



# Medical Laboratory

## NTQF Level III

# Learning Guide 23

Unit of Competence: Collect and Process Medical Samples

Module Title: Collect and Process Medical Samples

LG Code: HLT MLS4 LO1-08

TTLM Code: HLT MLS4TTLM 0919v1

## LO2. Prepare to collect samples



### Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 5 to 11.
3. Read the information written in all Information Sheets. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish all Self-check according to learning session separately
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to next Information Sheet. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to pervious Learning Activity.
7. Submit your accomplished Self-check. This will form part of your training portfolio.
8. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
9. Accomplish the all Self-checks.
10. After you accomplish self check proceed to operation sheet if available.
11. If you perform operation procedure correctly proceeds to LAP. test if available

Learning out comes (objectives): At the end of this module the trainee will be able to:-

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- Know the purpose, priority and scopes of sampling request
- Identify Site hazards and reviewing safety procedures
- Confirm type of sample, site of collection , time of collection and collection methods
- Assemble all specified sampling equipment, safety equipment, materials and containers
- Check pre-use and cleanliness of all items
- Check All items against given inventory and packed to ensure safe transport
- Confirm Handling sequence and any permit requirements
- Check Vehicle and communication devices are in working order
- Check Required transport containers and materials

Information sheet-1	Prepare to collect samples
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## 2.1. The purpose, priority and scopes of sampling request

### 2.1.1. Purpose of specimen

In the laboratory, patient disease condition can't be identified and confirmed without reliably analyzing specimen. Because of without the result of the specimen analysis, the treatment of patient relies on empirical treatment alone. Indeed, early detection and treatment of cases ensured by the help of analyzing appropriate specimen. Therefore analysis of specimen in the laboratory by competent laboratory professionals helps:

- To make a diagnosis of pathogen for the patients likely to receive the best possible care
- To identify source of disease correctly/confirm a clinical impressions
- To check epidemics and spread of major communicable diseases reliably/to screen for disease
- To rule out (R/o)a disease and diagnosis
- To provide prognostic information.
- Use properly valuable financial and human resource
- To identify patterns of emerging drug resistance /to reduce spread of resistance to essential drugs
- Drugs can be used more selectively.
- Side effects and progress are monitored.



### 2.1.2. Priority of sample request

- Time of collection:

The time of collection provide best chance of recovery of the causative agent .For sputum and urine the preferred time is early in the morning soon after the patients awoken.

For blood specimen the time of collection should be when the patient's temperature begins to rise.

- Collection of specimens before the administration of antimicrobial:

Because antimicrobials limits recovery of pathogens if specimen is collected after the administration of anti-microbial.

- Age of specimens:

Age of the specimen directly influences the recovery of protozoan organism

- Stage of the disease at which the specimen is collected

Enteric pathogens are present in great numbers during the acute or diarrheal stage of intestinal infection.

- Health and Safety Precautions

Use universal precautions when handling specimens containing blood or other potentially infectious material. Work areas contaminated with blood or serum must be disinfected immediately with 10% bleach (hypochlorite at 0.5% final concentration) or other approved disinfectant. (Referring from Occupational health and safety module)

- Patient preparation

Many tests require that the patient be prepared in some specific way to ensure useful results. The best analytical techniques provide results that are only as meaningful as the quality of the specimen that has been submitted for analysis. Our goal is to provide you with the most useful diagnostic information possible.

- Fasting requirements

For the majority of tests performed on serum, plasma or whole blood, a fasting specimen is preferred. Non-fasting specimens often contain fat particles that can interfere with many analytical procedures.

- Patient age



Age of the patient has a limiting factor to obtain enough volume of sample/ specimen required for analysis. Besides, It is helpful to indicate patient age and blood type so that appropriate reference ranges can be assigned for reporting purposes. On occasion, patient age will assist the technologists in choosing the appropriate initial sample dilution for the assay.

- Pediatric Specimens:

Special small conical tubes with screw caps with a holding capacity of up to 1.5 ml specimen should be provided to prevent evaporation of small volume samples, better if Pediatric color-coded Vacutainer test tubes are provided to facilitate special handling. These tubes will hold up to 1.5 ml of specimen. Standard specimen transfer tubes should be used for larger volume samples. For urine specimens, urine vials should also be used. We generally request 1 tube per test to avoid delays in processing and to expedite turnaround time. To minimize specimen volume requirements for small children, however, only one tube is required even when multiple tests are ordered. Bright orange, self-adhesive “Pediatric Sample” labels are provided. Please place one of these labels in a blank area of the Test Request Form. The Test Request Form, properly filled out and labeled, should be folded and inserted in the pediatric specimen bag.

- Provocation tests

Some tests require the patient to ingest a substance. The most common are the Glucose Tolerance Tests where the patient drinks a solution containing glucose, and blood specimens are obtained before and at various times after the drink, to measure the concentration of glucose in plasma or serum. In the standard Glucose Tolerance Tests, adults ingest 75 g (10 ounces) of a glucose solution (Glucola™). Children ingest an amount of glucose proportional to their body weight (1.75 grams of glucose per kilogram of body weight, up to 75 g of glucose).

Self-Check-1	Written Test
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Answer the Following Questions (2 point each):



1. Analysis of specimen in the laboratory by competent laboratory professionals helps:-
  - A. To rule out (R/o) a disease and diagnosis
  - B. To provide prognostic information.
  - C. Use properly valuable financial and human resource
  - D. None
  - E.
2. What is the to analysis of specimen in the laboratory by competent laboratory professionals
  - A. To rule out (R/o) a disease and diagnosis
  - B. To provide prognostic information.
  - C. Use properly valuable financial and human resource
3. Before sample collection Priority of sample request given to the following condition except
  - A. Patient preparation
  - B. Pediatric patients
  - C. Time of collection
  - D. Height of patient

**Note: Satisfactory rating - 6 points Unsatisfactory - below 6 points**

You can ask you teacher for the copy of the correct answers

**Answer Sheet**

Score _____
Rating _____

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Answer Sheet

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_



Information sheet-2	Identifying Site hazards and reviewing safety procedures
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## 2.2. Identifying Site hazards and reviewing safety procedures

### 2.2.1. Approaches to avoid contamination:

Careful patient education - There are occasions when patients participate actively in specimen collection (e.g. sputum, urine). -

Therefore, they must be given full instructions & cooperation by the care giver

- Educating by the clinicians
- How to collect & transport specimens through written document & make available at every patient care unit.

Obtaining a specimen involves the collection of tissue or fluids for laboratory analysis or near-patient testing, and may be the first step in determining a diagnosis and treatment. The procedure used to collect a specimen must minimize the risk of introducing error and protect the health and safety of both the patient and the staff who handle the sample.

- Specimens are an important part of a holistic assessment and can help to:
  - ✓ Build a clinical picture of the patient;
  - ✓ Confirm a diagnosis;
  - ✓ Inform a treatment plan.

Laboratory personnel frequently collect specimens including urine, stool and sputum. They may also perform vein puncture to collect blood samples and support patients through complex procedures to collect specimens, such as biopsies.

An accurate specimen collection technique is essential to reduce the risk of contamination, which can lead to inaccurate results and inappropriate treatment and can result in a longer length of hospital stay.



Specimens must be collected at the right time, using the correct technique and equipment, and be delivered to the laboratory as quickly as possible.





- Specimen collection: good-practice principles

The specimen must be:

- ✓ Appropriate to the patient's clinical presentation
- ✓ Collected at the right time
- ✓ Collected in a way that minimizes contamination
- ✓ Collected in a way that reduces health and safety risk to all staff handling the specimen (including laboratory staff)
- ✓ Collected using the correct equipment
- ✓ Documented clearly using appropriate forms
- ✓ Stored/transported appropriately
- Collecting tissue/body fluids: precautions to take

The collection of any tissue/fluid carries a risk to staff from splash or inoculation injury, so standard infection prevention and control precautions should be followed.

These include adhering to:

- ✓ Hospital environmental hygiene principles
- ✓ Hand hygiene principles
- ✓ Use of personal protective equipment
- ✓ Safe use and disposal of sharps

Criteria for Specimen rejection include:

- Specimen collected in the wrong tube, container, preservative, or media.
- Specimen inappropriately handled with respect to temperature, timing, or storage requirements.
- Quantity not sufficient – QNS.
- Lipemic or grossly hemolyzed specimens may be rejected depending on test requested. e) Specimens with IV fluid or other peripheral line contamination.
- Specimen collection device past expiry dates.



Self-Check-2	Written Test
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Answer the Following Questions (2 point each):

1. Which of the following is/are good practice of Specimen collection?

- A. Collected at the right time
- B. Collected in a way that minimizes contamination
- C. Collected using the correct equipment
- D. Documented clearly using appropriate forms
- E. All

2. Write Criteria for Specimen rejection.

**Note: Satisfactory rating–4 points Unsatisfactory–below-4 points**

You can ask you teacher for the copy of the correct answers

**Answer Sheet**

Score _____
Rating _____

Name: \_\_\_\_\_ Date: \_\_\_\_\_

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_



Information sheet-3	Confirming type of sample, site of collection , time of collection and collection methods
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### 2.3. Confirming type of sample, site of collection, time of collection and collection methods

#### 2.3.1. Introduction to anatomy and physiology of digestive system

Two groups of organs compose the digestive system: the gastrointestinal (GI) tract and the accessory digestive organs. The gastrointestinal (GI) tract, or alimentary canal (alimentary nourishment), is a continuous tube that extends from the mouth to the anus through the thoracic and abdomen pelvic cavities. - Organs of the gastrointestinal tract include the mouth, most of the pharynx, esophagus, stomach, small intestine, and large intestine. - The length of the GI tract is about 5-7 meters (16.5-23 ft) in human being.

The accessory digestive organs include the teeth, tongue, salivary glands, liver, gallbladder, and pancreas;

- Teeth aid in the physical breakdown of food, and the
- Tongue assists in chewing and swallowing
- Salivary glands, liver, gallbladder, and pancreas do not have direct contact with food but produce or store secretions that flow into the GI tract through ducts; the secretions aid in the chemical breakdown of food (dear trainee, read this accessory digestive organs function in relation to food digestion)

The GI tract contains food from the time it is eaten until it is digested and absorbed or eliminated. Muscular contractions in the wall of the GI tract physically break down the food by churning it and propel the food along the tract, from the esophagus to the anus. The contractions also help to dissolve foods by mixing them with fluids secreted into the tract. Enzymes secreted by accessory digestive organs and cells that line the tract break down the food chemically. Functions gastrointestinal tract:

- ✓ Ingestion: taking food into the mouth.
- ✓ Secretion: release of water, acid, buffers, and enzymes into the lumen of the GI tract.
- ✓ Mixing and propulsion: churning and propulsion of food through the GI tract.
- ✓ Digestion: mechanical and chemical breakdown of food.
- ✓ Absorption: passage of digested products from the GI tract into the blood and lymph.
- ✓ Defecation: the elimination of feces from the GI tract



### 2.3.3. Stool specimen collection and materials

Patients usually collect this sample themselves during toileting, following instructions to prevent the sample from becoming contaminated from other material in the toilet bowl. Patients may also be told to avoid certain foods during the test period. Depending on the test, patients may be instructed to collect the sample in a container, scoop a small portion into a vial, or smear a small amount on special test paper. Wash your hands well after handling the sample.

Stool specimens are collected aseptically and submitted to the laboratory for the diagnosis of intestinal problem – intestinal bleeding (occult blood), parasitic infection, bacterial dysentery (shigellosis), enteric fever (Salmonellosis), diarrhea, GIT problem or abnormalities in the function of pancreas. Stool containers- Various containers are used in collecting stool

- A waxed cardboard box
- An empty tin with a lid
- A light plastic box
- Match boxes

Collection of sufficient quantity is important to permit detection of parasites and to prevent rapid drying. The stool specimen should contain at least 4 ml.

Once the specimen collected; If possible, process:

- Liquid stool: < 30 minutes of passage at Room Temperature.
- Semi-formed stool: < 1 hour of passage at Room Temperature.
- Formed stool: < 24 hours of passage, 4 0C.

If delay is unavoidable, place in suitable preservative or transport medium

- ✓ Macroscopic Examination

Stool specimen is examined with the naked eye for:

- ✓ Presence of worms: - may have adult helminthes or segments Example: Ascaris, Taenia species, E.vermicularis and gravid Taenia species.
- ✓ Consistency (degree of moisture)

It varies in diet but certain clinical conditions associated with parasite presence may be suggested by particular consistencies.

It will be described as hard, formed, semi-formed and diarrheic (watery).



- ✓ Color: - any abnormal color e.g., pale yellowish passed in steatorrhoeac conditions such as giardiasis, dark or black stools occur when iron or bismuth is taken or when there is intestinal hemorrhage
- ✓ Pathologic odor Offensive, non-offensive
- ✓ Abnormal features seen (composition): mucus, blood or fat globules.

#### Microscopic Examination preparation

The detection and identification of species of parasites require microscopic examination of specimens

#### 1. Direct Microscopic Examination of stool Specimen with Physiological Saline and Dobell's Iodine Solutions

Routine microscopic examination of stool specimen with physiological saline and Dobell's iodine solution helps to detect and identify the stages of some parasitic organisms.

#### Material and Methods

Wooden applicator sticks

Microscopic slides

Cover slips

Dropping bottles containing physiological saline (0.85%w/v) and Dobell's Iodine solutions  
Microscope Pasture pipette Procedure

1. Place a drop of physiological saline (0.85%w/v) in the center of the left half of the slide and place a drop of Dobell's Iodine solution in the center of the right half of the slide.
2. With an applicator stick, pick up a small portion of the feces (Approximately 2mg which is about the size of a match head) and put on the drop of saline. Add a similar portion of stool sample to the drop of iodine.
3. Mix the feces with the drops to form homogeneous suspensions.
4. Cover each drop with a cover slip by holding the cover slip at an angle of 30°, touching the edge of the drop, and gently lowering the cover slip onto the slide so that air bubbles are not produced.
5. Examine the saline preparations using the 10X objective for motile forms, cyst and oocyte of intestinal protozoa and for any ova or larva of helminthes.
6. Examine the iodine solution preparation using 40X objective to identify the cyst stages of protozoa. The iodine will stain the nuclei and the glycogen mass of the cyst



### 2.3.4. Collection of urine sample

- ✓ Anatomy and physiology of urinary system

The kidneys do the major work of the urinary system. The other parts of the system are mainly passageways and storage areas. Nephrons are the functional units of the kidneys. Each nephron consists of two parts: a renal corpuscle (tiny body), where blood plasma is filtered, and a renal tubule into which the filtered fluid passes.

To produce urine, nephrons and collecting ducts perform three basic processes

Glomerular filtration: - the first step of urine production,

- ✓ water and most solutes in blood plasma filtered and move across the wall of glomerular capillaries into the glomerular capsule

Tubular re-absorption; - the filtered fluid flows along the renal tubule

- ✓ through the collecting duct, tubule cells reabsorb about 99% of the filtered water and many useful solutes
- ✓ The water and solutes return to the blood as it flows through

Tubular secretion: - the collecting duct, the tubule and duct cells secrete other materials, such as wastes, drugs, and excess ions into the fluid.

- ✓ Urine sample collection and necessary materials

A urine specimen is collected and submitted to the lab in case of possible renal problems or metabolic disorders of the body. A volume of urine specimen required for routine urinalysis is 15 to 33 ml. The urine specimen can be referred to urinalysis, clinical chemistry, and Bacteriology and Parasitology labs.

Most urine specimens are collected by having the patient urinate into a container or receptacle. To keep the sample from becoming contaminated by materials outside the urinary tract, patients are given instructions on how to clean the genital area and void a bit of urine before collecting the specimen into the container. (If a urinary catheter is required, a health practitioner is usually responsible for insertion.) Collecting the urine specimen is awkward but not in itself uncomfortable (An infection, however, can create a burning sensation during urination.). For certain tests, 24-hour urine samples are collected at home and must be refrigerated during the collection process. Remember to wash hands well after collecting the specimen.

- For urine collected in the laboratory use a:



- ✓ Clean conical urine jar
- ✓ Any clean glass container or bottle
- ✓ Container should be clean, dry, leak-proof and free from disinfectants.
  - ✓ Collection of urine specimen

When urine sample is received with request to find urinary parasites and urine sediment, the method to use is described below. This will concentrate most of the parasite and urinary materials.

1. Collect random urine sample, preferably at midday, into a clean container.
2. Centrifuge 10ml of urine at 1500RPM for 2 min. to deposit the ova of the parasite and sediments
3. Decant the supernatant and Place a drop of deposit onto a microscope slide and cover with a cover slip. Make ready for microscopic examination

To make a permanent preparation, make a smear of the urine sediment on a slide, allow it to dry and fix it in methanol

The collected urine sample should process as much as possible early otherwise it would preserve with appropriate physical or chemical preservatives.



### Urine preservative methods, advantages and disadvantages

	Methods	Advantages	Disadvantages
Physical	Refrigeration	This method prevents bacterial growth, and so avoids changes that occur due to the growth of bacteria. No chemical is used	The urine sample at 2-60c .used for short period of time, usually from 6to 8 hours preservation
	Freezing	Keeping the urine sample below - 200c this method good for preserving bilirubin andUrobilinogen.	Destroys formed elements. It is also not suitable for physical examination, because of turbidity. Urine preserved by deep freezing, will increase its specific gravity
Chemical	Toluene (Till it forms thin layer over the urine)	Preserves acetone, Reducing Substances, protein	Flammable
	Thymole(small crystal 5mm diameter/100ml urine)	Preserves most constituents	Can cause false positives for proteins.
	Chloroform (1 tablet/60ml urine)	Preserves urine aldosterone level	Settles to the bottom of the urine containers
	Formaldehyde (1 drop/30 ml urine)	Preserves formed elements	Interferes with glucose evaluation
	HCL (1 drop/15 ml urine)	Stabilizes steroids, catecola mines	Formed elements are destroyed,
	Boric acid	Preserves chemicals and formed elements	Precipitate uric acid
	Sodium Carbonate	Preserves porphyrines and urobilinogen	Interfere with other urine constituents

Table -2.1. Urine preservative methods, advantages and disadvantages





### 2.3.5. Blood sample collection

Blood samples can be collected from blood vessels (capillaries, veins, and sometimes arteries) by trained phlebotomists or medical personnel. The sample is obtained by needle puncture and withdrawn by suction through the needle into a special collection tube. Some specimens may be obtained by a finger puncture that produces a drop of blood, such as that used for glucose testing. The procedure usually takes just a few minutes and hurts just a bit, typically when the needle is inserted or from the puncture of a lancet.

#### ✓ *Introduction to Cardiovascular system*

Cardiovascular system consists of three interrelated components: blood, the heart, and blood vessels. Blood contributes to homeostasis by transporting oxygen, carbon dioxide, nutrients, and hormones to and from your body's cells. It helps regulate body pH and temperature, and provides protection against disease through phagocytosis and the production of antibodies. Blood constitutes about 20% of extracellular fluid, amounting to 8% of the total body mass. The blood volume is 5-6 liters (1.5gal) in an average-sized adult male and 4-5liters (1.2 gal) in an average sized adult female. The difference in volume is due to differences in body size.

**Blood vessels:** The three main types of blood vessels are arteries, capillaries and veins. Arteries-carry blood away from the heart to other organs

**Capillaries-** branched and numerous tiny vessels which allow the exchange of substances between the blood and body tissues. **Veins-** are the blood vessels that convey blood from the tissues back to the heart

#### ✓ Blood collection site

Blood samples for laboratory testing may be obtained in several ways. The most common procedures are vein puncture, capillary finger or heel prick and arterial puncture.

**Vein puncture -** withdrawal of blood from a vein using a needle and collecting tube which contains various additives.

A tourniquet is wrapped around the arm above the vein puncture site, which causes blood to accumulate in the vein

This increased blood volume makes the vein stand out. Opening and closing the fist further causes it to stand out, making the vein puncture more successful.



A common site for vein puncture is the median cubital vein anterior to the elbow (see Figure below).

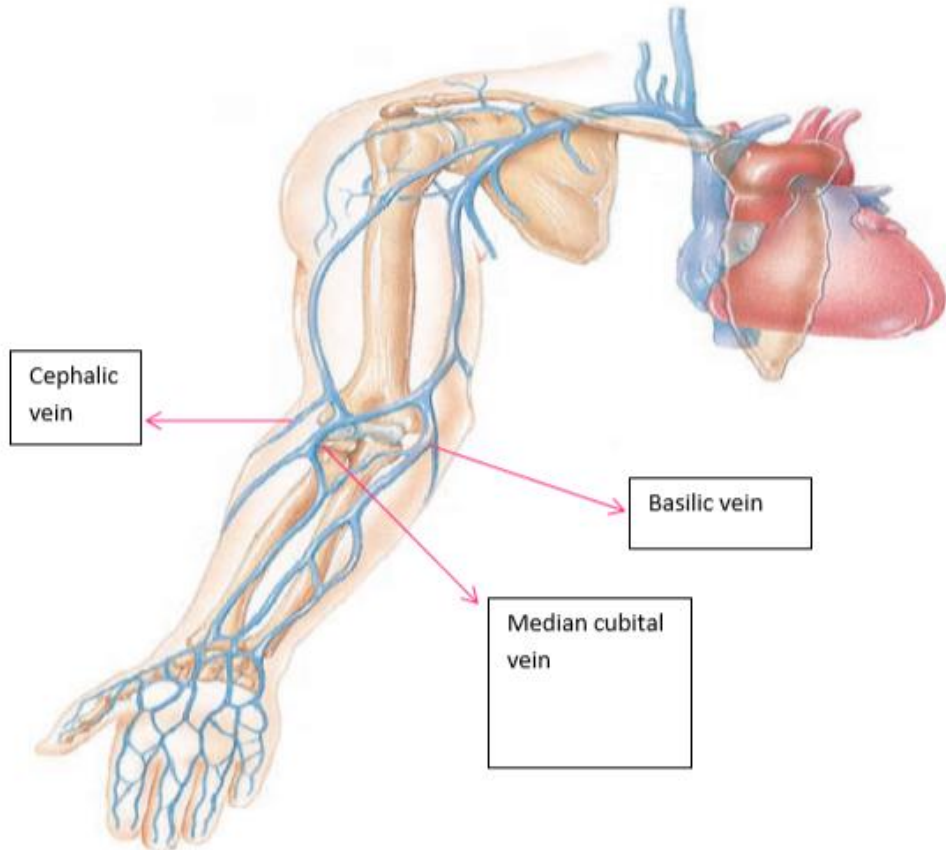


Fig.2.1. Vein puncture site for venous blood collection

Capillary finger or heel prick- this collection is used when small blood is required

- ✓ It is often used for drawing blood from infants and children.

Arterial puncture- blood is withdrawn from an artery

- ✓ this test is used to determine the level of oxygen in oxygenated blood

Blood collection materials and procedure

- ✓ Vein puncture



The volume of blood obtained by vein puncture is sufficient to carry out multiple tests. Vein puncture can be done either by the syringe method or vacuum tube method. The latter is disposable and is not popular in developing countries because of the high cost.

Anticoagulants: -

Anticoagulants are chemical substances that are added to blood to prevent coagulation. A number of different anticoagulants are available which have different functions but EDTA and citrate are mostly useful. The venous blood can be collected either in anticoagulant or without anticoagulant test tube based on the need of the blood collected. Blood collection Procedure by syringe method:

1. Assemble all the things required during blood
2. Read carefully the patient's form, identify the patient and decide the total amount of blood needed for the entire test.
3. Select the blood collection container and label them with the patient's identification number.
4. Introduce yourself to the patient.
  - ✓ Ask the patient to sit alongside the table used for taking blood.
  - ✓ Lay his arm on the table, palm upwards.
  - ✓ For indoor patients lying in bed, lay patient's arm in an outstretched position.
  - ✓ The procedure of blood collection should be explained by the vein-puncturist to the patient to minimize apprehension.

Never draw blood from standing patient or patient sitting on a high stool.

The vein-puncturist should be prepared for the occasional patient who may faint and should be trained to administer first aid techniques should this occur.

5. Select the puncture site carefully after inspecting both arms. If necessary apply the tourniquet to select the puncture site and then release the tourniquet to proceed with the next step.
6. Re-apply the tourniquet as described earlier before drawing blood. The tourniquet should not be left in place unless the technician is ready to proceed immediately with the vein puncture.
7. Using the index finger of your left hand, feel for the vein where you will introduce the needle.
8. Disinfect the skin with a swab dipped in methanol or 70% alcohol. Rub the vein puncture site thoroughly.



9. Remove the syringe from the protective wrap or test tube used during sterilization and the needle from the sterilized vial, assemble them and see the needle is fixed tightly. Do not touch the tip of the needle or wall of the position.
10. With the patient cooperation, grasp the elbow with your left hand and hold the arm fully extended.
11. Tie the syringe in the right hand holding your index finger against the base of the needle. Position the needle with the bevel uppermost and push the needle firmly and steadily, without hesitation, in to the center of the vein. Try to enter the skin first and then the vein at a 30 to 40° angle
12. As the needle enters the vein there is a sudden loss of resistance. Push the needle along the line of the vein to a depth of 1 to 1.5 cm.
13. With your left hand slightly pull back the position. Blood should appear in the barrel. Continue with draw the position and fill the syringe with the request amount of blood.
14. Release the tourniquet by pooling on the looped end. Ideally this should be released once the needle has been inserted in to the skin but it can also be released after the blood is drawn.
15. Place a swab of cotton wool over the hidden point of the needle. With draw the needle in one rapid movement from under the swab.
16. Ask the patient to firm on the cotton wool swab for 3 to 5 minutes. This stops bleeding from the wound. Do not bend the arm, this may cause hematoma.
17. Remove the needle from the syringe and gently expel the blood in to appropriate container.
18. Mix the blood immediately and thoroughly but gently with the anti-coagulant. Label the bottle clearly with the name of the patient, date, sex and registration number.
19. Immediately rinse the syringe and the needle with cold water. This will prevent clotting of blood in to the syringe or lumen of the needle. The syringe and the needle are left in the water with a mild detergent and later washed thoroughly prior to sterilization.
20. Before the patient leaves, re inspect the vein puncture site to ascertain that the bleeding has stopped. If the bleeding has stopped, apply an adhesive tape over the cotton wool swab on the wound; otherwise continue to apply pressure until the bleeding stops.

Do not leave the patient until the bleeding stops.



## 2.2. Venous blood specimen collection

### ✓ Capillary puncture materials and procedure

The capillary blood is obtained by skin puncture and anticoagulant is not required. It provides only small quantities of blood specimen for making a blood smear (differential count), cell count or Hematocrit determination. Skin puncture specimen is preferred over vein puncture specimen for the study of blood smear and differential count. Procedure:

1. Assemble the necessary materials: lancet, alcohol pad, dry surgical gauze, capillary tube, microscope, slide and other supplies (glass, marking pencil, lead pencil, etc.).
2. Be sure that the patient is seated comfortably.
3. Find a spot on the middle or ring finger of the left hand. The spot is located on the side of the finger, which is less sensitive than the tip.
4. Clean the site with a sterile cotton wool swab dipped in 70% alcohol, and then removes the alcohol with a dry sterile cotton wool swab. These remove dirt, and epithelial debris. Warm up the part chosen for pricking, increase the blood circulation and leave the area relatively sterile.
5. Grasp the finger firmly and make a quick, firm puncture with a sterile lancet (sharp pointed blade). The puncture should be 2-3 millimeter deep at the pre-located spot on the side of the finger in line with the finger print striations. If a good puncture has been made, the blood will flow freely. If it does not, use gentle pressure to make the blood form a round drop. Excessive squeezing will cause dilution of blood with tissue fluid. Discard the lancet in the appropriate disposal container. Used lancets should never be left lying on the work area.



6. Wipe away the first drop of blood with sterile cotton wool. The first drop of blood is contaminated with tissue fluid and will interfere with the laboratory result if used. The succeeding drops are used for test.

7. Collect the specimen by holding a capillary tube to the blood drop (for Hematocrit determination), or for blood count, or by touching the drop to the glass slide for preparing blood smear.

Blood film: Microscopic examination of the peripheral blood and hematological parasite are most often done by preparing, staining, and examining a thin film (smear) thick film of blood on glass slide. A great deal of information can be obtained from the examination of a blood film.

#### Blood film preparation

- A small drop of blood (2 $\mu$ l) is placed in the center line of a slide about 1-2cm from one end. Another slide, the spreading slide placed in front of the drop of blood at an angle of 30 $^{\circ}$ - 45 $^{\circ}$  to the slide and then is moved back to make contact with the drop. The drop will spread out quickly along the line of contact of the spreader with the slide.
- Once the blood has spread completely, the spreader is moved forward smoothly and with a moderate speed. The drop should be of such size that the film is 3-4cm in length (approx. 3/4th of the length of the slide). It is essential that the slide used as a spreader have a smooth edge and should be narrower in breadth than the slide on which the film is prepared so that the edges of the film can be readily examined.
- Once the slide is dry, the name of the patient and date or a reference number is written on the head of the film using a lead pencil or graphite. If these are not

Available, writing can be done by scratching with the edge of a slide. A paper label should be affixed to the slide after staining.

#### 2.3.6. Collection of Sputum

##### Anatomy and physiology of respiratory system

The respiratory system consists of the nose, pharynx (throat), larynx (voice box), trachea (windpipe), bronchi, and lungs. Its parts can be classified according to either structure or function. Structurally, the respiratory system consists of two parts:

(1) The upper respiratory system includes the nose, pharynx, and associated structures



(2) The lower respiratory system includes the larynx, trachea, bronchi, and lungs

Functionally, the respiratory system also consists of two parts:

(1) The conducting zone consists of a series of interconnecting cavities and tubes both outside and within the lung include the nose, pharynx, larynx, trachea, bronchi, bronchioles and terminal bronchioles; their function is to filter, warm, and moisten air and conduct it into the lungs.

(2) The respiratory zone consists of tissues within the lungs where gas exchange occurs include the respiratory bronchioles, alveolar ducts, alveolar sacs, and alveoli; they are the main sites of gas exchange between air and blood

To diagnose the respiratory system impairment, sputum sample is an appropriate

Sputum collection and necessary materials

Patients are instructed to cough up sputum from as far down in the lungs as possible.

(A health practitioner may assist the patient in some situations.) This is best accomplished first thing in the morning before eating or drinking, by taking several deep breaths before expectorating into the collection cup. Sputum should be relatively thick and not as watery as seen when producing saliva.

Sputum is usually examined to determine the presence of disease of the lungs or of the upper respiratory tract. Careful! sputum to be collected should not be saliva.

Saliva: - is secreted by the salivary glands and is limited in the oral region.

Sputum: - is the material coughed up from the throat and lungs.

#### Collection Method

Provide the patient with a sterile wide- mouthed glass bottle of about 50 ml capacities with a screw top.

- Two samples required :Spot–Spot  
WHO/IUATLD Recommendation
- 1<sup>st</sup>Spot -initial visit to the clinic
- 2<sup>nd</sup>Spot-after 30`-1hr of 1<sup>st</sup> spot collection on the same day.

The laboratory technician or the nurse should be present when the sample is taken.

First, the patient should be standing, if possible. Then, he/she should take a very deep breath, filling his/her lungs.





She/he should empty his/her lungs in one breath, coughing as hard and deeply as she/he can. She/he should spit what he brings up into the jar.

After Collection: Check that a sufficient amount of sputum has been produced. The sputum of an infected person usually contains:

- Thick mucus with air bubbles
- Threads of fibrin
- Patches of pus
- Occasional brownish streaks of blood

N.B- The first sputum coughed out in the early morning is the most desirable specimen for the laboratory investigation.

- Liquid frothy saliva and secretions from the nose and pharynx are not acceptable expectations. Have the patient produce another specimen.

Blood sputum is also not accepted for Gene X-pert technique







Fig.2.3.-Collecting sputum sample  
2.3.7. Collection of body fluids and discharges

A sample of cerebrospinal fluid is obtained by lumbar puncture, often called a spinal tap. It is a special but relatively routine procedure. It is performed while the person is lying on their side in a curled up, fetal position or sometimes in a sitting position. The back is cleaned with an antiseptic and a local anesthetic is injected under the skin. A special needle is inserted through the skin, between two vertebrae, and into the spinal canal. The health practitioner collects a small amount of CSF in multiple sterile vials; the needle is withdrawn and a sterile dressing and pressure are applied to the puncture site. The patient will then be asked to lie quietly in a flat position, without lifting their head, for one or more hours to avoid a potential post-test spinal headache. The lumbar puncture procedure usually takes less than half an hour. Discomfort levels can vary greatly. The most common sensation is a feeling of pressure when the needle is introduced. Let your healthcare provider know if you experience a headache or any abnormal sensations, such as pain, numbness, or tingling in your legs, or pain at the puncture site.

✓ Formation and Physiology

Cerebrospinal fluid (CSF) is a major fluid of the body. CSF provides a physiologic system to supply nutrients to the nervous tissue, remove metabolic wastes, and produce a mechanical barrier to cushion the brain and spinal cord against trauma. The brain and spinal cord are lined by the meninges, which consists of three layers:

- The dura mater, arachnoid, and pia mater. The outer layer is the dura mater that lines the skull and vertebral canal.
- The arachnoid is a filamentous (spiderlike) inner membrane.
- The pia mater is a thin membrane lining the surfaces of the brain and spinal cord. Cerebrospinal fluid is produced in the choroid plexuses of the two lumbar ventricles and the third and fourth ventricles. In adults, approximately 20 ml of fluid is produced every hour. The fluid flows through the subarachnoid space located between the arachnoid and pia mater. To maintain a volume of 90 to 150 ml in adults and 10 to 60 ml in neonates, the circulating fluid is reabsorbed back into the blood capillaries in the arachnoid granulations/villae at a rate equal to its production. The cells of the arachnoid granulations act as one-way valves that respond to pressure within the central nervous system (CNS) and prevent reflux of the fluid. CSF Collected in three sequentially labeled tubes:

Tube 1 .Chemical and immunologic tests



Tube 2 .Microbiology Tube

3. Hematology (gross examination, total white blood cell & differential)

This is the list likely to contain cells introduced by the puncture procedure



Fig.2.4. Synovial fluid collection

Synovial fluid, often referred to as “joint fluid,” is a viscous liquid found in the cavities of the movable joints (diarthroses) or synovial joints.

The bones in the synovial joints are lined with smooth articular cartilage and separated by a cavity containing the synovial fluid. The joint is enclosed in a fibrous joint capsule lined by the synovial membrane.

The synovial membrane contains specialized cells called synoviocytes. The smooth articular cartilage and synovial fluid reduce friction between the bones during joint movement. In addition to providing lubrication in the joints, synovial fluid provides nutrients to the articular cartilage and lessens the shock of joint compression that occurs during activities such as walking and jogging.

Sample collection:

Joint fluid aspiration (arthrocentesis) should be confined to patients with an undiagnosed effusion. It should be performed by an experienced operator using good sterile technique. Large joints (knee) normally contain < 4.0 ml of synovial fluid. Small sample size is common unless effusion is present.



- Uro-genital and semen samples collection
  - ✓ Uro-genital collection

The organs of the female reproductive system include the ovaries , the uterine (fallopian) tubes or oviducts , the uterus, the vagina and the external organs.

Uro-genital specimens should be collected by a medical officer or an experienced nurse. Amies medium is the most efficient medium for transporting urethral, cervical and vaginal swabs. Specimen should be transported in a cool box.

- Semen collection

Male patients ejaculate into a specimen container, avoiding lubricants, condoms, or any other potentially contaminating materials. Usually, men need to refrain from ejaculating for at least 2 days prior but less than 7 days before collecting the specimen. The specimen must not be refrigerated but kept as close to body temperature as possible by placing the container in a pocket and delivering it to the laboratory within 60 minutes.

The testes or testicles are paired oval glands in the scrotum measuring about 5 cm (2 in.) long and 2.5 cm (1 in.) in diameter. Each testis (singular) has a mass of 10–15 grams. The testes develop near the kidneys, in the posterior portion of the abdomen, and they usually begin their descent into the scrotum through the inguinal canals (passageways in the anterior abdominal wall during the latter half of the seventh month of fetal development.

Functions of the Male Reproductive System:

1. The testes produce sperm and the male sex hormone testosterone.
2. The ducts transport, store, and assist in maturation of sperm.
3. The accessory sex glands secrete most of the liquid portion of semen.
4. The penis contains the urethra, a passageway for ejaculation of semen and excretion of urine.

Summary of semen production



## Summary of Semen Production

Seminiferous tubules of testes	Spermatogenesis
Epididymis	Sperm maturation
Ductus deferens	Propel sperm to ejaculatory ducts
Seminal vesicles	Provide nutrients for sperm and fluid
Prostate gland	Provide enzymes and proteins for coagulation and liquefaction
Bulbourethral glands	Add alkaline mucus to neutralize prostatic acid and vaginal acidity

- Semen analysis:
  - ✓ Used in the evaluation of reproductive dysfunction (infertility) in the male
  - ✓ Used to select donors for therapeutic insemination
  - ✓ Is a cost-effective and relatively simple procedure.
  - ✓ Consists of microscopic and macroscopic components
- Collection and transport of semen
  - ✓ Give the person a clean, dry, leak-proof container
  - ✓ request him to collect a specimen of semen at home following 3 days of sexual abstinence
  - ✓ Condom is used to collect the fluid; this must be well-washed to remove the powder which coats the rubber.
  - ✓ It must be dried completely before being used
- *How to Collect a Semen Sample for Your Lab Test*

Read all of the instructions before collecting a semen sample. It's important to follow the instructions so the sample is collected in the right way. This will help your test results be correct. You will need to bring your test request form from your health care provider.

- Before You Collect a Sample
  - ✓ You should not have sexual activity for 2 to 5 days before collecting a semen sample. It should be more than 2 days from your last ejaculation but not more than 7 to 10 days.



- ✓ If you are collecting the sample at home, please pick up a clean container at the lab. You will need to make an appointment to return the sample. Call the scheduling line for the location at which you wish to return the sample.
- ✓ The sample must be collected within 1 hour of your appointment for your test results to be correct.
  - How to Collect Your Sample
  - ✓ Clean the head of your penis with wet, soapy towelettes or cotton balls.
  - ✓ If you are not circumcised, pull back your foreskin and cleanse.
  - ✓ Rinse the cleansed area with a new towelette or cotton ball that is wet with plain water.
  - ✓ Dry your penis well before you collect the sample.
  - ✓ Remove the lid from the collection container.
  - ✓ Make sure the container is clean and dry.
  - ✓ The sample should be collected by masturbation into the container.
  - ✓ Lubricants or condoms should not be used while collecting the sample.
  - ✓ They can kill the sperm and affect your test results.
  - ✓ If you need to collect the sample with intercourse
    - You can buy a nontoxic condom (one that won't kill your sperm) from the lab. After you are finished, seal the condom with the twist tie and put it in a clean container.
    - make sure intercourse is not interrupted. This may harm the first part of the ejaculate and affect your test results.
  - ✓ If a pubic hair or thread from your clothing falls into the container, do not take it out. The lab will take it out using a clean tool.
  - ✓ Put the lid back on the container.
  - ✓ Make sure it is closed tightly.
- After Collecting Your Sample
- ✓ Write the following information on the container with a pen or marker that will not run if the ink gets wet:
  - Full name
  - Date of birth
  - Date and time of collection.
- ✓ Wrap the container in a dry towel and place it in a paper sack. Keep it at room temperature.
- Other body Fluid



Other body fluids such as synovial fluid, peritoneal fluid, pleural fluid, and pericardial fluid are collected using procedures similar to that used for CSF in that they require aspiration of a sample of the fluid through a needle into a collection vessel. These are generally more complex type of collections and often require some patient preparation, use of a local anesthetic, and a resting period following sample collection. For details, see the descriptions for arthrocentesis, paracentesis, thoracentesis, and pericardiocentesis.

### 2.3.8. Collection of skin sample

- Anatomy and physiology of integumentary system

The skin (also known as the cutaneous membrane or integument) covers the external surface of the body and it is the largest organ of the body in both surface area and weight. In adults, the skin covers an area of about 2 square meters (22 square feet) and weighs 4.5–5 kg (10–11 lb), about 16% of total body weight. It ranges in thickness from 0.5 mm (0.02 in.) on the eyelids to 4.0mm (0.16 in.) on the heels. However, over most of the body it is 1–2 mm (0.04–0.08 in.) thick. Structurally, the skin consists of two main parts.

- Epidermis- superficial and thinner portion
    - composed of epithelial tissue, is the
  - Dermis- deeper and thicker connective tissue portion of the skin. Functions of the skin: •  
Regulates body temperature.
  - Stores blood.
  - Protects body from external environment.
  - Detects cutaneous sensations.
  - Excretes and absorbs substances.
  - Synthesizes vitamin D.
- Collection of ulcer and skin Specimens

Most skin specimens should be collected by a medical officer or an experienced nurse.

- ✓ Ulcer: Using a sterile dry cotton wool swab Collect a sample of discharge from the infected tissue. If there is no discharge use a swab moistened with sterile physiological saline to collect a specimen. Insert the swab in a sterile tube. - If the tissue is deeply ulcerated, aspirate a sample of infected material from the sidewall of the ulcer using a sterile needle and syringe - Collect a drop of the exudates directly on a clean cover glass and invert on clean slide. Deliver immediately the specimen to the laboratory for examination by dark-field microscope
- ✓ Collection of skin and hair specimen



a- cleanse the affected area with 70% v/v ethanol

b- Collection skin scales, crusts, pieces of nail or hairs

Skin scales: - collect by scraping the surface of the margin of the lesion using a sterile scalpel blade.

Crust: - collect by removing part of the crust nearest to healthy skin using sterile scissors and tweezers

Nail pieces: - collect by taking snippiness of the infected part of the nail using sterile scissors & tweezers

Hairs: - collected by removing dull broken hairs from the margin of the lesion using sterile tweezers After collecting the specimens fold the paper to form a flat packet, label the patients name and number source of material, and the date collected.

Skin snip collection: -

The skin snip materials are surgical blade, swap, adhesive plaster, lancet and PPE - The collection procedures are as below pictures



Fig.2.5. Technique of skin snip collection



Self-Check-3	Written Test
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Answer the Following Questions (2 point each):

- Blood sample for diagnosis of malaria parasite is best if collected \_\_\_\_.  
A.  
when the body temperature rises  
B. when the body temperature falls  
C. when the patient is at convalescence period  
D. when the patient is at recovery period
- The suitable site/s for venous blood collection site for adults is/are\_\_\_\_\_  
A. The femoral veins  
B. the veins of the legs  
C. The jugular vein  
D. The veins of the forearm
- The most concentrated and bladder incubated urine specimen used for most urinalysis test procedures \_\_\_\_\_  
A. random urine sample  
B. 24 urine sample  
C. postprandial urine specimen  
D. Early morning urine
- The recommended sputum specimen for AFB detection is \_\_\_\_  
A. Morning-Morning-Morning  
B. Spot-Spot  
C. Spot-Spot-Morning  
D. Morning-Spot-Spot
- The three main types of blood vessels are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

**Note: Satisfactory rating - 10 points Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers

### Answer Sheet

1. \_\_\_\_\_

2. \_\_\_\_\_





3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Operation sheet-1	Selecting and using the required <i>sampling tools and equipment</i>
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Purpose: The purpose of this activity is to enable trainees to practice the skills necessary to perform Identifying equipment to obtain a representative Sample

N	Materials		Reagent
	<ul style="list-style-type: none"> <li>• TTLM (i.e. Laboratory manual, Log book,...)</li> <li>• Leak proof sample container</li> <li>• Wooden applicator stick</li> <li>• Microscope slide</li> <li>• Slide cover sip</li> <li>• Wool cotton</li> <li>• Filter paper</li> <li>• Surgical blade</li> <li>• Cotton tip applicator stick</li> </ul>	<ul style="list-style-type: none"> <li>• Reagent bottles</li> <li>• screw cupped container</li> <li>• Packing paper</li> <li>• Test tubes (different size)</li> <li>• Diamond pencils</li> <li>• Lead pencils</li> <li>• Adhesive plaster</li> <li>• Strong cup board (wooden box)</li> <li>• Scotch tape</li> <li>• Nonabsorbent cotton</li> <li>• Test tubes holder (wooden)</li> <li>• Applicator steak</li> <li>• Pasteur pipits</li> </ul>	Laboratory reagents to obtain representative samples, Eg. Sample preservatives, anticoagulants, sample diluting solutions...



Ser. No	Steps/Tasks	Needs improvement	Competently performed	Proficiently Performed	Remark
Get ready					
1.	Wearing gown				
2.	Washing your hand with soap and water				
3.	Wearing glove				
4.	Cleaning the working area				
5.	Ensure presence of full pack first aid kit				
6.	Confirming the working area fit for purpose(i.e. safe to work)				
7.	Observe materials for sampling				
8.	Perform log sample				
9.	Conduct sampling procedure to obtain representative sample				
10.	<ul style="list-style-type: none"> <li>• Blood Sample</li> <li>• Urine Sample</li> </ul>				
11.	<ul style="list-style-type: none"> <li>• Stool Sample</li> <li>• Sputum Sample</li> </ul>				
12.					
13.	Review SOP s for sample representativeness				
14.	Worn out your gown and gloves before leaving Laboratory				



15.	Assure that materials are placed in their appropriate place				
16.	Discarded waste produce appropriately & wash your hands before leaving laboratory				



Information sheet-4	Assembling all specified sampling equipment, safety equipment, materials and containers
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## 2.4. Assembling all specified sampling equipment, safety equipment, materials and containers

### 2.4.1. LABORATORY SAFETY RELATED TO SPECIMEN COLLECTION, PREPARATION AND STORAGE

All staff involved in handling of laboratory specimens should receive specimen management training and be covered by appropriate vaccinations.

- Use personnel protective equipment when processing biological specimens.
- Take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments.
- Do not recap, bend or break needles by hand or remove needles from disposable syringes.
- Discard all sharp instruments in puncture-resistant sharp containers located close to the work area.
- Secure lids immediately to avoid spillage and contamination during transport.
- Place all liquid specimens in containers that will prevent leakage during transport.
- Preferably use vacutainer tube with needle rather than ordinary (syringe with needle) Do not overfill specimen containers, as they can 'explode' upon opening.
- If hands or other skin surfaces become contaminated with blood or other body fluids, wash them immediately and thoroughly with soap and water.
- Remove gloves and wash hands with soap and water upon completion of processing after contact with each patient.
- Use a biological safety cabinet for procedures that have a high potential for generating droplets.
- Use mechanical pipette devices to manipulate all liquids in the laboratory.
- Decontaminate laboratory work surface area daily and after any spill of potentially dangerous materials with a freshly prepared household bleach (0.5% NaHCl).



- Disinfect refrigerators and centrifuge component primary by 1:10 dilution of household bleach then clean with water finally wipe with 70% ethanol. Autoclave or soak racks in 1:10 dilution of household bleach for Ten minutes and then rinse thoroughly with water.
- Dispose biological waste& disinfect all non disposable components with 1:10 dilution bleach and wipe with 70% ethanol.
- Allow disinfectant to remain in contact with surfaces for at least ten minutes at an ambient temperature for optimal effectiveness against dried blood or serum.
- If equipment needs maintenance, clean and decontaminate them in the laboratory before transporting to repair/maintenance.
- Incinerate or autoclave all waste before disposal in a sanitary landfill. Solutions containing bleach may corrode the autoclave; therefore, these solutions may be poured down a drain connected to a sanitary sewer.
- After decontaminating, carefully pour down a drain connected to a sanitary sewer bulk blood, suctioned fluids, excretions, and secretions.

## 2.4.2. STANDARD PRECAUTIONS

Universal Precautions Rules of universal precautions

Consider ALL patients potentially infectious.

Assume ALL blood and body fluids and tissue to be potentially infectious.

Assume ALL unsterile needles and other sharps to be similarly contaminated.

Standard Precautions

These precautions should be followed in all patient care situations. All staff should be informed of the need to report exposure to blood or potentially infectious body fluids to the duty doctor without any delay.

Certain standard precautions should be taken in all healthcare settings as given below:

- Wash hands before and after all patient or specimen contact.
- Handle the blood of all patients as potentially infectious.
- Wear gloves for potential contact with blood and body fluids.
- Prevent needle stick/sharp injuries.
- Wear personal protective equipment (PPE) while handling blood or body fluids.
- Handle all linen soiled with blood and/or body secretion as potentially infectious.
- Process all laboratory specimens as potentially infectious.



- Wear a mask for TB and other contagious respiratory infections (HIV is not air-borne).
- Correctly process instruments and patient care equipment.
- Maintain environmental cleanliness.
- Follow proper waste disposal practices.



Self-Check—4	Written Test
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Answer the Following Questions (2 point each).

1. List personnel protective equipment in specimen collection.
2. What are the standard precautions should be taken in Laboratory specimen collection

Note: Satisfactory rating - 4 points Unsatisfactory below -6 points

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score _____
Rating _____

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Short Answer Question

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_



Information sheet-5	Cleaning of work area pre-use of all items
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## 2.5. Cleaning of work area pre-use of all items

### 2.5.1. Cleaning and disinfecting work area and equipment after use

Laboratory work area and equipment should make free of contamination to minimize hazards of:

- Handling
- Collecting,
- Transporting
- Disposing of left over samples and unnecessary other biological materials
- Minimize hazard effect to the environment.

All left over samples and unnecessary other biological materials shall be discarded in a containers specifically designed, planned and marked for disposal of hazard wastes. Biological waste containers should not fill beyond their designed capacity. Sharps including needle, lancets, scalpels, glass and metals discarded directly to the puncture resistance containers. Rubbish and other laboratory wastes shall not allow accumulate. Filled containers shall be removed on a regular base from work area. They shall be held in a designated secure place, normally with in the laboratory area, prior to decontamination or disposal.







Self-Check—5	Written Test
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Answer the Following Questions(5point).

1. Laboratory work area and equipment should make free of contamination to minimize hazards of:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Note: Satisfactory rating - 5 points Unsatisfactory below -5 points

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score _____
Rating _____

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Short Answer Question

1. \_\_\_\_\_

\_\_\_\_\_





Information sheet-6	Packaging Specimens for Transportation
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## 2.6. Packaging Specimens for Transportation

### 2.6.1. Triple Packaging System

Referral testing requires proper packaging and shipping of patient specimens to preserve their integrity and suitability and to protect all persons involved in their transportation.

- Proper specimen packaging and shipping is important to ensure quality results and the safety of laboratory and courier personnel.
- The three factors necessary for specimen packaging and shipping are:
  - ✓ The right packaging
  - ✓ The right temperature
  - ✓ The right timeframe
- Regardless of the sophistication of the packaging materials, it is possible to properly package and ship specimens for referral testing.
- A well-collected, properly labeled, and properly stored specimen, with a matching test requisition form, must be forwarded to a referral testing site in a timely manner to ensure the viability of specimens for testing.
- Some specimens are of critical importance to patient health and the late arrival of specimens at the testing site, and failure to package and ship them intact or at the appropriate temperature may result in the need for another specimen to be drawn and an unnecessary (and perhaps costly) delay in the patient's treatment.
- Drivers and couriers must be trained in the biosafety practices relevant to their job. The training should be documented and included in the personnel file.
- Laboratory specimens must be tracked. The sending site should retain a copy of the requisition. The specimen referral log should be kept current and reviewed weekly to follow-up on any outstanding results. Link this to the activity, tracking a Referral Specimen.
- A communicative process between the sending and referral laboratory should be established. Areas that should be addressed are critical result notification, specimen rejection notification, specimen receipt verification, adding additional test confirmation, and result report transmission.
- The referral testing laboratory should provide a laboratory handbook as part of its customer service for the sending laboratory. The handbook should include instructions and guidelines that address such areas as: specimen collection and processing by test, available testing menu, expected turn-around-times, and required specimen identification and test information.
- ✓ Specimen Collection and Processing:



## Packaging Specimens for Shipment

### Primary Receptacles

- Contains the specimen
- Must be watertight and leak proof
- Must be appropriately labeled as to content.
- Wrapped in enough absorbent material to absorb all fluid in case of breakage or leakage.

### Secondary Packaging

- Encloses and protects the primary receptacle
- Must be watertight and leak proof
- Several wrapped primary receptacles may be placed in a single secondary packaging.

### Outer Packaging (Tertiary)

- Protects secondary packaging from physical damage while in transit
- Contains specimen data forms, letters, and other types of information that identify or describe the specimen and identify the shipper and receiver, and any other documentation required.
- Must be a sturdy container with a latch or able to be taped shut

### Specimen Packaging and Shipping

- Utilize PPE when packaging specimens.
- Ensure specimens are in the appropriate transport media (primary containers) for the specimen collected and the test requested (primary containers). Ensure that primary containers will not leak
- Determine the requirements temperature (ambient temperature vs refrigerated) and the referral timeframe (i.e., 6 hours) for the specimen collect and the test requested.
- Consult the driver/courier schedule to ensure that the sample will reach the referral center within the necessary referral timeframe.
- Place cool packs on the bottom of a secure leak-proof secondary container to properly preserve the specimens during shipping (specimens shipped at ambient temperature may not require cool packs, although it is often still advisable in warm climates.)
- Place the primary container(s) in the secondary container with sufficient absorbent material
  - paper towels, cotton balls, commercial product
  - to absorb the entire contents of the primary containers.
  - Ambient temperature specimens can be transported in the same secondary packaging as refrigerated specimens, but should be packed as far away from the cool pack as possible and be insulated by at least one layer of absorbent material.
- Ensure secondary container(s) is labeled properly with a biohazard sticker or stamp.



- Place secondary container(s) in an outer shipping container that can be secured with a screw top, latch mechanism or sealed with tape.
- Place test requisition forms in a plastic sheath (if possible) inside the outer shipping container with specimen tracking form.
- Confirm that the contact information for the laboratory is clearly marked on the outer shipping packaging and/or in paperwork inside the outer packaging
- Note the date and time of pick-up on the specimen tracking form and/or the driver/courier logbook.
- Ensure that the drivers/couriers have received basic safety training in the transportation of specimens.
- Disinfect the bench where the specimens were packaged.



## Specimen Packaging and Shipping

### Step-by-Step Specimen Packaging Example



1. Collect specimens in primary containers and packaging materials



2. Place absorbent into bottom of secondary container.



3. Wrap each tube in paper towel.



4. Place tubes and biohazard marker in secondary container



5. Put absorbent on top of tubes and screw on cap.



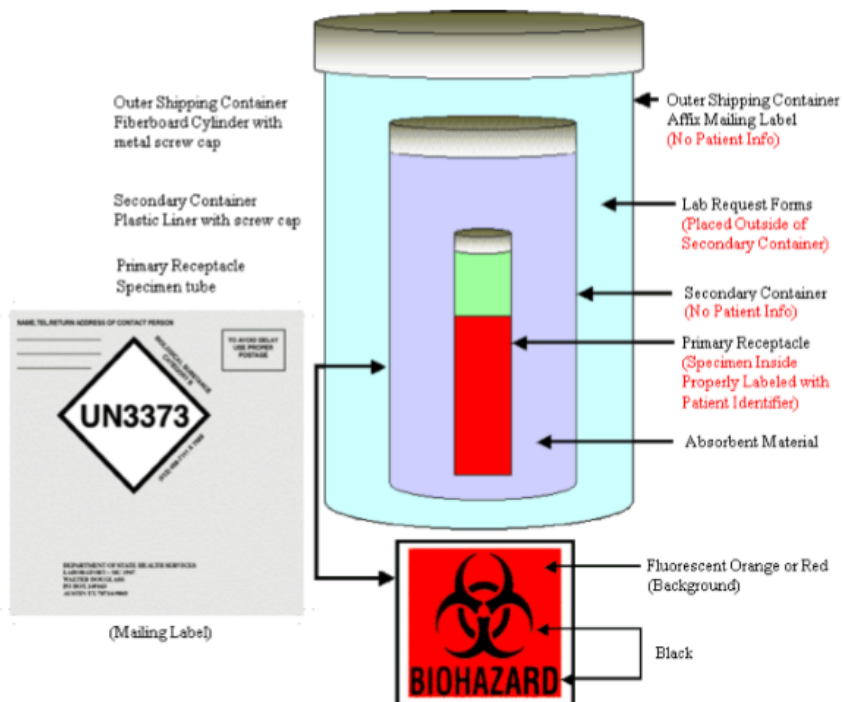
6. Roll lab form around the outside of the secondary container. Place in outer container. Screw on cap.

Fig.7-Specimen Packaging Procedure



## Specimen Packaging Diagram

**DO NOT put any patient information on outer container or secondary containers or lids.**



**Biohazard Label should be on Secondary Container.  
DO NOT put Biohazard Label on Outer Container.**

Fig.8.1.Specimen packing program





### Cross Section of Refrigerated Specimen Packaging

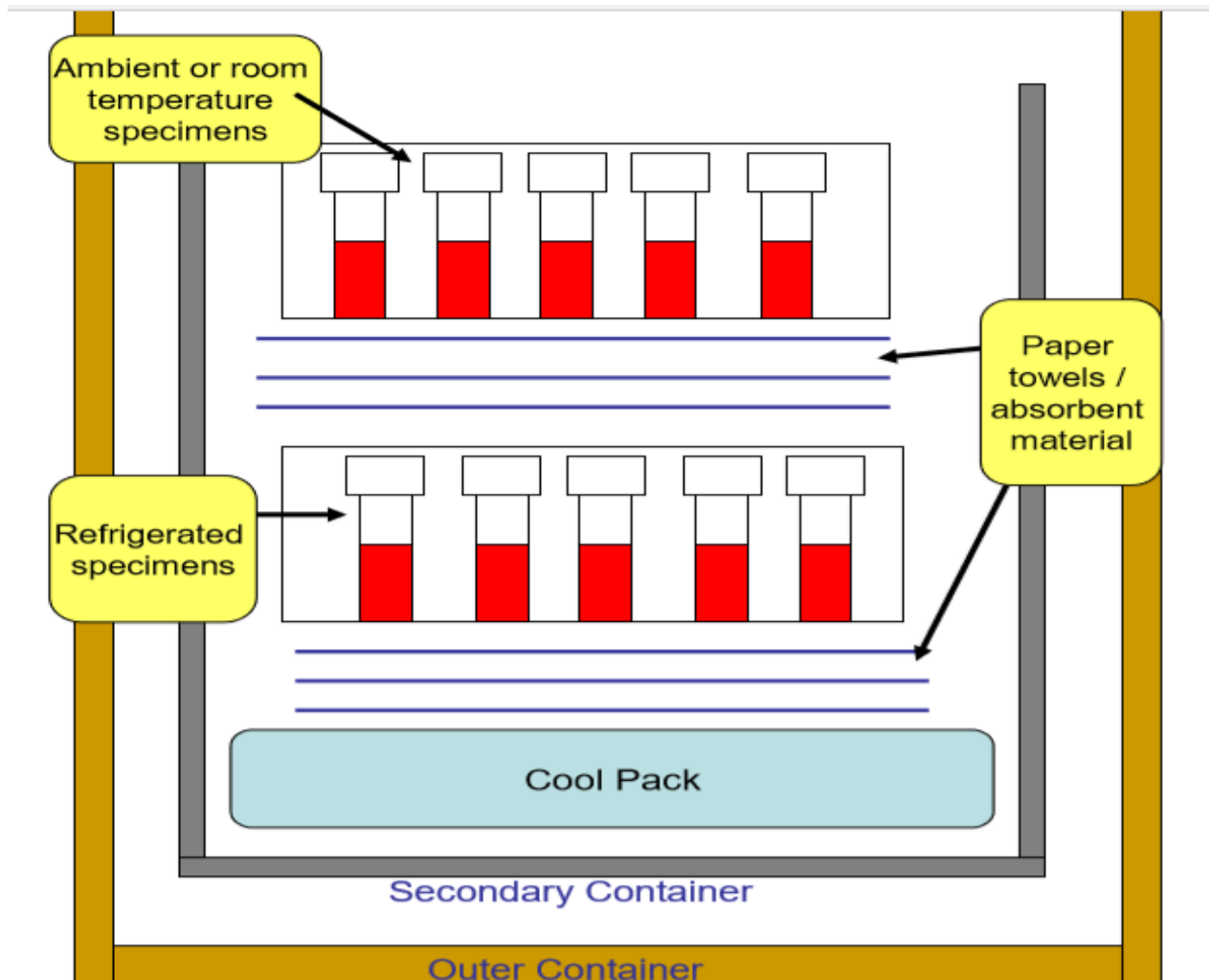


Fig.8.2.Specimen packing program

Ambient temperature specimens can be transported in the same secondary packaging as refrigerated specimens, but should be packed as far away from the cool pack as possible and be insulated by at least one layer of absorbent material.



Self-Check—6	Written Test
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Answer the Following Questions (2point each).

1. What are the three factors necessary for specimen packaging and transporting?

2. What does triple packing of sample means?

**Note: Satisfactory rating - 4 points Unsatisfactory below -4 points**

You can ask you teacher for the copy of the correct answers

**Answer Sheet**

Score _____
Rating _____

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





Information sheet-7	Requirements permitted for handling specimen
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## 2.7. Requirements permitted for handling specimen

### 2.7.1. HANDLERS' INSTRUCTIONS

Improper collection, transport, storage and handling of specimens between the laboratories carry a risk of infection to the personnel involved and the environment.

As a result, it is important to strictly follow the rules of general laboratory safety:

- Ensure that containers are leak-proof with a screw cap so that no material remains on the outside of the container. To avoid cracking or bending this container, never use mechanical devices to tighten the cap.
- Avoid spills and splashes during the opening and closing of tubes by using appropriate materials such as paper towel (absorbent pad), gauze, etc.
- When applicable, ensure that the outer part of triple package is large enough to hold the containers.
- Label containers to facilitate identification; do not wrap request or specification forms around the containers.
- To avoid accidental leakage or spillage, use secondary metal or plastic containers fitted with racks so that the containers remain upright. The secondary containers should be autoclavable or resistant to the action of chemical disinfectants and should be regularly decontaminated.
- For laboratories that receive large numbers of specimens, designate a particular room or area for this purpose.
- Shipping cartons or carriers must be immediately unpacked in a designated area equipped with a discard container (infectious, non infectious and sharps), alcohol swabs and paper towels.
- Use a Class II biosafety cabinet to limit exposure of laboratory staff to potential pathogens.
- If a biosafety cabinet is not available, use a clean workbench that can be easily disinfected using common laboratory disinfectants; this should be located away from areas used for other laboratory activities.
- Open the package safely and record and maintain all related documents:
- If there is linkage, broken container and contaminated paper manage it according to universal safety precaution.
- For blood specimen, ensure that appropriate safety measures are adopted to prevent laboratory infections; the handling of patient's blood and arthropods is particularly hazardous because the specimens are suspected to contain infectious agents.



Self-Check—7	Written Test
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Answer the Following Questions (5point).

1. What are general laboratory safety rule that are followed by the laboratory Personnel?

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Note: Satisfactory rating - 5 points Unsatisfactory below -5 points

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score _____
Rating _____

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. \_\_\_\_\_

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Information sheet-8	Make available Vehicle and communication devices are in working order
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## 2.8. Make available Vehicle and communication devices are in working order

### 2.8.1. laboratory specimen couriers

- Transport the specimen(s) properly and safely from referring to referral laboratories and return results back to referring laboratories in a timely manner(per established TAT)
- Ensure the quality and/or safety of the specimen, environment and all parties involved in the process including keeping bio-security.
- Ensure that the required documentation is available and maintained
- Maintain Communicate with referring and referral laboratories
- Follow the memorandum of understanding and SOP.
- Must report any incident based on the incident report form
- 2.8.2. REFERRAL/RECEIVING LABORATORIES
- Check for integrity and safety of specimen.
- Ensure that all the formats are properly filled, that complete documentation is provided to the appropriate authorities and that all information is appropriate and adequate
- Inspect the packaging and transportation process as per the SOP
- Perform the requested test analysis using the referred specimens and provide timely results back to referring laboratories
- Establish and communicate TAT to referring laboratories
- Dispose of leftover specimen(s) appropriately
- Maintain proper reporting documentation
- Maintain early notification and proper communication with referring laboratories and couriers.



Self-Check—8	Written Test
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Answer the Following Questions

1. When transporting specimen what is the carrier should check
  - A. Ensure that the required documentation is available and maintained
  - B. Maintain Communicate with referring and referral laboratories
  - C. Follow the memorandum of understanding and SOP.
  - D. Must report any incident based on the incident report form
  - E. All
2. What are the conditions of specimen Referral/receiving laboratories should check.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ etc.

**Note: Satisfactory rating - 5 points Unsatisfactory below -5 points**

You can ask you teacher for the copy of the correct answers

**Answer Sheet**

Score _____
Rating _____

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



Information sheet-9	Identifying Required transport containers and materials
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## 2.9. Identifying Required transport containers and materials

Referral testing requires proper packaging and shaping of patient sediment to preserve their integrity and suitability and to protect all persons involved in their transportation.

- Primary receptacle
- Paper towel
- Secondary receptacle (packaging)
- Absorbent
- Outer receptacle (packaging)
- Biohazard marker

### Special Safety Precautions

- Use universal precaution (PPE) when packaging specimen or infectious materials
- Disinfect the bench where the specimens were packaged.
- Wash hands after packaging specimens.

### Procedural Notes

1. Make sure that the lab request & specimen forms are filled properly.
2. Note the date and time of pick-up on the specimen referral log form.
3. Make certain that the test-tube labeled properly and clearly
4. Determine the requirements temperature (ambient temperature vs. refrigerated) and the referral timeframe (i.e., 6 hours) for the specimen collect and the test requested.
5. Ambient temperature specimens can be transported in the same secondary packaging as refrigerated specimens, but should be packed as far away from the cool pack as possible and be insulated by at least one layer of absorbent material.
6. Ensure that the outside of the specimen container is clean and uncontaminated
7. Check if the test tube /container/ closed tightly so that its contents do not leak during transportation.
8. Place test tube into test tube rack aseptically in appropriate manner.
- 9 Check if vaccine carrier cool box is large enough to hold sufficient specimen container.
10. Each test tube rack must be individually protected by absorbent materials  
(absorptive paper, cotton or cloth/ to reduce cotton or cloth/ to reduce shake or prevent breakage.
11. Place test-tube rack in to cold box or sample packaging box.
12. Place the dry ice packs at the bottom of the box and along the sides, place specimen in the center, and then place more ice packs on top in order to keep the temp at 2-8°C.

N.B. Specimens shipped at ambient temperature may not require cool packs, although it is often still advisable in warm climates





13. Close the cold box tightly.
14. If the external temp is high, the samples should be shipped cool (not frozen) packs.
15. Ensure that the drivers/couriers have received basic safety training in the transportation of specimens.
16. Arrange for immediate transport of the sample to testing laboratory.
17. Disinfect the bench where the specimens were packaged.
18. Wash hands after sample handling and Packaging.

Self-Check—9	Written Test
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Answer the Following Questions(5-points)

1. What is Special Safety Precautions should be taken in specimen packing for transportation?

**Note: Satisfactory rating - 4 points Unsatisfactory below -4 points**

You can ask you teacher for the copy of the correct answers

### Answer Sheet

Score _____
Rating _____

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Short Answer Question

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



LAP- test	Conduct sampling procedure to obtain representative sample
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Task-1 Collect Capillary Blood Sample and prepare thin blood film

Task-2 Collect Capillary Blood Sample and prepare thin blood film

Task-3 Collect Urine Sample

Task-4 Collect Stool Sample

Task-5 Collect Sputum Sample

Prepared By							
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