COURSE CURRICULUM FOR FIRST PROFESSIONAL BSMS (PRESCRIBED BY NCISM)

"தொட்டனைத் தூறும் மணற்கேணி மாந்தர்க்குக்
கற்றனைத் தூறும் அறிவு"

(As deep you dig the sand spring flows; As deep you learn the knowledge grows- Thirukkural 396)

UYIR VEDHIYIYAL

SUBJECT CODE: SIDUG-UV

BIOCHEMISTRY

(Applicable from 2021-2022 batch onwards for five years or until further notification by NCISM, whichever is earlier)

ncism

प्राणाभिसरः प्राणायतनानाम्

BOARD OF UNANI, SIDDHA AND SOWA RIGPA

NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE

NEW DELHI- 110058

SCAN ME

SIDUG-UV

NCISM

I Professional Siddha MaruthuvaArignar
(Bachelor of Siddha Medicine and Surgery – B.S.M.S)
Subject Code: SIDUG-UV
UyirVedhiyiyal (Biochemistry)

Summary:

Total number of Teaching hours: 210		
Lecture hours (LH) - Theory		
Paper - I	**70 Hours**	**70 Hours**
Non-Lecture hours (NLH) – Theory		
Paper - I	**40 Hours**	**140 Hours**
Non-Lecture hours (NLH) - Practical	**100 Hours**	

Examination (Papers & Mark Distribution)					
Item	**Theory Component Marks**	**Practical Component Marks**			
		Practical	**Viva**	**Elective**	**IA**
Paper I	**100**	**100**	**20**	**10**	**20**
Sub-Total	**100**	**150**			
Total Marks	**250**				

PREFACE

UYIR VEDHIYIYAL (Biochemistry)

UyirVedhiyiyal (Biochemistry) is the study of both life sciences and Chemical Sciences deals with biological processes at the Cellular and Molecular level. It is the science explores the structure, Properties, chemical reactions, biomolecular changes in living system in relation to
Medicine. It is concerned with nutrition, human health diseases and support clinical diagnosis towards treatment.

UyirVedhiyiyal (Biochemistry) in Siddha system discovers the mastery scientific facts given by ancient Siddhars and interpret cross culture Fusion of Knowledge, technique, and research. It is concerned on the conceptual framework in enroute the cellular and molecular changes inassociation with five elements Earth, Water, Fire, Air and Sky.

The Syllabus for UyirVedhiyiyal(Biochemistry) to Siddha Medical Students is framed in amiable pattern and the updated content provides intense knowledge on biochemical Principles, how body functions, create ,produce of drugs, diagnosis and treatment for patients.

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First Professional BSMS

Course Code and Name of Course

SN	Course Code	Name of Course
1	SIDUG-UV	UYIR VEDHIYIYAL

Table 1: Course outcomes and matched Program outcomes

S N	A1 Course Outcome (CO) <SIDUG-UV > At the end of the course <SIDUG-UV > the student should be able to-	B1 Course Outcome matched with program outcomes.
C01	Discuss the biochemical basis of Modern science and explain the types, properties, Significance, digestion, assimilation, metabolism disorders of major biomolecules	**PO1, PO8**
C02	Describe the classification, structure, mechanism of action and diagnostic importance of enzymes, types and functions of various endocrine hormones and their disorders and the biochemical applications of Prostaglandins	**PO1, PO9**
C03	Discuss Electron transport chain and Biological Oxidation, structure and functions of nucleic acids, Importance of Nutrition, functions of vitamins, minerals and Manifestation of their Deficiency	**PO 1, PO3, PO8**
C04	Explain the Heme Synthesis, degradation and Clinical significance and tests to assess the Liver, Kidney, Gastric, Thyroid Functions and enumerate the processes involved in replication and repair of DNA, Translation mechanism, application of Molecular technologies like PCR, Human genome project and Bioinformatics	**PO1, PO11, PO12**
C05	Describe the importance of Water and Electrolytes balance in the life Process, Complement System, Immunity in Health and Disease and role of Xenobiotics, oncogene Activation, Tumour markers, cancer therapy, Immunological Abnormalities of AIDS	**PO1, PO2, PO9**
C06	Demonstrate the Reactions of Carbohydrate, Proteins and determine Urine Analysis, the non-protein nitrogenous substances, normal and Abnormal constituents interpret, correlate the findings with pathological conditions	**PO1, PO9, PO12**
C07	Demonstrate and estimate the biochemical investigations in Blood / Plasma / Serum, Demonstrate the GTT, Paper Electrophoresis and Chromatography and Identify and observe the commonly used equipment and instruments in Biochemistry lab.	**PO1, PO9, PO12**

Table 2: Contents of the Course

SN	A2 List of Topics <SIDUG-UV >	B2 Term	C2 Marks	D2 Lecture Hours	E2 Non-Lecture Hours
1	**Chemical basis of life**		**8**	**14**	**44**
1.1	**Chemistry of Carbohydrates:**	**I**			
1.1.1	Definition, Functions of Carbohydrates, Classification of Carbohydrates	I		1	-
1.1.2	Biomedical importance of monosaccharaides and disaccharides	I		1	-
1.1.3	Polysaccharides- Classification, composition and function.	I		1	1
1.14	Reactions of Glucose	1		-	2
1.1.5	Reactions of fructose	1		-	2
1.1.6	Reactions of maltose	1		-	2
1.1.7	Reactions of lactose	1		-	2
1.1.8	Reactions of sucrose	1		-	2
1.1.9	Reactions of starch	1		-	2
1.2	**Chemistry of Lipids:**				
1.2.1	Definition, Functions of Lipids, Classification of Lipids, Classification of fatty acids, Essential fatty acids	I		1	1
1.2.2	Types and functions of phospholipids, Glycolipids and lipoproteins	I		1	-
1.2.3	Steroids, Micelles, Free radicals and antioxidants	I		1	-
1.3	**Chemistry of Proteins:**				
1.3.1	Definition, Functions of proteins, Classification of amino acids based on structure, Classification of proteins based on chemical nature and solubility.	I		1	-
1.3.2	Structure of proteins primary, secondary, tertiary and quaternary. Biologically important peptides	I		1	1
1.3.3	Plasma proteins: Types and major functions	I		1	-
1.3.4	Reactions of albumin	I		-	2
1.3.5	Reactions of peptone	I		-	2
1.3.6	Reactions of gelatin	I		-	2
1.3.7	Reactions of casein	I		-	2
1.3.8	Estimation of Total proteins	I		-	4
1.3.9	Electrophoresis (Separation of plasma proteins)- Demonstration	III		-	1

1.3.10	Paper Chromatography (Separation of amino acids)	III		-	1
1.4	**Enzymes:**				
1.4.1	Definition, Classification, Factors affecting enzyme activity, Active site	I		1	1
1.4.2	Mechanism of enzyme action, Coenzymes	I		1	-
1.4.3	Diagnostic importance of enzymes, Enzyme pattern in diseases	II		1	-
1.4.4	Estimation of serum amylase	II		-	4
1.4.5	Estimation of SGOT	II		-	4
1.4.6	Estimation of SGPT	II		-	4
1.4.7	Case report Acute myocardial infarction	II		-	1
1.5	**Nucleic acids:**				
1.5.1	Watson and cricks structure of DNA	I		1	1
1.5.2	Types and functions of RNA, structure of transfer RNA			1	-
2	**Digestion and absorption of carbohydrates, proteins and lipid**		**7**	**3**	**3**
2.1	Definition of digestion, digestion of carbohydrates, absorption of monosaccharaides, mechanism of absorption, abnormalities of carbohydrates digestion	I		1	1
2.2	Digestion of proteins, mechanism of amino acid absorption,	I		1	1
2.3	Digestion of lipids, mechanism of absorption of lipids, abnormalities of lipids digestion	I		1	1
3	**Metabolism**		**24**	**21**	**44**
3.1	**Biological oxidation**				
3.1.1	Classification of high energy compounds, ATP-ADP cycle	I		1	1
3.1.2	Substrate level phosphorylation, oxidative phosphorylation	I		1	1
3.1.3	Electron transport chain & uncouplers	I		1	1
3.2	**Metabolism of carbohydrates:**				
3.2.1	Glycolysis	II		1	-
3.2.2	TCA cycle, Gluconeogenesis	II		1	1
3.2.3	Glycogenesis & glycogenolysis	II		1	-
3.2.4	HMP shunt pathway	II		1	-

3.2.5	Glucose homeostasis, diseases and disorders, Diabetes mellitus	II		1	1
3.2.6	Estimation of Blood sugar	II		-	4
3.2.7	GTT graph (Normal & abnormal) - Demonstration	III		-	1
3.2.8	Case reports - GTT	II		-	1
3.2.9	Case report – Renal glycosuria	II		-	1
3.3	**Metabolism of Lipids:**				
3.3.1	Fatty acid oxidation	II		1	-
3.3.2	Ketone bodies, Ketosis	II		1	1
3.3.3	Biosynthesis of fatty acids	II		1	-
3.3.4	Biosynthesis of cholesterol, Degradation of cholesterol, Hypercholesterolemia	II		1	-
3.3.5	Metabolism of HDL, Fatty liver, Obesity	II		1	1
3.3.6	Estimation of Serum Cholesterol	II		-	4
3.3.7	Estimation of serum triglycerides	II		-	4
3.3.3	Case report - Hypercholesterolemia	II		-	1
3.4	**Metabolism of proteins:**				
3.4.1	Transamination, deamination,	I		1	-
3.4.2	Urea cycle, diseases and disorders	I		1	1
3.4.3	Estimation of Blood urea	I		-	4
3.4.4	Case report - Alkaptonuria	III		-	1
3.4.5	Biosynthesis of proteins (Translation)	III		2	1
3.5	**Purine nucleotides:**				
3.5.1	Degradation of purine nucleotides, Gout	II		1	1
3.5.2	Estimation of serum uric acid	II		-	4
3.5.3	Case report – Gout	II		-	1
3.5.4	Case report – LeschNyhan syndrome	II		-	1
3.6	**Hemoglobin:**				
3.6.1	Structure of hemoglobin, Clinical significance of Glycosylated Hemoglobin, Hemoglobinopathies	II		1	1
3.6.2	Biosynthesis of heme &porphyrias	II		1	-
3.6.3	Degradation of heme & Jaundice	II		1	-
3.6.4	Estimation of serum bilirubin	II		-	4
3.6.5	Case report – Jaundice	II		-	1
3.6.6	Case report – Sickle cell anemia	II		-	1

4	**Nutrition**		**18**	**11**	**16**
4.1	**Minerals:**				
4.1.1	Definition, Macro Elements– food source, RDA, biochemical functions and deficiency Manifestations	II		2	1
4.1.2	Micro Elements– food source, RDA biochemical functions and deficiency Manifestations	II		2	1
4.1.3	Estimation of serum Inorganic phosphate	III		-	4
4.1.4	Case report – Wilson's disease	III		-	1
4.2	**Vitamins**				
4.2.1	Definition, classification of vitamins - Fat soluble Vitamins- food source, RDA, biochemical functions and deficiency Manifestations	II		2	1
4.2.2	Water-soluble vitamins - food source, RDA, biochemical functions and deficiency Manifestations	II		2	2
4.2.3	Case report – Vitamin D deficiency	III		-	1
4.3	**Nutrition:**				
4.3.1	Definition, Calorie value of food stuffs, Basal metabolic rate	III		1	1
4.3.2	Specific dynamic action, Energy requirements, Fiber in nutrition	III		1	1
4.3.3	Balanced diet, protein – Energy malnutrition	III		1	1
4.3.4	Case report - Kwashiorkor	III		-	1
4.3.5	Case report – Marasmus	III		-	1
5	**Advanced Biochemistry**		**18**	**13**	**9**
5.1	**Hormones: Biochemical functions and disorders**				
5.1.1	Definition, classification, functions of hormones of hypothalamus, pituitary	II		1	1
5.1.2	Functions & brief account of disorders of hormones - thyroid,	II		1	1
5.1.3	Functions & brief account of disorders of hormones - parathyroid, pancreatic	II		1	-
5.1.4	Functions & brief account of disorders of hormones – adrenal gland	II		1	1
5.1.5	Male and female reproductive hormones.	II		1	-
5.2	**Prostaglandins and Related Compounds**				-

5.2.1	Names of eicosanoids, Synthesis of Prostaglandins,	III		1	-
5.2.2	Biochemical actions Of Prostaglandins, biomedical Applications of Prostaglandins, Leukotriene	III		1	-
5.3	**Metabolism of Xenobiotics (Detoxification). - Definition, Mechanism in detoxification, Salient features of cytochrome P450**	**III**		**1**	-
5.4	**Immunology**				
5.4.1	The Complement System	III		1	1
5.4.2	Immune response, Cytokines, Immunity in Health and Disease	III		1	1
5.5	**Cancer and AIDS:**				
5.5.1	Cancer – Etiology	III		1	1
5.5.2	Cancer – molecular basis and tumor markers	III		1	1
5.5.3	AIDS – Transmission of HIV, Natural course of AIDS and Lab Diagnosis	III		1	2
6	**Organ function tests**		**17**	**3**	**20**
6.1	Liver function tests	III		1	1
6.2	Gastric Function test, Thyroid function tests	III		1	1
6.3	Renal function tests	III		1	-
6.4	Estimation of serum Creatinine	III		-	4
6.5	Reactions of non-protein nitrogenous substances – urea, uric acid, creatinine	III		-	2
6.6	Reactions of normal urine	III		-	2
6.7.1	Abnormal constituents of urine Part 1	I		-	2
6.7.2	Abnormal constituents of urine Part 1I	III		-	6
6.8	Case report – Renal failure	III		-	1
6.9	Case report - Hyperthyroidism	III		-	1
7	**Molecular Biology and Biotechnology**		**7**	**4**	**2**
7.1	Replication of DNA	III		1	1
7.2	DNA damage and Repair, Definition of transcription,	III		1	-
7.3	Polymerase chain reaction (PCR), - Principle, technique& applications	III		1	1
7.4	Blotting Technique – Types, Human genome project, Bioinformatics	III		1	-

8	**Water & Electrolytes-** Functions of water, water turn over and balance, Composition of electrolytes in the body fluids.	**III**	**1**	**1**	**-**
9	**Spotters-** Principles & applications of laboratory instruments – Calorimeter, pH meter, centrifuge, Ryle's tube, Semi auto analyzer, Hemoglobinometer, Spectroscope, Electrophoresis, Chromatography, Osazone crystals	**III**		**-**	**2**
Total			**100**	**70**	**140**

Table 3: Learning objectives (Theory) of Course <SIDUG- UV >

UYIR VEDHIYIYAL (BIOCHEMISTRY)									
A3 **Course outcome**	**B3** **Learning Objective** **(At the end of the session, the students should be able to)**	**C3** **Domain/ Sub**	**D3** **Must to know/ desirable to know/ Nice to know**	**E3** **Level Does/ Shows how/ Knows how/ knows**	**F3** **T-L method**	**G3** **Assessment**	**H3** **Formative / Summative**	**I3** **Term**	**J3** **Integration**
Topic 1- Chemical basis of life					**Lecture: 14 hrs**	**Non lecture: 44 hours**			
CO1	Define Carbohydrate	Cognitive / Recall	MK	K	Lecture / Group Study	Written/ Viva-voce	F&S	I	
CO1	Explain the functions of Carbohydrate	Cognitive /Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Describe the Classification of Carbohydrates, and differentiate the Monosaccharide, Disaccharide	Cognitive /Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	

	Polysaccharide with an example								
CO1	Discuss about the biomedical importance of monosaccharaides, disaccharides,	Cognitive / understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Explain about Polysaccharides- Classification, composition, and function.	Cognitive / Comprehension	MK	K	Lecture / Seminar	Written/ Viva-voce	F&S	I	
CO1	Define Lipid	Cognitive / Recall	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Discuss about the functions of Lipids	Cognitive / Understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Describe about the main classes of Lipids,	Cognitive / Comprehension	MK	K	Lecture / Flash cards	Written/ Viva-voce	F&S	I	
CO1	Classify fatty acids,	Cognitive / Understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Define and explain about the Essential fatty acids	Cognitive/ Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Discuss on Free radicals and antioxidants	Cognitive / Understand	MK	NK	Lecture / Group study	Written/ Viva-voce	F&S	I	

CO1	Explain on Types and functions of phospholipids	Cognitive /Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Discuss on Glycolipids and lipoproteins	Cognitive / Understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Explain Steroids and Micelles	Cognitive / Comprehension	MK	NK	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Define Protein	Cognitive / Recall	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Explain about Functions of Proteins	Cognitive / Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Discuss about the classification of Proteins based on chemical nature	Cognitive / Understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Discuss about the classification of Proteins based on solubility	Cognitive / Understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Classify amino acids based on structure	Cognitive / Understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Explain about Structure of proteins primary, secondary , tertiary and quaternary	Cognitive / Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Explain about the chemical bonds in Protein Structure	Cognitive / Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	

CO1	Explain the Biologically important peptides	Cognitive / Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Define Plasma proteins	Cognitive / Recall	MK	K	Lecture / Group study	SAQ and MCQ	F&S	I	
CO1	Discuss about the types and major functions of Plasma protein	Cognitive / Comprehension	MK	K	Lecture / Group study	SAQ and MCQ	F&S	I	
CO1	Elaborate types and major functions of Plasma protein	Cognitive /comprehension Affective / Responding Psychomotor/ Imitations	MK	K	Assignment	Observation & Questionnaire Session with Check List	F&S	I	Udal Thathuvam
CO2	Define Enzymes	Cognitive /Recall	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO2	Classify enzymes with eg	Cognitive / Understand	MK	KH	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO2	Describe the Factors affecting enzyme action	Cognitive/ Comprehension	MK	KH	Lecture / group study	Written/ Viva-voce	F&S	I	
CO2	Define Active site,	Cognitive / Recall	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO2	Summarize about Mechanism of enzyme action	Cognitive /Understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	

CO2	Define & types of Coenzymes	Cognitive / Recall	NK	K	Lecture / Flash cards	Written/ Viva-voce	F&S	I	
CO2	Discuss about Diagnostic importance of enzymes	Cognitive / Understand	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	II	
CO2	Interpret Enzyme pattern in diseases	Cognitive / Apply, Affective /Responding, Psychomotor/ imitation	MK	K,	Learning through Case Discussions	Written/ Viva-voce	F&S	II	
CO3	Define Nucleic acid	Cognitive / Recall	MK	K	Lecture	Written/ Viva-voce	F&S	I	
CO3	Discuss about Watson and cricks structure of DNA,	Cognitive / Understand	MK	K	Lecture / seminar	Written/ Viva-voce	F&S	I	
CO3	Explain the Types and functions of RNA,	Cognitive / Comprehension. Affective / Responding Psychomotor / Imitation	MK	K,	Group Study	Written/ Viva-voce	F&S	I	
CO3	Discuss the structure of transfer RNA	Cognitive / Understand	MK	K	Lecture / Group Study	Written/ Viva-voce	F&S	I	
Topic 2 - Digestion and absorption of Carbohydrates, proteins and lipids **Lecture:- 3 hours Non lecture : 3 hours**									

CO1	Define Digestion	Cognitive / Recall	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	I	
CO1	Discuss about the process involved in digestion of Carbohydrate	Cognitive /Understand	MK	K	Lecture / Group Study	Written/ Viva-voce	F&S	I	
CO1	Describe the absorption of Carbohydrate	Cognitive /Comprehension	MK	K	Lecture / Group Study	Written/ Viva-voce	F&S	I	
CO1	Explain the active transport of glucose	Cognitive / Comprehension	MK	K	Lecture	Written/ Viva-voce	F&S	I	
CO1	Discuss about the process involved in digestion of protein	Cognitive / Understand	MK	K	Lecture /	Written/ Viva-voce	F&S	I	
CO1	Describe the absorption of protein	Cognitive / Comprehension	MK	K	Lecture / Group study	Written/ Viva-voce	F&S	I	
CO1	Discuss about the process involved in digestion of lipid	Cognitive / Understand	MK	K	Lecture / Group Study	Written/ Viva-voce	F&S	I	
CO1	Describe the absorption of lipids	Cognitive / Comprehension	MK	K	Lecture / Flash card	Written/ Viva-voce	F&S	I	
CO1	Explain Abnormalities of Carbohydrate, protein& lipid digestion.	Cognitive/ Comprehension	MK	K	Lecture / Group Study	Written/ Viva-voce	F&S	I	
CO1	Present and Explain Digestion and absorption of Carbohydrate, protein	Cognitive / Evaluate , Affective/ Responding	MK	KH	Seminar	Observation, Questionnaire Session with Check List /	F	I	Udal Thathuvam

	and lipid					Feedback			
Topic 3 - Metabolism							**Lecture:- 21 hours Non lecture : 44 hours**		
CO3	Define Biological Oxidation	Cognitive / Recall	MK	K	Lecture	Written/ Viva-voce	F&S	I	
CO3	Classify high energy compounds	Cognitive/ Understand	MK	K	Lecture / Group Study	Written/ Viva-voce	F&S	I	
CO3	Describe ATP-ADP cycle,	Cognitive / Comprehension , Affective / Awareness	MK	K	Lecture / Group Study	Quiz/ written	F&S	I	
CO3	Discuss electron transport chain,	Cognitive / Understand Affective/ Awareness	MK	K	Lecture / Audio Visual/animated videos	Written/ Viva-voce	F&S	I	
CO3	Describe oxidative phosphorylation	Cognitive / Comprehension, Affective	MK	K	Lecture / Simulation	Written/ Viva-voce	F&S	I	
CO3	Explain Substrate level phosphorylation	Cognitive /Comprehension	MK	K	Lecture / group study	Written/ Viva-voce	F&S	I	
CO3	Present and Explain biological Oxidation and Electron Transport Chain	Cognitive / Evaluate , Affective/ Control Psychomotor/	MK	KH,	Seminar	Questionnaire Session with Check List / Feedback	F & S	I	

		Imitation							
CO1	Enlist the major Pathways of Carbohydrate Metabolism	Cognitive / Recall	MK	K	Lecture	Oral	F&S	II	
CO1	Define Glycolysis	Cognitive/ Recall	MK	K	Lecture / Group discussion	Viva & MCQ	F&S	II	
CO1	Explain about the metabolic pathway of Glycolysis	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written	F&S	II	
CO1	Discuss about the energetics and regulation of glycolysis	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Discuss about conversion of Pyruvate to Lactate	Cognitive/ Understand	NK	K	Lecture / Group discussion	Written/ Viva-voce /MCQ	F&S	II	
CO1	Define TCA cycle	Cognitive / Recall	MK	K	Lecture / Group discussion	MCQ/Oral	F&S	II	
CO1	Explain about the metabolic reactions of TCA cycle	Cognitive/ Comprehension	MK	K	Lecture / Seminar	Written/ Viva-voce	F&S	II	
CO1	Discuss about the energetics and regulation of TCA cycle	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Define HMP shunt pathway	Cognitive/ Recall	MK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	II	

CO1	Explain about the metabolic reactions of HMP shunt pathway	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Explain the Clinical significance of HMP shunt pathway	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Define Glycogenesis	Cognitive /Recall	MK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	II	
CO1	Explain about the metabolic reactions of Glycogenesis	Cognitive / comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Define glycogenolysis	Cognitive / Recall	MK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	II	
CO1	Explain about the metabolic reactions of glycogenolysis	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Define Gluconeogenesis	Cognitive /Recall	MK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	II	
CO1	Explain about the metabolic reactions of Gluconeogenesis	Cognitive / Comprehension	MK	K	Lecture / Seminars	Written/ Viva-voce	F&S	II	
CO1	Describe the homeostasis of Glucose	Cognitive / Comprehension	DK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Discuss about Diabetes mellitus & disorders	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce / case presentations	F&S	II	

CO1	Perform a Role Play on the homeostasis of Glucose and Diabetes mellitus.	Cognitive / Create , Affective / Responding, Psychomotor / Imitation	MK	KH, S	Simulation	Observation and Questionnaire session	F&S	II	
CO1	Define Fatty acid oxidation	Cognitive / Recall	MK	K	Lecture / Group discussion	MCQ/Oral	F&S	II	
CO1	Explain about beta oxidation of Fatty acid	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Discuss about the energetics of beta oxidation of Fatty acid	Cognitive/ Understand	MK	K	Lecture / Group discussion	MCQ/ written	F&S	II	
CO1	Explain about the Disorders in fatty Acid oxidation	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO1	Explain synthesis and Degradation of ketone bodies	Cognitive / Comprehension	DK	K	Lecture / Case based learning	MCQ/ Viva-voce /written	F&S	II	
CO1	Discuss about Biosynthesis of fatty acids	Cognitive / Understand	MK	K	Lecture / Group discussion	Written	F&S	II	
CO1	Discuss about Biosynthesis of cholesterol,	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce /MCQ	F&S	II	
CO1	Discuss about Degradation of cholesterol	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce /MCQ	F&S	II	

CO1	Discuss on Hypercholesterolemia	Cognitive / Understand	MK	K	Lecture / Group discussion	Viva-voce /MCQ	F&S	II	
CO1	Summaries on Metabolism of HDL	Cognitive / Understand	MK	K	Lecture / Group discussion	Viva-voce /MCQ	F&S	II	
CO1	Explain About Fatty liver	Cognitive Comprehension, Affective /Responding, Psychomotor / imitation	MK	K	Group Discussion	Orals / Written/MCQ	F&S	II	
CO1	Discuss on Obesity	Cognitive Comprehension, Affective /Responding, Psychomotor / imitation	Mk	K	Seminar	Viva-voce /MCQ /written	F&S	II	
CO1	Define Transamination	Cognitive / Recall	MK	K	Lecture	Viva-voce /MCQ	F&S	I	
CO1	Describe the mechanism of Transamination	Cognitive/ Comprehension	MK	K	Lecture	Written/ Viva-voce	F&S	I	
CO1	Explain Clinical significance of Transaminases	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	I	
CO1	Define deamination	Cognitive / Recall	MK	K	Lecture / Group discussion	Theory	F&S	I	
CO1	Describe the reaction of deamination	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	I	
CO1	Discuss about urea cycle.	Cognitive / Comprehension	MK	K	Lecture / flash cards	Written/ Viva-voce	F&S	I	

CO1	Explain the regulation & energetic of Urea cycle	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	I	
CO1	Discuss about Metabolic Disorders of Urea Cycle	Cognitive / Comprehension	MK	K	Lecture / Audio Visual Lecture / Group discussion	Written/ Viva-voce	F&S	I	
CO1	Define Translation	Cognitive / Recall	MK	K	Lecture	Written/ Viva-voce	F&S	III	
CO1	Explain Biosynthesis of Protein	Cognitive / Comprehension	MK	K	Lecture /Audio visual aids	Written/ Viva-voce	F&S	III	
CO1	Metabolism Of Protein -an over view	Cognitive / Comprehension, Affective / Responding, Psychomotor / imitation	MK	K	Group discussion	Observation & Questionnaire Session with Check List	F&S	II	
CO3	Explain degradation of purine nucleotides	Cognitive	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	II	
CO3	Discuss hyperuriemia and gout	Cognitive /Comprehension	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	II	
CO3	Discuss on Gout	Cognitive Comprehension, Affective /Responding, Psychomotor / imitation	MK	K	Learning through Case Discussions	Orals	F&S	II	
CO4	Explain Structure of hemoglobin	Cognitive / Comprehension	MK	K	Lecture / Quiz	Written/ Viva-voce	F&S	II	

CO4	Describe Biosynthesis of heme	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO4	Discuss Degradation of heme.	Cognitive / understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO4	Summarize Clinical significance of Glycosylated Haemoglobin	Cognitive / Understand	DK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	II	
CO4	Discuss the classification of Jaundice	Cognitive Comprehension, Affective /Responding, Psychomotor / imitation	MK	K	Discussions of Case reports	Written/ Viva-voce	F&S	II	
Topic 4 - Nutrition						**Lecture:- 11 hours**	**Non lecture : 16 hours**		
CO3	Define Minerals	Cognitive / Recall	MK	K	Lecture	MCQ/ Viva-voce	F&S	II	
CO3	Classify Minerals	Cognitive / Understand	MK	K	Lecture / Audio Visual	Written/ Viva-voce	MCQ/ Viva-voce	II	
CO3	Describe the Macro Minerals	Cognitive / Comprehension	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	II	
CO3	Explain the Micro Minerals	Cognitive Comprehension	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	II	
CO3	Discuss the RDA of Minerals	Cognitive / Understand	MK	K	Lecture / Audio Visual	MCQ	F&S	II	

CO3	Explain the sources of Minerals	Cognitive / Comprehension	MK	K	Lecture / seminar	MCQ/ Viva-voce	F&S	II	
CO3	Describe the biochemical functions of Minerals	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO3	Discuss about deficiency, Manifestations	Cognitive Comprehension, Affective /Responding, Psychomotor / imitation	MK	K	Case based learning	Observation/ Questionnaire /MCQ	F&S	II	
CO3	Define vitamins	Cognitive / Recall	MK	K	Lecture / Audio Visual	MCQ/ Viva-voce	F&S	II	
CO3	Classify Vitamins	Cognitive / Understand	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	II	
CO3	Describe the fat soluble vitamins	Cognitive /Comprehension	MK	K	Lecture / Assignment	Written/ Viva-voce	F&S	II	
CO3	Explain the water soluble vitamins	Cognitive / Comprehension	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	II	
CO3	Discuss the RDA of vitamins	Cognitive / Understand	MK	K	Lecture / Audio Visual	MCQ/ Viva-voce	F&S	II	
CO3	Explain the sources of Vitamins	Cognitive / comprehension	MK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	II	

CO3	Describe the biochemical functions of vitamins	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO3	Discuss the deficiency manifestations of Vitamins	Cognitive / Understand	MK	K	Lecture / Case based learning	Written/ Viva-voce	F&S	II	
CO3	Presentations on Vitamin	Cognitive / Evaluate, Affective and Psychomotor	MK	KH	Seminar	Observation and Questionnaire Session	F	II	
CO3	Define Nutrition	Cognitive / Recall	MK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	III	
CO3	Discuss Calorie value of food stuffs,	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	III	
CO3	Explain the Basal metabolic rate,	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO3	Discuss the factors affecting Basal metabolic rate	Cognitive/ Understand	MK	K	Lecture	Written/ Viva-voce	F&S	III	
CO3	Explain Specific dynamic action	Cognitive / Comprehension	MK	K	Lecture	Written/ Viva-voce	F&S	III	
CO3	Discuss the role of Fiber in nutrition	Cognitive / Understand	MK	K	Lecture/Seminar	Written/ Viva-voce	F&S	III	
CO3	Describe Balanced diet	Cognitive / Comprehension	MK	K	Lecture	MCQ/ Viva-voce	F&S	III	
CO3	Explain how Energy	Cognitive/	MK	K	Lecture	MCQ/	F&S	III	

	requirements are calculated	Comprehension				Viva-voce			
CO3	Explain protein – Energy malnutrition	Cognitive/ Comprehensiion	MK	K	Lecture/Case based learning	Written/ Viva-voce	F&S	III	
CO3	Creative connect on Nutrition	Cognitive Comprehension, Affective /Responding, Psychomotor / Manipulation	MK	KH	Creative Connect (Quiz)	Questionnaire Session with Check List	F&S	III	
Topic 5 : Advanced Biochemistry							**Lecture:- 13 hours**	**Non lecture : 9 hours**	
CO2	Define Hormone	Cognitive / Recall	MK	K	Lecture / Flash cards	MCQ/ Viva-voce	F&S	II	
CO2	Discuss Biochemical functions of Hypothalamus hormones	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO2	Explain Biochemical functions of Pituitary hormone	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO2	Discuss Biochemical functions of Thyroid hormone	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO2	Discuss Biochemical functions of Pancreatic hormone	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	
CO2	Explain Biochemical functions of Adrenal hormone	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	II	

CO2	Explain Biochemical functions of Male and female reproductive Hormone	Cognitive / Comprehension	MK	K	Lecture / Seminar	Written/ Viva-voce	F&S	II	
CO2	Brief account on Hormonal Disorders	Cognitive Comprehension, Affective /Responding, Psychomotor / imitation	MK	KH,	Lecture/Quiz	Questionnaire Session with Check List / Feedback	F&S	II	
CO2	List the Names of eicosanoids	Cognitive / Recall	DK	K	Lecture / Group discussion	MCQ/ Viva-voce	F&S	III	
CO2	Explain Synthesis of Prostaglandins	Cognitive / Comprehension	DK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO2	Discuss Biochemical actions Of Prostaglandins	Cognitive / Understand	DK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO2	Explain biomedical Applications Of Prostaglandins	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO2	Explain Leukotriene	Cognitive / Comprehension	DK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO5	Define Xenobiotics	Cognitive/ Recall	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO5	Explain the mechanism in detoxification	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO5	Explain Salient features of cytochrome P450	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	

CO5	Define Immunology	Cognitive / Recall	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO5	Explain about the complement system	Cognitive / Comprehension	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	III	Nunuyiriyal
CO5	Discuss innate and adaptive Immune Response	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	Nunuyiriyal
CO5	Describe Cytokines	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO5	Explain immunity in Health and disease & diagnostic tests	Cognitive Comprehension, Affective /Responding, Psychomotor /Automatism	MK	K	Lecture/Assign ment	Observation and Questionnaire Feed Back		III	
CO5	Explain the etiology of Cancer	Cognitive / Comprehension	MK	K	Lecture / Flash cards	Written/ Viva-voce	F&S	III	
CO5	Discuss the molecular basis of cancer	Cognitive / Understand	MK	K	Lecture / simulations	Written/ Viva-voce	F&S	III	
CO5	Discuss about tumour markers	Cognitive / Understand	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	III	
CO5	Explain about biochemical basis of cancer therapy	Cognitive / Comprehension	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	III	

CO5	Explain epidemiology of AIDS	Cognitive / Comprehension	MK	K	Lecture / self study	Written/ Viva-voce	F&S	III	
CO5	Describe Immunological abnormalities of AIDS	Cognitive / Comprehension	MK	K	Lecture / seminar	Written/ Viva-voce	F&S	III	
CO5	Discuss Laboratory diagnosis of AIDS	Cognitive/ Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce /MCQ	F&S	III	
CO5	Write a Minor Project on Cancer / AIDS	Cognitive Comprehension, Affective /Responding, Psychomotor /Automatism	MK	KH	Learning Through Research - Mini Project	Evaluation and Questionnaire session	F	III	
Topic 6 : Organ Function Test						**Lecture:- 3 hours**	**Non lecture : 20 hours**		
CO4	Define organ function test	Cognitive/ Recall	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	III	
CO4	Describe the liver function test	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Discuss the disorders of liver function	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Describe the Renal function test	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Discuss the disorders of Renal function	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	

CO4	Describe the thyroid function test	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Discuss the disorders of Thyroid function	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Describe the Gastric function test	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Discuss the disorders of Gastric function	Cognitive / Understand	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Demonstrate Organ Function Test	Cognitive Comprehension, Affective /Responding, Psychomotor /Automatism	MK	K	Case based learning	Observation and Questionnaire		III	Udal Thathuvam
Topic 7 Molecular Biology and Biotechnology							**Lecture:- 4 hours Non lecture: 2 hours**		
CO4	Define Replication	Cognitive / Recall	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Explain Replication of DNA	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Define transcription	Cognitive /Recall	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Describe the processes involved in DNA damage	Cognitive/ Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	

CO4	Explain the processes involved in Repair of DNA	Cognitive / Comprehension	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Describe Principle and applications of Polymerase chain reaction (PCR) technique	Cognitive / Comprehension, and Affective	MK	K	Lecture / Audio Visual	Written/ Viva-voce	F&S	III	
CO4	Enlist the Types of Blotting Technique	Cognitive / Recall	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Discuss applications Blotting Technique	Cognitive / Comprehension / Affective	MK	K	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Define and Summarize Human genome project	Cognitive / Recall	MK	K	Lecture/Seminars	Written/ Viva-voce	F&S	III	
CO4	Define Bioinformatics	Cognitive / Recall	MK	DK	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Explain the Applications of Bioinformatics	Cognitive / Comprehension	MK	DK	Lecture / Group discussion	Written/ Viva-voce	F&S	III	
CO4	Molecular Biology and Biotechnology an Overview	Cognitive Comprehension, Affective /Responding, Psychomotor /Automatism	MK	K	High Tech Applied learning – Field trip	Observation Questionnaire Feed Back	F&S	III	Molecular biology/ Biotechnology
Topic 8 - Water and electrolytes							**Lecture:- 1 hour**	**Non lecture : 0 hour**	
CO5	Explain the Functions of water	Cognitive / Comprehension	Nk	K	Lecture	SAQ and MCQ	F&S	III	

CO5	Discuss the water turn over and balance	Cognitive/ Understand	Nk	K	Lecture	SAQ and MCQ	F&S	III	
CO5	Explain the Composition of electrolytes in the body fluids	Cognitive /Comprehension	Nk	K	Lecture	SAQ and MCQ	F&S	III	

Practical – UyirVedhiyiyal (Biochemistry)

Marks: 100
Hours: 100

SN	Name of the Practical (P)	Term	Hours
P1	**Reactions of Carbohydrates.**		**12**
P.1.1	Reactions of Glucose	I	2
P.1.2	Reactions of Fructose.	I	2
P.1.3	Reactions of Maltose.	I	2
P.1.4	Reactions of Lactose.	I	2
P.1.5	Reactions of Sucrose.	I	2
P.1.6	Reactions of Starch.	I	2
P.2	**Reactions of Protein**		**8**
P.2.1	Reactions of Albumin.	I	2
P.2.2	Reactions of Peptone.	I	2

P.2.3	Reactions of Gelatin.	I	2
P.2.4	Reactions of Casein.	I	2
P3	**Reactions of non-protein nitrogenous substances – urea, uric acid, creatinine**	**III**	**2**
P4	**Reactions of Normal Urine**	**III**	**2**
P5	**Abnormal constituents of urine**		**8**
P.5.1	Abnormal constituents of urine Part 1	I	2
P.5.2	Abnormal constituents of urine Part 2	III	6
P.6	**Quantitative analysis**		**48**
P.6.1	Estimation of Blood Sugar.	II	4
P.6.2	Estimation of serum urea.	I	4
P.6.3	Estimation of serum creatinine	III	4
P.6.4	Estimation of serum uric acid.	II	4
P.6.5	Estimation of serum total proteins	I	4
P.6.6	Estimation of serum bilirubin.	II	4
P.6.7	Estimation of serum cholesterol.	II	4
P.6.8	Estimation of serum triglycerides.	II	4
P.6.9	Estimation of serum inorganic phosphate.	III	4
P.6.10	Estimation of serum amylase.	II	4
P.6.11	Estimation of SGOT.	II	4

P.6.12	Estimation of SGPT.	II	4
P7	**Demonstration**		**3**
P.7.1	Glucose Tolerance Test with graph (Normal and Abnormal)	III	1
P.7.2	Paper electrophoresis – Demonstration	III	1
P.7.3	Paper chromatography - Demonstration	III	1
P8	Spotters	III	2
P9	**Case Studies**		**15**
P.9.1	GTT Graph –	II	1
P.9.2	Renal Glycosuria – Case Studies	II	1
P.9.3	Acute myocardial infraction – Case Studies	II	1
P.9.4	Jaundice – Case Studies	II	1
P.9.5	Gout – Case Studies	II	1
P.9.6	Hyperthyroidism – Case Studies	III	1
P.9.7	Vitamin D deficiency – Case Studies	III	1
P.9.8	Renal failure – Case Studies	III	1
P.9.9	Kwashiorkor – Case Studies	III	1
P.9.10	Marasmus– Case Studies	III	1
P.9.11	Hypercholesterolemia. – Case Studies	II	1
P.9.12	Sickle Cell Anemia – Case Studies	II	1

P.9.13	LeshNyhan Syndrome – Case Studies	II	1
P.9.14	Wilsons Disease – Case Studies	III	1
P.9.15	Alkaptonuria – Case Studies	III	1
Total			**100**

Table 4: Learning objectives (Practical) of Course <SIDUG-UV>

A4 Course outcome	B4 Learning Objective (At the end of the Practical/ Clinic the Students should be able to)	C4 Domain/ Sub	D4 Must to know/desirable to know/Nice to know	E4 Level Does/ shows how / Knows how/ Knows	F4 T-L method	G4 Assessment	H4 Formative /summative	I4 Term	J4 Integration
Practical 1- Reactions of carbohydrates Practical : 12 hours other activity : 1 hours									
CO6	Explain the Reactions of Glucose, Fructose, Maltose, Lactose, Sucrose, Starch	Cognitive/ Comprehension Psychomotor / Imitation	DK	K	Demonstration	Viva	F	I	
CO6	Discuss the mechanism of action and Clinical significance	Cognitive/ Comprehension Psychomotor/ Imitation	DK	K	Demonstration	Viva	F	I	
CO6	Illustrate how to do the Practical	Cognitive/ Comprehension Psychomotor/	DK	K	Demonstration	Viva	F	I	

		Imitation							
CO6	Allow the student Perform the experiment	Psychomotor / Imitation	DK	KH,	Hands On	Viva	F	I	
Practical 2 - Reactions of Protein						**Practical: 8 hours**		**other activity : 1 hours**	
CO6	Explain the Reactions of Albumin ,Peptone, Gelatin, Casein	Cognitive/ Comprehension Psychomotor / Imitation	DK	K	Demonstration	Viva	F	I	
CO6	Discuss the mechanism of action and Clinical significance	Cognitive/ Comprehension Psychomotor/ Imitation	DK	K	Demonstration	Viva	F	I	
CO6	Illustrate how to do the Practical	Cognitive/ Comprehension Psychomotor/ Imitation	DK	K	Demonstration	Viva	F	I	
CO6	Allow the student Perform the experiment	Psychomotor/ Imitation	DK	KH	Hands On	Viva	F	I	
Practical 3 - Reactions of non-protein nitrogenous substances – urea, uric acid, creatinine						**Practical : 2 hours**		**other activity: 1 hours**	
CO6	Explain about the of non- protein nitrogenous substances	Cognitive/ Comprehension Psychomotor / Imitation	DK	K	Demonstration	Viva	F	III	
CO6	Enlist the non- protein	Cognitive /	DK	K	Demonstration	Viva	F	III	

	nitrogenous substances - urea, uric acid, creatinine	Recall, Psychomotor/ Imitation							
CO6	Explain reactions of the non-protein nitrogenous substances - urea, uric acid, creatinine	Cognitive/ Comprehension Psychomotor/ Imitation	DK	K	Demonstration	Viva	F	III	
CO6	Analyze the mechanism of action and Clinical significance	Cognitive / Analyse, Psychomotor/ Imitation	DK	K	Demonstration	Viva	F	III	
CO6	Illustrate how to do the Practical	Cognitive/ Comprehension Psychomotor / Imitation	DK	K	Demonstration	Viva	F	III	
CO6	Allow the student to Perform the experiment	Psychomotor / Imitation	DK	KH	Hands On	Viva	F	III	
Practical 4- Reactions of Normal Urine						**Practical: 2 hours**		**other activity : 1 hours**	
CO6	Explain about Specimen Collection	Cognitive/ Comprehension Psychomotor/ Imitation	MK	K	Demonstration	Viva	F	III	
CO6	Discuss the physical Examination of Urine	Cognitive/ Comprehension Psychomotor/ Imitation	MK	K	Demonstration	Viva	F	III	

CO6	Discuss the Chemical characteristics of Urine and Clinical findings	Cognitive/ Comprehension Psychomotor/ Imitation	MK	K	Demonstration	Viva	F	III	
CO6	Allow the student to Perform the experiment	Psychomotor/ Imitation	MK	KH	Hands On	Viva	F	III	
Practical - 5. Abnormal Constituents of urine.							**Practical: 8 hours other activity : 2 Hour**		
CO6	Explain about the Abnormal urine	Cognitive/ Comprehension Psychomotor / Imitation	MK	K	Demonstration	Perform Written Viva	F	I	
CO6	Enlist the Abnormal Chemical Constituents in urine	Cognitive / Recall, Psychomotor/ Imitation	MK	K	Demonstration	Perform Written Viva	F	III	
CO6	Illustrate how to do the Practical	Cognitive/ Comprehension Psychomotor/ Imitation	MK	K	Demonstration	Perform Written Viva	F	III	
CO6	Allow the student to Perform the experiment	Psychomotor/ Imitation	MK	KH	Hands On	Perform Written Viva	F	III	
CO6	Interpret the Result with the Clinical	Cognitive / Apply	MK	K	Lecture	Perform Written Viva	F	III	

Practical - 6 Quantitative analysis								**Practical: 48 hours other activity: 10 Hours**	
CO7	Discuss about methodology, Principle and reagent Required for estimation of blood glucose	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	II	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	II	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	II	
CO7	Discuss about methodology, Principle and reagent Required for estimation of blood urea	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	I	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	I	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	I	

CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum creatinine	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	III	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	III	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	III	
CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum uric acid	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	II	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	II	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	II	
CO7	Discuss about methodology, Principle and reagent Required for	Cognitive / Understand Cognitive/ Psychomotor/	MK	K	Lecture	Viva	F&S	I	

	estimation of Serum total protein	Imitation							
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	I	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	I	
CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum bilirubin	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	II	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	II	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	II	
CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum cholesterol	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	II	
CO7	Allow the student to Perform the	Psychomotor		KH	Hands On	Perform and	F&S	II	

	experiments		MK			Written			
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	II	
CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum triglycerides	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	II	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	II	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	II	
CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum inorganic phosphate	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	III	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	III	
CO7	Explain the calculation to get the	Cognitive / Comprehension	MK	K	Lecture	Perform and	F&S	III	

	result and Interpret the Result with the Clinical data					Written			
CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum amylase	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	II	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	II	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	II	
CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum SGOT	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	II	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	II	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	II	

CO7	Discuss about methodology, Principle and reagent Required for estimation of Serum SGPT	Cognitive / Understand Cognitive/ Psychomotor/ Imitation	MK	K	Lecture	Viva	F&S	II	
CO7	Allow the student to Perform the experiments	Psychomotor	MK	KH	Hands On	Perform and Written	F&S	II	
CO7	Explain the calculation to get the result and Interpret the Result with the Clinical data	Cognitive / Comprehension	MK	K	Lecture	Perform and Written	F&S	II	
Practical 7- Demonstration							**Practical :3 hours other activity : 3 hours**		
CO7	Explain the Procedure of Glucose Tolerance Test	Cognitive / Comprehension	MK	K	Lecture,	Viva	F&S	III	
CO7	Demonstrate the Test	Psychomotor/ Imitation	MK	KH	Virtual learning Hands On	Viva	F&S	III	
CO7	Discuss the Interpretation of GTT	Cognitive / Understand	MK	K	Lecture	Viva	F&S	III	
CO7	Explain the other relevant Aspect of GTT	Cognitive / Comprehension	MK	K	Lecture	Viva	F&S	III	
CO7	Define Paper Electrophoresis	Cognitive / Recall	MK	K	Lecture	Viva	F&S	III	

CO7	Discuss about different types of Electrophoresis	Cognitive / Comprehension	MK	K	Lecture	Viva	F&S	III	
CO7	Explain the Procedure for Paper electrophoresis	Cognitive / Comprehension	MK	K	Virtual Demonstration	Viva	F&S	III	
CO7	Demonstrate the Test	Psychomotor	MK	KH	Virtual Demonstration Hands On	Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive/ Understand	MK	K	Lecture	Viva	F&S	III	
CO7	Define Paper chromatography	Cognitive / Recall	MK	K	Lecture. / Virtual learning	Viva	F&S	III	
CO7	Discuss about different types of chromatography	Cognitive / Understand	MK	K	Lecture	Viva	F&S	III	
CO7	Explain the Procedure for Paper chromatography	Cognitive/ Comprehension	MK	K	Lecture	Viva	F&S	III	
CO7	Demonstrate the Test	Psychomotor	MK	KH	Virtual Demonstration Hands On	Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive/ Understand	MK	K	Lecture	Viva	F&S	III	

Practical 8 –Spotters						**Practical : 2 hours other activity : 0 hour**			
CO7	Explain about The commonly used equipments and instruments in Biochemistry lab	Cognitive / Comprehension	MK	K	Virtual Demonstration Lecture	Identification &Written	F&S	III	
CO7	Demonstrate the Working Principle of the Instruments	Cognitive / Understand	MK	K	Virtual Demonstration Lecture	Identification &Written	F&S	III	
CO7	Explain the role and importance of instruments in Biochemistry	Cognitive / Comprehension	MK	K	Virtual Demonstration Lecture	Identification &Written	F&S	III	
Practical 9 Case Studies						**Practical : 15 hours other activity : 11hour**			
CO7	Explain about The GTT Graph	Cognitive / Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Demonstrate the through case Discussions	Cognitive / Understand Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Discuss the Clinical Interpretation	Cognitive / Understand	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	II	
CO7	Explain about The Renal Glycosuria	Cognitive / Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Demonstrate through case Discussions	Cognitive / Understand/	MK	KH	Live Or Virtual	Written/	F&S	II	

		Psychomotor			Demonstration	Viva			
CO7	Discuss the Clinical Interpretation	Cognitive/ Understand	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	II	
CO7	Explain about The Acute myocardial infraction	Cognitive / Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Demonstrate the through case Discussions	Cognitive / Understand Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Discuss the Clinical Interpretation	Cognitive/ Comprehension	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	II	
CO7	Explain about The Jaundice	Cognitive/ Recall	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Demonstrate the through case Discussions	Cognitive/ Understand Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Discuss the Clinical Interpretation	Cognitive/ Comprehension	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	II	
CO7	Explain about The Gout	Cognitive/ Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Demonstrate the through case Discussions	Cognitive/ Understanding Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	II	

CO7	Discuss the Clinical Interpretation	Cognitive / Comprehension	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	II	
CO7	Explain about The Hyperthyroidism	Cognitive/ Comprehension	MK	K	Live Or Virtua/l Demonstration	Written/ Viva	F&S	III	
CO7	Demonstrate the through case Discussions	Cognitive/ Understands Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	III	
CO7	Explain about The Vitamin D deficiency	Cognitive	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Demonstrate the through case Discussions	Cognitive Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive/ Understands	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	III	
CO7	Explain about The Renal failure	Cognitive/ Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	III	

CO7	Demonstrate the through case Discussions	Cognitive / Understand Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive / understanding	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	III	
CO7	Explain about The Kwashiorkor	Cognitive. Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Demonstrate the through case Discussions	Cognitive. Understand Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive/ Apply	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	III	
CO7	Explain about Marasmus	Cognitive/ Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Demonstrate the through case Discussions	Cognitive/ Understand Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive / Understand	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	III	

CO7	Explain about The Hypercholesterolemia	Cognitive/ Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Demonstrate the through case Discussions	Cognitive Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Discuss the Clinical Interpretation	Cognitive / Comprehension	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	II	
CO7	Explain about The Sickle Cell Anemia	Cognitive / Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Demonstrate the through case Discussions	Cognitive/ Understanding Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Discuss the Clinical Interpretation	Cognitive/ /Comprehension	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	II	
CO7	Explain about The LeshNyhan Syndrome	Cognitive / Comprehension	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Demonstrate the through case Discussions	Cognitive /Understand Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	II	
CO7	Discuss the Clinical Interpretation	Cognitive /Understands	MK	K	Virtual Demonstration	Written/ Viva	F&S	II	

					Lecture				
CO7	Explain about Wilsons Disease	Cognitive/ Recall	MK	K	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Demonstrate the through case Discussions	Cognitive Understand Psychomotor	MK	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive Constituents Apply	MK	K	Virtual Demonstration Lecture	Written/ Viva	F&S	III	
CO7	Explain about The Alkaptonuria	Cognitive/ Comprehension	Mk	k	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Demonstarte the through case Discussions	Cognitive / Understands Psychomotor	Mk	KH	Live Or Virtual Demonstration	Written/ Viva	F&S	III	
CO7	Discuss the Clinical Interpretation	Cognitive Apply	Mk	k	Virtual Demonstration Lecture	Written/ Viva	F&S	III	

Table 5: Non Lecture Activities Course <SIDUG-UV>

UyirVedhiyiyal (Biochemistry)

SN	Teaching-Learning methods	I Term (Hrs)	II Term (Hrs)	III Term (Hrs)	Number of Activities (Hrs)
1.	Seminars	4	4	2	10
2.	Assignment	1	1	2	4
3.	Flash cards	4	1	1	6
4.	Self- study	-	-	1	1
5.	Quiz	-	3	1	4
6.	Case Based Learning	-	4	2	6
7.	Simulations	1	1	1	3
8.	Audio-visual videos/Models	2	-	3	5
9.	Field Trip (Visit to modern laboratories)	-	-	1	1
Total		12	14	14	40

Table 6: Assessment Summary

6 A- Number of papers and Marks Distribution

S N	Subject	Papers	Theory	Practical /Clinical Assessment					Grand Total
				Practical	Viva	Electives	IA	Total	
01	UyirVedhiyiyal (Biochemistry)	1	100	100	20	10	20	150	250

6 B - Scheme of Assessment (formative and Summative)

SR.NO.	PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
		First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
1	First	3 PA & First TT	3 PA & Second TT	3 PA & UE

PA: Periodical Assessment; TT: Term Test; UE: University Examinations

6 C - Calculation Method for internal assessment Marks (20 Marks)

TERM	PERIODICAL ASSESSMENT*				TERM TEST**	TERM ASSESSMENT	
	A	B	C	D	E	F	G
	1 (20)	2 (20)	3 (20)	Average (A+B+C/3) 20	Term Test (MCQ+SAQ+LAQ and Practical (Converted to 20)	Sub Total	Term Assessment
FIRST						D+E	D+E /2
SECOND						D+E	D+E /2
THIRD					NIL		D
Final IA	Average of Three Term Assessment Marks as Shown in 'G' Column						
	* Select an Evaluation Methods which is appropriate for the objectives of Topics from the Table 6 D. Convert it to 20 marks. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 20Marks.						

6 D - Evaluation Methods for Periodical Assessment

S. No.	Evaluation Methods for Periodical Assessment
1.	Practical / Clinical Performance
2.	Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3.	Open Book Test (Problem Based)
4.	Summary Writing (Research Papers/ Samhitas)
5.	Class Presentations; Work Book Maintenance
6.	Problem Based Assignment
7.	Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
8.	Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
9.	Small Project
10.	Other activities explained in Table 3 Column G3 as per indicated term and objective of the topic.

6 E Question Paper Pattern

I PROFESSIONAL BSMS EXAMINATIONS<SIDUG-UV>

Time: 3 Hours Maximum Marks: 100
INSTRUCTIONS: All questions compulsory

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ)	20	1	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40
				100

6 F Distribution of Theory Exam

UyirVedhiyiyal (Biochemistry)

SN	A List of Topics	B Term	C Marks	D Type of Questions "Yes" can be asked. "No" should not be asked		
				MCQ (1 mark)	SAQ (5 marks)	LAQ (10 marks)
1	Chemical basis of life	I & II	8	Yes	Yes	No
2	Digestion and absorption of carbohydrates, proteins and lipid	I	7	Yes	Yes	No
3	Metabolism	I, II & III	24	Yes	Yes	Yes
4	Nutrition	II & III	18	Yes	Yes	Yes
5	Advanced Biochemistry	II & III	18	Yes	Yes	Yes
6	Organ function tests	III	17	Yes	Yes	Yes
7	Molecular Biology and Biotechnology	III	7	Yes	Yes	No
8	Water & Electrolyte balance	III	1	Yes	No	No
9	Spotters-	III		-	-	-

6 G Question paper blue print

UyirVedhiyiyal (Biochemistry)

A Question SN	B Type of Question	C Question Paper Format
Q.1	Multiple Choice Questions (MCQ) (All Questions compulsory) **(20 X 1 = 20 Marks)**	**1.** Topic number **1** **2**. Topic number **1** **3**. Topic number **1** **4**. Topic number **2** **5**. Topic number **2**

	Must know part 15 **MCQ** **Desirable to know 3 MCQ** **Nice to know 2 MCQ**	**6.** Topic number **3** **7.** Topic number **3** **8**. Topic number **3** 9. Topic number **3** **10**. Topic number **4** **11**. Topic number **4** **12**. Topic number **4** **13**. Topic number **5** **14**. Topic number **5** **15**. Topic number **5** **16**. Topic number **6** **17**. Topic number **6** **18**. Topic number **7** **19**. Topic number **7** **20**. Topic number **8**
Q.2	Short Answer Questions (SAQ) (All Questions compulsory) **(8 X 5 = 40 Marks)** **Must know part 7** **SAQ** **Desirable to know 1 SAQ** **No SAQ from Nice to know**	1. Topic number **1** 2. Topic number **2** 3. Topic number **3** 4. Topic number **3** 5. Topic number **4** 6. Topic number **5** 7. Topic number **6** 8. Topic number **7**

Q.3	Long Answer Questions (LAQ) (All Questions compulsory) **(4 X 10 = 40 Marks)** **Must know part 4 LAQ** **No LAQ on Nice to know** **No LAQ on Desirable to know**	**1**.Topic number **3** **2**.Topic number **4** **3**.Topic number **5** **4**.Topic number **6**

6 H Distribution of Practical Exam

S N	Heads	Marks
1.	**Practical (Total Marks 100)**	
	Quantitative analysis	30
	Qualitative Analysis	30
	Spotters	10
	Case studies	20
	Record	10
2.	**Viva**	**20**
3.	**Internal Assessment**	**20**
4.	**Electives**	**10**
Total		**150**

7. References

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