA which can move from one DNA molecule to another are called.....
2. The binding site for RNA polymerase is known as.....
3. The unit of DNA in which individual acts of replication occur is called.....
4. The enzyme that synthesise RNA from RNA template is.....

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Reverse transcriptase
6. Chargaff's rule
7. RNA priming
8. Base excision repair
9. DNA polymerase
10. Anticodon
11. Helicase
12. Ribosomes
13. Wobble hypothesis
14. Polysome

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Histones
16. tRNA
17. Aminoacid activation
18. Gene regulation by recombination
19. Hyperchomic effect
20. Rolling circle replication

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Explain the various post transcriptional modifications in prokaryotes.
22. Explain the mechanism of gene regulation in tryptophan operon.
23. Explain the semi conservative model of DNA replication. List the enzymes and proteins involved in the process.
24. List the features of Watson and Crick model of DNA with a neat diagram.

[2x5=10]

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Model Question paper for U.G Core Courses -Theory

**IV semester B Sc Microbiology degree Examination**

**4A14 MCB MICROBIAL GENETICS AND GENETIC ENGINEERING**

Maximum marks: 40 Time: 3Hours.

**Section A** (Answer ***all the four*** questions)

1. The transfer of genetic material from one bacteria to another through the agency of a virus is known as.....
2. Enzymes that cut double stranded DNA at particular nucleotide sequence are called.....
3. Plasmids that confer antibiotic resistance are known as.....
4. The cell structure that connects two bacteria during conjugation is called.....

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Law of segregation
6. Point mutation
7. F plasmid
8. Insulin
9. Expression vector
10. GM foods
11. Cosmids
12. Bacteriophage
13. Chromosomal theory of heredity
14. Interferon

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Lytic life cycle
16. Cloning vectors
17. Subunit vaccine
18. Transgenic plants
19. Congugation
20. Mutagens

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Give a comparative account on lytic and lysogenic life cycles of bacteriophages.
22. Explain the procedure for the introduction of r DNA into host cells.
23. Give an account on the production of synthetic vaccines.
24. What is genetic recombination? Explain the mechanism of transduction.

[2x5=10]

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Model Question paper for U.G Microbiology (Core Courses) -Theory

**IV semester B Sc Microbiology degree Examination**

**4B05 MCB IMMUNOLOGY**

Maximum Marks: 40 Time: 3 Hours.

**Section A** (Answer ***all the four*** questions)

1. Presence of microbial toxins in blood is called.....
2. Tetanus toxoid provides.....immunity.
3. Which is the antibody that crosses the placenta?
4. Resistance without an antigenic stimulus is called.....

[4x1=4]

**Section B** (Answer ***any seven*** questions out of ten)

Comment on the following:

5. Phagocytosis.
6. Infection.
7. Ig G
8. Nosocomial infection.
9. VDRL test.
10. Agglutination.
11. Plasma cells.
12. Carrier.
13. Atopy.
14. Leucocytes. [7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Monoclonal antibodies.
16. Sources of infections.
17. WIDAL test.
18. Transplantation.
19. ELISA.
20. Thymus. [4x3=12]

**Section D** (Answer ***any two*** questions out of four. Each carries 5 marks)

21. Define Immunity. Explain the different types of Immunity.
22. Define and classify Hypersensitivity reactions. Discuss type I hypersensitivity.
23. What are the different types of Antigen-Antibody reactions? Write briefly on precipitation reactions.
24. Discuss the different types of autoimmune diseases.

[5x2=10]

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**Model Question paper for U.G Core Courses -Theory**

**V semester B Sc Microbiology degree Examination**

**5B07 MCB MICROBIAL BIOTECHNOLOGY**

Maximum marks: 40
Time: 3Hours.

**Section A** (Answer ***all the four*** questions)

1. Starter culture for the production of vinegar is.....
2. Enzyme that degrades protein to peptides is called.....
3. The insecticidal component of *Bacillus thuringiensis* is.....
4. Organisms used in the industrial production of penicillin G is.....

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Sparger
6. Penicillin
7. Baculovirus
8. Bread
9. Vinegar
10. Enzyme immobilisation
11. Molasses
12. Distillation
13. Auxotrophic mutants
14. Citric acid

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Vitamin $B_{12}$
16. *Bacillus thuringiensis*
17. Biosensors
18. Industrial alcohol
19. Strain improvement
20. Inoculums preparation

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. What are Bio insecticides? Explain with examples.
22. What are antibiotics? Explain the productions of penicillin G.
23. Describe the various methods for the immobilization of enzymes and their applications.
24. Describe the design and parts of a fermenter.

[2x5=10]

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Model Question paper for U.G Microbiology (Core Courses) -Theory

**V semester B Sc Microbiology degree Examination**

**5B08 MCB BACTERIAL DISEASES**

Maximum Marks: 40 Time: 3 Hours.

**Section A** (Answer ***all the four*** questions)

1. What is the common name of leptospirosis in man?
2. Carry Blair medium is used for the transport of.....
3. .....is the generic name of pathogenic spore forming Gram positive anaerobic bacilli.
4. .....is the bacterium causing Lyme disease.

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Morphology of meningococci.
6. BCG.
7. Elek's test.
8. Symptoms of Cholera.
9. Quellung reaction
10. Coagulase enzyme
11. Bubonic plague.
12. Typhoid Mary.
13. *Shigella sonnei*
14. Asymptomatic bacteriuria

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Symptoms of leptospirosis.
16. Clinical features of syphilis.
17. Pathogenesis and clinical features of diphtheria
18. Types of Leprosy.
19. Bacillary dysentery
20. Clinical manifestations of tetanus

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Discuss the pathogenesis and laboratory diagnosis of tuberculosis.
22. Discuss different prophylactic measures against bacterial diseases with examples.
23. Discuss the pathogenesis and laboratory diagnosis of enteric fever.
24. Discuss the pathogenicity of *S.aureus.*

[2x5=10]

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**Model Question paper for U.G Core Courses -Theory**

**V semester B Sc Microbiology degree Examination**

**5B09 MCB ENVIRONMENTAL MICROBIOLOGY**

Maximum marks: 40 Time: 3Hours.

**Section A** (Answer ***all the four*** questions)

1. Microbial inhabitants of the bottom regions of a water body are called.....
2. The relationship between organisms in which one species benefits and the other remains unaffected is known as.....
3. Name the enzyme catalysing nitrogen fixation.
4. Give an example for recalcitrant hydrocarbon.

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Ecosystem
6. Mutualism
7. Droplet nuclei
8. Xenobiotics
9. Biofilm
10. Trophic levels
11. Biomagnification
12. Ammensalism
13. Anderson sampler
14. Soil fungi

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Bioremediation
16. Antibiosis
17. Sulphur cycle
18. Nitrogen fixation
19. Fresh water microflora
20. Parasitism

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Describe the various air sampling methods
22. Explain the process of microbial leaching and write its importance.
23. Explain the microbial degradation of petroleum hydrocarbons.
24. What are biogeochemical cycles? Explain nitrogen cycle.

[2x5=10]

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Model Question paper for U.G Core Courses -Theory

**V semester B Sc Microbiology degree Examination**

**5B10 MCB DISASTER MANAGEMENT**

Maximum marks: 40 Time: 3Hours.

**Section A** (Answer ***all the four*** questions)

1. Name the central force concerned with rescue operations during disasters in India.
2. In Richter scale, the amount of energy released during an earthquake of magnitude 5 is .....times greater than earthquake measures 4.
3. The Hyogo framework of action was developed in the year.....
4. When the tsunami waves approach coast, what happens to its amplitude and wavelength?

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

5. Distinguish between sudden onset disasters and slow onset disasters.
6. What do you mean by risk perception?
7. Link the terms hazard, risk, vulnerability and exposure.
8. Differentiate between coping capacity and resilience.
9. Write a short note on IDNDR.
10. Write a short note on structural and non-structural mitigation measures?
11. Mention the role of disaster exercises (mock drills).
12. What do you mean by capacity building?
13. Write a short note on Disaster vulnerability.
14. Write a short note on various impacts of disasters.

[7x2=14]

**Section C** (Answer ***any four*** questions out of six)

15. Why disaster mitigation is considered as the “corner stone of disaster management”?
16. Briefly explain how the human factors can contribute to environmental degradation and vulnerability to disasters.
17. Mention the importance of community participation in disaster management.
18. Write a short note on the characteristics of different types of landslides.
19. Briefly explain the role of local authorities in disaster management.
20. 'The terms vulnerability and resilience are highly complementary'. Explain. [4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Mention the correlation between disasters and development.
22. Explain the various components of disaster management spectrum. How they linked each other?
23. Describe the role of multilateral organizations, NGO's, private sector and academia in disaster management.
24. Explain the roles and responsibilities of District Disaster Management Authority. [2x5=10]

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Model Question paper for U.G Core Courses -Theory

**V semester B Sc Microbiology degree Examination**

**5B11 MCB EVOLUTION AND BIODIVERSITY**

Maximum marks: 40 Time: 3Hours

**Section A** (Answer ***all the four*** questions)

1. Name the two tiger reserves in Kerala.
2. Maintenance of a steady internal environment is called.....
3. Give an example for a perfect cycle.
4. Limnology is the study of.....habitat

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

5. What is soil community?
6. Comment on exotic species.
7. Define habitat.
8. What is a trophic level?
9. Define acid rain.
10. What is climax community?
11. What is Red Data Book?
12. What the two main approaches to biodiversity conservation?
13. Comment on Green House Effect.
14. Differentiate between home range and territory.

[7x2=14]

**Section C** (Answer briefly on ***any four*** questions out of six)

15. Differentiate between Synecology and Auticology
16. Comment on population dispersal. Mention the reasons for population dispersal
17. Differentiate among *Steppe, Prairie, Pampas & Savannah*
18. Briefly explain Nitrogen Cycle.
19. What is a Ramsar site? Name the Ramsar sites in Kerala.
20. Comment on negative types animal interactions.

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Write an essay on ecological succession. Briefly explain its types.
22. Define population. Briefly explain the properties of population.
23. What are the major threats of biodiversity?
24. Define Ecosystem. Explain the structure and functioning of a forest ecosystem.

[2x5=10]

Sd/-

Dr.Sarala Gopalakrishnan,

Chairperson, Board of Studies

Pattern of Question paper for U.G Core Course (Microbiology) -Theory

**V Semester B Sc Degree Examination**

**5B12 MCB VIROLOGY, MYCOLOGY AND PARASITOLOGY**

Maximum marks: 40 Time: 3Hours.

**Section A** (Answer ***all the four*** questions)

1. What is the common name for dermatophytosis?
2. Name the virus causing AIDS in human beings.
3. The larva of filarial worm is called.....
4. SDA is the medium used for cultivation of..... [4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. MMR
6. Rhinosporidiosis
7. *Trichomonas vaginalis*
8. Negri body
9. KFD
10. LD bodies
11. Mycotoxins
12. Serum hepatitis
13. *Histoplasma capsulatum*
14. Trophozoite

[7x2=14]

**Section C**(Answer ***any four*** questions out of six briefly)

15. Pathogenesis and symptoms of polio myelitis
16. Sub cutaneous mycoses
17. Toxoplasmosis in human beings
18. Symptoms and complications of chikungunya
19. Candidiasis
20. Complications of amoebiasis

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Discuss the life cycle of malarial parasite.
22. Give an account on deep mycoses
23. Discuss viral hepatitis.
24. Describe filariasis in man

[2x5=10]

Sd/-

Dr.Sarala Gopalakrishnan,

Chairperson, Board of Studies

Model Question paper for U.G Core Courses -Theory

**VI semester B Sc Microbiology degree Examination**

**6B15 MCB FOOD MICROBIOLOGY**

Maximum marks: 40 Time: 3Hours.

**Section A** (Answer ***all the four*** questions)

1. Infection of gastrointestinal tract caused by *Salmonella species* is called.....
2. The casein coagulating enzyme used in cheese production is.....
3. Starter culture for wine manufacture contains.....
4. The causative agent of bacillary dysentery is.....

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. SCP
6. Staphylococcal food poisoning
7. Cheese
8. Putrefaction
9. Water activity
10. Pasteurization
11. Wine
12. Drying
13. Soy sauce
14. Diarrhoea

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Fodder yeast
16. HACCP
17. Preservation of fish
18. Food additives
19. Mushroom food poisoning
20. Spoilage of egg

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Describe the various factors affecting the growth and survival of microorganisms in food.
22. What are fermented foods? Explain the Microbiology of yoghurt production.
23. Give a detailed account on HACCP.
24. Differentiate between food infection and intoxication. Explain the pathogenesis and clinical features of botulism.

[2x5=10]

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Chairperson, Board of Studies

Model Question Paper for U.G Core Courses -Theory

**VI semester B Sc Microbiology degree Examination**

**6B16 MCB SANITATION MICROBIOLOGY**

Maximum Marks: 40 Time: 3 Hours.

**Section A** (Answer ***all the four*** questions)

1. The process of removal of all micro organisms including spores is called....
2. The micro organism used in oxidation pond is.....
3. The chlorine residue permitted in drinking water is.....
4. Expand MPN

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. Sanitizer
7. Disinfection
8. Rotating bio disks
9. Sewage
10. Anaerobes
11. Chlorination of water
12. Coliforms
13. Sludge
14. COD

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Methanogenesis
16. Vermicomposting
17. Laminar air flow
18. Importance of environmental sanitation and aesthetics
19. Sterilization concepts.
20. BOD

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Explain Air Sanitation methods.
22. Give an account on water purification methods.
23. Explain production of biogas. Add a note on the design and management of a biogas plant.
24. Explain solid waste management systems.

[2x5=10]

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Chairperson, Board of Studies

Model Question Paper for U.G Core Courses -Theory

**VI semester B Sc Microbiology degree Examination**

**6B17 MCB AGRICULTURAL MICROBIOLOGY AND PLANT PATHOLOGY**

Maximum Marks: 40 Time: 3 Hours.

**Section A** (Answer ***all the four*** questions)

1. Name the region around the root surface.
2. The disease potato blight is caused by.....
3. Give an example of free living nitrogen fixer.
4. The process of nitrogen fixation is achieved by the enzyme.....

[4x1=4]

**Section B** (Answer very briefly on ***any seven*** questions out of ten)

Comment on the following:

5. *Rhizobium*
6. Marble mosaic disease
7. *Azotobacter*
8. *Azolla*
9. Blast disease
10. Phosphobacteria
11. *Erwinia carotovora*
12. Protozoa in soil
13. IPM
14. Bt cotton

[7x2=14]

**Section C** (Answer ***any four*** questions out of six briefly)

15. Biofertilizers
16. Lithosphere
17. Importance of Humus
18. Symbiotic Nitrogen Fixation
19. Endomycorrhizae
20. Protoplasmic Resistance

[4x3=12]

**Section D** (Answer ***any two*** questions out of four)

21. Give an account on biological nitrogen fixation. Add a note on nitrogenase.
22. Explain biological control measures against plant diseases.
23. Explain symbiotic and non- symbiotic association of microbes with plants and their usefulness in Agriculture**.**
24. Give a detailed account on factors affecting disease incidents in plants. [2x5=10]

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**MODEL QUESTION PAPERS FOR UG CORE MICROBIOLOGY PRACTICALS**

Practical Examination for **3B04MCB Microbiology-Practical I and 4B06MCB Microbiology -Practical II**

Maximum marks: **80**
Time: 3 Hours x 2 days /Batch.

I. Perform Gram staining OR Endospore staining with the given sample and report results. Write the principle of the experiment you have done. (**20 Marks**)
II. Find out the motility of the organism in the given culture by microscopy and report your result. (**15 Marks**)
III. Isolate pure culture by streak plate method. Write the procedure. Mention other Culture methods for isolation. (**15 Marks**)
IV. Perform fungal staining using LPCB. Identify the fungal culture by macroscopy and microscopy. Report your results. Write the ingredients of the stain with functions of each. (**20 Marks**)

V. Spotters. (**5x2=10 Marks** )

Practical Examination for **5B13 MCB Microbiology-Practical III and 6B18 MCB Microbiology -Practical V**

Maximum marks: **80**
Time: 3 Hours x 2 days /Batch.

I. Find out the viable count of the given soil sample by pour plate method and report. Write the procedure. (**20 Marks**)
**II.** Identify the lactose fermentation character using Mac Conkey agar medium OR salt tolerance character using Mannitol Salt agar, of the given culture. Write the principle and additional inference from the test. (**15 Marks)**
III. Perform antibiotic sensitivity test by disc diffusion method. Write the principle and name the technique. (**15 Marks**)
IV. Perform IMViC test with the given sample. Write the principle of each test and give examples for positive and negative tests (**20 Marks**)

V. Spotters. (**5x2=10 Marks**)

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Chairperson, Board of Studies

Practical Examination for **5B14 MCB Microbiology-Practical IV and 6B19 MCB Microbiology -Practical VI**

Maximum marks**: 80**
Time: 3 Hours X 2 days/Batch.

I. Determine the microbiological quality of the given water sample using MPN method and report. Write the procedure. (**20 Marks**)

II. Identify the quality of the milk sample given to you by MBRT and report. Write the principle and procedure of the experiment. (**20 Marks**)

III. Perform the serological test and report. Write the principle. (**10 Marks**)

IV. Spotters. (**5x2=10**)

V. Viva Voce. (**20 Marks**)

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Dr.Sarala Gopalakrishnan,

Chairperson, Board of Studies

KANNUR UNIVERSITY

**Syllabus for**

**Undergraduate Programme in**

**MICROBIOLOGY**

**(OPEN COURSES) Under the**

**Kannur University Choice Based Credit and Semester System**

**(KUCBCSS)**

***(with effect from 2014 admission)***

**Open Courses in MICROBIOLOGY:**

**5D 01 MCB BIOSAFETY AND BIOETHICS**

(20 Hours)

Hours/week-2 Credits-2

Learner Objectives
1. To gain a preliminary understanding about Biosafety
2. To get an idea about Bioethics

**MODULE I**: Introduction to Biosafety-definition. Objectives of safety guidelines. Risk assessment. Biohazardous materials (infectious agents, toxins, rDNA etc.) Biohazard control. Biosafety in clinical and animal research. Risk assessment for planned introduction, risk assessment for Biotechnological products. Containment-physical containment, biological containment. Planned introduction of genetically modified organisms. Biosafety during industrial production using GMO. Biosafety guidelines in India. (10 Hours)

**MODULE II:** Introduction to Bioethics. Applications of Bioethics. Ethics of reproductive technologies, abortion, organ donation, human cloning and stem cell researches. Molecular detection of pre-symptomatic genetic diseases and its importance in healthcare. Prenatal diagnosis. Genetic manipulations and their ethical issues. Human Genome Project and its ethical issues-ethical, legal and social implications. Genetic studies on ethnic races. (10 Hours)

**REFERENCES**:

Biosafety and Bioethics- Rajmohan Joshi

Biological safety: Principles and Practices-Diane O Fleming

Bioethics and Biosafety- Satheesh M K

Bioethics: A return to Fundamentals-Bernard Gert

Bioethics: An introduction to History, Methods and Practices-Jones and Bartlett

Bioethics: Current Issues and Challenges-Rajpal Kaur

**Open Courses in MICROBIOLOGY:**

**5D 02 MCB FOOD BORNE DISEASES**

(20 Hours)

Hours/week-2 Credits-2

Learner Objectives
1. To gain a preliminary understanding about Food borne diseases
2. To enhance awareness about microbial pathogens and toxins in food and the preventive measures.

**MODULE I**: Significance of food borne diseases. Types of food borne illnesses. Food infections and intoxications-differences. Etiology of food infections :bacteria, viruses and protozoa with examples of diseases. Helminth larval infections through ingestion of food-examples. Food intoxications- reasons-algal, fungal and bacterial toxins- a brief account. (3 Hours)

**MODULE II:** Food infections-Pathogenesis of diarrheal diseases by bacteria. *Salmonalla* (different species) *Shigella* (different species), *Escherichia coli, Vibrio cholerae, C. perfringenes, Listeria monocytogenes* as examples of food borne pathogens- pathogenesis and clinical features. Amoebic dysentery- *Entamoeba histolytica* pathogenesis- clinical symptoms and complications. (10 Hours)

**MODULE III:** Food intoxications by bacteria- Botulism and Staphylococcal food poisoning. *Clostridium botulinum, Staphylococcus aureus* –pathogenesis and clinical manifestations. Fungal food poisoning- mycotoxicoses-mycotoxins- aflatoxin, ergotoxin as examples. Mycetismus-mushroom food poisoning-symptoms (5 Hours)

**MODULE IV:** Food safety**:** Control and prevention of food borne illnesses- general measures-environmental sanitation and personal hygiene. Immunoprophylactic measures- Vaccines against typhoid and cholera. Treatment for diarrheal diseases- Rehydration therapy- ORS and IV fluids. (2 Hours)

**REFERENCES:**

Food Microbiology- William C Frazier, Dennis C Westhoff

Text book of Microbiology – R Ananthanarayan and C K J Paniker.

Textbook of Medical Parasitology- C K Jayaram Panicker.

Introduction to Food Biotechnology-Sinosh Scariachan and Abhilash M

**Open Courses in MICROBIOLOGY:**

**5 D03 MCB MICROBES AND ENVIRONMENT** (20 Hours)

Hours/week-2 Credits-2

Learner Objectives:
1. To gain an understanding about Environmental Microbiology
2. To enhance awareness about xenobiotic and other pollutions

**MODULE I**: Basic concepts of Ecology and Environment. Ecosystem- concept and components-food chains, food webs and trophic levels. Environmental factors influencing the growth and survival of microbes-physical-temperature, light, osmotic pressure and hydrostatic pressure. Chemical- pH, oxygen and carbon dioxide. Biological factors. (4 Hours)

**MODULE II**: Biogeochemical cycles- C cycle, water cycle, N cycle- Nitrogen fixation, nitrification, denitrification. Rhizosphere and microbial interactions in soil: positive and negative. ( brief account). (4 Hours)

**MODULE III**: Faecal pollution of water, water borne diseases, indicator organisms, sanitary examination of water. Drinking water purification methods. (4 Hours)

**MODULE IV**: Dispersal of air borne micro organisms. Micro organisms and sewage treatment. BOD and DO. Trickling filters, activated sludge process, oxidation ponds. (4 Hours)

**MODULE V**: Global environmental problems-ozone depletion, Green house effect and acid rain. Xenobiotics and Biomagnification. Release of GMO to environment and their impact-Ethical issues. (4 Hours)

**REFERENCES:**

Microbial Ecology : Fundamentals & Applications- Richard Bartha, Ronald M Atlas

Sd/-

Dr.Sarala Gopalakrishnan,

Chairperson, Board of Studies

**MODEL QUESTION PAPERS**

**Model Question paper for U.G Microbiology (Open Course) -Theory**

**5 D01 MCB BIOSAFETY AND BIOETHICS**

Maximum Marks: 20
Time: 2 Hours.

Answers are to be written only in English

**Section A**

(Answer ***all the five*** questions)

1. Name the first mammal to be successfully cloned.
2. Biosafety level applicable to non pathogenic organisms is……
3. Technique for identification of disease in foetus is known as……
4. Name the medical procedure in which grafting of an organ or tissue is done.
5. Mobile genetic elements that enable genes to move between non homologous sites on DNA are called…. **(5x1=5)**

**Section B**

(Answer briefly on ***any three*** questions out of five)

Comment on the following:

6. Risk assessment
7. Biological containment
8. Biosafety guidelines in India
9. Importance of molecular detection of genetic diseases
10. Ethics of human cloning **(3x2=6)**

**Section C**

(Answer ***any three*** questions out of five)

11. Define Biosafety. Mention the objectives of safety guidelines.
12. Write a note on bio hazardous materials and their control treatments
13. What is Human Genome Project? Add a note on its ethical issues.
14. Give an account on the ethical issues in biomedical research and medicine.
15. Define GMO. What are the bio safety measures to be taken during their industrial production? **(3x3=9)**

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Dr.Sarala Gopalakrishnan,

Chairperson, Board of Studies

**Model Question paper for U.G Microbiology (Open Course) -Theory**

**5 D02 MCB FOOD BORNE DISEASES**

Maximum Marks: 20
Time: 2 Hours.

Answers are to be written only in English

**Section A**

(Answer ***all the five*** questions)

1. Name the spectrum of diseases caused by *Shigella* species
2. Toxin produced by *Clostridium botulinum* is called.....
3. Causative agent of bacillary dysentery is.....
4. Name the fungi producing ergotoxin.
5. ..... is the vaccine against enteric fever. (**5x1=5)**

**Section B**

(Answer very briefly on ***any three*** questions out of five)

Comment on the following:

6. Symptoms of amoebic dysentery
7. Botulism
8. Mushroom food poisoning
9. Vaccines against food borne illnesses
10. *Listeria monocytogenes* **(3x2=6)**

**Section C**

(Answer ***any three*** questions out of five)

11. Discuss bacterial food borne diseases
12. Explain mycotoxicoses
13. What are the measures used in the prevention of food borne illnesses?
14. Discuss food intoxications with examples
15. Explain pathogenesis of diarrhoeal diseases **(3x3=9)**

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Chairperson, Board of Studies

**Model Question paper for U.G Microbiology (Open Course) -Theory**

**5 D03 MCB MICROBES AND ENVIRONMENT**

Maximum Marks: 20
Time: 2 Hours.

Answers are to be written only in English

**Section A**

(Answer ***all the five*** questions)

1. Name the network of food chain in ecosystem.
2. Give an example for a denitrifying microorganism.
3. Name the bacteria causing cholera.
4. The microbial film formed over trickling filter is called.....
5. The compounds that are completely resistant to biodegradation are known as.....

**(5x1=5)**

**Section B**

(Answer briefly on ***any three*** questions out of five)

Comment on the following:

6. The components of ecosystem
7. Carbon Cycle and its importance
8. Indicator organisms.
9. BOD
10. Green house effect **(3x2=6)**

**Section C**

(Answer ***any three*** questions out of five)

11. Discuss the factors influencing the growth and survival of microbes.
12. What are the positive microbial interactions in soil?
13. Discuss the different methods for purification of water.
14. Give an account on ethical issues related to release of GMOs to the environment.
15. Discuss the methods of sewage treatment **(3x3=9)**

Sd/-

Dr.Sarala Gopalakrishnan,

Chairperson, Board of Studies

KANNUR UNIVERSITY

**Course Structure & Syllabus for**

**Undergraduate Programme in**

**MICROBIOLOGY**

**(COMPLEMENTARY COURSES) Under the**

**Kannur University Choice Based Credit and Semester System**

**(KUCBCSS)**

***(With effect from 2014 admission)***

| **B Sc MICROBIOLOGY (Complementary) Courses in Microbiology** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. | Sem | Course code | Title of the course | Hours Per week | Credit | Exam Hours x days | Marks (CE) | Marks (ESE) | Total Marks |
| 1 | I | 1C01 MCB | Basic Microbiology I | 4 | 3 | 3 | 8 | 32 | 40 |
| 2 | II | 2C02 MCB | Basic Microbiology II | 4 | 3 | 3 | 8 | 32 | 40 |
| 3 | III | 3C03 MCB | Applied Microbiology I | 3 | 2 | 3 | 8 | 32 | 40 |
| 4 | III | 3C04 MCB | Microbiology (Complementary) Practical I | 2/Batch | - | - | - | - | |
| 5 | IV | 4C05MCB | Applied Microbiology II | 3 | 2 | 3 | 8 | 32 | 40 |
| 6 | IV | 4C06 MCB | Microbiology (Complementary) Practical II | 2/Batch | 2 | 3x2 | 8 | 32 | 40 |
| **Total** | | | | | **12** | | **40** | **160** | **200** |

The practical examinations for III semester and IV semester are to be conducted together at the end of IV semester with 2 credits and 40 marks.

**B.Sc MICROBIOLOGY (COMPLEMENTARY): Syllabus-Theory**

**1CO1 MCB BASIC MICROBIOLOGY- I** (50 Hours)

Hours/week-4 Credits-3

1. To gain a preliminary understanding about the history and developments in Microbiology

2. To familiarize with Microbiological techniques

**Module I**: Introductory Microbiology: History- biogenesis versus abiogenesis, Germ theory of diseases, Koch's postulates, antisepsis, immunization and chemotherapy. The concept of sterilization, methods of sterilization (dry heat, wet heat, radiation, chemical methods). Filteration. (10 Hours)

**Module II:** Microscopy: Hand lens, Leuwenhoek and his microscope, principle behind ocular microscopy-bright field and darkfield, phase contrast, fluorescent electron microscope- TEM and SEM. Staining methods -simple, Differential (Gram and Ziehl Neelsen), Negative, Special staining for endospore, capsule and flagella. Fungal staining-LPCB. (10 Hours)

**Module III:** The Five Kingdom Classification: Kingdom Monera, Protista, Fungi ,Plantae, and Animalia with special reference to microbes, classification of bacteria, numerical taxonomy, Concept of microbial species and strains. Simple tests for biochemical characterization (Sugar fermentation, IMViC, Urease, Catalase, Oxidase). (10 Hours)

**Module IV:** Prokaryotic cell versus Eukaryotic cells. The morphology and ultra structure of bacterial cell wall, flagella and pili, reference to antibiotic penicillin and cell wall growth. Nature of microbial cell -Gram positive and Gram negative. Cytoplasmic matrix and nuclear material. Bacterial endospore formation-mechanism. Aerobic and anaerobic spore formers-examples (10 Hours)

**Module V:** Microbial Nutrition: The concept of nutrition. The common nutrient requirements, major elements minor elements and their role, nutritional classification of

organisms. Nutrient uptake imbibition, diffusion, osmosis, facilitated diffusion, role of carrier proteins, active transport, group translocation, uniport, symport and antiport. Culture media, preparation of media - nutrient agar, Mac Conkey Agar, PDA, EMB. Isolation of pure cultures-culture methods-streak, pour plate. Preservation of cultures. (10 Hours)

**REFERENCES:**

Microbiology : Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg

Text Book of Microbiology- R Ananthanarayan, C.K.J Paniker

Prescott, Harley, and Kleins MIcrobiology -Prescott

**2CO2 MCB Basic Microbiology II**

(50 Hours)

Hours/Week-4 Credits-3

Learner Objectives

1. To gain a preliminary understanding about the microbial growth and metabolism.

2. To familiarize with gene transfer in micro organisms.

**Module I:** Microbial Growth: Growth curve, Measurement of growth- dry weight, total count, viable count, colorimetric techniques to determine growth, Factors affecting growth. (8 Hours)

**Module II:** Bacterial heterotrophism: Nitrogen nutrition-Mechanism of bacterial nitrogen fixation. Bacterial photosynthesis: Description of photosynthetic reaction centre and light harvesting pigment. Critical differences with photosynthetic apparatus in plants. Sulphur assimilation in microbes. (12 Hours)

**Module III:** Bacteriophages: DNA and RNA phages,T4 phage, lytic and lysogenic cycles, Host cell adsorption and penetration, synthesis phage nucleic acid. Cultivation of phages. (12 Hours)

**Module IV:**Gene transfer in micro organisms-transformation ,transduction -generalised and specialised, conjugation- $F^+ \times F^-$, Hfr x $F^-$, F' x $F^-$ (10 Hours)

**Module V:** Bacterial toxins, pathogenesis and virulence factors. (8 Hours)

**REFERENCES:**

Microbiology : Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg

Prescott, Harley, and Kleins MIcrobiology –Prescott

Microbial Genetics- David Freifelder

Text book of Microbiology-R C Dubey

**3C03 MCB APPLIED MICROBIOLOGY- I** (30 hrs)

Hours/week-3 Credits-2

Learner Objectives

1. To gain a preliminary understanding about Food Microbiology

2. To enhance awareness about food and water borne diseases and the microbial pathogens.

3. To develop interest in food preservation techniques

**MODULE I:** Food Microbiology: General characteristics of molds - Identification of fungi associated with food including fruits and vegetables : *Mucor, Rhizopus, Thamnidium, Aspergillus. Penicillium. Trichothecium. Geotrichum, Neurospora* and *Trichoderma.* Yeast and yeast like fungi – General characteristics -Classification and identification of yeasts (Brief account). Yeasts of industrial importance -True and false yeasts. Bacteria: Morphological and Physiological characteristics important in Food Microbiology (5 Hours)

**MODULE II:** Food spoilage : Chemical changes caused by micro organisms - Fitness or unfitness of food for consumption - Causes of spoilage - Factors affecting the growth of micro organisms in food- Chemical changes caused by microorganisms. (3 Hours)

**MODULE III:** Food preservation - General principles - Aseptic, removal, anaerobic conditions. Methods of preservation : (i) Preservation by use of High temperature - Heat resistance of microbes and their spore- Heat treatments -Pasteurisation - Heating at 100°C, Canning. (ii) Preservation by use of low temperature - Common or cellar storage - chilling or cold storage -Freezing or Frozen storage- Response of micro organism to freezing. (iii) Preservation by Drying - Sun drying - Drying by mechanical dryers - Freeze drying - Smoking - Microbiology of dried foods like fruits, Vegetables, eggs and milk. (iv) Preservation by food additives - Organic acids and their salts -Propionates, Benzoates, Sorbates, Acetates, Nitrites and Nitrates, Sugar and Salt, Alcohol, Wood smoke, spices and condiments and antibiotics. (10 Hours)

**MODULE IV**: Food and water-borne diseases: Viral- Gastro enteritis, Infectious hepatitis, Polio myelitis. Bacterial- Cholera, Typhoid fever, Listeriosis – symptoms, and preventive measures commonly employed. (2Hours)

**MODULE V**: Industrial microbiology: Food fermentations - Bread leavening by yeasts – by other micro organisms - chemical leavening. Brewing: Manufacture of Beer- microbiological aspects. Wine: Kinds of wines, manufacture, microbial spoilage, Distilled liquors. Vinegar : Methods of manufacture - microbial defects - Fermented vegetables - Sauerkraut - Pickles - Fermented dairy products - fermented milk , cheese, butter, yoghurt and other milk products - spoilage of milk - Preservation of milk. (10 Hours)

**REFERENCES:**

Food Microbiology- William C Frazier, Dennis C Westhoff

Industrial Microbiology-L E Casieda

Introduction to Food Biotechnology- Sinosh Skariyachan, Abhilash M

**3C04 MCB Microbiology (Complementary) – Practical I**

**Experiments for III Semester**

1. Use and care of microscopes
2. Microscopy-Staining-simple, Negative, Gram and Ziehl-Neelsen staining, Hanging drop motility, Fungal staining-LPCB
3. Cleaning and sterilization of glass wares
4. Use of Hot air oven, autoclave, incubator, water bath, colony counter, fillers, Laminar Air Flow
5. Use of PH meter, centrifuge, calorimeter
6. Preparation of Culture media-Simple, Selective, Differential
7. Isolation of bacteria by Streak plate method
8. Personal hygiene- Microbes from hands, tooth scum and other body parts
9. Isolation of microorganisms from soil samples (Serial dilution and pour plating.)

**REFERENCES:**

Microbiology- A laboratory Manual - James G. Cappuccino, Natalie Sherman

Microbiological Applications - Harold J Benson

**4C05 MCB APPLIED MICROBIOLOGY - II**

(30 Hours)

Hours/week-3 Credits-2

1. To gain a preliminary understanding about soil Microbes

2. To enhance awareness about environmental pollution

3. To develop interest in management of wastes.

**MODULE I:** Microbes as Biofertilizers: *Azolla- Anabaena* system, *Rhizobium*. Mycorrhiza - structure, Nutrition and Physiology and its benefits- Increased uptake of minerals. Vesicular Arbuscular Mycorrhiza (VAM): occurrence, ecology of VAM in the soil, physiology, Host interaction -Isolation and identification of VAM fungal spores- Orchidaceous mycorrhizae. (10 Hours)

**MODULE II:** Microbiology of Municipal sewage: sewage treatment- primary, secondary and tertiary treatments - Industrial effluents - microbes as indicators of waste water -pollution treatment process - septic tank - waste water treatment process -mechanical and biological treatment - trickling filters - Imhoff tank - activated sludge process - oxidation ponds - anaerobic sludge digestion. ( 10 Hours)

**MODULE III**: Solid waste disposal: Sanitary land fills - composting – Vermicompost - disposal of animal and agricultural wastes - Biogas - Gobar gas plant technology –common models. Microbiology of Methane production. (5 Hours)

**MODULE IV**: Soil micro organisms and their interaction with pesticides: Microbial metabolism of aromatic compounds - microbial decomposition of herbicides, insecticides and fungicides - Effect of pesticides on soil micro organisms. (5 Hours)

**REFERENCES:**

Microbial Ecology: Fundamentals & Applications- Richard Bartha, Ronald M Atlas

Agricultural Microbiology - G. Rangaswami, D.N Bagyaraj

Soil Microorganisms and Plant Growth - N S Subba Rao

Microbiology: Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg

**4C06 MCB: MICROBIOLOGY (Complementary) Practical II**

**Experiments for IV Semester**

1. Metabolic characterization of bacteria (IMViC test)

2. Quantitative estimation of micro organisms: Total count – Haemocytometer method, Viable count- Serial dilution and pour plating technique

3. Antibiotic sensitivity test- use of antibiotic disc diffusion method (Kirby- Bauer Technique).
4. Testing antibodies in serum by latex agglutination
5. Identification of important fungi associated with post harvest rot of fruits and vegetables by Microscopy (LPCB staining) and culture ( on SDA or PDA)
6. Demonstration of enzyme action using a yeast fermentation system
7. Demonstration of the effect of temperature on yeast fermentation

**REFERENCES:**

Microbiology- A laboratory Manual - James G. Cappuccino, Natalie Sherman.

Microbiological Applications - Harold J Benson

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Dr.Sarala Gopalakrishnan,

Chairperson, Board of Studies

**MODEL QUESTIONS**

**B.Sc Microbiology (Complementary) Model Question Paper- Theory**

**1CO1 MCB BASIC MICROBIOLOGY- I**

Time: 3 Hours Maximum Marks: 32

**Section A** (Answer **all the five** questions)

1……..microscope is used to identify bacteria like *Treponema pallidum*.

2. An amphipathic phospholipids found in bacterial membrane is ……..

3. Some bacteria have a layer of material lying outside the cell wall called…….

4. Movement of bacteria towards chemical attractants and away from repellents is……

5. The shortest time needed to kill all organisms in a microbial suspension at a specific temperature and defined condition known as …… **(5x1=5)**

**Section B** (Answer very briefly on **any four** of ten following)

Comment on the following:

6. Hot air oven

7. Ionizing radiation

8. Acid fast staining

9. Phylogenic tree

10. Complex media

11. Robert Koch **(4x2=8)**

**Section C** (Write short notes on **any three** of the following)

12. Kingdom Protista

13. Cyanobacteria

14. Numerical Taxonomy

15. Grams staining

16. Different types of culture media **(3x3=9)**

**Section D** (Answer **any two** of the following)

17. Describe chemical methods of sterilization

18. Describe the ultra structure of Gram positive cell wall.

19. Describe the working principle and applications of TEM

20. Discuss kingdom Fungi in detail. **(2x5=10)**

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**B.Sc Microbiology (Complementary) Model Question Paper- Theory**

**2CO2 MCB Basic Microbiology II**

Time: 3Hours Maximum Marks: 32

**Section A** (Answer **all the five** questions)

1. Transport in which the transported substances move in opposite direction is ……

2. …….is a population of cell arising from a single cell to characterize an individual species.

3. Chlorophyll and accessory pigments assembled in highly organized arrays called ……..

4. The enzyme that catalyzes biological nitrogen fixation is……

5…..is the photo system in eukaryotic cells that absorbs shorter wavelength.

**(5x1=5)**

**Section B** (Answer very briefly on **any four** of ten following)

Comment on the following:

6. Streak plate method

7. Complex media

8. Anaerobes

9. Microelements

10. Hfr conjugation

11. Sulphur assimilation **(4x2=8)**

**Section C** (Write short notes on **any three** of the following)

12. Lytic cycle

13. Biological nitrogen fixation

14. Bacterial photosynthesis

15. Endospore formation

16. Bacterial Growth curve **(3x3=9)**

**Section D** (Answer **any two** of the following)

17. Explain Transduction in bacteria

18. Explain nutrient uptake in bacteria

19. Explain the different methods for measurement of growth

20. Write an essay on conjugation **(2x5=10)**

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**B.Sc Microbiology (Complementary) Model Question Paper- Theory**

**3C03 MCB APPLIED MICROBIOLOGY- I**

Time :3 Hrs Maximum Marks :32

**Section A** (Answer ***all the five*** questions in a single word.)

1. The process that prevents fat from rising to the surface of milk is called.....

2. Distillate from saccharified and fermented grain mashes is called.....

3. Legal vinegar contain..... gram of acetic acid /100ml

4. Typhoid is caused by.....

5.....is a type Beer, light in colour, containing little remaining fermentable carbohydrate.

**(5x1=5)**

**Section B** (Answer very briefly on ***any four*** of the following)

Comment on the following:

6. Oxidation Reduction potential

7. Assessory growth factors

8. Biological structure of food

9. Cold storage

10. Propionates

11. HTST **(4x2=8)**

**Section C** (Write short notes on ***any three*** of the following)

12. Canning

13. Methods of drying

14. Kinds of Wine

15. *Listeria monocytogenes*

16.Smoking **(3X3=9)**

**Section D (**Answer *any two* of the following in detail.)

17. Chemical changes caused by micro organisms in food during soilage.

18. Types and major characters of micro organisms in food.

19. Fermented dairy products.

20. Brewing of Beer. **(2X5=10)**

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**B.Sc Microbiology (Complementary) Model Question Paper- Theory**

**4CO5 MCB APPLIED MICROBIOLOGY II**

Time: 3 Hrs Maximum Marks: 32

**Section A** (Answer ***all the five*** questions in a single word.)

1. *Azolla* is used as biofertilizer as it has.....

2. BOD is an important measure of.....

3. *E.coli* is an indicator of .....pollution

4. Expand VAM

5..... is a green manure biofertilizer. **(5x1=5)**

**Section B** (Answer very briefly on ***any four*** of the following)

Comment on the following:

6 .Imhoff tanks

7. Herbicides

8. Nitrogenase

9. Sanitary landfills

10. Xenobiotics

11. Indicator Organisms **(4x2=8)**

**Section C** (Write short notes on ***any three*** of the following)

12. Methanogenesis

13. Effect of pesticides on microorganisms

14. Septic Tank

15 .Oxidation ponds

16. Vermicomposting **(3X3=9)**

**Section D** (Answer ***any two*** of the following in detail)

17. Biogas production

18. Treatment of Sewage

19. Biofertilizers

20. Microbial interactions in soil **(2X5=10)**

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**Model Question paper for U.G Microbiology Complementary Course – (Practical)**

Practical examination of **3C04 MCB Microbiology (Complementary) – Practical I and 4C06 MCB Microbiology (Complementary) Practical II**

Maximum marks: 32
Time: 3 Hours x 2 days/Batch.

VI. Perform Gram staining with the given sample and report results. Write the principle of the experiment you have done.

**OR**

Identify the motility of the given culture by hanging drop method (8 Marks)

VII. Isolate pure culture by streak plate method. Write the principle and procedure. List your requirements.

**OR**

Find out the viable count of the given sample by pour plate method. Write the procedure. (8 Marks)

VIII. Find out the lactose fermentation character of the given culture and report your result. Write the principle

**OR**

Stain the fungal culture using LPCB and identify the microscopic characters of the given culture. Write the principle (4 Marks)

IX. Perform IMViC test. Write the principle of each test

**OR**

Perform antibiotic sensitivity test by disc diffusion method and report the antibiogram. Write the principle and procedure. (4 Marks)

X. Spotters. (4x2=8 Marks)

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