

**Government College (Autonomous) Rajamahendravaram  
Accredited “A” Grade by NAAC**

**Department of Biotechnology**



**B.Sc., Biotechnology Syllabus : CBCS ( Choice Based Credit System )**

**semester wise**

**Approved by Board Of Studies for Jun-Oct 2019**

**For**

**1,3,5 semesters**

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- ✓ PO attainment data (CO-PO mapping) for 2015-18 batch.

**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 2019** – 20 -Regarding.

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

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

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**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 other wise and new programmes (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 deliberations 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<br>(Paper) | Hrs./week | Max. Marks<br>(SEE) | Marks in CIA | Credits |
|-------|----------|--------------------------------|-----------|---------------------|--------------|---------|
|-------|----------|--------------------------------|-----------|---------------------|--------------|---------|
- 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 & Paper setters
  - 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**

- Copy to:
1. Lecturers-in-Charge of all the departments
  2. File

## Composition of BOS

Proceedings of the Principal, Government Autonomous College, Rajamahendravaram

Present: Dr.R.David Kumar Swamy, M.Sc, M.Phil, Ph.D

Re. No: Spl/Acad.Cell-GC[A]-RJY/BOS/2018-1, Dated: 17 April 2018

Sub:- Government Autonomous College, Rajamahendravaram- Boards of Studies (BoS) -  
Nomination of Members - Orders Issued.

Ref:- UGC Guidelines for Autonomous Colleges - 2018.

### ORDER:

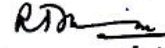
The Principal, Government Autonomous College, Rajamahendravaram is pleased to constitute **Board of studies in BIOTECHNOLOGY** for framing the syllabi in Biotechnology subject for all semesters duly following the norms of the UGC Autonomous guidelines.

S.No.	Name	Designation
1	Dr. B. Nageswari, Lecturer In- Charge/HoD, Department of Biotechnology, GC[A], Rajamahendravaram	Chairman
2	All Faculty members in the department	Member
3	Sri K. Suresh Babu, ABN College, Kovuru, WGDt.	Subject Expert
4	Sri G. Sam Babu, Sri Y.N.College [A], Narsapur DNR College, Bheemavaram	Subject Expert
5	Dr. P. Vijaya Nirmala, ANUR	University Nominee
6	Dr. K. Sarala, Principal Scientist, Crop Improvement Division, CTRI, Rajamahendravaram	Expert from Industry/Corporate Sector
7	Ms. Reeni Angel, M.Sc. Biotechnology, Adikavi Nannaya University, Rajamahendravaram	Student Nominee

The above members are requested attend the BOS meetings and share their valuable views, suggestions on the following functionaries:

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stake holders and national requirement for consideration and approval of the Academic Council
- Suggest methodologies for innovate teaching and evaluation techniques
- Suggest panel of names to the Academic council for appointment of examiners
- Coordinate research, teaching, extension and other activities in the department of the college.

The term of the members will be Three years from the date of the nomination. The Chairman of the BoS (HoD/lecturer In-Charge of the department) is directed to coordinate with the Principal of the College and conduct BoS meetings as and when necessary, but at least twice a year.



PRINCIPAL  
GOVERNMENT COLLEGE [A]  
RAJAHMUNDRY

Copy to:

- The above individuals
- File

Se	paper	Title of course	Hrs per	Marks			Credits	
				CIA	SEE	Total		
1	1	Microbiology and cell biology	4	40	60	100	3	BTL112
1	1	“ lab	2	-	50	50	2	BTL112P
2	2	Macromolecules, Enzymology and bioenergetics	4	40	60	100	3	BTL113
2	2	“ lab	2	-	50	50	2	BTL113P
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

Govt College (A), Rjy. Department Of Biotechnology : Allocation of credits

Cotd.....

me ste r			week	CIA	SEE	Total		Course code
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 8A2 8A3	*Plant Physiology *Animal Physiology *Inheritance Biology	4 4 4	40 40 40	60 60 60	100 100 100	3 3 3	BTL117 BTL122 BTL131
6	8A1 8A2 8A3	“ Lab “ Lab Project	2 2 2	-	50 50 50	50 50 50	2 2 2	BTL117P BTL122P BTL131P
6	8B1 8B2 8B3	*Diversity in Life *Evolution *Project	4 4 4	40 40 40	60 60 60	100 100 100	3 3 3	BTL129 BTL130 BTL131
6	8B1 8B2 8B3	“ Lab “ Lab Project	2 2 2	-	50 50 50	50 50 50	2 2 2	BTL129P BTL130P BTL131P
6	8C1 8C2 8C3	*Plant Biotechnology and Animal Biotechnology *Environmental & Industrial Biotechnology *Biomedical Nanotechnology	4 4 4	40 40 40	60 60 60	100 100 100	3 3 3	BTL132  BTL145  BTL ----
6	8C1 8C2 8C3	“ Lab “ Lab Project	2 2 2	--	50 50 50	50 50 50	2 2 2	BTL132P BTL145P BTL 131P

# Government College (A), Rajamahendravaram

## FOUNDATION COURSES

### **1<sup>st</sup> Year:**

**Semester-1:** Foundation Course- 1 HVPE (Human Values & Professional Ethics),  
Foundation Course-2 Communication & Soft Skills-1

**Semester-2:** Foundation Course-3 Environmental Sciences  
Foundation Course-4A ICT-1 (Information & Communication Technology)

### **2<sup>nd</sup> Year:**

**Semester: 3:** Foundation Course- 5 Entrepreneurship  
Foundation Course-2B Communication & Soft Skills-2

**Semester-4:** Foundation Course-2C Communication& Soft Skills-3  
Foundation Course- 6 Analytical Skills  
Foundation Course- 7 CE (Citizenship Education)  
Foundation Course- 4 B ICT-2 (Information & Communication Technology)

### **3<sup>rd</sup> Year:**

**Semester-5:** Skill Development Course-1 (University's Choice)  
Skill Development Course- 2 (University's Choice)

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

<b>Sem-1</b>	<b>S.No</b>	<b>Subject</b>	<b>Theory Hours per week</b>	<b>Theory Credits</b>	<b>Practical Hours</b>	<b>Practical credits</b>	<b>Total credits</b>
		<b>I - Language</b>	4	<b>3</b>	*	*	3
		<b>II-Language</b>	4	<b>3</b>	*	*	3
		<b>FC-I (HVPE)</b>	2	<b>2</b>	*	*	2
		<b>FC-II(Comm.skills)</b>	2	<b>2</b>	*	*	2
		<b>Biotechnology</b>	4	<b>3</b>	3	<b>2</b>	5
		<b>Botany</b>	4	<b>3</b>	3	<b>2</b>	5
		<b>Chemistry</b>	4	<b>3</b>	3	<b>2</b>	5
						<b>25</b>	

<b>Sem-II</b>	<b>S.No</b>	<b>Subject</b>	<b>Theory Hours per week</b>	<b>Theory Credits</b>	<b>Practical Hours per week</b>	<b>Practical credits</b>	<b>Total credits</b>
		<b>I - Language</b>	4	<b>3</b>	*	*	3
		<b>II-Language</b>	4	<b>3</b>	*	*	3
		<b>FC-I (environmental science)</b>	2	<b>2</b>	*	*	2
		<b>FC-II( ICT)</b>	2	<b>2</b>	*	*	2
		<b>Biotechnology</b>	4	<b>3</b>	3	<b>2</b>	5
		<b>Botany</b>	4	<b>3</b>	3	<b>2</b>	5
		<b>Chemistry</b>	4	<b>3</b>	3	<b>2</b>	5
						<b>25</b>	



Sem-III	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
		FC-I (Entrepreneurship)	2	2	*	*	2
		FC-II (Communication and soft skills 2)	2	2	*	*	2
		Biotechnology	4	3	3	2	5
		Botany	4	3	3	2	5
		Chemistry	4	3	3	2	5
						<b>25</b>	

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

										23
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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
							<b>30</b>

Sem-VI	S.No	Subject	Theory Hours per week	Theory Credits	Practical Hours per week	Practical credits	Total credits
	Course 7	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
							<b>30</b>
	<b>Total</b>						<b>158</b>

## Certificate & Diploma Courses offered by College

As per the college Governing Body resolution dated 22 May 2017, Certificate Course is made mandatory for all 1<sup>st</sup> 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.	English	Domestic Business Process Outsourcing(BPO)	60 Hours
2.	Chemistry	Chemical Lab Technician	60 Hours
3.	MicroBiology	Clinical Health Science	60 Hours
4.	Fine Arts	Kuchupudi(Dance)	60 Hours
5.	Commerce	Direct Tax Procedures and Practices	60 Hours
6.	Commerce	Financial Education	60 Hours
7.	Commerce	Fundamentals of Management	60 Hours
8.	Computer Science & Applications	Desktop Publishing(DTP)	60 Hours
9.	English	Functional English	60 Hours
10.	Telugu	Functional Telugu	60 Hours

S.No	Name of the Department	Proposed Certificate Course	Duration
11.	Philosophy	Gandhian Studies	60 Hours
12.	Physics	Household Wiring	60 Hours
13.	Political Science	Journalism and Mass Communication	60 Hours
14.	Fine Arts	Carnatic(Music)	60 Hours
15.	Economics	Office Management	60 Hours
16.	Physics	Photography	60 Hours
17.	Botany	Plant Propagation and Nursery Management	60 Hours
18.	History	Tourism and Travel Management	60 Hours
19.	Zoology	Vermi Compost	60 Hours
20.	Fine Arts	Yoga	60 Hours
21.	Telugu	Functional Telugu	60 Hours
21.	TISS	Analytical Skills	60 Hours
22.	TISS	Communication Skills	60 Hours
23.	TISS	Digital Literacy	60 Hours

S.No	Name of the Department	Proposed Certificate Course	Duration
24.	TISS	Youth Leadership and People Skills	60 Hours
25.	TISS	Introduction to Entrepreneurship	60 Hours
26.	TISS	Financial Literacy	60 Hours

**Government College (A), Rajamahendravaram : Department of Biotechnology**

**Board of Studies Meeting : Chairman with Members : April 2019.**

The Board of Studies of the Department of Biotechnology was convened at 11:30 a.m. on -----April 2019 under the chairmanship of Dr.B.Nageshwari. Assistant professor, Incharge Department of Biotechnology

<b>S.No</b>	<b>Nominee</b>	<b>Name and Designation</b>	<b>Signature</b>
<b>1</b>	Chairman	<b>Dr.B.Nageshwari</b> Head, Department of Biotechnology. Govt (A) College, Rjy.	
<b>2</b>	Member	<b>Mrs K.Vasudha</b> Faculty, Department of Biotechnology. Govt (A) College, Rjy.	
<b>3</b>	Member	<b>M.R.R. Kowlini</b> Faculty, Department of Biotechnology. Govt (A) College, Rjy.	
<b>4</b>	Subject expert	<b>Sri.K.Suresh Babu,</b> Faculty, Department of Biotechnology. ABN College, Kovvuru, W.G.Dist.	
<b>5</b>	Subject expert	<b>Sri.G.SamBabu</b> Faculty, Department of Biotechnology. Sri. Y.N.College (A), Narsapur.	
<b>6</b>	University Nominee	<b>Dr.P.Vijaya Nirmala,</b> Asst Prof of Zoology, AKNU, Rjy.	
<b>7</b>	Expert from Industry / Corporate Sector	<b>Dr.K.Sarala</b> Principal Scientist, Crop Improvement Division, CTRI, Rajamahendravaram.	
<b>8</b>	Student Nominee		
<b>9</b>	Student Nominee		

**Chairman  
Board Of Studies**

**Government (Autonomous) College, Rajamahendravaram**

**Department of Biotechnology**

**Board of Studies Meeting : 2017-18.**

The Board of Studies of the Department of Biotechnology was convened at 11:30 a.m. on \_\_\_ April 2018 under the chairmanship of Dr.B.Nageshwari. Assistant professor, Incharge Department of Biotechnology.

S.No	Nominee	Name and Designation	Signature
1	Chairman	<b>Dr.B.Nageshwari,</b> Lecturer in Charge /Head Department of Biotechnology, Govt (A) College, Rjy	<i>B. Nageshwari</i>
2	Member	<b>Dr A.K.P. Siva Ranjani</b> Faculty, Dept of Biotechnology, Govt (A) College, Rjy	<i>A.K.P. Sivarajani</i>
3	Subject Expert	<b>Sri. K.SureshBabu,</b> ABN College, Kovvuru, WG Dist.	<i>K.S. e 18</i> 20/4/18
4	Subject Expert	<b>Sri.G.SamBabu</b> Sri Y.N. College (A), Narsapur	<i>S - S - G</i>
5	University Nominee	<b>Dr.P.VijayaNirmala,</b> Assistant Professor of zoology , ANUR	<i>P.Vijayanirmala</i> 20/4/18
6	Expert from Industry / Corporate Sector	<b>Dr.K.Sarala</b> Principal Scientist, Crop Improvement Division, CTRI, Rajamahendravaram.	<i>Sarala.K</i> 20/4/18
7	Student Nominee	<i>K. Rajesh</i>	<i>K. Rajesh</i>

*B. Nageshwari*

Chairman

Board of Studies

Dr. B. NAGESHWARI, M.Sc., Ph.D.  
Lecturer  
Department of Biotechnology  
Govt. College (A)  
Rajahmundry, E.G. Dist

**Government College (A), Rajamahendravaram**

**Department Of Biotechnology**

**Resolutions approved by Board Of Studies**

The members present discussed various aspects of the 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 2019-2020 and resolved the following.

**RESOLUTIONS**

1. It is resolved to design the new curriculum for 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> year B.Sc., Biotechnology based on
  - Job opportunities for students.
  - Feedback from stake holders
  - Keeping in view local industry needs / local advantage
  - To encourage research oriented thinking,
  - To enable students to clear entrance exams for pursuing higher studies
2. 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 papers will be offered in the same semester (6) of the final year.
  - b. As for 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.
3. 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 student 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).
4. 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.

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

6. It is resolved to adapt new pattern of weightage of marks in theory and practical's for B.Sc-I, II & III as recommended by Autonomous Committee, As shown below.

S.No.	Component				Distribution of Marks
1  CIE I	<b>Q No</b>	<b>Learning Objective</b>	<b>Marks</b>		CIE I (after completion of 50% of syllabus)       20
	1	Memory based (Remember)	2		
	2	Understand (Comprehension)	2		
	3	Application	3		
	4	Analysis	3		
	5	Evaluation	5		
	6	Creativity	5		
		<b>TOTAL</b>	<b>20 marks</b>		
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		
<b>Pedagogical Strategies</b>					
4	ASSIGNMENT				5
5	Participation or Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student Study Project/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	5
<b>TOTAL</b>		<b>50</b>

Government College (Autonomous) Rajahmundry Concept document on CIA:SEE as 50:50 – April 2019

### 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 allotted 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	
<b>Pedagogical Strategies</b>				
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	
<b>TOTAL</b>			<b>50</b>	

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

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. The 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
	<b>TOTAL</b>	<b>20 marks</b>

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 20 MCQs 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 through 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 (5 Marks)**

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 (5 Marks)**

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 7 days 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 (5 Marks)**

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.

	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, study projects in prescribed format will be considered for awarding marks in this component.

For a student who has not participated in any events in that semester, the student will be awarded “0” for this component. If a student participates more than one event and win prize, the best would be considered for the subject.

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). The timing for quiz should be 30 minutes. No negative marking. Each question carries 1 mark. The marks secured should be converted to 5.

### **Semester End Examinations (SEE)**

The question paper is of 2 ½ 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)

**7. Practical exam** would be conducted at the end of each semester for BSc **I, II & III** year.

Internal exam at the end of 1<sup>st</sup>, 3<sup>rd</sup> and 5<sup>th</sup> semester each for - 50 marks.

External exam at the end of 2<sup>nd</sup>, 4<sup>th</sup>, and 6<sup>th</sup> semester each for - 50 marks.

\*A minimum of 36% should be scored in each CIA & SEE and 40% together should be scored in CIA & SEE for passing the course.

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 / ( --- credits)**

\*\*\*\*\*

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

**Government College (A), Rajamahendravaram**

**Department Of Biotechnology**

**Resolutions approved by Board Of Studies**

The members present discussed various aspects of the Syllabi, Model Question Papers, activities proposed by the Department of Biotechnology to be implemented for the academic year 2019-2020 and resolved the following.

<b>S.No</b>	<b>Nominee</b>	<b>Name and Designation</b>	<b>Signature</b>
<b>1</b>	Chairman	<b>Dr.B.Nageshwari</b> Head, Department of Biotechnology. Govt (A) College, Rjy.	
<b>2</b>	Member	<b>Mrs K.Vasudha</b>	



		Faculty, Department of Biotechnology. Govt (A) College, Rjy.	
<b>3</b>	Member	<b>M.R.R. Kowlini</b> Faculty, Department of Biotechnology. Govt (A) College, Rjy.	
<b>4</b>	Subject expert	<b>Sri.K.Suresh Babu,</b> Faculty, Department of Biotechnology. ABN College, Kovvuru, W.G.Dist.	
<b>5</b>	Subject expert	<b>Sri.G.SamBabu</b> Faculty, Department of Biotechnology. Sri.Y.N.College (A), Narsapur.	
<b>6</b>	University Nominee	<b>Dr.P.Vijaya Nirmala,</b> Asst Prof of Zoology, AKNU, Rjy.	
<b>7</b>	Expert from Industry / Corporate Sector	<b>Dr.K.Sarala</b> Principal Scientist, Crop Improvement Division, CTRI, Rajamahendravaram.	
<b>8</b>	Student Nominee		
<b>9</b>	Student Nominee		

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

✓ **Activites for the semester ( Jun-Oct 2019 ) approved by the Board of Studies.**

1. The Department shall take the students on a field visit in one of the semesters.
2. The Department proposes to conduct a guest lecture in each semester.
3. The Department proposes to Conduct a seminar (Nation level) on “ Emerging trends in the field of life sciences”.
4. The Department proposes to conduct a state level workshop for degree college teachers for hands on experience for instruments used in sciences.
5. The Department proposes to allocate study projects with hands on experience to each and every student.

6. The Department proposes to conduct a student fest – academic (state level )

<b>S.No</b>	<b>Nominee</b>	<b>Name and Designation</b>	<b>Signature</b>
<b>1</b>	Chairman	<b>Dr.B.Nageshwari</b> Head, Department of Biotechnology. Govt (A) College, Rjy.	
<b>2</b>	Member	<b>Mrs K.Vasudha</b> Faculty, Department of Biotechnology. Govt (A) College, Rjy.	
<b>3</b>	Member	<b>M.R.R. Kowlini</b> Faculty, Department of Biotechnology. Govt (A) College, Rjy.	
<b>4</b>	Subject expert	<b>Sri.K.Suresh Babu,</b> Faculty, Department of Biotechnology. ABN College, Kovvuru, W.G.Dist.	
<b>5</b>	Subject expert	<b>Sri.G.SamBabu</b> Faculty, Department of Biotechnology. Sri.Y.N.College (A), Narsapur.	
<b>6</b>	University Nominee	<b>Dr.P.Vijaya Nirmala,</b> Asst Prof of Zoology, AKNU, Rjy.	
<b>7</b>	Expert from Industry / Corporate Sector	<b>Dr.K.Sarala</b> Principal Scientist, Crop Improvement Division, CTRI, Rajamahendravaram.	
<b>8</b>	Student Nominee		
<b>9</b>	Student Nominee		

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

✓ **Detailed record of discussions transpired between the members during the BOS meeting. April – 2019.**

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

✓ List of colleges for engaging Examiners / Paper setters.

<b>S.No</b>	<b>Name of the college</b>
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
6.	K.G.R.L College(A), Bhimavaram
7.	CR Reddy College(A), Eluru
8.	Y.N.College(A), Narsapur
9.	S.K.B.R college(A), Amalapuram
10.	VS Krishna Govt.college, Visakhapatnam
11.	Women's college, Visakhapatnam
12.	SRR college, Vijayawada
13.	Govt.college for Men, Srikakulam
14.	Govt.college for Women, Srikakulam
15.	AVN Degree college, Kakinada
16.	ABN college, Kovuru, W.G.Dist.A.P

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

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

1. PROGRAMMES for which syllabus revision was carried out.

Programme code	Name of the programme	Revised (Addition/deletion/both)				Date revision
		Course code	Course title	Total number of units/modules in the course	Percentage of addition	

2209	BBC	BTL112	Microbiology and cell biology	5	10%	19 <sup>th</sup> April 2019
		BTL124	Biophysical Techniques	5	10%	19 <sup>th</sup> April 2019
		BTL125	Genetics and Molecular Biology	5	10%	19 <sup>th</sup> April 2019
		BTL126	Gene Expression and rDNA Technology	5	10%	19 <sup>th</sup> April 2019

2 New programs and courses introduced

New Programme Code	New Programme introduced	New course introduced		Date of introduction
		Course code	Course title	

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

**B.Sc., Biotechnology: Choice based Credit System**

**Additional Inputs into Syllabus Jun-Oct 2019**

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.

**I B.Sc : Semester 1: Paper 1 : Microbiology and cell biology**

Additional input - Advantages and Disadvantages of microbes.

**II B.Sc: Semester 3:Paper 3 - . Biophysical Techniques**

Additional input - Applications of fractionation in research

**III B.Sc : Semester 5 : Paper 5 : Genetics and Molecular Biology**

Additional input - Inhibitors of Protein Synthesis

**III B.Sc : Semester 5 : Paper 6 : Gene Expression and rDNA Technology**

Additional input - Recombinant products – production & advantages

**I B.Sc : Semester 1 : Paper 1 :**

**“Microbiology and cell biology”**

**Theory &Practicals**

**Government ( Autonomous ) College , Rajamahendravaram.**

**Department of Biotechnology**

**B.Sc-I; Biotechnology ; Semester -1; Theory syllabus**

**Paper-1 :MICROBIOLOGY AND CELL BIOLOGY**

**UNIT I**

**History, Development and Microscopy :**

**History and development of microbiology:** contributions of Louis Pasteur, Robert Koch and Edward Jenner.

**Microscopy:** Compound microscopy: Numerical aperture and its importance, resolving power, oil immersion objectives and their significance, principles and applications of dark field, phase contrast, fluorescent microscopy. Electron microscopy: Principle, ray diagram and applications, TEM and SEM, comparison between optical and electron microscope, limitations of electron microscopy.

**Stains and staining procedures:** Acidic, basic and neutral stains, Gram staining, Acid fast staining, Flagella staining, Endospore staining.

## **UNIT II**

### **A. Bacteria:**

Bacterial morphology and subcellular structures, general morphology of bacteria, shapes and sizes, generalized diagram of typical bacterial cell.

Slime layer and capsule, difference between the structure, function and the position of the two structures. Cell wall of gram +ve and Gram -ve cells, Prokaryotic classification.

General account of flagella and fimbriae.

Chromatin material, plasmids; definition and kind of plasmids (conjugative and non-conjugative) F, R, and Col plasmids.

Endospores: Detailed study of endospore structure and its formation, germination, basis of resistance.

A brief idea Bergey's manual. Morphology of archaea, archaeal cell membrane (differences between bacterial and archaeal cell membrane), other cell structures, concept of the three distinct archaea groups.

### **B. Viruses:**

General characteristics of viruses, difference between virus and typical microbial cell, structure, different shapes and symmetries with one example of each type, classification of viruses on the basis of nucleic acids, phage and animal cell viruses, example of each and their importance. Brief idea of lytic cycle and lysogeny.

## **UNIT III**

**Microbial Nutrition:** Basic nutritional requirements: Basic idea of such nutrients as water, carbon, nitrogen, sulfur and vitamins etc., natural and synthetic media, nutritional classification of bacteria. Selective and Differential media, Enriched media, Enrichment media.

## **UNIT IV:**

**Microbial growth:** Growth rate and generation time, details of growth curve and its various phases. Concept of synchronous cultures, continuous and batch cultures (chemostat and turbidostat). Measurement of growth.



Physical conditions required for growth: Temperature (classification of microorganisms on the basis of temperature requirements), pH etc. Pure cultures and cultural characteristics. Maintenance of pure culture.

**Microbial Control:** Terminologies - Sterilization, disinfection, antiseptic, sanitization, germicide, microbistasis, preservative and antimicrobial agents.

Mechanism of cell injury: Damage to cell wall, cell membrane, denaturation of proteins, inhibition of protein synthesis, transcription, replication, other metabolic reactions and change in supercoiling of DNA.

**Physical control:** Temperature (moist heat, autoclave, dry heat, hot air oven and incinerators), dessication, surface tension, osmotic pressure, radiation, UV light, electricity, ultrasonic sound waves, filtration.

**Chemical control:** Antiseptics and disinfectants (halogens, alcohol, gaseous sterilization. Concept of biological control.

## **UNIT V**

### **Cell Biology**

Eukaryotic Cell - Structure and function of the following: nucleus, nuclear membrane, nucleoplasm, nucleolus, golgi complex, Mitochondria, Chloroplast, endoplasmic reticulum, lysosomes, peroxisomes, glyoxisomes and vacuoles. Plant cell wall.

Cytoskeleton (Micro and Macro filaments, microtubules) and cell locomotion. Mitosis and meiosis. Brief idea of cell cycle.

Muscle and nerve cell structure, synaptic transmission and neuromuscular junctions.

**Additional input** - Advantages and Disadvantages of microbes.

### **Reference Books:**

1. Biotechnology – By K. Trehan
2. Cell and Molecular Biology – By De Robertis
3. Cell and Molecular Biology – By Lodish
4. Cell Biology and Genetics – By P. K. Gupta
7. Biotechnology - K. Trehan
8. Biotechnology –I - R.S. Setty and G.R. Veena
9. Biotechnology – II - R.S. Setty and V. Sreekrishna
10. Molecular Biology - David Friefeilder
11. Cell Biology - By S.C. Rastogi (New Age International (P) Ltd)
12. The World of the Cell - By Becker (Pearson Education)

**Government ( Autonomous ) College , Rajamahendravaram.  
Department of Biotechnology  
B.Sc-I; Biotechnology ; Semester -1;**

### **Paper-1 :MICROBIOLOGY AND CELL BIOLOGY**

**Model question paper for Semester end theory examinations. Oct /Nov 2019**

Time : 2.5 Hours

Max.Marks : 50

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 IV

Question 6 from additional input

Part-B

Very short answer questions : All the 5 5 X 2= 10 M

Question 6 : from Unit I

Question 7: from Unit II

Question 8: from Unit III

Question 9 : from Unit IV

Question 10: from Unit V

**Government ( Autonomous ) College , Rajamahendravaram.**

**Department of Biotechnology**

**B.Sc-I; Biotechnology ; Semester -1;**

**Paper-1 :MICROBIOLOGY AND CELL BIOLOGY**

**Model question paper for Semester end theory examinations. Oct /Nov 2019**

**Time : 2.5 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 in detail about electron microscopy.
2. Explain the features of a typical bacterial cell.
3. Discuss the basic nutritional requirements of microbes.
4. Write the various physical control methods for microorganisms
5. Describe in detail the mechanism of synaptic transmission .
6. Write about useful and harmful bacteria.

**Part -B**

**Answer all very short answer Questions**

**5X4=20 M**

7. Louis pasteur
8. Lysogeny
9. Dessication
10. Cytoskeleton
11. Enriched media

**Government ( Autonomous ) College , Rajamahendravaram.**

**Department of Biotechnology**

**B.Sc-I; Biotechnology ; Semester -1**

**Practicals syllabus**

**Paper-1 :MICROBIOLOGY AND CELL BIOLOGY**

1. Demonstration, use and care of microbiological equipments.
2. Preparation of media, sterilization and isolation of bacteria.
3. Isolation of Bacteriophage from sewage / other sources.
4. Demonstration of motility of Bacteria.
5. Simple staining of bacteria
6. Gram staining of Bacteria
7. Acid fast staining of Bacteria
8. Endospore staining.
9. Demonstration of starch hydrolysis by bacterial cultures
10. Growth of fecal coliforms on selective media.
11. Isolation of pure culture by pour plate method
12. Isolation of pure culture by streak plate method.
13. Anaerobic cultivation of microorganisms.
14. Cultivation of yeast and moulds.
15. Antibiotic sensitivity assay.
16. Oligodynamic action of metals.
17. To study germicidal effect of UV light on bacterial growth.
18. Stages of mitosis.
19. Stages of meiosis.

**Note: - Mandatory to perform at least ten practical.**

\* \* \* \* \*

Government ( Autonomous ) College , Rajamahendravaram.  
Department of Biotechnology  
B.Sc-I; Biotechnology ; Semester -1;

**Paper-1 :MICROBIOLOGY AND CELL BIOLOGY**

Model question paper for Semester end practical examinations. Oct/Nov 2019

**TIME: 3 hours**

**Max. Marks: 50**

1. Major experiment.	15 marks
(Principle-5M, Methodology-10M, Results-05)	
2. Minor experiment.	10 marks
(Principle -2M, Methodology-05M, Results-03)	
3. Identify the given spotter and a brief note on it- (5x3M)	15 marks
A,	
B,	
C,	
D,	
E,	
4. Record	05 marks
5. Viva-voce	05 marks
	-----
	Total 50 marks
	-----

**Government ( Autonomous ) College , Rajamahendravaram.  
Department of Biotechnology  
B.Sc-I; Biotechnology ; Semester -1**

**Paper-1 :MICROBIOLOGY AND CELL BIOLOGY**

**Model question paper for Semester end practical examinations. Oct/Nov 2018**

Time : 3 hrs

Max . Marks : 50 M

- |  |                   |
|--|-------------------|
| 1. Determine the nature of the given bacterial sample using Grams ' Staining method. | 15 M              |
| 2. Identify the stage of mitosis in the given sample.                                | 10M               |
| 3. Spotters (5 Nos)  | (5x3) = 15M       |
| 4. Record  | 5 M               |
| 5. Viva-voce   | 5 M               |
|  | -----             |
|  | Total <u>50 M</u> |

II B.Sc : Semester 3 : Paper 3 :

“Biophysical Techniques”

Theory &Practicals

Government ( Autonomous ) College , Rajamahendravaram.

Department of Biotechnology

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

Paper-3 :BIOPHYSICAL TECHNIQUES

**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. Ionexchange 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, Solubilizers, 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.

**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 ( Autonomous ) College , Rajamahendravaram.  
Department of Biotechnology  
B.Sc-II; Biotechnology ; Semester -3;**

**Paper-3 :BIOPHYSICAL TECHNIQUES**

**Model question paper for Semester end theory examinations. Oct /Nov 2019**

Time : 2.5 Hours

Max.Marks : 50

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 IV

Question 6 from additional input

Part-B

Very short answer questions : All the 5 5 X 2= 10 M

Question 6 : from Unit I

Question 7: from Unit II

Question 8: from Unit III

Question 9 : from Unit IV

Question 10: from Unit V

**Government ( Autonomous ) College , Rajamahendravaram.**

**Department of Biotechnology**

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

**Paper-3 :BIOPHYSICAL TECHNIQUES**

**Model question paper for Semester end theory examinations. Oct/Nov 2019**

Time : 2.5 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. Write about the principle technique and types of centrifugation.
6. Explain the application of fractionation in research.

**Part-B**

**Answer ALL the five very short answer questions.**

**5 X2= 10 M**

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

**Government ( Autonomous ) College , Rajamahendravaram.  
Department of Biotechnology  
B.Sc-II; Biotechnology ; Semester -3**

**Practicals syllabus**

## Paper-3 :BIOPHYSICAL TECHNIQUES

1. Spectrophotometric analysis of DNA denaturation.
2. Determination of absorption spectrum of oxy- and deoxyhemoglobin and methemoglobin.
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 diacetylenoxime 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. Biostatistical problem based on standard deviation.

**Note: - Mandatory to perform at least 10 practicals**

Government ( Autonomous ) College , Rajamahendravaram.  
Department of Biotechnology  
B.Sc-II; Biotechnology ; Semester -3

Paper-3 :BIOPHYSICAL TECHNIQUES

Model question paper for Semester end practical examinations. Oct/Nov 2019

**Time : 3 hrs**

**Max . Marks : 50M**

- |   |                   |
|---|-------------------|
| 1. Perform SDS-PAGE for the given oligomeric protein and determine its molecular weight .15 M |                   |
| 2. Estimate the given protein by E280/E260 method   | 10M               |
| 3. Spotters   | (5x3) = 15M       |
| 4. Record   | 5 M               |
| 5. Viva-voce  | 5 M               |
|   | -----             |
|   | Total <u>50 M</u> |

**III B.Sc : Semester 5 : Paper 5 :**

**“Genetics and Molecular Biology”**

**Theory & Practicals**

**Government ( Autonomous ) College , Rajamahendravaram.**

**Department of Biotechnology**

**B.Sc-III; Biotechnology ; Semester -5; Theory syllabus**

**Paper-5 : GENETICS AND MOLECULAR BIOLOGY**

UNIT I

Mendels Laws and Inheritance:

Mendel experiments, Mendel Laws and Deviations : Incomplete dominance and Co dominance, Penetration and pleiotropism, 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 nondisjunction 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 processive properties of DNA polymerase I and III, importance of the  $\beta$ -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  $\sigma$  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

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**Paper-5 :GENETICS AND MOLECULAR BIOLOGY**



**Model question paper for Semester end theory examinations. Oct /Nov 2019**

Time : 2.5 Hours

Max.Marks : 50M

**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 IV

Question 6 from additional input

**Part-B**

Very short answer questions : All the 5 5 X 2= 10 M

Question 6 : from Unit I

Question 7: from Unit II

Question 8: from Unit III

Question 9 : from Unit IV

Question 10: from Unit V

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**Paper-5 :GENETICS AND MOLECULAR BIOLOGY**

**Model question paper for Semester end theory examinations. Oct /Nov 2019**

**Time : 2.5 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. 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 All the very short questions**

**5 X 2= 10 M**

1. Multiple alleles
2. Hardy Weinberg law and equation
3. Discontinuous replication
4. Mutagen with examples
5. Translation.

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**Practicals syllabus**

**Paper-5 :GENETICS AND MOLECULAR BIOLOGY**

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

Note:-Mandatory to perform atleast 6 practicals

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**Paper-5 :GENETICS AND MOLECULAR BIOLOGY**

Model question paper for Semester end practical examinations. Oct /Nov 2019

**TIME: 3 hours**

**Max. Marks: 50**

1. Major experiment. (Principle-5M, Methodology-10M, Results-05)	15 marks
2. Minor experiment. (Principle -2M, Methodology-05M, Results-03)	10 marks
3. Identify the given spotter and a brief note on it- A, B, C, D, E,	(5x3M) =15 marks
4. Record	05 marks
5. Viva-voce	05 marks
	----- Total 50 -----

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Paper-5 :GENETICS AND MOLECULAR BIOLOGY

Model question paper for Semester end practical examinations. Oct /Nov 2019

**TIME: 3 hours**

**Max. Marks: 50**

1. Isolate the plasmid from the given bacterial culture and report the size of the plasmid.  
(Principle-5M, Methodology-10M, Results-05) 15 marks
  
  2. Problem on Mendelian genetics. 10 marks  
(Principle -2M, Methodology-05M, Results-03)
  
  3. Identify the given spotter and a brief note on it (5x3M)=15 marks  
    - A,
    - B,
    - C,
    - D,
    - E,
  
  4. Record 05 marks
  
  5. Viva-voce 05 marks
- Total 50  
-----
-

**III B.Sc : Semester 5 : Paper 6 :**

**“Gene Expression and rDNA Technology”**

**Theory &Practicals**

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**B.Sc-III; Biotechnology ; Semester -5; Theory syllabus**

**Paper-6 : GENE EXPRESSION AND rDNA TECHNOLOGY**

**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: aminoacyl synthetases, 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, Phagmids, 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**

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**Paper-6 :GENE EXPRESSION AND rDNA TECHNOLOGY**

**Model question paper for Semester end theory examinations. Oct /Nov 2019**

Time : 2.5 Hours

Max.Marks : 50

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 IV

Question 6 from additional input

Part-B

Very short answer questions : All the 5 5 X 2= 10 M

Question 6 : from Unit I

Question 7: from Unit II

Question 8: from Unit III

Question 9 : from Unit IV

Question 10: from Unit V

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**Paper-6 :GENE EXPRESSION AND rDNA TECHNOLOGY**



**Model question paper for Semester end theory examinations. Oct /Nov 2019**

**Time : 2.5 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. 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 All very the short answer questions**

**5 X 2= 10 M**

7. ShineDalgarno sequence
8. post translational modification
9. Rho factor mediated termination
10. Transfection
11. Primer

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**Practicals syllabus**

## **Paper-6 :GENE EXPRESSION AND rDNA TECHNOLOGY**

1. To measure concentration of DNA & RNA by UV spectrophotometry
2. Estimation of proteins by Bradford method
3. Isolation of genomic DNA
4. Isolation of Plasmid DNA
5. Restriction digestion of DNA
6. Demonstration of Replica plating technique
7. Identification of Lac+ bacteria by blue white screening using IPTG
8. Ligation of DNA
9. Chemical mutagenesis and production of microbial mutants

Note : Mandatory to perform atleast 6 practicals

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**Paper-6 :GENE EXPRESSION AND rDNA TECHNOLOGY**

Model question paper for Semester end practical examinations. Oct /Nov 2019

**TIME: 3 hours**

**Max. Marks: 50**

- |  |                 |
|--|-----------------|
| 1. Major experiment.                                 | 15 marks        |
| (Principle-5M, Methodology-10M, Results-05)          |                 |
| 2. Minor experiment.                                 | 10 marks        |
| (Principle -2M, Methodology-05M, Results-03)         |                 |
| 3. Identify the given spotter and a brief note on it | (5x3M)=15 marks |
| A,   |                 |
| B,   |                 |
| C,   |                 |
| D,   |                 |
| E,   |                 |
| 4. Record  | 05 marks        |
| 5. Viva-voce   | 05 marks        |
|  | -----           |
|  | Total 50 marks  |
|  | -----           |

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Paper-6 :GENE EXPRESSION AND rDNA TECHNOLOGY

Model question paper for Semester end practical examinations. Oct/Nov 2019

**TIME: 3 hours**

**Max. Marks: 50**

1. Measure the concentration of DNA and RNA in the given samples using spectrophotometry technique. 15 marks

(Principle-5M, Methodology-10M, Results-05)

2. Subject the given DNA sample to restriction digestion and report the result 10 marks

(Principle -2M, Methodology-05M, Results-03)

3. Identify the given spotter and a brief note on it (5x3M)=15 marks

A,  
B,  
C,  
D,  
E,

4. Record 05 marks

5. Viva-voce 05 marks

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Total 50 marks  
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