Resolution Number: AC/II(23-24).2.RUS7

S. P. Mandali's
Ramnarain Ruia Autonomous College
(*Affiliated to Mumbai University*)

RUIA COLLEGE
Explore • Experience • Excel

Syllabus for UG
Program: S.Y.B.Sc. (Minor) Life Science

Program Code: RUSLSc

(As per the guidelines of National Education Policy 2020

For **Academic year 2024-25**)

(Choice based Credit System)

Course Code: RUSLSc Minor I
Course Title: Minor SY Sem III
Academic year 2024-25

SY Sem III Minor		**Minor** **Biochemical Approach to Life Processes in Plants and Animals-I**	**3 Credits Total 45 lectures**
	I	**Enzymology** Strategies for Isolation and purification of enzymes, measurement of specific activity and purification fold. Classification of enzymes (With an example of each). Effect of pH and Temperature. Coenzymes and cofactors : NAD, FAD, Mn, Mg, Zn and Cu (one example each). Kinetics (Michealis Menten, Lineweaver Burk plots). Enzyme Inhibitors, Activators and feed-back inhibition. Allosteric enzymes (Kinases in Glycolysis) and their significance in metabolic regulation. Concept of Isoenzymes: LDH.	**15 Lectures**
	II	**Carbohydrate Metabolism and Bioenergetics.** Carbohydrate Metabolism: a) Glycolysis – Process and metabolic regulation b) Pentose Phosphate Pathway c) Citric Acid Cycle: Process and regulation, Importance as a central amphibolic pathway. Electron Transport System: Localisation and Sequence of electron transporters. Oxidative Phosphorylation: Mitchell's Chemiosmotic Hypothesis, ATP synthesis, Control of respiration, uncoupling and metabolic poisons.	**15 Lectures**
	III	**Lipids and Proteins Metabolism.** Lipids - Catabolism : Lipolysis, Role of Carnitine in mitochondrial permeability, Beta– Oxidation of fatty acids and integration into Kreb's cycle, Ketone bodies and their significance. Amino Acids – Catabolism: Protein Degradation liberating amino-acids', Deamination,	**15 Lectures**

		Transamination & ammonia disposal by Urea cycle, Decarboxylation & integration into Kreb's cycle.	
		PRACTICALS	**1 Credit/** **Total 15 lectures**
RUSLScP **MINOR**	**II**	**Practicals in Biochemical Approach to Life Processes in Plants and Animals- I** 1.A. Instrumentation / Technique - pH metry - Colorimetry - Titration. B- Process / Concept and immediate Relevance. - Extraction, Purification - Analysis / Estimation - GLP(Good Laboratory practices) incorporated into every practical Acid, bases and buffers. 2. pH meter - a) Principle & instrumentation and b) Determination of pH (titration of Acids/Bases/Buffers/ 'chameleon balls'). *(in FY the students were introduced to the concept of pH measurement of familiar liquids- here tech & details are given- practically understanding buffering using Glycine / titration curve).* c) Phosphate buffer preparation using Henderson Hasselbalch equation d) Glycine titration 3.Protein precipitation by pH manipulation (Casein from Milk/ Curds) *(From previous experiments and pH manipulation, proteins can be precipitated).* 4.Study of Enzyme activity and Kinetics: Determination of K_M of an enzyme. Urease (from Jack beans) /Lipase/Protease/ (from seeds/ detergents) / amylase source *(Enzyme activity can be detected and estimated - using colorimetry).* 5.Histochemical localization of Enzymes (Acid Phosphatase) *(Enzyme activity can be localized).* 6.Estimation / Quantitation :	

		Colorimetric Protein Estimation by Biuret Method. (Enzyme extract / Casein from previous expts) *(Proteins, such as the isolate from experiment 2 can be estimated by colour reaction).* 7.Colorimetric Cholesterol Estimation / total Lipid Estimation from egg. *(Lipid metabolism is an important component of our systems, content can be estimated by colour reaction).* 8.Titrimetric estimation of Ascorbic acid (Vit C). *(Estimation of biological materials by non-colorimetric method)*	

REFERENCES

	RUSLSc 302
1	1. Lehninger's Principles of Biochemistry Eds : D.L Nelson and M.M. Cox, Pub : WH Freeman Publishers, New York. 4th edition (2005)
2	Biochemistry Eds : J.M. Berg, J L Tymencko and L. Stryer Pub : W H Freeman and co., New York. 5th edition (2002)
3	Fundamentals of Biochemistry by Eds : D.Voet , J. G. Voet Pub : John Wiley &Co., New York Pratt 1st ed (2004)
4	Principles of Biochemistry Ed: Lehninger.A Pub: CBS Publishers and Distributors, 2nd Edition (1993)
5	Principles of Biochemistry Eds: Zubay G.L, Parson W.W. and Vance D.E. Pub: W. C. Brown, First Edition (1995)
6	An Introduction to Genetic Analysis Ed: Griffiths A.J. et al, Pub: W. H. Freeman London) Seventh Edition(2000)

Modality of Assessment

Theory Examination Pattern:

A) Internal Assessment- 40%- 40 Marks

Sr No	Evaluation Type	Marks
1.	Written Test	20
2.	Presentation on topic from syllabus / Quiz / Open book test	10
3.	Presentation on any journal article/ newsletter/ book review/ conference/ guest lecture	10
	TOTAL	**40**

B) External Examination- 60%- 60 Marks

Semester End Theory Examination: (Deviation from the usual modality)

Semester End Theory Examination:

Duration - These examinations shall be of **2 HRS** duration.

Theory question paper pattern:

Paper Pattern:

Question	Options	Marks	Based on
Q1	Answer any 2 questions out of 3	16	Unit I
Q2	Answer any 2 questions out of 3	16	Unit II
Q3	Answer any 2 questions out of 3	16	Unit III
Q4	Short notes on topics of all 3 units; Answer any 3 out of 5;	12	Unit I, II, III
	Total	**60**	

Practical Examination Pattern:

A) Internal Examination:20 Marks

Particulars	Marks
Journal	05
Experimental tasks	15
Total	**20**

B) External Examination:30 Marks
Semester End Practical Examination:

Particulars	Paper
Main question to perform Experimental task/Estimation/ dissection/Bioinformatics statistical analysis/ project work	20
Identifications	10
Total	**30**

Overall Examination & Marks Distribution Pattern

Semester III

Course	MINOR II			Grand Total
	Internal	External	Total	
Theory	**40**	**60**	**100**	**200**
Practical	**20**	**30**	**50**	**100**

Course Code: RUSLSc Minor II

Course Title: Biochemical Approach to Life Processes in Plants and Animals-II (Minor SY Sem IV)

Academic year 2024-25

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION
	Students will gain insights about following;
CO 1	To explain the anabolic pathways in carbohydrate, lipids and proteins
CO 2	To compare non- cylclic and cyclic photosynthetic pathways. To justify how photorespiration is a wasteful process and to review how C4 plants circumvent it.
CO 3	Understand the role of different enzymes in replication of DNA. Compare between the prokaryotic and eukaryotic replication process.
CO 4	Explain the transcription and translation process in prokaryotes and regulation of gene expression in prokaryotes.
CO 5	Compare transcription and translation process in eukaryotes. Understand the concept of post translational modifications in eukaryotes

Minor - Sem IV		Minor - Biochemical Approach to Life Processes in Plants and Animals- II	3 Credits Total 45 lectures
	I	**Anabolism of Biomolecules** Anabolism of Carbohydrates: a) Gluconeogenesis b) Glycogen synthesis Anabolism of Lipids: a) Fatty acid biosynthesis b) Cholesterol and prostaglandin biosynthesis. Anabolism of Amino acids: a) Transamination and its significance b) Glutamine synthesis Synthesis of purines & pyrimidines with Significance. Photosynthesis, Light reaction and Calvin cycle Photorespiration in plants: C3 and C4 plants	**15 Lectures**
	II	**Molecular Biology studies in prokaryotes** DNA replication in prokaryotes. Transcription in Prokaryotes Translation in prokaryotes Regulation of gene expression and its significance: Operon model (Lactose / Tryptophan)	**15 Lectures**
	III	**Molecular Biology studies in eukaryotes** DNA Replication in Eukaryotes Transcription in Eukaryotes and Post Transcriptional modifications Translation in Eukaryotes and post translational modification	**15 Lectures**
PRACTICALS		**PRACTICALS**	**1 Credit/** **Total 15 lectures**
RULScP MINOR SEM IV		Practicals in Biochemical Approach to Life Processes in Plants and Animals- II. : A. Instrumentation / Technique (I / T) (1) PAGE (Demonstration). Chromatography – Paper, Thin layer, Column. B. Process / Concept and immediate Relevance (C and R) - Extraction, Purification - Analysis / Estimation GLP(Good Laboratory practices) incorporated	

		into every practical Separation / Extraction techniques 1.Extraction and Detection of RNA/Ribose Sugars. C, T *(Extraction of nucleic acid and detection by colour reaction)* 2.Chromatography of Sugars – Circular Paper **C, T** *(Separation of carbohydrates and detection by colour reaction)* 3.Thin Layer Chromatography for separation of Plant Pigments.(Slide technique) **C,T,R** *(Separation techniques for charged, uncharged materials based on solvent partition)* 4.Solvent Extraction of Lipids. **C, T, R** *(Extraction of lipid and proportional estimation by weight)* 5.Column Chromatography of Proteins / Pigments. **I, C, T***(Separation technique for proteins/ other materials based on charge/size)* 6.Protein separation by PAGE (Demonstration) **I, C** *(Separation techniques for charged materials based on electrophoretic mobility)* 7.Interpretation of pathological reports based on biochemical analysis.	

REFERENCES

	RUSLSc 402
1	1. Lehninger's Principles of Biochemistry Eds : D.L Nelson and M.M. Cox, Pub : WH Freeman Publishers, New York. 4th edition (2005)
2	Biochemistry Eds : J.M. Berg, J L Tymencko and L. Stryer Pub : W H Freeman and co., New York. 5th edition (2002)
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6	An Introduction to Genetic Analysis Ed: Griffiths A.J. et al, Pub: W. H. Freeman (London) Seventh Edition (2000)

Modality of Assessment

Theory Examination Pattern:

C) Internal Assessment- 40%- 40 Marks

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3.	Presentation on any journal article/ newsletter/ book review/ conference/ guest lecture	10
	TOTAL	**40**

D) External Examination- 60%- 60 Marks

Semester End Theory Examination: (Deviation from the usual modality)

Semester End Theory Examination:

Duration - These examinations shall be of **2 HRS** duration.

Theory question paper pattern:

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Q3	Answer any 2 questions out of 3	16	Unit III
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	Total	**60**	

Practical Examination Pattern:

C) Internal Examination:20 Marks

Particulars	Marks
Journal	05

Experimental tasks	15
Total	**20**

D) External Examination:30 Marks
Semester End Practical Examination:

Particulars	Paper
Main question to perform Experimental task/Estimation/ dissection/Bioinformatics statistical analysis project work	20
Identifications	10
Total	**30**

Overall Examination & Marks Distribution Pattern

Semester IV

Course	MINOR II			Grand Total
	Internal	External	Total	
Theory	40	60	100	200
Practical	20	30	50	100

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