

Syllabus

SEMESTER I 1.1 ENGLISH AND COMMUNICATION SKILLS - I

L T P

3 - 2

RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this subject is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the subject, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

DETAILED CONTENTS

1. Facets of Literature (14 hrs)

1.1 Short Stories

1.1.1 Homecoming – R.N. Tagore

1.1.2 The Selfish Giant - Oscar Wilde

1.1.3 The Diamond Necklace- Guy- De Maupassant

1.1.4 The Stick – Justice Surinder Singh

1.2 Prose

1.2.1 I Have A Dream – Martin Luther King

1.2.2 On Habits – A. G. Gardiner

1.2.3 My struggle for An Education- Booker T Washington

1.2.4 Seeing People Off – Max Beerbohm

1.3 Poems

1.3.1 Ozymandias – P.B. Shelley

1.3.2 Daffodils – William Wordsworth

1.3.3 Stopping by Woods on a Snowy Evening – Robert Frost

1.3.4 Forefathers- Edmund Blunden

2. Grammar and Usage

(10 hrs)

2.1 Parts of speech

2.1.1 Nouns

2.1.2 Pronouns

2.1.3 Adjectives

2.1.4 Articles

2.1.5 Verbs

2.1.6 Adverbs

2.1.7 Prepositions

2.1.8 Conjunction

2.1.9 Interjection

2.1.10 Identifying parts of speech

2.1.11 Structures: Verb patterns, Question tags,

2.1.12 Subject – Verb agreement (concord)

2.2 Pair of words (Words commonly confused and misused)

2.3 Tenses

2.4 Correction of incorrect sentences

2.5 One word substitution

2.6. Words often misspelled (200 words)

2.7. Forms of verbs (100 words)

3. Translation

(04 hrs)

- 3.1 Glossary of Administrative Terms (English and Hindi)
- 3.2 Translation from Hindi into English

4. Paragraph of 100-150 words from outlines (08 hrs)

5. Comprehension (04 hrs)

Unseen passages of literature, scientific data/graph based for comprehension exercises

6. Communication (08 hrs)

- 6.1 Definition, Introduction and Process of Communication
- 6.2 Objectives of Communication
- 6.3 Notices

LIST OF PRACTICALS

1. Locating a Book in Library
2. To look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics
3. To seek information from an Encyclopedia
4. Listening pre-recorded English language learning programme
5. Paper reading before an audience (reading unseen passages)
6. Study of spelling Rules
7. Study of essentials of a good speech to respond and comprehend visual, oral themes, situations or stimulus and practice before select gathering
8. Exercises on use of different abbreviations
9. Greetings for different occasions
10. Introducing oneself, others and leave taking
11. Exercises on writing sentences on a topic

Note:

1. The Text Book on "English and Communication Skills, Book-I By Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching and setting-up the question papers.
2. A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDs and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.

3. Elements of body language will be incorporated in all the practicals
4. The practical exercises involving writing may also be included in Theory Examination.

INSTRUCTIONAL STRATEGY

Looking into the present day needs of effective communication in every field, it is imperative to develop necessary competencies in students by giving practical tips and emphasis on grammar, vocabulary and its usage in addition to practical exercises. The teacher should give report writing assignments, projects etc. while teaching this subject.

RECOMMENDED BOOKS

1. English and Communication Skills, Book-I By Kuldip Jaidka, Alwinder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2. Essentials of Business Communication by Pal and Rorualing; Sultan Chand and Sons
3. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India
4. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
5. New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
6. A Practical English Grammar by Thomson and Marlinet
7. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill
8. English Conversation Practice by Grount Taylor; Tata McGraw Hill
9. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. Communication Skills by R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	30
2	10	20
3	4	10

4	8	15
5	4	10
6	8	15
Total	48	100

LIST OF COMMONLY USED ADMINISTRATIVE TERMS

1. Senior	वरिष्ठ	ਸੀਨੀਅਰ, ਉੱਚਾ, ਵੱਡਾ
2. Cashier	ਖਜਾਨਚੀ, ਰੋਕਡਿਯਾ	ਚੈਕੀਆ
3. Consent	ਸਹਮਤੀ	ਸਹਮਤੀ
4. Earned Leave	ਅਜਿਤ ਅਵਕਾਸ਼	ਕਮਾਈ ਛੁੱਟੀ
5. Under Consideration	ਵਿਚਾਰਾਧੀਨ	ਵਿਚਾਰ ਅਧੀਨ
6. Criterion	ਕਸ਼ੀਟੀ	ਕਸ਼ੀਟੀ
7. Staff	ਕਰਮਚਾਰੀ	ਅਮਲਾ, ਸਟਾਫ਼
8. Tenure	ਕਾਰਜਕਾਲ	ਕਾਰਜ ਕਾਲ
9. Working Committee	ਕਾਰਜ ਸਮਿਤੀ	ਕਾਰਜ ਸਮਿਤੀ
10. Estate	ਸੰਪਦਾ	ਸੰਪਦਾ
11. Self-Sufficient	ਆਤਮਨਿਰਭਰ	ਆਤਮਨਿਰਭਰ
12. Emergency	ਆਪਾਤਕਾਲ	ਆਪਤਿ ਕਾਲ
13. General Body	ਆਮ ਸਭਾ	ਆਮ ਸਭਾ
14. Exemption	ਛੂਟ	ਛੁੱਟ
15. Daily Wages	ਦਿਹਾੜੀ, ਦੈਨਿਕ ਵੇਤਨ	ਦਿਹਾੜੀ, ਰੋਜ਼ਾਨਾ ਉਜਰਤ
16. Death-Cum Retirement	ਮ੍ਰਿਤ੍ਯੁ ਵ ਨਿਵ੍ਰੱਤਿ	ਮ੍ਰਿਤ੍ਯੁ ਅਤੇ ਨਿਵਰਤੀ
17. Dispatch Register	ਰਵਾਨਗੀ ਰਜਿਸਟਰ, ਪ੍ਰੇਸ਼ਣ ਰਜਿਸਟਰ	ਰਵਾਨਗੀ ਰਜਿਸਟਰ
18. Dispatch	ਰਵਾਨਗੀ, ਪ੍ਰੇਸ਼ਣ	ਰਵਾਨਗੀ
19. Stenography	ਆਸ਼ੁਲਿਪਿ	ਆਸ਼ੁਲਿਪੀ, ਸਟੈਨੋਗ੍ਰਾਫੀ
20. Assurance	ਦਿਲਾਸਾ, ਆਸ਼ਵਾਸਨ	ਦਿਲਾਸਾ
21. Justify	ਸਹੀ ਸਾਬਿਤ ਕਰਨਾ	ਠੀਕ ਸਾਬਿਤ ਕਰਨਾ
22. Superior	ਬਢਿਆ, ਉਚਕੋਟਿ	ਉੱਚਾ/ ਵਧੀਆ
23. High Commission	ਉਚਕਾਰਯੁਕਤ	ਉੱਚ ਆਯੁਕਤ
24. Simultaneous	ਸਾਥ-ਸਾਥ	ਨਾਲ-ਨਾਲ
25. Precaution	ਏਹਤਿਆਤ, ਸਤਰਕਤਾ, ਸਾਵਧਾਨੀ	ਇਤਿਆਤੀ
26. Commanding Officer	ਕਮਾਂਡਿੰਗ ਅਫਸਰ	ਕਮਾਨ ਅਫਸਰ
27. Negligence	ਲਾਪਰਵਾਹੀ	ਲਾਪਰਵਾਹੀ
28. Performance	ਨਿਸ਼ਪਾਦਨ	ਨਿਭਾਉਣ, ਪ੍ਰਦਸ਼ਨ
29. Proof Reader	ਪ੍ਰੂਫ ਰੀਡਰ	ਪਰੂਫ ਰੀਡਰ
30. Take Over	ਕਾਮ ਸੰਭਾਲਨਾ	ਕੰਮ ਸੰਭਾਲਨਾ
31. Timely Compliance	ਸਮਯ ਦੌਰਾਨ ਪੂਰਾ ਕਰਨਾ	ਸਮੇਂ ਵਿਚ ਪੂਰਾ ਕਰਨਾ
32. Responsibility	ਜਿੰਮੇਦਾਰੀ	ਜਿੰਮੇਦਾਰੀ
33. Chief Justice	ਮੁਖਯ ਨਯਾਧੀਸ਼	ਮੁੱਖ ਨਿਆਇਧੀਸ਼
34. Disciplinary Action	ਅਨੁਸ਼ਾਸਨਿਕ ਕਾਰਜਵਾਹੀ	ਅਨੁਸ਼ਾਸਨਿਕ ਕਾਰਵਾਈ
35. Efficiency Bar	ਦਕਸ਼ਤਾ ਰੋਕ	ਦਖਿਅਤਾ ਰੋਕ
36. Flying Squad	ਉਡਨ ਦਸਤਾ	ਉਡਣ ਦਸਤਾ
37. Regret	ਖੇਦ	ਖੇਦ
38. Inconvenience	ਅਸੁਵਿਧਾ	ਅਸੁਵਿਧਾ
39. Ambiguous	ਅਸਪਸ਼ਟ	ਅਸਪਸ਼ਟ
40. Part Time	ਅਸ਼ਾਂਕਾਲੀਨ	ਅੰਸਕਾਲਿਕ
41. Academy	ਅਕਾਦਮੀ	ਅਕਾਦਮੀ
42. Disparity	ਅਸਮਾਨਤਾ	ਅਸਮਾਨਤਾ
43. Extraordinary	ਅਸਾਧਾਰਣ	ਅਸਧਾਰਣ
44. Provisional	ਅਰਥਾਧੀ	ਕੱਚਾ
45. Income Tax	ਆਯਕਰ	ਆਯਕਰ, ਆਮਦਨ ਕਰ
46. Bonafide	ਅਸਲੀ	ਅਸਲੀ / ਅਸਲ
47. Acting in Official Capacity	ਬਤੌਰ ਅਧਿਕਾਰਿਕ ਹੈਸਿਯਤ	ਬਤੌਰ ਅਧਿਕਾਰੀ ਹੈਸਿਅਤ
48. Contractor	ਠੇਕੇਦਾਰ	ਠੇਕੇਦਾਰ
49. On probation	ਪਰਿਵੀਕਸ਼ਾਧੀਨ	ਅਜਮਾਇਸ਼ ਤੇ
50. State	ਰਾਜਯ	ਰਾਜ

51. Administrator	प्रशासक	पुर्बपक, पुर्सासक, औडमिनिस्ट्रेटर
52. Admission	प्रवेश	दाखला, पूवेस, सवीकार, मंन
53. Aforesaid	पूर्वोक्त, उपरोक्त	उपरोक्त, उपरकथित
54. Affidavit	शपथपत्र	हलदीआ बिआन, हलफनामा
55. Agenda	कार्यसूची	ऐजेन्डा, कारज-सूची
56. Alma Mater	विद्यालय जहां किसी व्यक्ति ने शिक्षा प्राप्त की	सवै विद्याल्ला, इलमी-मां
57. Appointing Authority	नियुक्ति अधिकारी	निपुक्ती अधिकारी
58. Apprentice	प्रशिक्षु	सिखिआरबी
59. Additional	अतिरिक्त	वपीक, वापु
60. Advertisement	विज्ञापन	इसतिहार, विगिआपन
61. Assistant	सहायक	सहायक
62. Assumption of Charge	अधिकार ग्रहण करना	चारज संभालना, चारज लैना
63. Attested Copy	सत्यापित प्रति	उसदीक कीती कपी
64. Chief Minister	मुख्यमन्त्री	मुख-मंतरी
65. Clerical Error	लेखन सम्बन्धी त्रुटि	लिखत दी त्रुटी
66. Code	कानून की किताब, गुप्त भाषा	जाबडा, कोड, संख्या
67. Corruption	भ्रष्टाचार, खोटापन	ब्रुसटाचार, कुरपसन
68. Craftsman	दस्तकार	दसतकार
69. Compensation	हरजाना	मुआवजा
70. Compensatory Allowance	क्षतिपूरक मत्ता	मुआवजा बँडा
71. Compile	संकलन करना, संग्रह करना	संकलन करना
72. Confidential Letter	गोपनीय पत्र	गुपत पत्र
73. Chief Engineer	मुख्य अभियन्ता	मुख इंजनीअर
74. Data	सूचना सामग्री (आंकड़े)	आपार समगरी, आंकड़े, डैटा
75. Dearness Allowance	मंहगाई मत्ता	महिंगाई बँडा
76. Department	विभाग	विभाग
77. Dictionary	शब्द कोष	सब्द-कोष
78. Director	निदेशक	डाइरेक्टर/निदेशक
79. Director of Tech. Edu	निदेशक तकनीकी शिक्षा	निदेशक तकनीकी सिखिआ
80. Executive Engineer	अधिशाली अभियन्ता	कारजकारी इंजनीअर
81. Employment Exchange	रोजगार केन्द्र	रोजगार केंद्र
82. Head Office	मुख्य कार्यालय	मुख दफतर
83. Head Clerk	प्रधान लिपिक	मुख कलरक
84. Indian Admn. Services	भारतीय प्रशासनिक सेवा	भारती पुर्सासनिक सेवा
85. Legislative Assembly	विधान सभा	विधान सभा
86. Officiating	स्थानापन्न	काटिम मकाम होना
87. Office Record	कार्यालय रिकार्ड	दफतरी रिकार्ड
88. Office Discipline	कार्यालय अनुशासन	दफतरी अनुशासन
89. Polytechnic	बहुतकनीकी	बहुतकनीकी
90. Temporary	अस्थायी	आरजी
91. Qualification	अर्हता, योग्यता	जेगता
92. Under Investigation	जाँच अधीन	पडताल अधीन
93. Treasury	खजाना	खजाना
94. Target Date	लक्ष्य तिथि	मिथी/निजत मिती
95. Technical Approval	तकनीकी मान्यता	तकनीकी पुर्वानगी
96. Verification	जाँच पड़ताल	जांच पडताल
97. Viva-voce	मौखिक परीक्षा	जबानी प्रीथिआ
98. Write off	बट्टेखाते में डालना	वैटे खाते पाठुना
99. Warning	चेतावनी	ताजना, चेतावनी
100. Yours Faithfully	भवदीय	विस्वासपात्र

1.2 BASIC CHEMISTRY

L T P

3 - 2

RATIONALE

The role of chemistry and chemical products in every field of life is expanding greatly. Now a days various products of chemical industries are playing important role in the medical field and the number of such products is increasing. Chemistry is one of the important subjects for diploma students in Medical Lab. Technology for developing in them scientific temperament and understanding other subjects in their profession. Efforts should be made to teach the subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. Basic concepts (8 hrs)
 - 1.1 Units and Dimensions, derived units (with special reference to pressure, volume, temperature, density, specific gravity)
 - 1.2 Matter, element, compound and mixtures, atom, molecule, ion, symbols and formulae (recapitulation only)
 - 1.3 Atomic mass (A), molar mass, mole concept and its applications, molar volume of gases
 - 1.4 Solution, strength of solutions, molarity (M), molality (m), normality (N), mass fraction, mole fraction and parts per million.
 - 1.5 Chemical equations and balancing of chemical equations.
 - 1.6 Numerical problems based on mole concept.
2. Atomic structure and Chemical Bonding (8 hrs)
 - 2.1 Fundamental particles i.e. electron, proton and neutron (their masses and charges)
 - 2.2 Postulates of Bohr's model of atom, success and failures of Bohr model.

- 2.3 Heisenberg's uncertainty principle
- 2.4 Brief idea of modern concept of atom, quantum numbers (significance only), definition of shells, sub shells and orbitals. Difference between orbit and orbital shapes of S and p orbitals only.
- 2.5 Electronic configuration of elements (atomic no. 1-30 only) on the basis of Aufbau principle, Pauli's principle and Hund's rule.
- 2.6 Modern periodic law, periodicity and its cause, introduction of periodic table, periods and groups.
- 2.7. Division of the periodic table into s, p, d, and f blocks (details excluded)
- 2.8 Chemical bonding and its cause
- 2.9 Ionic bond, covalent bond, orbital concept of covalent bonding, valence bond theory, sigma (σ) and pi (π) bonds.
- 2.10 Metallic bonding (electron sea model)
- 2.11 Coordinate bond with examples of ozone, ammonium chloride, $\text{H}_3\text{N}-\text{BF}_3$ complex

3. Water (9 hrs)

- 3.1 Sources of water
- 3.2 Hard and soft water, types of hardness, action of soap on hard water
- 3.3 Degree of hardness in terms of calcium carbonate, Units of hardness in Clark degree, French degree and ppm
- 3.4 Disadvantages of hard water in domestic and industrial uses
- 3.5 Qualities of drinking water and purification of available water for drinking purposes
- 3.6 Chemical analysis: Estimation of alkalinity, estimation of total dissolved solids.

4. Equilibrium, Acids and Bases. (9 hrs)

- 4.1 Equilibrium state, equilibrium constant and statement of Le-chatelier's principle with illustration
- 4.2 Ionization of electrolyte in aqueous solution, ionic equilibrium, degree of ionization, self-ionization of water and ionic product of water (K_w)
- 4.3 Concept of pH and pH scale

4.4 Various concept of acids/bases; strong acids/bases, weak acids/bases, dissociation constants of acids/bases. Neutralization, acid base titration, choice of indicators for acid base titration

4.5 Hydrolysis of salts, common ion effect, buffer solutions (acidic and basic), buffer action of a buffer solution, applications of buffers

4.6 Simple numerical problems

5. Electrochemistry. (9 hrs)

5.1 Electronic concept of oxidation and reduction, redox reactions

5.2 Electrolytes and non electrolytes

5.3 Conductors and their types.

5.4 Electrolysis, Faraday's laws of electrolysis.

5.5 Applications of electrolysis

5.6 Simple numerical problems related to Faraday's laws

6. Surfaces and Colloids (5 hrs)

6.1 Adsorption and its types

6.2. Applications of adsorption

6.3. Colloidal state and types of colloids

6.4. Preparation and purification of colloids in brief

6.5 Properties of colloids brownian motion, electrophoresis and Tyndall Effect

6.6. Gels and Sols, emulsions

6.7. Micelles and cleaning action of soaps

LIST OF PRACTICALS

1. Preparation of standard solutions.
2. To prepare $\frac{N}{10}$ Sodium carbonate
- 3 To prepare $\frac{M}{10}$ oxalic acid solution
- 4 To prepare 5N HCl from given 12 NHCl.
5. To determine strength of given solution of sodium hydroxide by titrating against standard solution of oxalic acid using phenolphthalein indicator.
6. To determine strength of given solution of sulphuric acid by titrating against standard solution of sodium carbonate using methyl orange indicator.
7. To determine %age of purity of green vitriol by using potassium permanganate solution.
8. Determine the normality and strength of Mohr's salt.
9. To verify the first law of electrolysis
10. To distinguish between aldehyde and ketone
11. To prepare crystals of Mohr's salt
12. To prepare colloidal solution of starch.

INSTRUCTIONAL STRATEGY

Teacher may take help of various models and charts while giving instructions to make the concepts clear. More stress may be laid on practical applications of various chemical processes and reactions. In addition, students should be encouraged to study those processes in details, which may find practical applications in their future life.

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose And J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.
3. Engineering Chemistry by Shashi Chawla.
4. Progressive Applied Chemistry – I by Dr. G.H. Hugar Eagle Prakashan Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	15
2	8	15
3	9	20
4	9	20
5	9	20
6	5	10
Total	48	100

SEMESTER II

2.2 ORGANIC CHEMISTRY

L T P
3 - 2

RATIONALE

Diploma holders in Medical Laboratory Technology are supposed to know about the chemical properties of various materials. For this purpose, it is essential that they should be equipped with knowledge and skill covering topics like solutions, acids, bases and salts, electrolytes, ionization, organic chemistry such as hydrocarbons, alcohols, ethers, carbohydrates, lipids, proteins and enzymes etc., so as to enable them to perform various activities in a medical laboratory effectively.

DETAILED CONTENTS

1. Organic chemistry (2 hrs)

Introduction and importance of organic compounds
Comparison of organic and inorganic compounds
Properties of carbon

2. IUPAC Nomenclature of organic compounds (4 hrs)

- 2.1 Hydrocarbons
- 2.2 Alcohols and Ethers
- 2.3 Aldehydes and Ketones
- 2.4 Carboxylic Acids

3. Hydrocarbons (6 hrs)

- 3.1 Preparation, properties and uses of saturated hydrocarbons
- 3.2 Preparation, properties and uses of unsaturated hydrocarbons
- 3.3 Sources of hydrocarbons
- 3.4 Preparation, properties and uses of Halogen derivatives of hydrocarbons

4. Alcohols and ethers (5 hrs)

General introduction, classification, preparation and properties and uses of:

- 4.1 Methyl alcohol, Ethyl alcohol and glycerol
- 4.2 Diethyl ether

5. Aldehydes and ketones (5 hrs)

General introduction, classification, preparation and properties and uses of:

- 5.1 Methanal and ethanal
- 5.2 Propanone

6. Carboxylic Acids (5 hrs)

General Introduction, classification, preparation, properties and uses of

Methanoic acid
Ethanoic acid

7. Carbohydrates (6 hrs)

- 7.1. Definition
- 7.2. Optical Activity and mutarotation
- 7.3. Composition and sources
- 7.4. Classification
- 7.5. Reactions
- 7.6. Important monosaccharides, disaccharides, polysaccharides
- 7.7. Breakage of glucose, fructose, galactose, lactose, maltose
- 7.8. Role of carbohydrates

8

Lipids

(5 hrs)

- 8.1. Definition
- 8.2. Classification
- 8.3. Introduction to fatty acids, phospholipids, triglycerides, sterol, ergosterol, Cholesterol
- 8.4. Reactions of fats
- 8.5. Role of lipids

9.

Proteins

(5 hrs)

- 9.1. Definition
- 9.2. Classification
- 9.3. Composition , molecular weight and hydrolysis
- 9.4. Name of various amino acids
- 9.5. Structure and properties of proteins
- 9.6. Role of proteins
- 9.7. Colour reactions

10

Enzymes

(5 hrs)

- 10.1 Definition
- 10.2 Classification
- 10.3 Chemical nature of enzymes
- 10.4 Properties of Enzymes
- 10.5 Factors affecting enzyme activity
- 10.6 Enzyme Inhibitors
- 10.7 Enzymes of Diagnostic Importance

LIST OF PRACTICALS

1. Iodometric titrations oxidation reduction titrations, Acid-base titrations
2. Saponification of fatty acids
3. Distinction between aldehydes and ketones
4. Detection of carbohydrates
5. Detection of proteins
6. Detection of lipids

RECOMMENDED BOOKS

1. Modern's Abc of Chemistry Vol I and II by Dr. S.P.Jauhar, Modern Publishers, New Delhi
2. A textbook of Biochemistry and Clinical Pathology by Sukhdev Singh and Om Parkash

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	2	5
2	4	8
3	6	12
4	5	10
5	5	10
6	5	10
7	6	10
8	5	10
9	5	10
10	5	15
Total	48	100

2.3 ANATOMY AND PHYSIOLOGY - II

L T P
3 - 2

RATIONALE

The students are supposed to have basic knowledge of structure of body, their anatomical parts, physiological functions. After studying this subject, the students shall be able to understand various parts of body and their anatomical positions along with functions. Students are also supposed to have basic operational skill of E.C.G.

DETAILED CONTENTS Theory

1. Nervous system (8 hrs)
 - 1.1 Central nervous system (brain and spinal cord)
 - 1.2 Peripheral nervous system (cranial and spinal nerves)
 - 1.3 The sense organs (eye, ear, tongue and nose); structure and functions
2. Muscular system (6 hrs)
 - 2.1 Brief description of skeletal, smooth and cardiac muscles
 - 2.2 Muscle fatigue
3. Circulatory system (12 hrs)
 - 3.1 Composition and functions of blood
 - 3.2 Anatomy and physiology of Heart
 - 3.3 Circulation of blood, Cardiac Cycle and Conducting System of Heart
 - 3.4 The blood pressure
 - 3.5 Arteries and veins
 - 3.6 Lymph and lymphatic system
4. Endocrine system (8 hrs)

Description of each endocrine gland its secretions and their effect on the body
5. Reproductive System (8 hrs)
 - 5.1 Male and female reproductive system
 - 5.2 Histology of gonads
 - 5.3 The ovarian cycle and ovulation
 - 5.4 Fertilization

6. E.C.G. (6 hrs)

- 6.1 Introduction and basic principle of E.C.G.
- 6.2 Types of Leads and Importance of E.C.G.
- 6.3 Care and Maintenance of E.C.G. Machine

LIST OF EXPERIMENTS

1. Demonstration of various parts of skin (Demonstration from models)
2. Demonstration of various parts of nervous system (brain and spinal cord) (Model)
3. Structure of eye and ear (demonstration from models)
4. Demonstration of structural differences between skeletal, smooth and cardiac muscles (permanent mounts)
5. Demonstration of various bones and joints
6. Demonstration of various parts of reproductive system (male and female from models and charts)
7. Demonstration of E.C.G. Machine
8. Performance of E.C.G.

RECOMMENDED BOOKS

1. Anatomy and Physiology by Pears; JP Brothers, New Delhi
2. Anatomy and Physiology by Sears; ELBS, London
3. Basic Anatomy and Physiology by N Murugesh; Sathya Publishers, Madurai

4. Ross and Wilson Anatomy and Physiology by Anne Waugh and Kathleen JW Wilson;
Churchill Living Stone; London

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks allotted (%)
1	8	16
2	6	12
3	12	26
4	8	16
5	8	18
6	6	12
Total	48	100

2.4 CLINICAL MICROBIOLOGY - II

(Bacteriology)

L	T	P
3	-	4

RATIONALE

The students undergoing training of medical laboratory technology learn the knowledge of basic morphology, staining, culture, biochemical characteristics and lab-diagnosis of pathogenic bacteria. In addition to this, they are also made aware about the examination of bacteria present in milk and water.

DETAILED CONTENTS

Theory

1. Bacteriology (22 hrs)

- General characteristics of bacteria - morphology, staining, culture, biochemical

- Characteristics and Lab diagnosis of:

- 1.1 Staphylococi

- 1.2 Streptococci and pneumococci

- 1.3 Corynebacterium diptheria

- 1.4 Enterobacteriaceae - I (E coli, Klebsiella, Enterobacter)

- 1.5 Enterobacteriaceae – II (Salmonella, Shigella, Proteus)

- 1.6 Pseudomonas

- 1.7 Vibrio Cholerae

- 1.8 Neisseria

- 1.9 Clostridium

- 1.10 Treponema Pallidum

- 1.11 Mycobacterium tuberculosis

2. Bacteriological examination of: (6 hrs)

2.1 Water

2.2 Milk

3. Bacterial pathogenicity (4hrs)

3.1 Definition of pathogenicity, pathogenesis and virulence

3.2 Sources of infection

3.3 Mode of spread of infection

3.4 Types of infection

4. Nosocomial Infection (6 hrs)

- 4.1 Introduction
- 4.2 Common types and source of nosocomial infection
- 4.3 Control of nosocomial infections

5. Laboratory diagnosis of infectious diseases (10 hrs)

- 5.1 Respiratory tract infections
- 5.2 Wound and skin infections
- 5.3 Urinary tract infections
- 5.4 Genital tract infection
- 5.5 Gastro intestinal infections
- 5.6 PUO/Enteric fever

LIST OF PRACTICALS

1. Collection, transportation of clinical samples, processing including culture of following clinical samples for identification of pathogens – Urine, Stool, Sputum, Throat swabs, Pus and Pus swabs, Blood, Skin, Eye and Ear swabs and CSF
2. Identification of pure bacterial cultures of common pathogens.
3. Bacteriological examination of water and milk samples

INSTRUCTIONAL STRATEGY

The teacher should lay stress on general characteristics of bacteria, morphological features, nomenclature of bacterial for common use. The students should be made familiar with common names of bacteria and stress on correct use of bacterial pronunciation and spellings. The students should be taught with illustrations/audio-visual aids.

RECOMMENDED BOOKS

1. Textbook of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi

2. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
3. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
4. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
5. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
6. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
7. Text Book of Microbiology by Ananthanarayan and Paniker; Orient Longman, Hyderabad
8. Text book of Medical Microbiology by Cruickshank Vol. I
9. Textbook of Medical Microbiology by Greenwood, ELBS
10. Medical Laboratory Science by Jockie and Kolhatkar, Tata McGraw Hill.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	22	40
2	6	15
3	4	10
4	6	15
5	10	20
Total	48	100

2.5 HAEMATOLOGY - II

L T P
3 - 4

RATIONALE

The training in haematology is imparted to enable the students to know the principle of tests, methodology of routine as well as advanced procedures being carried out in the laboratory by using routine as well as sophisticated instruments. Stress is also given in use of safety measures in the laboratory

DETAILED CONTENTS

Theory

1. Haemoglobinometry (12 hrs)
 - 1.1 Formation of haemoglobin, function and its degradation
 - 1.2 Types of haemoglobin
 - 1.3 Various methods of estimation with specific reference to cyanmethaemoglobin method

2. Haemocytometry (18 hrs)
 - 2.1 Various counting chambers
 - 2.2 Methods of counting of RBC, WBC and platelets, their calculation and reference values.
 - 2.3 Errors involved in haemocytometry and means to minimize them

3. Differential leucocyte counting (DLC) (06 hrs)
 - 3.1 Preparation and staining of blood film
 - 3.2 Performance of DLC
 - 3.3 Normal values and significance of DLC
 - 3.4 Blood cell morphology in health and disease

4. Quality Assurance in haematology such as accuracy, precision etc. (06 hrs)
5. Automation in haematology such as blood cell counters (06 hrs)

LIST OF PRACTICALS

1. Preparation of peripheral blood film and recognition of different cellular components
2. Preparation and standardization of stains (leishman and giemsa)
3. Preparation of thick and thin blood smear
4. Haemoglobin Estimation by Oxy-Hb and Cyanmethaemoglobin method
5. Counting of RBC
6. Counting of WBC
7. Platelet counting
8. Absolute eosinophil counting
9. Study of morphology of normal RBC and WBC with the help of stained slide
10. To study abnormal morphology of RBC with the help of stained slide
11. To study abnormal morphology of WBC with the help of stained slide
12. To study abnormal morphology of platelet with the help of stained slide

RECOMMENDED BOOKS

1. Medical Laboratory Technology Vol. 1 by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi

2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth Heinmann, Oxford
3. Medical Laboratory Manual for Tropical Countries by Monica Cheesbrough; Cambridge University Press, UK
4. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
5. Practical Haematology by JV Decei; ELBS with Curchill Living Stone; UK
6. Medical Laboratory Science Theory and Practical by J Ochei and A Kolhatkar, Tata McGraw Hill Publishing Company Ltd., New Delhi 2000 Ed.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	12	24
2	18	40
3	6	12
4	6	12
5	6	12
Total	48	100

2.6 CLINICAL BIOCHEMISTRY - II

L T P
3 - 4

RATIONALE

The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the technique of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of the different tests is obtained. The students are also given basic training in safety measures, quality control and automation

DETAILED CONTENTS

Theory

1. Blood glucose/ sugar estimation, screening test and glucose tolerance test (GTT) (12 hrs)

- 1.1 Principle and methods of estimation
- 1.2 Reference values
- 1.3 True and apparent sugar
- 1.4 Renal threshold
- 1.5 Importance and Performance of ST/GTT
- 1.6 Clinical importance of blood sugar, ST/GTT

2. Blood urea (8 hrs)

- 2.1 Formation and excretion of urea
- 2.2 Principle and procedures of different methods of urea estimation
- 2.3 Reference values
- 2.4 Clinical Importance

3. Serum Creatinine (4 hrs)

- 3.1 Principle and procedure of various estimation methods
- 3.2 Reference values

- 3.3 Clinical importance
- 4. Serum proteins (8 hrs)
 - 4.1 Definition and types
 - 4.2 Different methods of estimation including principles and procedures
 - 4.3 Reference values
 - 4.4 Clinical importance
- 5. Electrolytes and trace elements (8 hrs)
 - 5.1 Functions of electrolytes (Na^+ , K^+ and Cl^-).
Other essential elements like P, Ca^{2+} , Fe^{2+} . Metabolism of these ions
 - 5.2 Principles and procedures of estimation of Na^+ , K^+ , Cl^- .
 - 5.3 Reference values
 - 5.4 Clinical importance
- 6. Uric Acid (4 hrs)
 - 6.1 Principles and procedures various estimation methods
 - 6.2 Reference values
 - 6.3 Clinical Importance
- 7. Quality Assurance in Biochemistry as per National Standards (4 hrs)
 - 7.1. Internal quality assurance
 - 7.2. External quality assurance

LIST OF PRACTICALS

- 1. Estimation of blood glucose/sugar (Folin-Wu method, O-toluidine method and enzymatic method)
- 2. Performance of ST/GTT

3. Serum urea estimation
4. Serum creatinine estimation
5. Serum uric acid estimation
6. Plasma and serum protein estimation
7. Estimation of electrolyte levels of Na^+ , K^+ and Cl^- by flame photometer and kit method
8. Preparation of all types of reagents

RECOMMENDED BOOKS

1. A Procedure Manual for Routine Diagnostic Tests Vol. I and III by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. A Textbook of Medical Laboratory Technology by P Godkar; Bhalani Publishing House, Mumbai

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	12	22
2	8	16
3	4	10
4	8	16
5	8	16
6	4	10
7	4	10

Total	48	100
--------------	-----------	------------

ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This is to be organized at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table
3. Sources of pollution - natural and man made, their effects on living and non-living organisms
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms
6. Sources of noise pollution and its effects
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods
8. Mining, blasting, deforestation and their effects

9. Legislation to control environment
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements
11. Current issues in environmental pollution and its control
12. Role of non-conventional sources of energy in environmental protection

SEMESTER III

3.1 CLINICAL MICROBIOLOGY- III (Parasitology and virology)

L T P

3 - 4

RATIONALE

The students undergoing training of medical laboratory technology learn the techniques of collection of samples, their processing and identification of various pathogens like parasites and viruses by using different techniques. In addition to the above, students are given training in the use of safety measures while handling infected materials. The training is aimed at making the students competent to identify the causative parasites and viruses for microbial infections.

DETAILED CONTENTS

Theory

1. Introduction to medical parasitology (2 hrs)
2. General characteristics, morphology, classification (2 hrs)
 - 2.1 Protozoa
 - 2.2 Helminths
3. Laboratory Samples (2 hrs)

Collection, transportation, processing and preservation of samples for routine investigations – Blood, stool

4. Concentration techniques (6 hrs)

- Principle and application of concentration techniques of stool for demonstration of ova and cysts

5. Giardia and Entamoeba histolytica (5 hrs)

- Morphology
- Life cycle
- Lab diagnosis

6. Ancylostoma and Ascaris lumbricoides (6 hrs)

- Morphology
- Life cycle
- Lab diagnosis

7. T solium, T saginata (5 hrs)

- Morphology
- Life cycle
- Lab diagnosis

8. Malarial Parasite (P. Vivax and P. Falciparum) (6 hrs)

- Morphology
- Life cycle
- Lab diagnosis

9. Virology (4 hrs)

- Introduction
- General Characteristics, Classification Structure of virus.

10. Medically important viruses (6 hrs)

Pathogenicity, Lab diagnosis and prevention of –

- Rabies
- Polio
- HIV
- Influenza

11. Virological Samples (4 hrs)

- Collection
- Transportation
- Storage

LIST OF PRACTICALS

1. Collection and routine stool examination for detection of intestinal parasites

- Saline preparation
- Lugol's Iodine preparation
- Concentration methods
 - a) Floatation method (saturated salt solution/zinc sulphate)
 - b) Centrifugation method (formal ether)

2. Identification of following adult worms from preserved specimen/slides

- Tapeworm
- Roundworm
- Hookworm
- Giardia

- Entamoeba . hystolytica, E. Coli

3. Preparation and identification of blood parasites

- Preparation of stains (Leishman, Giemsa Field)
- Preparation of thin and thick smears
- Staining of smears by Leishman, Giemsa Field
- Examination of smears for malarial parasite (P. vivax and P. falciparum)
- Demonstration of various stages of malarial parasite from stained slides

INSTRUCTIONAL STRATEGY

The teacher should lay emphasis on common names, morphology of helminth and blood parasites. The students should be shown diagrams/illustration/permanent fixed slides and audio-visual aids. The students should be made aware about medically important viruses, collection and cultivation of viruses.

RECOMMENDED BOOKS

1. Parasitology by KD Chatterjee; Chatterjee Medical Publishers, Kolkatta
2. Pledical Parasitology by Arora & Arora
3. An introduction to Medical Laboratory Technology by FJ Baker; Butterworth Heinemann Oxford
4. Text Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
5. Textbook of Microbiology by Ananthanarayan and Panikar; Orient Longman, Hyderabad
6. Text Book of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House; Mumbai
7. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
8. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
9. Medical Laboratory Science Theory and Practice by J Ochei and A Kolhatkar
10. Medical Laboratory Science by J. Achie and Kolhatkar, Tata McGraw Hill
11. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill Publishers, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	2	4
2	2	6
3	2	6
4	6	8
5	5	6
6	6	14
7	5	10
8	6	14

9	4	8
10	6	12
11	4	12
Total	48	100

3.2 HAEMATOLOGY - III

L T P
3 - 4

RATIONALE

This subject aims to enable the students to carry out routine clinical laboratory investigation (blood, urine etc). He/she should be able to provide technical help for selected sophisticated hematological techniques with adequate knowledge of various principles. The training in laboratory safety is also provided.

DETAILED CONTENTS

Theory

1. Erythrocyte sedimentation rate (ESR) and packed cell volume (PCV) (12 hrs)
 - 1.1 Introduction
 - 1.2 Various methods of estimation of ESR and PCV and their merits and demerits
 - 1.3 Factors involved in ESR
 - 1.4 Interpretation of results
2. Red Cell indices (Mean Corpuscular Values) – MCV, MCH, MCHC (5 hrs)

Theory, reference range, calculation and interpretation
3. Supravital stain and reticulocyte counting (7 hrs)
 - 3.1 Introduction
 - 3.2 Principle and procedure of staining and calculation
 - 3.3 Reference values and interpretation
 - 3.4 Variation in Physiological Values
4. Anemias (16 hrs)
 - 4.1 Definition and classification
 - 4.2 Laboratory diagnosis of:
 - (a) Iron deficiency anaemia
 - (b) Megaloblastic anaemia
 - (c) Haemolytic anaemia

(d) Aplastic anaemia

- | | | |
|-----|-------------------------|---------|
| 5. | Red cell fragility test | (8 hrs) |
| 5.1 | Principle and procedure | |
| 5.2 | Clinical importance | |

LIST OF PRACTICALS

1. ESR estimations (wintrobe and westergren) in blood
2. Determination of PCV (wintrobe and capillary) in blood
3. Counting of Reticulocyte in blood
4. To perform red cell fragility test on blood
5. To perform Sickling test on blood
6. Estimation of foetal haemoglobin by alkali denaturation test
7. Estimation of plasma haemoglobin and G₆PD (MRT)

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually but under supervision.

Visits to hospital/medical colleges should be planned to demonstrate the processes. It is important to make use of models and audiovisual aids to show specific processes. Experts should be invited to deliver lectures on specific topics and share their experiences.

RECOMMENDED BOOKS

1. Medical Laboratory Technology Vol. 1 by KL Mukherjee; Tata McGraw Hill Publishing Company, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworths Heinemann, Oxford
3. Medical Laboratory Manual for Tropical Countries by Monica Cheesbrough; Cambridge University Press; UK
4. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
5. Practical Haematology by J.V Decie; ELBS with Churchill Living Stone, UK

6. Medical Laboratory Science Theory and Practical by J. Ochei and Kolhatkar; Tata McGraw Hill Publishing Company Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	12	30
2	5	8
3	7	15
4	16	35
5	8	12
Total	48	100

RATIONALE

The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the techniques of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of the different tests is obtained. The students are also given basic training in safety measures, quality control and automation

DETAILED CONTENTS

Theory

1. Serum Bilirubin (6 hrs)
 - 1.1 Formation and excretion of bilirubin
 - 1.2 Formation of bile pigments
 - 1.3 Conjugated and unconjugated bilirubin
 - 1.4 Principle and procedures of serum bilirubin estimation (Direct & Indirect)
 - 1.5 Reference values
 - 1.6 Clinical importance
2. Urinary Proteins and Creatinine (4 hrs)
 - 2.1 24 hr. urinary proteins and creatinine estimation
 - 2.2 Reference values
 - 2.3 Clinical importance
3. SGOT and SGPT (6 hrs)
 - 3.1 Principle and procedures of estimation
 - 3.2 Reference values
 - 3.3 Clinical importance
4. ALP and ACP (6 hrs)

- 4.1 Principle and procedures of estimation
- 4.2 Reference values
- 4.3 Clinical importance

5. Serum Amylase (3 hrs)
- 5.1 Principle and procedures of estimation
 - 5.2 Reference values
 - 5.3 Clinical importance
6. Renal Function Tests (9 hrs)
- 6.1 Renal clearance test-Principle and procedures
 - 6.2 Clinical importance
7. Serum Calcium and Phosphorus (4 hrs)
- 7.1 Principle and procedures of estimation
 - 7.2 Reference values
 - 7.3 Clinical importance
8. Lipid Profile (10 hrs)
- 8.1 Formation of cholesterol
 - 8.2 High density and low density cholesterol
 - 8.3 Principles and procedures of estimation
 - 8.4 Reference value
 - 8.5 Clinical importance
 - 8.6 Triglycerides
 - 8.7 Estimation and importance of various ratios of HDL, LDL and VLDL

LIST OF PRACTICALS

1. Serum bilirubin estimation
2. Phosphorus estimation
3. Calcium estimation
4. Renal clearance tests
5. SGOT estimation
6. SGPT estimation
7. ALP estimation
8. ACP estimation
9. Total cholesterol estimation

10. Triglyceride estimation
11. Estimation of HDL and calculation of VLDL and LDL
12. Urinary protein and creatinine estimation (24 hr)
13. Estimation of serum amylase

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually but under supervision.

RECOMMENDED BOOKS

1. A Procedure Manual for Routine Diagnostic Tests Vol. I, II and III by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. Practical Clinical Biochemistry by H. Varley; Heinmann Publishers, Oxford
3. A Text Book of Medical Laboratory Technology by P Godkar; Bhalani Publishers, Mumbai
4. Medical Laboratory Science, Theory and Practice by J Ochaie and A Kolhatkar, Tata McGraw Hill

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	6	12
2	4	8
3	6	12
4	6	12
5	3	10
6	9	14
7	4	12
8	10	20
Total	48	100

3.4 HISTOPATHOLOGY AND CYTOLOGY- I

L T P

3 - 4

RATIONALE

This part of the subject is aimed at introducing the students to the various types of tissue preparations and developing expertise in the students to cut very thin tissue sections from tissue blocks and facilitate visualization using various stains and dyes. Cytology part aims at exposing the students to the latest advancements in cytological investigations.

DETAILED CONTENTS

Theory

1. Introduction and definition of: (1 hr)
 - 1.1 Histology
 - 1.2 Histopathology
 - 1.3 Biopsy
 - 1.4 Autopsy
 - 1.5 Autolysis
 - 1.6 Putrefaction

2. Preparation of Tissue (Different Methods of Preparation of Tissue) (2 hrs)
 - 2.1 Unfixed Tissue preparations
 - 2.1.1. Imprint methods – Impression Smears
 - 2.1.2 Teased preparation
 - 2.1.3 Squashed preparation
 - 2.1.4 Frozen section

2.2 Fixed Tissue preparations (introduction only)

2.2.1 Paraffin embedding

2.2.2 Celloidin embedding

2.2.3 Gelatin embedding

3. Reception of Specimen (1 hr)

3.1 Reception, recording, labeling and preservation of histological specimen

4. Fixation (Histological Specimens) (6 hrs)

4.1 Classification of fixatives

4.2 Composition of various fixatives

4.3 Advantages and disadvantages

5. Processing (by Paraffin Technique) (6 hrs)

5.1 Dehydration

5.2 Clearing/Dealcoholization

5.3 Infiltration and impregnation

5.4 Paraffin embedding

5.5 Automation: Histokinete (automatic tissue processor)
- its types, working, care and maintenance

6. Microtomy (7 hrs)

6.1 Microtome

6.1.1 Types

6.1.2 Advantages and disadvantages

6.1.3 Working principle, care and maintenance

6.2 Microtome Knives

6.2.1 Various types of knives

6.2.2 Sharpening of knives

- Honing technique
- Stropping technique
- Automation: Automatic knife sharpener – uses, care and maintenance
- Uses of abrasives and lubricants

6.3 Section Cutting

6.3.1 Rough cutting

6.3.2 Fine cutting

6.3.3 Use of tissue floatation bath

6.3.4 Use of various adhesive media and lifting of sections to the slide

6.3.5 Errors /cutting faults in sections and their remedies

7. Theory of staining (Routine) (5 hrs)

7.1 Dye Chemistry

7.2 Principle and mechanism of routine stain (Haematoxylin and Eosin)

7.3 Various steps of staining (Haematoxylin and Eosin)

- Deparaffinization
- Hydration
- Nuclear Staining
- Differentiation
- Blueing
- Counterstaining
- Dehydration
- Clearing and Mounting
- Results

7.4 Automation: Use of automatic stainer and coverslipper

8. Mountants (2 hrs)

8.1 Various types of mounting media (aqueous, resinous)

8.2 Advantages and Disadvantages

9. Various Terms associated with staining (4 hrs)

9.1 Solvents

9.2 Mordants

9.3 Metachromasia

9.4 Accelerators

9.5 Progressive and regressive staining

9.6 Use of controls in staining and their significance

10. Cell (2 hrs)

10.1 Defination and function

10.2 Structure

11. Exfoliative Cytology (4 hrs)

11.1 Introduction

11.2 Preparation of vaginal & cervical smears

11.3 Collection and Processing of specimen for cytology

- Urine
- Sputum
- CSF (Cerebro Spinal Fluid)
- Other fluids

12. Fixation (Cytological Specimen) (2 hrs)

- 12.1 Definition
- 12.2 Various types of Cytological fixatives
- 12.3 Advantages and Disadvantages

13. Cytological Staining (4 hrs)

Principle, Technique and interpretation of results in

- Papanicalaou staining
- May Grunwald & Giemsa staining
- Haematoxylin and Eosin staining

14 Role of Laminar airflow and cytotechnician in cytology (2 hrs)

LIST OF PRACTICALS

1. Reception of specimen, labeling and preserving the specimen
2. Preparation of various smears by unfixed methods
 - Imprint smears
 - Teased smears
 - Squashed smears
3. Preparation of different fixatives with special emphasis on preparation of formaline based fixatives
4. Preparation of paraffin blocks from various tissue pieces and labeling with emphasis on orientation
5. Handling of microtome
6. Sharpening of microtome knives
7. Preparation of blocks for fine cutting
 - Rough cutting
 - Trimming
8. Practice of fine section cutting
9. Practice of lifting of sections on the slides
10. Performing H&E staining on sections
11. Mounting and labeling of tissue section using various mounting medias

12. Demonstration of cell
13. Processing of urine samples for malignant cells
14. Processing of sputum sample for malignant cytology
15. To perform PAP stain on given smear
16. To perform MGG stain on given smear
17. To perform H&E on given smear

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually. Visits to hospital/medical colleges should be planned to demonstrate the processes. It is important to make use of models and audiovisual aids to show specific processes. Experts should be invited to deliver lecture on specific topics and share their experiences.

RECOMMENDED BOOKS

1. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworths Scientific, London
2. Carleton's Histological Technique by RAB, Drury, MADM (OXON), FRC Path, Northwick Paru Hospital, Harrow, Middlesex
3. Theory and Practice of Histological Technique by John D. Bancroft, Churchill Livingstone, London
4. Cellular Pathology Techniques by CFA Culling, Butterworths, London
5. Medical Lab Technology by Dr. Ramnik Sood, MD, Maulana Azad College, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	1	2
2	2	4
3	1	2
4	6	13
5	6	13
6	7	14
7	5	12
8	2	4
9	4	8
10	2	4
11	4	8

12	2	4
13	4	8
14	2	4
Total	48	100

3.5 BASICS OF INFORMATION TECHNOLOGY

L T P
- - 4

RATIONALE

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS Office/Open Office using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

Explanation of Introductory part should be dovetailed with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Information Technology – its concept and scope, applications of IT, impact of computer and IT in society.
2. Computers for information storage, information seeking, information processing and information transmission
3. Computer Application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, Air and Railway Ticket reservation, robotics, Military, banks, Insurance financial transactions and many more
4. Elements of computer system, computer hardware and software; data types – numeric data, alpha numeric data; contents of a program, processing
5. Computer organization, block diagram of a computer, CPU, memory
6. Input devices; keyboard, Scanner, mouse etc; output devices; VDU and Printer, Plotter
7. Electrical requirements, inter-connections between units, connectors and cables
8. Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD), primary and secondary memory: RAM, ROM, PROM etc., Capacity; device controllers, serial port, parallel port, system bus
9. Installation concept and precautions to be observed while installing the system and software

10. Introduction about Operating Systems such as MS DOS, Windows, Windows NT etc. as an interface to Computer System
11. Special features, various commands of MS Office/Open Office
12. About the internet – server types, connectivity (TCP/IP, shell); applications of internet like: e-mail and browsing
13. Various Browsers like Internet explorer, Mozilla Firefox, WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol)
14. Basics of Networking – LAN, WAN, Topologies
15. Ethics and information Technology
16. Future with information Technology

LIST OF PRACTICALS

1. **Given a PC, name its various components and peripherals. List their functions**
2. Practice in installing a computer system by giving connection and loading the system software and application software
3. Exercises on entering text and data (Typing Practice)
4. Installation of operating System viz. Windows XP, Windows 2007 etc..
Features of Windows as an operating system
 - Start
 - Shutdown and restore
 - Creating and operating on the icons
 - Opening closing and sizing the windows
 - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
 - Creating and operating on a folder
 - Changing setting like, date, time, colour (back ground and fore ground)
 - Using short cuts
 - Using on line help
5. Word Processing (MS Office/Open Office)
 - File Management:
 - Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
 - Page Set up:
 - Setting margins, tab setting, ruler, indenting
 - Editing a document:
 - Entering text, Cut, copy, paste using tool- bars

- Formatting a document:
- Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
- Aligning of text in a document, justification of document ,Inserting bullets and numbering
- Formatting paragraph, inserting page breaks and column breaks, line spacing
- Use of headers, footers: Inserting footnote, end note, use of comments
- Inserting date, time, special symbols, importing graphic images, drawing tools
- Tables and Borders:
- Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
- Print preview, zoom, page set up, printing options
- Using Find, Replace options
- Using Tools like:
- Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
- Using shapes and drawing toolbar,
- Working with more than one window in MS Word,
- How to change the version of the document from one window OS to another
- Conversion between different text editors, software and MS word

6. Spread Sheet Processing (MS Office/Open Office)

- Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
- Menu commands:
 - Create, format charts, organise, manage data, solving problem by analyzing data, exchange with other applications. Programming with Excel Work Sheet, getting information while working
- Work books:
 - Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays
- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
- Creating a chart:
 - Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list
- Retrieve data with query: Create a pivot table, customising a pivot table. Statistical analysis of data

- Exchange data with other application: embedding objects, linking to other applications, import, export document.

7. PowerPoint Presentation (MS Office/Open Office)

a) Introduction to PowerPoint

- How to start PowerPoint
- Working environment: concept of toolbars, slide layout, templates etc.
- Opening a new/existing presentation
- Different views for viewing slides in a presentation: normal, slide sorter etc.

b) Addition, deletion and saving of slides

c) Insertion of multimedia elements

- Adding text boxes
- Adding/importing pictures
- Adding movies and sound
- Adding tables and charts etc.
- Adding organizational chart

d) Formatting slides

- Using slide master
- Text formatting
- Changing slide layout
- Changing slide colour scheme
- Changing background
- Applying design template

e) How to view the slide show?

- Viewing the presentation using slide navigator
- Slide transition
- Animation effects etc.

8. Working with Data Processing (MS Office/Open Office)

a) Understanding different data types

b) Creation of table

- c) Entering data in a table and modify it.
- d) Creating simple Queries
- 9. Internet and its Applications
 - a) Log-in to internet
 - b) Navigation for information seeking on internet
 - c) Browsing and down loading of information from internet
 - d) Sending and receiving e-mail
 - Creating a message
 - Creating an address book
 - Attaching a file with e-mail message
 - Receiving a message
 - Deleting a message

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, 7th edition, Tata Mc Graw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi

8. Fundamentals of Information Technology by Leon and Leon;Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

3.6 TRANSFUSION MEDICINE

(Blood Banking)

L T P

3 - 2

RATIONALE

Blood transfusion has become a life saving procedure in modern medical sciences. To avoid any mistake, the students must understand to learn the blood bank procedures, such as ABO & Rh blood grouping carefully and accurately. He must also have an adequate knowledge of cross matching both major and minor procedures as well as selection of a suitable donor. He should be competent enough to collect blood and its long-term preservation for safe blood transfusion.

DETAILED CONTENTS

1. Historical introduction to Transfusion medicine (blood banking) (2 hrs)
2. Development of ABO antigen in red cells (4 hrs)
3. Glassware used in Blood Banking (3 hrs)
Types of glassware and cleaning agents used
Cleaning of new and used glassware/plastic ware
Care of glassware/plasticware
4. Anticoagulants used in blood bank (3 hrs)
 - 4.1 Types and composition of various anticoagulants
 - 4.2 Advantages and disadvantages of various anticoagulants
5. Screening of blood donors for: (10 hrs)
 - 5.1 MP
 - 5.2 VDRL

- 5.3 HIV
- 5.4 HbsAg
- 5.5 HCV

- 6. Antigen and Antibody (3 hrs)
 - 6.1 Definition of antigen and antibody
 - 6.2 Classification of antigens and antibodies.

- 7. ABO Blood Group System (3 hrs)
 - 7.1 Antigens and antibodies involved
 - 7.2 Principle and procedure of ABO blood grouping
 - 7.3 Various other sub groups A1,A2,A1B,A2B

- 8 The Rh Blood Group System (3 hrs)
 - 8.1 Antigen and antibody involved
 - 8.2 Principle and procedure of Rh grouping
 - 8.3 Variant of D antigen (Du)

- 9. Coombs Test (3 hrs)
 - 9.1 Direct coombs test (principle, procedure, importance and application)
 - 9.2 Indirect coombs test (principle, procedure, importance and application)

- 10. Cross Matching (2 hrs)
 - 10.1 Types of cross matching
 - 10.2 Various methods and their procedures

11. Blood Collection and storage (2 hrs)

- 11.1 Screening of blood donor and characteristics of ideal blood donor.
- 11.2 Blood collection procedure
- 11.3 Transportation and storage

12. Various blood components (Packed cells, Fresh frozen plasma, (4 hrs)

Cryoprecipitate, PRP(Platelet rich plasma)

- 12.1 Preparation
- 12.2 Preservation

13. Blood Transfusion reactions (6 hrs)

LIST OF PRACTICALS

1. Washing and sterilization of glass ware
2. Performing ABO blood grouping by following method:
 - Direct
 - Tube Test
 - Indirect (reverse)
 - Subgroup
3. Performing-Rh grouping by following techniques:
 - Slide
 - Tube technique
4. Performance of Coombs Test
 - Direct
 - Indirect

5. Cross Matching (compatibility testing)

- Major
- Minor

6. Preparation of anticoagulants

- ACD (Acid Citrate Dextrose)
- CPD (Citrate Phosphate Dextrose)
- CPDA (Citrate Phosphate Dextrose Analine)

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually.

Visits to hospital/medical colleges should be planned to demonstrate the processes. It is important to make use of models and audiovisual aids to show specific processes. Experts should be invited to deliver lecture on specific topics and share their experiences.

RECOMMENDED BOOKS

1. Introduction to Modern Lab Technology by FJ Baker, Butterworth, Heinemann Publishers Oxford
2. Text book of Modern Lab Technology by Praful and Godker, Bhalani Publisher, Mumbai
3. Modern Lab Technology – A Procedure Manual for Routine Diagnostic Test by Kanai L. Mukerjee, Volume 1, Tata McGraw Hill Publishing, New Delhi
4. Modern Blood Banking and Transfusion Practices by Denise M Harmering, Jay Pee Brothers, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	2	4
2	4	10
3	3	6

4	3	6
5	10	20
6	3	6
7.	3	6
8	3	6
9	3	6
10	2	4
11	2	4
12	4	10
13	6	12
Total	48	100

ENTREPRENEURIAL AWARENESS CAMP

The employment opportunities for diploma holders especially in public sector are dwindling. The diploma holders need to explore the possibilities of becoming entrepreneurs. For this, they must be acquainted with entrepreneurship development, scope of setting up small-scale industry, existing business opportunities, financial support available and various aspects of managing business. In this context, an entrepreneurial awareness camp is suggested. During the camp, experts from various organizations such as banks, financial corporations, service institutes etc. may be invited to deliver expert lectures. Successful entrepreneurs may also be invited to interact with the students. Students may be encouraged to read papers or give seminar during the camp on Entrepreneurship Development related topics.

The camp is to be organized at a stretch for two to three days during fourth semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject

1. Who is an entrepreneur?
2. Need for entrepreneurship, entrepreneurial career and self employment

3. Scenario of development of small scale industries in India
4. Entrepreneurial history in India, Indian values and entrepreneurship
5. Assistance from District Industries Centres, Commercial Banks, State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other Financial and Development Corporations
6. Considerations for product selection
7. Opportunities for business, service and industrial ventures
8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)
9. Legal aspects of small business
10. Managerial aspects of small business

SEMESTER IV

174

Medical Lab Technology

175

CLINICAL MICROBIOLOGY- IV

(Immunology and mycology)

L T P

3 - 4

RATIONALE

The students undergoing training of medical laboratory technology learn the techniques of collection of samples, their processing and identification of various fungal infections and diagnosis of microbial infections by serological methods. In addition to the above, students are given training in the use of safety measures while handling infected materials. The training is aimed to make the students competent to isolate and identify fungi and do serological tests for various microbial infections.

DETAILED CONTENTS

1. Mycology (4 hrs)

- Characteristics and classification of medically important fungi

2 Fungal Culture media (2 hrs)

- SDA (Sabouraud's dextrose agar) with and without antibiotics
- CMA (Corn meal agar)
- RSA (Rice Starch Agar)

3 Fungal Staining (2 hrs)

- KOH preparation
- LCB (Lactophenol cotton blue)

4 Fungal Cultivation (6 hrs)

- Medically important fungi - Candida, Dermatophytes and Aspergillus
- Laboratory Contaminants – Penicillium, Rhizopus, Mucor

5. Introduction to Immunology (6 hrs)

Immunity:

- Innate and
- Acquired

6. Antigens (4 hrs)

- Definition, types and properties

7 Antibodies (4 hrs)

- Definition, types and properties

176

8 Antigen – Antibody Reactions (6 hrs)

- Principle and applications of agglutination, precipitation and flocculation reactions

9 Serological tests (8 hrs)

I Principle, techniques and interpretation of

- Widal - Tube method
- Anti streptolysin O
- C-reactive protein
- VDRL

II Principle, techniques and Interpretations of (6 hrs)

- Latex agglutination
- ELISA
- Widal – latex method

LIST OF PRACTICALS

Preparation of different culture media used in mycology - Sabouraud's dextrose agar with and without antibiotics, Corn meal agar, Rice Starch Agar (RSA)

To perform staining techniques – KOH, LCB

To study characteristics of common laboratory fungal contaminants

Collection and processing of samples for diagnosis of fungal infections in skin, hair, nail scrapings

To perform serological tests

- Widal test (Both slide and tube method)
- ASO (slide and tube method)
- CRP (slide and tube method)
- RA-Slide method
- VDRL Test (slide and tube method)
- HIV Test – Strip/Test card method
- HBsAg Test- Strip/ Test card method

177

INSTRUCTIONAL STRATEGY

The teacher should describe the morphology of important pathogenic and non-pathogenic fungi. The students should be taught to collect and process samples for isolation and identification of fungi. The teacher should emphasize on antigen and antibody tests and quality control in microbiology. The students should be taught with illustrations/audiovisual aids.

RECOMMENDED BOOKS

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. An introduction to Medical Laboratory Technology by FJ Baker; Butterworth Heinemann Oxford
3. Textbook of Microbiology by Ananthanarayan and Panikar; Orient Longman, Hyderabad
4. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
5. Text Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
6. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesberg; Cambridge University Press; UK
7. Text Book of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House; Mumbai
8. Medical Lab Science Theory and Practice by J Ochei and A Kolhatkar
9. Text Book of Medical Microbiology by Greenwood, ELBS

SUGGESTED DISTRIBUTION OF MARKS

Topic No. Time allotted (Hrs) Marks Allotted (%)

1 4 8
2 2 8
3 2 8
4 6 10
5 6 12
6 4 8
7 4 8
8 6 12
9 8 14
10 6 12

Total 48 100

178

4.2 HAEMATOLOGY - IV

L T P

3 - 4

RATIONALE

This subject aims to enable the students to carry out routine clinical laboratory investigation (blood, urine etc). He/she should be able to provide technical help for sophisticated hematological techniques with adequate knowledge of various principles. The training in laboratory safety is also provided.

DETAILED CONTENTS

Theory

1. Introduction to normal haemostasis (22 hrs)
 - 1.1 Theories of blood coagulation
 - 1.2 Platelets and their role in haemostasis
 - 1.3 Bleeding disorders and related diseases
 - 1.4 Principles, clinical importance, reference values and methods of:
 - prothrombin time, prothrombin time index (PTI) International normalized ratio (INR), Activated Partial Thromboplastin time

(APTT) – bleeding time (BT), Hess test, clotting time (CT), and clot retraction test (CRT)

2. Bone – marrow (5 hrs)

2.1 Composition and function of bone-marrow

2.2 Aspiration of bone-marrow by various methods

2.3 Preparation, staining and examination of bone-marrow smears

2.4 Iron staining (Perls' reaction)

2.5 Significance of bone-marrow examination

3. Leukemia (10 hrs)

3.1 Definition of leukemias

3.2 Classification (FAB)

3.3 Laboratory diagnosis of various leukemias

4. LE Cell phenomenon (3hrs)

4.1 Phenomenon of LE cell, its differentiation from tart cell

4.2 Demonstration of LE cell by various methods

4.3 Clinical importance

5. Processing of biological fluids and interpretation of results (8 hrs)

such as semen, CSF, pleural and ascitic fluids, urine

179

LIST OF PRACTICALS

Determination of bleeding time by Ivy's and Dukes method

Determination of clotting time by Lee and white and capillary method

Determination of prothrombin time, index and INR (International Normalised Ratio)

Determination of Activated Partial thrombo plastin time (APTT)

Demonstration of Hess test

Performance of Clot retraction test

Demonstration of LE Cell

Processing of biological body fluids

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually.

Visits to hospital/medical colleges should be planned to demonstrate the processes. It is important to make use of models and audiovisual aids to show specific processes. Experts should be invited to deliver lecture on specific topics and share their experiences.

RECOMMENDED BOOKS

Medical Laboratory Technology Vol. 1 by KL Mukherjee; Tata McGraw Hill Publishing Company, New Delhi

An Introduction to Medical Laboratory Technology by FJ Baker; Butterworths Heinemann, Oxford

Medical Laboratory Manual for Tropical Countries by Monica Cheesberg; Cambridge University Press; UK

Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai

Practical Haematology by J.V Decie; ELBS with Churchill Living Stone, UK

Medical Laboratory Science Theory and Practical JO Chei and Kolhatkar, Tata McGraw Hill Publishing Company Ltd., New Delhi

Haematology for Medical Technologists by Charles F. Seiverd 5th Ed. 1983, Lea & Febigue Philadelphia

SUGGESTED DISTRIBUTION OF MARKS

Topic No. Time allotted (Hrs) Marks Allotted (%)

1 22 46

2 5 10

3 10 21

4 3 6

5 8 17

Total 48 100

180

4.3 CLINICAL BIOCHEMISTRY- IV

L T P

3 - 4

RATIONALE

The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the technique of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of different tests is obtained. The students are also given basic training in safety measures, quality control and automation

DETAILED CONTENTS

Theory

1. Urine Analysis (11hrs)

1.1 Normal composition of urine and its properties

1.2 Clinical importance of urine analysis

1.3 Qualitative analysis of proteins, sugar, bile salts, bile pigments, urobilinogen and blood.

1.4 Detailed discussion on glycosuria and albuminuria

1.5 Ketone bodies, 17 Ketosteroids

2. Stool Chemistry (8 hrs)

2.1 Physical characteristics and chemical composition of stool

2.2 Significance of presence of blood and excess fat in stool

2.3 Occult blood detection

3. Cerebrospinal Fluid (5 hrs)

3.1 Composition and functions of CSF

3.2 Methods of determination of proteins, sugar and chloride in CSF

3.3 Reference Values

3.4 Clinical importance

4. Biological fluids (5 hrs)

Formation, composition and significance of biological fluids (peritoneal, pleural, synovial, ascitic fluid and gastric juice)

5. Electrophoresis (4 hrs)

5.1 Theory

5.2 Principle and procedure of paper, gel electrophoresis, method of elution

5.3 Clinical importance

181

6. Chromatography (4 hrs)

6.1 Theory of Chromatography, separation between stationary and mobile phases

6.2 Principle and procedure of Paper chromatography

6.3 Importance of chromatography

7. Automation in Biochemistry (5 hrs)

8. Thyroid function tests

(6 hrs)

8.1 Functions of thyroid

8.2 Principle, reference values and clinical importance of T3, T4 and TSH

LIST OF PRACTICALS

1. Analysis of urine for sugar and proteins (qualitative and quantitative)
2. Detection of ketone bodies in urine
3. Detection of haematuria
4. Detection of bile pigments, bile salts and urobilinogen
5. Occult blood test for stool specimen
6. Estimation of glucose in CSF
7. Estimation of total proteins and globulins in CSF
8. Estimation of chloride in CSF
9. Titration for acidity determination and qualitative analysis of gastric juice
10. Demonstration of electrophoresis (Paper electrophoresis)
11. Demonstration of chromatography (Paper chromatography)

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually.

Visits to hospital/medical colleges should be planned to demonstrate the processes. It is important to make use of models and audiovisual aids to show specific processes. Experts should be invited to deliver lecture on specific topics and share their experiences.

182

RECOMMENDED BOOKS

A Procedure Manual for Routine Diagnostic Tests, Vol. I, II and III by KL Mukherjee;

Tata McGraw Hill Publishers, New Delhi

Practical Clinical Biochemistry by Varley; Heinmann Publishers, Oxford

A Text Book of Medical laboratory Technology by P Godkar; Bhalani Publishers, Mumbai

Medical Laboratory Science Theory and Practice by J Ochaie and A Kolhatkar, Tata McGraw Hill

SUGGESTED DISTRIBUTION OF MARKS

Topic No. Time allotted (Hrs) Marks Allotted (%)

1 11 20

2 8 16

3 5 10

4 5 10

5 4 10

6 4 10

7 5 10

8 6 14

Total 48 100

183

4.4 HISTOPATHOLOGY AND CYTOLOGY - II

L T P

4 - 4

RATIONALE

This part of the subject is aimed at exposing the students to the latest advancements and automation in the field of histopathology and cytology.

DETAILED CONTENT

Theory

1. Light Microscope (11 hrs)
 - 1.1 Principles of light microscope
 - 1.2 Various parts of microscope
 - 1.3 Uses of microscope
 - 1.4 Cleaning and maintenance of microscope
 - 1.5 Various attachments of light microscope (introduction only)
 - Polarizing
 - Dark field
 - Phase contrast
 - Fluorescent
2. Special stains (11 hrs)
 - 2.1 Principle, significance and interpretation of different types of stains
 - PAS
 - Silver impregnation stain – Reticulin fibre
 - Ziehl Neelson's – for AFB and Leptrae
 - Masson's trichrome stain
 - Pearl's Prussion Blue – Iron
 - Oil Red O – fat
 - Gram's stain – Gram +ve and Gram –ve
3. Decalcification (6 hrs)
 - 3.1 Process of decalcification
 - 3.2 Various types of decalcifying methods
 - 3.3 Their mechanism, advantage, disadvantage and applications
 - 3.4 Assessment of decalcification
4. Handling of fresh histological tissues (Frozen Section) (6 hrs)
 - 4.1 Reception and processing of frozen tissue
 - 4.2 Freezing microtome and cryostat
 - 4.3 Advantages and dis-advantages of freezing microtome and cryostat
 - 4.4 Working, care, maintenance of freezing microtome and cryostat
 - 4.5 Frozen section cutting
 - 4.6 Staining
 - Rapid H&E
 - Fat stain
 - 4.7 Mounting of frozen section
- 184
5. Museum Techniques (10 hrs)
 - 5.1 Introduction to museum with emphasis on importance of museum
 - 5.2 Reception, fixation and processing of various museum specimens
 - 5.3 Preparation of mounting solutions
 - 5.4 Technique of mounting specimen
 - 5.5 Care of mounted specimen
 - 5.6 Cataloguing of museum specimen
6. Autopsy (2 hrs)
 - 6.1 Introduction to autopsy technique
 - 6.2 Use of autopsy
7. Malignant Cells (2 hrs)
 - 7.1 Characteristics
 - 7.2 Differences from normal cell
8. Harmonal Assessment (2hrs)
 - 8.1 Introduction

8.2 Uses

9. Sex Chromatin (Barr bodies) (2 hrs)

9.1 Introduction

9.2 Collection of sample

9.3 Staining

9.4 Interpretation

10. Aspiration Cytology (6 hrs)

10.1 Principle of FNAC (Fine Needle Aspiration Cytology)

10.2 Indications of FNAC

10.3 Uses of FNAC

10.4 Staining Techniques

- MGG (May-Grunwald – Giemsa)

- PAP (Papanicolaou Stain)

- H&E (Haematoxylin & Eosin Stain)

11. Cytological special stains (4 hrs)

Principle, Technique & Interpretation of

11.1. PAS (Periodic Acid Schiffs reagent Stain)

11.2. Zeihl Neelson's(ZN) Stain (AFB)

12. Advancement (2 hrs)

12.1 Automation in Cytology- Use of Cytospin

185

LIST OF PRACTICALS

1. Demonstration of various parts of light microscope (Mechanical & Optical)

2. Demonstration of cryostat

3. Processing of tissue for frozen section

4. Staining and mounting of frozen section using H&E stain (rapid method), Oil Red "O".

5. Preparation of various mounting reagents for museum specimens

6. Demonstration and care of autopsy instruments

7. Demonstration of malignant cell

8. Preparation, Staining and interpretation of buccal smear

9. Preparation of dry smear and wet smear

10. To perform Pap stain

11. Fixation of smears and staining with MGG

186

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually.

Visits to hospital/medical colleges should be planned to demonstrate the processes. It is important to make use of models and audiovisual aids to show specific processes. Experts should be invited to deliver lecture on specific topics and share their experiences.

RECOMMENDED BOOKS

An Introduction to Medical Laboratory Technology by FJ Baker; Butterworths Scientific, London

Carleton's Histological Technique by RAB, Drury, MADM (OXON), FRC Path, Northwick Paru Hospital, Harrow, Middlesex

Theory and Practice of Histological Technique by John D. Bancroft, Churchill Livingstone, London

Cellular Pathology Techniques by CFA Culling, Butterworths, London

Medical Lab Technology by Dr. Ramnik Sood, MD, Maulana Azad College, New Delhi

Diagnostic Cytology and its Histopathology Basis by Leo Pold G.Koss; JB Lupein,

4.6 MEDICAL LABORATORY MANAGEMENT

L T P

4 - -

RATIONALE

The students are taught techniques of planning a clinical laboratory. They are also supposed to be taught how to procure chemicals, reagents and equipment. The students are imparted special training in maintaining laboratory equipment, the preventive maintenance and daily up keeping. They are also given training for the maintenance of stocks and inventory. They are also given knowledge of recording results, interpretation, quality control and reproducibility. Students also learn how to communicate effectively.

DETAILED CONTENTS

1. Introduction, Layout, Facility of Lab (8 hrs)

Role of medical laboratory technology in total health care, principles of management, techniques of planning, physical facilities/equipment – layouts and design

2. Laboratory Organization (10 hrs)

Laboratory organization, operation, job description, evaluation, performance

3. Material Required (6 hrs)

Material management, procurement, financial resources, importing, inventory, control and analysis, inspection, storage etc

4. Quality Assurance (10 hrs)

Analytical control, Internal and external quality assurance in clinical laboratories, precision, accuracy, standard deviation as per national standards

5. Safety Precautions (5 hrs)

Safety measures in clinical laboratories (microbiology, haematology, biochemistry, histopathology and cytology, transfusion medicine), Disposal of Biomedical waste.

6. Human Relations and Motivation (4 hrs)

Inter-personal relations, inter and intradepartmental relations and their importance, concept and importance of motivation-drives and incentives; intrinsic and extrinsic motivation

188

7. Managing Psychological self (2 hrs)

- Stress
- Emotions
- Anxiety

8. Leadership

Concept, types, qualities of good leader (3 hrs)

9. Medical Ethics and Code of Conduct (8 hrs)

Ethics and code of conduct - legal aspects – confidentiality malpractice/negligence; legal implications, law suits, consumer protection and insurance for professional health hazards

10. Equipment – Care and Maintenance (5 hrs)

Preventive maintenance and care of various laboratory equipment

11. Role of Computers in Lab (3 hrs)

Storage and retrieval of laboratory data manually and with help of computers

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical

work individually but under supervision.

Visits to hospital/medical colleges should be planned to demonstrate the processes. It is important to make use of models and audiovisual aids to show specific processes. Experts should be invited to deliver lecture on specific topics and share their experiences.

RECOMMENDED BOOKS

1. Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai (India)
2. Text Book of Medical Laboratory Technology by FJ Baker; Butterworths Heinmann Publishers, Oxford
3. Text Book of Medical Laboratory Technology by KL Mukherjee Vol I, II and III; Tata McGraw Hill Publishers, New Delhi
4. Medical Lab Technology by Ramnik Sood, Jay Pee Brothers, New Delhi
5. District Laboratory Practice in Tropical Countries by Monica Chesbrough, Churchill Livingstone.

189

SUGGESTED DISTRIBUTION OF MARKS

Topic No. Time allotted (Hrs) Marks Allotted (%)

1 8 12

2 10 16

3 6 8

4 10 16

5 5 8

6 4 6

7 2 4

8 3 5

9 8 12

10 5 8

11 3 5

Total 64 100

190

PERSONALITY DEVELOPMENT AWARENESS CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person Interviews; Telephonic Interview' Panel interviews; Group interviews and Video Conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene

SEMESTER V AND VI

5.1 PROFESSIONAL TRAINING-I AND

6.1 PROFESSIONAL TRAINING- II

L	T	P
-	-	40

OBJECTIVE

The objective of providing professional training is to:

1. Create confidence in the students to work in world of work by developing practical skills pertaining to laboratory management and diagnostic skills in the field of clinical haematology, transfusion medicine blood banking, clinical biochemistry, clinical microbiology, histopathology and cytology and ensuring laboratory safety and quality assurance.
2. Create necessary awareness regarding use of various types of diagnostic equipment, particularly sophisticated ones which are used in the field of medical laboratory technology.
3. Develop appreciation regarding size and scale of operations, environment and other related aspects like value of team work, interpersonal relations and professional ethics in the field of medical laboratory technology.
4. Develop necessary traits for starting small clinical laboratories as per requirements.

SELECTION OF TRAINING PLACES

The institute offering diploma programme in Medical Laboratory Technology should establish contact/rapport by personal visit to following types of organizations:

1. Medical Colleges/Research institutions
2. Civil Hospitals at District Headquarters having well equipped laboratory
3. Hospitals in private sector
4. Well established clinical laboratories being run by a qualified person

LIST OF PRACTICALS

List of exercises is suggested below which should be carried out during 5th semester and 6th semester.

During 5th Semester

1. Preparation of various anticoagulants/containers
2. Collection of various clinical samples
3. Haemoglobin estimation
4. TLC, DLC, ESR, PCV, BT & CT
5. Absolute Eosinophil Count
6. APTT/PTTK
7. Prothrombin Time & calculation of INR
8. Blood Sugar – Random/Fasting/PP
9. GTT/ST
10. Urine – Complete examination
11. Stool – Complete examination
12. RA/RF factor
13. ABO and Rh blood grouping
14. Widal test
15. VDRL test
16. Cleaning of glassware
17. Disposal of Medical wastes (use of bags)
18. Staining of blood film
19. H&E staining
20. Spotting

During 6th Semester

1. Reticulocyte count
2. Platelet count
3. Peripheral blood film examination
4. Sputum examination for AFB
5. Serum calcium
6. CSF examination
7. Lipid profile
8. Liver function test
9. Renal function test
10. Stool for occult blood
11. Urine for culture and sensitivity
12. Blood for culture and sensitivity
13. Semen culture

14. Pus culture and sensitivity
15. Staining of smears by various staining procedures
16. Biochemical testing
17. HIV Test
18. Hbs Ag test
19. ASO
20. CRP
21. Pregnancy test
22. Spotting

In addition to the above, students are expected to learn various tests being conducted at the training centre, where ever they are undergoing training.

Note:

1. The Principal of the institute where diploma programme in Medical Laboratory Technology is being offered, with the help of Directorate of Technical Education/Secretary, Technical Education may approach Director, Health Services/Director, Medical Education/Secretary, Health to collaborate in offering structured and supervised project work/practical training of students in above organizations. It will be worthwhile to sign a "Memorandum of Understanding" regarding the involvement of students in undergoing practical training
2. The Principal of the institute may also approach regional Apprenticeship Adviser (Northern Region), Kanpur to provide training seats under Apprenticeship Act to the students

METHODOLOGY OF ORGANIZING PRACTICAL TRAINING

Each concerned teacher will be responsible for a group of students in respective speciality to plan, supervise and monitor the progress when placed in different organizations for practical training. For this purpose, necessary recurring expenditure for making payment of TA/DA to the faculty of institute and the experts may be worked out by respective institutes, keeping in view, number of visits and the distances involved in such travelling. The concerned teacher will have to continuously interact with training centres to monitor the progress of the students

EVALUATION OF STUDENTS FOR PRACTICAL/PROFESSIONAL TRAINING

Practical training will have 400 marks. Out of which 100 marks will be awarded by the organization where placed for practical/professional training and 300 marks are for external examination. The criteria for internal assessment will be as under:

a)	Criteria for internal assessment by organization where placed for practical/professional training	Weightage
1.	Attendance/Punctuality	10 percent
2.	Proficiency in conducting laboratory test	30 percent
3.	Preparation of portfolio based on day to day work done in various laboratories	20 percent
4.	Initiative/responsibility exhibited	10 percent
5.	Interpersonal relations	10 percent
6.	Behaviour/attitude	10 percent
7.	Maintenance of equipment and work place	10 percent

GENERAL GUIDELINES

- (i) The students are expected to prepare practical record book as per given list of the experiments. Besides, they can also add other experiments as well.
- (ii) External examiner along with internal faculty should evaluate the student's performance through viva voce/spotting/performance and synopsis:

ACADEMIC SCHEDULE/CALENDER FOR ODD SEMESTER (SESSION 2012-13)

Last date for readmission cases of 3rd and 5th semester classes	27.07.2012
Last date for readmission cases of 1st semester classes	27.08.2012
Last Date for receipt of application for trade change only 3rd Civil,EE,ME	27.07.2012
Date for hearing UMC cases pertaining to May-2012 Exam	07.08.2012

Teaching Days for 3rd and 5th semester classes	16.07.2012 to 26.11.2012
Teaching Days for 1st semester classes	16.08.2012 to 24.12.2012
Registration of students of 3rd Semester classes	16.07.2012
Commencement of regular classes of 3rd semester students	17.07.2012
Registration of students of 5th Semester classes	01.08.2012
Commencement of regular classes of 5th semester students	02.08.2012
Janmashtami	10.08.2012
Independence Day	15.08.2012
Registration of students of 1st Semester classes	16.08.2012
Commencement of regular classes of 1st semester students	17.08.2012
Id-ul-Fitr	20.08.2012
MST-I	27.09.2012 to 29.09.2012
Gandhi Jayanti	02.10.2012
Dussehra	24.10.2012
Valmiki Jayanti	29.10.2012
MST-II	01.11.2012 to 06.11.2012
Deepawali	13.11.2012
Rationalisation of sessional marks 3rd and 5th Semester classes	22.11.2012 to 26.11.2012
Practical Exam 3rd to 6th semester classes	27.11.12 to 03.12.2012
Guru Nanak Jayanti	28.11.2012
Board Examinations 3rd to 6th semester classes	07.12.2012 onwards
Rationalisation of sessional marks 1st Semester classes	20.12.2012 to 24.12.2012
Christmas	25.12.2012
Practical Exam 1st and 2nd semester classes	03.01.2013 to 10.01.2013
Board Examinations 1st and 2nd semester classes	11.01.2013 onwards
Start of Even Semester for 4th and 6th semester classes	16.01.2013

1.

