

# **Basic Instrumentation required for blood sample**

*A training report*

*Submitted to*

**Atmiya University**

*In partial fulfillment of the requirements for the degree of*

**Bachelor of Science in Biotechnology**

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## DECLARATION

I hereby declare that the work incorporated in the present training report entitled “...Pathology laboratory report...” which being is submitted as a partial fulfillment of the Degree of Bachelor of Science inBiotechnology, is carried out by me during academic year 2022. The information and articles referred from authors, journals and library are duly acknowledged.

I further declare that this training report written by me has not been previously submittedto this or any other College/Institute/University for any Certificate/ Diploma/ Degree

**Date: 26<sup>th</sup> August 2022 to 25<sup>th</sup> Septemer 2022.**

**Place: Rajkot**

## ACKNOWLEDGMENTS

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**About**

**institution and Trainer**

**Training project background**

**Observation in \_\_\_\_\_ department**

**Experiment perform in \_\_\_\_\_ department**

**Procedure / Results / Outcome**

## INTRODUCTION

A clinical laboratory is a laboratory where tests are done on clinical specimens in order to get information about the health of a patient as pertaining to the diagnosis, treatment, and prevention of disease.

Medical laboratory science is a complex subject enclosing a number of different disciplines.

PATHOLOGY is a medical science to study the disease through the studies of its causes, its effect together with associated alteration in structure & functions.

**The Functional Components Of The Clinical Laboratory Can Be Listed As Follows:**

- Clinical pathology
- Haematology
- Clinical biochemistry
- Clinical microbiology & serology
- Blood bank
- Histology & cytology

**The Responsibilities of the Laboratory Worker:**

- The laboratory worker plays an important role to find out the cause of disease by providing the physician the required laboratory test result.
- The laboratory worker thus helps the patients to get better by providing accurate test finding to the physician.
- The laboratory worker should not offer personal excuses for shortcomings in the performance of duty.
- Equipment and chemicals cost money. The laboratory worker should look after all equipment carefully and should try to use the correct amount of reagent needed for each test.
- Many patients are not treated until their reports are kept ready. If these reports are delayed, patients can not be treated early. It is necessary to keep all reports ready in time.
- In the course of laboratory testing, the laboratory worker gains a lot of information about patients and their illness. The laboratory worker must regard this information as strictly confidential.
- Only the physician who requested the examinations should receive the patient reports.
- Every laboratory worker must maintain high moral & professional standards behavior.

## Introduction to Instruments Used In Laboratory:

### MICROSCOPE

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### CENTRIFUGE

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**REFRIGERATOR**

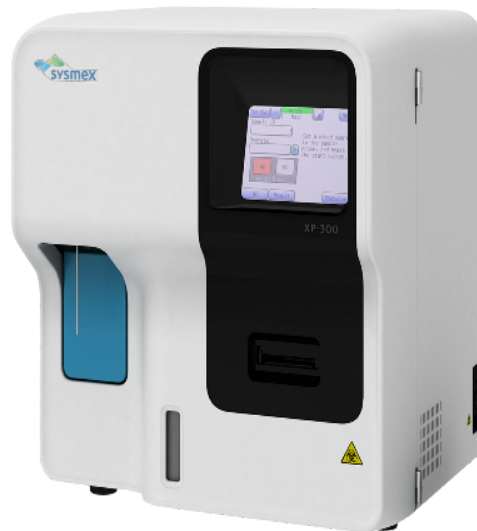
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**AUTOMATION**

## Blood Cell Counter (SYSMEX XP-300):

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an electronic counting of cells was first introduced by the Coulter counter(USA).

This counter enables determination of

1. HGB
2. RBC count
3. WBC count
4. HCT
5. MCV
6. MCH
7. MCHC
8. PLT

Importance characteristics are,

- Required only about 10-20  $\mu$ l of blood.
- Highly accurate for reproducible results.
- Simple to operate.
- Counting is fast with display of result.
- Automatic cleaning procedure.
- Error codes for easy trouble shooting.

**BIOCHEMISTRY ANALYZER ( ErbaChem 5 Plus V2) :**

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The Clinical Biochemistry Analyzer is an instrument that uses the pale yellow supernatant portion (serum) of centrifuged blood sample or a urine sample, and induces reactions using reagents to measure various components, such as sugar, cholesterol, protein, enzyme, etc.

**HAEMATOLOGY**

## **INTRODUCTION:**

- Blood may be described as a specialized connective tissue which circulates in a closed system of blood vessels.
- The circulating blood consists of suspension of formed elements such as erythrocyte, leukocyte and platelet, in a pale yellow coloured fluid called plasma.
- In adults, the total volume of blood comprises about 8% of the body weight or about 5600 ml in a 70 kg man.
- The formed element account for about 46% of the total blood volume.

## **BLOOD TUBE GUIDE**

### **1. Light Blue – Sodium Citrate**



Coagulation tubes have light blue-coloured stopper and a sodium citrate additive. It is used for coagulation tests, requiring full draw.

### **2. Plain Red – No Additive**



This is commonly used for routine venipuncture and does not require any additive.

### **3. Plastic Red – Clot Activator**



Tubes with plastic red stoppers contain a clot activator. It causes blood clots and help in separating the serum by centrifugation. This process is often used in blood bank (cross-match), chemistry, immunology and serology.

### **4. Green – Heparin-Lithium or Sodium**



Tubes with green tops have lithium heparin anticoagulant.

### **5. Lavender, Purple, Tall Pink – EDTA**



The EDTA anticoagulant in tubes with lavender or purple stopper helps remove calcium by forming calcium salts. This draw is often used in blood bank cross-matching and haematology.

### **6.Gray – Sodium Fluoride, Potassium Oxalate**



Tubes with gray-coloured stopper contain sodium fluoride or potassium oxalate additives, which acts as an Antiglycolytic agent that helps preserve glucose for up to five days. This requires full draw, as the opposite may cause haemolysis.

Aside from these, there is a tube with royal blue top that contains FDP. The draw is used when there is an order to test deep vein thrombosis or blood clot in a deep vein, pulmonary embolism, stroke and other blood clotting disorders.

## **Arterial Blood**

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Arterial blood is required for the estimation of arterial blood gases like carbon dioxide, bicarbonate etc.

**Sites:**

Radial, brachial or femoral artery. Arterial puncture is not without danger & hence must be performed with due precautions.

The blood collected is added to anticoagulant if whole blood or plasma is required for investigations. Whenever anticoagulants are used, smear should be made immediately to avoid morphological changes in leukocytes.

**Arterial Blood Collection:**

- Label the tube
- Check patient ID
- Locate artery
- Clean with sterilization
- Puncture at 45° angle
- Collect sample
- Mix sample to dissolve heparin

**Normal range:**

- Hemoglobin:-  
**M:**13.5-18.0g/dl     **F:**11.5-15.5g/dl
- RBC:-  
**M:**4.5-6.5mil./cu.mm **F:**3.9-5.6mil./cu.mm
- WBC:-  
4,000-10,000mil./cu.mm
- Neutrophils:  
60%-70%

- Lymphocyte:  
20%-30%
- Eosinophil:  
1%-4%
- Monocyte:  
2%-6%
- Basophil:  
0-1%
- Platelet:  
1,50,000/cu.mm-4,50,000/cu.mm
- S. Creatinine:  
**M:**0.9-1.5mg/dl**F:**0.8-1.3mg/dl
- Random blood sugar:  
60-140 mg/dl

**HIV Test**



The HIV TRI-DOT test is a visual, rapid, sensitive and accurate immunoassay for the differential detection of HIV-1 & HIV-2 antibodies (IgG) in human serum or plasma using HIV-1 & HIV-2 Antigens immobilized on an immunofiltration membrane.

**Test procedure:**

1. Add 3 drops of Buffer Solution to the centre of the device.
2. Hold the dropper vertically and add 1 drop of patient's sample 50 $\mu$ l (serum or plasma) using the sample dropper provided (use a separate sample dropper for each specimen to be tested).
3. Add 5 drops of Buffer Solution.
4. Add 2 drops of Protein-A Conjugate directly from the conjugate vial.
5. Add 5 drops of Buffer Solution and read results.

6. Read results immediately and discard the device considering it to be potentially infectious.

## **INTERPRETATION OF RESULTS**

### **NON-REACTIVE:**

1. If only one Dot (only the Control Dot) appears the specimen is non reactive for antibodies either to HIV-1 or HIV-2. Interpret sample as non-reactive.

### **REACTIVE :**

1. If two Dots, one for the control and the other for HIV-1 appear the specimen is reactive for antibodies to HIV-1.

2. If two Dots, one for the control and the other for HIV-2 appear the specimen is reactive for antibodies to HIV-2.

3. If all the three Dots, one each for control, HIV-1 & HIV-2 appear the specimen is reactive for antibodies to HIV-1 & HIV-2.

### **INVALID TEST :**

If no Dot appears after the test is complete, either with clear background or with complete pinkish/purple background the test indicates ERROR. This may indicate a procedural error or deterioration of specimen/reagents or particulate matter in the specimen. The specimen should be tested on a new device.

**Hepatitis B surface antigen (HBsAg)**





Hepatitis B surface antigen (HBsAg) is a blood test ordered to determine if someone is infected with the hepatitis B virus. If it is found, along with specific antibodies, it means the person has a hepatitis B infection.

**ROUTINE URINE EXAMINATION**

## **INTRODUCTION:**

The routine analysis of urine includes the physical, chemical and microscopic observation of the urine.

It is useful for diagnosis and detection of metabolic or systemic diseases not directly related to the kidney.

It yields a large amount of information quickly and economically.

### **By color:**

Under normal conditions the color of urine varies from pale yellow to yellow due to the pigments urochrome urobilin & uroerythrin.

Abnormal color:

Dark yellow or brownish yellow: due to bilirubin, in jaundice.

White: due to chyle, pus

Red: due to red cells

Dark brown to black: due to melanin

Pink: due to uric acid, urate

Blue to green: due to biliverdin

Deep yellow or orange: vitamin B complex treatment

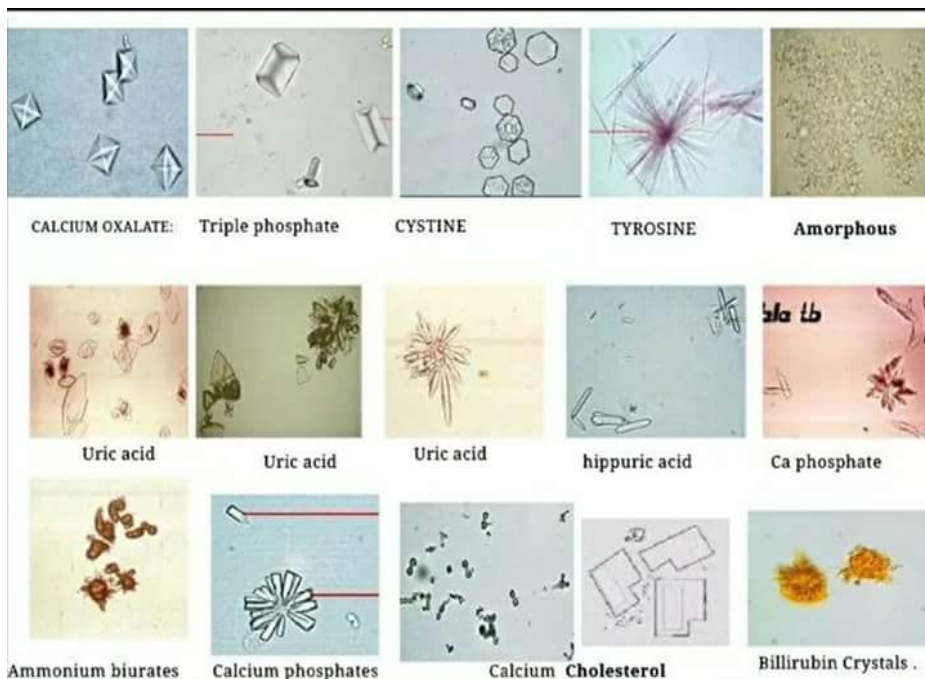
## **pH strip examination:**



Normal range: 4.8 to 7.5

When stand for sometime at room temp, pH is converted to alkaline because of urea is converted to ammonia by bacteria.

### Microscopic analysis:



Pregnancy test:



### **Procedure:**

After urinating into a disposable cup, dip the pregnancy test strip tip into the urine.

Lay the strip flat on a clean, dry, non-absorbent surface. Results will show in 3-5 minutes.

### **Read the Results**

- **Positive (Pregnant):** Distinct red lines appear on the control and test regions. Both test line and control lines indicate that you are pregnant. The color intensity of the test bands may vary due to different concentrations of HCG at different stages.
- **Negative (Not Pregnant):** Only one red line appears on the control region. No apparent line on the test region.
- **Invalid:** No visible band at all or only in the test region.

**COAGULATION**

## **Bleeding Time:**

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It is a time require for the bleeding to stop naturally.

It is one of the most important test used in detection and differential diagnosis of hemorrhagic diseases.

### **Procedure:**

1. Clean the finger with spirit or alcohol by using a piece of cotton. Allow to dry.
2. Puncture the finger deeply(1 mm) by using sterile lancet. Start the stopwatch. The blood should flow freely without squeezing the finger.
3. After 10 sec collect the drop of blood at one corner of the filter paper. Do not touch the skin with the paper.
4. Repeat step no. 3 after every 10 sec.
5. When bleeding ceases, stop the stopwatch.
6. Note the time on the watch.

Normal range:

1-5 minutes

## **Clotting Time:**

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Clotting time is the time required for a sample of blood to coagulate in vitro under standard conditions.

**Procedure:**

1. Clean the finger with spirit or alcohol by using a piece of cotton. Allow to dry.
2. Puncture the finger deeply(1 mm) by using sterile lancet. Start the stopwatch when blood starts coming at the puncture site.
3. Wipe off the first blood drop & collect blood in the capillary up to 2/3 of it's length.
4. Move the capillary up and down. At first the column of blood will move. When the blood stops moving go on breaking the capillary tube from one end at an interval of 30 sec till the fibrin appears between two broken ends of the capillary tube.
5. When the fibrin string appears, stop watch & note down the time.



**ABO Blood grouping**

There are nearly 300 blood group systems so far discovered, such as Rh, MNs, Luthera, Kell, Duffy etc.

(Rh)Rhesus blood group system is clinically the second most important blood group system in humans after the ABO system. It was discovered in 1940 by Landsteiner & wiener.

Rh antibodies are not naturally occurring but develop only after exposure to Rh antigen.

These are of IgG type.

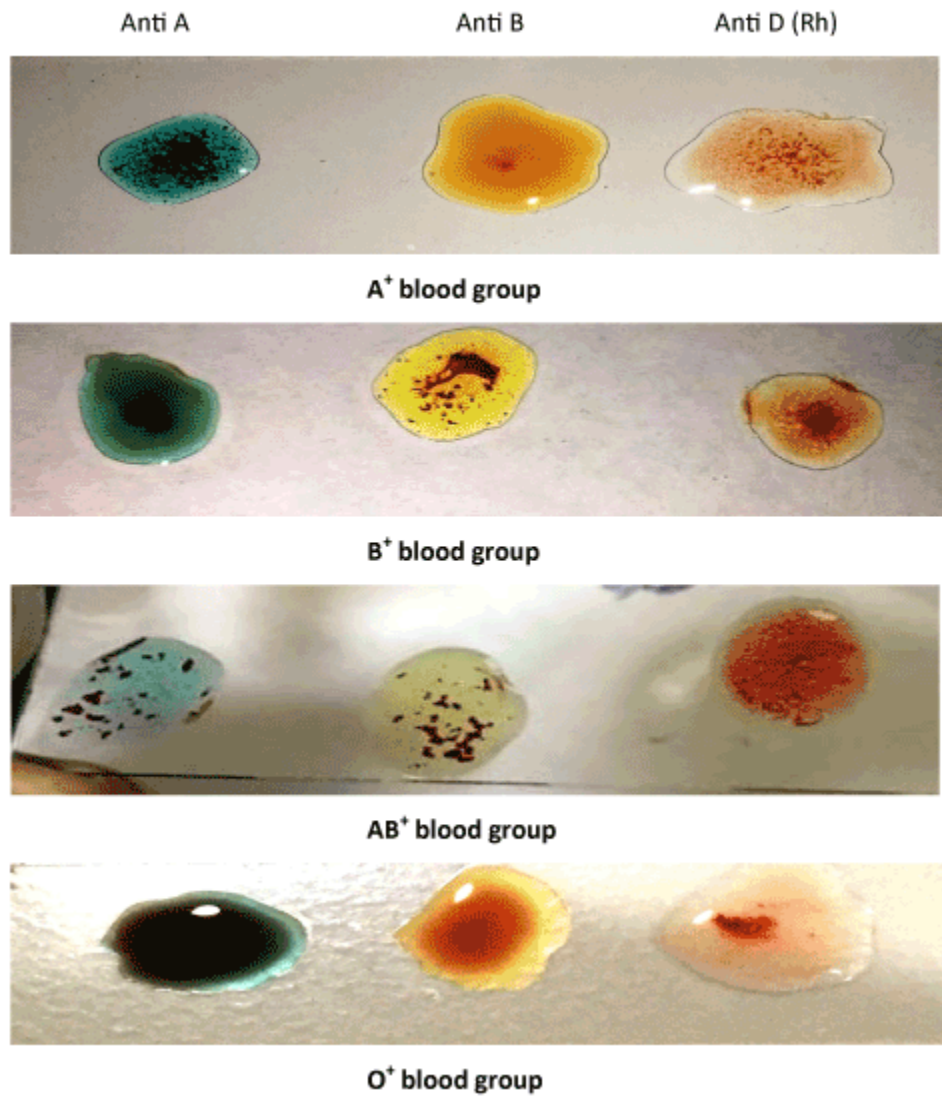
<b>GROUP</b>	<b>ANTIGEN</b>	<b>ANTIBODY</b>
A	A	anti B
B	B	anti A
O	OO	anti A & B
AB	A,B	no Abs

#### **PROCEDURE:**

- Take 2 slides
- Put 1- 1 drop of A, B & O pooled cells
- Add 1-1 drop of serum to each
- Mix well with applicator stick for 1 min & spread at least in 15 mm area of slide.
- Observe for agglutination.
- Interpret the results.

<b>Blood Group</b>	<b>Agglutination with A cells</b>	<b>Agglutination with B cells</b>	<b>Agglutination with O cells</b>

A	-	+	-
B	+	-	-
AB	-	-	-
O	+	+	-



**WIDAL SLIDE TEST**

(widely investigated diagnosed assay laboratory)



Qualitative analysis of salmonella typhi antibody by rapid slide method.

Widal test is for qualitative determination of antibodies produced in response to the stimulation by specific antigen of salmonella group in human.

**Procedure:**

1. Place one drop of positive control on one reaction circles of the slide.
2. Pipette one drop of Isotonic saline on the next reaction circle. (-ve Control).
3. Pipette one drop of the patient serum tested onto the remaining four reaction circles.
4. Add one drop of Widal test antigen suspension 'H' to the first two reaction circles. (PC & NC).
5. Add one drop each of 'O', 'H', 'AH' and 'BH' antigens to the remaining four reaction circles.
6. Mix contents of each circle uniformly over the entire circle with separate mixing sticks.
7. Rock the slide, gently back and forth and observe for agglutination macroscopically within one minute.



**ESR**

**(Erythrocyte Sedimentation Rate)**

The ESR test, determines the rate at which RBCs (Red Blood Cells) descend into a standardized tube. It is a relatively simple and inexpensive test that is done to detect inflammation, that may be caused by infection or autoimmune diseases.

ESR test means measuring the time needed by the red blood cells to settle at the bottom of a blood sample. Although ESR blood test cannot determine any disease of its own accord, it confirms the absence or presence of inflammatory activity in the body.

Taking an ESR blood test is an integral part of any routine health check-up, as it determines inflammatory activity in the body. Along with other tests that check for various medical conditions, conditions like infection, cancer or autoimmune disease can be determined with ESR.



## BIOCHEMISTRY

**Glucose:**

- 1000µl - reagent
- 10µl - serum

### **Creatinine:**

- 500µl – reagent
- 50µl - serum

### **Total protein:**

- 500µl – reagent
- 10µl - serum
- 5 min incubation

### **Albumin:**

- 500µl – reagent
- 5µl - serum
- 5 min incubation

### **SGPT:**

- 500µl – reagent
- 50µl - serum

### **Bilirubin Total:**

- 500µl – R<sub>1</sub>
- 10 µl - R<sub>3</sub>
- 25 µl - serum
- 15 min incubation

### **Bilirubin Direct:**

- 500µl – R<sub>2</sub>
- 10 µl - R<sub>3</sub>

- 25 µl - serum
- 15 min incubation

### **Alkaline phosphate:**

- 1200µl – reagent
- 500µl - serum

### **Amylase:**

- 500µl - reagent
- 10µl - serum

### **Result:**

In this laboratory, we have done our many test like,

- Biochemistry test (glucose, creatinine, SGPT, etc.)
- Urine analysis
- Blood collection

We usually perform some test like glucose, creatinine, SGPT etc.

We have wonder full experience to work in this laboratory.

## **Conclusion:**

During work in this laboratory we experienced that how to work with doctors, lab technicians and staff.

Also learned that how to operate some automated machines, how to work with this machine, how to communicate with patients.

**THANK YOU...**