



UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

NOTIFICATION (20/Nov. /Adp/45)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of revised Syllabi and Courses of Study in the subject of **Biotechnology** for Semesters V and VI under the **Choice Based Credit System** at the Undergraduate level (as given in the Annexure) for the examinations to be held in the years indicated against each semester as under:-

Subject	Semester	For the examinations to be held in the year	Course Code	%of change
Biotechnology	Semester-V	Dec. 2021, 2022 and 2023	UBTTE501	40%
			UBTPE502	100%
			UBTTS503	65%
			UBTPS504	
	Semester-IV	May 2022, 2023 and 2024	UBTTE601	100%
			UBTPE602	100%
			UBTTS603	50%
			UBTPS604	

The alternative question papers are required to be set as per the University regulation given as under:-

- I. If the change in the syllabi and courses of study is less than 25%, no alternative question paper will be set
- II. If the change is 25% and above but below 50%, alternative Question paper be set for one year
- III. If the change is 50% and above or whole scheme is changed, alternative Question paper be set for two years.

The Syllabi of the courses is available on the University website: www.jammuuniversity.in

Sd/-
DEAN ACADEMIC AFFAIRS

No. F.Acd/II/20/4275-4290

Dated: 18-12-2020

Copy to:

1. Dean, Faculty of Life Science
2. HOD/Convener, Board of Studies in Biotechnology
3. All members of the Board of Studies
4. C.A. to the Controller of Examinations
5. Director, Computer Centre, University of Jammu
6. Asst. Registrar (Conf. /Exams. UG)
7. Incharge University Website for necessary action please

Sumitachama
17/12/2020
Deputy Registrar (Academic)

16/12/20
15/12/20
15/12/20

B.Sc. Biotechnology
SEMESTER V
(Under CBCS at Undergraduate Level) Dec. 2021, 2022 + 2023
Syllabi for the examinations to be held in the years
(Discipline Specific Elective Course)

Title: Animal Biotechnology and Immunology
Credits: 4

Course Code: UBTTE501
Total marks: 100
Internal Examination: 20 marks
End Semester Examination: 80 marks
Duration: 2 & ½ hours

Unit I: Introduction to Cell Culture

(12 hours)

History and concept of cell culture development, advantages and disadvantages of cell culture. Laboratory organization and equipment's used for animal cell culture, Aseptic technique of culturing. Characteristics of a normal cell, anchorage dependence, Normal cell vs Transformed cells. Primary culture: Source of tissue, Dispersion and disruption of tissue.

Unit II: Cell culture types and basic techniques

(12 hours)

Functions of different constituents of culture medium, Role of serum, CO₂ and Humidity. Continuous cell lines, adherent vs suspension culture, Subculturing of adherent & suspension cells, common cell culture contaminants. Measurement of viability and cytotoxicity, cryopreservation. Common Transfection methods- Lipofection, electroporation, Retroviral infection.

Unit III: Animal Biotechnology and its applications

(12 hours)

Organ, Organotypic and Histotypic culture, Three dimension culture and its applications, Stem cell culture and its applications. Transgenic animals, Production of useful products in transgenic animals. CRISPR based Gene therapy.

Unit IV: Overview of Immune system

(12 hours)

Innate and acquired Immunity and their features. Primary and secondary lymphoid organs; Immune cells- Macrophages, Dendritic cells, NK cells, T cells, B cells, Eosinophils, Neutrophils and Mast cells. Antibody structure and function, Introduction to MHC. Immunoglobulins: classes and structure. B cell and T cell activation.

Unit V: Immunobiotechnology

(12 hours)

Antigen-Antibody interactions and Techniques- ELISA and its variants, Immunofluorescence. Overview of Hybridoma and Monoclonal antibodies, Technology and its application. Vaccines: History of vaccine development, introduction to the concept of vaccine, Types of vaccines, Active and passive immunization.

BSL

B.Sc. Biotechnology
SEMESTER V
(Under CBCS at Undergraduate Level) Dec-2021, 2022 + 2023
Syllabi for the examinations to be held in the years 2020, 2021 and 2022
(Discipline Specific Elective Course)

Title: Animal Biotechnology and Immunology
Credits: 4

Course Code: UBTTE501
Total marks: 100
Internal Examination: 20 marks
End Semester Examination: 80 marks
Duration: 2 & ½ hours

References:

1. Freshney, R. I. (2009). Culture of animal cells (6th ed.). New Jersey: John Willey & Sons
2. Butler, M. (2004). Animal cell culture and technology: the basics (2nd ed.). New York: Bios scientific.
4. Glick, B.R., & Pasternak, J. J. (2009). Molecular biotechnology- principles and applications of recombinant DNA (4th ed.). Washington, USA: ASM press7.
5. Singh BD. (2014). "Text book of Biotechnology." Kalyani publishers.
6. Karp G. (2013) Cell Biology. John Wiley Inc. New York. 7th ed.
7. Goldsby, R. A., Kindt, T. J., & Osborne, B. A. (2007). Kuby's Immunology (6th ed.). New York :W.H. Freeman and Company.
8. Abbas, A. K., Lichtman, A. H., & Pillai, S. (2011). Cellular and Molecular Immunology (7th ed.). Philadelphia, USA : Saunders Publication.
9. Delves, P., Martin, S., Burton, D., & Roitt I. M. (2006). Roitt's Essential Immunology (11th ed.). Oxford : Wiley Blackwell Scientific Publication.

Scheme of examination:

The students shall be evaluated during the conduct of the course in the semester as follows:

Examination (Theory)	Syllabus to be covered in the examination	Time allotted	% Weightage (Marks)
Internal Assessment test	Up to 50% (after 45 days)	1 hour	20% (20 marks)
External End Semester University examination	Up to 100% (after 90 days)	2½ hours	80% (80 marks)
Total			100

PSL

B.Sc. Biotechnology
SEMESTER V
(Under CBCS at Undergraduate Level) Dec - 2021, 2022 + 2023
Syllabi for the examinations to be held in the years 2021, 2022 & 2023
(Discipline Specific Elective Course)

Title: Animal Biotechnology and Immunology
Credits: 4

Course Code: UBTTE501
Total marks: 100
Internal Examination: 20 marks
End Semester Examination: 80 marks
Duration: 2 & ½ hours

Note for paper setters

External End Semester Examination (Total marks: 80)

Time duration: 2hrs 30 min

The question paper will have 3 sections.

Section I: Five (5) short answer questions representing all units i.e. at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (**All compulsory**)

Section II: Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (**All compulsory**)

Section III: Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only **two** questions of 15 marks each = 30 marks.

Internal Assessment (Total Marks:20)

Time duration: 1hr

The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 10 marks. It will have eight short answer questions, selecting at least three from each of the two/three units/50% of the syllabus covered. A candidate has to attempt **any five** questions of two marks each.

Part B: Total weightage to this part shall be 10 marks. It will have two long answer questions, selecting at least each one from first two / three units/50% of the syllabus covered. A candidate has to attempt **any one** question of 10 marks.

PSL

**B.Sc. Biotechnology
SEMESTER V**

(Under CBCS at Undergraduate Level) Dec. 2021, 2022 + 2023
Syllabi for the examinations to be held in the years

**Title: Laboratory Course based on
Animal Biotechnology and Immunology**

**Course Code: UBTPE502
Total Marks: 50**

Credits: 2

**Internal Examination: 25 marks
End Semester Examination: 25 marks**

Note: Visit to Animal Cell Culture facility is recommended

Practicals

1. Fumigation of cell culture lab, sterilization of glassware and equipment
2. Estimation of cell viability by dye exclusion (Trypan blue).
3. Total and differential Leucocyte count.
4. Total RBC count.
5. Separation of serum from blood.
6. Blood grouping.
7. Double immunodiffusion Test
8. Radial Immunodiffusion Test
9. Rocket immunoelectrophoresis.
10. Demonstration of ELISA

References:

1. Freshney, R. I. (2009). Culture of animal cells (6th ed.). New Jersey: John Willey & Sons
2. Butler, M. (2004). Animal cell culture and technology: the basics (2nd ed.). New York: Bios scientific.
3. DBT Life Sciences Protocol Manual January, 2018
<https://indiabioscience.org/media/articles/DBT-Life-Science-Protocol-Manual.pdf>

Scheme of Examination:

Examination (Practical)	Syllabus to be covered in the examination	% Weightage(marks)
Daily evaluation of practical records / Viva voce / attendance etc.		50% (25 Marks including 5 for attendance, 5 for Viva-voce and 15 marks (5 for Test + 10 marks daily performance)
Final Practical Performance + Viva voce (External Examination)	100%	50% (25 Marks including 20 for external paper and 5 marks for Viva voce)
Total		50 marks

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B.Sc. Biotechnology
SEMESTER V
(Under CBCS at Undergraduate Level) Dec. 2021, 2022 + 2023
Syllabi for the examinations to be held in the year
(Skill Enhancement Course)

Title: Bioinformatics

Credits: 2

Course code: UBTTS503
Total Marks: 50 marks
Internal Examination: 10 marks
End Semester Examination: 40 marks
Duration: 2 hours

UNIT I: Introduction to Bioinformatics

Basic Bioinformatics and its relation with molecular biology. Omics; Biological Data Acquisition; Types of DNA sequences; RNA sequencing methods; Protein sequencing and structure determination methods; Gene expression data. Format and Annotation: Conventions for databases indexing and specification of search terms; Common sequence file formats

UNIT II: Biological databases and sequence analysis

Nucleic acid databases (GenBank, DDBJ, EMBL, NDB & Ensembl); Gene expression databases (EBI Expression atlas, The Human Protein Atlas); Protein databases (PIR, SWISS-PROT, TrEMBL, PDB); Gene Ontology(GO) analysis; Basic Concepts of Sequence Alignment- Local and global alignment, Pair wise and multiple sequence alignments, BLAST, ClustalW;

UNIT III: Tools and Applications of Bioinformatics

Pymol, Rasmol, Swisspdb, UCSC Genome Browser, STRING, DAVID and Panther Database. Identification Feature based approach – ORF's; Primer Designing; Vector designing. Phylogenetic analysis; Basic concepts of Drug discovery methods.

References:

1. Attwood, T. K and parry-Smith, D. J. (2006). Introduction to Bioinformatics. Pearson Education, Singapore.
2. Introduction to Bioinformatics by Aurther M Lesk

Scheme of examination:

The students shall be evaluated during the conduct of the course in the semester as follows:

Examination (Theory)	Syllabus to be covered in the examination	Time allotted	% Weightage (Marks)
Internal Assessment test	Up to 50% (after 45 days)	45 min	20% (10 marks)
External End Semester University examination	Up to 100% (after 90 days)	2 hours	80% (40 marks)
Total			50



B.Sc. Biotechnology
SEMESTER V
(Under CBCS at Undergraduate Level) Dec. 2021, 2022 & 2023
Syllabi for the examinations to be held in the year ~~2020-2021~~
(Skill Enhancement Course)

Title: Bioinformatics

Credits: 2

Course code: UBTTS503

Total Marks: 50 marks

Internal Examination: 10 marks

End Semester Examination: 40 marks

Duration: 2 hours

Note for paper setters

External End Semester Examination (Total marks: 40)

Time duration: 2hrs

The question paper will have 3 sections.

Section I: Three (3) short answer questions representing all units (without detailed explanation having 70-80 words) of 3 marks each = 9 marks (**All compulsory**)

Section II: Three (3) medium answer questions (with explanation having 250-300 words) of 7 marks each = 21 marks (**All compulsory**)

Section III: Two (2) long answer questions (with detailed explanation/ of 400-500 words) covering all the units. The candidate will be required to answer only **one** questions of 10 marks each = 10 marks.

Internal Assessment (Total Marks:10)

Time duration: 45 min

The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 5 marks. It will have eight short answer questions, selecting at least each one from first two /50% of the syllabus covered. A candidate has to attempt **any five** questions of **one** mark each.

Part B: Total weightage to this part shall be 5 marks. It will have two long answer questions, selecting at least each one from first two/50% of the syllabus covered. A candidate has to attempt **any one** question of **five** marks.

AB

B.Sc. Biotechnology
SEMESTER V
 (Under CBCS at Undergraduate Level) Dec. 2021, 2022 + 2023
 Syllabi for the examinations to be held in the years 2020, 2021, 2022, 2023
 (Skill Enhancement Course)

Title: Laboratory course based on Bioinformatics

Course code: UBTPS504

Total Marks: 50 marks

Internal Examination: 25 marks

End Semester Examination: 25 marks

Credits: 2

Practicals:

1. Database homology with query sequences using BLAST analysis.
2. Pairwise comparison of sequences.
3. Multiple sequence analysis and phylogenetic analysis using CLUSTAL W.
4. To check the expression of particular human gene in a tissue/cell line using Protein Atlas.
5. Gene list analysis using DAVID, STRING & PANTHER.
6. Primer Designing with BLAST
7. Exploring UCSC Genome Browser
8. Microarray data visualization using TbDb and Operon Detection

Scheme of Examination:

Examination (Practical)	Syllabus to be covered in the examination	% Weightage(marks)
Daily evaluation of practical records / Viva voce / attendance etc.		50% (25 Marks including 5 for attendance, 5 for Viva-voce and 15 marks (5 for Test + 10 marks daily performance)
Final Practical Performance + Viva voce (External Examination)	100%	50% (25 Marks including 20 for external paper and 5 marks for Viva voce)
Total		50 marks

BSE

B.Sc. Biotechnology
SEMESTER VI
(Under CBCS at Undergraduate Level) *May 2022, 2023 + 2024*
Syllabi for the examinations to be held in the years *2022, 2023 + 2024*
(Discipline Specific Elective Course)

Title: Enzymology and Bioprocess Engineering
Credits: 4

Course Code: UBTTE601
Total marks: 100
Internal Examination: 20 marks
End Semester Examination: 80 marks
Duration: 2 & ½ hours

Unit I: Introduction to Enzymes

(12 hours)

Enzymes and their comparison with chemical catalysts, Brief history and General classification of enzymes, Concept of coenzyme, cofactors, prosthetic groups. Specificity of enzyme action: Types of specificity, active site, hypothesis (lock-and-key, induced fit, strain or transition-state stabilization). Factors affecting enzyme activity (Enzyme concentration, substrate concentration, pH, temperature and reaction time).

Unit II: Enzyme Kinetics and inhibition

(12 hours)

Enzyme Kinetics- Derivation of Michaelis-Menten equation for single substrate reactions, K_m and its significance, Lineweaver-Burk plot, Importance of K_{cat}/K_m . Enzyme inhibition: reversible and irreversible inhibition. Overview of competitive, uncompetitive and non-competitive inhibition.

Unit III: Enzyme purification, modification and applications

(12 hours)

Overview of Enzyme Purification from natural sources, Tag based purification of recombinant enzymes, Enzyme Engineering by site directed mutagenesis. Clinical and industrial applications of enzymes- Detergent, food, leather.

Unit IV: Introduction to Bioprocess Engineering

(12 hours)

Concept of Industrial fermentation. Overview of components of fermentation/bioprocess technology. Isolation and screening of microorganisms of industrial importance. Types of microbial culture and its growth kinetics- Batch, Fed-batch and Continuous culture. Sterilization methods & its importance in fermentation.

Unit V: Bioreactors and Bioprocess based products

(12 hours)

Basic design of a fermenter/Bioreactor. Significance of Impeller, Baffles, Sparger in Bioreactors. Types of fermenters, Bioprocess monitoring & Control. Introduction to downstream processing, product recovery and purification, effluent treatment. Production of useful products by Bioprocess Technology- Ethanol, Antibiotics, Enzymes.

BE

B.Sc. Biotechnology
SEMESTER VI
(Under CBCS at Undergraduate Level) May 2022, 2023 + 2024
Syllabi for the examinations to be held in the years 2022, 2023 + 2024
(Discipline Specific Elective Course)

References:

1. Palmer, T., & Bonner, P. L. (2007). Enzymes: Biochemistry, biotechnology, clinical chemistry. United Kingdom: Horwood Publishing Limited.
2. Nelson D.L. & Cox M. (2017). Lehninger Principles of Biochemistry. W.H. Freeman, New York, 7th ed.
3. Berg J.M., Tymoczko J.L. & Stryer L. (2011). Biochemistry. W.H. Freeman & Company, New York. 7th ed.
4. Voet, D. and Voet, J.G. (2011) Biochemistry. John Wiley and Sons inc. USA. 4th ed.
5. Crueger, W., & Crueger, A. (2000). Biotechnology: A textbook of Industrial Microbiology. (2nd ed.). New Delhi: Panima Publishing Co.
6. Stanbury, P.F., Whitaker, A., & Hall, S.J. (2006). Principles of Fermentation Technology (2nd ed.). India: Elsevier Science Ltd.
7. Shuler, M. L., & Kargi, K. (2003). Bioprocess Engineering: Basic concepts (2nd ed.). India: Prentice Hall.

Scheme of examination:

The students shall be evaluated during the conduct of the course in the semester as follows:

Examination (Theory)	Syllabus to be covered in the examination	Time allotted	% Weightage (Marks)
Internal Assessment test	Up to 50% (after 45 days)	1 hour	20% (20 marks)
External End Semester University examination	Up to 100% (after 90 days)	2½ hours	80% (80 marks)
Total			100

Note for paper setters

External End Semester Examination (Total marks: 80)

Time duration: 2hrs 30 min

The question paper will have 3 sections.

Section I: Five (5) short answer questions representing all units i.e. at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (**All compulsory**)

Section II: Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (**All compulsory**)

Section III: Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units; The candidate will be required to answer only **two** questions of 15 marks each = 30 marks.

BS

B.Sc. Biotechnology
SEMESTER VI
(Under CBCS at Undergraduate Level) *May 2022, 2023 + 2024*
Syllabi for the examinations to be held in the years
(Discipline Specific Elective Course)

Internal Assessment (Total Marks:20)

Time duration : 1hr

The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 10 marks. It will have eight short answer questions, selecting at least three from each of the two/three units/50% of the syllabus covered. A candidate has to attempt **any five** questions of two marks each.

Part B: Total weightage to this part shall be 10 marks. It will have two long answer questions, selecting at least each one from first two / three units/50% of the syllabus covered. A candidate has to attempt **any one** question of 10 marks.

BSL

B.Sc. Biotechnology
SEMESTER VI
(Under CBCS at Undergraduate Level) *May - 2022, 2023 + 2024*
Syllabi for the examinations to be held in the years *2022, 2023*

**Title: Laboratory Course based on
Enzymology and Bioprocess Engineering**

**Course Code: UBTPE602
Total Marks: 50**

Credits: 2

**Internal Examination: 25 marks
End Semester Examination: 25 marks**

Practicals:

1. Extraction of enzymes from bacteria/plants and check their activity.
2. Effect of pH on the activity of enzyme and pH stability.
3. Effect of temperature on the activity of enzyme and thermostability.
4. Effect of reaction time on the activity of enzyme.
5. Effect of metals on the activity of enzyme.
6. Calculation of kinetic parameters such as K_m , V_{max} , K_{cat}
7. Isolation of industrially important lipolytic/proteolytic etc microorganisms from natural resource.
8. Batch fermentation using shake-flask for ethanol production by *Saccharomyces cerevisiae*.
9. Determination of growth pattern, cell number and wet mass of *Saccharomyces cerevisiae* culture during shake-flask fermentation.
10. Assay for substrate utilization during shake flask fermentation.
11. Assay for product formation during shake flask fermentation.

References:

1. Plumer, D. (2017). An Introduction to Practical Biochemistry. McGraw Hill Education. 3rd ed.
2. DBT Life Sciences Protocol Manual January, 2018
<https://indiabioscience.org/media/articles/DBT-Life-Science-Protocol-Manual.pdf>
3. Sawhney, S.K. and Randhir Singh (2001). Introductory Practical Biochemistry. Narosa Publishing House.

Scheme of Examination:

Examination (Practical)	Syllabus to be covered in the examination	% Weightage(marks)
Daily evaluation of practical records / Viva voce / attendance etc.		50% (25 Marks including 5 for attendance, 5 for Viva-voce and 15 marks (5 for Test + 10 marks daily performance))
Final Practical Performance + Viva voce (External Examination)	100%	50% (25 Marks including 20 for external paper and 5 marks for Viva voce)
Total		50 marks

RSJ

B.Sc. Biotechnology
SEMESTER VI
(Under CBCS at Undergraduate Level) *May 2022, 2023 + 2024*
Syllabi for the examinations to be held in the year ~~2021, 2022 and 2023~~
(Skill Enhancement Course)

Title: Instrumentation and Analytical Techniques

Course code: UBTTS603

Credits: 2

Total Marks: 50 marks

Internal Examination: 10 marks

End Semester Examination: 40 marks

Duration: 2 hours

Unit I: Microscopy

Microscopy: Principle and types; Bright field microscopy, Phase contrast microscopy, Fluorescence microscopy, Confocal microscopy; Electron microscopy: TEM and SEM; various types of stains, Staining- Direct staining, indirect staining, Negative staining, Differential staining.

Unit II: Chromatography and electrophoresis

Principle and Types of chromatography: Paper chromatography, thin layer chromatography, column chromatography, ion exchange chromatography, Gel filtration, Affinity chromatography techniques. Electrophoresis- General Principles and types; Horizontal and vertical gel electrophoresis; Agarose gel electrophoresis and Poly-acrylamide gel electrophoresis; Native PAGE, SDS PAGE.

UNIT III: Centrifugation, Spectroscopy & Molecular Biology Techniques

Basic principle of centrifugation, different types of centrifuges and their uses, types of rotors: swing bucket and fixed angle rotors, Spectroscopy- UV, Vis, IR. Radioisotopy: Principles and applications of tracer techniques in biology, Protein purification and analysis, concentration of proteins, specific activity, criteria of purity. PCR and applications. DNA sequencing- Sanger's and Next Gen sequencing.

References:

1. Plumer, D. (2017). An Introduction to Practical Biochemistry. McGraw Hill Education. 3rd ed.
2. DBT Life Sciences Protocol Manual January, 2018
<https://indiabioscience.org/media/articles/DBT-Life-Science-Protocol-Manual.pdf>
3. Wilson, K., & Walker, J. (2010). Principle and techniques of biochemistry and molecular biology. Cambridge : Cambridge University Press.

Scheme of examination:

The students shall be evaluated during the conduct of the course in the semester as follows:

Examination (Theory)	Syllabus to be covered in the examination	Time allotted	% Weightage (Marks)
Internal Assessment test	Up to 50% (after 45 days)	45 min	20% (10 marks)
External End Semester University examination	Up to 100% (after 90 days)	2 hours	80% (40 marks)
Total			50

ABE

B.Sc. Biotechnology
SEMESTER VI
(Under CBCS at Undergraduate Level) *May 2022, 2023 & 2024*
Syllabi for the examinations to be held in the year
(Skill Enhancement Course)

Title: Instrumentation and Analytical Techniques

Course code: UBTT5603

Credits: 2

Total Marks: 50 marks

Internal Examination: 10 marks

End Semester Examination: 40 marks

Duration: 2 hours

Note for paper setters

External End Semester Examination (Total marks: 40)

Time duration: 2hrs

The question paper will have 3 sections.

Section I: Three (3) short answer questions representing all units (without detailed explanation having 70-80 words) of 3 marks each = 9 marks (**All compulsory**)

Section II: Three (3) medium answer questions (with explanation having 250-300 words) of 7 marks each = 21 marks (**All compulsory**)

Section III: Two (2) long answer questions (with detailed explanation/ of 400-500 words) covering all the units. The candidate will be required to answer only **one** questions of 10 marks each = 10 marks.

Internal Assessment (Total Marks:10)

Time duration: 45 min

The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 5 marks. It will have eight short answer questions, selecting at least each one from first two /50% of the syllabus covered. A candidate has to attempt **any five** questions of **one** mark each.

Part B: Total weightage to this part shall be 5 marks. It will have two long answer questions, selecting at least each one from first two/50% of the syllabus covered. A candidate has to attempt **any one** question of **five** marks.

Signature

B.Sc. Biotechnology
SEMESTER VI
(Under CBCS at Undergraduate Level) *May 2022, 2023+2024*
Syllabi for the examinations to be held in the years
(Skill Enhancement Course)

Title: Laboratory course based on Instrumentation and Analytical Techniques

Credits: 2

Course code: UBTPS604

Total Marks: 50 marks

Internal Examination: 25 marks

End Semester Examination: 25 marks

(Visit to any University Level or National lab is highly recommended for better exposure of the students)

Practicals:

1. Determine the absorption spectra of a biological sample with single/double beam spectrophotometer & verification of Beer's Lambert law.
2. Quantitative estimation of proteins by Bradford/Lowry's method.
3. Native gel electrophoresis of proteins
4. SDS-polyacrylamide slab gel electrophoresis of proteins under reducing conditions.
5. To identify amino acids in a given sample by TLC.
6. Design, handling and maintenance of Light microscope.
7. Simple and Differential staining.
8. Agarose gel electrophoresis to separate DNA
9. Demonstration of PCR machine.
10. Preparation of chromatographic column.

Scheme of Examination:

Examination (Practical)	Syllabus to be covered in the examination	% Weightage(marks)
Daily evaluation of practical records / Viva voce / attendance etc.		50% (25 Marks including 5 for attendance, 5 for Viva-voce and 15 marks (5 for Test + 10 marks daily performance)
Final Practical Performance + Viva voce (External Examination)	100%	50% (25 Marks including 20 for external paper and 5 marks for Viva voce)
Total		50 marks

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