



III. Microbiology

1.

Syllabus

2.

Garbage to Grader (2018-19)

3.

Activity MGM Clean India (2019-20)

4.

Contribution of Microbiologist of Clean Env.

5.

Microbes in Clean Environment

6.

Student List with Signature

7.

Poster Competition

B) Immunology :

- 1) Blood Grouping
- 2) HBsAg (Hepatitis/B/C)
- 3) Pregnancy test

List of Books Recommended :

- 1) Immunology by Roitt (Blackwell)
- 2) Cell and Molecular Biology : Darnell Lodish Baltimore.
- 3) Animal Cell Culture : Practical approach : R.J.Freshney.
- 4) Introduction to Practical Biochemistry by Plummer
- 5) Practical Manual in Biochemistry by Jairaman.
- 6) Text Book of Biochemistry and Human Physiology by J.P.Talwar
- 7) Lehninger's Principles of Biochemistry (2000) by - Nelson, Cox, M.M.Macmillan, New York.
- 8) Text Book of Biochemistry by U.Satyanarayana.
- 9) Text Book of Biochemistry by Sucheta Dandekar.
- 10) Practical Clinical Biochemistry by Hirowled Varle.

List of Instruments/Equipment/Glass-ware with specification required for B.Sc. first to final semesters :-

List of equipments shall be mentioned in the Prospectus of B.Sc.-III (Prospectus No.2011123), printed on Page Nos.39 to 43).

**B.S.C. FINAL (SEMESTER-V)
17 : MICROBIOLOGY**

The examination shall comprise of two theory papers, one in each semester and one practical in each Semester. Each theory paper will be of 3 hours duration and carry 80 marks. The internal assessment will carry 20 marks. The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper have been divided into 6 units. There shall be one question on each unit, will internal choice and for each of 12 marks and one compulsory question covering all the syllabus of semester V (6 marks)

5S MICROBIOLOGY

(Environmental Microbiology and Bioinstrumentation)

Unit-I : Microbial Associations and Air Microbiology

- A. Microbial Associations : Definition and examples of positive (Mutualism, Commensalism, Symbiosis) and negative (Antagonism, Competition, Parasitism) and neutral association.

B. Air Microbiology

- a) The atmosphere and its layers.
- b) Different types of microorganisms in air.
- c) Techniques for microbiological analysis of air:
 - i) Solid impingement devices
 - ii) Liquid impingement devices.
- d) Airborne diseases : Etiology, symptoms and prevention.
- e) Control of microorganisms in air.

Unit-II : Microbiology of Soil.

- a) Microorganisms in soil.
- b) Rhizosphere.
- c) Decomposition of plant and animal residues in soil.
- d) Definition, formation, function and microbiology of humus and compost.
- e) Biological Nitrogen fixation : Type of nitrogen fixing microorganisms, factors affecting and mechanism of symbiotic and non-symbiotic nitrogen fixation. Process of nodulation, nitrogenase complex, recombinant DNA and nitrogen fixation, legume inoculants.
- f) Cycles of elements in nature :
 - i) Carbon cycle : CO₂ fixation, organic carbon degradation.
 - ii) Nitrogen cycle : Proteolysis, amino acid degradation, Nitrification, Denitrification, Degradation of nucleic acids.
 - iii) Sulphur cycle
 - iv) Phosphorus cycle.
 - v) Biofertilizers, biological pest control.

Unit III : Water Microbiology

- a) Planktons : Definition, types, factors affecting growth of planktons, methods of enumeration, beneficial and harmful activities of planktons.

- b) Control of plankton problems
- c) Eutrophication and its control.

Unit IV : Assessment of Water Quality and Treatment

Bacteriological analysis of water:

- i) Significance of bacteriological analysis of water.
- ii) Collection and handling of water sample from various sources.
- iii) Indicators of excretal pollution.
- iv) Multiple tube dilution technique, MPN.
- v) IMViC classification of coliform.
- vi) Membrane filter technique for coliform and faecal Streptococci.
- vii) ICMR and WHO Bacteriological standards of drinking water.

Unit V : A) Water Treatment

- a) Self purification of water : Various zones and factors responsible for self purification.
- b) Treatment of water : Aeration, Coagulation, Flocculation, Sedimentation and Filtration.
- c) Slow and Rapid sand filters : Construction, mechanism of filtration, differences.
- d) Methods of chlorination : Plain, super chlorination, ammoniachlorine treatment, Break-point chlorination.

B) Waste Water Treatment

- a) Aims of sewage treatment, composition of effluent
- b) Municipal sewage treatment plant.
- c) Preliminary treatment (seiving and Grit chamber)
- d) Primary treatment (sedimentation)
- e) Secondary treatment (Aerobic)
 - i) Trickling filter
 - ii) Activated sludge process
 - iii) Oxidation pond
- f) Anaerobic sludge digestion

- g) Domestic sewage treatment by septic tank and Imhoff tank.
- h) Concept of COD, BOD.
- i) Outline of bio-gas production

Unit VI : Bio-Instrumentation

- a) Spectroscopy- Definition, Principle, types (UV&IR) & its applications.
- b) Electrophoresis- Definition, Principle, types (Paper&Gel) & its applications.
- c) Chromatography- Definition, Principle, types (Paper&TLC) & its applications.
- d) Isotopic Tracer Techniques- Definition, Principle & applications.

* Microbiology Practicals. Sem-V

1. Bacteriological analysis of water and Waste Water.
 - a) Standard plate Count.
 - b) Multiple tube dilution technique (MPN for Coliform)
 - i) Presumptive test ii) Confirmatory test
 - iii) Completed test.
 - c) IMViC test for coliform
 - d) Multiple tube dilution technique for faecal strepto cocci.
 - e) Membrane filter technique for coliforms & faecal streptococci.
 - f) BOD estimation.
 - g) Isolation of Bacteriophage from Sewage.
 - h) Determination of Chlorine demand and residual chlorine.
2. Study of Soil Microbiology
 - a) Enumeration of Soil microorganisms.
 - b) Isolation of Azotobacter from Soil.
 - c) Isolation of Rhizobium from Soil

- d) Isolation of Antibiotic producers from soil
3. Effect of Ultra-violet/Filtration on micro-organism present in water
- ✓ 4. Separation of amino acids and sugars by paper chromatography.

Distribution of marks for Microbiology practical Examination:

1. Major Experiment	- 15 marks
2. Minor Experiment	- 10 Marks
3. Viva Voce	- 10 marks
4. Spotting	- 10 marks
5. Laboratory Journals	- 05 Marks
Total	- 50 marks

List of Reference Books for 5S Microbiology:

1. Introduction to Soil Microbiology : Alexander Martin
2. Soil Microbiology : Subbaroa N.S.
3. Introduction to environmental Microbiology: Mitchell, R.
4. Sewage & Waste treatment : Hammer
5. Water Pollution : Zajic J.E.
6. Water Pollution Microbiology - Mitchell R.
7. Air Pollution : Perlins H.L.
8. Aquatic Microbiology : Stainer & Shewan
9. Introduction to Waste Water Treatment processes. Rainwater

**B.S.C. FINAL (SEMESTER-VI)
6S. MICROBIOLOGY**

The examination shall comprise of two theory papers in each semester and one practical in each Semester. Each theory paper will be of 3 hours duration and carry 80 marks. The internal assessment will carry 20 marks. The following syllabi is prescribed in the six lectures per week and 6 practical periods per month. The theory paper have been divided into 6 units. There shall be 10 questions on each unit, will internal choice and for each of 11 compulsory question covering all the syllabus of each unit. 20 marks

(Industrial Fermentation, Food Microbiology and Metabolism)

Unit-I : Fermentation in General.

- a) Definition and scope of Industrial microbiology and biotechnology.
- b) Important classes of industrial microorganisms.
- c) Fermentation :- Definition and types (batch and continuous, aerobic and anaerobic, surface and submerged fermentations)
- d) Production strains
- e) Screening :- Definition, Primary screening (crowded plate technique, auxonography, enrichment culture technique, use of indicator dyes), secondary screening.
- f) Scale up process :- Definition and significance.
- g) Inoculum buildup : Spore and vegetative inoculum.
- h) General layout of fermentation plant :- Fermentation equipment and its uses.
- i) Raw materials :- Composition and uses. Saccharine, starchy, cellulose raw materials, hydrocarbon and vegetable oils, nitrogenous material (corn steep liquor).
- j) Antifoam agents.
- k) Sterilization of media :- Batch and continuous sterilization.
- l) Detection and assay of fermentation products.

Unit-II : Industrial Productions I:

Microorganisms, raw material, inoculums buildup, fermentation conditions, recovery, uses and mechanism of the following products.

- a) Ethyl-alcohol : From molasses and waste sulphite liquor.
- b) Beer.
- c) Wine (Red table and White table)
- d) Acetone- Butanol from corn.

Department of Microbiology



Date / /

Page:

Shankarlal Khandelwal
College, Akola.

Year :- 2018-19

Student Name :- Ju. Aarti G. Tikande

Subject :- Microbiology.

Std :- B.Sc III (sem VI.)

Topic :- Garbage to Garden

Date :- 10/3/19.

Subpark

Sign of HOD.

Sign: _____



Garbage To Garden

'Garbage to Garden', The process of converting garbage to a garden, including the main process known as Decomposition.

Decomposition is the process by which organisms or substance are broken into a more simpler organic matter. This process is apart of the nutrient cycle and is essential for recycling the finite matter, that occupy physical space in the biosphere, bodies of living organism begins to decompose shortly after death.

For decomposition, a particular and specific culture is required. We used the culture from 'soil waste management, Puna'. We started a project of garbage to garden - step by step -

Compositing An Effective Step Towards the 'Green Future'.

Composting is nature's way of recycling and is one of the simplest ways to manage your waste. What's great that it can be done at home. Composting involves decomposing everyday's kitchen waste into a rich soil known as compost.

Following four steps are as follows:-

Step 1: Though the best place to start composting it is outdoor, like your balcony, terrace or roof. You can even begin composting in the kitchen itself, if you really trapped four space. It can be started in the garden too.

Step 2: Start separating your kitchen waste like vegetable peels, fruit peels, small of waste of cooked food, used tea leaves, etc in a bin.

Step 3: Construct your composting bin. Take an empty container as big as or as small as you need. Drill around 4-5 holes at the bottom of container at different levels, so as to let some air in case.

Step 4: Start the process of composting. Now comes the process of adding the waste in the bin. Start adding food waste. Maintaining the wet waste, layer by layer and add our culture then again add on it, the matter layer of vegetable & fruit waste and water it. Pour this compost in seven diff. pots with a of the beautiful flower plant. Observe the result after completing this step.

Observation: Decomposition takes place with the help of micro-organism. All wet garbage decompose into a simple. All the flower plants grow beautifully with the nutrient development due to formation of nutritious compost with the help of decomposition process.

Rishu

Shankarlal Khandelwal College, Akola

Department of Microbiology

Report of Program/ Activity

Academic Session 2019 -2020

Title/Topic of the activity: MGM Clean India Centre-Workshop on solid waste Management through city farming, Aurangabad.

Type of Activity : Co-curricular-Workshop

Class and Semester: B.Sc. III , Sem-V

Objective: To train the students for solid waste Management through city farming and making them aware about its applied potential for entrepreneurship.

Name of Coordinator : Dr. A. R. Deshpande Co-coordinator:Dr. D. D. Bhokare

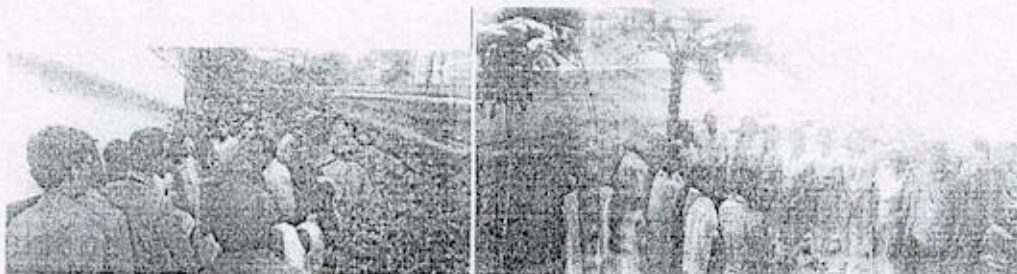
Date of activity: 13/9/19

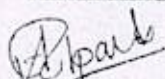
Name of the Resource person: Dr. R. R. Deshpande


Number of participants: 17

Brief Description : Organic biodegradable solid waste can be recycled by using it for growing plants by utilising active biological decomposer. MGM clean India Centre is doing it very efficiently. One day workshop was conducted for Students of sem 5 to get training for this technique.

Photographs:




Head


Principal
Shankarlal Khandelwal College
Godbole Plot, Akola

(1)

Shankarlal Khandelwal College, Akola

Department of Microbiology

Report of Program/ Activity

Academic Session 2019 -2020

Title/Topic of the activity: Contribution of Microbiologist for Clean Environment.

Type of Activity : Co-curricular- Group Discussion

Class and Semester: B. Sc. III, Sem-5

Objective: To Make the Students aware about the applied potential of Microbiology for Clean Environment

Name of Coordinator : Dr. A. R. Deshpande

Date of activity: 15/10/19

Number of participants: 38

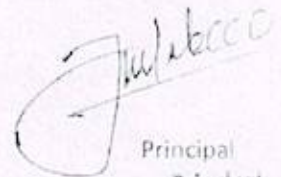
Brief description: It was a class activity held for triggering the thoughts of students regarding the applied potential of Microbiology for Clean Environment and how a microbiologist can contribute for it. Students were divided in groups to discuss the topic and were allowed to use the internet. Then the group leaders summarized and presented the highlighting points.



Head



Coordinator



Principal
Principal
Shankarlal Khandelwal College
Akola

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Shankarlal Khandelwal College, Akola

Department of Microbiology

Report of Program/ Activity

Academic Session 2019 -2020

Topic of the activity: Microbes in clean Environment

Type of Activity : Co- Curricular- Poster Competition

Class and Semester : B.Sc.III, Sem-5

Objectives: To enhance awareness about the subject , to provide opportunity for participative learning, to boost their creativity, to enhance their presentation skills, to enhance soft skills related with planning and management of the event .

Name of Coordinator : Dr. Aarti R. Deshpande

Name of Co-coordinator: Dr. D. D. Bhokare

Date of activity : 03/09/19

Names of Special Guests : Dr. Harish Malpani – Inaugurator and Evaluator

Number of participants: 40

Brief Description :It was a class activity held for triggering the thoughts of students regarding the applied potential of Microbiology for Clean Environment and how a microbiologist can contribute for it. Students gathered information using internet, prepared posters and presented their posters related with microbial technology for clean environment .

Photographs:



A. R. Deshpande
HOD

J. Malpani
Principal
Principal
Shankarlal Khandelwal College
Gadboldi, Akola.

Organic waste disposal through City Farming

Dr.R.R.Deshpande

Hon Director,

MGM-CLEAN India Centre,

MGM's *Kala-Dirgha* Art Gallery, Gate No. 07,

Near MGM Cricket Stadium, N-6, CIDCO,

Aurangabad (MS) -431003

Email – mgmcleanindia@themgmgroup.com

rr.heritage.bio@gmail.com

INTRODUCTION

Urban India is likely to face a massive waste disposal problem in the coming years. A closer look at the current and future scenario reveals that waste needs to be treated scientifically and holistically, recognizing its natural resource roots as well as health impacts. The need of the hour is to manage it at the source itself as far as possible. A major portion of the waste generated in households (80%) is organic in nature i.e., it is biodegradable and it can be done effectively and successfully through City Farming at the source itself.

WHAT IS CITY FARMING?

The disposal of Organic waste can be done effectively through City Farming at the source itself. It is an innovative technology which deals with the farming in urban areas and essentially on terrace, balconies and even on the walls of civil construction. It was invented by **Padmashri late Dr. R.T.Doshi** and modified and improved by Dr.R.R.Deshpande by using bio-culture and biocatalyst developed by **BERI, Pune***. A pilot project consisting of 100 city farms drums have been set-up at MGM Campus Aurangabad to create model for adaption by citizens, NGOs corporations, municipalities, town councils, industries etc.

BENEFITS

- Disposal of organic waste at the source itself simultaneously growing variety of plants.
- Creates oxy rich environment around and reduces CO₂ and NO₃ due to uptake of the same by plants.
- It reduces obnoxious odour of the waste and controls growth of pathogens, pests, flies mosquitoes etc as well.
- Also develops biodiversity in adjacent environ.
- It creates clean and green environment around.
- Self operating and self improving system.

OBJECTIVE

It is the scientific and innovative technique for disposal of organic waste at the source where it is generated, simultaneously growing vegetables/fruits/flowering/medicinal/ ornamental plants etc. By adopting this city farming in community, the responsibility of the municipality for the disposal of organic waste is greatly reduced, **reaching the zero level progressively.**

REQUIREMENTS OF CITY FARMING

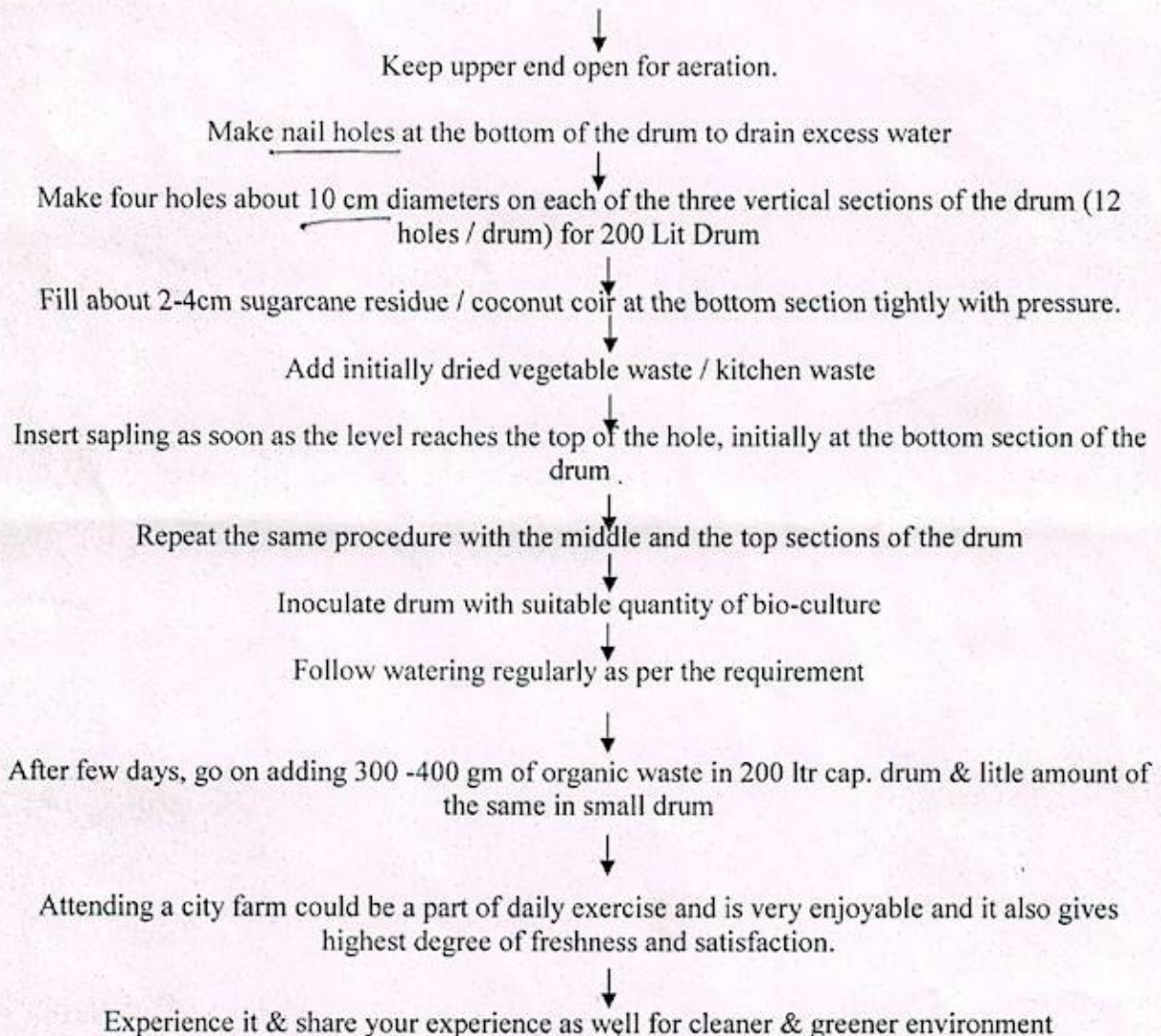
Sun energy, little water, little or no soil, sugarcane residue/ (baggase)/coconut coir, coco peat,

organic waste (initially in dry form) small metal drums/ (for single crop) and 200 lit. cap. metal drum (for multi crops). And suitable dose of bio-culture/biocatalyst* for excellent results.

It is very simple, inexpensive, within the reach of city people and has great potential, eco-friendly, profitable, and gives creative pleasure.

Drum method

Use 200 liters capacity barrel / drum (for more than 8 plants) or 20/10 liters capacity drum (for single plant)



In one drum, you can plant 12 fruity plants flowering/ medicinal plants sapling in 12 holes and on the top area, 1 to 2 saplings and then you daily go on adding adequate amount of organic kitchen waste, vegetable waste peelings. (appr.300 to 500 grams) kitchen + garden waste etc. Watering is also to be followed.

Every plant you grow, every harvest you have, is a experiment. Even you start with a failure, there will be an addition to your knowledge and each of the further experiments will lead you progressively, to success and to excellence.

● ACTIVITY ●

Academic / Extension / Social / Research / Co-curricular / Guest Lecture / Educational
Tour & Visit / Interdisciplinary / Entrepreneurship / Innovative / Workshops / Creative

Date : 13/9/19

Faculty : Science Deptt. Microbiology Committee : _____

Name of the activity & Name of the Guest/Speaker/Judge/Resource person	Aims & Objectives of the activity	Number of beneficiaries	Outcomes of the activity	Remark
MAM ^{TPW} Clean India Centre - Workshop on solid waste management through city farming. Aurangabad	To train the students in SWM with city farming & to inspire them for working in that sector.	20	Students learnt the techniques of SWM on organic waste using city farming.	Scope Awareness about scope of the topic was increased.

Sr. No.	Name of the Student	Class	Signature
1)	Madhuri V. Ambhore	B.Sc III	
2)	Apurva V. Mankar	B.Sc III	
3)	Pragati P. Kedar	B.Sc III	
4)	Vidhya M. Yewale	B.Sc III	
5)	Prerona U. Khunde	B.Sc III	
6)	Mahima H. Gattani	B.Sc II	
7)	Saxoj S. Gujar	B.Sc III	
8)	Pooja R. Deshmukh	B.Sc III	
9)	Nikita D. Tayde	B.Sc III	
10)	Vaishnavi K. Fulkar	B.Sc III	
11)	Pratiksha V. Telrandhe	B.Sc III	
12)	Smushti P. Rele	B.Sc III	
13)	Rutuja S. Wankhade	B.Sc II	
14)	Sayali G. Pavitkar	B.Sc II	
15)	Prerona S. Shewane	B.Sc III	
16)	Kash A. Shaema	B.Sc III	
17)	Vaibhav B. Churgarke	B.Sc III	
18)	Abhishek R. Dawale	B.Sc III	
19)	Vicky P. Sahu	B.Sc II	
20)	Ranjit S. Rahate	B.Sc III	

Dr. Anand

Shankarlal Khandelwal Arts, Science & Commerce College, Akola

• ACTIVITY •

Academic / Extension / Social / Research / Co-curricular / Guest Lecture / Educational Tour & Visit / Interdisciplinary / Entrepreneurship / Innovative / Workshops / Creative

Date: 15/10/19

Faculty: Science

Deptt: Microbiology

Committee: _____

Name of the activity & Name of the Guest/Speaker/Judge/Resource person	Aims & Objectives of the activity	Number of beneficiaries	Outcomes of the activity	Remark
G.D. Topic: Contribution of Microbiologist for clean environment.	To make the students think about the ways to contribute for clean environment as microbiologist.	38		Students actively & enthusiastically participated & got inspired.

Sr. No.	Name of the Student	Class	Signature
1) Circul	1) Vicky P. Sahu	B.Sc III	
	2) Yash A. Sharma.	B.Sc. III	
	3) Yash M. Deshmukh	B.Sc. III	
	4) Vaibhavsing B. Chougale	B.Sc. III	
	5) Prajwal S. Shewane	B.Sc. III	
2)	1) Vicky. T. Raut	B.Sc III	
	2) Akurh. R. Thakare	B.Sc III	
	3) Ranjit. S. Rahate	B.Sc III	
	4) R. Bitesh M. Ratneypantehi	B.Sc III	
	5) Abhishek. R. Dewale.	B.Sc III	
3)	1) Ku. Ankita Ashok Amankor	B.Sc III	
	2) Ku. Chaitali Balasaheb Bhatkar	B.Sc. III	
	3) Ku. Pallavi G. Kale	B.Sc. III	
	4) Ku. Mayuri J. Gavhale	B.Sc III	
	5) Ku. Chanchal V. Thombare	B.Sc III	
	6) Ku. Gunbai V. Karale.	B.Sc III	

SHANKARLAL KHANDELWAL COLLEGE

MICROBIOLOGY DEPARTMENT

POSTER COMPETITION

MICROBIOLOGY SOCIETY

DATE:- 03/09/19

Sr.No.	NAMES	TOPIC	MARKS			TOTAL
			PM	PP	Q/A	
1	Pranali gawai Pranali khande	Bioremediation & Biodegradation	07	07	05	
2	Ankita amankar Pallavi kale	Application of micro-organisms in environment	06	08	03	
3	Chaitali bhatkar Gayatri karale	Microbes in clean environment	06	05	03	
4	Sawi lodam Shivani vagare	Microbes in clean environment	07	07	04	
5	Dipti dhote Priya malokar	Microbes in clean environment	05	04	02	
6	Vidya yewale Pragati kedar	Microbes in clean environment	08	07	05	20 — (3)
7	Mayuri gawale Raksha gomase	Cleaning of water system	07	06	04	
8	Nikita tayde Shital khirodkar	Microbes in clean environment	06	06	02	
9	Pratiksha telrandhe Vaishnavi fulkar	Role of soil microbes in clean environment	09	07	04	20 — (3)
10	Pratiksha mhasal Anuja bopulkar	Sewage water treatment and drinking water treatment	07	06	04	

