OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502

[Recognised by Medical Council of India, Ministry of Health letter No U/12012/249/2005-ME (P-II) dt. 11/07/2011]
(Affiliated to Bharath University, Chennai - TN)

Circular

08.09.2017

Sub: Organising Value-added Course: **The Importance of Pre-analytical phase in laboratory testing and diagnosis . reg**

With reference to the above mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"The Importance of Pre-analytical phase in laboratory testing and diagnosis"**. The course content form is enclosed below.

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered, speed post only so as to reach on or before Sep to Oct, 2017. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

The Importance of Pre-analytical phase in laboratory testing and diagnosis

2. Duration & Period

30 hrs & Sep – Oct 2017

3. Information Brochure and Course Content of Value Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1, Sep – Oct 2017

8. Year of discontinuation: 2018

9. Summary report of each program year-wise

Value Added Course- September -October 2017

Sl. No	Course Code	Course Name	Resource Persons	Target Students	Strength & Year
1	BIO-05	The Importance of Pre-analytical phase in laboratory testing and diagnosis	Dr. JansiRani Dr.Santhosakumari	MBBS	20 students (Sep Oct 2017)

10. **Course Feed Back**

Enclosed as Annexure- V

RESOURCE PERSON

1. **Dr.JansiRani**
2. **Dr.Santhosakumari**

COORDINATOR
Dr.JansiRani

Course Proposal

Course Title: **The Importance of Pre-analytical phase in laboratory testing and diagnosis**

Course Objective:

1. Overview of what is a pre-analytical phase
2. Errors in pre-analytical phase
3. Methods to overcome the errors for better patient care

To sensitise the medical students about the importance and manual mishandling and ignorance of pre-analytical phase of laboratory testing and diagnosis of patients sample.

Course Outcome: Gained knowledge on pre-analytical errors for the future doctors has possibility of reduced sample rejection in near future.

Course Audience: MBBS students of 2017 Batch

Course Coordinator: Dr.Jansirani

Course Faculties with Qualification and Designation:

1.Dr.Jansirani, Professor & HOD

2.Dr.Santhosakumari, Assistant Professor

Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1	15.09.2017	Introduction, Background, Objectives	4-6 PM	1
2	16.09.2017	Laboratory errors in toto	2-4 PM	2
3	17.09.2017	Pre-analytical errors	10-12PM	2
4	18.09.2017	Types of collection errors	4-6 PM	2
5	20.09.2017	Patient identification errors with its reasons	4-6 PM	2
6	21.09.2017	Patient complication and variables	4-6 PM	2
7	23.09.2017	Timing of collection and its relation to pre-analytical errors	2-5 PM	3
8	25.09.2017	Preanalytical influence of exercise	4-6 PM	1
9	27.09.2017	Phlebotomy technique errors	4-6 PM	2
10	29.09.2017	Cleaning blood collection site	4-6 PM	2
11	30.09.2017	Specimen handling & processing	2-5 PM	3
12	01.10.2017	Test collection errors	4-6 PM	2
13	02.10.2017	Order of draw with reasons	4-6 PM	2
14	03.10.2017	Hemolysis	4-5 PM	1
15	04.10.2017	Posture changes	4-5 PM	1
16	05.10.2017	Specimen transport errors	4-6 PM	2
17	06.10.2017	Transportation of specimens	4-6 PM	2
18	07.10.2017	Sampling kit components	4-5 PM	1
19	08.10.2017	Error prevention	4-6 PM	2
20	09.10.2017	Posting in sample collection at	9-1 PM	4

		bedside		
	10.10.2017	Posting in sample collection (OP)	9-1 PM	4
		Total		43

REFERENCE BOOKS:

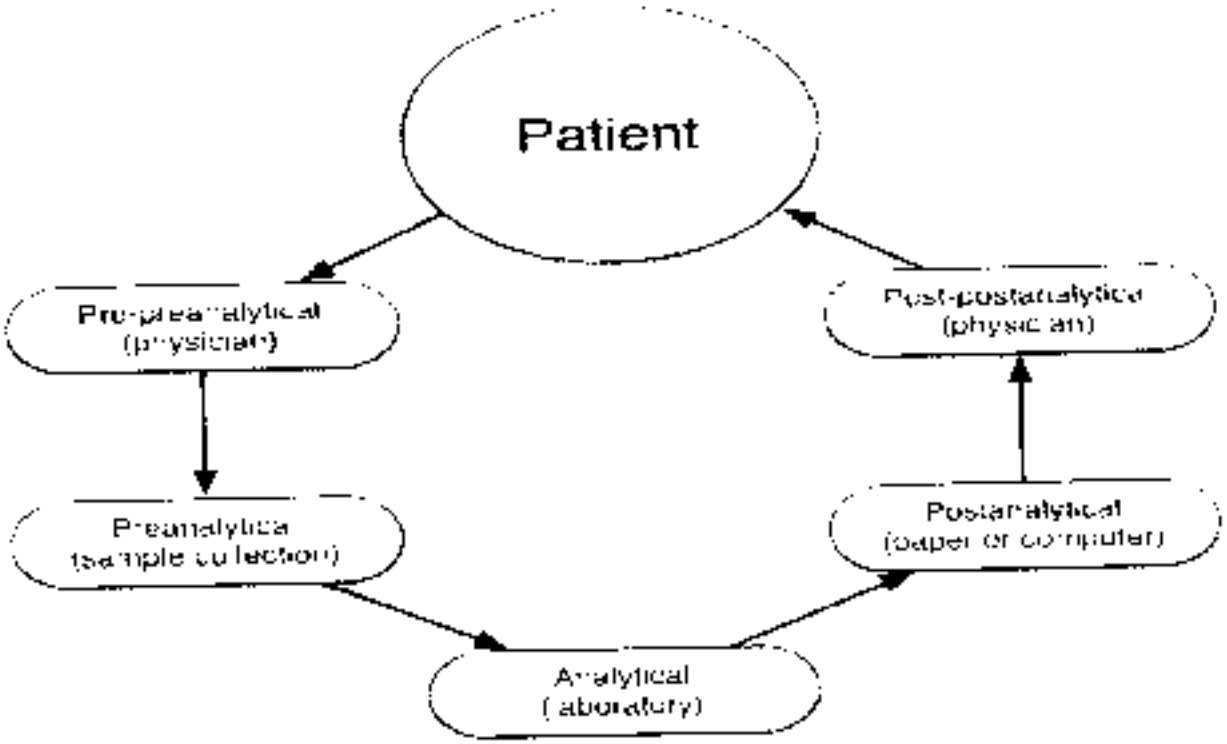
1. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics by Carl A. Burtis, David E Bruns. MD. and Edward R Ashwood, MD

2. Henry's Clinical Diagnosis and Management by Laboratory Methods

THE IMPORTANCE OF PRE-ANALYTICAL PHASE IN LABORATORY TESTING AND DIAGNOSIS

PARTICIPANT HAND BOOK

The total testing process



BIHER

SLIMS

Particulars	Description
Course Title	The Importance of Pre-analytical phase in laboratory testing and diagnosis
Course Code	BIO - 05
Topics and content of the course in the Hand book	1. Introduction 2. Laboratory errors 3. Pre-analytical errors 4. Types of collection errors 5. Patient identification errors 6. Reason for Patient identification errors 7. Patient complication and variables 8. Timing of collection 9. Preanalytical influence of exercise 10. Phlebotomy technique errors 11. Cleaning blood collection site 12. Specimen handling & processing 13. Test collection errors 14. Order of draw with reasons 15. Hemolysis 16. Posture changes 17. Specimen transport errors 18. Transportation of specimens 19. Sampling kit components 20. Error prevention 21. Summary& conclusion
Advantages of learning and evaluation	• Proper Implementation of pre-analytical phase of sample collection • Guidance by paramedical personnel • Better sample withdrawal at patient bedside • Reduces sample rejection rate
Further learning	1. Competency based assessment can be done.

Opportunities	2. Boost the self confidence of the students. 3. As they are the lifelong learner, the foundation will be laid strong. 4. As a responsible person committed to the society they know their roll and contribute to the society. 5. Can be included in the university examination for testing KH, SH, P and ethical issues. 6. Self satisfaction for the student as their performance is evaluated in a transparent method. 7. Should be made a must know competency in CRRI period.
Key Competencies	• Evaluation by practical performance right from the second year can be beneficial both to the patients and the student.
Target Student	I MBBS
Duration	30hrs ,May June 2017 & Sep – Oct 2017
Theory Session	20hrs
Practical Session	10hrs
Assessment Procedure	Assessment Evaluation by MCQ

Annexure I

THE IMPORTANCE OF PRE-ANALYTICAL PHASE IN LABORATORY TESTING AND DIAGNOSIS

Introduction

Three phases of laboratory testing:

pre-analytical, analytical and post-analytical

1. Pre-analytical—specimen collection, transport and processing
2. Analytical—testing
3. Post-analytical—testing results transmission,interpretation, follow-up, retesting

Laboratory testing errors

There is a heterogeneity of available data and a lack of definition of laboratory error:

1. pre-analytical 46%
2. analytical 7%
3. post-analytical 47%

Advances in instrument technology and automation have simplified tasks in lab diagnosis and improved quality of test results.

Meanwhile, errors occurring during the pre-analytical (from the time the test is ordered by the physician until the sample is ready for analysis) can account for up to 93% of the errors currently encountered during the total diagnostic process

Pre-analytical errors

1. Most errors affecting laboratory test occur in the pre analytical phase
2. Errors at any stage of the collection,testing and reporting process can potentially lead to a serious patient misdiagnosis

Types of Collection Errors

1. Patient Identification and Preparation
2. Selecting the site and site preparation for Phlebotomy Technique
3. Test Collection Procedures (proper venipuncture technique, order of draw, proper tube mixing, correct specimen volume)
4. Specimen Handling and Processing
5. Specimen Transport

Patient Identification Errors

Errors in correctly identifying the patient are indefensible

Annexure I

Reasons for patient identification errors

Proper positive patient identification procedures not followed

1. Patient identification from identification bracelet (inpatients)
2. Patient identification by asking patients to state or spell their full name (inpatients/outpatients)
3. Patient identification by staff or family member if patient unable to identify him/herself

Patient Identification Errors

Specimen tubes unlabeled

a. Requisition or collection tube labels not or wrongly affixed to tubes
b. Requisition or collection tube labels in bag containing collection tubes
    a. Requisition or collection tube labels rubberbanded to tubes
    b. Collection tube labels not affixed to all tubes
    c. Specimen collection tubes labeled insufficiently with at minimum patient's full name, date/time of collection, phlebotomist's initials

Collection tubes labeled with the wrong patient

Wrong computerized labels/barcodes affixed to collection tubes at bedside

Collection tubes not labeled at the time of collection

Collection tubes incorrectly labeled by someone other than the phlebotomist who collects the specimen

Patient Complications and Variables

Some patient variables that affect blood specimens

Diet

Fasting

Exercise

Obesity

Allergies to alcohol or iodine used to clean venipuncture site

Timing of collections

Humans: biorhythmic changes occur during a 24h period. Fluctuations occur in the blood analyte levels due to the biorhythmic changes

Most blood normal values have been determined at :

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Annexure I

BASAL STATE(early morning, 8-12h after last ingestion of food; not more>14h)

FASTING restrictions (abstinence from food. not from water!!!)

NO SMOKING OR DRINKING COFFEA OR TEA

AVOID DIAGNOSTIC OR TREATMENT REGIMENS interferences

The pre-analytical influence of exercise

Moderate to strenuous exercise can change the laboratory test results

CK, UA, LDH, cortisol,ACTH,creatinine will change in blood levels due to physical exercise

e.g. bike race 50 miles/jogging prior to blood collection will most likely alter the lab test (false results)

Phlebotomy Technique Errors

Phlebotomy technique is important

Ensures test result validity

Minimizes trauma to patient

Minimizes potential for phlebotomist injury

Reduces recollections

Vein selection essential for successful

venipuncture

Venous Access Difficulties

Obstructed, hardened, scarred veins

Veins difficult to locate

Use of Alternative sites

Top of hand/Side of wrist

Areas to avoid

Vein Collapse

Use of appropriate needle size

Smaller evacuated collection tube

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Annexure I

Tourniquet Application

Tourniquet tied too close to the venipuncture site can cause hematoma

Veins may not become prominent if tourniquet is tied too high (more than 6-8 cm above venipuncture site)

Tourniquet left on longer than one minute can result in hemoconcentration, affecting some test results

Tourniquet should be released as soon as needle is in the lumen of the vein and blood flow established

Large molecular compounds and compounds bound to protein and blood cells (chol, triglycerides,albumin,Hb) cannot move through the capillary walls and their blood vessels level increase as the tourniquet remains on the arm-false results

Cleansing the blood collection site

Sterile swab with 70%isopropyl alcohol

30-60 seconds to dry and to create a barrier to bacterial contamination

Allow alcohol to dry completely to avoid stinging sensation upon needle entry and hemolysis of sample

The alcohol can interfere in test results

If using iodine as cleansing agent for skin puncture, this antiseptic can lead to erroneous laboratory test results(elevate potassium, uric acid, phosphate)

Samples such as blood cultures should be collected using iodine to cleanse site to ensure sterility of sample

Specimen handling and processing

Test Collection Errors

Hemolysis

Blood collected insufficient to amount of additive in tube,

Traumatic venipuncture

Blood collected from area with hematoma

Vigorous shaking of tubes after collection

Blood collected using a small diameter needle.

Order of Draw

Annexure I

Order of draw affects the quality of the sample and can lead to erroneous test results due to contamination with the additive from the previous blood collection tube

CLSI (former NCCLS) recently revised the specific order for collection of tubes and recommends this order.

Culture tubes (yellow top) or culture Non-additive or serum tubes (red top)

Citrate tubes (light top)

Gel separator tubes and clot activator tubes (incolor top)

Heparin tubes (green top)

EDTA tubes (lavender top)

Other additive (color depends on manufacturer)

reasons for that

1. Blood culture tubes first decrease possibility of bacterial contamination

2. Heparin (green top) tube for K measurement must be collected before EDTA (lavender top) because if this orders is switched, K is falsely elevated since the blood rupture release K into plasma

3. EDTA is usually bound to K as EDTA K 3 or to sodium as EDTA Na 2 and it is important to collect electrolytes (K and Na) before collecting blood with EDTA tube to avoid falsely elevated results

4. Citrate (light blue top) tube for coagulation must be collected before the heparin (green top) tube to avoid erroneous coagulation results

5. If numerous blood collection tubes are to be collected, the tube with an additive should be collected LAST so it can mixed as soon after collection as possible

Posture changes

Preanalytical errors can also result if the blood collectors are not aware of the standardized posture guidelines

Sometimes these guidelines do not exist and need to be implemented

Sitting versus lying can vary lab test results of some chemical constituents(cholesterol, aldosterone)

Specimen Transport Errors

Transport of blood specimens in the proper manner after collection ensures the quality of the sample

Timing

Annexure I

Some specimens must be transported immediately after collection, for example Arterial Blood Gases.

Specimens for serum or plasma chemistry testing should be centrifuged and separated within two hours

Transport Errors

Temperature

Specimens must be transported at the appropriate temperature for the required test

On ice- Ammonia

Warmed - cryoglobulins

Avoid temperature extremes if transported from via vehicle from other collection site

Transport Container

Some samples need to be protected from light, for example, bilirubin

Transport in leak-proof plastic bags in lockable rigid containers

Transportation of the Specimens

All specimens must be handled according to the Standard/Universal Precautions written by Centers for Disease Control and Prevention (CDC) :

1. Be transported vertically in leak proof plastic bags and/or in lockable rigid containers with a biohazard sign on the outside

2. Have lockable rigid containers that contain "dry ice" for specimens to be maintained on ice and cols packs to keep other specimens from becoming hot during transport in the warmer months

3. The specimens must be delivered to the laboratory within 45 minutes of collection in order to ensure the centrifugation and separation of the specimen within 1hour(CLSI/NCCLS set the maximum time limits for separating serum or plasma from the blood cells at 2hours from time of collection

If more time is needed, separator tubes for collection should be used!

Sampling kits

Sampling kit components

Materials Provided

to the sites in CT

•Visual of kits and components

Annexure I

•Study specific kit types

•Extra supply "kit"

•Additional supplies shipped

Error Prevention

Phlebotomy Education

Phlebotomists should have completed a standard academic course in phlebotomy and undergo thorough on-the-job training under the supervision of a senior phlebotomist

Continuing Education

Phlebotomists should participate in regular educational competency assessments (written and observatinnal) Professional Licensure

Phlebotomy Staffing

Adequate staffing to maintain collection standards

Technology

Use of barcode scanners for patient identification

CONCLUSIONS

a. There is a need for better definition of laboratory errors and their causes
b. There is a distinction between 1)errors exclusively inside the lab and 2)lab errors caused by organizational problems outside the lab
c. The quantitatively largest reduction in lab errors are likely to result from inter-departamental coooeration designed to impruve the quality of specimen collection and data dissemination
d. Clinical audit-increasingly recognized
e. It is impossible in medicine, as in any other human activity, to completely eliminate errors, but it is possible to reduce them
f. Educational programs and introduction nf automation technology
g. To create a culture in which the existence of risk is acknowledged and injury prevention is recognized as everyone's responsibility

TRAINING, EDUCATION AND CULTURE!

DEPARTMENT OF BIOCHEMISTRY

STUDENT LIST

S.No	Reg No	Name	Signature
1	U17MB370	SHARAN OS	
2	U17MB371	SHASHI SHASTRI	
3	U17MB372	SHATAVISHA MUKHERJEE	
4	U17MB373	SHEDAM OMKAR MAHADEV	
5	U17MB374	SHIVA VEERANNA HOUSR	
6	U17MB376	SHUBHAM KAMDE	
7	U17MB379	SOTALA MANULIKHA CHOWDARI	
8	U17MB380	SOUNDHARYA K	
9	U17MB381	SOURABH DAS	
10	U17MB395	VISHAL.S	
11	U17MB396	VISHNU.K	
12	U17MB397	VIVEK AMAN SINGH	
13	U17MB398	YASHWANT RATHORE	
14	U17MB399	YAZHINI MURUGAN	
15	U17MB387	SURVE BHUSHAN SUNIL	
16	U17MB300	SURVESH PODDAR	
17	U17MB389	SURYAWANSHI SIDDHANT AJAY	
18	U17MB390	SYAMA SHAJEEV	
19	U17MB391	THIRUKKUMARAN I T	
20	U17MB392	TWINKLE JAISWAL	

1. The Laboratory Testing Cycle consists of :
A. Pre-analytic and post-analytic phase
B. Analytic and post-analytic phase
C. Pre-analytic and post-analytic phase
D. Pre-analytic, analytic and post-analytic phase

2. Causes of pre-analytical errors are :
A. Patient ID error
B. Specimen collection tube not filled properly
C. Result reported on the wrong patient
D. Incorrect interpretation
E. A and B
F. C and D

3. Post-analytical errors include :
A. Test request error
B. Empty collection tube
C. Result reported on the wrong patient
D. Using the wrong value and/or the wrong units
E. A and B
F. C and D

4. Vacuum collection tube with additive/anticoagulant EDTA is used for:
A. Coagulation studies
B. Hematology studies
C. Serology tests

5. Which of the following specimen types causes prolonged delay in pre-analytical specimen processing? :
A. Whole blood
B. Citrate plasma
C. Serum with silica activator
D. EDTA plasma

6. Serum and plasma differ by:
A. Content of carbohydrates
B. Content of lipids
C. Content of electrolytes
D. Content of proteins

7. Reasons for ordering a laboratory test:
A. Diagnosis
B. Monitoring
C. Screening
D. Research
E. All of the above

8. Analytical errors are of 2 types :
A. Random and systematic
B. Random and common
C. Systematic and common

9. Vacuum collection tube with additive/anticoagulant Sodium Citrate is used for:
A. Coagulation studies
B. Hematology studies
C. Serology tests

10.Vacuum collection tube with serum separated material (silicone/gel) is used for:
A. Clinical chemistry studies
B. Hematology studies
C. Coagulation studies

11.Which are the most frequent errors in laboratory testing?:
A. Pre-analytical errors
B. Analytical errors
C. Post- analytical errors

12.Factors affecting reference ranges are:
A. Age, sex
B. Physical activity, diet
C. Pregnancy
D. All of the above

13.The laboratory result is:
A. Precise and accurate
C. Imprecise and accurate

B. Precise and inaccurate
D. Only precise

14. Which is not true?:
A. During blood collection needle cannot be in vein more than 1 minute
B. Release the tourniquet as the last tube is filling
C. Release the tourniquet before ending draw

15. Microsampling on a newborn infant is usually taken from:
A. Heel
B. Toe
C. Finger
D. Ear

16. Venipuncture is usually performed on the:
A. Median cubital
B. Cephalic
C. Jugular
D. Median antibrachial

17. The buffy coat is composed of:
A. Fat and white cells B. White cells and red cells
C. White cells and plasma D. White cells and platelets

18. EDTA inhibits blood from clotting by:
A. Binding chloride B. Binding calcium
C. Binding plasma D. Binding red blood cells

19. Which cells are present in a normal blood specimen?:
a) RBC, PLT, neutrophils, blasts and monocytes
b) RBC, PLT, WBC
c) RBC, PLT, megakaryocytes, promyelocytes, reactive lymphocytes
d) RBC, NRBC, blasts, monoytes and WBC

20. Vacuum collection tube with additive/anticoagulant heparin is used for:
A. Coagulation studies
B. Hematology studies
C. Serology tests

Annexure III

1. The Laboratory Testing Cycle consists of :
A. Pre-analytic and post-analytic phase
B. Analytic and post-analytic phase
C. Pre-analytic and post-analytic phase
D. Pre-analytic, analytic and post-analytic phase

2. Causes of pre-analytical errors are :
A. Patient ID error
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E. A and B
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B. Empty collection tube
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E. A and B
F. C and D

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A. Coagulation studies
B. Hematology studies
C. Serology tests

Sri Lakshmi Narayana Institute of Medical Sciences

CERTIFICATE OF MERIT

This is to certify that **SHABAN OS** has actively participated in the Value Added Course on **The importance of pre-analytical phase in laboratory testing and diagnosis** held during Sep 2017 – Oct 2017 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502. India.

Dr. Santhosakumari
RESOURCE PERSON
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY - 605 502.

Dr. Jansirani
COORDINATOR

Sri Lakshmi Narayana Institute of Medical Sciences

CERTIFICATE OF MERIT

This is to certify that **THIRUKKUMARAN J.T** has actively participated in the Value Added Course on **The importance of pre-analytical phase in laboratory testing and diagnosis** held during Sep 2017 – Oct 2017 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. Santhosakumari
RESOURCE PERSON
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY - 605 502.

Dr. Jansirani
COORDINATOR

Course feedback form

Course title: Date : 28/9/17

Course code: BIO - 01

Department: Biochemistry

S.no	Design of the course	1	2	3	4	5
1	The objective of the course clear to you					
2	The course contents met with your expectations					
3	The lecture sequence were well planned					
4	The lectures were clear and easy to understand					
5	The audiovisual teaching aids were effectively used					
6	The instructor's encouraged interaction and was it helpful					
7	The contents were illustrated with examples					
8	Overall Rating of the course					

* Rating: 5 – Outstanding; 4 - Excellent; 3 – Good; 2– Satisfactory; 1 - Not Satisfactory

Suggestions if any

Twinkle

Signature

Course feedback form

Course title: Date : 28 · 9 · 2017

Course code: BIO - 01

Department: Biochemistry

S.no	Design of the course	1	2	3	4	5
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Suggestions if any:

Signature

Date: 30.10.2017

From

Dr.Jansirani
Professor and Head,
Department of Biochemistry,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research.
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research.
Chennai.

Sub: Completion of value-added course: The Importance of Pre-analytical phase in laboratory testing and diagnosis

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: The Importance of Pre-analytical phase in laboratory testing and diagnosis from Sep to Oct 2017 for 20 students. We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards.

Dr.Jansirani

Encl: **Certificates**

Photographs