

MEDICITI COLLEGE OF MEDICAL LAB TECHNOLOGY

(Affiliated with Kaloji Narayana Rao University of Health Sciences)

B.Sc. Medical Lab Technology

1st year

COURSE STRUCTURE

FIRST YEAR	THEORY		PRACTICALS		Total
	Univer'ty	I.A.	University	I.A. + Record	
	(Min:40%)	(Min:35%)	(Min:50%)	(Min:35%)	
1. English Language	80	20	NA	NA	100
2. Anatomy	80	20	40	5 + 5	150
3. Physiology	80	20	40	5 + 5	150
4. Clinical Laboratory practices	80	20	40	5 + 5	150
SECOND YEAR	THEORY		PRACTICALS		Total
	Univer'ty	I.A.	University	I.A. + Record	
	(Min:40%)	(Min:35%)	(Min:50%)	(Min:35%)	
1. Pathology- 1	80	20	40	5 + 5	150
2. Microbiology- 1	80	20	40	5 + 5	150
3. Biochemistry- 1	80	20	40	5 + 5	150
THIRD YEAR	THEORY		PRACTICALS		Total
	Univer'ty	I.A.	University	I.A. + Record	
	(Min:40%)	(Min:35%)	(Min:50%)	(Min:35%)	
1. Pathology-II	80	20	40	5 + 5	150
2. Microbiology-II	80	20	40	5 + 5	150
3. Biochemistry-II	80	20	40	5 + 5	150
NA – Not Applicable.					

Scheme of Theory examination:

Subject	Type of Question	Questions to be Answered	Marks per Question	Distribution of Marks
English	Essay Questions	2	20	$2 \times 20 = 40$
	Short-Note Questions	5	8	$5 \times 8 = 40$
Total				80
Other Theory Subjects	Essay Questions	2 out of 3	10	$2 \times 10 = 20$
	Short-Note Questions	6 out of 8	5	$6 \times 5 = 30$
	Brief Short-Note Questions	10	3	$10 \times 3 = 30$
Total				80

Scheme of Practical examination:

S. No.	Practical Examination	Components	Marks
1	English	No practical examination	—
2	Anatomy	1. Histology slides: 4×2 2. Abdomen, thorax and pelvis: 8×2 3. Head and neck organs: 1×2 4. Brain: 1×2 5. Upper-limb bones: 2×2 6. Lower-limb bones: 2×2 7. Head, neck and thorax bones: 2×2	8 16 2 2 4 4 4
		Identification of 20 spotters $\times$ 2 marks each	40
		<i>Twenty diagrams must be drawn in the record.</i>	
3	Physiology	1. Haematology 2. Spotters: RBC/WBC/platelets/blood groups or instruments 3. Staining and WBC differential count 4. Recording of BP/auscultation of heart sounds	15 10 10 5
		Total	40
4	Clinical Laboratory Practice	1. Spotters 2. SOP of various tests—any two, subject-wise 3. Biomedical-waste management	10 20 10
		Total	40

SYLLABUS

PAPER – 1: ENGLISH

Course Description

The Course is designed to enable students to enhance ability to comprehend spoken and written English (and use English) required for effective communication in their professional work. Students will practice their skills in verbal and written English during clinical and classroom experiences.

Unit	Time (Hrs)	Learning Objectives	Content	Teaching-Learning Activities	Assessment Methods
I	10	Speak and write grammatically correct English	Review of Grammar; Remedial study of Grammar; Building Vocabulary; Phonetics; Public Speaking	Demonstrate use of dictionary; Classroom conversation; Exercises on use of Grammar; Practice in public speaking	Objective Type; Fill in the blanks; Paraphrasing
II	30	Develop ability to read, understand and express meaningfully the prescribed text	Read and comprehend prescribed course books	Exercises on Reading, Summarizing and Comprehension	Short Answers; Essay Types
III	10	Develop writing skills	Various forms of composition; Letter writing; Note taking; Precis writing; Resume/CV	Exercises on writing; Letter writing; Story writing; Resume/CV; Essay writing; Discussion on written reports/documents	Assessment of the skills based on the checklist
IV	6	Develop skill in spoken English	Spoken English; Oral report; Discussion; Debate; Telephonic conversation	Debating; Participating in Seminar, Panel and Symposium; Telephonic conversation	Assessment of the skills based on the checklist
V	4	Develop skill in listening comprehension	Listening Comprehension; Media, audio, video, speeches, etc.	Listening to audio and video tapes and identifying the key points	Assessment of the skills based on the checklist

Prescribed Textbook

English for B.Sc. Nursing by Ms. P. Angela Vanaja Kumari and Prof. Mrs. R.S. Caroline
Front Line Publications, Hyderabad.

PAPER – 2: HUMAN ANATOMY

The students of B.Sc. M.L.T. will not be doing the dissection of cadaver. Demonstrations should be given in such a way that they have as clear an understanding of human anatomy as possible.

I. The Human Body as a Whole

Definitions, subdivisions of Anatomy, terms of location and positions, fundamental planes, vertebrate structure of man, and organisation of the body, cells and tissues.

II. Locomotion and Support

The Skeletal System

Types of bones, structure of bone, divisions of the skeleton, appendicular skeleton, axial skeleton—names of all the bones and their parts; joints—classification and types of movements with examples.

Practicals: Demonstrations of all bones showing their parts. Joints—X-rays of all normal bones and joints.

III. Anatomy of the Nervous System

Central Nervous System

Spinal cord: anatomy, functions, reflex actions and meninges. Main and fundamental parts of the brain: hindbrain, midbrain and forebrain—location, functions and coverings of the brain.

Excluded: Injuries to the spinal cord and brain.

IV. Anatomy of the Circulatory System

Heart—size, location, coverings, chambers and blood supply. Blood vessels, general plan of circulation, pulmonary circuit, names of arteries and veins, and their positions.

Only histology of the lymphatic system is included.

Practical: Demonstration to illustrate.

V. Anatomy of the Respiratory System

Organs of the respiratory system—nose, nasal cavity, trachea and bronchial tree.

PNS and larynx topics are excluded.

Pleurae and lungs—brief knowledge of parts and position.

Practical: Demonstration to illustrate.

VI. Anatomy of the Digestive System

Components of the digestive system, alimentary tract, and anatomy of the organs of the digestive system: mouth, tongue, salivary glands, liver, biliary apparatus, pancreas and spleen—their positions and brief functions.

Practical: Demonstration to illustrate.

VII. Anatomy of the Excretory and Reproductive Systems

Kidneys—location and gross structure; ureters, urinary bladder and urethra.

Male Reproductive System: Testis and duct system.

Female Reproductive System: Ovaries, duct system and accessory organs.

Practical: Illustrations.

VIII. Anatomy of the Endocrine System

Names of all endocrine glands and their positions.

Only hormones of the endocrine glands are included.

Thyroid, parathyroid, pituitary and adrenal glands, gonads and islets of the pancreas.

Functions of endocrine glands are excluded.

Histology

IX. General Slides

1. Hyaline cartilage
2. Fibrocartilage
3. Elastic cartilage
4. T.S. and L.S. bone
5. Blood vessels
6. Tonsils
7. Spleen
8. Thymus
9. Lymph node
10. Epithelial tissue
11. Skeletal and cardiac muscle—Excluded
12. Peripheral nerve and optic nerve—Excluded

X. Systemic Slides

1. **GIT:** Fundamental structure of the GIT, liver, stomach and small intestine
2. **Respiratory System:** Lung and trachea
3. Kidney
4. **Endocrines:** Pituitary, thyroid, parathyroid, adrenal and pancreas
5. **Reproductive System:** Ovary and testis; uterus—Excluded

PAPER – 3: PHYSIOLOGY

1. Haematology – 16 Hours

1. **Blood:** Composition, properties and functions of blood.
2. **RBC:** Size, shape, functions, count, physiological variations in RBC count, polycythaemia and erythropoiesis.
3. **Haemoglobin:** Function, concentration, physiological variations in concentration and methods of determination of Hb.
4. **WBC:** Functions, production, lifespan, count, leucocytosis, leucopenia, leukaemia and DLC.
5. **Platelets:** Size, shape, count, production, functions, thrombocytopenic purpura, bleeding time and clotting time.
6. **Blood Groups:** ABO and Rh grouping, criteria of classification, antigens and antibodies, percentage distribution, determination of blood groups, Landsteiner's law and significance of blood groups.
7. **Blood Transfusion:** Indications, general qualities of a donor, matching donor's blood with recipient's blood, universal donor and recipient concept, blood grouping or typing, cross-matching, causes and complications of mismatched blood transfusion, Rh factor, Rh incompatibility, transfusion and erythroblastosis foetalis.
8. **Haemostasis:** Vasoconstriction, platelet-plug formation, blood coagulation, definition, clotting factors, mechanism of blood clotting—*intrinsic* and *extrinsic* pathways, intravascular blood clotting, disorders of clotting, vitamin K deficiency bleeding, purpura and haemophilia.
9. **Anticoagulants:** Classification, examples and uses.
10. Blood bank.
11. **Blood Indices:** Colour index, MCH, MCV and MCHC.
12. **ESR and PCV:** Determination, definition, values, variations, factors affecting them and significance.
13. **Blood Volume:** Normal value, determination and regulation of blood volume.
14. **Lymph:** Lymphoid tissue formation, circulation, composition and functions of lymph.

2. Cardiovascular System – 12 Hours

1. Heart—brief description of functions.
2. **Blood Pressure:** Definition, normal values, physiological variations, factors affecting and regulation of BP, hypotension, hypertension and determination of BP.

3. **Pulse:** Jugular and radial pulses.
4. **Heart Sounds:** Causes, characteristics, significance and phonocardiogram.
5. **ECG:** Definition, determination, significance and coronary circulation.

3. Digestive System – 8 Hours

1. Functions of the digestive system; physiological anatomy of the GIT; T.S. of the intestine and nerve supply.
2. Composition and functions of saliva; structure and functions of the stomach; properties, composition and functions of gastric juice; functions of the pancreas; composition, properties and functions of pancreatic juice; functions of the liver; properties, composition and functions of bile; functions and emptying of the gall bladder; jaundice; functions of the large intestine; and composition and functions of succus entericus.
3. Defaecation and normal stool.

4. Respiratory System – 10 Hours

1. Functions of the respiratory system and stages of respiration.
2. Transportation of respiratory gases.
3. Transportation of O₂—direction, pressure gradient, forms of transportation, oxygenation of Hb and quantity of O₂ transported.
4. Transportation of CO₂—direction, pressure gradient and modes of transportation.
5. Spirometry—spirogram and spirometer.
6. **Lung Volumes:** Tidal volume, inspiratory reserve volume, expiratory reserve volume, vital capacity, forced expiratory volume 1, forced expiratory volume 2 and forced expiratory volume 3.

5. Endocrine System – 12 Hours

1. **Hormone:** Definition, local and general hormones, properties of hormones, endocrine glands of the body and their locations.
2. **Pituitary:** Situation, master endocrine gland, anterior and posterior parts, anterior pituitary hormones, their functions and regulation of secretion; dwarfism, acromegaly and gigantism.
3. **Posterior Pituitary:** ADH and oxytocin—their sources and functions; diabetes insipidus.
4. **Thyroid Gland:** Physiological anatomy and location, hormones secreted, physiological functions, hypo- and hypersecretion, goitre, cretinism, myxoedema and Graves' disease.
5. **Adrenal Gland:** Adrenal cortex hormones—glucocorticoids, mineralocorticoids and sex steroids; functions of cortisol and aldosterone.
6. **Endocrine Disorders:** Addison's disease, Cushing's syndrome, Conn's syndrome and adrenogenital syndrome.
7. **Adrenal Medulla:** Functions of adrenaline and noradrenaline.
8. **Pancreas:** Insulin and glucagon—their functions and actions; regulation of blood glucose level and diabetes mellitus.

9. **Parathyroid Gland:** Functions and actions of PTH, hypo- and hypersecretion of PTH, and tetany.
10. **Calcitonin:** Functions and actions; regulation of blood calcium level.

6. Nervous System – 12 Hours

1. Functions of all parts of the central nervous system in brief.
2. EEG.
3. CSF—formation, circulation, properties, composition and functions; lumbar puncture.

7. Special Senses – 6 Hours

1. **Vision:** Functions of different parts of the eye, refractive errors and their correction, field of vision, structure and functions of the retina, pupillary reflexes, colour vision, colour blindness and tests for colour blindness.
2. **Hearing:** Functions of the outer, middle and inner ear, deafness, tests for deafness, Rinne's test and Weber's test.

8. Excretory System: Excretory Organs – 10 Hours

1. Functions of the kidneys.
2. Functional unit—nephron.
3. Mechanism of urine formation—GFR.
4. Selective reabsorption of substances such as glucose, urea, amino acids, chlorides and hydrogen ions.
5. Properties and composition of normal urine, urine output, names of abnormal constituents in urine, micturition and cystourethrogram.
6. Diuretics and renal-function tests.
7. Actions of ADH, aldosterone and PTH on the kidneys.

9. Reproductive System – 6 Hours

1. Functions of the reproductive system in males and females.
2. Semen—secretion, composition, influencing factors, abnormalities and oligozoospermia.
3. Ovulation, menstrual cycle and menstrual fluid.
4. Pregnancy and pregnancy tests.
5. Lactation—factors affecting lactation and composition of breast milk.

10. Muscle and Nerve Chapter

Included.

Practicals

- Study of the microscope and its uses
- Collection of blood and study of haemocytometry

- Haemoglobinometry
- Determination of the specific gravity of blood
- White blood cell count
- Red blood cell count
- Determination of blood groups
- Leishman's staining and differential WBC count
- Determination of erythrocyte sedimentation rate
- Determination of packed cell volume
- Calculation of blood indices
- Fragility test for RBC
- Determination of bleeding time
- Determination of clotting time
- Blood-pressure recording
- Examination of arterial pulse—Included
- Artificial respiration
- Determination of vital capacity

References

1. *Textbook of Physiology for BDS Students* by Dr. Jain.
2. *Textbook of Physiology for BDS Students* by Dr. Sembulingam

PAPER – 4: CLINICAL LABORATORY PRACTICES

1. Laboratory Services

Levels of laboratories—primary, secondary and tertiary levels. Reference laboratories, research laboratories and specific disease-reference laboratories.

2. Infrastructure in the Laboratories

a) Laboratory Space

Reception, specimen collection, quality water supply, power supply, work area, specimen/sample/slide storage, cold storage, record room, washroom, biomedical-waste room and fire safety.

b) Personnel in the Laboratory

Qualifications as per the NABL document.

c) Equipment

Listing, cleaning, maintenance, SOP, verification of performance and internal quality control.

d) Reagents and Materials

Purchase, maintenance, storage and use.

3. Specimen Collection, Storage and Transport

General guidelines for collection, labelling, handling, transportation and storage of specimens. Care in handling specimens.

- Accession list
- Worksheet
- Reporting of test results
- Specimen-rejection record
- Recording of laboratory data
- Maintenance of records

4. Standard Operating Procedure

Definition, format, text of SOP and types of SOP.

5. Safety in Laboratories

General safety measures, biosafety precautions and levels of biosafety laboratories: BSL-1, BSL-2, BSL-3 and BSL-4.

6. Ethical Considerations

Non-maleficence, beneficence, risk minimisation, institutional arrangements, ethical review, transmission of ethical values, voluntariness and compliance.

7. Quality Assurance

Internal and external quality assessment.

8. Biomedical-Waste Management

9. Accidents and Emergencies in the Laboratory

Practicals

1. Writing SOPs for equipment maintenance and practical procedures performed in the laboratory.
2. Internal and external quality control.
3. Sample collection, labelling, storage and transportation.
4. Biomedical-waste management.
5. Biosafety.

References

1. ICMR (2008) Guidelines for Good Clinical Laboratory Practices.
2. Hospital Waste Management: Chapter 13, *Park's Textbook of Preventive and Social Medicine*, 18th Edition.
3. NIH: DAIDS Guidelines for Good Clinical Laboratory Practice Standards, 2011.
4. WHO: Good Clinical Laboratory Practice (GCLP), 2009.