

# FACULTY OF LIFE SCIENCES

## SYLLABUS

### FOR

# **B.Sc. Medical Lab Technology** (Credit Based Evaluation & Grading System) (Semester : I-IV)

**Examinations: 2019-20**



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## **GURU NANAK DEV UNIVERSITY** **AMRITSAR**

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**(ii) Subject to change in the syllabi at any time.**  
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B.Sc. Medical Lab Technology (Semester System)  
(Credit Based Evaluation & Grading System)

### Scheme

Semester I		Credits			Total Credits
Course No.	Course Title	L	T	P	
MLL-101	Cell Biology	2	1	-	3
MLL-102	Hematology-I	2	1	-	3
MLL-103	Principles of Biochemistry-I	2	1	-	3
MLL-104	Anatomy & Physiology-I	2	1	-	3
ENL-101	Communicative English-I	2	0	0	2
PBL-121/ PBL-122/ HSL-101	Punjabi Compulsory <b>OR</b> *ਮੁੱਢਲੀ ਪੰਜਾਬੀ <b>OR</b> **Punjab History & Culture (Compulsory)	2	-	-	2
SOA-101	***Drug Abuse : Problem, Management and Prevention (Compulsory ID Course)	3	0	0	3
MLP-125	Practicals in Cell Biology	-	-	1.5	1.5
MLP-126	Practicals in Hematology-I	-	-	1.5	1.5
MLP-127	Practicals in Biochemistry-I	-	-	1.5	1.5
MLP-128	Practicals in Anatomy & Physiology-I	-	-	1.5	1.5

**Note:**

1. \*Special Paper in lieu of Punjabi Compulsory.
2. \*\*For those students who are not domicile of Punjab.
3. \*\*\*Student can opt this Paper whether in 1<sup>st</sup> or 2<sup>nd</sup> Semester.

B.Sc. Medical Lab Technology (Semester System)  
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**B.Sc. Medical Lab Technology (Semester System)**

<b>Semester II</b>					
MLL-151	Basic Microbiology	2	1	-	<b>3</b>
MLL-152	Hematology-II	2	1	-	<b>3</b>
MLL-153	Principles of Biochemistry-II	2	1	-	<b>3</b>
MLL-154	Anatomy & Physiology-II	2	1	-	<b>3</b>
ENL-151	Communicative English-II	2	-	-	<b>2</b>
PBL-121/ PBL-122/ HSL-102	Punjabi Compulsory <b>OR</b> *ਮੁੱਢਲੀ ਪੰਜਾਬੀ <b>OR</b> **Punjab History & Culture (Compulsory)	2	0	0	<b>2</b>
SOA-101	***Drug Abuse : Problem, Management and Prevention (Compulsory ID Course)	3	0	0	<b>3</b>
MLP-176	Practicals in Microbiology	-	-	1.5	<b>1.5</b>
MLP-177	Practicals in Hematology-II	-	-	1.5	<b>1.5</b>
MLP-178	Practicals in Biochemistry-II	-	-	1.5	<b>1.5</b>
MLP-179	Practicals in Anatomy & Physiology-II	-	-	1.5	<b>1.5</b>

**Note:**

- \*Special Paper in lieu of Punjabi Compulsory.**
- \*\*For those students who are not domicile of Punjab.**
- \*\*\*Student can opt this Paper whether in 1<sup>st</sup> or 2<sup>nd</sup> Semester.**

**Note : PSL-053 ID Course Human Rights & Constitutional Duties (Compulsory ID Paper). Students can opt. this paper in any semester except the 1<sup>st</sup> Semester. This ID Paper is one of the total ID Papers of this course.**

B.Sc. Medical Lab Technology (Semester System)  
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<b>Semester III</b>		<b>Credits</b>			<b>Total Credits</b>
<b>Course No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	
MTL-201	Basics of Pathology-I	2	1	-	<b>3</b>
MTL-202	Introduction to Bacteriology and Virology	2	1	-	<b>3</b>
MTL-203	Clinical Biochemistry-I	2	1	-	<b>3</b>
MTL-204	Basic Immunology	2	1	-	<b>3</b>
MTP-226	Practicals in Pathology-I	-	-	1.5	<b>1.5</b>
MTP-227	Practicals in Bacteriology and Virology	-	-	1.5	<b>1.5</b>
MTP-228	Practicals in Clinical Biochemistry-I	-	-	1.5	<b>1.5</b>
MTP-229	Practicals in Immunology	-	-	1.5	<b>1.5</b>
*ESL-220	Environment Studies (Compulsory)	4			

**\*Note : Credits will not be included in the total.**

<b>Semester IV</b>					
MTL-251	Basics of Pathology-II	2	1	-	<b>3</b>
MTL-252	Fundamentals of Mycology	2	1	-	<b>3</b>
MTL-253	Clinical Biochemistry-II	2	1	-	<b>3</b>
MTL-254	Basics of Molecular Biology	2	1	-	<b>3</b>
MTP-276	Practicals in Pathology-II		-	1.5	<b>1.5</b>
MTP-277	Practicals in Mycology		-	1.5	<b>1.5</b>
MTP-278	Practicals in Clinical Biochemistry-II		-	1.5	<b>1.5</b>
MTP-279	Practicals in Molecular Biology		-	1.5	<b>1.5</b>

**MLL-101: CELL BIOLOGY**

Credit Hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section-A**

Molecular basis of origin and evolution of life: origin of primitive cell and eukaryotic cell.

Types of cell, organization of prokaryotic and eukaryotic cell

Microscopic techniques: light and phase contrast microscopy, Electron microscopy (TEM and SEM), Fixation and Staining techniques.

**Section-B**

Cell Division, Mitosis and meiosis

Plasma Membrane: Structure and molecular models, Significance in osmosis and transport, endocytosis and exocytosis.

Structure of mitochondria and chloroplast DNA, their origin and roles. Role of mitochondria in respiration, Organization and working of PSI and PS II in chloroplasts

**Section-C**

Endoplasmic reticulum and Golgi complex: Structure and functions

Lysosomes, peroxisomes and glyoxysomes: their structures and functions

Ribosomes: Types, their structure and functions. Protein synthesis and types of RNA

**Section-D**

Organization of nucleus and packing of DNA as chromatin

Preliminary concepts of cell transformation in cancer, cellular basis of immunity, cytoskeleton and stem cells

**Books recommended:**

1. Alberts, B. Bracy, P. Lewis, J. Raff, M. Roberts K and Watson, J. (eds) (2008). Molecular Biology of the Cell (5<sup>th</sup> Ed.), Garland Publishing, New York.
2. Copper, G.M. (2015). The Cell, Molecular Approach (7<sup>th</sup> Ed)ASM press Washington, D.C.
3. Chandra Roy, S and DE Kumar, K. (2001) Cell Biology. New Central Book Agency (P) Ltd. Kolkata
4. Darnell, J. Lodish, Baltimore, D. (2007). Molecular Cell Biology, 6<sup>th</sup> edition, Freeman, New York.

**MLL-102 : HEMATOLOGY-I**

Credit Hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

Introduction to Hematology: Definition and significance of hematology, Blood and its various components, Erythropoiesis, Leucopoiesis, Thrombopoiesis, Leucocytes, Development of Blood corpuscles, Red blood cells in general blood circulation.

**Section B**

Hemoglobin and its various types of Hemoglobin, Iron metabolism, Hemoglobin derivatives.

**Section C**

Hematological Disorders: Anemia, various types of anemia, Megaloblastic Anemia, Iron deficiency Anemia, Hemolytic Anemia, Pernicious Anemia, Sideroblastic anemia, Sickle Cell Anemia.

**Section D**

Thalassemia, Polycythemia, Leukemia, Multiple Myeloma, Di-Gugliermo Syndrome, Hereditary Spherocytosis, Hereditary Elliptocytosis, Haemolytic disease of newborn, Infectious Mononucleosis, Parasitic infections of blood.

**Books Recommended:**

1. Godkar, PB and Godkar, DP (2008) Text Book of Medical Laboratory Technology, 2<sup>nd</sup> edition Bhalani Publishing House, Mumbai, India.
2. Martin R. Howard & Peter J Hamilton (2013) Text Book of Hematology, 4<sup>th</sup> edition, Churchill Livingstone.

**MLL-103 : PRINCIPLES OF BIOCHEMISTRY-I**

Credit Hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

**Introduction:**Principles of living organisms; Elements of living organisms; Fitness of Biomolecules. **Carbohydrates:** Definition; Classification of carbohydrates; Structure and functions of various classes of carbohydrates; Monosaccharides, Disaccharides, Polysaccharides

**Section B**

**Lipids:** Definition; Classification of lipids; structure and functions of various classes of lipids; Triglycerides; Phosphoglycerides; Sphingolipids; Terpenes; Steroids; Eicasonoids; fatty acids and essential fatty acids. **Nucleic acids:** Nitrogen bases: Purines and Pyrimidines; Nucleosides and Nucleotides, DNA Structure and its forms; RNA and its types; Differences between DNA and RNA; Biologically important nucleotides.

**Section C**

**Proteins:**Classification and structure of amino acid; unusual and non-protein amino acids;Essential amino acids; Important peptides and their functions; Organizational levels of protein structure; Functional and structural classification of proteins.

**Section D**

**Vitamins:** Definition; chemistry and functions of water and fat soluble vitamins.

**Enzymology:** Nomenclature; Classification and characteristics of enzyme; Enzyme specificity; Cofactors; Co-enzymes and Prosthetic groups;Types of enzyme inhibition; Factors effecting enzyme activity.

**Books Recommended**

1. Nelson D and Cox MM. (2013) Lehninger Principles of Biochemistry, 6<sup>th</sup> Edition. Macmillan Worth Publishers, New Delhi.
2. Berg JM, Tymoczko JL, Gatto GJ and Stryer L (2015) Biochemistry,8<sup>th</sup> Edition, WH Freeman& Co., New York.
3. Bender DA, Botham KM, Kennelly PJ, Rodwell VW and Weil PA (2015) Harper's Illustrated Biochemistry, 30<sup>th</sup> Edition, McGraw-Hill Medical Canada



**MLL-104 : ANATOMY AND PHYSIOLOGY I**

Credit Hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

**Organization of human body, Skeletal system** — Classification of bones, Histology of bone, Ossification and growth of bone, Types of joints, Movements at joints.

**Muscular system** — Classification of muscles, Structure of smooth, cardiac, skeletal muscle, neuromuscular junction.

**Section B**

**Nervous system** — Central nervous system- Gross anatomy and Functions of different parts of brain, structure and function of spinal cord

**Section C**

**Autonomic nervous system** organization and functions, Special senses — anatomy and working of the eye and the ear

**Section D**

**Integumentary system** — Skin, hair, nail, touch receptors.

**Endocrine system** — Brief anatomy of endocrine glands and functions

**Books Recommended**

1. Marieb, E.N. (2014). Human Anatomy and Physiology. Dorling Kindersley (India) Pvt. Ltd.,
2. Ross and Willson (2012). Anatomy and Physiology. ELBS Publication.
3. Tortora, G.J. and Henderson, S.R. (2012). Principles of Anatomy and Physiology. HarperCollins College Publishers.

**ENL-101 : COMMUNICATIVE ENGLISH-I**

**Credits: 02 (L= 2, T=0, U=0)**

**Total Marks-50**

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Objective:** To introduce students to the skills and strategies of reading and writing by identifying organizational patterns, spotting classification systems and understanding associations between ideas. This course will prepare students to read a variety of texts and also to communicate more effectively through writing. The course will also pay special attention to vocabulary building.

**Prescribed Text books:**

- *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.
- *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

**Section-A**

“Word List”, “Correct Usage of Commonly used words and Phrases” from the chapter “Vocabulary” given in *The Written Word* by Vandana R. Singh.

**Section-B**

Letter- writing as prescribed in *The Written Word* by Vandana R. Singh.

Report writing as prescribed in *The Written Word* by Vandana R. Singh.

**Section-C**

Section 1 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

**Section-D**

Section 2 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

**PBL 121 : ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ - I (Credit Based)**

**Credit : 2-0-0**

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਸੈਕਸ਼ਨ-ਏ**

- I. **ਦੋ ਰੰਗ** (ਸੰਖਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :  
(ੳ) ਭਾਈ ਵੀਰ ਸਿੰਘ  
(ਅ) ਧਨੀ ਰਾਮ ਚਾੜ੍ਹਕ  
(ੲ) ਪ੍ਰੋ. ਪੂਰਨ ਸਿੰਘ  
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਗੁਰਮੁਖੀ ਔਰਥੋਗਰਾਫੀ ਦੀ ਜੁਗਤ (ਪੈਂਤੀ, ਮੁਹਾਰਨੀ, ਬਿੰਦੀ, ਟਿੱਪੀ ਤੇ ਅੱਧਕ); ਵਿਸ਼ਰਾਮ ਚਿੰਨ੍ਹ, ਸ਼ਬਦ ਜੋੜ (ਸੁਧ-ਅਸੁਧ)

**ਸੈਕਸ਼ਨ-ਬੀ**

- I. **ਦੋ ਰੰਗ** (ਸੰਖਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :  
(ੳ) ਵਿਰੋਜਦੀਨ ਸ਼ਰਫ  
(ਅ) ਪ੍ਰੋ. ਮੋਹਨ ਸਿੰਘ  
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਲੇਖ ਰਚਨਾ (ਜੀਵਨੀ-ਪਰਕ, ਸਮਾਜਕ ਅਤੇ ਚਲੰਤ ਵਿਸ਼ਿਆਂ ਉੱਤੇ) : 10 ਲੇਖ ਲਿਖਵਾਉਣੇ (ਕਲਾਸ ਵਿਚ ਅਤੇ ਘਰ ਲਈ ਅਭਿਆਸ)

**ਸੈਕਸ਼ਨ-ਸੀ**

- I. **ਦੋ ਰੰਗ** (ਸੰਖਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :  
(ੳ) ਨੰਦ ਲਾਲ ਨੂਰਪੁਰੀ  
(ਅ) ਅਮ੍ਰਿਤਾ ਪ੍ਰੀਤਮ  
(ੲ) ਡਾ. ਹਰਿਭਜਨ ਸਿੰਘ  
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਸ਼ੁੱਧ, ਅਸ਼ੁੱਧ : ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿੱਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦਾਂ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ  
(15 ਪੈਰ੍ਹਿਆਂ ਦੇ ਸ਼ੁੱਧ ਅਸ਼ੁੱਧ ਅਭਿਆਸ ਕਰਵਾਉਣੇ)

**ਸੈਕਸ਼ਨ-ਡੀ**

- I. **ਦੋ ਰੰਗ** (ਸੰਖਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :  
(ੳ) ਸ਼ਿਵ ਕੁਮਾਰ ਬਟਾਲਵੀ  
(ਅ) ਸੁਰਜੀਤ ਪਾਤਰ  
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਅਖਬਾਰੀ ਇਸ਼ਤਿਹਾਰ : ਨਿੱਜੀ, ਦਫ਼ਤਰੀ ਤੇ ਸਮਾਜਕ ਗਤੀਵਿਧੀਆਂ ਨਾਲ ਸੰਬੰਧਤ

**PBL-122: ਮੁੱਢਲੀ ਪੰਜਾਬੀ**  
(In lieu of Punjabi Compulsory)

**Credits: 2-0-0**

**Time: 3 Hours**

**Max. Marks: 100**  
**Mid Semester Marks : 20**  
**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**  
**End Semester Examination: 80% weightage**

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿੱਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਪਾਠ-ਕ੍ਰਮ**

**ਸੈਕਸ਼ਨ-ਏ**

ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ,  
ਮਾਤ੍ਰਾਵਾਂ (ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ)  
ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) : ਪਛਾਣ ਤੇ ਵਰਤੋਂ

**ਸੈਕਸ਼ਨ-ਬੀ**

ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ  
ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ  
ਮੂਲ ਸ਼ਬਦ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ

**ਸੈਕਸ਼ਨ-ਸੀ**

ਸ਼ੁੱਧ ਅਸ਼ੁੱਧ : ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿੱਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ।  
ਸਮਾਨਾਰਥਕ ਤੇ ਵਿਰੋਧਾਰਥਕ ਸ਼ਬਦ

**ਸੈਕਸ਼ਨ-ਡੀ**

ਹਫਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਮ, ਇਕ ਤੋਂ ਸੌ ਤੱਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿੱਚ।

**HSL-101 : Punjab History & Culture (1450-1716)**  
**(Special paper in lieu of Punjabi Compulsory)**  
**(For those students who are not domicile of Punjab)**

**Credits: 2-0-0**

**Time: 3 Hours**

**Max. Marks: 100**  
**Mid Semester Marks : 20**  
**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**  
**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section-A**

1. Land and the People.
2. Bhakti Movement

**Section-B**

3. Life and Teaching of Guru Nanak Dev.
4. Contribution of Guru Angad Dev, Guru Arjun Dev, Guru Amar Das and Guru Ram Das.

**Section-C**

5. Guru Hargobind.
6. Martyrdom of Guru Teg Bahadur

**Section-D**

7. Guru Gobind Singh and the Khalsa.
8. Banda Singh Bahadur: Conquests and Execution.

**Suggested Reading**

1. Kirpal Singh(ed.), *History and Culture of the Punjab, Part-ii, Punjabi University, Patiala, 1990.*
2. Fauja Singh (ed.), *History of Punjab, Vol, III Punjabi University, Patiala, 1987.*
3. J.S. Grewal, *The Sikhs of the Punjab, Cup, Cambridge, 1991.*
4. Khushwant Singh, *A History of the Sikhs, Vol. I, OUP, New Delhi, 1990*

**SOA-101 : DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION  
(COMPULSORY ID COURSE)**

(Student can opt. this paper whether in 1<sup>st</sup> or 2<sup>nd</sup> semester)

**PROBLEM OF DRUG ABUSE**

**Time: 3 Hours**

**Credit 3-0-0**

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section – A**

**Meaning of Drug Abuse:**

- 1) Meaning, Nature and Extent of Drug Abuse in India and Punjab.
- 2) Consequences of Drug Abuse for:
 

Individual	:	Education, Employment, Income.
Family	:	Violence.
Society	:	Crime.
Nation	:	Law and Order problem.

**Section – B**

**Management of Drug Abuse:**

- (i) Medical Management: Medication for treatment and to reduce withdrawal effects.
- (ii) Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
- (iii) Social Management: Family, Group therapy and Environmental Intervention.

**Section – C**

**Prevention of Drug abuse:**

- (i) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
- (ii) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

**Section – D****Controlling Drug Abuse:**

- (i) Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
- (ii) Legislation: NDPS act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

**References:**

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Kessel, Neil and Henry Walton. 1982, *Alcoholism*. Harmond Worth: Penguin Books.
6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
9. Sain, Bhim 1991, *Drug Addiction Alcoholism*, Smoking obscenity New Delhi: Mittal Publications.
10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
11. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.
13. Verma, P.S. 2017, “*Punjab’s Drug Problem: Contours and Characteristics*”, Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
14. World Drug Report 2016, United Nations office of Drug and Crime.
15. World Drug Report 2017, United Nations office of Drug and Crime.



**MLP-125 : PRACTICALS IN CELL BIOLOGY**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Different types of Microscopes and their working.
2. Study of permanent slides of prokaryotic and eukaryotic cell
3. Study of permanent slides of tissues.
4. Temporary preparation of *Lacto bacillus* from curd
5. Temporary preparation of freshwater Protozoa
6. Histological preparation of tissues
7. To study mitosis from onion root tips.
8. To study meiosis from grasshopper gonads.

**Note:- Some changes can be made in the practicals depending on the availability of material.**

**MLP-126 : PRACTICALS IN HEMATOLOGY-I**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Basic requirements for Hematology laboratory.
2. Glassware for Hematology.
3. Equipments for Hematology.
4. Anticoagulant vial preparation.
5. Complete Blood Count.
6. Determination of Hemoglobin.
7. TRBC count by Hemocytometer.
8. TLC by Hemocytometer.
9. Differential Leukocyte count.
10. Determination of Platelet Count.

**Books Recommended:**

1. Godkar, PB and Godkar, DP (2008) Text Book of Medical Laboratory Technology, 2<sup>nd</sup> edition Bhalani Publishing House, Mumbai, India.
2. Martin R. Howard & Peter J Hamilton(2013)Text Book of Hematology, 4<sup>th</sup> edition, Churchill Livingstone

**MLP-127 : PRACTICALS IN BIOCHEMISTRY-I**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Introduction to Biochemistry Laboratory: General Glassware, Equipment: use of analytical balance and general safety measures
2. Cleaning of glassware: preparation of chromic acid
3. Calibration of Laboratory equipment
4. Preparation of distilled water
5. Preparation of 1N NaOH
6. Preparation of 1N HCl
7. Preparation of normal saline
8. To demonstrate the phenomenon of Dialysis
9. Use of pH meter and preparation of Buffer.
10. Use of Centrifuge with different types of Rotor
11. Use of spectrophotometer and colorimeter.
12. To find the absorption maxima of a dye.
13. To find the absorption maxima of aromatic amino acids.
14. To demonstrate Beer- Lambert's Law.
15. Volumetric analysis- acid base titration

**MLP-128 : PRACTICALS IN ANATOMY AND PHYSIOLOGY-I**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Anatomical positions — Superior, Inferior, Anterior, Medial, Posterior, Lateral, Proximal, Distal, External, Internal, Parietal, Visceral, Cavities and planes of human body.
2. Classification of bones,
3. Skull – different views,
4. Vertebrae, Typical, atypical-C1,C2, C7, T1, T10, T11, T12,L5
5. Sternum, Scapula, Clavicle, Bones of upper and lower limbs,
6. Innominate, Sex differentiation in skull, Innominate and Sacrum.
7. Types of joints, Movements at joints
8. Overview of reflex actions.

**MLL-151 : BASIC MICROBIOLOGY**

Credit Hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

Discovery of microorganisms in the living world (Haeckels kingdom Protista, Prokaryotes & Eukaryotes, Whittaker's five kingdom concept, kingdom prokaryotic after Bergeys manual of systematic bacteriology), groups of microorganisms, distribution in nature, spontaneous generation verses biogenesis, fermentation, germ theory of disease, laboratory techniques & pure cultures, immunology, medical microbiology agricultural, industrial & food microbiology, molecular microbiology.

**Section B**

Microscopy and staining, microbiological techniques, pour plating, spreading, streaking serial dilution, methods of sterilization, media preparation, types of media (synthetic, natural, enrichment, selective), Pure cultures & cultural characteristics: Mixed culture, selective methods, natural selection of microorganisms, maintenance & preservation of cultures, culture collection and cataloging of pure cultures, colony characteristics & characteristics of broth cultures.

**Section C**

Nutritional requirements for growing microorganisms, General account of Bacteria, fungi, slime & water molds, protozoa, viruses, their morphology, Mode of cell division, growth curve of bacteria mathematical expression of growth, quantitative measurement of bacterial growth, factors affecting growth.

**Section D**

Control of Microorganisms: Control of microbes by physical and chemical agents. Antibiotics: properties and mode of action. Drug resistance and its significance. Antibiotic sensitivity test. Industrial uses of bacteria, yeasts & molds.

**Books Recommended:**

1. Stanier, R.Y. Adelberg, E.A. and Ingraham, J.L. (1984), General Microbiology, IV edn. Mac Millan Press.
2. Pelczar, M.J. Chan, E.C.S. and Krieg, N.R. (1986), Microbiology, V Ed. McGraw Hill.
3. Prescott. L.M. Harley J.P. and L. Kreig D.A. (1990). Microbiology, WCB Publishers.
4. Rosenberg, E & Cohen I.R. (1983). Microbial Biology. H.S. International Editions.

**MLL-152 : HEMATOLOGY-II**

Credit Hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**  
**Mid Semester Marks : 20**  
**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**  
**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

**Coagulation** and mechanism of coagulation, Blood coagulation, Routine coagulation Tests, Automated coagulation system, Sysmex coagulation analyzer.

**Section B**

**Basic Hematological Techniques:** Characteristics of good technician, Preparation of specimen collection material, lab request form, veinpuncture and its complications, Patient after care, Specimen rejection criteria for blood specimen, Haemolysis of blood, Blood collection by skin puncture, Arterial puncture,

**Section C**

Anticoagulants, separation of serum, plasma, changes in blood on keeping, maintenance of specimen, identification & transport of the specimen, Complete blood count (CBC), ESR, effects of storage on blood cell morphology, universal precautions.

**Section D**

**Immunohematology:** Introduction, human blood group system, Inheritance of blood group system genetics, indirect anti-globulin (Coomb's test), direct anti-globulin (Coomb's test).

**Books Recommended:**

1. Godkar, PB and Godkar, DP (2008) Text Book of Medical Laboratory Technology, 2<sup>nd</sup> edition Bhalani Publishing House, Mumbai, India.
2. Martin R. Howard & Peter J Hamilton(2013)Text Book of Hematology, 4<sup>th</sup> edition, Churchill Livingstone

**MLL-153 : PRINCIPLES OF BIOCHEMISTRY-II**

Credit Hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**  
**Mid Semester Marks : 20**  
**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**  
**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

**Introduction:** Introduction to Metabolism: Catabolism and Anabolism; Regulation of metabolic pathways, Principles of Bioenergetics. **Nucleic acid Metabolism:** Biosynthesis of Purines and Pyrimidines; Degradation of Purines and Pyrimidines

**Section B**

**Carbohydrate metabolism:** Digestion and absorption of Carbohydrates, Representative pathways of carbohydrate metabolism: Glycolysis, Citric Acid Cycle, Pentose Phosphate Pathway, Glyoxalate cycle; Electron transport chain, gluconeogenesis.

**Section C**

**Lipid metabolism:** Digestion and absorption of Lipids; Transport of lipoproteins, Oxidation of Fatty acids; synthesis of fatty acids, cholesterol and Eicosanoids.

**Section D**

**Protein metabolism:** General reactions of amino acid metabolism, Transamination, Deamination, Urea cycle, Heme Biosynthesis.

**Books Recommended**

1. Nelson DL and Cox MM. (2013) Lehninger Principles of Biochemistry, 6<sup>th</sup> Edition. Macmillan Worth Publishers, New Delhi.
2. Berg JM, Tymoczko JL, Gatto GJ and Stryer L (2015) Biochemistry, 8<sup>th</sup> Edition, WH Freeman & Co., New York.
3. Bender DA, Botham KM, Kennelly PJ, Rodwell VW and Weil PA (2015) Harper's Illustrated Biochemistry, 30<sup>th</sup> Edition, McGraw-Hill Medical Canada



**MLL-154 : ANATOMY AND PHYSIOLOGY II**

Credit Hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**  
**Mid Semester Marks : 20**  
**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**  
**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

**Digestive system** -Brief description of gross anatomy and histology of constituent parts, gustatory receptors, physiology of digestion.

**Circulatory system**- Structure blood vessels, Types of blood vessels, Brief description of arterial, venous system

**Section B**

Blood composition, Structure and physiology of heart, maintenance of Heart rate, blood pressure

**Respiratory system**-Brief description of anatomy of constituent parts, physiology of respiration, olfactory receptors.

**Section C**

**Lymphatic system** -Anatomy and functions.

**Urinary system**- Brief anatomical description of constituent parts, Functions of urinary system, Role of kidney in Urine formation and maintaining blood volume .

**Section D**

**Reproductive system**-Brief Anatomical description of male and female reproductive organs, Physiology of reproduction.

**Books Recommended**

1. Drake, R., Vogl, W. and Mitchell, A. (2004). Gray's Anatomy for Students. Churchill, Livingstone, USA.
2. Marieb, E.N. (2014). Human Anatomy and Physiology. Dorling Kindersley (India) Pvt. Ltd.,
3. Ross and Willson (2012). Anatomy and Physiology. ELBS Publication.
4. Tortora, G.J. and Henderson, S.R. (2012). Principles of Anatomy and Physiology. HarperCollins College Publishers.

**ENL-151 :COMMUNICATIVE ENGLISH–II**

**Credits: 02 (L= 2, T=0, U=0)**

**Total marks-50**

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Objective:** To introduce students to the skills and strategies of reading and writing by identifying organizational patterns, spotting classification systems and understanding associations between ideas. This course will prepare students to read a variety of texts and also to communicate more effectively through writing. The course will also pay special attention to vocabulary building.

**Prescribed Text books:**

- *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.
- *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

**SECTION–A**

Practical question on Note Making, Summarizing and Abstracting as given in *The Written Word* by Vandana R. Singh

**SECTION–B**

Practical question on Paragraph writing as prescribed in *The Written Word* by Vandana R. Singh

**SECTION–C**

Theoretical questions based on ABC of Good Notes as prescribed in *The Written Word* by Vandana R. Singh.

Section C from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

**SECTION–D**

Practical question on Essay writing from *The Written Word* by Vandana R. Singh

Section 4 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

**PBL 131 : ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ - II (Credit Based)**

**Credit : 2-0-0**

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਸੈਕਸ਼ਨ-ਦੋ**

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਥੀਆ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :  
(ੳ) ਨਾਨਕ ਸਿੰਘ : **ਭੂਆ**  
(ਅ) ਗੁਰਮੁਖ ਸਿੰਘ ਮੁਸਾਫਿਰ : **ਬਾਗੀ ਦੀ ਧੀ**  
(ੳ) ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ : **ਪੇਮੀ ਦੇ ਨਿਆਣੇ**  
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- II. ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਧਾਤੂ/ਮੂਲ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਪਿਛੇਤਰ, ਵਿਉਂਤਪਤ ਅਤੇ ਰੁਪਾਂਤਰੀ), ਸਮਾਸ।

**ਸੈਕਸ਼ਨ-ਬੀ**

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਥੀਆ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :  
(ੳ) ਸੁਜਾਨ ਸਿੰਘ : **ਬਾਗਾਂ ਦਾ ਰਾਖਾ**  
(ਅ) ਕਰਤਾਰ ਸਿੰਘ ਦੁੱਗਲ : **ਤੈਂ ਕੀ ਦਰਦ ਨਾ ਆਇਆ**  
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- II. ਪੈਰ੍ਹਾ ਰਚਨਾ : ਕਲਾਸ ਵਿਚ 10 ਵਿਸ਼ਿਆਂ (ਸਭਿਆਚਾਰ, ਧਾਰਮਕ ਅਤੇ ਰਾਜਨੀਤਕ) 'ਤੇ ਪੈਰ੍ਹਾ ਰਚਨਾ ਦੇ ਅਭਿਆਸ ਕਰਵਾਉਣੇ।

**ਸੈਕਸ਼ਨ-ਸੀ**

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :  
(ੳ) ਕੁਲਵੰਤ ਸਿੰਘ ਵਿਰਕ : **ਧਰਤੀ ਹੇਠਲਾ ਬੋਲਦ**  
(ਅ) ਨਵਤੇਜ ਸਿੰਘ : **ਦੂਜੀ ਵਾਰ ਜੇਬ ਕੱਟੀ ਗਈ**  
(ੲ) ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ : **ਲੱਛਮੀ**  
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- II. ਮੁਹਾਵਰੇ ਤੇ ਅਖਾਣ (ਅਖਾਣ ਤੇ ਮੁਹਾਵਰਾ ਕੋਸ਼ ਵਿਚ) 200 ਮੁਹਾਵਰਿਆਂ ਅਤੇ 100 ਅਖਾਣਾਂ ਨੂੰ ਵਾਕਾਂ ਵਿਚ ਵਰਤਣ ਦੇ ਅਭਿਆਸ ਕਰਵਾਉਣੇ (ਕਲਾਸ ਵਿਚ ਤੇ ਘਰ ਲਈ)।

**ਸੈਕਸ਼ਨ-ਡੀ**

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :  
(ੳ) ਅਜੀਤ ਕੌਰ : **ਬੁੱਤ ਸ਼ਿਕਨ**  
(ਅ) ਦਲੀਪ ਕੌਰ ਟਿਵਾਣਾ : **ਬੱਸ ਕੰਡਕਟਰ**  
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- II. ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸੰਬੰਧਕ

**PBL-132: ਮੁੱਢਲੀ ਪੰਜਾਬੀ**  
(In lieu of Punjabi Compulsory)

**Credits: 2-0-0**

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿੱਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਪਾਠ-ਕ੍ਰਮ**

**ਸੈਕਸ਼ਨ-ਏ**

**ਸਬਦ ਸੂਣਾਆ : ਪਛਾਣ ਅਤੇ ਵਰਤ**

(ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆ ਵਸ਼ਸ਼ਣ)

**ਸੈਕਸ਼ਨ-ਬੀ**

**ਨਤ ਵਰਤ ਦਾ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਰਸਤ-ਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਨਾਲ ਸਬੰਧਤ ।**

**ਸੈਕਸ਼ਨ-ਸੀ**

**ਪੰਜਾਬੀ ਵਾਕ-ਬਣਤਰ**

**ਸਾਧਾਰਨ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤ)**

**ਸੰਯੁਕਤ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤ)**

**ਮਿਸ਼ਰਤ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤ)**

**ਸੈਕਸ਼ਨ-ਡੀ**

**ਪੜ੍ਹਾ ਰਚਨਾ**

**ਸੰਖੇਪ ਰਚਨਾ**

**HSL-102 : Punjab History & Culture (1717-1947)**  
**(Special paper in lieu of Punjabi Compulsory)**  
**(For those students who are not domicile of Punjab)**

**Credits: 2-0-0**

**Time: 3 Hours**

**Max. Marks: 100**  
**Mid Semester Marks : 20**  
**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**  
**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section-A**

1. Sikh Struggle for Sovereignty.
2. Ranjit Singh : Conquests, Administration and the Anglo-Sikh Relations.

**Section-B**

3. Anglo-Sikh Wars and the Annexation.
4. The Punjab under the British: New Administration, Education and social Change.

**Section-C**

5. Economic Changes: Agricultural
6. Socio-Religious Reform Movements.

**Section-D**

7. Role of Punjab in the Freedom Struggle.
8. Fairs and Festivals.

**Suggested Reading**

1. Kirpal Singh (ed.), *History and Culture of the Punjab*, Part-II, Punjabi University, Patiala, 1990.
2. Fauja Singh (ed.), *History of Punjab*, Vol, III, Punjabi University, Patiala, 1987.
3. J.S. Grewal, *The Sikhs of the Punjab, Cup, Cambridge, 1991.*
4. Khushwant Singh, *A History of the Sikhs*, Vol. I, OUP, New Delhi, 1990

**SOA-101 : DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION  
(COMPULSORY ID COURSE)**

(Student can opt. this paper whether in 1<sup>st</sup> or 2<sup>nd</sup> semester)

**PROBLEM OF DRUG ABUSE**

**Time: 3 Hours**

**Credit 3-0-0**

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section – A**

**Meaning of Drug Abuse:**

1. Meaning, Nature and Extent of Drug Abuse in India and Punjab.
2. Consequences of Drug Abuse for:
 

Individual	:	Education, Employment, Income.
Family	:	Violence.
Society	:	Crime.
Nation	:	Law and Order problem.

**Section – B**

**Management of Drug Abuse:**

- (iv) Medical Management: Medication for treatment and to reduce withdrawal effects.
- (v) Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
- (vi) Social Management: Family, Group therapy and Environmental Intervention.

**Section – C**

**Prevention of Drug abuse:**

- (iii) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
- (iv) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.



### Section – D

#### Controlling Drug Abuse:

- (iii) Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
- (iv) Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

#### References:

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Kessel, Neil and Henry Walton. 1982, *Alcoholism*. Harmond Worth: Penguin Books.
6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
9. Sain, Bhim 1991, *Drug Addiction Alcoholism*, Smoking obscenity New Delhi: Mittal Publications.
10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
11. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.
13. Verma, P.S. 2017, “*Punjab’s Drug Problem: Contours and Characteristics*”, Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
14. World Drug Report 2016, United Nations office of Drug and Crime.
15. World Drug Report 2017, United Nations office of Drug and Crime.

**MLP-176 : PRACTICALS IN MICROBIOLOGY**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. To study different lab apparatuses used in microbiology.
2. To study compound microscope.
3. To study various techniques of sterilization.
4. To prepare media & its sterilization.
5. To prepare agar slants/deeps.
6. Serial dilution for enumeration of microorganisms.
7. To study various cultural techniques like pour plating, spreading & streaking.
8. To study the morphology cell structure of microorganisms through staining procedures.
  - a. Simple staining
  - b. Gram staining
  - c. Negative staining
9. To count the no. of microorganisms by Haemocytometer.
10. Measure size of bacteria using micrometer

**MLP-177 : PRACTICALS IN HEMATOLOGY-II**

Credit Hrs.		
L	T	P
0	0	1.5

1. Determination of ESR by Wintrob's.
2. Determination of ESR by Westergren's method.
3. Determination of PCV by Wintrob's
4. Erythrocyte Indices- MCV, MCH, MCHC.
5. Reticulocyte count.
6. Absolute Eosinophil count.
7. Morphology of Red Blood Cells
8. Determination of Malarial Parasite.
9. Determination of Bleeding Time
10. Determination of clotting time

**Books Recommended:**

1. Godkar, PB and Godkar, DP (2008) Text Book of Medical Laboratory Technology, 2<sup>nd</sup> edition Bhalani Publishing House, Mumbai, India.
2. Martin R. Howard & Peter J Hamilton(2013)Text Book of Hematology, 4<sup>th</sup> edition, Churchill Livingstone

**MLP-178 : PRACTICALS IN BIOCHEMISTRY-II**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. To estimate total carbohydrates in a given sample by Anthrone method.
2. Estimation of reducing sugars.
3. To estimate the protein in a given sample by Biuret method.
4. To estimate the protein in a given sample by Bradford method.
5. To estimate cholesterol in a given sample.
6. To estimate Vitamin C in a given sample.
7. To estimate salivary amylase.
8. Isolation and quantification of DNA by inorganic method.
9. Separation of Serum protein by Agarose gel electrophoresis.
10. To perform Glucose tolerance test.
11. To determine serum inorganic phosphorus.
12. To determine serum/ urinary sodium and potassium.
13. To estimate serum bicarbonate.
14. To estimate Glycosylated Haemoglobin.
15. To estimate urinary uric acid.

**MLP-179 : PRACTICALS IN ANATOMY AND PHYSIOLOGY II**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Estimation of Bleeding time, clotting time.
2. Estimation of Hemoglobin concentration,
3. Blood cell counts- RBC Count, Total leukocyte count, Differential leukocyte count
4. Osmotic fragility of RBC,
5. Estimation of ESR
6. To record Heart rate and pulse rate
7. To record Blood pressure

**MTL-201 : Basics of Pathology – I**

Credit hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

**Microscopy**-Working principle, maintenance and applications of various types of microscopes.

**Staining:** Metachromasis and metachromatic dyes, haematoxylin stain, MGG, PAPANTICOLOU stains, special stains like PAS, Mucicarmine, Alcain blue, Schmorl, Acid phosphatase

**Section B**

**Alimentary and digestive system:** - Diseases of mouth and Oesophagus, Gastritis, Peptic ulceration, Appendicitis microbial diseases, food poisoning, hernia, Intestinal abstrictions & malabsorbtion.

**Accessory Digestive glands:** Salivary glands- mumps, Liver – hepatitis, liver failure, cirrhosis. Pancreas- pancreatitis, Gall Bladder- Gall stones, jaundice

**Section C**

**Study of body tissues:**-Epithelial tissues, connective tissue including bone and cartilage, muscular tissue

**Circulatory System:-** Diseases of Blood vessels- Atheroma, Atherosclerosis, Disorders of Blood Pressure - Hyper & Hypotension and cardiovascular diseases.

**Section D**

**Respiratory System:** - Upper respiratory tract infection, Bronchi, Asthma, Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.

**References:**

1. Textbook of Pathology by Harsh Mohan ( 2015). Jaypee Brothers Medical Publishers (P) Ltd. New Delhi, india
2. Muir's Textbook of Pathology (2014) edited by C. Simon Herrington. CRC press USA
3. Textbook of Pathology (2004) by V Krishna. Oirint Longman Pvt. Ltd, India

**MTL-202 : Introduction to Bacteriology and Virology**

Credit hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section-A**

Brief history of microbiology with special reference to the contributions of Louis Pasteur, Robert Koch and others. Morphology and growth requirements of bacteria. Sterilization and disinfection procedures. Stains – Gram's Stain, ZN Stain and special stain. Cultivation methods, isolation and identification of bacteria. Antibiotic susceptibility testing.

**Section-B**

Study (Classification, morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis) of clinically important bacteria- *Staphylococcus*, *Streptococcus*, *Neisseria*, *Corynebacterium*, *Mycobacterium*, *Clostridium*, *E.coli*, *Klebsiella*, *Salmonella*, *Proteus*, *Pseudomonas*, *Vibrio* & Spirochaetes (*Treponema*, *Borrelia* and *Leptospira*), *Mycoplasma*, *Helicobacter pylori*

**Section-C**

Brief history of virology. Virus: general characteristics, Morphology: envelope, capsid and nucleic acid. Bacteriophages. Lytic and lysogenic cycle. Detection of virus: Complement fixation test, haemagglutination, serological & molecular based methods. Electron microscopic techniques for visualization of virus

**Section-D**

One step growth curve for virus. Culture of animal virus. Cytopathogenic effects of virus infection. Symptoms, transmission, pathogenesis, detection and treatment of viral diseases: Influenza, Dengue, Hepatitis and AIDS.



**Recommended Books:**

1. Pelczar, M.J. Chan, E.C.S. and Krieg, N.R. 1986, Microbiology, 5<sup>th</sup> Ed. McGraw Hill.
2. Woolverten C. J. and Sherwood L. 1990. Prescott's Microbiology. 10<sup>th</sup> Ed. WCB Publishers.
3. Cann, Allan J. 1997. Principles of Molecular Virology, Academic Press London.
4. E.K. Wagner and M.J. Hewlet. 2004. Basic virology (2<sup>nd</sup> Ed) Blackwell publisher.

**MTL-203 : CLINICAL BIOCHEMISTRY-I**

Credit hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Course Contents**

**Section-A**

**Introduction:** Definition and scope of clinical biochemistry in diagnosis, Specimen collection, processing and handling in clinical laboratory – sources of biological variation, use of clinical laboratory and interpretation of results, quality control and quality assurance.

**Body Fluids:** Milk, Colostrum, Aqueous humor, Cerebrospinal fluid, Amniotic fluid, Assessment of fetal maturity

**Section-B**

**Assay procedures:** Principles of assay procedures, Normal range in blood, serum, plasma and urine and reference values for glucose, proteins, urea, uric acid, creatinine, bilirubin and lipids.

**Water balance:** Body water compartments, Donnan membrane equilibrium, Osmolality, Electrolyte concentration of body fluid compartments.

**Section-C**

**Electrolyte balance:** Regulation of sodium and water balance, Renin-angiotensin system, Isotonic contraction, Hypotonic contraction, Hypertonic contraction, Isotonic expansion, Hypotonic expansion, Hypertonic expansion, Clinical applications of Sodium, Potassium, Chloride, Hyponatremia, Hyponatremia, Hypokalemia, Hyperkalemia, Hyperchloremia, Hypochloremia.

### Section-D

**pH:** Production of acids and bases by the body, maintenance of body pH, Henderson-Hasselbalch equation, Buffers, Buffer capacity, Buffers of body fluids.

**Acid-Base Balance:** Respiratory regulation of pH, Renal regulation of pH, Titratable acid, Cellular buffers, Disturbances in acid-base balance, Anion gap, Metabolic acidosis, Metabolic alkalosis, Respiratory acidosis, Respiratory alkalosis, disorders of acid base balance.

### Books Recommended

1. Vasudevan D, Sreeekumari S and Vaidyanathan K (2016) Textbook of Biochemistry for Medical Students. 8<sup>th</sup> Edition. Jaypee Brothers Medical Publishers (P) Ltd.
2. Godkar PB and Godkar DP (2014) Textbook of Medical Laboratory Technology (Vol 1 and 2) by P.B. Godkar. Bhalani Publishing House.
3. Chaterjea MN and Shinde R (2012) Text book of Medical Biochemistry. 8<sup>th</sup> Edition. Jaypee Brothers Medical Publisher.

**MTL-204 : Basic Immunology**

Credit hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section-A**

Types of immunity-innate and adaptive; Features of immune response-memory; Specificity and recognition of self and non-self; Terminology and approaches to the study of immune system.

**Section-B**

Primary and secondary lymphoid organs- thymus, Bursa of Fabricius, spleen, lymph nodes, lymphatic system, Mucosa Associated Lymphoid Tissue (MALT), Cells of Immune system; T-cells, B-cells, NK cells; Macrophages etc.

**Section-C**

Antibodies; classes and structure, affinity and avidity, Antigens and their characteristics, Antigen-antibody interactions, Complement system, cytokines

**Section-D**

MHC class I and class II molecules, their structure and functions, structure of T-cell antigen receptors, Humoral immune response, Cell mediated immune response, Immunity to Infection: Bacteria, viral, fungal and parasitic infections

**Books Recommended:**

1. Abbas, A.K., Lichtman, A.H. (2006-2007). Basic Immunology: Functions and Disorders of the Immune System, 2<sup>nd</sup> Ed. (updated edition), Philadelphia, Pennsylvania: W.B. Saunders Company Publishers.
2. Benjamini, E., Coico, R. and Sunshine, G. (2009). Immunology: A Short Course, 6<sup>th</sup> Ed., New York, Wiley-Blackwell.
3. Roitt, I.M., Delves, P. Seamus M. and Burton D. (2006). Essential Immunology, 11<sup>th</sup> Ed., Wiley- Blackwell.
4. Roitt, I., Brostoff, J. and Male, D. (2001). Immunology, 7<sup>th</sup> Ed., Mosby
5. Kanfmann S.H.E., Sher, A., Ahmed, R. (2002). Immunology of Infections Diseases, ASM Press, Washington.
6. Goldsby, R.A., Kindt, T.J., Osborne, B.A. (2005). Kuby Immunology, 5<sup>th</sup> Ed., W.H. Freeman and Company, New York.

**MTP-226 : Practicals in Pathology – I**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Study of various types of microscope, Use & care of Microscope
2. Mounting Techniques
3. Maintenance of records and slides
4. Bio-Medical waste management
5. Urine Examination – Collection and Preservation of urine.
6. Physical, chemical, Microscopic Examination
7. Sputum Examination.
8. Examination of feces

**MTP-227 : Practicals: Bacteriology and Virology**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Composition and preparation of culture media: Mueller Hinton, Blood Agar, Baird Parker, Bismuth Sulphite agar
2. Identification of media & their uses
3. Culture methods
4. Isolation and identification of common bacteria
5. Preparation of antibiotic discs and antibiotic sensitivity testing.
6. Isolation of bacteriophage from sewage samples
7. Studying the symptoms of plant viral diseases
8. Haemagglutination assay for quantification of virus
9. Quantification of virus in infected plant leaves by protein estimation
10. Detection of purified/semi purified virus preparation by UV spectrophotometer

**Recommended Books:**

Cappuccino J and Sherman N. Microbiology: A laboratory manual. 10<sup>th</sup> Ed. Pearson Learning

**MTP-228: PRACTICALS IN CLINICAL BIOCHEMISTRY-I**

<b>Credit hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Collection and storage of blood
2. Preparation of serum
3. Preparation of plasma
4. Determination of Hb using a hemoglobinometer
5. Determination of Hb using alkaline hematin method
6. Determination of hematocrit
7. Collection and storage of urine
8. Detection of glucose in urine by Benedict reagent
9. Detection of glucose in urine by Fehling's reagent
10. Estimation of blood glucose
11. Estimation of proteins in urine
12. Estimation of proteins in plasma and calculation of A/G ratios
13. Estimation of serum urea
14. Estimation of serum creatinine
15. Estimation of serum uric acid

**MTP-229 : Practicals in Basic Immunology**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Blood Group testing
2. Dot Immuno blot assay (DIBA)
3. Double immunodiffusion test using specific antibody and antigen
4. Separation of serum from blood
5. Separation of plasma from blood
6. Enumeration of T-cells by E-rosetting method
7. Separation of peritoneal macrophages from rat
8. Viability test by dye exclusion method.



**ESL-220 : ENVIRONMENTAL STUDIES (COMPULSORY)**

**Credits: 4-0-0**

**Teaching Methodologies**

The Core Module Syllabus for Environmental Studies includes class room teaching and field work. The syllabus is divided into 8 Units [Unit-1 to Unit-VII] covering 45 lectures + 5 hours for field work [Unit-VIII]. The first 7 Units will cover 45 lectures which are class room based to enhance knowledge skills and attitude to environment. Unit-VIII comprises of 5 hours field work to be submitted by each candidate to the Teacher in-charge for evaluation latest by 15 December, 2019.

**Exam Pattern:**           **End Semester Examination- 75 marks**  
                                  **Project Report/Field Study- 25 marks [based on submitted report]**  
                                  **Total Marks- 100**

The structure of the question paper being:

**Part-A, Short answer pattern with inbuilt choice – 25 marks**

Attempt any five questions out of seven distributed equally from Unit-1 to Unit-VII. Each question carries 5 marks. Answer to each question should not exceed 2 pages.

**Part-B, Essay type with inbuilt choice – 50 marks**

Attempt any five questions out of eight distributed equally from Unit-1 to Unit-VII. Each question carries 10 marks. Answer to each question should not exceed 5 pages.

**Project Report / Internal Assessment:**

**Part-C, Field work – 25 marks [Field work equal to 5 lecture hours]**

The candidate will submit a hand written field work report showing photographs, sketches, observations, perspective of any topic related to Environment or Ecosystem. The exhaustive list for project report/area of study are given just for reference:

1. Visit to a local area to document environmental assets: River / Forest/ Grassland / Hill / Mountain / Water body / Pond / Lake / Solid Waste Disposal / Water Treatment Plant / Wastewater Treatment Facility etc.
2. Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
3. Study of common plants, insects, birds
4. Study of tree in your areas with their botanical names and soil types
5. Study of birds and their nesting habits
6. Study of local pond in terms of wastewater inflow and water quality
7. Study of industrial units in your area. Name of industry, type of industry, Size (Large, Medium or small scale)
8. Study of common disease in the village and basic data from community health centre
9. Adopt any five young plants and photograph its growth
10. Analyze the Total dissolved solids of ground water samples in your area.
11. Study of Particulate Matter (PM<sub>2.5</sub> or PM<sub>10</sub>) data from Sameer website. Download from Play store.
12. Perspective on any field on Environmental Studies with secondary data taken from Central Pollution Control Board, State Pollution Control Board, State Science & Technology Council etc.

### Unit-I

#### The multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness

(2 lectures)

### Unit-II

#### Natural Resources: Renewable and non-renewable resources:

Natural resources and associated problems.

- (a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
  - Role of an individual in conservation of natural resources.
  - Equitable use of resources for sustainable lifestyles.

(8 Lectures)

### Unit-III

#### Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

(6 Lectures)

### Unit-IV

#### Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

(8 Lectures)

**Unit-V****Environmental Pollution**

## Definition

- Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

**(8 Lectures)****Unit-VI****Social Issues and the Environment**

- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Protection Act, 1986
- Air (Prevention and Control of Pollution) Act, 1981
- Water (Prevention and control of Pollution) Act, 1974
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

**(7 Lectures)****Unit-VII****Human Population and the Environment**

- Population growth, variation among nations
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

**(6 Lectures)**

### Unit-VIII

#### Field Work

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-pond, river, hill slopes, etc

**(Field work equal to 5 lecture hours)**

#### References:

1. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
2. Down to Earth, Centre for Science and Environment, New Delhi.
3. Heywood, V.H. & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
4. Joseph, K. & Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
5. Kaushik, A. & Kaushik, C.P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
6. Rajagopalan, R. 2011. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
7. Sharma, J. P., Sharma. N.K. & Yadav, N.S. 2005. Comprehensive Environmental Studies, Laxmi Publications, New Delhi.
8. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publications, Meerut.
9. State of India's Environment 2018 by Centre for Sciences and Environment, New Delhi
10. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi.

**MTL-251 : Basics of Pathology – II**

Credit hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Course Contents**

**Section A**

**Urinary System:** - Glomerulonephritis, Nephrotic syndrome, Renal failure, Renal calculi, Urinary obstruction, Urinary tract infection.

**Section B**

**Reproductive system:-** Sexually transmitted diseases, Pelvic inflammatory disease, disorder of cervix(CIN), Disease of ovaries, ectopic pregnancy, prostatitis, infertility

**Section C**

**Nervous System:** - Neuronal damage, ICP, Cerebral Infarction, head injury, Alzheimer's disease, dementia.

**Sense Organs:-** Ear:- Otitis, Eye: - Cataract

**Section D**

**Endocrine System:-** Pituitary:- Hyper & Hypo secretions

Thyroid: - Goiter

Adrenal: - Cushing Syndrome, Addison Disease

Pancreas: - Diabetes

**References:**

1. Textbook of Pathology by Harsh Mohan ( 2015). Jaypee Brothers Medical Publishers (P) Ltd. New Delhi, india
2. Muir's Textbook of Pathology (2014) edited by C. Simon Herrington. CRC press USA
3. Textbook of Pathology (2004) by V Krishna. Orirnt Longman Pvt. Ltd, India

**MTL-252 : Fundamentals of Mycology**

Credit hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Course Contents**

**SECTION-A**

Introduction, history, Distribution, general characters, structure, septa, thallus organization, modifications of thallus, cell structure, cell wall types, Dimorphism.

**SECTION B**

Modes of nutrition, nutrient requirements of fungi, physical requirements for growth, modes of asexual reproduction, sexual reproduction: plasmogamy, sexual spores.

**SECTION-C**

Brief account of classification; Life cycles and general characteristics of *Aspergillus*, *Penicillium*, *Rhizopus*, *Candida*. Preservation of fungal cultures.

**SECTION-D**

Economic importance of fungi; Diseases caused by fungi: Characteristics of organisms and infections in cutaneous mycoses (*Epidermphyton*, *Microsporum*, *Trichophyton*), Systemic mycoses (Cryptococcosis, Blastomycosis, Histoplasmosis, Sporotrichosis,) Opportunistic mycoses, Pathogenesis of fungal infections.

**Books recommended:**

1. Alexopolous, C.J. and Mims, C.W., Blackwell, M 1996. Introductory mycology IV edn., John Wiley and Sons inc., New York.
2. Carlile, M.J. Watkinson, S.C. and Gooday, G.W. (2001) The Fungi, 2nd edition. Academic Press.
3. *Pelczar* Michael J. (Jr.), E.C.S. *Chan*, Noel R.K. *reig* (2001). Microbiology, 5<sup>th</sup> Edition. Tata McGraw-Hill Edition
4. R S Mehrotra, K R Aneja. An Introduction To Mycology (2015). New Age International pvt Ltd.



**MTL-253 : CLINICAL BIOCHEMISTRY-II**

Credit hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Course Contents**

**Section-A**

**Biomarkers:** Creatine kinase, Cardiac troponins, Lactate dehydrogenase, Markers of Cardiac diseases; Aspartate aminotransferase, Alanine amino transferase, Alkaline phosphatase, Nucleotide phosphatase, Gamma glutamyl transferase, Markers of liver diseases, Acid phosphatase, Cholinesterase, Glucose-6-phosphate dehydrogenase, Amylase, Lipase, Aldolase, Enolase.

**Clinical Enzymology:** Enzymes as therapeutic agents, Enzymes used for diagnosis, Immobilized enzymes.

**Section-B**

**Liver Function Tests:** Tests for liver function, Serum bilirubin, Classification of jaundice, Bile acids and bile salts, Tests based on the metabolic capacity of the liver, Test based on synthetic function, Serum enzymes as markers of hepatobiliary diseases.

**Gastric Function Tests:** Gastric function, Hydrochloric acid secretion, Assessment of free and total acidity, Pancreatic function tests.

**Section-C**

**Kidney Function:** Formation of urine, Functions of the tubules, Renal threshold, Tubular maximum, Abnormal constituents of urine, Proteinuria, Reducing sugars, Clearance tests, Inulin clearance, Creatinine clearance test, Cystatin C, Urea clearance test, Tests for tubular function, Acidification test.

### Section-D

**Regulation of Blood Glucose, Insulin and Diabetes Mellitus:** Regulation of blood glucose, Determination of glucose, Glucose tolerance test, Impaired glucose tolerance, Impaired fasting glycemia, Gestational diabetes mellitus, Alimentary glucosuria, Renal glucosuria, Reducing substances in urine, Glycosuria, Diabetes mellitus, Clinical presentation, Diabetic keto acidosis, Lactic acidosis, Chronic complications, Glycated hemoglobin.

**Cardiovascular Diseases and Hyperlipidemias:** Lipid profile, Atherosclerosis, Coronary artery disease, Relation of cholesterol with myocardial infarction, Risk factors of atherosclerosis, Prevention of atherosclerosis, Hypolipoproteinemias, hyperlipoproteinemias.

### Books Recommended

1. Vasudevan D, Sreeekumari S and Vaidyanathan K (2016) Textbook of Biochemistry for Medical Students.8<sup>th</sup> Edition. Jaypee Brothers Medical Publishers (P) Ltd.
2. Godkar PB and Godkar DP (2014) Textbook of Medical Laboratory Technology (Vol 1 and 2) by P.B. Godkar. Bhalani Publishing House.
3. Chaterjea MN and Shinde R (2012) Text book of Medical Biochemistry. 8<sup>th</sup> Edition. Jaypee Brothers Medical Publisher.

**MTL-254 : Basics of Molecular Biology**

Credit hrs.		
L	T	P
2	1	0

**Time: 3 Hours**

**Max. Marks: 100**

**Mid Semester Marks : 20**

**End Semester Marks : 80**

**Mid Semester Examination: 20% weightage**

**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Course Contents**

**Section-A**

Structure of DNA: B-DNA, The Watson-Crick structure, A and Z forms of DNA, C-value paradox DNA Replication: Replication mechanism, DNA polymerases I, II, III, helicase, primosome;

**Section-B**

DNA recombination molecular mechanisms: prokaryotic and eukaryotic, Messelson-Weigle experiment, Holliday model, role of RecA RecBCD. Insertion elements and transposons.

**Section-C**

Structure of prokaryotic genes. Prokaryotic transcription. Regulation of prokaryotic gene expression (lac, his, trp, catabolic repression), Prokaryotic translation.

**Section-D**

Transcription in eukaryotes: types of RNA polymerases, promoter and consensus sequences, enhancers, silencers, Post-transcriptional processing of messenger RNA, rRNA and tRNA: 5' cap and poly(A) tails, splicing, alternative splicing, Translation: genetic code and protein biosynthesis, contributions of Crick and Brenner, Nirenberg and Matthaei, and Hargobind Khorana; initiation, elongation and termination of protein synthesis, wobble base concept.

**Books Recommended:**

1. Lewin, B (1997), Gene VI, Oxford University Press.

**MTP-276 : Practicals in Pathology – II**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. To study squamous cell from cheek cells
2. To study stained slide preparation from organs of digestive system
3. Study of stained slides of liver, pancreas, gall bladder
4. To study stained slide preparation from organs of circulatory system
5. To study stained slide preparation from organs of Respiratory system
6. To study stained slide preparation from organs of Nervous system
7. To study stained slide preparation from organs of Urinary system
8. To study stained slide preparation from organs of Endocrine system

**MTP-277 : Practicals in Mycology**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. To prepare culture media used for cultivation of fungi.
2. Isolation of fungi
3. Isolation of yeast
4. To perform the lactophenol blue staining
5. To study the morphology of *Aspergillus*, *Penicillium*, *Rhizopus*.
6. To study the morphology of yeast using negative staining.
7. To perform the KOH preparation test
8. Preservation of fungal cultures

**MLP-278: Practicals In Clinical Biochemistry-II**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

1. Estimation of serum calcium
2. Estimation of serum chloride
3. Determination of serum lactate dehydrogenase
4. Determination of serum alkaline phosphatase
5. Determination of serum acid phosphatase
6. Estimation of total serum cholesterol
7. Estimation of HDL cholesterol
8. Estimation of LDL cholesterol
9. Determination of serum triglycerides
10. Determination of conjugated bilirubin
11. Determination of unconjugated bilirubin
12. Determination of serum SGOT
13. Determination of serum SGPT
14. Estimation of serum T3 & T4
15. Estimation of serum TSH

**MTP-279 : Practicals of Molecular Biology**

<b>Credit Hrs.</b>		
<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>1.5</b>

**Note. The question paper will be set by the examiner based on the syllabus.**

1. Preparation of stock solutions.
2. Isolation of genomic DNA from plants.
3. Gel casting and Setting up of gel apparatus
4. Preparation of Agarose gel for agarose gel electrophoresis
5. Spectrophotometric determination of purity.
6. Quantification of DNA by spectrophotometric and fluorometric (Ethidium bormide) analysis.

**Books Recommended:**

1. S.B. Primrose and R.M. Twyman; Principles of Gene Manipulation. 2006.
2. J. Sambrook and Michael R. Green; Molecular Cloning: A Laboratory Manual, (Fourth Edition), CSHL, 2012.