

Government College (Autonomous) Rajamahendravaram

Accredited “A⁺” Grade by NAAC

Department of Biotechnology



Syllabus for Courses Offered

B.Sc., Biotechnology and AgroBiotechnology

under CBCS (Choice Based Credit System)

Programmes : BBC(2209) and Agro BBC(2211)

Approved by Board Of Studies(2020 -2021)

JUNE-2020

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- Proceedings of the principal pertaining to BOS.**
- Composition of BOS Members**
- Table showing the allocation of Credits for theory and lab(also teaching hours per week, Marks for each course, Title of the course, Semester etc.)**
- Table showing Members present with signatures**
- Resolutions adopted in Board of Studies Meeting**
- Activities for the semester approved by the Board of Studies**
- Detailed record of discussions transpired between the members during the BOSmeeting.**
- List of colleges for engaging Examiners / Paper setters.**
- Addition / deletion of specific topics from the syllabus in each course (paper) with justification.**
- Syllabus for each course (both theory & practical"s) followed by model question papers.**

Government College (Autonomous), Rajamahendravaram.

Proceedings of the principal

RC. NO. 050/GCRJY /ACAD. CELL/ 2019/, DATED. 19.03. 2019

Sub: GCRJY-**Conduct of BoS Meetings for the Academic Year 2020-21** Regarding.

Ref: 1. Minutes of IQAC meeting dated 19 March, 2019

2. Resolutions adopted in Staff Council Meeting held on 23 March, 2019***

ORDER:

With reference to the subject cited, the lecturers-in-Charge of all the departments are hereby informed to conduct their respective Board of Studies (BoS) meetings, both UG & PG separately, before 20 April, 2019.

In Para 2 of Resolution 3 cited under Ref. 1, all the departments are hereby informed to meet Internal Quality Assurance cell with prior appointment to discuss the quality enhancement measures of departments such as changes/reforms to existing programmes/courses initiated or to be initiated or otherwise and new programs (if any) to be introduced along with justification before actual conduct of Boards of Studies.

You are also informed to intimate the date of your BoS meeting well in advance to the subject experts/University nominee/Industrial Nominee/members of BoS/Student nominee concerned to get their valuable views and suggestions in the deliberation to frame the concrete syllabi for your subjects keeping in view the objectives of the college and interest of the stake holders. The date should also be indicated to Academic Cell/IQAC in advance.

You are further suggested to utilize the academic autonomy in incorporating the additional modules in the syllabi and identify the pedagogical strategies to implement the same.

Please note that your BoS document should contain the following contents in order

- a) Proceedings of the Principal pertaining to BoS
- b) Composition of BoS
- c) Table showing the Allocation of Credits in the following table for both theory and Lab in case of science subjects

S. No	Semester	Title of the Course	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
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- d) Resolutions adopted in the meeting with detailed discussion that took place during the meeting.
- e) Table showing Members present with signatures
- f) List of Examiners & Papersetters
- g) Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50 marks) for each course.
- h) PO attainment data (CO-PO mapping) for 2015-18 batch

You are requested to submit a separate document regarding addition/deletion of specific topics from the syllabus in each course (paper) with justification, if any in the Proforma supplied by IQAC through e-mail.

All the **new certificate courses** proposed for the calendar year 2020, Seminars/workshops, field visits, study tours, on job trainings, internships for 2019-20 should be placed before the respective Board and get them approved.

You are also requested to submit 2 hard copies & 2 soft copies (CDs) of BoS document to the IQAC and settle the bills after completion of the BoS meeting

Important Note: All the HoDs should submit a detailed record of discussions transpired between the members during the BOS meeting in the BoS document.



PRINCIPAL

GOVERNMENT AUTONOMOUS COLLEGE RAJAHMUNDRY

Government College(Autonomous), Rajahmundry
Department Of Biotechnology: Allocation of credits

Semester	Paper	Title of course	Hrs per week	Marks			Credits	Course code
				CIA	SEE	Total		
1	1	Biomolecules, bioenergetics & Analytical Techniques	4	50	50	100	4	BTL149
1	1	Biomolecules, bioenergetics & Analytical Techniques lab	2	-	50	50	1	BTL149P
2	2	Microbiology, Cell and Molecular Biology	4	50	50	100	4	BTL150
2	2	Microbiology, Cell and Molecular Biology lab	2	-	50	50	1	BTL150P
3	3	Biophysical Techniques	4	50	50	100	3	BTL124
3	3	Biophysical Techniques lab	3	-	50	50	2	BTL124P
4	4	Immunology	4	50	50	100	3	BTL123
4	4	Immunology lab	3	-	50	50	2	BTL123P
5	5	Genetics and Molecular Biology	3	40	60	100	3	BTL125
5	5	Genetics and Molecular Biology lab	3	-	50	50	2	BTL125P
5	6	Gene Expression and rDNA Technology	3	40	60	100	3	BTL 126
5	6	Gene Expression and rDNA Technology lab	3	-	50	50	2	BTL126P
6	7 A	Developmental Biology	4	40	60	100	3	BTL127
6	7 A	Developmental Biology Lab	3	-	50	50	2	BTL127P
6	7B	Ecology	4	40	60	100	3	BTL128
6	7B	Ecology Lab	3	-	50	100	2	BTL128P

Semester	Paper	Title of course	Hrs per week	Marks			Credits	Course code
				CIA	SEE	Total		
6	7C	Biostatistics, bioinformatics and IPRS	4	40	60	100	3	BTL118
6	7C	Biostatistics, bioinformatics and IPRS Lab	3	-	50	50	2	BTL118P
6	8A1	Plant Physiology Animal Physiology Inheritance Biology	4	40	60	100	3	BTL117 BTL122 BTL131
	8A2		4	40	60	100	3	
	8A3		4	40	60	100	3	
6	8A1	Plant Physiology Lab Animal Physiology Lab Project	3	-	50	50	2	BTL117PBT L122P BTL131P
	8A2		3	-	50	50	2	
	8A3		3	-	50	50	2	
6	8B1	Diversity in Life Evolution Project	4	40	60	100	3	BTL129 BTL130 BTL131
	8B2		4	40	60	100	3	
	8B3		4	40	60	100	3	
6	8B1	Diversity in Life Lab Evolution Lab Project	3	-	50	50	2	BTL129P BTL130P BTL131P
	8B2		3	-	50	50	2	
	8B3		3	-	50	50	2	
6	8C1	Plant Biotechnology and Animal Biotechnology	4	40	60	100	3	BTL132
	8C2	Environmental & Industrial Biotechnology	4	40	60	100	3	BTL145
	8C3	Medical nano biotechnology	4	40	60	100	3	BTL 146
6	8C1	Plant Biotechnology and Animal Biotechnology Lab	3	--	50	50	2	BTL132P
	8C2	Environmental & Industrial Biotechnology Lab	3	--	50	50	2	BTL145P
	8C3	Project	3	--	50	50	2	BTL 131P

Pedagogical Techniques

- P1- Lecture
- P2- Demonstration
- P3- Question & Answer
- P4- Discussion, Debate or Collaboration
- P5- Audio & Video
- P6- Virtual or Online learning
- P7- Assignment or Case Study
- P8- Study (Research) Project
- P9- Hands on Study
- P10-Class Seminar
- Px1- Quiz
- Px2- Brainstorming
- Px5- Peer review
- Px6- Games & Puzzles
- Px7- Tutorial
- Px8- Display of Newspaper clipping
- Px9- Invited lecture
- Px10 – Group learning
- Px11 -Bulletin board,
- Px12 -Open text book study
- Px13 - Student magazine,
- Px14 -Report/Review writing
- Px15 - Diagrams in text book
- Px16 -3-D Models,
- Px17 -Drawing (maps)/charts
- P_T – Test,
- *Google classrooms
- *Project based teaching

Department Best Practices for CIA:

- 1. Weekly wall magazine : Poster
Presentation on notice board.**
- 2. Extension service: Awareness
programme/ rally.**
- 3. MOOCs : Enrolment and
completion of one course**
- 4. Internship / summer project.**

**Credits allocated for the program (BBC - 2209 & Agro BBC - 2211)
For 2018-19 and 2019-20 admitted batch**

Sem- I	S.No	Subject	Theory Hours per week	Theory Credits	Practical Hours	Practical credits	Total credits
		I - Language	4	3	*	*	3
		II-Language	4	3	*	*	3
		Life skill courses	2	2	*	*	2
		Skill Development courses	2	2	*	*	2
		Biotechnology	4	4	2	1	5
		Botany	4	4	2	1	5
		Chemistry	4	4	2	1	5
		Total Hrs/W	24	22	06	03	25

Sem- II	S.No	Subject	Theory Hours per week	Theory Credits	Practical Hours per week	Practical credits	Total credits
		I - Language	4	3	*	*	3
		II-Language	4	3	*	*	3
		Life skill courses	2	2	*	*	2
		Skill Development courses	2	2	*	*	2
		Biotechnology	4	3	3	2	5
		Botany	4	3	3	2	5
		Chemistry	4	3	3	2	5
		Total Hrs/W	24	22	06	03	25

Credits for the program (BBC - 2209 & Agro BBC - 2211)

	S.No	Subject	Theory Hours per week	Theory Credits	Practical Hours per week	Practical credits	Total credits
Sem-III		I - Language	4	3	*	*	3
		II-Language	4	3	*	*	3
		FC-I (Information and Communication Technology)	2	2	*	*	2
		FC-II (Communication and soft skills)	2	2	*	*	2
		Biotechnology	4	3	3	2	5
		Botany	4	3	3	2	5
		Chemistry	4	3	3	2	5
							25

	S.No	Subject	Theory Hours per week	Theory Credits	Practical Hours per week	Practical credits	Total credits
Sem-IV		FC-I (Communication and soft skills)	2	2	*	*	2
		FC-II (Analytical Skills)	2	2	*	*	2
		FC-III (Leadership Education)	2	2	*	*	2
		FC-IV (Entrepreneurship)	2	2	*	*	2
		Biotechnology	4	3	3	2	5
		Botany	4	3	3	2	5
		Chemistry	4	3	3	2	5
							23

Credits for the program (BBC - 2209 & Agro BBC - 2211)

Sem-V	S.No	Subject	Theory Hours per week	Theory Credits	Practical Hours per week	Practical credits	Total credits
	Course 5	Biotechnology	3	3	3	2	5
		Botany	3	3	3	2	5
		Chemistry	3	3	3	2	5
Course 6	Biotechnology	3	3	3	2	5	
	Botany	3	3	3	2	5	
	Chemistry	3	3	3	2	5	
						30	

Sem-VI	S.No	Subject	Theory Hours per week	Theory Credits	Practical Hours per week	Practical credits	Total credits
	Course 7 Elective	Biotechnology	3	3	3	2	5
		Botany	3	3	3	2	5
		Chemistry	3	3	3	2	5
Course 8 (Cluster)	Biotechnology	3	3	3	2	5	
	Biotechnology	3	3	3	2	5	
	Biotechnology	3	3	3	2	5	
						30	
					Total	158	

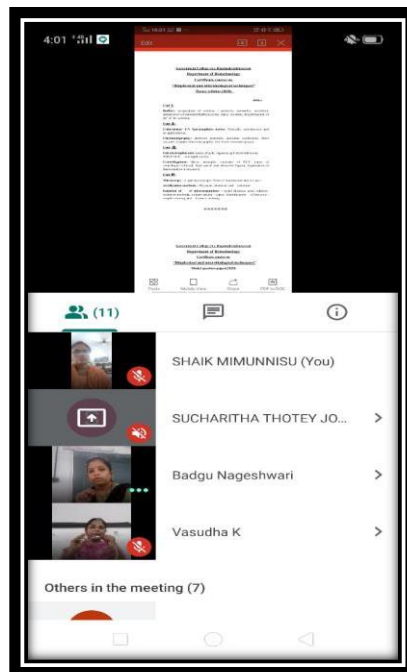
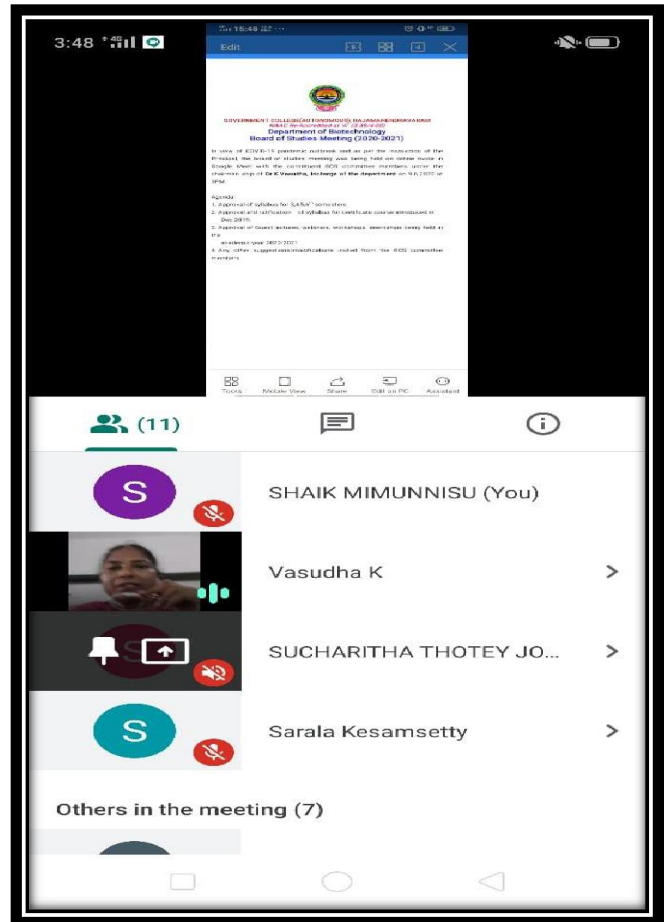
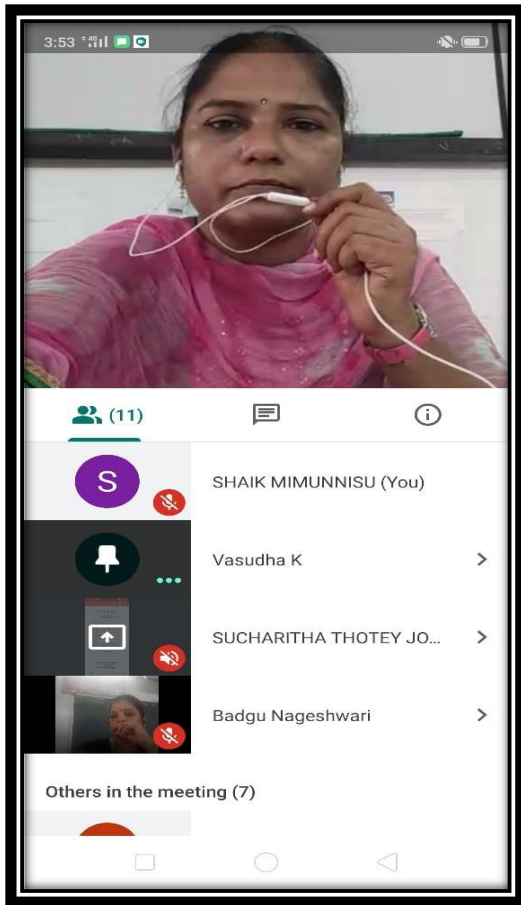
Certificate & Diploma Courses offered by College

As per the college Governing Body resolution dated 22 May 2017, Certificate Course is made mandatory for all 1st Year students admitted batch 2017-18 onwards. The Student may join any one of the Skill development/ Certificate courses offered by the college

Details of certificate courses offered by various departments

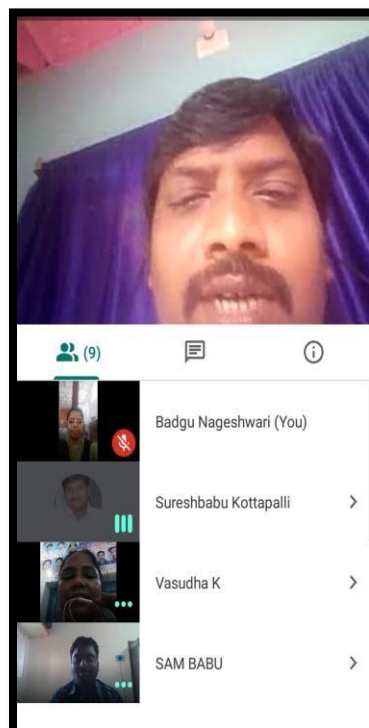
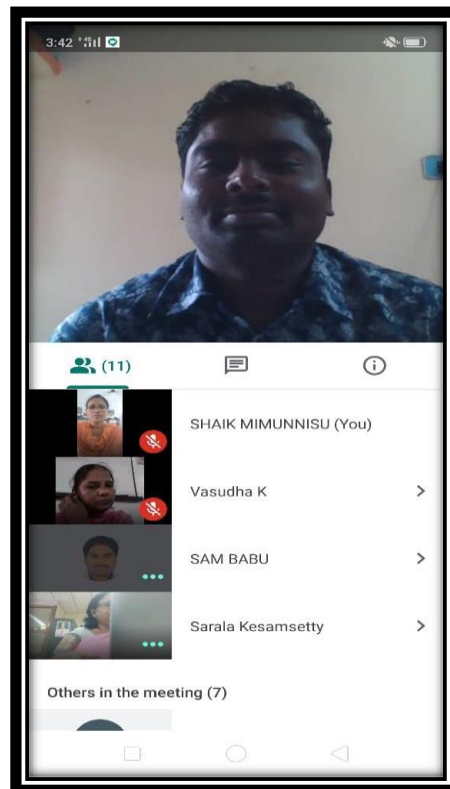
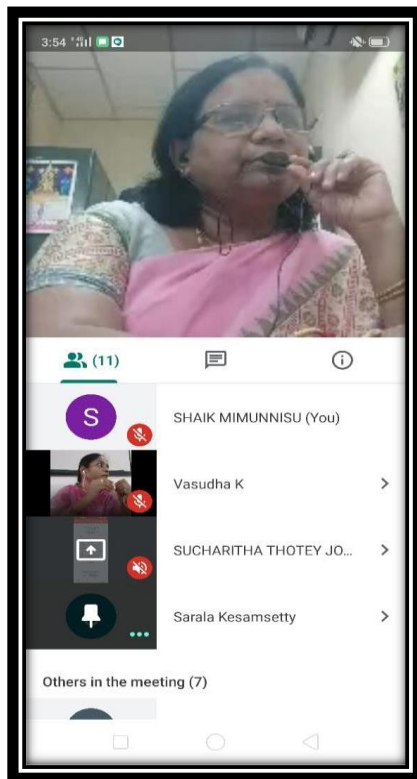
S.No	Name of the Department	Proposed Certificate Course	Duration
1.	Biotechnology	Biophysical and Microbiological Techniques	60 Hours
2.	English	Domestic Business Process Outsourcing(BPO)	60 Hours
3.	Chemistry	Chemical Lab Technician	60 Hours
4.	MicroBiology	Clinical Health Science	60 Hours
5.	Fine Arts	Kuchupudi(Dance)	60 Hours
6.	Commerce	Direct Tax Procedures and Practices	60 Hours
7.	Commerce	Financial Education	60 Hours
8.	Commerce	Fundamentals of Management	60 Hours
9.	Computer Science & Applications	Desktop Publishing(DTP)	60 Hours
10.	English	Functional English	60 Hours
11.	Telugu	Functional Telugu	60 Hours
12.	Philosophy	Gandhi an Studies	60 Hours
13.	Physics	Household writing	60 Hours
14.	Political science	Journalism& mass communication	60 Hours

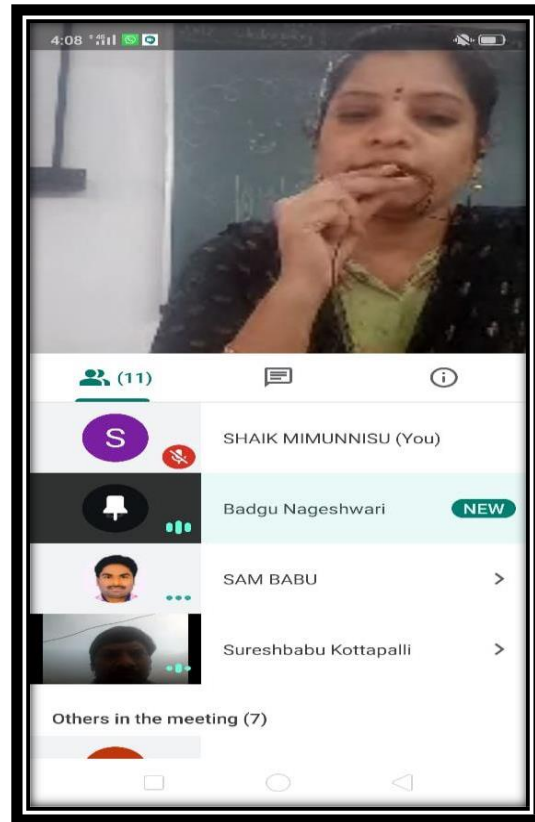
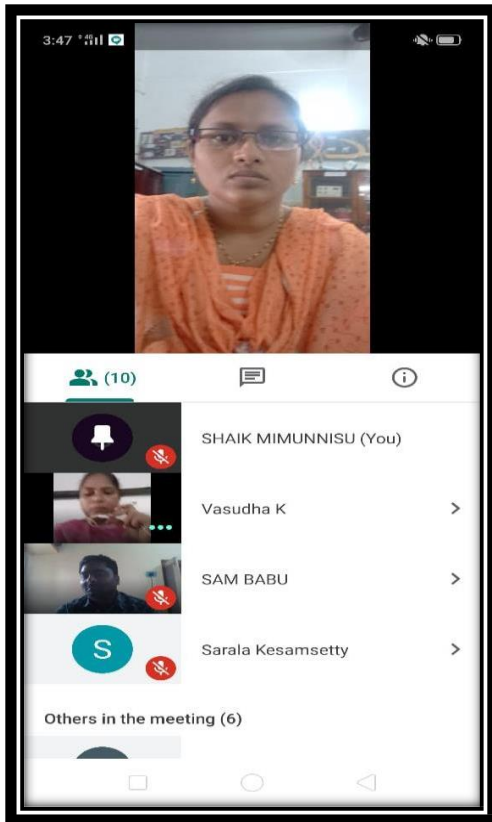
S.No	Name of the Department	Proposed Certificate Course	Duration
15.	Fine Arts	Carnatic(Music)	60 Hours
16.	Economics	Office Management	60 Hours
17.	Physics	Photography	60 Hours
18.	Botany	Plant Propagation and Nursery Management	60 Hours
19.	History	Tourism and Travel Management	60 Hours
20.	Zoology	Vermin Compost	60 Hours
20.	Fine Arts	Yoga	60 Hours
21.	Telugu	Functional Telugu	60 Hours
22.	TISS	Analytical Skills	60 Hours
23.	TISS	Communication Skills	60 Hours
24.	TISS	Digital Literacy	60 Hours
25.	TISS	Youth Leadership and People Skills	60 Hours
26.	TISS	Introduction to Entrepreneurship	60 Hours
27.	TISS	Financial Literacy	60 Hours



Syllabus up gradation meeting proceedings : Presentation of agenda, syllabus, blue print and model question papers on 09.06.2020 at 3PM

Members of BOS attended for virtual syllabus up gradation meeting through Google meet on 09.06.2020 at 3PM





Staff of Biotechnology attended the meeting

Government College (Autonomous), Rajamahendravaram
Department of Biotechnology
Resolutions approved by Board of Studies (2020-21)

Due to pandemic conditions of corona infection, with the orders of Principal, the syllabus up gradation meeting was held in virtual mode through google meet on 09.06.2020 at 3PM. The members present discussed various aspects of the UG Biotechnology Syllabi, Model Question Papers of both Theory and Practical for three year B.Sc., degree program in Biotechnology that is to be implemented for the academic year 2020-2021 and resolved the following.

RESOLUTIONS

1. It is resolved to implement the new CBCS CURRICULAR FRAMEWORK (2020 - 21 ONWARDS) for the first year students. The teaching, learning and evaluation procedure was designed according to the frame work.
2. It is resolved to design the new curriculum for 1st, 2nd and 3rd year B.Sc., Biotechnology based on
 - Job opportunities for students.
 - Feedback from stakeholders
 - Keeping in view local industry needs / local advantage
 - To encourage research oriented thinking,
 - To enable students to clear entrance exams for pursuing higher studies
3. Electives are offered in the 6 semester and the guidelines being followed are:
 - a. Papers 7 and 8 will be electives for any domain subject and both These papers will be offered in the same semester (6) of the final year.
 - b. Paper –7, a student will choose any one from three electives offered by each domain subject. The student of program BBC will study one Elective each from Biotechnology, Botany and Chemistry as individual Elective paper.
4. Cluster electives are offered as Paper–8, the student will study all the three papers of

An elective as a cluster from only one of the three domain subjects. For example, as paper-8, a student of program BBC may pursue all the three papers belonging to either Biotechnology alone or Botany alone or Chemistry alone. 3 Alternate clusters of Electives for each domain subject are offered, i.e., if the student chooses Biotechnology for cluster the student has the choice to elect cluster -1(8A1, 8A2, 8A3) Or cluster -2 (8B1, 8B2, 8B3) or cluster-3 (8C1, C2, C3).

5. The list of Electives and cluster Electives for the domain subject

Biotechnology, along with their syllabi (i.e., for papers 7 & 8) have been enclosed in this book.

6. It is resolved to submit a project report at the end of the 6th semester for Final year students and the marks allocated for project are 50M and total credits: 02.

7.It is resolved to include important topics as additional input in each course for I, II and III- B.Sc., biotechnology syllabus.

8. It is resolved to approve the list of paper setters and examiners given in the format.

9.It is resolved to adapt new pattern of weightage of marks in theory for B.Sc.- I and II YEAR as recommended by Autonomous Committee, as shown below:

Allocation of Internal component to I and II yrs.

S.No.	Component				Distribution of Marks
1 CIE I	Q No		Learning Objective		Marks
	1	Memory based (Remember)		2	
	2	Understand (Comprehension)		2	
	3	Application		3	
	4	Analysis		3	
	5	Evaluation		5	
	6	Creativity		5	
				TOTAL	20 marks
					20
2	CIE II (Online Exam)				10
3	ATTENDANCE		Above 95%	5	5
			91% to 95%	4	
			86% to 90%	3	
			81% to 85%	2	
			75% to 80%	1	
			Below 75%	0	
Pedagogical Strategies					
4	ASSIGNMENT				5
5	Participation or Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student StudyProject/Field Visit/Survey				5
		Participation	Second Prize	First Prize / Best Paper	
	Workshop/ Seminar/ Technical Symposium	2	3	5	
	National / International Conference	3	4	5	
6	Viva-voce/ chart preparation with diagrams				5
TOTAL					50

7. The assessment component is designed as follows:

For III year students (CBCS pattern) Theory examination:

Internal	- 40 marks	□ Assessment through new pedagogical methods
External exam	- 60 marks	
Total	-100 M	

For I and II year students (CBCS pattern) Theory examination:

Internal	- 50 marks	□ Assessment through new pedagogical methods
External exam	- 50 marks	
Total	-100 M	

8. Practical exam would be conducted at the end of each semester for Bsc I, II & III year.

- Internal practical exam at the end of 1st, 3rd and 5th semester each for – 50 marks.
- External practical exam at the end of 4th, and 6th semester each for- 50 marks.

9. The scheme of Model question papers for each course is framed at the end of the syllabus.

- ✓ A minimum of 120 credits should be earned to complete an undergraduate course.

***Extra credits can be earned for better future opportunities**

*It is mandatory to pursue a **certificate course** from semester-2 (for a complete Calendar year)

Internal assessment: **50 marks**

External assessment: **50 marks**

Total: 100 marks / (02 credits)

*Enrolment and completion of Course in SWAYAM “MOOCs” will be entitled to earn an additional 1 credit.

10. It is resolved to introduce a **certificate course** from this academic year (2020-21)

Onwards by department of biotechnology. Syllabus, blue print and model question papers pertaining to certificate course were enclosed with syllabus.

Title of the certificate course: **“BIOANALYTICAL AND MICROBIOLOGICAL TECHNIQUES”**

Course duration : 60Hrs; Theory: 45hrs; Practicals: 15hrs

Evaluation: Theory exam: 50M; Practical exam : 50M

11.It is resolved to conduct webinars and invited talks for enriching the scientific knowledge and encouraging the research motto in students.

Government College (Autonomous), Rajamahendravaram
Concept document on CIA: SEE as 50:50
(April2019)

Prologue

The Assessment has been a common practice in educational institutes to evaluate, measure, and document the academic inclination, learning progress, and skill attainment of students throughout their learning in the institution by systematically gathering information about their academic performance. Assessment is very important for tracking their academic progress thereby planning further steps and also for reporting and involving parents in policy making and curriculum design. Out of different terminologies used for assessment (such as Measurement, Tests, Examination, Appraisal and Evaluation), Examinations have become an indispensable tool in evaluating both curriculum and student performance as well as the adaptability and core competency of the faculty involved. The examinations involve written exercises, Oral questions or practical tasks, set to test a candidate's knowledge and skill. Evaluation is a broader term that refers to systematic acquisition and assessment of information to provide useful feedback about students through which the students learning abilities and teachers teaching abilities can be assessed. It can also be used to identify and address the students learning needs.

Generally, continuous internal examinations and semester end (external) examinations have been used to evaluate academic performance. More importantly, parents are informed about their wards academic progress and made involved in policy making.

Existing Practice

After conferred with autonomous status by UGC in the year 2000, the Government College (Autonomous), Rajahmundry has enhanced the CIA: SEE as 25:75, from 20:80, on par with the affiliating university. During the academic year 2016, the CIA: SEE is further reformed and made 40:60. It is to be noted here that the institution is in the IV cycle of autonomy as well as accreditation.

Further, the autonomy review committee which visited the institution during 2015, for extension of autonomy, orally suggested to have more marks for internal assessment than the SEE. Similarly, the NAAC Peer team in its visit to the institution for III cycle of accreditation during March 2019, has remarked and appreciated the move of institution to go with 50:50 for CIA and SEE.

Therefore, the institution is going to implement the 50:50 scheme from the academic year 2019-20. Following is the Standard Operating Procedure for the internal assessment.

Standard Operating Procedure for Continuous Internal Assessment

(Internal Marks –50)

The Internal marks in all the courses/subjects will be awarded based on continuous internal assessment made during the semester concerned. For each Courses/subject 50 marks are allotted for internal assessment and 50 marks are allocated for the End Semester Examination.

Continuous Internal Evaluation (CIA):

It has been decided to introduce Continuous Internal assessment marks for a total of **50 marks**, which are to be distributed as follows:

S.No.	Component			Distribution of Marks
1	CIE I (after completion of 50% of syllabus)			20
2	CIE II (Online Exam)			10
3	ATTENDANCE	Above 95%	5	5
		91% to 95%	4	
		86% to 90%	3	
		81% to 85%	2	
		75% to 80%	1	
		Below 75%	0	
Pedagogical Strategies				
4	ASSIGNMENT			5
5	Participation or Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student Study Project/Field Visit/Survey			5
6	Viva-voce			5
TOTAL				50

Component I : CIE I & CIE II (20+10 = 30Marks)

Two Internal Examinations, out of which one is Mandatorily Online examination, for each Course shall be conducted for assessment. These examinations will be conducted during August/September (CIE –I) and January/February (CIE-II). CIE-I carries 20 marks and CIE-II carries 10 marks. CIE-I will be conducted after completion of 50% of syllabus. These second internal examination, i.e., CIE–II, which is **mandatorily online examination** will cover the entire syllabus and consists of 20 multiple choice questions having ½ mark for each question. The sum of both the CIEs will be considered for awarding marks for CIA.

1.1.1. Suggestive Question Paper Pattern for CIE I & CIE II (Based on Blooms Taxonomy):

Though the faculty concerned are empowered to adopt their own pattern for question paper, a general and suggestive model for question paper is given below based on Blooms Taxonomy.

Q No	Learning Objective	Marks
1	Memory based (Remember)	2
2	Understand (Comprehension)	2
3	Application	3
4	Analysis	3
5	Evaluation	5
6	Creativity	5
	TOTAL	20 marks

- ✓ The active verbs used to frame the question based on Blooms Taxonomy is given below for the convenience.

Active verbs developed based on Bloom's Taxonomy

Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	Identify	Manipulate	survey	grade	produce
discover	indicate	Paint	advertise	measure	rearrange
duplicate	Infer	Prepare	appraise	predict	rewrite
enumerate	relate	produce	Break down	rank	role-play

CIE II will consist of multiple choice questions (MCQs). Number of questions and distribution of marks is at the discretion of the faculty concerned. However, a half an hour exam consisting of 20MCQs with ½ mark for each question is suggestible in view of the huge number of students. All the HODs should supply a question bank of MCQs of all the courses covering the entire syllabus along with key to the Computer Science department to enable them to conduct the online examination in the designated laboratories. Alternatively, all the HODs may upload the MCQs in the portal throughout their logins.

Further, all the HoDs should submit their schedule of CIE II to IQAC in advance to monitor the systematic conduct of the online examination.

Important Note:

Students who absent themselves from any CIE will lose the marks for the respective test. However, if a student is not able to write the CIE I / II because of his/her participation in an important event related to NSS/NCC or Games/Sports representing the College/University/health grounds, the student has to get the prior permission of the Principal through the proper channel and submit the same to the Office of the Controller of Examinations. Deadline is 7 days after the CIE. Applications submitted after the deadline will not be considered for the retest.

Component III: Attendance (5Marks)

Attendance mark will be awarded to the students based on their attendance percentage on a particular course. Faculty of each course has to award the attendance mark based on their subject attendance. The marks split-up is given below

Above 95%	5
91% to 95%	4
86% to 90%	3
81% to 85%	2
75% to 80%	1
Below 75%	0

Component IV: Assignment (5Marks)

One Assignment for each course must be submitted by a student in each semester. The marks allotted to this component will be awarded based on the performance of the student. The assignment topic may be assigned either individually or group. Assignment should be submitted by the student in the first half of the semester. Also maximum of 7days should be given to students to submit the assignment. Assignments should be evaluated by the faculty concerned and the same to be verified by the student. The assignment should be kept in department for the Academic Audit by IQAC and also for external academic audit conducted by office of Commissionerate of Collegiate Education. The marks should be awarded by the faculty.

Component V (Pedagogical Strategies): Participation /Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student Study Project/Field Visit/Survey (5Marks)

For this component, the marks will be provided to student, if he/she participate / win in the external college technical events. To score marks, the student has to participate / present papers related to subject in the technical events organized in the other colleges/other departments in the college.

Name of the event	Participation	Second Prize	First Prize / Best Paper
Workshop/Seminar/Technical Symposium	2	3	5
National / International Conference	3	4	5

In case of Classroom seminar, one seminar for each course must be presented by a student in each semester. Each student should be given individual topic for seminar, the student has to submit the seminar topic as assignment and the same will be presented minimum of 10 minutes in the class through ICT. The seminar presented by the student should be evaluated by the subject faculty and based on the performance of the presentation, the marks will be awarded. Similarly, reports on field visits, educational tours, and study projects in prescribed format will be considered for awarding marks in this component.

In case of Quiz, preferably online quiz, it should be conducted after the CIE II and well before the SEE. Faculty concerned has to announce the schedule for the quiz and create the quiz in the ERP (College Management System). The subject staff has to upload all the questions (unit-wise) in the ERP. Quiz should be created with 30 questions (ERP should choose 30 questions randomly out of 100 questions uploaded). Then timing for quiz should be 30 minutes. No negative marking. Each question carries 1 mark. The marks secured should be converted to 10.

Semester End Examinations (SEE)

For Semester -1 (2019-20 batch onwards), the question paper will be of 2 ½ hrs duration for 50 marks. The suggestive question paper model given in section 1.1.1. May be used for framing the question. This kind of question paper will be helpful in CO-PO Mapping and thereby graduate attributes.

(Prepared by IQAC & Academic Cell and submitted to the Chairman, IQAC & Principal on 3 April 2019)

New CBCS CURRICULAR FRAMEWORK (2020 - 21 ONWARDS) - BACHELOR OF SCIENCES

Subjects		SEM I		SEM II		SEM III		SEM IV		SEM V		SEM VI			
		Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits		
Languages															
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Major 1	Core 1,2,3,& 4	4 +	4 +	4 +	4 +	4 +	4 +	4 +	4 +						
Major 2	Core 1,2,3,& 4	4 +	4 +	4 +	4 +	4 +	4 +	4 +	4 +						
Major 3	Core 1,2,3,& 4	4 +	4 +	4 +	4 +	4 +	4 +	4 +	4 +						
Major 1	Core -5							4 +	4 +						
Major 2	Core -5							4 +	4 +						
Major 3	Core -5							4 +	4 +						
Major 1	Skill Enhancement Courses (6 & 7)									4 +	4 +				
										4 +	4 +				
Major 2	Skill Enhancement Courses (6 & 7)									4 +	4 +				
										4 +	4 +				
Major 3	Skill Enhancement Courses (6 & 7)									4 +	4 +				
										4+2	4+1				
Hrs/W (Academic Credits)		30	25	32	27	32	27	36	30	36	30		12	4	4
Project Work															
Extension Activities															
NCC/NSS/Sports/Extra Curricular									2						
Yoga							1		1						
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30		12	4	4

THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester

FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).

Government College (A), Rajamahendravaram
Department Of Biotechnology

List of colleges for engaging Examiners / Papersetters

S.No	Name of the college
1.	PR college(A), Kakinada
2.	Ideal Degree College(A), Kakinada
3.	ASD Govt.College for Women, Kakinada
4.	VS Lakshmi College, Kakinada
5.	DNR college(A), Bhimavaram, W.G.Dist.A.P
6.	K.G.R.L College(A), Bhimavaram, W.G.Dist.A.P
7.	Sir CR Reddy College(A), Eluru , W.G.Dist.A.P
8.	Sri Y.N.College(A), Narsapur, W.G.Dist.A.P
9.	S.K.B.R college(A), Amalapuram
10.	VS Krishna Govt. College, Visakhapatnam
11.	Women"s college, Visakhapatnam
12.	Andhra Loyola College, Vijayawada
13.	Govt.college for Men, Srikakulam
14.	Govt.college for Women, Srikakulam
15.	S.V.K.P. & Dr. K.S.Raju Arts & Science College, Penugonda, W.G.Dist.A.P
16.	ABN college, Kovuru, W.G.Dist.A.P

Government College (Autonomous) Rajahmundry

Department of Biotechnology

PROGRAMMES for which syllabus revision was carried out (2020-21)

Programme code	Name of the programme	Revised (Addition/deletion/both)				Date of revision
		Course code	Course title	Total number of units/modules in the course	Percentage of addition	
2209 & 2211	BBC & BBC Agro	BTL149	Biomolecules, bioenergetics & Analytical Techniques	5	100%	June, 2020
		BTL150	Microbiology, Cell and Molecular Biology	5	100%	June, 2020

**Government College (A), Rajamahendravaram.
Department Of Biotechnology**

B.Sc., Biotechnology: Choice based Credit System

Additional Inputs into Syllabus 2020-21

(Addition / deletion of specific topics from the syllabus in each course (paper) with justification.)

The topics which are related to the prescribed syllabus, which are of importance either as academic or application are selected and included in the syllabi as Additional inputs. The information regarding the research activities and achievements of various Local / Regional organizations, like CTRI, SIFT, CIFE is collected and considered as a part of the curriculum of B.Sc. Biotechnology course so as to encourage the students to opt for research in this vast field of science.

S.No	Name of the course	Course code	Semester	Additional input	Percentage of addition
1.	Biomolecules, bioenergetics & Analytical Techniques	BTL149	I	Applications of radio isotopes in biology	10%
2.	Microbiology, Cell and Molecular Biology	BTL150	II	Role of antibiotics in regulating the transcription and translation	10%
3.	Biophysical Techniques	BTL124	III	Applications of fractionation in research	10%
4.	Immunology	BTL123	IV	New generation vaccines	10%
5.	Genetics and Molecular biology	BTL125	V(Paper-5)	Inhibitors of Protein Synthesis	10%
6.	Gene expression and rDNA technology	BTL126	V (Paper-6)	Recombinant products - production & advantages	10%
BBC ELECTIVE & CLUSTERS					
7.	Biostatistics, bioinformatics and IPR	BTL118	VI (Elective)	Infringement – overuse or misuse of IPR	10%
8.	Plant biotechnology and animal Biotechnology	BTL132	VI (Cluster 8C1)	Phytohormones and edible vaccines	10%

Additional Inputs into Syllabus 2020-21

S.No	Name of the course	Course code	Sem ester	Additional input	Percentage of addition
9.	Environmental & Industrial Biotechnology	BTL145	VI Cluster 8C2	Super Bug & Vitamin B12 production	10%
10.	Medical nano biotechnology	BTL146	VI Cluster 8C3	Toxicological health effects caused by nanoparticles	10%
BBC AGRO ELECTIVE & CLUSTERS					
11.	Biostatistics, bioinformatics and IPR	BTL118	VI Elective	Infringement – overuse or misuse of IPR	10%
12.	Crop Improvement technology	BTL143P	VI (Cluster 8C1)	: Transgenic plants for crop improvement	10%
13.	Organic farming	BTL139P	VI Cluster 8C2	Multiple cropping	10%
14.	Vegetable Science	BTL143P	VI Cluster 8C3	Methods and practices of storage-ventilated, refrigerated, storage, hypobaric storage, pre-cooling and cold storage, zero energy cool chamber; storage disorders	10%

Program Specific Outcomes

B.Sc., B.B.C. (Biotechnology, Botany and Chemistry)

The program **Biotechnology, Botany and chemistry** has been introduced to prepare the students for a career which finds application and provides solution to some of the major contemporary problems on the earth i.e., providing food for growing population, designing advanced medical treatment options for increasing –evolving diseases, to find solution to deteriorating environment caused due to over exploitation / misuse of natural resources etc.,

In this program the study of botany offers the understanding about origin of life and the scope to manipulate the knowledge for better society through catering to the needs and growing demands of food and clothing to population.

In this program the knowledge about the subject chemistry comes in to play when structures of biomolecules and their interactive relations to the environment are to be understood.

Finally the subject biotechnology amalgamates the various disciplines of sciences and offers ethically acceptable knowledge to bring about sustainable solutions for a variety of problems related to agriculture, environment to improve quality of human life. These problems are solved with responsibility using appropriate tools while keeping in mind safety factor of environment and society.

Program Specific Outcomes

B.Sc., Agro B.B.C. (Agrobiotechnology, Agrobotany and Agrochemistry)

This program of **Agrobiotechnology, Agrobotany and Agrochemistry** is specially designed to solve the problems related to agriculture and to fortify the crop products, to produce genetically modified crops to withstand various biotic and abiotic stress. To enhance production of economically important plants.

With advanced techniques in **Agrobiotechnology**, shelf life is enhanced, artificial ripening is caused which helps efficient trading

In **Agrobotany** the study about structure, classification and evolution of plants. Study about physicochemical characters of soil, which helps us to know about requirements and hindrances faced in the agriculture. So it helps to find solutions.

In **Agro chemistry** the study about the chemical compositions present in different soils. Study of production, usage of various chemical fertilizers, pesticides, insecticides on the crops.

Government College (A), Rajamahendravaram
Department Of Biotechnology
I B.Sc., Biotechnology; Semester - 1; Theory syllabus W.E.F. 2020-21
Paper 1: Biomolecules, bioenergetics& Analytical Techniques
Course code: BTL149

Total Hrs :- 60hrs

No. of hours: 04/week

Credits: 04

 Skill Development Component;  Employability Component;  Entrepreneurship component

Unit-I-Carbohydrates, Proteins and Lipids

Classification, structure, properties of carbohydrates. Classification, structure and properties of amino acids, peptide bond and peptides. Classification, structure (primary, secondary, tertiary, quaternary) and functions of proteins. Denaturation and Renaturation of proteins. Classification structure and properties of saturated and unsaturated fatty acids. Structure and functions of glycolipids, phospholipids, and cholesterol.

Unit-II- Nucleic acids, Vitamins and Bioenergetics

Structure and functions of DNA and RNA. Source, structure, biological role and deficiency manifestation of vitamin A, B, C, D, E and K. Free energy, entropy, enthalpy and redox potential. High energy compounds, Glycolysis, TCA cycle, Electron-Transport System and Oxidative Phosphorylation.

Unit-III-Centrifugation, Chromatography and Electrophoresis

Basic principles of sedimentation and types of centrifugations. Principle, instrumentation and application of partition, absorption, paper, TLC, ion exchange, gel permeation, affinity chromatography. Basic principles and types of electrophoresis, factors affecting electrophoretic migration. PAGE (Native, SDS-PAGE). Introduction to 2D & Isoelectric Focusing.

Unit - IV-Spectroscopy, and Laser Techniques

Beer-Lambert law, light absorption and transmission. Extinction coefficient, Design and application of photoelectric calorimeter and UV-visible spectrophotometer. Introduction to crystallography and application. Introduction to radioisotopes, measurement of radioactivity (scintillation counter and autoradiography).

Unit –V- Biostatistics

Mean, median, mode, standard deviation.

- **Additional Input: Applications of radio isotopes in biology**

Recommended Books:

1. Outlines of Biochemistry, 5th Edition, (2009), Erice Conn & Paul Stumpf; John Wiley and Sons, USA
2. Principles of Biochemistry, 4th edition, (1997), Jeffery Zubey; McGraw-Hill College, USA
3. Principles of Biochemistry, 5th Edition (2008), Lehninger, David Nelson & Michael Cox; W.H. Freeman and Company, NY
4. Fundamentals of Biochemistry, 3rd Edition (2008), Donald Voet & Judith Voet; John Wiley and Sons, Inc. USA
5. Biochemistry, 7th Edition, (2012), Jeremy Berg & Lubert Stryer; W.H. Freeman and Company, NY
6. Textbook of Biochemistry with Clinical Correlations, 7th Edition, (2010), Thomas M. Devlin; John Wiley and Sons, USA
7. Proteins: biotechnology and biochemistry, 1st edition, (2001), Gary Walsch; Wiley, USA
8. Biochemical Calculations, 2nd Ed., (1997), Segel Irvin H; John Wiley and Sons, NY
9. Biophysical Chemistry Principles & Techniques Handbook, (2003), A. Upadhyay, K. Upadhyay, and N. Nath
10. Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001), Palmer Trevor, Publisher: Harwood Pub. Co., England.
11. Analytical Biochemistry, 3rd edition, (1998), David Holmes, H. Peck, Prentice-Hall, UK
12. Biochemistry, 5th Edition, 2020 U. Satyanarayana, Elsevier India.
13. Introductory Biostatistics, 1st edition, (2003), Chap T. Le; John Wiley, USA.
14. Methods in Biostatistics, (2002), B. K. Mahajan – Jaypee Brothers.
15. Statistical methods in biology, (1995), Bailey, N. T.; Cambridge university press

Government College (A), Rajamahendravaram
Department Of Biotechnology
I B.Sc., Biotechnology; Semester - 1; W.E.F. 2020-21
Paper 1: Biomolecules, bioenergetics& Analytical Techniques
Course code: BTL149
Blue print for Semester end theory examinations 2020 - 2021

Time: 2 ½ Hours

Max.Marks: 50

Part – A

I. Essay questions: answer any THREE

3 X 10 = 30 M

Each answer carries TEN marks.

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions: answer any FOUR

4 X 5= 20 M

Each answer carries FIVE marks.

- Question 7: from Unit I
- Question 8: from Unit I
- Question 9: from Unit II
- Question 10: from Unit II
- Question 11: from Unit III
- Question 11: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (A), Rajamahendravaram
Department Of Biotechnology
I B.Sc., Biotechnology; Semester - 1; Practical syllabus W.E.F. 2020-21
Paper 1: Biomolecules, bioenergetics & Analytical Techniques
Course code: PTL149P

Total Hours: 30

Credits:1

1. Introduction to basic instruments (Principle standard operation procedure) demonstration and record
2. Calculation of molarity, normality and molecular weight of compounds.
3. Qualitative analysis of carbohydrates(sugars)
4. Quantitative analysis of carbohydrates by using DNS reagent
5. Quantitative estimation of protein –Lowry's method
6. Estimation of DNA by diphenylamine reagent
7. Estimation of RNA by orcinol reagent
8. Preparation of standard buffer and p^H determination
9. Separation of amino acids by paper chromatography
10. Calculation of mean, median and mode

Course code: PTL149P: Model Question Paper for Semester End Examinations

Time:3hours

Max Marks: 50M

- | | |
|---|------------|
| 1. Estimation of DNA by Di phenyl amine method | 15M |
| 2. Write principle and procedure to separate amino acids by
Paper chromatography | 10M |
| 3. Spotter (3 x 5) | 15M |
| 4. Record | 5M |
| 5. Viva – voce | 5M |
| TOTAL | 50M |

Government College (Autonomous), Rajamahendravaram

Department Of Biotechnology

I B.Sc., Biotechnology; Semester - 1; W.E.F. 2020-21

Model question paper – May / Jun 2021

Paper 1: Bio-molecules & Analytical Techniques

Course code: BTL149

Time: 2 ½ hours

Max Marks: 50M

PART - A

Answer any THREE questions.

3 X 10 = 30M

Each answer carries TEN marks.

1. Write about classification, structure and properties of amino acid.
2. Write about structure and classification of saturated and unsaturated fatty acids
3. Explain biological role and deficiency manifestations of vitamin – A, C, D and K
4. Explain Glycolysis process with a flow chart
5. Explain gel filtration chromatographic technique
6. Describe the applications of radio isotopes in biology

PART - B

Answer any FOUR questions.

4 X 5 = 20M

Each answer carries FIVE marks.

7. Denaturation and Renaturation of Proteins
8. Structure of cholesterol
9. Entropy and Enthalpy
10. Beer-Lambert's law
11. Extinction coefficient
12. Epimers
13. Antioxidants
14. Mitochondria

Government College (A), Rajamahendravaram
Department Of Biotechnology
I B.Sc., Biotechnology; Semester - 2; Theory syllabus W.E.F. 2020-21
Course code: BTL150
Paper 2: Microbiology, Cell and Molecular Biology

TOTALHOURS:60

No. of hours: 04/week

CREDITS:4



Skill Development Component;



Employability Component;



Entrepreneurship component

Unit-I- Scope and Techniques of Microbiology

History and contribution of Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming. Types and design of microscopes - compound, phase contrast, fluorescent electron microscopy (TEM, SEM). Ultrastructure of bacteria and growth curve. Pure culture techniques. Sterilization techniques, principles and application of physical methods (autoclave, hot air oven, incineration), chemical methods and radiation methods. Simple, gram and acid-fast staining.

Unit-II-Microbial Taxonomy and Metabolism

Concepts of microbial species and strains. Classification of bacteria based on morphology, nutrition and environment. Bacterial toxins, tuberculosis, typhoid. Microbial production of penicillin.

Viruses: General characteristics, transmission and cultivation of viruses. Structure and properties of plant (tobacco mosaic virus, TMV), animal (Newcastle disease virus, NDV), human (Human immunodeficiency virus, HIV) and bacterial viruses (T4 phage). Emerging and re-emerging viruses (dengue virus), zoonotic viruses (rabies, SARS- CoV-2).

Unit-III- Cell Structure and Functions

Structure, properties and functions of cellular organelles (E.R, Golgibodies, Mitochondria, Ribosomes and Vacuoles) of eukaryotic cells. Cell cycle and cell division (mitosis and meiosis). Chemical composition and dynamic nature of the membrane, cell signaling and communication, endocytic pathways.

Unit-IV- DNA Replication, Repair and Regulation of Gene Expression

DNA replication in prokaryotes (semiconservative, dispersive, conservative, uni and bi-direction, rolling circle). Mechanism of DNA replication, enzymes and protein involved in DNA replication. DNA damage and repair. Regulation of gene expression in prokaryotes Lac and Trip operon concept.

Unit – V - Central Dogma of Molecular Biology

Genome organization of prokaryotic and eukaryotic organisms. Genetic code, prokaryotic and eukaryotic transcription, enzymes involved in transcription. Post-transcriptional modification (Capping Poly adenylation) and splicing.

Translation: mechanism of translation in prokaryotic and eukaryotic cells (initiation, elongation, termination). Post-translational modification (glycosylation and phosphorylation).

Additional input: Role of antibiotics in regulating the transcription and translation

Recommended Books:

- Microbiology—6th Edition, (2006), Pelczar M.J., Chan E.C.S., Krieg N.R.; The McGrawHill Companies Inc. NY
- Prescott's Microbiology, 8th edition, (2010), Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, Chris Woolverton; McGrawHill Science Engineering, USA
- Textbook of Microbiology, Anantnarayan and Paniker (2017)
- Brock biology of microorganisms, 2003, Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J.; Upper Saddle River (NJ): Prentice-Hall, 2003.
- Genes XI, 11th edition, (2012), Benjamin Lewin; Publisher - Jones and Barlett Inc. USA
- Molecular Biology of the Gene, 6th Edition, (2008), James D. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R.; Cold Spring Harbour Lab. Press, Pearson Pub.
- Molecular Biology, 5th Edition, (2011), Weaver R.; McGraw Hill Science. USA
- Fundamentals of Molecular Biology, (2009), Pal J.K. and Saroj Ghaskadbi; Oxford University Press.
- Molecular Biology: Genes to Proteins, 4th edition (2011), Burton E Tropp Jones & Bartlett Learning, USA.
- Cell and Molecular Biology: Concepts and Experiments, 6th Edition, Karp, G. 2010.; John Wiley & Sons. Inc.

Government College (A), Rajamahendravaram
Department of Biotechnology
I B.Sc., Biotechnology; Semester - 1; W.E.F. 2020-21
Model question paper
Course code: BTL150
Paper 2: Microbiology, Cell and Molecular Biology

Time: 2^{1/2} hours

Max Marks: 50M

PART - A

Answer any THREE questions.

3 X 10 = 30M

Each answer carries TEN marks.

1. Give an account on ultra-structure of Bacteria with neat labelled diagram
2. Explain the cell cycle and cell division
3. Explain the process of transcription in eukaryotes
4. What is replication and explain the process of replication in *E.coli*
5. Write a note on post-translational modifications in prokaryotes
6. Role of antibiotics in regulation of Gene expression

PART - B

Answer any FOUR questions.

4 X 5 = 20M

Each answer carries FIVE marks.

1. Contributions of Leeuwenhoek
2. Simple staining
3. General characteristics of virus
10. Mitochondria
11. SOS repair
12. Bacteria growth curve
13. Capping
14. Ribosomes

Government College (A), Rajamahendravaram
Department Of Biotechnology
I B.Sc., Biotechnology; Semester - 2; W.E.F. 2020-21
Paper 2: Microbiology, Cell and Molecular Biology
Course code: BTL150
Blue print for Semester end theory examinations 2020 - 2021

Time: 2 ½ Hours

Max.Marks: 50

Part – A

I. Essay questions: answer any THREE

3 X 10 = 30 M

Each answer carries TEN marks.

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions: answer any FOUR

4 X 5= 20 M

Each answer carries FIVE marks.

- Question 7: from Unit I
- Question 8: from Unit I
- Question 9: from Unit II
- Question 10: from Unit II
- Question 11: from Unit III
- Question 11: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (A), Rajamahendravaram
Department Of Biotechnology
I B.Sc., Biotechnology; Semester - 2; Practical syllabus W.E.F. 2020-21
Course code: PTL150P
Paper II: Microbiology, Cell and Molecular Biology Lab

TotalHours:30

Credits:1

1. Cleaning and preparation of glassware Sterilization techniques (autoclave, hot air oven, filter)
2. Preparation of nutrient agar medium for bacteria
3. Preparation of PDA medium for fungi
4. Isolation of bacteria from soil (SERIAL DILUTION)
5. Isolation of Pure cultures
6. Simple staining technique
7. Differential staining technique
8. Study of stages of mitotic cell division
9. Study of stages of meiotic cell division
10. Extraction and isolation of DNA from bacteria.

Recommended books:

1. David A. Thompson. 2011. Cell and Molecular Biology Lab.Manual.
2. P.Gunasekaran. 2007. Laboratory Manual in Microbiology. New AgeInternational.
3. D O Hall, S E Hawkins. 1974. Laboratory Manual of Cell Biology. British Society for Cell Biology, Published by Crane,Russia.
4. Mary L. Ledbetter. 1993. Cell Biology: Laboratory Manual. Edition: 2. Published by Ron Jon Publishing.Incorporated.
5. Gunasekaran, P. 2009. Laboratory Manual in Microbiology. 1st Edition. New Age InternationalPublishers.
6. Dr. T. Sundararaj. Microbiology Laboratory Manual. 2005. Dr.A.L. MPGIBMS, University of Madras, Taramani, Chennai – 600 113.
7. James G. Cappuccino and Natalie Sherman. 2013. Microbiology: A Laboratory Manual. 10th Edition. Benjamin Cummings.
8. Dr.David A Thompson. 2011. Cell and Molecular Biology Lab Manual

Government College (Autonomous), Rajamahendravaram
Department Of Biotechnology
I B.Sc., Biotechnology; Semester - 1; Theory syllabus W.E.F. 2020-21
Course code: PTL150

Paper 1: Bio-molecules & Analytical Techniques Lab

TotalHours:3 hours

Credits:1

- | | |
|--|-----|
| 1. Write procedure for isolation of bacteria from soil and carryout the experiment | 15M |
| 2. Write principle and procedure of simple staining and perform the Experiment | 10M |
| 3. Identify the given spotters | 15M |
| 4. Record | 5M |
| 5. Viva-Voce | 5M |

TOTAL: 50M

Government College (Autonomous), Rajamahendravaram

Department of Biotechnology

II B.Sc. - Biotechnology; Semester -3;

Course code: BTL124

Paper-3:BIOPHYSICAL TECHNIQUES

Theory syllabus 2020-2021

Total Hrs: - 60hrs

No. of hours: 04/week

Credits: 04

UNIT – I:

Spectrophotometry: Spectrum of light, absorption of electromagnetic radiations, Beer's law-derivation and deviations, extinction coefficient. Instrumentation of UV and visible Spectrophotometry, Double beam spectrometer; dual-wavelength spectrometer, Applications of UV and visible spectrophotometry. Colorimetry principles and its applications.

UNIT II:

Chromatography: Partition principle, partition coefficient, nature of partition forces, brief account of paper chromatography. Thin layer chromatography and column chromatography. Gel filtration: Concept of distribution coefficient, types of gels and glass beads, applications. Ion exchange Chromatography: Principle, types of resins, choice of buffers, applications including Amino acid analyzer. Affinity chromatography: Principle, selection of ligand, brief idea of ligand attachment, specific and non-specific elution, applications.

UNIT III:

Electrophoresis: Migration of ions in electric field, Factors affecting electrophoretic mobility. Paper electrophoresis, Gel electrophoresis: - Types of gels, Solubilizes, Procedure, Column & slab gels Detection, Recovery & Estimation of macromolecules. SDS-PAGE Electrophoresis and applications. Isoelectric focusing, Pulsed-field gel electrophoresis.

UNIT – IV:

Isotopic tracer technique: Radioactive & stable isotopes, rate of radioactive decay. Units of radioactivity. Measurement of radioactivity: - Ionization chambers, proportional counters, Geiger- Muller counter, Solid and liquid scintillation counters (basic principle, instrumentation and technique), Cerenkov radiation. Measurement of Stable isotopes: Falling drop method for deuterium measurement. Biological applications of Radioisotopes.

UNIT V:

Centrifugation: Basic principles, concept of RCF, types of centrifuges (clinical, high speed and ultracentrifuges). Preparative centrifugation: Differential and density gradient centrifugation, applications (Isolation of cell components). Analytical centrifugation: Sedimentation coefficient, determination of molecular weight by sedimentation velocity and sedimentation equilibrium methods.

Course Outcomes: To acquaint students with concepts of immunology and recombinant DNA technology. This course is aimed to give an understanding of the basics of immunology dealing cells and organs of the immune system, types of immune responses, antigen-antibody interactions, vaccines and tools, techniques and strategies and applications of genetic engineering. The course will provide an insight into basic aspects of immunology and rDNA technology.

Additional input - Applications of fractionation in research

Recommended Books:

1. Biochemistry – By Dr. U. Satyanarayana, U.Chakrapani
2. Biochemistry – By J.L.Jain
3. Biochemistry – By Lehninger
4. Biochemistry – By Stryer
5. Biochemistry – By Voet and Voet
6. Biochemistry (Jaypee) – By Vasudevan
7. Textbook of Medical Biochemistry – By S. Ramakrishnan, R. Rajan, and K.G.Prasanna (Orient Longman)
8. Biochemistry – By K Trehan
9. Biochemical methods – By S.Sadasivam and A.Manickam
10. An introduction to Practical Biochemistry – By T.Plummer

Government College (A), Rajamahendravaram
Department of Biotechnology
II B.Sc. - Biotechnology; Semester -3;
Course code: BTL124
Paper-3: BIOPHYSICALTECHNIQUES
Blue print for Semester end theory examinations 2020- 2021

Time: 2½ Hours

Max.Marks: 50

Part – A

I. Essay questions: answer any 4

4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Very short answer questions :

Answer All the 5 Questions

5 X 2= 10 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram
Department of Biotechnology
II B.Sc., - Biotechnology; Semester -3
Course code: BTL124
Paper-3: BIOPHYSICALTECHNIQUES
Model question paper for Semester end theory examinations. 2020-21

Time: 2 1/2 Hours

Max.Marks: 50

Part – A

Answer any 4 of the following essay questions

4 X 10= 40M

Note: Draw Diagrams wherever necessary for both essay and short answers.

1. Write the principle and instrumentation of spectrophotometer.
2. Write an essay on affinity chromatography.
3. Write an essay on SDS PAGE.
4. Write an essay on biological applications of radioisotopes.
- 5...Writeabout the principle technique and types of centrifugation.
6. Explain the application of fractionation in research.

Part-B

Answer the following questions.

5 X2 = 10 M

7. Colorimetry
8. Partition coefficient
9. Iso electric focusing
10. Geiger Muller counter
11. Sub cellular components

Government College (Autonomous), Rajamahendravaram.

II B.Sc.; Biotechnology; Semester -3

Course code: BTL124

Paper-3: BIOPHYSICALTECHNIQUES

Practicals syllabus

1. Spectrophotometric analysis of DNA denaturation.
2. Determination of absorption spectrum of oxy- and deoxy hemoglobin and met hemoglobin.
3. Protein estimation by E280/E260 method.
4. Paper chromatography of amino acids/sugars.
5. TLC of sugars/amino acids.
6. Estimation of Urea by diacetylmonoxime method.
7. Estimation of Sugars by Folin Wu method
8. Validity of Beer's law for colorimetric estimation of creatinine.
9. Preparation of standard buffers and determination of pH of a solution
10. Titration of a mixture of strong & weak acid
11. Paper electrophoresis of proteins
12. Gel electrophoresis of DNA.
13. SDS-PAGE of an oligomeric protein.
14. Calculation of mean, median, and mode (manual/computer aided).
15. Calculation of standard deviation and standard error (manual/computer aided).
16. Bio statistical problem based on standard deviation.

Note: - Depending on the availability of chemicals and equipment, any 8 of the above practicals should be performed.

Model question paper for Semester end practical examinations. 2020-21

TIME: 3 hours

Max. Marks:50

1. Major	15 M
2. Minor	10 M
3. Spotters	15 M
4. Record	05M
5. Viva-voce	05M

Total	50M

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology

B.Sc.-III; Biotechnology; Semester -5(2020-21)

Course code: BTL125, Theorysyllabus Paper -5

Total Hrs:- 45hrs

No.of Hours;- 04/week

Credits:-04

UNIT I

Mendel's Laws and Inheritance:

Mendel experiment, Mendel Laws and Deviations: Incomplete dominance and Codominance, Penetration and pleiotropic, Recessive and Dominant epistatic gene interaction, Concept of multiple alleles

UNIT II

Genes and their variations:

Structure of gene, gene and environment, gene copies and heterogeneity, Meiotic non-disjunction of chromosomes, chromosome abnormalities in animals and plants, Linkage, recombination, gene maps, interference and coincidence, Sex determination, genetic population studies and Hardy Weinberg Equations.

UNIT III

DNA Replication:

Enzymology of replication (detailed treatment of DNA polymerase I, brief treatment of pol II and III, helicases, topoisomerases, single strand binding proteins, DNA melting proteins, primase and RNA primers, distributive and possessive properties of DNA polymerase I and III, importance of the β -subunit in polymerase III). Proof for semiconservative replication, discontinuous replication and Okazaki fragments, Replication origins, initiation, primosome formation, elongation and termination. Use of DNA replication mutants in the study of replication.

UNIT IV

Mutations and DNA Repair:

Gene mutations: Induced and Spontaneous, Missense, non-sense and frameshift mutations, Mutagens: Physical and Chemical mutagens.

Repair: Mismatch repair, light induced repair, SOS repair, Rec gene and its role in DNA repair, post replication repair.

UNIT V

Transcription

Enzymatic synthesis of RNA: Basic features of transcription, structure of prokaryotic RNA polymerase (core enzyme and holoenzyme, significance of σ factor 0 concept of promoter (Pribnow box, -10 and -35 sequences and their significance).

Four steps of transcription (promoter binding and activation, RNA chain initiation and promoter escape.

Additional input – Translation definition and Inhibitors of Protein Synthesis

Recommended Books

- :
- Cell and Molecular Biology – By Roberties&Roberties
 - Molecular Biology & Biotechnology – By H.D.Kumar
 - Molecular Biotechnology – By G.R.Glick
 - Molecular Biology of Gene – By Watson
 - Microbial Genetics – By S.R.Maloy
 - Molecular Biology – By David Freifelder
 - Cell and Molecular Biology – By S.C.Rastogi

Government College (A), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III; Biotechnology; Semester -5(2020-21)
Course code: BTL125, Theory syllabus Paper -5
GENETICS AND MOLECULAR BIOLOGY

Model question paper for Semester end theory examinations. 20-21

Time: 3Hours

Max.Marks: 60

Part – A

I. Essay questions: answer any 4 :

4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions :

Answer All the 5 Questions

5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram
Department of Biotechnology
B.Sc.-III; Biotechnology; Semester -5(2020-21)
Course code: BTL125, Theory syllabus Paper -5
GENETICS AND MOLECULAR BIOLOGY

Model question paper for Semester end theory examinations. 20-21

Time: 3Hours

Max.Marks:60M

Part – A

Answer any 4 of the following essay questions

4 X 10= 40M

Note: Draw Diagrams wherever necessary for both essay and short answers

1. Describe Mendel's Laws and deviations
2. Describe chromosome abnormalities in plants and animals
3. Describe the semiconservative mode of replication with proof
4. Describe the various DNA repair mechanisms.
5. Describe in detail the process of transcription.
6. Write about inhibitors of protein synthesis.

Part-B

Answer any five of the following short questions

5 X 4 = 20

- | | |
|------------------------------------|--------------------------------|
| 7. Multiple alleles | 8. Pleiotropism |
| 9. Hardy Weinberg law and equation | 10. Interference & Coincidence |
| 11. Discontinuous replication | 12. Okazaki fragment |
| 13. Mutagen with examples | 14. SOS repair |
| 15. Core enzyme | 16. Pribnow |

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology

B.Sc.-III; Biotechnology; Semester -5(2020-21)

Course code: BTL125, practical syllabus Paper

GENETICS AND MOLECULAR BIOLOGY

Effect of UV radiations on the growth of microorganisms.

1. Isolation of plasmid DNA from bacteria
2. Purity analysis of the Nucleic acids
3. Study of different phases of mitosis in onion root tips and meiosis in *Allium cepa* flower buds.
4. Karyotyping in *Allium* or *Drosophila*
5. Problems and assignments in Mendelian genetics
6. Isolation of auxotrophic mutants (plants or insects).
7. Mutation of bacteria by UV
8. Chemical induced mutation in bacteria

Note:- Depending on the availability of the chemicals & equipment any 6 of the above practicals should be performed

Model question paper for Semester end practical examinations. 20-21

TIME: 3 hours

Max. Marks: 50

- | | |
|--|------|
| 1. Major experiment. | 15 M |
| 2. Minor Experiment. | 10 M |
| 3. Identify the given spotter and a brief note on it | 15 M |
| 4. Record | 05M |
| 5. Viva-voce | 05M |

Total 50M

Government College (A), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III; Biotechnology; Semester -5(2020-21)
Coursecode: BTL126, Theory syllabus Paper-6
Gene Expression & r DNA technology

Total Hrs: - 45hrs

No.of hours:-04/week

credits:-04

UNIT I

Genetic code

Genetic code : Codon and its characteristics, experimental elucidation of codons, identification of start and stop codons, Universality, degeneracy and comma less nature of codons.

The decoding system: aminoacylsynthetizes, the adaptor hypothesis, attachment of amino acids to tRNA. Codon-anticodon interaction –the wobble hypothesis.

Selection of initiation codon-Shine and Dalgarno sequence and the 16S rRNA.

UNIT II

Protein Synthesis:

Initiation, elongation, termination and post translational modification.

Regulation of translation: phage T4 protein p32 translational regulation. Antibiotics affecting translation.

UNIT III

Gene Expression and regulation

Details of initiation, elongation, and termination (intrinsic and rho factor mediated termination).

Regulation of transcription in prokaryotes: Basic idea of lac-and trp-operons. Negative and positive control of lac operon.

Eukaryotic Gene Regulation: Gal operon

UNIT IV

rDNA Technology

DNA cloning: Basics of genetic engineering, restriction endonucleases, other enzymes of DNA manipulation. Vectors: Plasmid vectors (pBR322 and pUC 18/19)

Phage vector, Lambda replacement and insertion vectors, Cosmids, Plasmids, and YAC. Cutting and Joining DNA (cohesive end ligation, methods of blunt end ligated). Transfection and transformation, Selection of transformed cells. Screening methods.

UNIT V

Genomic DNA library and cDNA library-concept and methods of creating these libraries. Advantages and disadvantages of cDNA library over genomic DNA library.

General consideration of polymerase chain reaction, designing of primers for PCR. Expression of cloned genes: General features of an expression vector. Expression of a eukaryotic gene in prokaryotes –advantages and problems. Applications of recombinant DNA technology.

Additional inputs: Recombinant products – production & advantages

Government College (A), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III; Biotechnology; Semester -5(2020-21)
Coursecode: BTL126, Theory syllabus Paper-6
GENE EXPRESSION AND rDNA TECHNOLOGY

Model question paper for Semester end theory examinations. 20-21

Time: 3Hours

Max.Marks: 60

Part – A

I. Essay questions: answer any 4 :

4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions :

Answer All the 5 Questions 5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (A), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III; Biotechnology; Semester -5(2020-21)
Coursecode: BTL126, Theory syllabus Paper-6
GENE EXPRESSION AND rDNA TECHNOLOGY

Model question paper for Semester end theory examinations. 20-21

Time: 3Hours

Max.Marks:60

Part – A

Answer any 4 of the following essay questions

4 X 10= 40M

Note: Draw Diagrams wherever necessary for both essay and short answers

1. Describe Genetic Code characteristics in detail
2. Describe the process of translation in detail.
3. Describe the regulation of Lac operon in detail
4. Describe the various vectors used in genetic engineering
5. Describe different types of cloning vectors
6. Describe construction, advantages and applications of cDNA library.

Part-B

Answer Any five of the following short answer questions

5 X 4= 20M

- | | |
|------------------------------------|---------------------------------------|
| 7. ShineDalgarnosequence | 8.Degeneracy |
| 9. Posttranslationalmodification | 10. Antibiotics affectingtranslation. |
| 11. Rho factormediatedetermination | 12. Operon |
| 13. Transfection | 14. Endonuclease |
| 15. Primer | 16. PCR |

Government College (A), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III; Biotechnology; Semester -5(2020-21)
Coursecode: BTL126, practical syllabus Paper-6
GENE EXPRESSION AND rDNA TECHNOLOGY

Practicals syllabus

1. To measure concentration of DNA & RNA by UVspectrophotometry
2. Estimation of proteins by Bradfordmethod
3. Isolation of genomic DNA
4. Isolation of PlasmidDNA
5. Restriction digestion of DNA
6. Demonstration of Replica platingtechnique
7. Identification of Lac+ bacteria by blue white screening usingIPTG
8. Ligation ofDNA
9. Chemical mutagenesis and production of microbial mutants

Note: Depending on the availability of chemicals & equipment any 5 of the above should be performed.

Model question paper for Semester end practical examinations. 20-21

TIME: 3 hours

Max. Marks: 50

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotter and a brief note Unit	15 M
4. Record	05M
5. Viva-voce	05M

Total	50M

**Government College (Autonomous)
Rajahmendravaram
Accredited „„A” Grade by NAAC**

Department of Biotechnology



**Syllabus for Courses Offered
III B.Sc., Biotechnology and AgroBiotechnology
Under CBCS (Choice Based Credit System)**

Programme: BBC and Agro BBC

**Approved by Board Of Studies(2020 -2021)
For
4, 6 semesters**

Government (AUTONOMOUS) College, Rajamahendravaram.

Department Of Biotechnology

Allocation of credits and marks to each paper/course

Semester	Paper	Title of course	Hrs per week	Marks			Credits	Course code
				CIA	SEE	Total		
3	3	Biophysical Techniques	4	40	60	100	3	BTL124
3	3	“ lab	2	-	50	50	2	BTL124P
4	4	Immunology	4	40	60	100	3	BTL123
4	4	“ lab	2	-	50	50	2	BTL123P
5	5	Genetics and Molecular Biology	3	40	60	100	3	BTL125
5	5	“ lab	2	-	50	50	2	BTL125P
5	6	Gene Expression and rDNA Technology	3	40	60	100	3	BTL 126
5	6	“ lab	2	-	50	50	2	BTL126P

Semester	paper	Title of course	Hrs per week	Marks			Credits	Course code
				CIA	SEE	Total		
6	7 A	Developmental Biology	4	40	60	100	3	BTL127
6	7 A	“ Lab	2	-	50	50	2	BTL127P
6	7B	Ecology	4	40	60	100	3	BTL128
6	7B	“ Lab	2	-	50	100	2	BTL128P
6	7C	Biostatistics, bioinformatics and IPRS	4	40	60	100	3	BTL118
6	7C	“ Lab	2	-	50	50	2	BTL118P
6	8A1	Plant physiology	4	40	60	100	3	BTL120
	8A2	Animal Physiology	4	40	60	100	3	BTL117
	8A3	Inheritance Biology	4	40	60	100	3	BTL122
6	8A1	“ Lab “ Lab Project	2	-	50	50	2	BTL120P BTL117P & BTL122P BTL 131
	2		50		50			
	2		50		50			
6	8B1	Diversity in Life Evolution Advanced ecology	4	40	60	100	3	BTL129
	8B2		4	40	60	100	3	BTL130
	8B3		4	40	60	100	3	BTL147
6	8B1	“ Lab “ Lab Project	2	-	50	50	2	BTL129P BTL130P & BTL 147P BTL131
	2		50		50			
	2		50		50			
6	8C1	Plant Biotechnology and Animal Biotechnology	4	40	60	100	3	BTL132
	8C2	Environmental Biotechnology and Industrial Biotechnology	4	40	60	100		
	8C3	Biomedical Nano technology	4	40	60	100		
6	8C1	“ Lab “ Lab Project	2	--	50	50	2	BTL132P BTL145P & BTL 146P BTL 131
	2		50		50			
	2		50		50			

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-II, Biotechnology Syllabus: 2020- 2021
Semester –4: Paper-4
Course: - Immunology

Total Hrs. - 60hrs

No.of weeks:- 04

Credits:-04

UNIT I

Immune system: Organs and cells of immune system Immunity, Immune response, innate immune mechanism, acquired immune mechanism, Antigen, Humoral immunity, main pathways of complement system.

UNIT II

Antibody and Antigen: Antibody structure and classes, Antibody diversity, Types of Antigens Antigenicity (factors affecting antigenicity). Complement system.

UNIT III

Immunity: Cell mediated immunity: TC mediated immunity, NK cell mediated immunity, ADCC, brief description of cytokines and MHC (MHC types and diversity)

UNIT IV

Hypersensitivity and vaccination: General features of hypersensitivity, various types of hypersensitivity, autoimmuneresponse, Vaccination: Discovery, principles, significance, Types of Vaccines

UNIT V

Immunological Techniques:Antigen-antibody reactions: Precipitation, agglutination, complement fixation, immune diffusion, ELISA. Hybridoma technology: Monoclonal antibodies and their applications in immune diagnosis.

Additional Input: New generation vaccines

References

1. Principles of Immunology J.Kubey

Government College (A), Rajamahendravaram.
Department of Biotechnology:
B.Sc.-II,Biotechnology:
Semester –4: Paper 4
Course BTL123: Immunology
Blue print for question Paper — 2020-21

Time: 2 ½ Hours Max.Marks: 50

Part – A

I. Essay questions:

answer any 4 questions

4 X 1= 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Very short answer questions :

Answer All the 5 Questions

5 X 2= 10 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

**Government College (A) , Rajamahendravaram.
Department of Biotechnology
II B.Sc.,Biotechnology: 2020-21
Semester –4: Paper 4
Course BTL123: Immunology
Model Question Paper —20-21**

Time:2 1/2 hours

Max. Marks: 50

Part- A

Answer any four essay questions.

4 X 10 = 40M

Note: Draw Diagrams wherever necessary.

1. Describe Organs of the human immunesystem.
2. Write in detail the antibodystructureand various classes.
3. What is cellmediatedimmunity describe the process in detail.
4. .Describe the various types of hypersensitivity.
5. Describe the various antigen –antibody reactions.
6. Describe in detail the process of Monoclonal Antibody production.

Part-B

Answer the following questions.

5 X2= 10 M

7. Differences between innate and acquired immunity
8. Hypersensitivity.
9. Factor affecting antigenicity.
10. Immunodiffusion.
11. NK cell mediated immunity.

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
II B.Sc., Biotechnology Practical Syllabus: 2020-2021
Semester –4
Course BTL123P: Immunology

1. Antigen – antibody reaction – determination of Blood group, Cross reactivity
2. Pregnancy test
3. Widal test
4. Ouchterloneyimmunodiffusion
5. Radial immunodiffusion
6. ELISA
7. Isolation of casein by isoelectric precipitation
8. Production of antibodies and their titration

*** Depending on the availability of chemicals and equipment any 6 of the above Practicals should be performed.**

Model Question Paper for Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50

- | | |
|-------------------|-----|
| 1. Major | 15M |
| 2. Minor | 10M |
| 3. Spotters {3x5} | 15M |
| 4. Record | 5 M |
| 5. Viva-voce | 5 M |

Total 50 M

Paper 7A: Course BTL127: Developmental Biology

Or

Paper 7 B: Course BTL128 : Ecology

Or

**Paper 7 C: Course BTL116: Biostatistics, Bioinformatics and IPRS
&**

Paper 8 A1: Course BTL 120: Plant Physiology

Paper 8 A2: Course BTL117: Animal Physiology

Paper 8 A3: Course BTL122: Inheritance Biology

Or

Paper 8 B1: Course BTL129: Diversity in Life

Paper 8 B2: Course BTL130: Evolution

Paper 8 B3: Course BTL 147: Advanced ecology

Or

Paper 8 C1: Course BTL 132 :Plant and Animal Biotechnology

Paper 8 C2 : Course BTL 145 : Environmental and Industrial Biotechnology

Paper 8 C3 : Course BTL146 : Medical Nanobiotechnology

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology Syllabus 2020- 2021
Semester –6
Course BTL 127: Elective 7A: Developmental Biology

Total Hrs- 45hrs

Credits:04

Unit I

Potency, commitment, specification, induction, competence, determination and differentiation; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants

Unit II

Production of gametes; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.

Unit III

Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, amphibia and chick; organogenesis– vulva formation in Caenorhabditiselegans, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development; sex determination.

Unit IV

Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum

Unit V

Programmed cell death, aging and senescence

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology:

B.Sc.-III, Biotechnology: 2020- 2021

Semester –6

Course BTL 127:Elective 7A: Developmental Biology

Blue print for question Paper

Time: 3Hours

Max.Marks: 60

Part – A

Essay questions:

answer any 4 :

4 X 10 = 40 M

- Question 1 from Unit I
 - Question 2 from Unit II
 - Question 3 from Unit III
 - Question 4 from Unit IV
 - Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions:

Answer All the 5 Questions

5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology:
B.Sc.-III, Biotechnology Practical Syllabus 2020- 2021
Semester –6
Course BTL 127:Elective 7A: Developmental Biology

1. Structure of young anther wall, microsporogenesis, mature anther (permanent slides).
2. Study of monosporic (Polygonum) type of embryo sac development (permanent slides/photographs).
3. Study of embryo sac through electron micrographs showing egg apparatus.
4. Determination of stomatal index of leaf of the given plant material.
5. Determination of a effect of an environmental factor on the rate of transpiration by an excised twig using photometer.

Model Question Paper for Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50

- | | |
|-------------------------------|----------|
| 1. Major experiment. | 5 marks |
| 2. Minor experiment. | 10 marks |
| 3. Identify the given spotter | 15 marks |
| 4. Record | 05 marks |
| 5. Viva-voce | 05 marks |

Total 50 M

Govrnment(Autonomous),Rajamahendravaram
Department of Biotechnology
B.Sc.-III, Biotechnology syllabus: 2020- 2021
Semester –6
Course BTL128: Elective 7B

Total Hrs: - 45hrs

Credits:-04

Unit 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.

Unit II

Population Ecology: Characteristics of a population; population growth curves; population regulation;

Unit 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.

Unit IV

Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

Unit V

Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C, N, and P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine).

**Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology:
B.Sc.-III,Biotechnology Syllabus Semester –6**

**Course BTL128 : Elective 7B : Ecology
Blue print for question Paper**

Time: 3Hours

Max.Marks: 60

Part – A

I. Essay questions:

answer any 4 question

4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions :

Answer All the 5 Questions

5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology:
B.Sc.-III, Biotechnology Practical Syllabus: 2020- 2021
Semester –6
Course BTL128 : Elective 7B : Ecology

1. To determine basal cover of trees in a forest ecosystem/forest plantation
2. Quantitative analysis of soil organic carbon.
3. Quantitative analysis of soil ph.
4. To study pore space, water holding capacity and bulk density of soil.
5. Identification of rocks and minerals on the basis of physical characters.

Model Question Paper for Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50 M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotter	15 M
4. Record	05 M
5. Viva-voce	05 M

	Total 50 M

Government College (Autonomous) , Rajamahendravaram.

Department of Biotechnology

B.Sc.-III,Biotechnology Syllabus: 2020- 2021

Semester –6

Course codeBTL118 : Elective 7C : Biostatistics, bioinformatics

Total Hrs:- 45hrs

Credits:04

Unit I :

Collection, Classification and Tabulation of data, bar diagrams and Pie diagrams, Histogram, Frequency curve and frequency polygon. Mean, median, mode, Standard deviation.

Concept of probability, basic laws and its application to Mendelian segregation. Concept of probability distribution. Binomial and Poisson distributions, Normal distribution and their application to biology.

Unit II:

Concept of sampling and sampling distribution. Concept of test of hypothesis. Applications of t-test statistics to biological problems/data: Chi-square, statistic applications in biology.

Simple regression and correlation. Concept of analysis of variance (one-way classification).

Unit III: Introduction to Bioinformatics

Biological Databases – Nucleotide sequence and Protein databases, their utilization in Biotechnology (NCBI, EMBL, EXPASY, PIR, Pfam. Concept of World Wide Web: HTML, HTPP).

Unit IV

Storage of biological data in databanks, data retrieval from databases and their utilization. Searching sequence databases using BLAST.

Unit V: Introduction to Intellectual property

Introduction to Intellectual property: Introduction to copyrights, patent law, trade mark, (any other type of intellectual property), international organizations, agencies and treaties. Importance of intellectual property rights.

Additional Input: Infringement – Overuse or Misuse of Intellectual Property Rights.

References

1. Fundamentals of Biostatistics by Khan and Khanum, Ukaaz Publishers
2. A text book of Bioinformatics by Sharma, Munjal, Shankar
3. Elements of Biotechnology by PK.Gupta

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology: 2020- 2021
Semester –6
Course BTL118: Elective 7C : Biostatistics, bioinformatics and IPRS

Blue print for question Paper - 2021

Time: 3Hours

Max.Marks: 60

Part – A

I. Essay questions:

II. answer any 4 :

4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions :

Answer all the 5 Questions

5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology:
B.Sc.-III, Biotechnology Syllabus: 2020- 2021
Semester –6
Course BTL118 : Elective 7C : Biostatistics, bioinformatics and IPRS
Model Question Paper – 2021

Time: 3hrs

Max. Marks: 60M

Part -A

Answer any Four of the following.

4X10=40M

1. Write in detail the applications of statistics in biology.
2. Write in detail about probability and probability distribution.
3. Write in detail about biological databases.
4. Write an essay on applications of bioinformatics.
5. Write an essay on intellectual property rights.
6. Write an essay on overuse and misuse of IPR.

Part -B

Answer all FIVE of the following.

5X4=20M

1. Calculate the mean for individual series 9, 7, 6, 10, 12, 11.
2. In F₂ generation, Mendel obtained 621 tall plants and 187 dwarf plants out of the total of 808. Test whether these two types of plants are in accordance with the Mendelian monohybrid ratio 3:1 or do they deviate from this ratio.
3. HTML
4. Write about Databank.
5. Write about trade mark.

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology Practical Syllabus: 2020- 2021
Semester –6
Course BTL118 : Elective 7C : Biostatistics, bioinformatics and IPRS

- Calculation of Mean of given data
- Draw pie chart of the following data
- Align the given sequences and calculate genetic similarity of the sequences
- Calculate median and mode of the following given data
- Arrange the given data in continuous and discrete form
- Calculate standard deviation of the given following data
- Identify the sequence of the given gene through blast
- Align the sequences using multiple alignment tool.
- Write the complete procedure for obtaining a Patent

Note: perform all practical's

Model Question Paper for Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50 M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotter (3x5M)	15 M
3. Record	05 M
4. Viva-voce	05 M
Total	----- 50 M -----

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology

B.Sc.-III, Biotechnology Syllabus: 2020- 2021

Semester –6

Cluster Elective -1: Paper 8 - A1: Plant Physiology: Course BTL 120

Total Hrs:- 45hrs

Credits:04

Unit I

Photosynthesis-Light harvesting complexes; mechanisms of electron transport;

Photoprotective mechanisms; CO₂ fixation -C₃, C₄ and CAM pathways.

Unit II

Respiration and photorespiration–Citric acid cycle; plant mitochondrial electron

Transport and ATP synthesis; alternate oxidase; photorespiratory pathway.

Unit III

Nitrogen metabolism- Nitrate and ammonium assimilation; amino acid Biosynthesis

Unit IV

Solute transport and photoassimilate translocation–uptake, transport and Translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photoassimilates

Unit V

Sensory photobiology-Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement;

Photoperiodism and biological clocks

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III,Biotechnology: 2020-2021
Semester –6
Cluster Elective -1: Paper 8 - A1: PlantPhysiology:Course BTL 120
Blue print for question Paper – 2021

Time: 3Hours

Max.Marks: 60

Part – A

I. Essay questions: answer any 4 : 4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions :

Answer All the 5 Questions

5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology Practical Syllabus: 2020- 2021
Semester –6
Cluster Elective -1: Paper 8 - A1: Plant Physiology: Course BTL 120

PRACTICALS

1. Osmosis – by potato osmoscope experiment
2. Determination of osmotic potential of plant cell sap by plasmolytic method using leaves of Rhoec / Tradescantia.
3. Structure of stomata (dicot & monocot)
4. Determination of rate of transpiration using cobalt chloride method.
5. Demonstration of transpiration by Gannon's photometer
6. Demonstration of ascent of sap/Transpiration pull.
7. Effect of Temperature on membrane permeability by colorimetric method.
8. Study of mineral deficiency symptoms using plant material/photographs.
9. Separation of chloroplast pigments using paper chromatography technique.
10. Rate of photosynthesis under varying Co₂ concentrations.
11. Effect of light intensity on oxygen evolution in photosynthesis using

*** Depending on the availability of chemicals and equipment any 6 of the above practicals should be performed.**

Model Question Paper for Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotter (3x5M)	15 M
3. Record	05 M
4. Viva-voce	05 M

Total	50 M

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology:

B.Sc.-III, Biotechnology Syllabus: 2020- 2021

Semester –6

**Cluster Elective -1: Paper 8 - A2: Animal Physiology: Course
BTL 117**

Total Hrs:- 45hrs

Credits:04

Unit I

Blood and circulation- Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, hemoglobin, immunity, hemostasis.

Unit II

Respiratory system- Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.

Unit III

Nervous system- Neurons, action potential, neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture. Sense organs - Vision, hearing and tactile response.

Unit IV

Digestive system -Digestion, absorption, energy balance, BMR.

Unit V

Endocrinology and reproduction- Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes, gametogenesis, ovulation, neuroendocrine regulation

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology

B.Sc.-III,Biotechnology: 2020- 2021

Semester –6

Cluster Elective -1: Paper 8 – A2: Animal Physiology:Course BTL 117

Blue print for question Paper — 2021

Time: 3Hours

Max.Marks: 60M

Part – A

I. Essay questions:

answer any 4 :

4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions :

Answer All the 5Questions

5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology Practical Syllabus: 2020- 2021
Semester –6

Cluster Elective -1: Paper 8 – A2: Animal Physiology:Course BTL 117

1. Detection of protein, carbohydrate and lipid.
2. Study of Human salivary enzyme activity in relation to pH.
3. Detection of nitrogenous waste products - Ammonia & Urea
4. Exercise on Hematology - Counting of RBC /WBC and Blood grouping in blood samples.
5. Estimation of Hemoglobin in blood samples.

Model Question Paper forSemester End Practical Examinations

TIME: 3 hours

Max. Marks: 50 M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotter (3x5M)	15 M
3. Record	05 M
4. Viva-voce	05 M
Total	----- 50 M -----

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology

B.Sc.-III, Biotechnology Syllabus: 2020- 2021

Semester –6

Cluster Elective -1: Paper 8 – A3: Inheritance Biology: Course BTL 122

Total Hrs: - 45hrs

Credits:04

Unit I

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids.

Unit II

Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance

Unit III

Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders

Unit IV

Mutation: Types, causes and detection, mutant types– lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, intentional mutagenesis.

Unit V

Recombination: Homologous and non-homologous recombination including transposition.

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III , Biotechnology : 2020- 2021,Semester –6
Cluster Elective -1: Paper 8 – A2 : Inheritance Biology : Course BT122
Blue print for question Paper –2021

Time: 3Hours

Max.Marks: 60

Part – A

I. Essay questions: answer any 4 : 4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions :

Answer All the 5Questions 5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology Practical syllabus:2020-2021,Semester –6
Cluster Elective -1: Paper 8 – A3: Inheritance Biology:
Course BTL122

1. Scoring of Drosophila and Maize cobs for Monohybrid and Dihybrid segregations.
2. Problems on Mendelian Segregations (Monohybrid, Dihybrid&Trihybrid Crosses).
3. Problems on Multiple alleles and non-allelic interactions.
4. Problems on Linkage analysis and mapping of genes.
5. Phenotyping of ABO blood groups.
6. Screening for Barr body.

Model Question Paper ForSemester End Practical Examinations

TIME: 3 hours

Max. Marks: 50M

1.Major experiment.	15 M
2. Minor experiment.	10 M
3.Identify the given spotter (3x5M)	15 M
3. Record	05 M
4. Viva-voce	05 M

Total	50 M

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III , Biotechnology : 2020-2021
Semester –6
Project : Course Code - BTL131

- ✓ **Title Page**
- ✓ **Certificate**
- ✓ **Acknowledgements**
- ✓ **Introduction**
- ✓ **Aim**
- ✓ **Materials and methods**
- ✓ **Review of literature**
- ✓ **Results**
- ✓ **Discussion**
- ✓ **Bibliography/References.**

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III , Biotechnology Syllabus : 2020- 2021,Semester –6
Cluster elective - 2:Paper- 8 B1 : Diversity in Life

Total Hrs:- 45hrs

Credits:04

Unit I

Principles & methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical & quantitative methods of taxonomy of plants, animals and microorganisms.

Unit II

Levels of structural organization: Unicellular, colonial and multicellular forms. Levels of organization of tissues, organs & systems. Comparative anatomy, adaptive radiation, adaptive modifications.

Unit III

Natural history of Indian subcontinent: Major habitat types of the subcontinent, geographic origins and migrations of species.

Unit IV

Organisms of health & agricultural importance: Common parasites and pathogens of humans, domestic animals and crops.

Unit V

Organisms of conservation concern: Rare, endangered species.
Conservation strategies.

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology : 2020-2021
Semester –6
Cluster elective - 2:Paper- 8 B1 : Diversity in Life : Course Code -
BTL122

Blue print for question Paper — Mar / Apr 2021

Time: 3Hours

Max.Marks: 60

Part – A

I. Essay questions:

answer any 4 :

4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions :

Answer All the 5 Questions

5 X 4= 20 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III , Biotechnology Practical Syllabus : 2020- 2021
Semester –6
Cluster elective - 2: Paper- 8 B1 : Diversity in Life : Course Code -
BTL129

1. Identification of museum specimens of some economically important fishes.
2. Study of flora and fauna through charts and maps.
3. Preparation of field report based on the visit to a Wild Life Sanctuary/National Park/Zoo/Biosphere Reserve.
4. Preparation of field report based on the survey of local flora.
5. Study of Centre of diversity of plants from maps.

Model Question Paper ForSemesterEnd Practical Examinations

TIME: 3 hours

Max. Marks: 50 M

1.Major experiment.	15 M
2. Minor experiment.	10 M
3.Identify the given spotter (3x5M)	15 M
3. Record	05 M
4. Viva-voce	05 M
Total	----- 50 M -----

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology

B.Sc.-III , Biotechnology Syllabus : 2020- 2021

Semester –6

Cluster elective - 2: Paper- 8 B2 : Evolution : Course Code - BTL130

Total Hrs:- 45hrs

Credits:- 04

Unit I

Emergence of evolutionary thoughts Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; Spontaneity of mutations; The evolutionary synthesis.

Unit II

Origin of cells and unicellular evolution: Origin of basic biological molecules; Concept of Oparin and Haldane; Experiment of Miller (1953); The first cell; Evolution of prokaryotes; Origin of eukaryotic cells; Evolution of unicellular eukaryotes; Anaerobic metabolism, photosynthesis and aerobic metabolism.

Unit III

Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; Molecular tools in phylogeny, classification and identification;

Unit IV

The Mechanism: Population genetics- Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift;

Unit V

Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology

B.Sc.-III, Biotechnology : 2020- 2021

Semester –6

Cluster elective - 2: Paper-8B2 : Evolution : Course Code - BTL130

Blue print for question Paper — 2021

Time : 3 Hours

Max.Marks : 60M

Part – A

Essay questions :

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Short answer questions

Answer all 5 questions

5 X 4= 20 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology :
B.Sc.-III , Biotechnology Practical Syllabus : 2020-2021
Semester –6
Cluster elective - 2: Paper- 8B2 : Evolution : Course Code - BTL130

- 1) Give detailed description of different symbolic representation of Pedigree analysis
- 2) Give diagrammatic representation of X-linked recessive trait
- 3) In a plant species the ability to grow in soil contaminated with nickel is determined by a dominant allele.
 - i. If 60% of the seeds in a randomly mating population are able to germinate in contaminated soil, what is the frequency of the resistance allele?
 - ii. Among the plants that germinate, that proportion is homozygous?
- 4) $\alpha\beta\gamma$ is an autosomal recessive disorder of man. The frequency of effected newborn infants is about 1 in 14000. Assuming random mating, what is the frequency of heterozygotes?
- 5) DNA isolation and Polymerize chain reaction of the DNA.

- 6) Agarose gel electrophoresis of the amplified solution and check the amplified bands in UV trans illuminator/UV Gel documentation.

Model Question Paper For Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotter (3x5M)	15 M
3. Record	05 M
5. Viva-voce	05 M

	Total 50 M

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology :

B.Sc.-III , Biotechnology : 2020- 2021

Semester –6

Cluster elective - 2: Paper- 8B3 :Advanced Ecology :

Course Code - BTL147

Total Hrs:-45hrs

CREDITS:04

UNIT : I Communities and Ecosystems

Ecosystem history and theory, species interactions, of plants and animals, including humans, with each other and with their non-living world population growth, competition, predation, food webs, met population dynamics, biodiversity and ecosystem function. modelling, complex systems theory, systems ecology, and quantitative approaches such as computer simulation. food webs, ecological networks, trophic cascades, ecological complexity and stability, and qualitative approaches such as loop analysis.

UNIT : II Molecular Ecology &Molecular Evolution

Techniques of molecular genetic analysis and consider how they can be used to identify species, populations, sexes, individuals and family relationships, and study population attributes such as historical dispersal, contemporary connectivity, mating behavior and effective population size. The process of evolutionary change at the molecular level. The sources of mutation, dynamics of population variation. Macro-evolutionary perspective on adaptive evolution and genetic co-option.

UNIT : III Ecological Genetics

An advanced examination of genetic variation in ecologically important (especially quantitative) traits. Determining whether a trait is inherited; natural selection in the wild; specialist vs. generalist strategies; how variation is maintained in the face of selection; trade-offs between competing selective pressures and selection for diversification.

UNIT : IV Environmental Ecology&Behavioral Ecology

The ecological effects of pollution, disturbance, and other stressors, both anthropogenic and natural. Air pollutants, toxic metals, acidification, eutrophication, oil spills, pesticides, forestry, warfare, urban ecology, risks to biodiversity, and resource degradation. Ecological sustainability of the human economy. Animal behavior from an evolutionary perspective. Using the theory of natural selection as a basis, foraging, grouping patterns, territorial behavior, parenting, mating behavior, social organization, aggression and cooperation.

UNIT : V Resource Ecology &Conservation Biology.

The ecology, utilization, and management of natural resources in fisheries, wildlife and forest management, agriculture and aquaculture. population dynamics, community interactions, and ecosystem support of resources as well as the history of resource utilization, practices of controlling production, pests, and predators, and sustainable management strategies. An introduction to conservation biology: the science of understanding and conserving biodiversity on Earth. Students learn how biodiversity change is assessed and what tools are used to prevent the extinction of species and the disruption of ecosystems.

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology : 2020- 2021
Semester –6
Cluster elective - 2: Paper- 8B3 :Advanced Ecology : Course Code - BTL147

Blue print for question Paper – 2020

Time : 3 Hours

Max.Marks : 60M

Part – A

Essay questions :

answer any 4 **4 X 10 = 40 M**

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Short answer questions :

Answer all 5 questions **5 X 4= 20 M**

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology :
B.Sc.-III , Biotechnology Practical Syllabus : 2020- 2021
Semester –6

Cluster elective - 2: Paper- 8B3 : Advanced Ecology : Course Code - BTL147

PRACTICALS

1. Water quality sampling in a tidal estuary. Sampling of water for dissolved oxygen, pH, temperature, and turbidity
2. Properties of soils; Dissolved oxygen and temperature
3. Field capacity of soil exercise; Describing populations: Seed weight in legumes; Allometric relationships: modeling size and shape relations
4. Population growth: population growth in yeast
5. Demography and Life History: Cemetery Demographics
6. Competition
7. Predators and Prey
8. Terrestrial Communities
9. Estimating Population Size; Spatial Pattern
10. The Community Concept
11. Biodiversity: measuring invertebrate biodiversity

*** Depending on the availability of chemicals and equipment, any 8 of the above practicals should be performed.**

Model Question Paper For Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50 M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotter (3x5M)	15 M
4. Record	05M
5. Viva-voce	05 M

	Total 50 M

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology

B.Sc.-III, Biotechnology : 2020- 2021

Semester –6

Cluster elective - 3: Paper- : Project : Course Code - BTL131

- ✓ **Title Page**
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- ✓ **Review of literature**
- ✓ **Results**
- ✓ **Discussion**
- ✓ **Bibliography/References.**

Government College (Autonomous), Rajamahendravaram.

Department of Biotechnology :

B.Sc.-III , Biotechnology Syllabus : 2020-2021

Semester –6

Cluster elective 3 : 8C1 : Plant and Animal Biotechnology : Course code BTL 132

Total Hrs :-45hrs

CREDITS:04

UNIT I:

Cell and tissue culture: Introduction to cell and Tissue culture Laboratory facilities, Explant. Tissue culture media (composition and preparation) Callus and suspension cultures: initiation and maintenance of callus and suspension cultures; single cell clones.

UNIT II:

Tissue and micro propagation: Direct and indirect regeneration, production of haploids, protoplast culture and Somatic hybridization.

UNIT III:

Cloning in plants -Ti plasmid organization. Concept of transgenic plants Bt-cotton and other plant applications.

UNIT IV:

Various techniques of animal cell and tissue culture: Culture media, growth factors, laboratory facilities for animal cell culture. Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell-cell communication etc.; Cell senescence; cell and tissue response to trophic factors. Primary culture, immortal cells, cell lines. Maintenance of cell lines in the laboratory.

UNIT V:

rDNA products: Brief idea about recombinant DNA products in medicine (insulin, somatostatin, vaccines), Concept of Gene therapy, Production of recombinant vaccines–hepatitis. Concept of transgenic animals In-vitro fertilization and embryo transfer in humans and farm animals.

Additional input – Phytohormones and edible vaccines

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology :
B.Sc.-III , Biotechnology : 2020- 2021
Semester –6
Cluster elective 3 : 8C1 : Plant and Animal Biotechnology :
Course code BTL 132
Blue print for question Paper — 2021

Time : 3 Hours

Max.Marks : 60M

Part – A

Essay questions :

Answer any 4 question

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Short answer questions :

Answerall 5 questions

5 X 4= 20 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III , Biotechnology : 2020- 2021
Semester –6
Cluster elective 3 : 8C1 : Plant and Animal Biotechnology
Course code BTL 132
Model Question Paper

Time : 3 hrs.

Max .Marks : 60M

Part- A

Answer Any 4 essay questions.

4 X 10 = 40M

Note: Draw Diagrams wherever necessary.

1. Write in detail the principles of animal cell culture.
2. Write the Culture of Stem cells and their application, classification of proteins.
3. Write the characteristics of cells in vitro culture.
4. Describe about recombinant DNA products in medicine.
5. Write an essay intellectual property rights.
6. Write an essay on Phytohormones and edible vaccines

Part-B

Answer all five short answer questions.

5 X4= 20 M

7. Explants and cell disaggregation
8. Gene therapy
9. Microinjection
10. Copy right.
11. Patent

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology Syllabus:2020-2021
Semester –6
Cluster elective 3 : 8C1: Plant and Animal Biotechnology:

Course code BTL 132

1. Establishing a plant cell culture (both in solid and liquid media)–seed germination, callus culture, suspension cell culture, regeneration from callus cells.
2. Suspension culture.
3. Cell count by hem cytometer.
4. Cytology of callus.
5. Establishing primary cell culture of chicken embryo fibroblasts.
6. Animal tissue culture –maintenance of established cell lines.
7. Animal tissue culture –virus cultivation.
8. Measurement of cell size.
9. Microphotography.
10. IMVIC test.
11. Determination of seed viability.

*** Depending on the availability of chemicals and equipment any 8 of the above practicals**

Should be performed.

Model Question Paper for Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50M

- | | |
|--------------------------------------|------|
| 1. Major experiment. | 15 M |
| 2. Minor experiment. | 10M |
| 3. Identify the given spotter (3x5M) | 15 M |
| 4. Record | 05M |
| 5. Viva-voce | 05 M |

Total 50 M

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology:
B.Sc.-III, Biotechnology Syllabus: 2020-2021
Semester –6
Cluster elective 3: 8C2
Environmental and Industrial Biotechnology: Course code BTL 145

Total Hrs:- 45hrs

CREDITS:-04

Unit I:

Principles of Ecology: Water and terrestrial ecosystems, Bio-geo chemical cycles - Carbon, Nitrogen cycles. **Inorganic and Organic pollutants** of air, land and water; maintenance of standards, Environmental monitoring. Biological indicators

Unit II:

Biocides, Refuse disposal - Treatment methods, effluent from pulp and paper industry. **Bioremediation**, Biodegradation of recalcitrant compounds and the role of genetically engineered microbes in the environmental management.

Unit III:

Isolation, Screening, Preservation of industrially Important Microorganisms. Synthetic and Natural Medium, Precursors, Antifoams, Sterilization Methods and Inoculum Preparation.

Definition of bioreactor, basic principles of bioreactor. Types of bioreactors

Unit IV:

Ethanol Production by Fermentation using Molasses. Production of Citric Acid by Submerged and Solid State Fermentations. **Waste water management** - Aerobic and anaerobic treatment, primary, secondary and tertiary treatment of municipal wastes.

Unit V:

Sources of Industrial Enzymes, Production of Microbial Enzymes like Amylase and SCP Production. Production of Antibiotics: Penicillin. **Biotechnology Products**- Production of recombinant proteins having therapeutic and diagnostic applications (Insulin, Growth Hormone, Recombinant vaccines, Monoclonal Antibody).

Additional Input : Super Bug & Vit B12

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III,Biotechnology: 2020-2021
Semester –6
Cluster elective 3: 8C2
Environmental and Industrial Biotechnology: Course code BTL 145
Blue print for question Paper — 2020

Time: 3 Hours

Max.Marks: 60M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Short answer questions :

5 X 4= 20 M

Answer any 5 questions

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology:
B.Sc.-III, Biotechnology Syllabus: 2020- 2021
Semester –6
Cluster elective 3: 8C2
Environmental and Industrial Biotechnology: Course code BTL 145

Model Question Paper

Time: 3 hrs.

Max. Marks: 60M

Part- A

Answer Any 4 essay questions

4 X 10 = 40M

Note: Draw Diagrams wherever necessary.

1. Describe in detail about Bio-geo chemical cycles.
2. Write in detail about effluent from pulp and paper industry.
3. Isolation, Screening, Preservation of industrially Important Microorganisms
4. Write about the production of citric acid.
5. Production of recombinant proteins, Insulin
6. Describe the Super Bug & Vit B12

Part-B

Answer any five short answer questions.

5 X4= 20 M

7. Antifoams.
8. Bio-Geo chemical cycle
9. Bioremediation
10. Growth hormone
11. Fermentation

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology :
B.Sc.-III , Biotechnology Practical Syllabus : 2020- 2021
Semester –6
Cluster elective 3 : 8C2
Environmental and Industrial Biotechnology : Course code BTL 145

Practicals: Environmental Biotechnology

1. Detection of coliforms for determination of the purity of potable water.
2. Determination of total dissolved solids of water
3. Determination of Hardness and alkalinity of water sample.
4. Determination of dissolved oxygen concentration of water sample
5. Determination of biological oxygen demand of sewage sample
6. Determination of chemical oxygen demand (COD) of sewage sample.
7. Isolation of xenobiotic degrading bacteria by selective enrichment technique
8. Estimation of heavy metals in water/soil
9. Estimation of nitrate in drinking water.
10. Preparation and formulation of microbial bio pesticide (bacteria, fungi and viruses)
11. In vitro evaluation of medicinal plants against pathogenic microbes.
12. Effect of mycorrhizal fungi on growth promotion of plants.
13. Production of microbial fertilizers (Rhizobium, Azotobacter and AMF).

Practicals: Industrial biotechnology

1. Isolation of industrially important microorganisms from soil.
2. Isolation of amylase producing organisms from soil.
3. Production of α – amylase from *Bacillus Spp.* by shake flask culture.
4. Production of alcohol or wine using different substrates.
5. Estimation of alcohol by titrimetric.
6. Estimation of alcohol by calorimetric method.
7. Production of citric acid.
8. Citric acid production by submerged fermentation.
9. Estimation of citric acid by titrimetry.

*** Depending on the availability of chemicals and equipment any 8 of the above practicals should be performed. (4 from Environmental biotechnology and 4 from Industrial biotechnology)**

Model Question Paper for Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50M

- | | |
|--------------------------------------|------|
| 1. Major experiment. | 15 M |
| 2. Minor experiment. | 10 M |
| 3. Identify the given spotter (3x5M) | 15 M |
| 4. Record | 05 M |
| 5. Viva-voce | 05 M |

Total 50 marks

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology:
B.Sc.-III, Biotechnology Syllabus: 2020- 2021
Semester –6
Cluster elective 3: 8C3
Medical Nano biotechnology: Course code BTL 146

Total Hrs: - 45hrs

Credits:04

Unit 1. Nanobiotechnology in biomedical applications:

Introduction, Applications of micro and Nano-electromechanical devices to drug delivery, Biological sciences , Regulatory dimensions, Implantable devices, Reservoirs for controlled release, Stents.

Photo dynamic therapy in target drug: Administration, combination therapy, targeting specific cellular functions sensitive linkages

Enhancement of photo dynamic therapy by the photo sensitizer: conjugation to carrier molecules, synthetic peptides, polymers, composite targeting.

Unit 2. Advances in manufacturing Biosensors:

Applications of biosensors, Biosensors types, Biosensor development, biomedical sensors and Biosensors: sensors in modern medicine, physical vs chemical sensors, effects of sensors in body, biosensors Quantum dot technology: quantum dots in early diagnosis of cancer, quantum dot technology, and synthesis of quantum dot, properties and applications of quantum dots
DNA based artificial nanostructures and their applications: fundamentals of DNA, attachment of DNA to surface, DNA based Nanomaterials as biosensors.

Unit 3: Biomaterials sciences:

Introduction about biomaterials, First generation

Biomaterials, second generation biomaterials, third generation biomaterials, biomaterials in Tissue engineering, micro/ nanotechnology and biomaterial sciences

Unit 4: Nano medicine and novel drug delivery systems:

Introduction, drug delivery systems, polymer-therapeutics, Nanomaterials for drug delivery, Nanoparticles target cancer cell in vivo, drug carriers , dendrimers as drug carriers, Bioresponsive hydrogels, tissue regeneration/engineering, applications of materials In medicine

Unit 5: Health and environmental impacts of nanotechnology:

Introduction, engineered Nanomaterials of relevance to human health, engineered Nanomaterials in the body, routes of entry- gastrointestinal tract, skin, lungs, toxic Mechanisms, environmental implications of nanoparticles, plant and microbes as Nanofactories, bacteria in nanoparticle synthesis, yeast in nanoparticle synthesis, fungi in Nanoparticle synthesis

Additional Input: toxicological health effects caused by nanoparticles,

References:

1. Nano biotechnology by Subbiah Balaji, MJP Publishers.
2. Hand book of Materials for Nano medicine by Torchilin V, PAN STANFORD publishers
3. Nanotechnology for biomedical applications by Thomas Varghese

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology: 2020- 2021
Semester –6
Cluster elective 3: 8C3
Medical Nanobiotechnology: Course code BTL 146

Blue print for question Paper — 2020

Time: 3 Hours

Max.Marks: 60M

Part – A

Essay questions:

answer any 4questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Short answer questions :

Answerall 5questions

5 X 4= 20 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology Syllabus: 2020- 2021
Semester –6
Cluster elective 3: 8C3
Medical Nanobiotechnology: Course code BTL 146

Time: 3 Hours

Max.Marks: 60M

Part – A

Essay questions: answer any 4 QUESTIONS 4 X 10 = 40 M

1. Write about photodynamic therapy in targeted drug administration.
2. Write an essay on biomedical sensors
3. Write in detail about the three generations of Biomaterials
4. Write in detail about dendrimers as Nanoparticulate drug carriers
5. Describe the process of nanoparticle synthesis by bacteria.
6. Write in detail about toxicological health effects caused by nanoparticles

PART-B

Answer all 5 questions

5 x 4 = 20 M

7. Write any two applications of biomaterials in medicine
8. Biomaterials in tissue engineering.
9. Advances in quantum dot technology for the diagnosis of cancer.
10. Implantable devices
11. Uses of yeast in Nanoparticle synthesis

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology Practical Syllabus: 2020-2021
Semester –6
Cluster elective 3: 8C3

Medical Nano biotechnology: Course code BTL 146

1. Ultrasonic production of Nano sized dispersion emulsion.
2. Synthesis of copper nanoparticles
3. Synthesis of copper sulphate nanoparticles using ultrasonication
4. Synthesis of copper chitasonenano particles using ultra sonication
5. Synthesis of copper Nano particles using wet chemical method
6. Synthesis of copper Nano particles using Hibiscus bark by wet chemical method.
7. Synthesis of copper herbal extract nanoparticle using ultrasonication and heat
8. Synthesis of copper herbal extract glucose nanoparticles by ultrasonication and heat.
9. Synthesis of copper particle using wet chemical method..

*** Depending on the availability of chemicals and equipment any 6 of the above practicals Should be performed.**

Model Question Paper for Semester End Practical Examinations

TIME: 3 hours

Max. Marks: 50M

- | | |
|--------------------------------------|------|
| 1. Major experiment. | 15 M |
| 2. Minor experiment. | 10 M |
| 3. Identify the given spotter (3x5M) | 15 M |
| 4. Record | 05 M |
| 5. Viva-voce | 05 M |

Total 50 M

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology: Nov 2020-Apr 2021
Semester –6
Cluster elective - 3: Paper- :Project: Course Code - BTL131

- ✓ **Title Page**
- ✓ **Certificate**
- ✓ **Acknowledgements**
- ✓ **Introduction**
- ✓ **Aim**
- ✓ **Materials and methods**
- ✓ **Review of literature**
- ✓ **Results**
- ✓ **Discussion**
- ✓ **Bibliography/References.**

Government College (Autonomous), Rajamahendravaram.
Department of Biotechnology
B.Sc.-III, Biotechnology: 2020- 2021
Semester –6

Course : Intellectual Property Rights and Protection

The Government College (A), Rajahmundry, Andhra Pradesh, INDIA is striving to motivate the students towards innovative and critical thinking. As a part of it, many ideas are incubated and some of them are turned up into start-ups. But, the protection of ideas is compulsory and it needs knowledge of intellectual property rights. Hence, the Board of Research Studies has proposed a non-credit course on Intellectual Property Rights for Under Graduate students, the same has been approved by Academic council of the College. The syllabi and minutes of the Council are as follows:

UNIT I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics –

Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property

Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory –

Over use or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works – Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law Semiconductor

Chip Protection Act.

UNIT III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent

Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade

Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation –

International Trade Mark Law.

REFERENCE BOOKS

- Deborah E. Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
- Kompal Bansal & Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)
- Prabhuddha Ganguli: „Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
- Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.
- R. Radha Krishnan, S. Balasubramanian: “Intellectual Property Rights”, Excel Books. New Delhi.
- M. Ashok Kumar and Mohd. Iqbal Ali: “Intellectual Property Right” Serials
Pub. <https://www.nalsar.ac.in/>

Programme Outcomes

On successful completion of Graduate & Post Graduate programme, graduating students/graduates will be able to:

PO 1 Domain Expertise:

- Acquire comprehensive knowledge and skills.
- Make use of the knowledge in an innovative manner.
- Effectively apply the knowledge and skills to address various issues.

PO 2 Life-long Learning and Research:

- Learn “how to learn”- Self motivated and self directed learning.
- Adapt to the ever emerging demands of work place and life.
- Be inquisitive and establish cause and effect relationship.
- Investigate and report.

PO 3 Modern equipment Usage

- Use ICT effectively.
- Access, retrieve and use authenticated information.
- Access, retrieve and use authenticated information. Have knowledge of software applications to analyse data.

PO 4 Computing Skills and Ethics

- Develop rationale and scientific thinking process.
- Use technology intelligently for communication, entertainment and for the benefit of mankind.
- Ensure ethical practices throughout ones endeavours for the well being of human race.

PO 5 Complex problem Investigation & Solving

- Predict and analyse problems.
- Frame hypotheses.
- Investigate and interpret empirical data.
- Plan and execute action.

PO 6 Perform effectively as Individuals and in Teams

- Work efficiently as an individual
- Cooperate, coordinate and perform effectively in diverse teams/groups.
- Prioritize common interest to individual interest.

PO 7 Efficient Communication & Life Skills

- Express thoughts in an effective manner
- Listen, understand and project views in a convincing manner.
- Decide appropriate media to share information
- Develop skills to present significant information clearly and concisely to interested groups.

PO 8 Environmental Sustainability

- Understand sensibly the Environmental challenges.
- Think critically on environment sustainability measures.
- Propagate and follow environment friendly practices.

PO 9 Societal contribution

- Render service for the general good of the society.
- Involve voluntarily in social development activities at Regional, National, global levels.
- Have own pride in volunteering to address societal issues viz: calamities, disasters, poverty, epidemics.
- Be a patriotic citizen to uphold the values of the nation

PO 10 Effective Project Management

- Identify the goals, objectives and components of a project and decide the appropriate time of completion.
- Plan, organize and direct the endeavours of teams to achieve the set targets in time.
- Be competent in identifying opportunities and develop strategies for contingencies.

Program Specific Outcomes

B.Sc., B.B.C. (Biotechnology, Botany and Chemistry)

The program Biotechnology, Botany and chemistry has been introduced to prepare the students for a career which finds application and provides solution to some of the major contemporary problems on the earth i.e., providing food for growing population, designing advanced medical treatment options for increasing –evolving diseases, to find solution to deteriorating environment caused due to over exploitation / misuse of natural resources etc.,

In this program the study of botany offers the understanding about origin of life and the scope to manipulate the knowledge for better society through catering to the needs and growing demands of food and clothing to population.

In this program the knowledge about the subject chemistry comes in to play when structures of biomolecules and their interactive relations to the environment are to be understood.

Finally the subject biotechnology amalgamates the various disciplines of sciences and offers ethically acceptable knowledge to bring about sustainable solutions for a variety of problems related to agriculture, environment to improve quality of human life. These problems are solved with responsibility using appropriate tools while keeping in mind safety factor of environment and society.

Program Specific Outcomes

B.Sc., Agro B.B.C. (Agro biotechnology, Agro botany and Agro chemistry)

This program of Agro biotechnology, Agro botany and Agro chemistry is specially designed to solve the problems related to agriculture and to fortify the crop products, to produce genetically modified crops to withstand various biotic and abiotic stress. To enhance production of economically important plants.

With advanced techniques in Agrobiotechnology, shelf life is enhanced, artificial ripening is caused which helps efficient trading

In Agrobotany we study about structure, classification and evolution of plants. Study about physicochemical characters of soil, which helps us to know about requirements and hindrances faced in the agriculture. So it helps to find solutions.

In Agro chemistry we study about the chemical compositions present in different soils. Study of production, usage of various chemical fertilizers, pesticides, insecticides on the crops.

**Government College (Autonomous)
Rajahmendravaram
Accredited „„A⁺” Grade by NAAC**

Department of Biotechnology



**IIIB.Sc. Agro Biotechnology Syllabus: CBCS (Choice Based
Credit System)**

Semester wise

Approved by Board Of Studies for (2020-2021)

For

6 semester agro BBC

Electives and clusters for AgroBiotechnology-2020-21(6th semester)

Semester	paper	Title of course	Course code	Hrs. per week	Marks			Credits
					CIA	SEE	Total	
6	7A	Basics of agronomy	BTL133	3	40	60	100	3
6	7A	Basics of agronomy practical"s	BTL133P	3	-	50	50	2
6	7B	Plant pathology	BTL140	3	40	60	100	3
6	7B	Plant pathology practicals	BTL140P	3	-	50	50	2
6	7C	Biostatistics, Bioinformatics and IPR	BTL118	3	40	60	100	3
6	7C (Elective)	Biostatistics, Bioinformatics and IPR practical"s	BTL118P	3	-	50	50	2
6	8A1	Basics of Crop Production	BTL135	3	40	60	100	3
6	8A2	Seed Processing Technology	BTL137	3	40	60	100	3
6	8A3	Soil science	BTL138	3	40	60	100	3
6	8A1	Basics of Crop Production Practical"s	BTL135P	3	-	50	50	2
6	8A2	Seed Processing Technology practical"s and Soil science practical"s	BTL137P BTL138P	3	-	50	50	2
6	8A3	Project	BTL131	3	-	50	50	2
6	8B1	Weed Biology	BTL139	3	40	60	100	3
6	8B2	Role of Herbicides	BTL136	3	40	60	100	3
6	8B3	Agroforestry	BTL141	3	40	60	100	3
6	8B1	Weed Biology practical"s	BTL139P	3	-	50	50	2
6	8B2	Role of Herbicides and Agroforestry practicals	BTL136P	3	-	50	50	2
6	8B3	Project	BTL131	3	-	50	50	2
6	8C1	Crop Improvement technology	BTL145	3	40	60	100	3
6	8C2	Organic Farming	BTL139	3	40	60	100	3
6	8C3	Vegetable Science	BTL143	3	40	60	100	3
6	8C1	Crop Improvement technology practical"s	BTL145P	3	-	50	50	2
6	8C2	Organic Farming practical"s and Vegetable Science practical"s	BTL139P BTL143P	3	-	50	50	2
6	8C3	Project	BTL131	3	-	50	50	2

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-.2021)

Course Elective: 7A - Basics of Agronomy (BTL133)

Total Hrs: - 45hrs

Unit: - I

Agriculture - Agronomy and its scope- Role of Agronomists in resource management for crop production

Unit: - II

Tillage and its types - Objectives of tillage- Characteristics of ideal seed bed- Effect of tillage on soil properties. Factors affecting tillage and seed bed preparation - After cultivation Paddling.

Unit:-III

Seeds and sowing- Characteristics of good quality of seed, seed treatment, agronomic significance of seed purity and quality - Methods of sowing, importance of time and depth of sowing.

Unit: - IV

Crop growth and nutrition: - Factors affecting growth and development. Agronomic manipulation of crop growth and development, Essential plant nutrients- Primary, secondary and micro nutrients – Nutrient uptake – Nutrient use efficiency.

Unit V: -

Soil-water relations – physical properties of soil viz., depth, soil texture, soil structure, particle density, bulk density and porosity influencing water retention, movement and availability.

References

1. Reddy, S.R. 2016. Principles of Agronomy. Kalyani Publishers, Ludhiana - 5th edition
2. Yellamanda Reddy, T. and SankaraReddi, G. H. (2016) Principles of Agronomy. Kalyani Publishers, Ludhiana.
3. Gopal Chandra de. 1989. Fundamentals of Agronomy. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Gupta, O.P. 2011. Modern weed management. Agro bios (India), Jodhpur

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology; Semester –VI (.2020-2021)

Course Elective: 7A - Basics of Agronomy (BTL133)

Question Paper Design and Guidelines to Paper setter – 2021

Time: 3 Hours

Max. Marks: 60M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Unit VI

Part-B

Very Short answer questions :

Answer all 5 questions

5 X 2= 10 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI 2020-.2021)**

Course Elective: 7A - Basics of Agronomy Practical"s (BTL133P)

1. Practice of primary tillage implements and peddling.
2. Practice of secondary tillage implements.
3. Go to a nearby farm and learn different types of seedbeds prepared by the Farmers.
4. Choose a place in your college and prepare seedbed.
5. Identify the tools required for tillage.
6. Testing seed viability test using simple viability tests.
7. Visit a seed company and learn seed treatment.
8. Practice different seed sowing methods.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15 M
4. Record	05 M
5. Viva-voce	05 M
Total	----- 50 M -----

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI 2020-2021)

Course Elective: 7B–Plant Pathology (BTL140)

Total Hrs: - 45hrs

Credits:04

Unit 1: History and Principles of Plant Pathology

Milestones in phytopathology with particular reference to India. Major epidemics and their social impacts. Historical developments of chemicals, legislative, cultural and biological protection measures including classification of plant diseases. Koch's postulates. Growth, reproduction, survival and dispersal of plant pathogens. Factors influencing infection, colonization and development of symptoms.

Unit 2: Laboratory and Analytical Techniques

Preparation and sterilization of common media. Methods of isolation of pathogens and their identification. Preservation of microorganisms in pure culture. Methods of inoculation. Measurement of plant disease.

Unit 3: Major diseases in plants:

Major diseases caused by crop plant viruses, bacteria, fungi. Identification and preventive measures of diseases, usage of chemical and bio pesticides and types of pesticides.

Unit 4: Plant Disease Epidemiology

Concepts in epidemiology. Development of disease in plant population. Role of environment and meteorological factors in the development of plant disease epidemics

Unit 5: Plant diseases caused due to other reasons:

Phanerogamic parasites and Non-parasitic diseases, Diseases due to unfavorable soil environment, drought and flooding stress etc. Nutritional deficiencies. Primary /secondary air pollutants and acid rain.

Suggested books:

Plant pathology by P.Vidyasekaran

Plant pathology techniques and protocols by Christophe

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Course Elective: 7B–Plant Pathology practical"s (BTL140P)

1. Study of symptoms, microscopic examination of diseased parts and identification of the Pathogens involved in some of the crop diseases.
2. Examination of the organisms used for biological control.
3. Culture techniques for the entomopathogens.
4. Mass multiplication of bio control agents.
5. Study of genetically engineered organisms.
6. Visiting the Agricultural fields for assessing the pest problem.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL

EXAMINATIONS

TIME: 3 hours

Max. Marks: 50 M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15 M
4. Record	05 M
5. Viva-voce	05 M
Total	----- 50 M -----

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Course Elective: 7C-Biostatistics, bioinformatics and IPRS (BTL118)

Total Hrs :-45hrs

Credits:04

Unit I:

Collection, Classification and Tabulation of data, bar diagrams and Pie diagrams, Histogram, Frequency curve and frequency polygon. Mean, median, mode, Standard deviation.

Concept of probability, basic laws and its application to Mendelian segregation. Concept of probability distribution. Binomial and Poisson distributions, Normal distribution and their application to biology.

Unit II:

Concept of sampling and sampling distribution. Concept of test of hypothesis. Applications of t-test statistics to biological problems/data: Chi-square, statistic applications in biology.

Simple regression and correlation. Concept of analysis of variance (one-way classification).

Unit III: Introduction to Bioinformatics

Biological Databases – Nucleotide sequence and Protein databases, their utilization in Biotechnology (NCBI, EMBL, EXPASY, PIR, Pfam. Concept of World Wide Web: HTML, HTTP).

Unit IV

Storage of biological data in databanks, data retrieval from databases and their utilization. Searching sequence databases using BLAST.

Unit V: Introduction to Intellectual property

Introduction to Intellectual property: Introduction to copyrights, patent law, trade mark, (any other type of intellectual property), international organizations, agencies and treaties. Importance of intellectual property rights.

Additional Input: Infringement – Overuse or Misuse of Intellectual Property Rights.

References:

4. Fundamentals of Biostatistics by Khan and Khanum, Ukaaz Publishers
5. A text book of Bioinformatics by Sharma, Munjal, Shanker
6. Elements of Biotechnology by PK.Gupta

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Course Elective: 7C-Biostatistics, Bioinformatics and IPRS (BTL118)

Question Paper Design and Guidelines to Paper setter – 2021

Time: 3 Hours

Max.Marks: 50M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Very Short answer questions :

Answer all 5 questions

5 X 2= 10 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Course Elective: 7C-Biostatistics, Bioinformatics and IPRS (BTL1168)

ModelQuestionPaper- 2021

Time: 3hrs

Max .Marks: 60M

Part -A

Answer any Four of the following.

4X10=40M

7. Write in detail the applications of statistics in biology.
8. Write in detail about probability and probability distribution.
9. Write in detail about biological databases.
10. Write an essay on applications of bioinformatics.
11. Write an essay on intellectual property rights.
12. Write an essay on overuse and misuse of IPR.

Part -B

Answer all FIVE of the following

5X4=20M

6. Calculate the mean for individual series 9, 7, 6,10,12,11.
7. In F₂ generation, Mendel obtained 621 tall plants and 187 dwarf plants out of the total of 808. Test whether these two types of plants are in accordance with the Mendelian monohybrid ratio 3:1 or do they deviate from this ratio.
8. HTML
9. Write about Databank.
10. Write about trade mark.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Course Elective: 7C-Biostatistics, Bioinformatics and IPRS (BTL118P)

Practical syllabus

1. Calculation of Mean of given data
2. Draw pie chart of the following data
3. Align the given sequences and calculate genetic similarity of the sequences
4. Calculate median and mode of the following given data
5. Arrange the given data in continuous and discrete form
6. Calculate standard deviation of the given following data
7. Identify the sequence of the given gene through blast
8. Align the sequences using multiple alignment tool.
9. Write the complete procedure for obtaining a Patent

Note: perform any 5 practicals

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15 M
3. Record	05 M
4. Viva-voce	05 M
Total	----- 50 M -----

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Cluster 8A1 - Basics of Crop Production (BTL135)

Total Hrs: - 45hrs

Credits:04

Unit-I: -Crop growth and development - Factors affecting growth and development. Agronomic manipulation of crop growth and development.

Unit –II: -Crop nutrition – Essential plant nutrients- Primary, secondary and micro nutrients – Nutrient uptake – Nutrient use efficiency.

Unit- III: -Cropping pattern, cropping system (navadhanya concept) - Crop rotation – Principles of crop rotation - Mono cropping and its disadvantages – Types of cropping systems-Mixed, multiple, intercropping, relay and multistoried cropping

Unit- IV: - Crop adaptation and distribution in Andhra Pradesh- Crop adaptation and distribution in Andhra Pradesh - Factors influencing crop adaptation and distribution.

Unit V:- Common problems in crop production related to climate, soil, pest and disease incidence (Discuss about any two problems) - Crop management technologies to overcome the problems identified.

References

1. Reddy, S.R. 2016. Principles of Agronomy. Kalyani Publishers, Ludhiana - 5th edition
2. Yellamanda Reddy, T. and SankaraReddi, G. H. (2016) Principles of Agronomy. Kalyani Publishers, Ludhiana.
3. Gopal Chandra de.1989. Fundamentals of Agronomy. Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi.
4. Gupta, O.P. 2011. Modern weed management. Agro bios (India), Jodhpur.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Cluster 8A1 - Basics of Crop Production (BTL135)

Question Paper Design and Guidelines to Paper setter – 2021

Time: 3 Hours

Max.Marks: 50M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Very Short answer questions :

Answer all 5 questions

5 X 2= 10 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Cluster 8A1 - Basics of Crop Production (BTL135P)

Practicals syllabus

1. Visit to college farm and identification of major crops and varieties.
2. Preparation of Different Culture Solutions
3. Detection of Nutrient Deficiency Occurring Under Field Conditions.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50 M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15 M
4. Record	05 M
5. Viva-voce	05 M
TOTAL	50M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Cluster elective –8A2

Course title: Seed Processing Technology - Course code: BTL137

Total Hrs: - 45hrs

Credits:04

Unit 1: Seed processing

Principles of seed processing, seed drying principles and methods, pre cleaning, grading, treatment and pelleting and packaging.

Unit 2: Seed quality control

History, concept, organization, phases and minimum certification standards, Field inspection principles and methods.

Unit 3: Seed Storage

Requirements and types of seed storage. Factors affecting seed storage and role of moisture, temperature, ph. Seed deterioration causes and methods of control. Physiological, biochemical and molecular changes in seed ageing. Seed drying and Packaging needs.

Unit 4: Seed Health

Significance of seed health. Mode and mechanism of transmission of microorganisms - fungi, bacteria and viruses. Procedures for seed health test and rules. Externally and internally seed - borne pathogens, mode of infection, spread, and methods of detection of seed borne diseases.

Unit 5: Seed Industry Development and Marketing Trends.

International Seed Trade Federation (ISF) and Indian seed associations. Market survey, pricing policies, marketing channels, role of Government, cooperative and private sectors in seed trade.

Reference

1. A Text book of seed science and technology by S. Padmavathi, New India Publishing agency
2. Seed Technology by Agarwal AL

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Cluster elective –8A2

Course title: Seed Processing Technology - Course code: BTL137

Question Paper Design and Guidelines to Paper setter – 2021

Time: 3 Hours

Max.Marks: 50M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Very Short answer questions :

Answer all 5 questions

5 X 2= 10 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Cluster elective –8A2

Course title: Seed Processing Technology - Course code: BTL137P

1. Prepare a project work on seed technology by visiting a seed factory
2. Synthetic seed preparation.
3. Visit a seed company and learn Cryo preservation methods.
4. Tetrazolium test for seed viability and determination.
5. Observing seeds of somatic embryogenesis.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15 M
4. Record	05 M
5. Viva-voce	05 M

	Total 50 M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective –8A3**

Course title: Soil Science - Course code: BTL138

Total Hrs:- 45hrs

Credits:04

Unit 1: Pedology

Concept of land, soil and soil science. Composition of earth crust and its relationship with soils; Rocks, minerals and other soil forming materials; Weathering of rocks and minerals; Factors of soil formation; Pedogenic processes and their relationships with soil properties;

Unit 2: Soil Physics

Soil physical constraints affecting crop production. Soil texture – textural classes. Soil structure – classification, soil aggregation and significance, soil crusting, porosity, their significance and manipulation soil temperature, Soil air- composition, gaseous exchange, influence of soil temperature and air on plant growth.

Unit 3: Soil Chemistry

Chemical composition of soil; Soil colloids - structure, composition, constitution of clay minerals, amorphous clays and other non-crystalline silicate minerals, oxide and hydroxide minerals; Charge development on clays and organic matter; pH-charge relations; Buffer capacity of soils.

Unit 4: Soil Fertility

Essential elements in plant nutrition; Nutrient cycles in soil; Transformation and transport of nutrients (Macro and micro nutrients) in soil; Manures and fertilizers; Fate and reactions of fertilizers in soils; Chemistry of production of different fertilizers.

Unit 5: Soil Microbiology

Soil biota, soil microbial ecology, types of organisms. Soil microbial biomass, microbial interactions, and uncultivable soil biota. Microbiology and biochemistry of root soil interface. Phyllosphere. Soil enzymes, origin, activities and importance. Soil characteristics influencing growth and activity of micro flora. Microbial transformations of N, P, K, S, Fe and Zn in soil.

Suggested books

1. Text book of soil sciences by S k Mukherjee 1987

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus**

Semester –VI (2020-2021)

Cluster elective –8A3

Course title: Soil Science - Course code: BTL138P

Question Paper Design and Guidelines to Paper setter – 2021

Time: 3 Hours

Max.Marks: 50M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V Question 6 from Additional input

Part-B

Very Short answer questions :

Answer all 5 questions

5 X 2= 10 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective –8A3**

Course title: Soil Science (Practical's) - Course code: BTL138P

1. Collect information's of soils in Andhra Pradesh and list their fertility, texture, suitability to grow Plants according to their physical, chemical, micro floral aspects.
2. Isolation of soil bacteria: Observation of bacteria colony phenotypes.
3. Isolation and culture of bacteria from modules.
4. Generation of RAPD patterns using PCR.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50 M

- | | |
|---|------|
| 1. Major experiment. | 15 M |
| 2. Minor experiment. | 10 M |
| 3. Identify the given spotters and write a brief note on it | 15 M |
| 4. Record | 05 M |
| 5. Viva-voce | 05 M |

Total 50 M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective –8B1
Course title: – Weed Biology**

Course code: BTL139

Total Hrs:- 45hrs

Credits:04

Unit:-I

Weed –Definition – Importance- Harmful and beneficial effects of weeds – Aquatic weeds

Unit:-II

Classification of weeds - Based on morphology, life cycle, habitat, origin, association and special features with examples

Unit:-III

Weed biology- Characteristic features of weeds, weed ecology – Persistence of weeds, climatic, edaphic and biotic factors.

Unit: - IV

Crop weed association – Factors affecting crop weed competition- Common weeds associated with major crops like rice, maize, wheat, sorghum, pulses, groundnut, sugarcane, cotton, and tobacco

Unit: - V

Methods of weed management - Prevention, control and eradication – Physical, mechanical and cultural methods - Chemical and biological methods of weed control.

References

1. Reddy, S.R. 2016. Principles of Agronomy. Kalyani Publishers, Ludhiana - 5th edition
2. Yellamanda Reddy, T. and SankaraReddi, G. H. (2016) Principles of Agronomy. Kalyani Publishers, Ludhiana.
3. Gopal Chandra de. 1989. Fundamentals of Agronomy. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Gupta, O.P. 2011. Modern weed management. Agro bios (India), Jodhpur

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective –8B1
Course title: – Weed Biology
Course code: BTL139**

Question Paper Design and Guidelines to Paper setter – 2021

Time: 3 Hours

Max.Marks: 50M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Very Short answer questions :

Answer all 5 questions

5 X 2= 10 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)**

Cluster elective –8B1

Course title: – Weed Biology Practical syllabus

Course code: **BTL139P**

1. Identification of weeds in field crops and other habitats
2. Study of weed flora in different weed management practices.
3. Herbicide label information and computation of herbicide doses.
4. Study of herbicide application equipment and calibration.
5. Herbicide application and precautionary measures.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15 M
4. Record	05 M
5. Viva-voce	05 M

Total	50M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)**

Cluster elective – 8B2

Course title – Role of Herbicides

Course code: BTL 136

Total Hrs:- 45hrs

CREDITS:04

Unit:-I

Herbicides- Definition, advantages and limitations of herbicide usage in India. Bio herbicides. Classification of herbicides based on chemical nature, time and method of application

Unit:-II

Herbicidal formulations active ingredient- Acid equivalent- Nomenclature of herbicides.

Unit:-III

Adjuvants and their use in herbicide application –Types of adjuvants with examples.

Unit:-IV

Mode of action of herbicides - Important biochemical modes of action of herbicides (especially interfering with photosynthesis and respiration).

Unit:-V

Selectivity and resistance- Selectivity of herbicides – Fundamental principles of selectivity- Differences in morphology and growth habit of plants - Differential absorption and translocation of herbicides.

References

1. Herbicides and Plant Physiology by Andrew Cobb and John PH

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus**

Semester –VI (2020-2021)

Cluster elective – 8B2

Course title – Role of Herbicides

Course code: BTL 136

Time: 3 Hours

Max. Marks: 60M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Short answer questions :

Answer all 5 questions

5 X 4= 20 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective – 8B2
Course title: - Role of Herbicides
Course code: BTL136P**

1. Herbicides- Definition, advantages and limitations of herbicide usage in India.
2. Classification of herbicides based on chemical nature, time and method of application
3. Herbicidal formulations – active ingredient- Acid equivalent- Nomenclature of herbicides.
4. Adjuvants and their use in herbicide application –Types of adjuvants with examples.
5. Mode of action of herbicides - Important biochemical modes of action of herbicides (Especially interfering with photosynthesis and respiration).

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50M

- | | |
|---|------|
| 1. Major experiment. | 15 M |
| 2. Minor experiment. | 10 M |
| 3. Identify the given spotters and write a brief note on it | 15 M |
| 4. Record | 05 M |
| 5. Viva-voce | 05 M |

Total 50 M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective –8B3
Course title: – Agroforestry**

Course code: BTL141

Total Hrs:-45hrs

Unit -1 :

Introduction to agro forestry: Introduction. Definition of agroforestry. Concept of agroforestry. Components of agroforestry. Objectives of agroforestry. Benefits of agroforestry. Limitations of agroforestry.

Unit – 2 :

Agroforestry in India : National agroforestry policy -2014. Variants: agroforestry vis-à-vis social forestry . Community forestry and Farm forestry. Latest status of agroforestry in India.

Unit - 3

Agroforestry principles : Classification of agroforestry systems . Structural basis. Functional basis. Spatial and temporal basis. Physiognomic basis. Floristical basis. Ecological basis. Socio-economical basis.

Unit -4

Agroforestry systems : Agroforestry practices under agrisilvicultural system. Biomass transfer. Improved fallows. The Taungya system. Multispecies tree garden. Home gardens (Tree-livestock-crop mix around homesteads). Apiculture. Sericulture. Lac culture.

Unit -5

Trees in agroforestry systems : Multipurpose trees for agroforestry. Nitrogen fixing tree (NTF) species. Tree crop inter Rhizobial plants. Actinorhizal plants. Tree architecture in agroforestry. Weeding. Cleaning. Climber cutting. Thinning. Improvement. Pruning..

Additional Input: Girdling. Cultural operation. Lopping. Pollarding. Hedging.

References

1. A Text book of Agroforestry by S.M.S. Quli and M.A. Islam
2. Tree crop interactions by C.K. Ong
3. Restoration Agriculture by Mark Shepard

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**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective –8B3
Course title: – Agroforestry**

Course code: BTL141

Question Paper Design and Guidelines to Paper setter -2020

Time: 3 Hours

Max. Marks: 50M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Very Short answer questions :

Answer all 5 questions

5 X 2= 10 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)**

Cluster elective – 8B3

Course title: – Agroforestry Practical syllabus

Course code: BTL141P

1. Identification of seeds and seedlings of multipurpose tree species.
2. Nursery practices for populous deltoids, Grewiaoptiva, Morusalba, Acacia catechu, Delbergiasissoo, Robinia etc.
3. Visit to agroforestry to study the compatibility of MPTS with agriculture crops: silvi-pasture, alley cropping, horti-silviculture, agro –silvipature fuel and fodder block.
4. Visit to social forestry plantations- railway line plantation
5. Extraction of spores of arbuscularmycorhizal (AM) fungi from soil and assessment of mycorhizal root infection
6. Girdling experiment

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50 M

- | | |
|---|------|
| 1. Major experiment. | 15 M |
| 2. Minor experiment. | 10 M |
| 3. Identify the given spotters and write a brief note on it | 15 M |
| 4. Record | 05 M |
| 5. Viva-voce | 05 M |

Total 50 M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-.2021)**

Cluster elective –8C1: Course code: BTL148

COURSE TITLE: CROP IMPROVEMENT TECHNOLOGY

Total Hrs:-45hrs

Credits:04

Unit I:

Introduction to plant tissue culture – History – Scientists – Terminology, Steps in general tissue culture Lab Organisation – Types of sterilization and nutrient media – Types of cultures – Organ cultures, cell suspension culture, callus culture, pollen culture and their application

Unit II:

Micro propagation – Procedure techniques – Organogenesis and Embryogenesis – Problems – Advantages – Limitations - Applications of Micro propagation. Anther culture – embryo culture – Ovule culture – Somatic embryogenesis - Synthetic seeds and its applications.

Unit III:

Protoplast isolation and fusion – Somatic hybridization – Cybrids – Soma clonal variations and applications in crop improvement – Cryo preservation

Unit IV:

Recombinant DNA methods - Introduction to genetic engineering – Definitions – Gene cloning - Vectors. Gene transfer methods – Indirect methods (Agrobacterium) and direct methods (particle bombardment/gene gun method; chemical-PEG mediated and other methods) with case studies / examples.

Unit V:

Transgenic plants – Present status - Applications in crop improvement – Limitations – biotechnology regulations. Markers - Morphological, biochemical and molecular markers – RFLP, RAPD and SSR – Marker assisted selection for crop improvement.

Additional Input: Transgenic plants for crop improvement

References:

1. Plant tissue culture by Bhojwani and M.K.Rajdan
2. Elements of Biotechnology by P.K.Gupta
3. Biotechnology by V.Kumaresan
4. Plant Biotechnology by H.S.Chawla
5. Biotechnology by U.Satyanarayana

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (.2020-2021)
Cluster elective –8C1:Course code: BTL148**

COURSE TITLE:CROP IMPROVEMENT TECHNOLOGY

Question Paper Design and Guidelines to Paper setter – 2020

Time: 3 Hours

Max. Marks : 60M

Part – A

Answer any four essay questions 4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part-B

Answer all the questions

5 X 4= 20 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective –8C1:Course code: BTL148**

COURSE TITLE:CROP IMPROVEMENT TECHNOLOGY

Time: 3 Hours

Max.Marks : 60M

Part – A

I. Answer any four essay questions

4 X 10 = 40M

1. Write an essay on preparation of plant tissue culture media.
2. What is micropropagation.write in detail about somatic embryogenesis and its applications.
3. Write in detail about cybrids.
4. Write about Agrobacterium mediated gene transfer method in plants.
5. Write an essay on molecular markers used for crop improvement .
6. Write an essay on applications of transgenic plants in crop improvement

Part – B

II. Answer all the questions

5 x 4 = 20M

7.Pollen culture

8.synthetic seeds

9.Cryopreservation.

10.Gene gun method

11. Applications of Molecular markers.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)**

COURSE TITLE: CROP IMPROVEMENT TECHNOLOGY Practical syllabus

Cluster elective – 8C1: Course code: BTL148P

1. Preparation of Plant tissue culture medium
2. Callus culture
3. Regeneration from callus cells
4. Cytology of callus
5. Suspension culture.
6. Isolation of Protoplast
7. Anther culture
8. Preparation of synthetic seeds

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50 M

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15M
4. Record	05 M
5. Viva-voce	05 M
Total	----- 50 M -----

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Course title: Organic Farming-Course code: BTL139

Cluster – 8C2

Total Hrs:- 45hrs

Credits:04

Unit 1:- Organic farming – definition – need – scope – principles – characteristics relevance to modern agriculture

Unit 2:- Different eco-friendly farming systems- biological farming, natural farming, regenerative agriculture – permaculture - biodynamic farming.

Unit 3:- Organic nutrient sources and their fortification – organic manures- methods of composting

Unit 4:- Green manures- bio fertilisers – types, methods of application – benefits and limitations. Nutrient use in organic farming-scope and limitations.

Unit 5:- Nutrient management in organic farming. Choice of crops and varieties in organic farming – crop rotations – need and benefits

Additional Input: Multiple cropping.

Reference books:

1. Arun K. Sharma. 2002. A Hand book of organic farming. Agrobios, India.627p.
2. Palaniappan, S.P and Annadurai, K.1999. Organic farming-Theory and Practice. Scientific publishers, Jodhpur, India. 257p.
3. Mukund Joshi and PrabhakarasettyT.K. 2006. Sustainability through organic farming. Kalyani publishers, New Delhi. 349p.
4. Balasubramanian, R., Balakishnan, K and Siva Subramanian, K. 2013.
5. Principles and practices of organic farming. Satish Serial Publishing House. 453p

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (2020-2021)

Course title: Organic Farming-Course code: BTL139

Cluster – 8C2

Question Paper Design and Guidelines to Paper setter – 2020

Time: 3 Hours

Max. Marks: 50M

Part – A

Essay questions:

answer any 4questions

4 X 10 = 40 M

Question 1 from UnitI

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Question 7 from Unit III

Part-B

Very Short answer questions :

Answer all 5 QUESTIONS

5 X 2= 10 M

Question 7 from Unit III

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Department of Biotechnology

III B.Sc., Agro biotechnology syllabus

Semester –VI (.2020-2021)

Course title: Organic Farming-Course code: BTL139

Cluster – 8C2

Time: 3 Hours

Max. Marks: 60M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

1. Write an essay on principles and characteristics relevance to modern agriculture.
2. Write an essay on different eco-friendly farming systems.
3. Write in detail about methods of composting.
4. Write about nutrients used in organic farming its scope and limitations.
5. Write an essay on crop rotation and its benefits.
6. Write an essay on multiple cropping.

Answer all 5 questions

5 x 4 = 20 M

7. Organic farming
8. Regenerative agriculture
9. Fortification
10. Green manures
11. Nutrient management in organic farming.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster – 8C2**

Course title: Organic Farming (Practical's) – Course code: BTL139P

1. Visit to organic farm to study the various components, identification and Utilisation of organic products.
2. Compost making- aerobic and anaerobic methods
3. Vermicompost preparation
4. Preparation of enriched farm yard manure
5. Visit to organic clusters and bio control lab to study the maintenance of Biofertilizers/bio-inoculant cultures
6. Biological nitrogen fixers.
7. Methods of application of Bio-pesticides (Trichocards, BT, NPV)
8. Preparation of neem products and other botanicals for pest and disease Control
9. Preparation of green pesticides (panchagavya, beezamrutam, jeevamrutam, ghanajeevamrutam, dravajeevamrutam).
10. Different methods of bio fertiliser applications.

Note: depending on availability of facilities and chemicals any Six practicals should be performed

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50M

1. Major experiment.	15M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15 M
4. Record	05 M
5. Viva-voce	05 M

Total	50 M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)
Cluster elective –8C3

Course title: Vegetable Science - Course code: BTL143

Total Hrs:- 45hrs

Credits:-04

Unit 1. Production technology of cool season vegetable Crops:
Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods,

Unit 2. Production technology of warm season vegetable crops.
Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods. seed production of: Tomato, eggplant, hot and Okra, beans .

Unit 3. Breeding of vegetable crops breeding methods (introduction, selection, hybridization, mutation), varieties and varietal characterization, biotechnology and their use in breeding in vegetable crops

Unit 4. Growth and Development : Definition of growth and development, growth analysis and its importance in vegetable production;; Role of auxins, gibberellins, Cytokinin and abscissic acid; Role of light, temperature and photoperiod on growth, development of underground parts, flowering and sex expression in vegetable crops; apical dominance; Physiology of fruit set, fruit development, fruit growth, flower and fruit drop;

Unit 5. Seed production:Seed morphology and development in vegetable seeds; steps in quality seed production; post-harvest, diseases and prevention from infestation, principles of transport

Additional Input : Methods and practices of storage- ventilated, refrigerated, storage, hypobaric storage, pre-cooling and cold storage, zero energy cool chamber; storage disorders

.

Suggested books:

Vegetable crops by T.R.GOPALAKRISHNAN

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)**

Cluster elective –8C3

Course title: Vegetable Science - Course code: BTL143

Question Paper Design and Guidelines to Paper setter — 2021

Time: 3 Hours

Max. Marks: 50M

Part – A

Essay questions:

answer any 4 questions

4 X 10 = 40 M

Question 1 from Unit I

Question 2 from Unit II

Question 3 from Unit III

Question 4 from Unit IV

Question 5 from Unit V

Question 6 from Additional input

Part - B

Very Short answer questions :

Answer all 5 questions

5 X 2 = 10 M

Question 7 from Unit I

Question 8 from Unit II

Question 9 from Unit III

Question 10 from Unit IV

Question 11 from Unit V

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI 2020-2021)**

Cluster elective –8C3

Course title: Vegetable Science - Course code: BTL143

Question Paper Design and Guidelines to Paper setter –2021

Time: 3 Hours

Max. Marks: 60M

Part – A

Essay question :

answer any 4 questions 4 X 10 =40M

1. Write an essay on commercial varieties of warm season vegetable crops.
2. Write in detail about breeding methods of vegetable crops.
3. Write an essay on phytochromes.
4. Write an essay on vegetable seed diseases.
5. Write about methods of seed storage.

Part- B

Answer all 5 questions 5 x 4 = 20M

6. Planting times of different vegetable
7. Seed production
8. Selection of crop for breeding
9. Apical dominance
10. Steps in quality seed production.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

**Department of Biotechnology
III B.Sc., Agro biotechnology syllabus
Semester –VI (2020-2021)**

Cluster elective –8C3

Course title: Vegetable Science - Course code: BTL143P

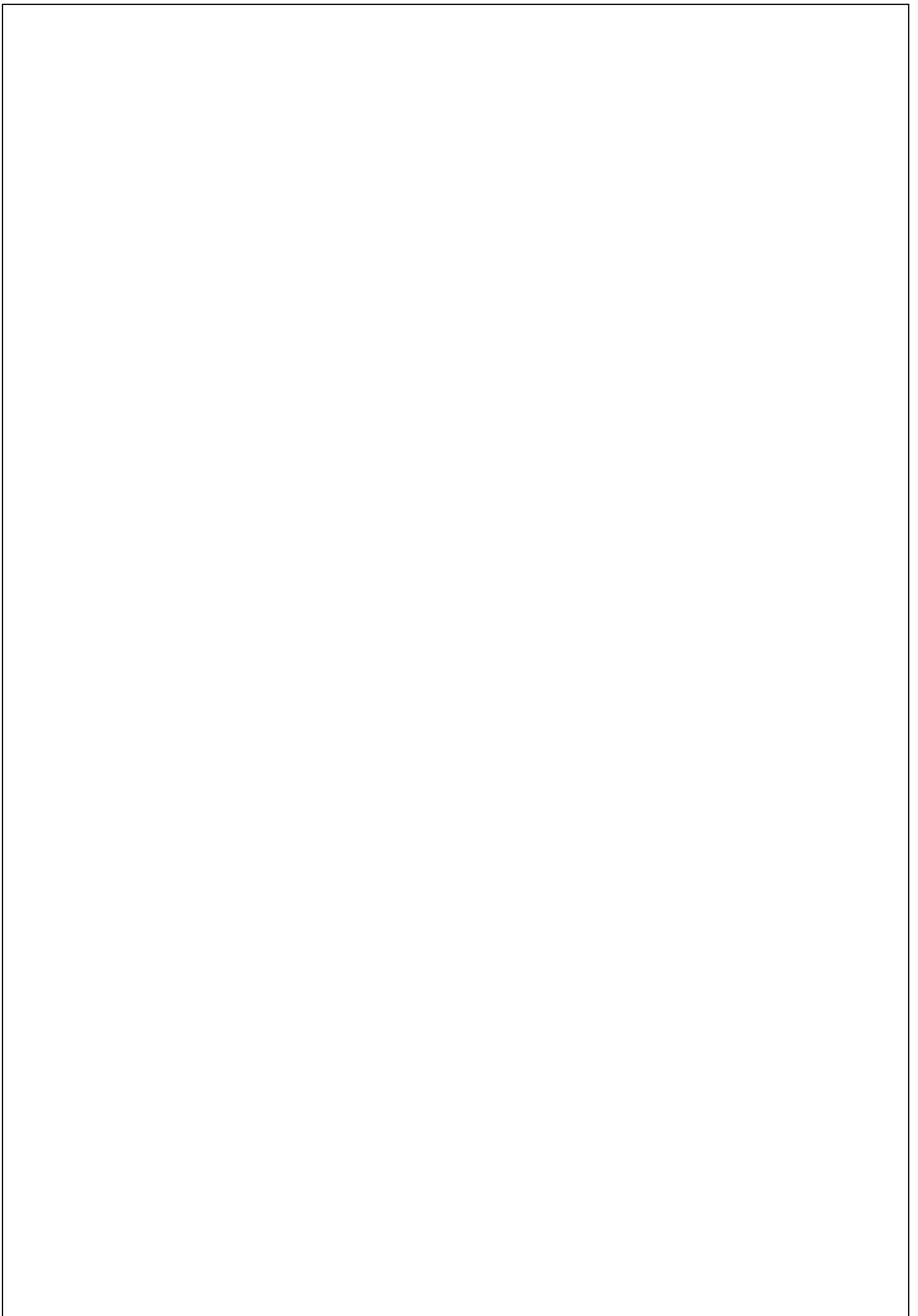
1. Seed extraction methods in vegetable crops.
2. Methods of hybrid seed production.
3. Experiment with the plant growth hormone gibberellins.
4. Study of physiological disorders of cole vegetable crops.
5. Observing stages of Somatic Embryogenesis.
6. Collect information about common diseases caused in vegetable plants.
7. Prepare a report on Pre-treatment of plants after postharvest technology.
8. Visit to commercial green house / Poly house.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

TIME: 3 hours

Max. Marks: 50 M

1. Major experiment.	15M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15 M
4. Record	05 M
5. Viva-voce	05 M
Total:	----- 50M -----



Government College (A), Rajamahendravaram

Department of Biotechnology

Certificate course on

“Biophysical and microbiological techniques”

Theory syllabus (2020)

60hrs

Unit-I:

Buffers- preparation of solution (molarity, normality, molality), preparation of standard buffers(acidic, basic, neutral), determination of pH of the solution.

Unit- II :

Colorimeter/ UV Spectrophoto meter: Principle, construction and its applications.

Chromatography: partition principle, partition coefficient, brief account of paper chromatography, thin layer chromatography

Unit -III:

Gel electrophoresis: types of gels, Agarose gel electrophoresis, SDS-PAGE and applications

Centrifugation: Basic principle, concepts of RCF, types of centrifuges (clinical, high speed and ultracentrifuges), Application of fractionation in research.

Unit-IV:

Microscopy - Light microscope- Parts of microscope and its uses

sterilization methods - Physical, chemical and radiation

Isolation of of microorganisms - serial dilution, pure cultures-isolation methods, culture media - types; Identification of bacteria - simple staining and Gram's staining .

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Government College (A), Rajamahendravaram

Department of Biotechnology

Certificate course on

“Biophysical and microbiological techniques”

Model question paper(2020)

Time: 3hrs

Max.marks:50M

Answer any FIVE questions and draw la belled diagram where ever necessary.
5×10 = 50M

1. Explain the preparation of standard acidic buffer solution
2. Describe about principle and applications of light microscope
3. Write an essay on SDS-PAGE.
4. Write about the principle and types of centrifuges.
5. Write a brief account on paper chromatography.
6. Describe the principle and applications of colorimeter.
7. Write about different methods of isolation of pure culture
8. Describe gram staining method.

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Blue print

Time: 3hrs

Max.marks:50

<u>UNIT</u>	<u>Essay</u>
Unit – I	2
Unit – II	2
Unit – III	2
Unit – IV	2

Government College (A), Rajamahendravaram

Department of Biotechnology

Certificate course on

“Biophysical and microbiological techniques”

Practical syllabus(2020)

1. Preparation of standard buffers and determination of pH of a solution
2. Gel electrophoresis of DNA
3. SDS-PAGE of an oligomeric protein
4. Paper chromatography of amino acids or sugars
5. TLC of sugars or amino acids
6. Quantitative estimation of carbohydrates or proteins or nucleic acids
7. Preparation of media, sterilization and isolation of bacteria
8. Simple staining of bacteria
9. Gram staining of bacteria
10. Antigen –antibody reaction – determination of blood group
11. Pregnancy test
12. Observation of cell division using staining method.

NOTE: Depending on the availability of chemicals and equipment, any 10 of the above practicals should be performed.

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Government College (A), Rajamahendravaram

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Certificate course on

“Biophysical and microbiological techniques”

Practical model question paper (2020)

Time: 3hrs

Max.marks:50M

1. Perform SDS-PAGE for the given oligomeric protein and determine its molecular weight 15M
2. Identify the given bacterial culture by gram staining method 10M
3. Identify the given Spotters 3×5=15M
4. Record 5M
5. Viva-voice 5M

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