PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

DEPARTMENT OF ZOOLOGY

4th BOARD OF STUDIES

M.Sc., Zoology Syllabus

2023-24

(20 -12-2023)

Index

PROCEEDINGS OF THE PRINCIPAL, PITHAPUR RAJAH's GOVT. COLLEGE [A]:KAKINADA

Present:Dr. B.V. TIRUPANYAM, Ph.D.

Dt.04 Dec 2023

Rc.No.12A/A.C/ BOS/2023-24

Sub: P.R.G.C[A] – Academic Cell –**Conduct of BOS Meetings for the Academic Year 2023-24** – Guidelines issued - Regarding.

Ref: 1.Minutes of IQAC meeting dated 18 September 2022

2. Resolutions adopted in Staff Council Meeting held on 04 Dec 2023

The Autonomous colleges are, as per its vision, mission, stated objectives and core values, mandated to design and develop their own outcome -based curricula keeping in view the societal, local and global industry requirements, employability and industry – ready and transferable skills duly prescribing Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) and suitable learning outcome assessment management system through robust and transparent evaluation system to measure their attainment levels by the students.

The Sustained Developmental Goals (SDG-4) of UNEP recommended assurance of quality to students in HEIs promoting creativity, critical thinking and collaborative skills, while building curiosity, courage, resilience and gender equality among public good.

Further, the NEP-2020 recommended that the HEIs shall equip students with such skills that translate them into leaders and potential entrepreneurs too besides credit transfer mechanism through ABC.

The HEIs are also, as per the Revised Accreditation Framework [RAF] of NAAC, endowed with the responsibility of rolling out quality and holistic human resources to the modern Indian Economy by ingraining quality in teaching-learning process by facilitating the students experience a wide range of participative and experiential learning strategies including field trips, conferences, integration of technology, community service programmes, career guidance, certificate and value added courses, research and inquisition based teaching, exchange programmes, gender equity programmes, etc.

Besides, the students shall have social consciousness, regard for constitutional provisions, right perspective on environmental protection, awareness on gender equity, health and hygiene, Yoga and wellness, college social responsibility, culture and values.

The NIRF prescribes quality research, infrastructure augmentation, placement and progression to higher education, employability skills leading to enhanced public perception about the college among the public.

ORDER:

In the light of the above mandate and responsibilities prescribed by institutions vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, our institution needs to customize, design and re-orient their academic and research administration in tune with the policies of above bodies, our institution is no exception.

Hence, the Chairmen of U.Gand P.G Boards of Studies of various Departments and their Chairmen are requested to prepare curricula and extracurricular activities and devise suitable evaluation system keeping in mind above recommendations to make students a wholesome personality and a 21st century student capable of facing challenges, adaptive to changes, creative and innovative.

Further, the BOS chairmen are requested to make necessary arrangements for the conduct of the meetings separately between 11 October 2022 and 15 October 2022 duly incorporating above mandate as agenda in the meeting. The SOP prescribing mandatory 20% changes in the existing curricula and other benchmarks has been attached herewith for reference as **Annexure – I.**

Further, the Chairman of the each BOS, in association with the IQAC coordinator, preceding the BOS meeting, is requested to prescribe benchmarking, quality initiatives in pedagogy and learning in design of curriculum and optimum utilization of existing human, physical and ICT resources and adopt resolutions to the extent of benchmarks. Further, as the regular attendance of students to the classes is a deciding factor in enhancement of quality in learning, a minimum attendance of 60% for I mid-term examination, 75% for II mid-term examination under CIA component shall be the benchmark for attendance and it shall be approved in the BOS. The Chairmen are also requested to approve the new programmes to be introduced for 2022-23, if any, number of certificate courses, their frequency, Bloom's-Taxonomy based evaluation system for effective learning outcomes as per the Annexure - I

The Chairmen are, therefore, requested to

- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula and
  invite suggestions and changes to be made.
- Invite the University nominee, subject experts, industrial nominees, student nominees, parents well in advance along with the date, venue, agenda, etc., A soft copy shall be communicated well in advance to the members to have an idea on the matters.
- Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, etc.,

- Each Department shall approve and recommend additional credits for additional modules, training programmes, N.S.S, N.C.C, participation in cultural programs, sports and games, environmental programs, blood donations camps, etc.
- All meetings shall be offline. Online attendance of members faculty will be permitted only in exceptional cases.
- The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the commencement of the examination.
- Each Chairman of BOS, shall get the rough draft of the curricula verified by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity among the departments.

The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.

- The Academic Coordinator and IQAC coordinator shall conduct a meeting with the Chairmen, BOS between 28-29 September 2022 and explain the structure of curricula, uniformity other modalities.
- The Controller of Examinations of the institution shall fund the BOS meeting expenditure from the available funds on the condition of reimbursement after receiving autonomous funds from UGC. Initially he shall pay Rs. 5,000/- uniformly as an advance to each Chairman towards each course (If BOS meetings for multiple courses are held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of courses x Rs.500/-)
- The Chairman of each BOS shall apply to the principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III).

BOS document should contain the following contents in order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the college
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. 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 (Paper)	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
1	I	Tools and Techniques for biology	4	75	25	4

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting (Activities and Benchmarking as per Annexure –I)

7. At the end of each theory paper, each topic shall be mapped as per the Blooms taxonomy and scope of that topic for skill/ employability/

S.No	Subject	Sem	TitleoftheCourse	Topic	Parameter as per Blooms taxonomy (Knowledge/ Application/ Creativity/ Innovation	Experiential learning component	Scope (Skill/ employability/ entrepreneurship)
1	Zoology	I	Molecular Cell Biology	Animal Cell	Knowledge	Shall be shown Microscope	

entrepreneurship opportunities in the following table incorporated

8. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification, in theProforma given in Annexure – I.

9. Table showing Members present with signatures.
10. List of Examiners & Paper setters
11. Syllabus for each course (boththeory&Practical in case of Science subjects)followed by model question papers (theory & practical) and allocationof CIA (50marks) for each course.
12. PO attainment data (CO-PO mapping)

PRINCIPAL
PRINCIPAL
P.R.Govt. College (A)
KAKINADA

Enclosures: Annexure I, II & III

Copyto:

Lecturers-in-Charge (BOS Chairmen) of all the departments
Academic Coordinator
IQAC coordinator
Controller of Examinations
Office

PROCEEDINGS OF THE PRINCIPAL, P.R. GOVERNMENT COLLEGE(A), KAKINADA - A. P

Present: Dr. B. V. Tirupanyam, M. Sc; Ph.D.

R.C.No.1/A.C./BOS/2023-24, Dated: 20.12.2023

SUB: P.R. Government College(A), Kakinada-PG Board of Studies (BOS)- Program/Course- Nomination of Members-Orders issued.

REF: 1. UGC Guidelines of for Autonomous Colleges-2018.

ORDERS:

The Principal, P.R. Government College(A), Kakinada is pleased to constitute PG Boards of Studies in -ZOOLOGY- for framing the syllabi in respective Subject for all Semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name of the Person	Designation
1	Sri. B. Chakravarthi	Chairman & Lecturer In charge, Department of Zoology & Aquaculture
2	Dr.A.Matta Reddy	University Nominee, Associate Proffessor Dept. of Zoology Adikavi Nannaya University
3	Dr. Samuel Devid Raj	Subject Expert -I, Prof. in Zoology Dr. VSK GDC (A)
4	Dr.J .Chandra Shekara Rao	Subject Expert – II, Assistant Professor in Zoology SRK Govt Degree College Yanam,UT- Puducherry
5	Dr. P. Ram Mohan	Representative from Industry, Aqua Industry consultant
6	Dr. Kiran Kumar Pappu	P.G Co-ordinator
7	Dr. B. Elia	Member
8	P.V. Chandrika	Member
9	B. Devi	Member
10	Y. Gowthami	Member
11	T. Sushma	Member
12	MD. Shamreen	Member
13	M. Sowmya	Member
14	R.Sunita	Member
15	G. Arun kumar	Student Alumni Member
16	V. Lakshmi Narasamma	Student Member
17	N. Rikhitha Sai Lakshmi	Student Member

The above members are requested to attend the BoS meeting on 20- 12 -2023 and share their valuable reviews, and 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 IQAC and Academic Council.
- Suggested methodologies for innovative teaching and evaluation techniques.
- Suggest the panel of Names to the academic council for appointment of Examiners.
- Coordinate research, teaching, extension and other activities in the Department of the college.

B.V.T.

PRINCIPAL
P.R.Govt. College (A)
KAKINADA

02/04/2024 11:22

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
***An AUTONOMOUS and NAAC Accredited Institution*(A Grade- 3.17 CGPA)**
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravarm.)

ACADEMIC CELL

(Certificate to be issued by the UniversityNomine/Subject Expert/Member of BOS)

Department Name: M.Sc., Zoology /Aquaculture/ B. Voc Commercial Aquaculture

Name of the BOS Member : Dr.A.Matta Reddy.

(UniversityNomine/Subject Expert/Industrilist/ Member)

I certify that the syllabus submitted by the ……. Department is verified by me and I recommend the following suggestions:

1.

2.

3.

4.

5.

The syllabus is approved with the above suggested modification

Signature with Date

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
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Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

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ACADEMIC CELL

(Certificate to be issued by the UniversityNomine/Subject Expert/Member of BOS)

Department Name: M.Sc., Zoology/Aquaculture/ B. Voc Commercial Aquaculture

Name of the BOS Member : Dr. Samuel Devid Raj.

(UniversityNomine/Subject Expert/Industrilist/ Member)

I certify that the syllabus submitted by the .....P.G...Zoology..... Department is verified by me and I recommend the following suggestions:

1.

2.

3.

4.

5.

The syllabus is approved with the above suggested modification

Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

02/04/2024 11:17

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
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ACADEMIC CELL

(Certificate to be issued by the University Nomine/Subject Expert/Member of BOS)

Department Name: M.Sc., Zoology/Aquaculture/ B. Voc Commercial Aquaculture

Name of the BOS Member : Dr.J .Chandra Shekara Rao.
(University Nomine/Subject Expert/ Industrilist / Member)

I certify that the syllabus submitted by the ....PG... Zoology..... Department is verified by me and I recommend the following suggestions:

1.

2.

3.

4.

5.

The syllabus is approved with the above suggested modification

J. Chandra Sekhara Rao
Signature with Date

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
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ACADEMIC CELL

(Certificate to be issued by the UniversityNomine/Subject Expert/Member of BOS)

Department Name: M.Sc., Zoology/Aquaculture/ B. Voc ~~Commercial Aquaculture~~

Name of the BOS Member : Dr. P. Ram Mohan. Representative from Industry, Aqua Industry consultant

(University Nomine/Subject Expert/ Industrilist / Member)

I certify that the syllabus submitted by the ..... PG : Zoology ..... Department is verified by me and I recommend the following suggestions:

1.

2.

3.

4.

5.

The syllabus is approved with the above suggested modification

20/12/2023
Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

IV -BOARD OF STUDIES MEETING 2023- 24

Time: .
Date:

Venue: ***Department of Zoology***

The IV BOARD OF STUDIES Meeting of M.Sc Zoology took place at on in the Department of Zoology P.R. Govt. College, (A) Kakinada for the year 2023 - 2024 .

The following members attended.

Sl No	Name and affiliation	Designation	Signature
01	B. Chakravarthi Lecturer in-charge Dept of zoology P.R.Govt College (A) Kakinada.	Lecture in-charge	
02	Dr.A.Matta Reddy Associate Proffessor Dept. of Zoology Adikavi Nannaya University	Vice-Chancellor's Nominee	
03	Dr. Samuel Devid Raj Prof. in Zoology Dr. VSK GDC (A)	Subject Expert	
04	Dr.J .Chandra Shekara Rao Assistant Professor in Zoology SRK Govt Degree College Yanam UT- Puducherry	Subject Expert	
05	Dr .P. Rama Mohan Rao Aquaculture Consultant Kakinada	Aqua Industrialist	

DEPARTMENTAL STAFF	MEMBER
1. B.Chakravarthi Lecturer in-Charge Dept.of Zoology P.R.Govt College (A) Kakinada	Member& Lecture in-Charge
2. Dr. Kiran Kumar Pappu Lecturer in Zoology P.G Co-ordinator P.R.Govt College (A) Kakinada	Member& P.G Co-ordinator
3. B. Elia Lecturer in Zoology P.R.Govt College (A) Kakinada	Member
4. T. Venkateswra Rao Lecturer in Zoology () P.R.Govt College (A) Kakinada	Member
5. P.Vijaya Chandrika Lecturer in Zoology (Guest) P.R.Govt College (A) Kakinada	Member
6. B.Devi Lecturer in Zoology (Guest) P.R.Govt College (A) Kakinada	Member
7. Y.Gowthami Lecturer in Zoology (Guest) P.R.Govt College (A) Kakinada	Member
8. T.SushmaMember Lecturer in Zoology (Guest) P.R.Govt College (A) Kakinada	Member
9. Md.Shamreen Lecturer in Zoology(Guest) P.R.Govt College (A) Kakinada	Member
10. M.SowmyaMember Lecturer in Zoology(Guest) P.R.Govt College (A) Kakinada	Member
11. R.Sunita Lecturer in Zoology(Guest)P.R.Govt College (A)Kakinada	Member

VISION:

To contribute its might for holistic and quality human capital formation for modern economy with focus on developing employment opportunity – enhancing skilling ecosystem, through integration of research, value system and technology into teaching – learning process.

MISSION:

- To provide conducive and outcome-based skill development environment in the institution to brighten prospects for progression to higher education, employment opportunities in Government and Private agencies, for personal growth and enhanced productivity and economic growth.
- To collaborate with coaching centers or skill development institutions for skill development.
- To develop systems for quality enhancement in learning by student through promotion of ICT integration into learning, deployment of learning resources at the door steps of students for optimum utilization.
- Designing and implementing student-centric, inquisitive, practical-rich and research based curriculum
- curricula, including project works, problem-solving & applications oriented TLPs, field trips, etc., that facilitate experiential and participative learning.
- To strengthen research and development and create new research knowledge through intense research, collaborations, knowledge and technology transfer
- To foster innovation among students through trainings and forging collaborations with outside organizations
- To turn each student into a wholesome personality through initiatives in Community Service, Gender equity initiatives, Environment protection, personality development, transferable skills, understanding constitution and its spirit and their role in nation building.
- To inculcate scientific temper in young minds to foster human values

PROCEEDINGS OF THE PRINCIPAL, P.R. GOVERNMENT COLLEGE(A), KAKINADA

DEPARTMENT OF ZOOLOGY&AQUACULTURE

Consolidated Report of Board of Studies for the Year 2023-2024

The Board of Studies Meeting in the Department of zoology was convened on 20-12-2023 at 11 AM under the Chairmanship of Sri B.Chakravarthi, Lecturer in charge, Department of zoology & Aquaculture. The following members are present

S. No	Name of the Person	Designation	Signature
1	Sri. B. Chakravarthi	Chairman & Lecturer In charge, Department of Zoology & Aquaculture	
2	Dr.A.Matta Reddy	University Nominee, Associate Proffessor Dept. of Zoology Adikavi Nannaya University	Attended online
3	Dr. Samuel David Raj	Subject Expert -I, Prof. in Zoology Dr. VSK GDC (A)	Attended online
4	Dr.J .Chandra Shekara Rao	Subject Expert – II, Assistant Professor in Zoology SRK Govt Degree College Yanam,UT- Puducherry	Attended online
5	Dr. P. Ram Mohan	Representative from Industry, Aqua Industry consultant	Attended online
6	Dr. Kiran Kumar Pappu	P.G Co-ordinator	
7	Dr. B. Elia	Member	
8	P.V. Chandrika	Member	
9	T.Venkateswara Rao	Member	
10	B. Devi	Member	
11	Y. Gowthami	Member	
12	T. Sushma	Member	T. Sushma
13	MD. Shamreen	Member	Md. Shamreen
14	M. Sowmya	Member	M. Sowmya
15	R.Sunita	Member	R. Sunita
16	D. Ratna Manjula	Member	
17	G. Arun kumar	Student Alumni Member	G. Arun Kumar
18	V. Lakshmi Narasamma	Student Member	V. Lakshmi Narasamma
19	N. Rikhitha Sai Lakshmi	Student Member	N Rikhithasai Lakshmi

AGENDA FOR BOARD OF STUDIES MEETING2023 - 2024

Agenda I: To discuss regarding the changes to be made in the theory and practical syllabus
Agenda II: To discuss the percentage of implementation of internal , external marks

Agenda III : To discuss either to consider the Average percentage or best of one regarding the mid Sem I&II

Agenda IV: To discuss the matters related to semester end and practical end examinations

Agenda V : To discuss the patterns of the model paper to be Implemented

Agenda VI : To discuss the total theory and practical have to be allotted to each paper

Agenda VII : To discuss Weitage of questions from each module and Percentage of choice to be given in the question Paper

Agenda VIII : To discuss the percentage of marks to be bifurcated for internal and external examination assessment regarding practical examinations

Agenda IX : To discuss on issue related to blueprint

Agenda X : To discuss about arrangement of training programmes / intenships hands on training or any other curriculum enrichment programmes

Resolution

The members present have discussed the syllabi and model question papers (Theory and Practical) related to I,II, III& IV semesters in M.SC Zoology and made the following Resolutions.

Resolution I : Resolved to adopt the theory and practical syllabus prescribed by affiliating university

Adikavi Nannayya University, Rahamahendravara m as this is the first batch.

Resolution II: Resolved to implement 75% external and 25% internal marks for both theory and practical's from the academic year 2022 -23 for I, II, III& IV semesters.

Resolution III: Resolved to conduct mid-I and mid-II for each semester and its average marks are considered.

Resolution IV: Resolved to conduct semester end practical examinations, with external examiners.

Resolution V: Resolved to follow Adikavi Nannaya University M.Sc zoology model question paper pattern for the conduct of internal mid exams and semester end exams.

Resolution VI: It is resolved to engage 4 to 5 hours per week for each theory paper & 3 hrs for each practical.

Resolution VII : Resolved that the Semester End Examination question paper comprises of Two sections –Section A & B, section A consists of 4 questions one question from each unit of syllabus with internal choice'a'or'b'. Section-B consists of 8 short questions two from each unit of the syllabus, with internal choice out of which only 5 are to be attempted

Resolution VIII: Resolved that each practical will be evaluated for a total of 50 marks

Resolution IX: Resolved to include Blue Prints for model question papers for All semesters.

Resolution X : Resolved to conduct training programmes or internship to enrich the curriculum

Chairperson
Board of Studies
Dept. of Zoology

P. R. GOVTCOLEGE(A), KAKINADA

P.G –ACTION PLAN 2023-24

DEPARTMENT OF ZOOLOGY & Aquaculture

Sl.	MONTH &YEAR	ACTIVITY	Tentative Date	Remarks
	October2023	Wild Life week celebrations Proposed International Webinar on Biodiversity	Firs tweek of October 2nd week of October	
	November2023	Extension activity in Ruralhigh Schools Guest Lecture	**3rd Week of November** **4thWeek of November**	
	December2023	**One day Student Development Programme(FDP)for High school students**	**1st week of December 2023**	
		Field visits, Industrial visits One day workshop for students in laboratory specimen examination and preservation tech. I Mid Exam toIII/V Sem	2rdweekofDecember 20-23Dec	
	January 2024	**Peer Teaching**	2nd weekofJan-2024	

	February 2024	**Workshop on Career opportunities, Prospects in Higher Education with biology background** **National Science Day**	4th week of February 2024 28th February	
	March 2024	**Practical exams Student Projects for Final year** **students.**	1-13March 3rdweekofMarch	

Tentative Budget Estimation for2023-2024

1.Field trips-Rs.50,000

2.Guest lectures-Rs.10,000

4.National Seminar–Rs.1,25,000

5.Purchase of Consumable items for Practicals-Rs.50,000

6.BOS Meetings-Rs.30,000

Total Rs.2,65,000

PG Co-ordinator

Lecturer in Charge

Department of Zoology & Aquaculture

M.Sc. Zoology Program Structure

Code	Title of the paper	Total Marks	Credits	Teaching Hours/ Week
I Year				
I SEMESTER				
I	TOOLS AND TECHNIQUES FOR BIOLOGY	100	4	4
II	BIOSYSTEMATICS, BIODIVERSITY AND EVOLUTION	100	4	4
III	BIOMOLECULES	100	4	4
IV	MOLECULAR CELL BIOLOGY	100	4	4
	PRACTICALS			
I	TOOLS AND TECHNIQUES FOR BIOLOGY LAB	50	2	3
II	BIOSYSTEMATICS, BIODIVERSITY AND EVOLUTION LAB	50	2	3
III	BIOMOLECULES LAB	50	2	3
IV	MOLECULAR CELL BIOLOGY LAB	50	2	3
	II SEMESTER			
I	BIOSTATISTICS & BIO-INFORMATICS	100	4	4
II	ANIMAL PHYSIOLOGY	100	4	4
III	IMMUNOLOGY	100	4	4
IV	MOLECULAR BIOLOGY	100	4	4
	PRACTICALS			
I	BIOSTATISTICS & BIO-INFORMATICS LAB	50	2	3
II	ANIMAL PHYSIOLOGY LAB	50	2	3
III	IMMUNOLOGY LAB	50	2	3
IV	MOLECULAR BIOLOGY LAB	50	2	3

II Year				
III SEMESTER				
I	APPLIED ZOOLOGY	100	4	4
II	DEVELOPMENTAL BIOLOGY	100	4	4
III	METABOLIC CELL FUNCTIONS & REGULATION	100	4	4
IV	PRINCIPLES OF ECOLOGY	100	4	4
	PRACTICALS			
I	APPLIED ZOOLOGYLAB	50	2	3
II	DEVELOPMENTAL BIOLOGY LAB	50	2	3
III	METABOLIC CELL FUNCTIONS & REGULATION LAB	50	2	3
IV	PRINCIPLES OF ECOLOGY LAB	50	2	3
IV SEMESTER				
I	NEUROBIOLOGY & ANIMAL BEHAVIOUR	100	4	4
II	ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY	100	4	4
III	AQUACULTURE	100	4	4
IV	ANIMAL BIOTECHNOLOGY & BIO-ETHICS	100	4	4
	PRACTICALS			
I	NEUROBIOLOGY & ANIMAL BEHAVIOUR LAB	50	2	3
II	ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY LAB	50	2	3
III	AQUACULTURE LAB	50	2	3
IV	ANIMAL BIOTECHNOLOGY & BIO-ETHICS LAB	50	2	3
v	PROJECT-COMPREHENSIVE VIVA-VOCE	100	4	

PROGRAMME OUTCOMES

- M.Sc ZOOLOGY is a fascinating programme that provides a platform to the students to learn not only about the diversity of but also about the chemical and physical structure of biological cells, tissues, organs, organisams, and their physiology.
- Create deep sense of understanding about human health, conservation of nature and natural resources
- Students can easily understand the concept of origin of life, Evolution, basic genetics, blood group inheritance, embryonic development and stem cell technology etc., through this programme.
- Course like Molecular Biology and Neuro Biology attracts the attention of students to emerge as good research scholars

After completing M.Sc Zoology programme students can get of employment opportunities in various fields such as agriculture, aquaculture, and pharmaceutical either in private or government sectors. This programme enables students to establish their own business in the areas like aquaculture and Sericulture etc., Students can also pursue either Ph.D or they may appear for NET or SET to enter into college or university as facult

PITHAPURRAJAH'S GOVERNMENT COLLEGE (A),KAKINADA

PG DEPARTMENT OF ZOOLOGY

P G DEPARTMENT OF ZOOLOGY
LIST OF EXAMINERS

S.No	Name of the Examiners	Subject	Name of the College
01	Prof. G. Mani	Zoology	Andhra University,Visakhapatnam
02	D. K. Rama Rao	Zoology	VSK.College, Visakhapatnam
03	Dr. R. Ramachandra Rao	Zoology	GDC, Rajam
04	K. Sujatha	Zoology	GDC (W),Srikakulam
05	N. Suneetha	Zoology	SRR&CVR GDC (A)
06	M. Vijaya Kumar	Zoology	GDC Kaikuluru
07	Dr. G Vijaya Prathap	Zoology	Dr. VSK GDC (A)
08	A. Arjuna apparao	Zoology	GDC ,Yalamanchala
09	Dr. Samuel Devid Raj	Zoology	Dr. VSK GDC (A)
10	Dr. R. Praveen Dathu	Zoology	GDC, Thiruvuru
11	Dr. V. Sandhya	Zoology	GDC, kaikaluru
12	Dr.Y.PoliNaidu	Zoology	GDC, Srikakulam
13	Dr.P.John Kiran	Zoology	GDC Perumallapuram
14	Dr.P Jaya	Zoology	Dr. V. S. K(A) Vizag
15	Dr. P. R Vani	Zoology	GDC Vijayanagaram
16	Dr. N.Sreenivas	Zoology	GDC, Ramachandrapuram
17	Dr. G. Sithamma	Zoology	Dr. KV R (W),Karnool
18	Sri. k .Durga Rao	Zoology	GDC (A),Rajahmandry
19	Dr.P.S.C.H.PDeepikaRani	Zoology	SKR College(W),

			Rajahmandri
20	Dr.D. Sailaja	Zoology	GDC (A) Rajahmandri
21	U.D.V.P.PullaRao	Zoology	SVKP& Dr.K.SRaju Arts And Science College
22	Dr.ChandrashekarRao	Zoology	SRK Govt Degree College Yanam UT-Puducherry
23	Ravi Teja	Zoology	GDC, Rajamahendravaram

Lecturer in charge-PG Dept of Zoology

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A),KAKINADA

P G DEPARTMENT OF ZOOLOGY

LIST OF QUESTION PAPER SETTERS

DEPARTMENT OF ZOOLOGY

S.N	Name of the Examiners	Subject	Name of the College
01	Dr.Samuel Devid Raj	Zoology	Dr. VSK GDC (A)
02	Dr.P.R Vani	Zoology	GDC Vijayanagaram
03	Dr.Y. Poli Naidu	Zoology	GDC, Srikakulam
04	Dr. P. John Kiran	Zoology	GDC, Perumallapuram
05	Dr. N.Sreenivas	Zoology	GDC, Ramachandrapuram
06	Dr. P Jaya	Zoology	Dr. VSK College(A), Vizag.
07	Dr. G. Mani	Zoology	Andhra University,Visakhapatnam
08	D. K. Rama Rao	Zoology	Dr. VSK (A) Visakhapatnam
09	P.S.C.H.P Deepika Rani	Zoology	SKR College(W),Rajahmandri
10	Dr. G Vijaya Prathap	Zoology	Dr. VSK GDC (A) Visakhapatnam
11	A. Arjun Apparao	Zoology	GDC,Yalamanchala
12	Dr. Praveen Dathu	Zoology	GDC, Thiruvuru
13	Dr. V Sandhya	Zoology	GDC, kaikaluru
14	Dr.G.Sithamma	Zoology	Dr.KVR (W) Karnool
15	U.D.V.P.Pulla Rao	Zoology	SVKP & Dr.K.S Raju Arts And Science College
16	Dr.Chandrashekara Rao	Zoology	SRK Govt Degree College Yanam UT-Puducherry

Lecturer in charge-PG Dept of Zoology

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

I SEMESTER

TOOLS AND TECHNIQUES FOR BIOLOGY

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on tools technique and research biology.
- Understand Principlesandusesofanalyticalinstruments.
- EMPLOYIBILITY OPPORTUNITY IN LABS

UNIT- I

Assay- Definition, Biological & Chemical assay. Microscopy- Principles and applications of light, dark field, phase contrast, fluorescence, transmission, electron, scanning electron microscopes. Different fixation and staining techniques for EM. Freeze-etch, freeze-fracture methods for EM, Image processing methods in microscopy. pH meter: Operation of pH electrodes, Principles and applications of Ion-selective and gas sensing electrodes, Oxygen electrodes.

UNIT - II

Centrifugation -Basic principles of centrifugation, types of centrifuges, applications of preparative and analytical ultra-centrifuges. Principles and applications of sedimentation, lyophilization. Chromatography: Principles and applications of gel-filtration, ion-exchange and affinity chromatography; TLC, GC & HPLC.Electrophoresis – Principle ,instrumentation and applications

UNIT - III

Properties of electromagnetic radiations; Principles,instrumentation and applications of UV, visible, infrared, NMR spectroscopy; Spectrofluorimetry and mass spectrometry. X-ray diffraction, Incorporation of radio-isotopes in biological tissues and cells. Radiolabeling techniques:Detection and measurement of different types of radio-isotopes used in biology, Molecular imaging of radio-active material, safety guidelines.

UNIT - IV

Micro-biological Techniques: Media preparation & sterilization, Inoculation & Growth monitoring, Biochemical Mutants & their uses, Microbial assays.
PCR – Basic principle,Instrumentation and applications of PCR

Suggested Reading Material:

1. Introduction to Instrumental Analysis. Robert Braun. McGraw Hill International Editions
2. A Biologist Guide to Principles and Techniques of Practical Biochemistry. K. Wilson &
K.H. Goulding, ELBS Edn.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology
I Semester Model Question Paper:
Paper – I Tools and Techniques for Biology

Time: 3hours **Max. Marks: 75**
Answer ALL questions.

I. All questions carry equal marks **4X15=60**

Section-A

1. a) What is an assay? Explain different types of assays.

(OR)

b) Write the principle and types of microscopy and elaborate on dark field microscopy.

2. a) Describe the principle and applications of centrifuges with an emphasis on ultracentrifuge.

(OR)

b) Describe various types of chromatographic techniques to separate molecules.

3. a) Describe the principle and applications of spectrophotometer.

(OR)

b) What is autoradiography? Give an account on its biological applications.

4. a) Describe the process of inoculation and growth monitoring.

(OR)

b) Explain in detail about microbial assays.

Section-B

II. Answer any FIVE of the following: **5X3=15**

1. pH meter.
2. Biochemical mutants and their uses.
3. TLC.
4. Spectrofluorimetry.
5. Density gradient centrifugation.
6. Treatment of substrate surfaces.
7. Oxygen electrode.
8. Radioactive counter.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given inthe above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY
I SEMESTER LAB SYLLABUS

PAPER-I: TOOLS AND TECHNIQUES FOR BIOLOGY

1. Spectrophotometer – Estimation of biomolecules
2. Centrifugation – Demonstration and working
3. Separation Techniques - Paper chromatography
4. Electrophoresis – Demonstration and usage
5. PH Meter – Preparation of Phosphate buffer Preparation
6. Microscope –
    a) Demonstration of oil immersion – WBC & RBC
    b) Preparation of tissue for SEM & TEM procedure

I SEMESTER PAPER-I: TOOLS AND TECHNIQUES FOR BIOLOGY SEMESTER END EXAMINATION MODEL PAPER

1.	Major Experiment	12 Marks
2.	Minor Experiment	10 Marks
3.	Principle/Working model	06 Marks
4.	Viva Voce	05 Marks
5.	Record	05 Marks
6.	Total	38 Marks
7.	Lab internal	12 Marks
	Grand Total	50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

I SEMESTER

PAPER-II: BIOSYSTEMATICS, BIODIVERSITY AND EVOLUTION

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on bio systematic and natural resource management
- Analyse diversity of animals.
- Understand the Origin of basic biomolecules
- Understand the concept of living kingdom
- Identify different animal species

UNIT – I **15 Hrs**

Biosystematics-Definition and basic concepts. Importance and applications of biosystematics. Material Basis of Biosystematics. Biological classification-Theories and objectives. Procedures in taxonomy - Taxonomic collections. taxonomic keys. Types of taxonomy-Conventional types, Cytotaxonmy. Chemotaxonomy and Molecular taxonomy. Concept of Zoological Nomenclature.

UNIT – II **15 Hrs**

Origin of basic biological molecules. Abiotic synthesis of organic monomers and polymers. Concept of Oparin and Haldane. Experiment of Miller. Evolutionary time scale – Eras, Periods and epochs. Origin and diversification of eukaryotes - Origin of cells and first organisms. Evolution of eukaryotic cell from prokaryotes. Evolution of eukaryotic genomes. duplication and divergence. Molecular divergences, molecular clocks and molecular drive. Phylogenetics-Molecular tools in phylogeny.

UNIT – III **15 Hrs**

Universal common ancestor and tree of life – three domain concepts of living kingdom. Hierarchical components of bio-diversity. Evolutionary relationships among taxa. Concepts of species. Species category, subspecies and other infraspecific categories. Hierarchy of categories. Speciation- Genetics of speciation, modes of speciation, Patterns and mechanisms of reproductive isolation. Allopatry, sympatry, Convergent evolution, Sexual selection, Co-evolution.

UNIT – IV **15 Hrs**

Concepts of evolution – An overview of evolutionary biology, & theories of organic evolution. Concepts of Neutral Evolution, Population genetics- Populations, gene pool, Gene frequency; Hardy Weinberg law. Concepts and rate of change in gene frequency through Natural selection, mutation, migration and random genetic drift. Phylogenetic gradualism, punctuated equilibrium and origin of higher categories

Suggested Reading Material:

M. Kato. The Biology of Biodiversity, Springer.

J.C. Avice. Molecular Markers. Natural History and Evolution, Chapman & Hall, New York.

E.O. Wilson. Biodiversity, Academic Press, Washington.

G.G. Simpson. Principles of Animal Taxonomy. Oxford IBH Pub. Co.

E. Mayr. Elements of Taxonomy.

E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northern & Co.
Dobzhansky, Th. Genetics and origin of species, Surjeet Publication, Delhi
Dobzhansky, Th., F.J.Ayala, G.L.,Stebbens and J.M. Valentine Evolution, Surjeet Publication, Delhi
Futuyama, D.J. Evolutionary Biology, Suinuer Associates, INC, Publishers, Dunderland
Hartl. D.L.A. Primer of population Genetics, Sinauer Associates, INC Massachusetts.
Jha, A.P. Genes and Evolution, John Publication, New Delhi
King, M. Species Evoluution -the role of chromosomal change. The Cambridge University Press, Cambridge.
Strikberger, M.W. Evolution, Jones and Bartett Publishers, Boston London
TandonRK.1999.Biodiversity, Taxonomy & Ecology. Prithipal singh Scientific Publishers, Jodhpur.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology .

I Semester Model Question Paper:
Paper – II Biosystematics, Biodiversity & Evolution

Time: 3hours **Max. Marks: 75**

Answer ALL questions. All questions carry equal marks **4X15=60**

Section-A

1.a) Define Biosystematics. Explain in detail the importance and applications of Biosystematics

(OR)

b) Discuss about the different taxonomic procedures.

2. a) Discuss in detail about the origin of basic biological molecules.

(OR)

b) Explain about the evolution of eukaryotic genome

3. a) What is the three domain concept of living kingdom. Discuss

(OR)

b) What is Speciation. Explain the mechanism involved in speciation.

4.a) Discuss in detail about the theories of Organic Evolution.

(OR)

b) What is Hardy Weinberg Law. Discuss.

Section-B

Answer any FIVE of the following **5X3=15**

5. Chemotaxonomy

6. ICZN.

7. Molecular Clocks.

8. Eras.

9. Subspecies.

10. Hierarchy of categories.

11. Punctuated equilibrium.

12.Gene pool.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	**ESSAY QUESTIONS 15 MARKS**	**SHORT ANSWER QUESTIONS 3 MARKS**	**MARKS ALLOTED TO THE UNIT**
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08 Of which 4 to be answered**	**08 Of which 5 to be answered**	**144 Marks including choice. Of which 75 Marks to be answered**

NOTE :The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

I SEMESTER LAB SYLLABUSPAPER-II: Biosystematics, Biodiversity and Evolution Lab

1. Invertebrate and Vertebrate Phyla
2. Types of Speciation-Models/Charts
3. Problems on Hardy-Weinberg law
4. Random genetic drift causing change in gene frequency-Practical demonstration.
5. Recent studies in Evolution- Examples

I SEMESTER PAPER-II: Biosystematics, Biodiversity and Evolution Lab Semester End Examination Model paper

8. Major Problem		10 Marks
9. Minor Specimens/Charts/Models	06 Marks	
10. Spottes	4*3	12 Marks
11.Viva Voce		05 Marks
12. Record		05 Marks
Total		38 Marks

Lab internal 12 Marks

Grand Total 50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

PAPER-III: BIOMOLECULES

Learning out comes:

By the completion of this course student can able to

- Understand the structure, Classification of Proteins, carbohydrates, lipids and nucleic acids

UNIT – I **15 Hrs**

Chemical foundations of biology, Amino acids – classification, Physicochemical properties, Peptide bond, Proteins – classification, Physicochemical properties, structural organization of proteins, primary structure, secondary structure, tertiary structure, quaternary structure, Conformation of proteins (Ramachandran plot) - domains, motifs and folds.Denaturation & renaturation of proteins.

UNIT – II **15 Hrs**

Carbohydrates: Definition and classification of carbohydrates, nomenclature, Reaction of Mono-saccharides, Acid derivatives of Mono-saccharides, amino-sugars, Oligosaccharides, structure and properties, Chemistry and biological roles of homo and hetero-polysaccharides, peptidoglycan, glycosaminoglycans, glycoproteins and other glycoconjugates.

UNIT – III **15 Hrs**

Classification of Lipids & Fatty acids and their physicochemical properties, characterization of fats and oil; Structure, properties and biological roles of triacylglycerol, phospholipids, sphingolipids, Gangliosides, Prostaglandins, Thromboxanes, Leukotrienes and steroids.

UNIT – IV **15 Hrs**

Nucleic acids – nitrogen bases, nucleosides, nucleotides, physicochemical properties of nucleic acids, cleavage of nucleic acids by enzymatic and non-enzymatic methods, chemical synthesis of DNA; Nucleic acid sequencing, chromatin structure, Three dimensional structure of DNA; Types of RNA, Structure of RNAs – Secondary and Tertiary structure; DNA denaturation and renaturation.

Suggested Reading Material:

1. Nelson.D.L, Cox. M. M. Lehninger's Principle of Biochemistry. Freeman.
2. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W. Harper's Biochemistry, McGraw Hill.
3. Fundamentals of Biochemistry by Donald Voet.
4. Textbook of Biochemistry West, E.S., Todd, Mason &Vanbruggen, Macmillian&Co.

   Biochemistry, Lubert Stryer.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

M. Sc Zoology
I Semester Model Question Paper
Paper – III Biomolecules

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a) Describe the structure, classification and properties of amino acids.
(OR)
b) Explain about structural characterization of proteins.

2. a) Write about the classification, structure, properties and functions of monosaccharides.
(OR)
b) Explain about polysaccharides and their occurrence in nature.

3. a) Discuss about the classification, structures, properties and biological functions of fatty acids.
(OR)
b) Explain about phospholipids, sphingolipids, prostaglandins, and steroids with their biological role.

4. a) Explain about the structure, types and physicochemical properties of Nucleic acids.
(OR)
b) Write in detail about RNA and its functions.

Section-B

II. Answer any FIVE of the following
5X3=15

1. Peptide bond.
2. Glycoproteins.
3. fatty acids.
4. Chitin.
5. Ramachandran plot.
6. Leukotrienes.
7. mRNA.
8. Denaturation of DNA.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
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P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Max Marks: 75
Time: 3 Hrs

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

I SEMESTER SYLLABUS PAPER-III: Biomolecules lab:

1. Estimation of glycine by formal titration
2. Estimation of proteins by Lowry and Biurett methods
3. Analysis and identification of monosaccharides
4. Estimation of maltose by DNS method
5. Determination of Iodine value of oils
6. Estimation of Cholesterol
7. TLC of Amino acids

I SEMESTER PAPER-III: Biomolecules lab Semester End examination Model paper

8. Major Experiment		12 Marks
9. Minor Experiment		10 Marks
10. Identification tests	2*3	06 Marks
11. Viva Voce		05 Marks
12. Record		05 Marks
13. Total		38 Marks
14. Lab internal		12 Marks
Grand Total		50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

I SEMESTER

PAPER-IV: MOLECULAR CELL BIOLOGY

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on Molecular cell biology.
- Understand cell and cell signalling.
- Recognize cell cycle.
- Analyze genetic code for different amino acids

UNIT – I **15 Hrs**

Introduction: Experimental system in
Cell Biology Biomembranes
Molecular composition and arrangement, functional consequences
Transport across cell membrane: diffusion, active transport, pumps, uniports, symports and antiports
Membrane potential
Co-transport by symporters or antiporters
Transport across epithelia: Transport of macromolecules

UNIT – II **15 Hrs**

Cytoskeleton
Microfilaments and microtubules – structure and dynamics
Microtubules and mitosis
Cilia and flagella
Cell movements – intracellular transport, role of kinesin and dynein, signal transduction mechanisms

UNIT – III **15 Hrs**

Cell-Cell Signaling Cell surface receptors, Second messenger system, MAP kinase pathways, Apoptosis: Definition, mechanism and significance, Cell-Cell adhesion and communication, Ca++ dependent homophillic cell-cell adhesion, Ca++ independent homophillic adhesion, Gap junctions and connections, Integrins, Collagen

UNIT – IV **15 Hrs**

Cell cycle Cyclines and cyclin dependent kinases Regulation of CDK-cycline activity Genome organization Hierarchy in organization Chromosomal organization of genes and non-coding DNA Mobile DNA Morphological and functional elements of eukaryotic chromosomes Intracellular protein traffic Protein synthesis on free and bound polysomes Uptake into ER Membrane proteins, Golgi sorting, post-translational modifications Biogenesis of mitochondria and nuclei Trafficking mechanisms

Suggested Reading Material:

1. Molecular Cell Biology, J. Darnell. H. Lodish and D. Baltimore, Scientific American Book INC, USA.
2. 2. Molecular Biology of the Cell, B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson Garland Publishing INC, New York.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology

I Semester Model Question Paper

Paper – IV Molecular Cell Biology

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.

All questions carry equal marks **4X15=60**

Section-A

1. a) Describe in detail about the transport across the cell membrane.

(OR)

b) Explain the transport of macromolecules across the epithelial layer.

2. a) Explain the role of cytoskeletal elements in defining the structure of a cell.

(OR)

b) Enumerate the role of cytoskeletal elements in mitosis.

3. a) Write in detail about cell adhesion and communication mechanisms.

(OR)

b) Elaborate on the second messenger system in cell signaling.

4. a) Cyclines and cyclin dependent kinases regulate cell cycle, Justify.

(OR)

b) Describe various post-translational mechanisms in protein synthesis.

Section-B

II. Answer any FIVE of the following

5X3=15

1. Membrane potential.
2. Cilia and flagella.
3. Integrins and collagen.
4. Chromosomal organization of genes.
5. Mobile DNA.
6. Symportes and antiports.
7. Microtubules.
8. Apoptosis.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

I SEMESTER SYLLABUS PAPER-IV: Molecular cell Biology lab

1. Light microscopic examination of tissues
2. Preparation of different cell – types Hepatic parenchymal cells, adipocytes, macrophages, neuronal cells, epithelial cells
3. Stages of Mitosis and Meiosis
4. Squash preparation
5. Sub-cellular fractionation – separation of macromolecules

I SEMESTER PAPER-IV: Molecular cell Biology lab Semester End examination Model Paper

15.	Major Experiment		10 Marks
16.	Minor Identification of stages of cell division		06 Marks
17.	Spottes	4*3	12 Marks
18.	Viva Voce		05 Marks
19.	Record		05 Marks
20.	Total		38 Marks
21.	Lab internal		12 Marks

Grand Total 50 Marks

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Particulars of changes in the syllabus

S.NO	Existing title of the paper	Revised title of the paper and the syllabus in cooperated
1	**Paper – I** Tools and techniques for biology Unit - II Unit - IV	1)Electrophoresis - Principle instrumentation and applications 2)Basic principle, Instrumentation and applications of PCR
2	**Paper – III** Biomolecules Unit - I	Physicochemical properties of amino acids and proteins

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
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P G DEPARTMENT OF ZOOLOGY

II SEMESTER

PAPER-I: BIOSTATISTICS & BIOINFORMATICS

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concept on statistics.
- Understand sampling.
- Analyze the process of measures of central tendency
- Create different types of graphs
- Understand basic concepts of computer.

UNIT – I **15 Hrs**

Biostatistics- Introduction and Scope of biostatistics, Sampling. Primary and Secondary data, Frequency distribution, Graphic representation of data- bar diagram, histograms, pie diagram, frequency polygon and Ogive. Measures of central tendency- mean, median, mode. Measures of Dispersion- variance, standard deviation, coefficient of variation

UNIT – II **15 Hrs**

Probability and probability distributions-definition of probability - Bernoulli, binomial, Poisson and normal distributions; Correlation and regression Tests of Significance - hypothesis, critical region and error probabilities, t- test, chi-square test for independence, one way and two- way analysis of variance.

UNIT – III **15 Hrs**

Basic components of computers– hardware (CPU, input, output, storage devices), Software (operating systems), Application software; Introduction to MS-EXCEL. Use of in-built statistical functions for computations of mean, SD, correlation, regression coefficients, Use of bar diagram, histogram, scatter plots, Graphical tools in EXCEL for presentation of data; Introduction to MS-WORD, word processor- editing, copying, moving, formatting, table insertion, drawing flow charts etc; Introduction to Power Point, image and data handling.

UNIT – IV **15 Hrs**

Bio-informatics –Introduction, History, Internet, Knowledge. Review of relevant definitions in molecular biology. Biological Databases –introduction. Examples of databases together with steps involved in use and interpretation of results). Sequence alignment. Phylogenetic analysis with the program PHYLIP, Introduction to computational genomics and proteomics

Suggested Reading Material:

1. Batschelet, E., Introduction to Mathematics for Life Scientists. Springer- Verlag, Berling.
2. Principles of Biostatistics, Pagano M., Gauvreau, K, (2000), Duxbury Press, USA

3. Murray, J.D. Mathematical Biology. Springer – Verlag, Berlin.
4. T.K. Attwood & D.J. Parry-Smith 1999. Introduction to Bioinformatics. Pearson Education Asia.
5. Stephen Misener & S.A. Krawez 2000. Bioinformatics: Methods and Protocol.
6. Bioinformatics: Sequence and Genome Analysis, Mount, D. W. (2nd Ed., 2001), Cold Spring Harbor Laboratory Press, New York, USA
7. Bioinformatics for Dummies, Claverie J. M., Notredame C., (2nd Ed., 2007), Wiley Publishing, Inc., New York, USA
8. Sokal, R.R. & F.J. Rohlf. Biometry. Freeman, San Francisco.
9. Snedecor, G.W. and W.G. Cochran, Statistical methods for environmental biologists. John Wiley Sons, New York.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology

II Semester Model Question Paper

Paper – I Biostatistics and Bio-informatics

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.

All questions carry equal marks **4X15=60**

Section-A

1. a) What is Sampling. Discuss

(OR)

b) Discuss in detail about the Measures of Central tendency.

2. a) Explain in detail about the bivariate analysis.

(OR)

b) What is test of significance. Discuss in detail.

3. a) Describe about the Basic components of the Computer.

(OR)

b) Explain the use of MS excel in for data presentation.

4. a) What are biological databases? Explain.

(OR)

b. Discuss in detail about sequence alignments.

Section-B

II. Answer any FIVE of the following **5X3=15**

1. Frequency distribution.
2. Ogive.
3. Poisson distribution.
4. Chisquare test.
5. MS word.
6. Power point.
7. Genomics.
8. Phylogenetic analysis.

ABC PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
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P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

II SEMESTER

PRACTICALS PAPER-I: Biostatistics & Bioinformatics lab:

1. Sampling and Frequency distribution
2. Graphical presentation of the data
3. Measures of Central Tendency – Mean, median and mode
4. Measures of Dispersion – Standard deviation and Coefficient of variation
5. Correlation and Regression
6. Nucleic acid and protein databases.
7. Retreval and analysis of DNA or protein sequence from NCBI
8. Sequence Alignment in excel sheet for data processing.

II SEMESTER PAPER-I: Biostatistics & Bioinformatics lab Semester End Examination Model paper

22. Major Problem	12 Marks
23. Minor Problem	10 Marks
24. Graphical presentation of data	06 Marks
25. Viva Voce	05 Marks
26. Record	05 Marks
27. Total	38 Marks
28. Lab internal	12 Marks
Grand Total	50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

II SEMESTER

PAPER-II: ANIMAL PHYSIOLOGY

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on general and comparative physiology.
- Understand different concepts of osmoregulatiion thermoregulation hoemothermic poikiothermic nature of animals.
- Compare different physiological processes in different animals.
- Generalize Physiological adaptations of animals to different environments

UNIT – I **15 Hrs**

Muscle: Molecular Structure and properties of Muscle and muscle contraction , Slidingfilament theory

Blood and Circulation – Blood corpuscles, haemopoiesis and formed elements, plasmafunction, blood volume, blood volume regulation, Blood groups, Haemoglobin, immunity, haemostasis , factors affecting blood coagulation

Nerve impulses , Synaptic transmission & Neurotransmitters, **Nervous system :** Neurons,action potential, gross neuro anatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture

UNIT – II **15 Hrs**

Thermoregulation: Comfort zone, body temperature- Physical, chemical, neural regulation, acclimatization.

Osmoregulation in aquatic and terrestrial Environments mechanism of ionic regulation
Stress Physiology: Responses to biotic and abiotic factors: Light, temperature, salts

UNIT – III **15 Hrs**

Digestion: absorption, energy balance of BMR

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

Excretory System : Comparative physiology of excretion, Kidney, Urine formation, Urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.

Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized tissue ECG - its principle and significance, heart as a pump, blood pressure.

UNIT – IV **15 Hrs**
Sensory physiology: Photoreceptors, Auditory, Chemoreceptor, Mechanoreceptors

Physiological Adaptation: Marine environment, shores, Estuaries Fresh water and Terrestrial environment Role of Yoga and meditation on Health.

Suggested Reading Material:

1) Eckert, R .Animal Physiology: Mechanisms and adaptation, W .H.Freeman and Company, New York
2) Hochackka,P.W. and Somero, G.N.Biochemical adaptation,Princeton,N.J.
3) Hoar,W.S.General and comparative Animal physiology prentice Hall of India.
4) Schimdt Neisen,Animalphysiology ,Adaptation and Environment,Cambridge.
5) Stamd,F.L.Physiology: A regulatory systems approach,Macmillan publishing Co., NewYork.
6) Punmer, L.Practical Biochemistry,Tata McGraw-Hill.
7) Prosser,C.L. and Brown .Comparative Animal physiology.
8) Wilson,K.and Walker, j.Practical Biochemistry.
9) Willmer, PIG Sone and 1.Johnson, Environmental physiology,BlackWell Science,Oxford, U.K .944p
10) Newell,R.C.(ed)1976.Adaptation to environment, Essays on the physiology of marine animals. Butterworths,London,UK539pp
11) Townsend ,C.R and P.Callow, physiological Ecology An evolutionary approach resource use, Blackwell Sci.publication, Oxford, UK.

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KAKINADA

P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology
II Semester Model Question Paper
Paper-II Animal Physiology

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a) Write briefly molecular structure and properties of muscle, Add note on sliding filament theory.

(OR)

b) Write about haemopoiesis, Haemoglobin, and haemostasis. Add note on factors affecting blood coagulation.

2. a) Write about osmoregulation in aquatic Environments.

(OR)

b) Write about response to biotic and abiotic factors.

3. a) Write about the comparative physiology of excretion, Urine formation, Urine concentration, and waste elimination.

(OR)

b) Write about comparative anatomy of heart structure, myogenic heart. Add a note on blood pressure.

4. a) Write about photoreceptors, Auditory, Mechanoreceptors.

(OR)

b) Explain fresh water and terrestrial environment.

Section-B

II. Answer any FIVE of the following

5X3=15

1. Synaptic transmission & Neurotransmitters.
2. Neural control of muscle tone and posture.
3. Yoga and meditation.
4. Chemoreceptor.
5. Acclimatization.
6. Micturition.
7. BMR.
8. ECG.

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P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE :The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

II SEMESTER PRACTICALSPAPER-II: Animal Physiology lab:

1. Digestive enzymes
2. Effect of body size vs oxygen consumption
3. oxygen consumption vs temperature
4. Osmotic regulation
5. Ion concentration measurements
6. Spotters
7. Dissection- Pituitary gland of fish
8. Dissection- Nervous system of prawn.

II SEMESTER PAPER-II: Animal Physiology lab Semester end examination Model paper

29. Major Dissections		12 Marks
30. Minor Experiment		10 Marks
31. Spottes	2*3	06 Marks
32. Viva Voce		05 Marks
33. Record		05 Marks
34. Total		38 Marks
35. Lab internal		12 Marks
Grand Total		50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

II SEMESTER

PAPER-III: IMMUNOLOGY

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of immunology
- Differentiate innate and acquired immunity.
- Understand the concept of antigen antibody interaction.
- Understand th econcept of Immunological tests

UNIT – I **15 Hrs**

Immunity-innate and acquired, innate immune mechanisms, acute phase reactants, properties of acquired immunity

Immunogens and antigens- Properties, factors governing immunogenicity, haptens, epitopessize and identification. Adjuvants- properties and mechanism of action.

Immunoglobulins- structure, isotypes, allotypes and idiotypes. Functions of antibody inrelation to structure

UNIT – II **15 Hrs**

Antigen-antibody interactions- affinity of antibody, avidity, bonus effect, classical precipitinreaction, antigen-binding site of antibody, forces involved in antigen - antibody complex formation.

Lymphoid tissue- primary and secondary lymphoid organs, structure and cellularorganization. Lymphocyte traffic.

Cells involved in the immune response- T cells, B cells, CD antigens, neutrophils,eosinophils and natural killer cells.

Antigen presentation – pathways of antigen processing and presentation of intracellular andextracellular antigens.

UNIT – III **15 Hrs**

Antibody response - Primary and secondary antibody response, antibody response to haptens,enumeration of antibody-forming cells, T- dependent and T- independent antigens.
Macrophage- role in immune response and activation.

Cell mediated immunity- helper, cytotoxic, suppressor T cells.*In vivo*and*in vitro*assays forassessment of cell mediated immunity

Complement- classical and alternative pathways of activation. Regulation of complementactivation and functions.

Antigen receptors -On T and B cells. Generation of receptor diversity.

Hypersensityvity- types of hypersensitivity and mechanism of reaction

UNIT – IV

Development of immune system- T cell ontogeny in thymus, thymic hormones, cell development. **Immunological tolerance -** pathways of tolerance and mechanisms of tolerance in T and B cells. **Immunological tests-** Immunodiffusion, immunoelectrophoresis, immunofluorescence, radioimmunoassay and enzyme-linked immunosorbent assay.

15 Hrs

Suggested Reading Material:

1. Immunology and Immunopathology by Stewart.
2. Cellular and Molecular Immunology by Abul K. Abbas *et. al*.
3. Textbook of Immunology by Barret.
4. Essential Immunology by Roitt, Brostoff, Male, Harcourt Brace &Company (5^{th} Ed), Mosby (6^{th} Ed).
5. Immunology by Kuby, Richard A. Goldsby, Thomas, J. Kindl, Barbara A.Osbome, Freeman & Company, Mosby publishers.
6. Immunobiology – The immune system in Health disease by Janeway and Travers.
7. Immunology – An introduction by Tizard.
8. Text book of Immunology by Unani and Benacerraf.
9. Fundamentals of Immunology by Paul.
10. Immunology – A short course by Benjaini, Sunshine and Lesrowitz.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
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P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology
II Semester Model Question Paper
Paper - III Immunology

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a) What is innate immunity? Describe various innate immune mechanisms.
(OR)
b) Describe the structure and functions of various types of immunoglobulins.

2. a) Write an essay on antigen-antibody interactions.
(OR)
b) What are the cells involved in immune response? Describe their role.

3. a) Elucidate the mechanisms of antibody response to antigens.
(OR)
b) Write about Classical and alternative activation of complement.

4. a) What is immune tolerance? Elucidate the mechanisms of tolerance in T and B cells.
(OR)
b) Write an essay on immunological tests used in molecular and diagnostic laboratories.

Section-B

II. Answer any FIVE of the following: **5X3=15**

1. Acquired immunity.
2. Haptens.
3. Lymphocyte traffic.
4. Antigen presenting cells.
5. Cytotoxic T-cells.
6. Antigen receptors.
7. ELISA.
8. Thymic hormones.

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P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

II SEMESTER PRACTICALS
PAPER-III: Immunology lab:

1. Blood grouping
2. Widal test for detection of typhoid bacteria
3. VDRL Test
4. SRID
5. Ouchterlony DID
6. Immunoelectrophoresis
7. Blood clotting time and bleeding time.
8. RIA -Demonstration
9. ELISA - Demonstration

PAPER-III: Immunology lab Semester End Examination Model Paper

36.	Major Experiment	12 Marks
37.	Minor Experiment	10 Marks
38.	Skill Experiment	06 Marks
39.	Viva Voce	05 Marks
40.	Record	05 Marks
41.	Total	38 Marks
42.	Lab internal	12 Marks

Grand Total 50 Marks

PTHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
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P G DEPARTMENT OF ZOOLOGY

II SEMESTER

PAPER-IV: MOLECULAR BIOLOGY

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of molecular biology.
- Differentiate the structure of DNA and RNA.
- Understand molecular mechanisms of DNA repairing system.
- Understandmolecularmechanismsof translation,translation

UNIT – I **15 Hrs**

History and scope of Molecular Biology

DNA Structure and Replication

- Prokaryotic and Eukaryotic DNA Replication
- Mechanics of DNA Replication
- Enzymes and accessory proteins involved in DNA Replication

UNIT – II **15 Hrs**

Transcription

- Prokaryotic Transcription
- Eukaryotic Transcription
- RNA Polymerases

Post-transcriptional modifications in RNA

- Splicing
- Cap formation
- Tail formation
- Nuclear Export of m-RNA

UNIT – III **15 Hrs**

Translation

- Genetic Code
- Prokaryotic and eukaryotic Translation
- Mechanisms of initiation, elongation and termination
- Regulation of translation

Antisense and Ribozyme technology

- Molecular mechanisms of antisense molecules
- Inhibition of splicing, polyadenylation and translation

UNIT – IV **15 Hrs**

Recombination and Repair

- Holiday junction, gene targeting and gene disruption RecA and other Recombinases DNA repair mechanisms

Molecular mapping of genome

- Genetic and physical maps
- Physical mapping and map-based cloning
- Southern fluorescence insitu hybridization (FISH) for genome analysis

Suggested Reading Material:

1. J.D. Watson, N.H. Hopkins, J.W. Roberts, J.A. Steitz and A.M. Weiner. Molecular biology of Gene. The Benjamin/Cummings Pub. Co. Inc., California.
2. Alberts, B., D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson. Molecular Biology of the Cell. Garland Publishing Inc., New York.
3. Benjamin Lewin, Gene IV, Oxford University Press, U.K.
4. Meyers, R.A. (Eds.) Molecular Biology and Biotechnology : A comprehensive desk reference. VCH Publishers Inc., New York.
5. Sambrook, J., E.F. Fritch and T. Maniatis. Molecular cloning : A Laboratory Manual. Cold Spring Harbor Laboratory Press, New York.
6. Daber, P.D. Introduction to practical Molecular Biology.John Wiley & Sons Ltd., New York.
7. Brown, T.a. (Eds.). Molecular Biology Lab Fax. Bios Scientific Publishers Ltd., Oxford.

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II Semester Model Question Paper
Paper - IV Molecular Biology

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a) Explain the prokaryotic and eukaryotic DNA replication.
   (OR)
   b) Explain the mechanics of DNA replication.

2. a) Explain the post transcription in prokaryote and eukaryotic transcription.
   (OR)
   b) Explain the post transcriptional modifications in RNA.

3. a) Explain the mechanisms of prokaryotic and eukaryotic translation.
   (OR)
   b) Explain the molecular mechanism of the antisense molecules and add a note on inhibition of splicing.

4. a) Write about gene targeting and DNA repair.
   (OR)
   b) Explain the types of mapping and molecular mapping of genome.

Section-B

II. Answer any FIVE of the following **5X3=15**

1. Enzymes involved in DNA replication.
2. RNA polymerases.
3. Genetic code.
4. FISH.
5. Necessary proteins involved in DNA replication.
6. Genetic map.
7. Cap formation in post-translational modifications.
8. Structure of DNA.

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P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Max Marks: 75

Time: 3 Hrs

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

P G DEPARTMENT OF ZOOLOGY

II SEMESTER PRACTICALS

PAPER-IV: Molecular Biology Lab

1. Estimation of DNA (Colorimetric method)
2. Estimation of RNA in tissue (Colorimetric method)
3. Fulgen reaction method for DNA localization
4. Localization of RNA by methyl green pyronin – 'Y'
5. SDS PAGE of serum proteins.
6. Testing purity of DNA

PAPER-IV: Molecular Biology Lab Semester End examination Model paper

1.	Major Experiment :	12 Marks
2.	Minor Experiment	10 Marks
3.	Explanation of the Principle of Experiment	06 Marks
4.	Viva Voce	05 Marks
5.	Record	05 Marks
6.	Total	38 Marks
	Lab internal Marks	12 Marks
	Grand Total	**50 Marks**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(AUTONOMOUS) KAKINADA

P G DEPARTMENT OF ZOOLOGY

III SEMESTER

PAPER-I: APPLIED ZOOLOGY

UNIT - I **15 Hrs**

Microbial fermentations: Batch, continuous culture techniques, Design, operation, principle and types of fermenters and biosensors. Industrial production of chemicals - solvents (alcohol), acids (citric, lactic), antibiotics (penicillin and streptomycin), Vitamins (Riboflavin and Vitamin B12), amino acids (lysine and glutamic acid), Single Cell Protein (SCP).

UNIT - II **15 Hrs**

Animal Breeding: Principles, Structure of livestock breeding – poultry, sheep and cattle. Marker - assisted selection. Artificial insemination (AI) techniques, *in vitro* fertilization. Preservation of endangered species. Germplasm bank.

UNIT - III **15 Hrs**

Production of transgenic animals and their applications: mice, sheep and fish. Molecular farming and animal cloning. Somatic cell nuclear transfer in humans – Legal and ethical aspects. Potential applications of transgenic animals – Animal models for diseases and disorders.

UNIT - IV **15 Hrs**

Bioremediation - solid and liquid waste treatment. Biomass and energy production from waste. Bioleaching – Microbial recovery of metals and acid mine drainage. Water pollution and its control. Microbiological approach of waste water treatment.

Biofertilizers – Blue green algal fertilizers – Azolla, Anabaena, symbiotic association. Sea weed fertilizers. Mycorrhizal biofertilizers, bacterial fertilizers. Biopesticides in agricultural production.

Suggested Reading Material:

1. Fermentation Technology, Standury (Pergman press)
2. Industrial Microbiology, L.E.Casida, JR. New Age International.
3. Industrial Microbiology by Presscot and Dunn.
4. Biotechnology by BD Singh (Kalyani).
5. Plant Biotechnology by A. Slater, N.W. Scott and M.R. Fowler (Oxford University press). Biotechnology in Agriculture by Swaminathan, M.S (Mc. Milllan India Ltd).
6. Biotechnology and its applications to Agriculture, by Copping LG and P.Rodgers (British Crop Projection).

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
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P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology - III Semester
Model Question Paper:
Paper - I :Applied Zoology Time:

3hours **Max. Marks: 75**

Answer ALL questions.

All questions carry equal marks
Section-A

1.a) What are fermenters? Write about principle and types of fermenters.

OR)

b) Explain in detail about the industrial production of pencillin and riboflavin

2. a) Explain in detail about the industrial production of pencillin and riboflavin

(OR)

b) Explain artificial insemination technique.

3. a) Elucidate on breeding of animals through artificial insemination.

(OR)

b) Describe the production of transgenic animals and their applications in health and disease

4. a) Explain the mechanism of recovery of metals and acid mines from drainage using bioresources

.(OR)

b) Discuss in detail on the need and usage of biopesticides in agricultural production.

Section-B

5 X 3 = 15

Answer any **FIVE** of the following:

a) Germplasm bank.

b) Molecular cloning.

c) Bioremediation.

d) Single cell protein.

e) Recombinant vector antigens.

f) Somatic cell nuclear transfer.

g) Anabaena.

h) Marker-assisted technology.

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KAKINADA

P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Max Marks: 75

Time: 3 Hrs

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY
III SEMESTER LABSYLLABUS
Applied Zoology lab:

1. Production of protease/amylase by batch fermentation.
2. Selective isolation of Actinomycetes from soil samples
3. Microbial growth curve.
4. Production of alcohol by S.cerevisiae and its estimation.
5. Production of streptomycin by fermentation.
6. Production of citric acid by A.niger.
7. Production of red wine from grapes.
8. Determination of suspended solids in industrial effluents.
9. Removal of color of the industrial effluents by biological methods.
10. Reduction of pollution load in effluents by biological methods (laboratory models).

III SEMESTER PAPER-I: Applied Zoology lab:

SEMESTER END EXAMINATION MODEL PAPER

1.	Major Experiment	12 Marks
2.	Minor Experiment	10 Marks
3.	Biological methods for pollution reduction	06 Marks
4.	Viva Voce	05 Marks
5.	Record	05 Marks
6.	Total	38 Marks
7.	Lab internal	12 Marks

Grand Total 50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
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P G DEPARTMENT OF ZOOLOGY

III SEMESTER

PAPER-II: DEVELOPMENTAL BIOLOGY

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts on developmental biology
- Analyze the process of gametogenesis.
- Understand gene regulation.

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UNIT – I **15 Hrs**

Gametogenesis, Fertilization and Cleavage:
Introduction to animal development, pattern of embryonic development, Fertilization (species specific recognition of egg and sperm in sea urchin, acrosome reactions, fast and slow block to polyspermy); oogenesis & Spermatogenesis. Cleavage (patterns, molecular mechanism of cleavage)

UNIT – II **15 Hrs**

Early embryonic Development:
Gastrulation (frog, chick) Neurulation (Establishment of neural tube, Tissue architecture of CNS, cerebral organization, differentiation of neural tube, neurons and neural crest cells); Specification of cell fate and cellular basis of morphogenesis, Autonomous development, Regulative development, Syncytial development.

UNIT – III **15 Hrs**

Organogenesis:
Mechanism of cellular differentiation – Ectoderm (CNS and Epidermis), Mesoderm (Chorda Mesoderm, paraxial, intermediate and lateral plate mesoderm) and Endoderm (digestive tube and its derivatives), Cell-cell communication, Development during organ formation: introduction and competence, paracrine and other factors (the inducer molecules), Signal transduction cascades. Birth defects -Malformations & Disruptions.

UNIT – IV **15 Hrs**

Gene expression during development:
Establishment of body axes. Anterior-posterior polarity-role of maternal effector, segmentation and homeotic selector genes, Dorso-Ventral polarity. Differential gene expression during animal development, Differential gene transcription, Selective nuclear RNA processing and mRNA translation. Differential protein modification. Regeneration of organs.

Suggested Reading Material

1. Scott F. Gilbert. Developmental Biology, Latest Edition, Sinauer Associates, Inc., Publishers Sunderland, Massachusetts, USA
2. L. Wolpert Rosa Beddington Thomas M. JessellPeter Lawrence Elliot M. Meyerozitz and Jim Smith (2002) Principles of Development Lates Edition Oxford University Press.
3. JMW Slack (2005) Essential Developmental Biology Latest Edition Blackwell Publishing Australia.
4. Mac E. Hadley Endocrinology Sixth Edition Prentice hall International, Inc. Arizona (For Section 9).
5. Medical Implications of Developmental Biology

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P G DEPARTMENT OF ZOOLOGY

M.ScZoology

III Semester Model Question Paper:

PAPER – II DEVELOPMENTAL BIOLOGY

Time: 3hourMax. Marks: 75

I. Answer ALL questions.

All questions carry equal marks 4X15=60

Section-A

1. a) Describe in detail about the process of fertilization

(OR)

b) Write an account on molecular mechanism of cleavage and cleavage patterns.

2. a) Give a detailed account on chick gastrulation.

(OR)

b) What is neurulation .Explain the process of neurulation with an example.

3. a) Explain the mechanism of cellular differentiation of ectoderm into CNS &Epidermis.
(OR)
b) How does cell to cell communication help in organ formation during development?

4. a) How does differential gene expression occurs during animal development.
(OR)
b) Write about selective nuclear RNA processing and mRNA translation.

Section-B

II. Answer any FIVE of the following 5X3=15

a) Blocking of polyspermy.

b) Regulative development.

c) Endoderm derivatives.

d) Homeotic selector genes.

e) Structure of sperm.

f) Autonomous development.

g) Signal transduction cascades.

h) Regeneration of organs.

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KAKINADA

P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

III SEMESTER LAB SYLLABUS
PAPER-II: DEVELOPMENTAL BIOLOGY

1. Estimation of shell calcium during the development of chick and its role
2. Estimation of phosphorous during the development of chick
3. Observation of spermatozoa in vertebrates
4. Effect of Iodine in the metamorphosis of frog.
5. Effects of Thyroxine in the metamorphosis of frog.
6. Preparation of sperm smear from goat testis
7. Observation of slides: Cleavage, Morula, Blastula, Gastrula
8. Neurulation slides: Neural plate, Neural fold, Neural tube.
9. Incubation of egg in natural method.

I SEMESTER PAPER-II: Developmental Biology Lab
Semester End Examination Model paper

8.	Major Experiment	10 Marks
9.	Minor Experiment	06 Marks
10.	Slides 4x3	12 Marks
11.	Viva Voce	05 Marks
12.	Record	05 Marks
13.	Total	38 Marks
14.	Lab internal	12 Marks

Grand Total 50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
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P G DEPARTMENT OF ZOOLOGY

III SEMESTER

PAPER-III: METABOLIC CELL FUNCTIONS & REGULATION

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of cell function and regulation
- Understand the basic principles of thermodynamics.
- Classify different types of enzymes.
- Generalize the process of immobilization process.

UNIT – I 15 Hrs

Thermodynamic principles and steady-state conditions of living organisms
Organization and methods to study metabolism
Degradation of glucose, palmitic acid, phenylalanine

UNIT – II 15 Hrs

Energy metabolism and high energy compounds
Redox potentials
Mitochondrial electron transport chain
Oxidative phosphorylation
Storage and utilization of biological energy
Biosynthesis of Urea, Glucose, Glycogen, Oleic acid and prostaglandins

UNIT – III 15 Hrs

Nature of Enzymes
Classification and nomenclature of enzymes
Kinetic analysis of enzyme catalysed reactions
Metabolic profile of adipose, neural, hepatic, and muscle tissues

UNIT – IV 15 Hrs

Metabolic Engineering

Immobilized enzymes and their applications

Suggested Reading Material:

1. Voet, D. and J.G. Voet. Biochemistry. J. Wiley & Sons 2. Foster, R.L. Nature of

Enzymology 3. Lodish et. al. Molecular Cell Biology 4. Annual Reviews of Biochemistry 5. Garett and Grisham. Biochemistry.

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P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology

III Semester Model Question Paper

Paper – III METABOLIC CELL FUNCTIONS & REGULATION

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.

All questions carry equal marks **4X15=60**

Section-A

1. a) Describe the thermodynamic principles suitable for living organisms.

(OR)

b) Write notes on degradation of glucose.

2. a) Explain the electron transport chain in mitochondr

(OR)

b) Explain the biosynthesis of prostaglandins.

3. a) Write an account on classification and nomenclature of enzymes.

(OR)

b) Discuss on the metabolic profile of neural tissue.

4. a) Explain the process of immobilization of enzymes

(OR)

b) What is metabolic engineering? Elaborate.

Section-B

II Answer any FIVE of the following:5X3=15

a) Methods to study metabolism.

b) Oxidative phosphorylation.

c) Kinetic analysis of enzymes.

d) Metabolic profile of adipose.

e) Degradation of palmitic acid.

f) Storage of biological energy.

g) Metabolic profile of tissue.

h) Applications of immobilized enzymes.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

IIISEMESTER SYLLABUSPAPER III:
METABOLIC CELL FUNCTIONS &REGULATION LAB

1. Enzyme kinetics
2. Dehydrogenase assay
3. Lactic acid estimation
4. Proteins, glucose and Lipid estimations
5. DNA, RNA estimation
6. Transaminases

III SEMESTER PAPER-III: Metabolic cell function and regulations lab:
Semester End examination Model paper

15. Major Experiment		12 Marks
16. Minor Experiment		10 Marks
17. Principle / working model	06 Marks	
18. Viva Voce		05 Marks
19. Record		05 Marks
20. Total		38 Marks
21. Lab internal		12 Marks
Grand Total		50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

Particulars of changes in the syllabus

S.NO	Existing title of the paper	Syllabus in cooperated
1	**Developmental Biology** **Unit – I** **Practicals**	• Fertilization (species specific recognition of egg and sperm in sea urchin. • Spermatogenesis • Incubation of egg in natural method.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

III SEMESTER

PAPER-IV: PRINCIPLES OF ECOLOGY

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of ecology.
- Understand Inter-specificrelationships
- Generalize different biogeo -chemical cycles

UNIT – I **15 Hrs**

Introduction to Ecology, Environmental concepts, Ecosystem structure and function-Biotic and Abiotic environments.Habitat and Ecological Niche. Dynamics of ecosystem- energy flow, food chain, food web, Ecological pyramids. Concepts of primary productivity.Mineral cycling.

UNIT – II **15 Hrs**

Population Ecology- Characteristics of population. Population growth. Growth models. Optimal yield. Life histories strategies(r and K Selection). Intraspecific and Interspecific interactions. Concept of metapopulation. Population Demography and life tables- mortality, natality, age structure,fecundity, net reproductive rate,

UNIT – III **15 Hrs**

Evolutionary ecology. Community ecology- Nature of communities. community structure and attributes. Community composition. Concept of Ecological succession. Patterns of biodiversity, Latitudinal and altitudinal gradients: Theory of Island biogeography. Biogeographic realms of the world. Biogeographic zones of India and faunal diversity. Hotspots the world & in India.

UNIT – IV

Environmental stress- environment pollution.Major drivers of bio-diversity change. Biodiversity status, Monitoring and documentation. Biodiversity conservation-Threats, major approaches to management. IUCN classification of wild life. Indian case studies on conservation/management strategy. Concepts of sustainable development.

15 Hrs

Suggested Reading Material:

1. Begon, M., J.L. Harper and C.R. Townsend. Ecology, Individuals, Populations and Communities.Blackwell Science, Oxford, UK.
2. Koromondy, E.J. Concepts of ecology. Prentice Hall, New Delhi.
3. Clarke, G.L. Elements of Ecology, John Wiley & Sons, New York.
4. Odum, E.P. Fundamentals of Ecology. W.B. Saunders, Philadelphia.

5. Krebs, C.J. Ecology. Harper & Row, New York.
6. Chapman JL and Reiss MJ. 1995. Ecology Principles and Application. Cambridge University Press.
7. Trivedy RK, Goel and Trisa. 1997. Practical methods in Ecology &Environmental Science.
8. Agarwal KC. 1998. Biodiversity. India.
9. Peggy I. Fieldler and Perer M. Kareiva. 1997. Conservation Biology.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology
III Semester Model Question Paper
PAPER – IV PRINCIPLES OF ECOLOGY

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a) Write in detail about the abiotic component of the ecosystem.

(OR)

b) Explain the Concept of Primary Productivity.

2. a) Discuss about the Population growth.

(OR)

b) Expalin about the different types of species interactions

3. a) What is an Ecological Community. Explain in detail about the structure and form of the Community

(OR)

b) Discuss about the biogeographic realms of the world.

4. a)Discuss in detail about the major drivers responsible for environmental stress.

(OR)

b) What is biodiversity conservation? Discuss.

Section-B

II Answer any FIVE of the following **5X3=15**

a) Food chain
b) Ecological Pyramids
c) Metapopulation
d) Optimal yield
e) Ecological Successsion.
f) Hotspots
g) Sustainable development
h) IUCN.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY
III SEMESTER SYLLABUS PAPER-IV:PRINCIPLES OF ECOLOGY

1. Ecosystem-structure and function-demonstration.
2. Populations interactions.
3. Local fauna- Identification. Conservation activities for any
4. Enumeration of Plankton.
5. Estimation of Population-Plant/Animal sps by quadrant method
6. Diversity indices- Abundance, dominance and Diversity
7. Creation of Life tables

III SEMESTERPAPER-IV: Principles of Ecology
lab Semester End examination Model Paper

22.	Major Experiment	10 Marks
23.	Minor Experiment	06 Marks
24.	Creation of life table	12 Marks
25.	Viva Voce	05 Marks
26.	Record	05 Marks
27.	Total	38 Marks
28.	Lab internal	12 Marks
	Grand Total	50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY
IV SEMESTER

PAPER-I: NEUROBIOLOGY & ANIMAL BEHAVIOUR

UNIT – I **15 Hrs**

Introduction to Neurobiology: Organization of the Brain: Functional Anatomy of the brain. Systems neurobiology – Visual systems, Hearing systems. Neurons, astrocytes, oligodendroglia, Schwaan cells, microglia, ependymal cells, neuroglial cell interaction

UNIT – II **15 Hrs**

Neuron: Passive and membrane properties, information flow in neurons, compartments, spike initiation zone. Neuron – Excitability, conductivity, Membrane potentials (Resting & Action), Single neuron recording, Patch-clamp recording, Nerve Impulse, Refractory period, The Nernst equation and Goldman equation.

UNIT – III **15 Hrs**

Signaling and Channels: Ion and Voltage-gated Channels. Sodium, Potassium &Calcium channels structure and function.

Neural Communication: Synapses- Electrical and Chemical synapses, Nerve-muscle synapse and signaling, Neurotransmitters (synthesis, storage and function), post-synaptic action of neurotransmitters, neuro-transmitter gated ionic channels; Dale's principle drugs affecting their activities, ionotropic and metabotropic receptors. Synaptic Integration, Synaptic Plasticity.

UNIT – IV **15 Hrs**

Cognitive Neuroscience: Nerve cells and their network, Role of limbic System in cognition, Cognitive skills, Learning and memory- Conditioning, habituation, insight learning, association learning. Imprinting – case studies of animal models

Suggested Reading Material:

1. Fundamental Neuroscience by Haines, Duane E., Churchill Livingston, New York.
2. Principles of Neural Science by Kandel Eric, James H. Schwartz, and Thomas Jessel; 4th ed. Mc Graw-Hill.
3. Basic Neurochemistry: Molecular, Cellular and Medical Aspects, by George M.D. Siegel, R. Wayne Albers, Scott Brdy, Donald M. D. Price; Seventh Edition; Elsevier Academic Press.
4. Foundations of Neurobiology by Fred Delcomyn, N.Y. Freeman.
5. The Neuron: Cell and Molecular Biology 3ed by Irwin B. Levitan, Leonard K. Kaczmarek, (2002), Oxford University Press.
6. Neuroscience (Book with CD-ROM) 3ed by Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Lawrence C. Katz, Anthony-Samuel LaMantia, Jomes O. McNamara, S. Mark Williams (2004) Sinauer Assoc.,
7. Fundamental Neuroscience, 2ed by Larry R. Squire, Floyd E. Bloom, Susan K. McConnell, James L. Roberts (Editor), Nicholas C. Spitzer, Michael J. Zigmond (2002) Academic Press.
8. An Introduction to Animal Behaviour, 5th Edition by Aubrey Manning and Marian Stamp Dawkins.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology
IV Semester Model Question Paper
Paper – I NEUROBIOLOGY& ANIMAL BEHAVIOUR

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)Describe in detail the flow of information in neurons
(OR)
b) Derive Nernst equation

2. a) What is Action potential. Explain the propagation of action potential across the neuron.
(OR)
b) Discuss the types of channels involved in signaling

3. a)Write an account on Catecholamine synthesis, release and uptake

(OR)
b) Write an account on organization of the brain.

4. a) Discuss the behavior in insects with examples.
(OR)
b) What are cognitive skills. Explain different types of learning with examples

Section-B

II. Answer any FIVE of the following **5X3=15**

a) Neuroglial cell interaction
b) Metabotropic receptors.
c) Cerebellum
d) Imprinting.
e) Structure of neuron
f) Sodium channel
g) Temporal labe.
h) Memory

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Max Marks: 75
Time: 3 Hrs

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

IV SEMESTER PRACTICALS

PAPER-I: Neurobiology and Animal Behaviour lab

1. An introduction to animal behaviour – Animal Psychology – Classification of behavioural patterns
2. Perception of the environment – Examples
3. communication – Examples from invertebrates and vertebrates (Terrestrial, Aerial, Aquatic habitats)
4. Ecological aspects – Food selection, optimal foraging, prey and predator, HostParasite relations
5. Social behaviour – Aggregations – Examples from fishes, birds and mammals, social organization - insects
6. Reproductive behaviour – mating systems, sexual selection,parental care
7. Biological rhythms – examples – migration of fish, turtle and bird.

IV SEMESTER PAPER-I: Neurobiology & Animal Behaviour lab Semester End Examination Model paper

29.	Major	12 Marks
30.	Minor	10 Marks
31.	Behavioral patterns	06 Marks
32.	Viva Voce	05 Marks
33.	Record	05 Marks
34.	Total	38 Marks
35.	Lab internal	12 Marks

Grand Total 50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

IV SEMESTER

PAPER-II: ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of Stem cells
- Understand Hybridoma technology
- Understand the cancer biology
- Know the Clinical applications of stem cell therapy

UNIT – I **15 Hrs**

Introduction to cell and tissue culture, Components of cell culture: cell types and cell lines,
different substrates, Preparation of cell lines: viral and chemical induction; maintenance of
cell lines. Types of culture processes.
Cancer Biology: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells
with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

UNIT – II **15 Hrs**

Hybridoma technology: methods of cell fusion, hybrid selection, cloning and in vitro & in vivo methods of hybridoma propagation, production and characterization of monoclonal antibodies and their applications. Vaccines: Conventional, peptide and recombinant vaccines.
Production and characterization of recombinant chimeric & multimeric antibodies, immunoadhesins& immunotoxins and their uses, Principle of diagnostic kit development.

UNIT – III **15 Hrs**

The biology of stem cells: Overview; types of stem cells-embryonic stem cells, fetal tissue
stem cells, adult stem cells; human & animal cloning. Isolation and propagation of embryonic
stem cells. Differentiation of adult stem cells, Stem cell plasticity: self renewal potential; differentiation versus stem cell renewal; transdifferentiation. Yamanaka factors, Induced pleuripotent stem cells, Ex- vivo expansion of haemopoetic cells for the production of blood
cells and their products.

UNIT – IV **15 Hrs**

Stem cell assays and protocols: Isolation of defined stem cell populations; sources of progenitor cells, cytokine and chemotherapy approaches to mobilization of progenitor cells;
flow cytometric techniques.
Clinical applications of stem cell therapy: neurodegenerative diseases, tissue systems failuresdiabetes, cardiomyopathy, kidney failure, liver failure, hemophilia, lymphoma and leukemic
malignancies requiring stem cell therapy.

Suggested Reading Material:

1. Culture of animal cells; a manual of basic technique, 5th ed. Freshney, R. Ian. Wiley-Liss.
2. Handbook of stem cells Volume 1 and 2 Eds Robert Lanza and others Elsevier Academic Press.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology
IV Semester Model Question Paper
Paper-II ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1.a)What is Cell Culture ? Explain in detail about various Components of cell Culture ?

(OR)

b)Explain in detail about virus induced Cancer

2.a) Give an account on the production of monoclonal antibodies and their applications

(OR)

b) Define Vaccine ?Explain in detail about Conventional , peptide andRecombinant Vaccines

3. a) Describe in detail about types of stem cells and their applications

(OR)

b) Write an essay on animal cloning and their types

4.a) Explain in detail about the chemotherapy approaches to mobilizationOf progenitor cells

(OR)

b) Discuss about Various Clinical applications involved in tissues systems Failure stem cell therapy

Section-B

II Answer any FIVE of the following **5X3=15**

a) Tumor suppressor genes

b) Metastasis

c) Immunoadhesins & Immuno toxins

d) Induced pluripotent stem cells

e) Yamanka Factors

f) Stem cell plasticity

g) Stem cell assay

h) Flow cytometry techniques

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(AUTONOMOUS) KAKINADA

P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

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PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

IV SEMESTER PRACTICALS
PAPER-II:
ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY LAB

1. Preparation of animal cell culture media
2. Preparation of single cell suspension from spleen and thymus
3. Viable cell counting.
4. Primary culture demonstration
5. Sub-culture preparations
6. Cell preparation for storage.
7. Cell preparation for feeding

IV SEMESTER PAPER-II:
Animal cell culture &Stem cell Technology lab Semester end examination Model paper

1.	Major Experiment	12 Marks
2.	Minor Experiment	10 Marks
3.	Cell preparation	06 Marks
4.	Viva Voce	05 Marks
5.	Record	05 Marks
6.	Total	38 Marks
7.	Lab internal	12 Marks

Grand Total 50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

IV SEMESTER

PAPER-III: AQUACULTURE

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of Aquaculture
- Understand fish seed resources
- Identify different cultivable fish resources.
- Generalize hatchery management
- Differentiate different types of culture practices

EXTRACURRICULARACTIVITTY

Field visit to shrimp farm/hatchery.

UNIT – I **15 Hrs**

Aquaculture- History, General Principles. Types of culture systems and economics of different kinds of aquaculture and productivity of culture ponds. Biological characteristics of aquaculture species. Fish seed Resources and Transportation - Fish seed technology - natural collection, bundh breeding, induced breeding, cryopreservation of gametes. Transport of finfish and shellfish- transport of eggs, fry, fingerlings and adults. Induced breeding.Fish hatchery.

UNIT – II **15 Hrs**

Construction of fish fresh water & brackish water farms. Pond preparation- and management.- Pre-stocking and post stocking.Integrated fish farming. Indian Major carp culture,cat fishes, murrels and prawn culture. Ornamental fish culture
Handling and Principles of fish Processing and Preservation

UNIT – III

Principles of fish nutrition - nutritional requirements of commercially important finfish and shellfish, feed types, feeding techniques and Feed management, role of probiotics in nutrition.
Shell fish hatchery construction and management. Role of genetics in aquaculture– gynogenesis, androgenesis, triploidy, tetraploidy, hybridization, sex reversal and breeding, production of transgenic fish, impact of GMOs on aquatic biodiversity Chanos chanos. Lates calcarifer. Litopenaeus vannamei.

UNIT – IV **15 Hrs**

Water quality management in aquaculture. Overview of fish diseases in fish and shell fish culture- common fish pathogens, routes of pathogen entry in fish, methods of colonization and spread of pathogens, immune - evasion mechanisms of fish pathogens.. General principles of Molluscan culture. Pearl Oyster culture.Seaweeds culture. Environmental impact of aquaculture- aquacultural wastes and future developments in waste minimization, environmental consequences of hyper-nutrification

Suggested Reading Material:

1. Pillay, T.V.R. 1990. Aquaculture – Principles and Practices. Fishing News Books Survey, U.K.
2. Jhingran, V.G. 1993. Fish and fisheries of India. Hindustan Publishing Corporation (India), New Delhi.
3. Ravishankar Piska, 1999. Fisheries and Aquaculture.Lahari Publications, Hyderabad.
4. Santanam, R., Ramanathan, N. and Jegatheesan, G. 1990. Coastal Aquaculture in India.CBS Publishers & Distributors, Delhi.
5. Bardach, J.E., Ryther, J.H. and McLarney, W.O. 1972. Aquaculture. John Wiley & Sons Inc., USA.
6. Ghosh, S.., Palanisamy, K. and Pathak, S.C. 1994. Shrimp and Freshwater Hatchery Public Relations Division, National Bank for Agriculture and Rural Development, Bombay.
7. Fishponds in Farming Systems, Zijpp, V. D., Verreth, J. A. J., Tri, L. Q., van Mensvoort, M. E. F., Bosma, R. H., and Beveridge, M. C. M., Wageningen Academic Publishers, Netherlands
8. Aquaculture and Fisheries Biotechnology Genetic Approaches, Dunham, R. A., CABI Publishing, USA

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

M.Sc Zoology
IV Semester Model Question Paper
Paper - III Aquaculture

Time: 3hours **Max. Marks: 75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)Explain the criteria involved for the construction of fish farms.
(OR)
b) Write about the preparation and management of different types of ponds in fish farms

2. a) What are the different fish seed resources? Add a note on their transportation.
(OR)
b) Discuss about carp culture

3. a) Discuss about fish nutrition
(OR)
b) Explain crab culture.

4. a) Discuss about the shrimp hatchery construction and its management
(OR)
b) Explain the water quality management in brackish water farms

Section-B

II Answer any FIVE of the following: **5X3=15**

a) Biological criteria for selection of aquaculture species.

b) Integrated fish farming.

c) Milk fish culture.

d) Feed management.

e) Pearl oyster culture.

f) Preparation and management of nursery ponds.

g) Composite Fish Culture.

h) Cage culture and pen culture.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 3 Hrs **Max Marks: 75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

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PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

IV SEMESTER PRACTICALS
PAPER-III: AQUACULTURE

1. Spotters: cultivable species of finfish, shellfish and ornamental based on the theory
2. Analysis of water: Turbidity, pH, Dissolved oxygen, Alkalinity etc.
3. Primary productivity, Estimation by Light and Dark bottle method
4. Dissecting out the pituitary gland and preparing the extract
5. Identification of types of feeds
6. Feed analysis-Biochemical constituents
7. Visits to aquaculture farms, finfish and shellfish hatcheries

PAPER-III: Aquaculture lab Semester End Examination Model Paper

8. Major Experiment	12 Marks
9. Minor Experiment	10 Marks
10. Spotters 4* 3	06 Marks
11. Viva Voce	05 Marks
12. Record	05 Marks
13. Total	38 Marks
14. Lab internal	12 Marks

Grand Total 50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

P G DEPARTMENT OF ZOOLOGY

IV SEMESTER

PAPER-IV: ANIMAL BIOTECHNOLOGY& BIO-ETHICS

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of principles of biotechnology.
- Understand recombinant DNA technology.
- Application of PCR in biotechnology and genetic engineering.
- EMPLOYIBILILY OPPURTUNITY IN LABS.

UNIT – I **15 Hrs**

Introduction to Animal Biotechnology, Recombinant DNA technology: Restriction endonucleases, Restriction maps, isolation of gene fragments using restriction endonucleases and mechanical shearing; Cloning vectors - Isolation and properties of plasmids, bacteriophage cosmids, Ti plasmid (binary vector), expression vectors, viral vectors, YAC, BAC, phagemids and vectors used for cloning in mammalian cells, Hosts - Prokaryotic: E.coli, B.subtilis, Eukaryotic: Yeast and mammalian cell lines; Ligation of fragments

UNIT – II **15 Hrs**

Gene transfer techniques: Biological and artificial delivery system, Cloning strategies, shot gun experiments, isolation of poly mRNA, synthesis of cDNA, cDNA cloning in bacteria; Genomic and cDNA libraries, Identification of recombinants - structural and functional analysis of recombinants; Design and preparation of DNA and RNA probes for hybridization, Southern and Northern blotting

UNIT – III **15 Hrs**

DNA sequencing methods: Maxam and Gilbert's chemical and Sanger's chain termination methods, automated DNA sequencing, Base calling and sequencing accuracy. Introduction to next generation sequencing (NGS). DNA fingerprinting.
PCR amplification and diagnosis - Applications in forensic medicine.Genetic diseases.Gene therapy- Types and use of rDNA constructs for gene therapy.

UNIT – IV **15 Hrs**

Bioethics: Introduction – causes of unethical acts, ignorance of laws, policies and procedures, recognition, friendship, personal gains. Professional ethics – professional conduct.Ethical decision making, ethical dilemmas. Teaching ethical values to scientists, good laboratory practices, good manufacturing practices, laboratory accreditation.
Socio-economic and legal impacts of biotechnology, national and international guidelines, experimental protocols approval, levels of containment.IPP,IPR

Suggested Reading Material:

1. Principles of Gene manipulation: An Introduction to genetic Engineering. R.V.Old and S.B.Primrose (Blackwell Scientific Publications).
2. Biotechnology by B.D.Singh (Kalyani).
3. Molecular Biology and Biotechnology by Meyers, RA, A comprehensive Desk reference (VCH Publishers).
4. Biotechnology by U. Satyanarayana (Books & Allied (P) Ltd).
5. Bioethics and Biosafety in Biotechnology by V. Sree Krishna, New Age International

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
P G DEPARTMENT OF ZOOLOGY

IV Semester Model Question Paper

Paper - IV ANIMAL BIOTECHNOLOGY & BIO-ETHICS

Time: 3hoursMax. Marks: 75

I. Answer ALL questions.

All questions carry equal marks **4X15=60**

Section-A

1. a) Write about the tools used in rDNA technology with examples

   (OR)

   b) Describe different types of vectors used for cloning in mammalian cells

2. a) What is gene transfer? Write the mechanism of gene delivery systems

   (OR)

   b) What is hybridization? Explain the design and preparation of probes used for hybridization.

3. a) Enumerate the methods of DNA sequencing and add a note on next generation sequencing.

   (OR)

   b) Discuss the role of DNA finger printing in forensic science

4. a) Define bioethics. Discuss the need to follow the policies and laws in scientific field.

   (OR)

   b) Write an account on good laboratory practices.

Section-B

II. Answer any FIVE of the following **5X3=15**

a) Mechanical shearing.

b) cDNA librarylibrary

c) Automated DNA sequencing.

d) Un-ethical acts.

e) Ti plasmid.

f) Northern blottg) Gene therapy.

h) Laboratory accreditation

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BLUE PRINT FOR QUESTION PAPER SETTER

Max Marks: 75
Time: 3 Hrs

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT – II	02	02	36
UNIT – III	02	02	36
UNIT – IV	02	02	36
Total No.of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE:The question paper setters are requested to kindly adhere to the format given inthe above table.

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IV SEMESTER PRACTICALS

PAPER-IV: ANIMAL BIOTECHNOLOGY& BIO-ETHICS

1. Isolation of genomic DNA
2. Agarose gel electrophoresis of genomic DNA.
3. Purification of bovine serum IgG by ammonium sulphate precipitation
4. Western Blotting of proteins.
5. Southern Blotting (Demonstration)
6. PCR diagnosis of white spot syndrome virus, monodon baculovirus, haemotopoetic necrosis virus - Demonstration
7. Intellectual property and India: comprehensive e-filing patents, Trademarks.
8. On line patent search.
9. Online patent register and application status.
10. WIPO online database search

PAPER-IV: Semester End examination Model paper
Animal Biotechnology and Bio-ethics Lab:

1.	Major Experiment :	12 Marks
2.	Minor Experiment	10 Marks
3.	Explanation of the Principle of Experiment	06 Marks
4.	Viva Voce	05 Marks
5.	Record	05 Marks
6.	Total	38 Marks

Lab internal Marks 12 Marks

Grand Total **50 Marks**

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Particulars of changes in the syllabus

S.NO	Existing title of the paper	Syllabus in cooperated
1	**Paper – III** **Aquaculture** **Unit – II**	Handling and Principles of fish Processing and Preservation

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PROJECT-COMPREHENSIVE VIVA-VOICE

Summer vacation project

1. Duration of the project – 3 months

2 months – field work

1 month –Project preparation and Drafting

2. External valuation

3. Total marks - 100 M