An

On Job Training Report

On

PATHOLOGY LABORATORY

Completed at

Sun diagnostics Kolhapur
Address- 1839, 'A' Ward, Near Sai Mandir,
Rankala Bus Stand, Kolhapur -416012

By

Miss. Vaishnavi Jitendra Khot

M.Sc. Microbiology
Part I Sem II

PG Department of Microbiology
Vivekanand College
(An Empowered Autonomous Institute)
Kolhapur, 416003
Maharashtra, India

2025-26

"Dissemination of Education for Knowledge, Science and Culture"

-Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

VIVEKANAND COLLEGE, KOLHAPUR

(स्वायत्त) कोल्हापूर

(AN EMPOWERED AUTONOMOUS INSTITUTE)

PG Department of Microbiology

CERTIFICATE

OF

"ON JOB TRAINING"

This is to certify that Miss. Vaishnavi Jitendra Khot (Exam seat no. 5412) has satisfactorily carried out the required practical work prescribed by the BoS Department of Microbiology, Vivekanand College, Kolhapur (An Empowered Autonomous Institute) for M.Sc.I Semester-II course in On Job Training (Sub code – OJT20MIC21) and this report represents his/her Bonafide work in the year 2025-2026.

Place: Kolhapur
Date: 23/03/2026

Examiner

OJT In charge

Head

I/C Head
Department of Microbiology
Vivekanand College, Kolhapur
(Empowered Autonomous)

Internship Undertaking

1. Student Name:	Miss. Vaishnavi Jitendra Khot		
2. Current Address	Flat no. 301, Indraprastha Nagri, Kolhapur		
3. Residence Address	Flat no. 301, Indraprastha Nagri, Devkar Panand, Kolhapur - 416012		
4. Email id	vaishukhot2004610@gmail.com		
5. Mobile Nos.	8799811415		
6. Aadhar	4832 5289 7879		
7. PAN	OETPK2102E		
8. Overall GPA	—		
9. Mode of Internship	offline		
10. Internship Preferences	—		
	Location	**Core Area**	**Organization / Institute**
Preference-1	Kolhapur	Rankala Bus Stand	Sun Diagnostics Laboratory
Preference-2	—	—	—
Preference-3	—	—	—

I confirm that I agree with the terms, conditions, and requirements of the Internship Policy

Student Signature: Khot

Date 05/01/2026

I confirm that the student has attended the internship orientation and has met all paperwork and process requirements to participate in the internship program, and has received approval from his/her mentor.

Amali

Sign of Department Faculty Coordinator

Date 05/01/2026

Student Diary (Log) Recording Format

Week	Task Assigned	Activities Performed	Key Learnings	Additional Remarks
16/12/2025 to 20/12/2025	To study laboratory instruments & basic micro-pathological Procedures.	Observed & learned work of laboratory instructures & basic Pathology tests.	Knowledge of Instruments & procedure to use & Understanding all aspects in laboratory	Good exposure to Laboratory Setup.
21/12/2025 to 26/12/2025	Handling & analysis of different clinical Samples.	Performed Urine routine culture, biochemical tests & anti-biotic sens-itivity, testing & Reporting.	Hands on experiment experience in sample Processing Culture Method organism, identification	Improved Practical & analytical skills.
27/12/2025 to 31/12/2025	Biochemical tests & Staining techniques.	Performed different biochemical tests & prac-ticed Stain-ing techniques.	Understand-ing of Staining techniques & biochemic-al use & reactions.	Improved Confidence & technical skills.

Signature of Industry Supervisor

Attendance Sheet

Name & Address of Organization

Sun Diagnostics, Kolhapur
Address - 1839 'A' ward, Near Sai Mandir, Rankala Bus Stand, Kolhapur - 416012

Name of the Student	Miss. Vaishnavi Jitendra Khot
Roll Number	5412
Name of Course	Msc I (Microbiology)
Date of Commencement of Training	16/12/2025
Date of Completion of Training	31/12/2025

Month and Year:

Day	Date	Sign of student
1	16/12/2025	Khot
2	17/12/2025	Khot
3	18/12/2025	Khot
4	19/12/2025	Khot
5	20/12/2025	Khot
6	21/12/2025	Khot
7	22/12/2025	Khot
8	23/12/2025	Khot
9	24/12/2025	Khot
10	25/12/2025	Khot
11	26/12/2025	Khot
12	27/12/2025	Khot
13	28/12/2025	Khot
14	29/12/2025	Khot
15	31/12/2025	Khot

- Attendance Sheet should remain affixed in Daily Training Diary. Do not remove or tear it off.
- Holidays should be marked in Red Ink in attendance column. Absent should be marked as A 'in Red Ink.

Name and Signature with date of Internship Supervisor Nisha Pravin Talekar

31/12

Supervisor Evaluation of Intern

Student Name: Miss. Vaishnavi Jitendra Khot Date: 31/12/2025

Work Supervisor: Nisha Talekar Title: _____

Organization: SunDiagnostics Pathology Laboratory

Internship Address: 1839 'A' Ward, Near Sai Mandir, Rankala Bus Stand, Kolhapur

Dates of Internship: From 16/12/2025 To 31/12/2025

Please evaluate intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs Improvement	Satisfactory	Good	Excellent
Behaviors			✓	
Performs in a dependable manner			✓	
Cooperates with co-workers and supervisors			✓	
Shows interest in work				✓
Learns quickly				✓
Shows initiative			✓	
Produces high quality work			✓	
Accepts responsibility			✓	
Accepts criticism			✓	
Demonstrates organizational skills			✓	
Uses technical knowledge and expertise		✓		
Shows good judgment			✓	
Demonstrates creativity/originality		✓		
Analyzes problems effectively			✓	

Is self-reliant			✓	
Communicates well			✓	
Writes effectively		✓		
Has a professional attitude		✓		
Gives a professional appearance		✓		
Is punctual		✓		
Uses time effectively		✓		

Overall performance of student intern (circle one):

(Needs improvement / Satisfactory / ✓ Good / Excellent)

Additional comments, if any: —

Signature of Industry supervisor Rahul

HR Manager — _____

Student Feedback of Internship

(To be filled by Students after Internship completion)

Student Name: Miss. Vaishnavi Jitendra Kha Date: 05/01/2026

Address: Kolhapur

Give a brief description of your internship work (title and tasks for which you were responsible):

Was your internship experience related to your major area of study?

- Yes, to a large degree
- Yes, to a slight degree
- No, not related at all

Indicate the degree to which you agree or disagree with the following statements.

This experience has:	Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
Given me the opportunity to explore a career field	✓				
Allowed me to apply classroom theory to practice		✓			
Helped me develop my decision-making and problem-solving skills	✓				
Expanded my knowledge about the work world prior to permanent employment	✓				
Helped me develop my written and oral communication skills	✓				
Provided a chance to use leadership skills (influence others, develop ideas with others, stimulate decision-making and action)	✓				

Expanded my sensitivity to the ethical implications of the work involved	✓				
Made it possible for me to be more confident in new situations		✓			
Given me a chance to improve my interpersonal skills		✓			
Helped me learn to handle responsibility and use my time wisely	✓				
Helped me discover new aspects of myself that I didn't know existed before	✓				
Helped me develop new interests and abilities		✓			
Helped me clarify my career goals		✓			
Provided me with contacts which may lead to future employment	✓				
Allowed me to acquire information and/ or use equipment not available at my Institute	✓				

- In the Institute internship program, faculty members are expected to be mentors for students. Do you feel that your faculty coordinator served such a function? Why or why not?

  Yes, the faculty co-ordinator guided & supported me throughout the internship.

- How well were you able to accomplish the initial goals, tasks and new skills that were set down in your learning contract? In what ways were you able to take a new direction or expand beyond your contract? Why were some goals not accomplished adequately?

  I was able to achieve most of the goals & learned several new practical skills.

- In what areas did you most develop and improve?

  I improved my laboratory techniques, communication & practical knowledge.

- What has been the most significant accomplishment or satisfying moment of your internship?

  Succesfully performing laboratory experiments independently.

- What did you dislike about the internship?

  Limited time to explore more advanced techniques.

- Considering your overall experience, how would you rate this internship? (Circle one).

  -Satisfactory/ Good/ Excellent

  Excellent

- Give suggestions as to how your internship experience could have been improved. (Could you have handled added responsibility? Would you have liked more discussions with your professor concerning your internship? Was closer supervision needed? Was more of an orientation required?)

  More hands-on training & longer internship during would improve the experience.

Signature of Student: Khot

Name: Vaishnavi Jitendra Khot

Roll number: 5412

Date: 05/01/2026

- How well were you able to accomplish the initial goals, tasks and new skills that were set down in your learning contract? In what ways were you able to take a new direction or expand beyond your contract? Why were some goals not accomplished adequately?

  I was able to achieve most of the goals & learned several new practical skills.

- In what areas did you most develop and improve?

  I improved my laboratory techniques, communication & practical knowledge.

- What has been the most significant accomplishment or satisfying moment of your internship?

  Successfully performing laboratory experiments independently.

- What did you dislike about the internship?

  Limited time to explore more advanced techniques.

- Considering your overall experience, how would you rate this internship? (Circle one).

  -Satisfactory/ Good/ Excellent

  Excellent

- Give suggestions as to how your internship experience could have been improved. (Could you have handled added responsibility? Would you have liked more discussions with your professor concerning your internship? Was closer supervision needed? Was more of an orientation required?)

  More hands-on training & longer internship during would improve the experience.

Signature of Student: Khot

Name: Vaishnavi Jitendra Khot

Roll number: 5412

Date: 05/01/2026

SUN DIAGNOSTICS
QUALITY RESULTS ASSURED
Registered Under PCPNDT Act, No. 242
NABL Accredited Lab.

DR. YUGANDHAR VIJAY PATIL
Consultant Radiologist
M.D. Radio-Diagnosis
Fellowship in Obstetric Ultrasound (Mediscan, Chennai)
Fetal Medicine Foundation, London (FMF, UK) Certified
International Ovarian Tumor Analysis (IOTA), Europe Certified

DR. SHRIYA YUGANDHAR PATIL
Consultant Oncopathologist
M.D. Pathology

INTERNSHIP CERTIFICATE

Date: 08/01/2026

This is to certify that **Ms. Vaishnavi J Khot**, a student of M.Sc. part 1 Microbiology, Vivekanand College, Kolhapur, has successfully completed an internship in the Microbiology Department at Sun Diagnostics Pathology Laboratory from 16th December to 31st December 2025.

During the internship period, she was exposed to routine microbiology laboratory procedures, sample handling, staining techniques, culture methods, and basic diagnostic practices. Her performance was found to be sincere, disciplined, and satisfactory throughout the training period.

We wish her all the best for his/her future academic and professional endeavors.

Name: Dr. Shriya Patil

Designation: MD Pathology

SUN DIAGNOSTICS KOLHAPUR

Index

About laboratory

Sun diagnostic laboratory situated in Kolhapur. This laboratory is full of equipments and higher facilities. This laboratory provides all types of services at reasonable rate. The result of this laboratory are accurate because the pathology specialist are well trained. All the tests are properly performed in this laboratory. This laboratory is well developed in the Kolhapur. Mostly the all samples are came from sunshine hospital.

This laboratory provides opportunity to freshers, students who are persuing education in microbiology. There is need to know the pathological practice and their facts to students.

This laboratory conducts the histopathological studies, microbiology studies and pathological studies. All the staff are well experienced. This laboratory is assured the quality results.

Infrastructure of pathology lab

A) Pathology laboratory is well equipped with various instruments like incubator, laminar air flow, centrifuge, CBC machine, freeze, autoclave, electrolyte analyzer, electron microscope.

B) Various chemicals, indicators and papers are used-

1) Ethanol
2) Hydrochloric acid
3) Litmus paper
4) Phenol red indicator
5) Phenolphthalein
6) Buffer

Instruments

1) Laminar air flow -

Fig no. 1- Laminar air flow

Laminar Air Flow cabinet is used in microbiology laboratories to provide a sterile working environment by preventing contamination.

A. Principle-

The principle is based on:

i) Laminar Air Movement- Air moves in a uniform, unidirectional flow (parallel layers) without mixing or turbulence. This prevents airborne contamination from entering the work area.

ii) HEPA Filtration- Air passes through a High Efficiency Particulate Air (HEPA) filter. HEPA filter removes 99.97% of particles ≥ 0.3 µm, including bacteria and fungal spores.

B. Working-

The working involves the following steps:

i) Air Intake- Room air is drawn inside through a pre-filter. Pre-filter removes large dust particles.

ii) HEPA Filtration- The air then passes through a HEPA filter, which removes microorganisms and fine particles.

iii) Laminar Air Flow- Filtered sterile air flows:
Horizontally (in horizontal LAF), or
Vertically (in vertical LAF)

iv) Continuous Air Curtain- The constant sterile airflow prevents contaminated air from entering the cabinet.

2) HbA1c machine -

Fig no. 2- HbA1c machine

HbA1c (Glycated Hemoglobin) measures the percentage of hemoglobin that is chemically linked to glucose. It reflects average blood glucose levels for the past 2–3 months.

A.Principle-

HbA1c is formed by non-enzymatic glycation of hemoglobin with glucose. Most commonly measured by HPLC (ion-exchange chromatography) where hemoglobin fractions are separated based on charge difference, and %HbA1c is calculated.

B.Working-

i) EDTA whole blood sample is taken.
ii) RBCs are lysed to release hemoglobin.
iii) Sample passes through chromatography column.
iv) HbA1c separates from other hemoglobin fractions.
v) Detector measures peak areas.
vi) %HbA1c is calculated and displayed.

3) Electrolyte analyzer -

Fig no. 3- Electrolyte analyzer

A.Principle-

Electrolyte analyzer works on the principle of Ion Selective Electrode (ISE).

i) It measures the electrical potential (voltage) developed between a selective electrode and reference electrode.

ii) The voltage produced is proportional to the concentration of specific ions in the sample.

iii) Based on Nernst equation.

It is mainly used to measure:

i) Sodium (Na^+)
ii) Potassium (K^+)
iii) Chloride (Cl^-)
iv) Sometimes Ca^{2+}, Li^+

B.Working-

i) Patient sample (serum/plasma/whole blood) is aspirated.
ii) Sample comes in contact with ion-selective electrodes.
iii) Each electrode is specific for one ion.
iv) The electrode develops electrical potential.
v) Analyzer converts voltage into concentration (mmol/L).
vi) Result is displayed on screen.

4) Sphera-

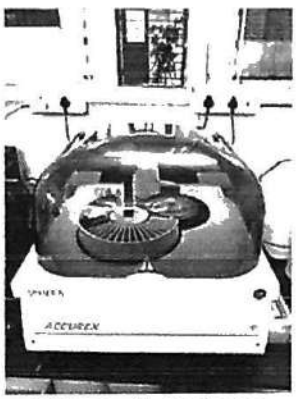

Fig no. 4- Sphera

A.Principle-

Sphera chemistry analyzer works mainly on the principle of:
i) Spectrophotometry (Colorimetry)
It measures the absorbance of light by a colored solution. The concentration of the substance is calculated using Beer-Lambert's law (Absorbance $\propto$ Concentration).
ii) Some tests may also use:
a) Turbidimetry
b) ISE (Ion Selective Electrode) for electrolytes

5) Creatinine-

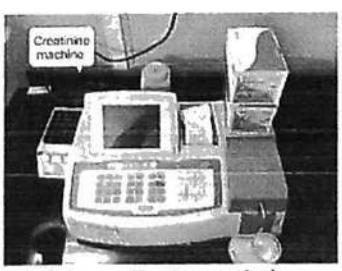

Fig no. 5- Creatinine

A.principle-

Creatinine is commonly estimated by the Jaffe's reaction. In alkaline medium, creatinine reacts with picric acid to form an orange-red colored complex. The intensity of the color produced is directly proportional to the concentration of creatinine in the sample.

6) Celltac α haematology analyzer-

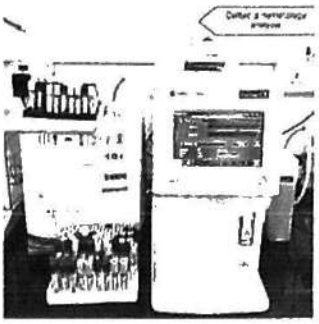

Fig no. 6- Celltac α haematology analyzer

The Celltac Alpha Hematology Analyzer (by Nihon Kohden) is an automated blood cell counter.

A. Principle-

i) Electrical Impedance Principle (Coulter Principle)-

Used for counting RBCs, WBCs, and Platelets. When blood cells pass through a small aperture, they change electrical resistance. The change in resistance is proportional to the number and size of cells.

ii) Non-Cyanide Hemoglobin Method (SLS Method)-

Hemoglobin reacts with Sodium Lauryl Sulfate (SLS). Forms a stable colored complex. The analyzer measures absorbance photometrically to calculate Hb concentration

7) Autoclave-

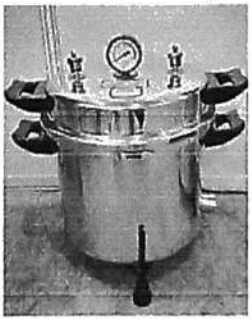

Fig no. 7- Autoclave

A. Principle-

The autoclave works on the principle of moist heat sterilization using steam under pressure.

When water is heated under pressure, its boiling point increases above 100°C.

At increased pressure, steam reaches 121°C at 15 psi, which is sufficient to kill:

Bacteria, Viruses, Fungi, Bacterial spores (like *Bacillus* and *Clostridium*).

B. Working-

Water is heated to produce steam.
Air inside the chamber is removed (because air reduces sterilization efficiency).
Steam under pressure fills the chamber.
High temperature steam coagulates and denatures proteins of microorganisms.
This leads to cell death and complete sterilization.

8) Incubator-

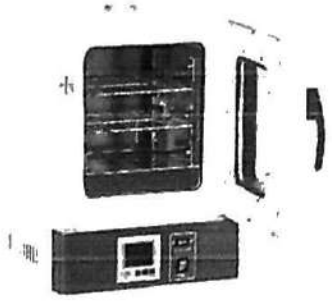

Fig no. 8- Incubator

A. Principle-

An incubator works on the principle of maintaining a controlled temperature environment for the growth of microorganisms.
It keeps a constant temperature (usually 37°C for bacteria) using a thermostat.
The stable temperature provides optimal conditions for microbial growth and metabolism.

9) Centrifuge-

Fig no. 9- Centrifuge

A. Principle-

The principle of a centrifuge is based on sedimentation under the influence of centrifugal force. When a mixture is spun at high speeds, this force—which is many times stronger than gravity—pushes components outward from the center of rotation.

i) Density-Based Separation: Denser and heavier particles experience a greater force, causing them to migrate faster toward the periphery (bottom of the tube).

ii)Buoyancy & Friction: While centrifugal force pulls particles out, they are simultaneously opposed by the buoyancy of the liquid and the frictional force (viscosity) of the medium.

iii) Resulting Layers:

- Pellet: The concentrated, denser material that settles at the bottom.
- Supernatant: The remaining, less dense liquid at the top.

10) Fridge-

Fig no.10- Fridge

A. Principle-

A refrigerator works on the principle of refrigeration cycle, where a refrigerant absorbs heat from inside the fridge during evaporation and releases heat outside during condensation, keeping the inside cool.

B. Working-

i) Compression – The compressor compresses the refrigerant gas, increasing its pressure and temperature.

ii) Condensation – The hot gas passes through condenser coils at the back and releases heat to the surroundings, turning into liquid.

iii) Expansion – The liquid refrigerant passes through an expansion valve, reducing pressure and temperature.

iv) Evaporation – The cold refrigerant absorbs heat from inside the fridge and evaporates into gas again.

11) Microscope-

Fig no.11- Microscope

A. Principle-

A microscope works on the principle of magnification using lenses.
The objective lens forms an enlarged image of the specimen, and the eyepiece lens further magnifies it, making small objects appear larger and clearly visible.

B. Working-

Light passes through (or reflects from) the specimen and enters the objective lens, which forms a magnified image.

C. Types-

i) Light (Optical) Microscopes-
Simple microscope – Uses a single lens
Compound microscope – Uses two lenses (objective + eyepiece)
Stereo microscope – Gives 3D image
Phase contrast microscope – For living cells
Fluorescence microscope – Uses fluorescent dyes

ii) Electron Microscopes-
TEM (Transmission Electron Microscope) – Shows internal structure
SEM (Scanning Electron Microscope) – Shows surface structure

iii) Other Advanced Microscopes-
Confocal microscope
Dark field microscope

12) CBC machine-

Fig no.12- CBC machine

A. Principle-

A CBC (Complete Blood Count) machine works mainly on the Coulter principle (electrical impedance) and sometimes flow cytometry.
In the Coulter principle, blood cells pass through a small aperture, and each cell causes a change in electrical resistance, which is counted.
In flow cytometry, cells are counted and analyzed using laser light scattering.

13) Colorimeter-

Fig no.13- Colorimeter

A. Principle-

A colorimeter works on the Beer–Lambert law, which states that the absorbance of light is directly proportional to the concentration of the colored solution and the path length.

B. Working-

i) A light source produces white light.
ii) A filter selects a specific wavelength (color) of light.
iii) The light passes through the sample solution in a cuvette.
iv) The colored solution absorbs some light and transmits the rest.
v) A photodetector measures the transmitted light.
The instrument calculates absorbance, which is used to determine concentration.

Tests

1) Widal test-

A. Principle-

The Widal test is a serological test used to diagnose enteric fever (typhoid and paratyphoid fever) caused by: *Salmonella typhi, Salmonella paratyphi.*

The Widal test is based on the antigen–antibody agglutination reaction.

When a person is infected with *Salmonella*, the body produces specific antibodies against the bacterial antigens.

If the patient's serum (which contains antibodies) is mixed with known *Salmonella* antigens in the laboratory:

i) Visible clumping (agglutination) occurs

ii) This indicates the presence of antibodies in the patient's blood

B. Types of Antigens Used-

There are two main antigens tested:

i)O Antigen (Somatic antigen)

Found in the cell wall

Produces IgM antibodies

Appears early in infection

Indicates acute infection

ii) H Antigen (Flagellar antigen)

Found in flagella

Produces IgG antibodies

Appears later

Indicates past or current infection

For *Salmonella paratyphi,* similar O and H antigens (AH and BH) are tested.

C.Procedure-

i) Patient serum is collected.

ii) Serial dilutions of serum are prepared.

iii) Known standardized *Salmonella* O and H antigens are added.

iv) The mixture is incubated.

v) Observe for agglutination (clumping).

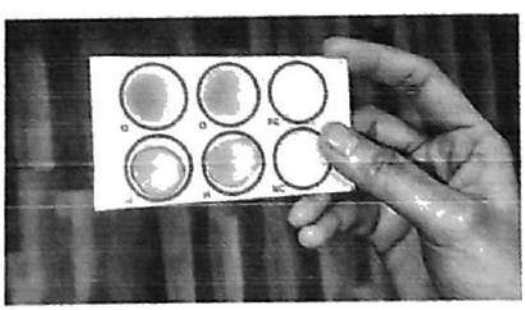

Fig no. 14- Widal test

2) HBs Ag test-

A. Principle-

The HBsAg test is used to detect the presence of *Hepatitis B* surface antigen in blood. It is the main screening test for *Hepatitis B*, a viral infection caused by the *Hepatitis B* virus (HBV) that affects the liver.

The HBsAg test is based on the Antigen–Antibody reaction.

If HBsAg (viral surface antigen) is present in the patient's serum, It reacts with specific anti-HBs antibodies present in the test kit.

This reaction forms an antigen–antibody complex.

The complex is detected by:

i) ELISA method

ii) Rapid immunochromatographic method

iii) CLIA method

B. Types of HBs Ag test-

1) Rapid Card Test (Immunochromatographic Assay)-

i) Quick screening method.

ii) Gives result in 10–20 minutes.

iii) Used in blood banks and clinics.

2) ELISA (Enzyme Linked Immunosorbent Assay)-

i) More sensitive and specific.

ii) Used in laboratories.

3) CLIA (Chemiluminescence Immunoassay)-

i) Highly sensitive.

ii) Used in automated analyzers.

C. Procedure-

i) Collect 2–3 ml venous blood.

ii) Separate serum by centrifugation.

iii) Add 2–3 drops of serum into the sample well of test card.

iv) Wait for 10–15 minutes.

v) Observe result.

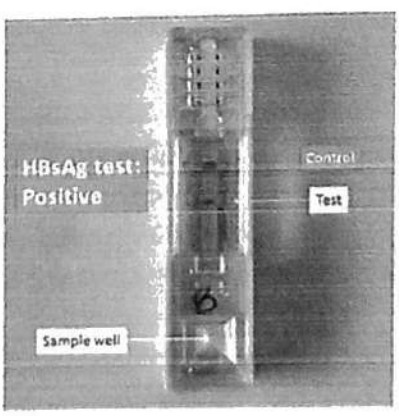

Fig no. 15- HBs Ag test

3) HIV TRI DOT test-

A. Principle-

The HIV TRI-DOT test is a rapid screening test used to detect antibodies against the Human immunodeficiency virus (HIV-1 and HIV-2) in serum or plasma.

It works on the antigen–antibody reaction and immunofiltration (flow-through) technique.

If HIV antibodies are present in the patient's sample, they bind to HIV antigens fixed on the membrane and produce a colored dot.

B. Procedure-

i) Add 2–3 drops of patient serum to the test membrane.
ii) Allow it to absorb.
iii) Add wash buffer.
iv) Add conjugate reagent.
v) Wash again.
vi) Add substrate solution.
vii) Observe colored dots within 5–10 minutes.

Fig no. 16- HIV TRI DOT test

4) HCV TRI DOT test-

A. Principle-

The HCV TRI-DOT test is a rapid screening test used to detect antibodies against the *Hepatitis C* virus (HCV) in serum or plasma. It is used for screening of *Hepatitis C*.

It works on the antigen–antibody reaction and immunofiltration (flow-through) technique.

If anti-HCV antibodies are present in the patient's sample, they bind to HCV antigens coated on the membrane and form a colored dot.

B. Procedure-

i) Collect 2–3 ml venous blood and separate serum/plasma.
ii) Place the TRI-DOT test device on a flat surface.
iii) Add 2–3 drops of patient serum into the sample port (membrane area).
iv) Allow the sample to absorb completely.
v) Add wash buffer to remove unbound materials.
vi) Add conjugate reagent (as provided in kit).
vii) Wash again with buffer.
viii) Add substrate solution.
ix) Observe for colored dot formation within 5–10 minutes.

Fig no. 17- HCV TRI DOT test

5) Haem test-

A. Principle-

Haem test is used to confirm the presence of blood stains in forensic examination.

When blood is treated with glacial acetic acid and sodium chloride and heated, the haemoglobin forms brown rhombic crystals called haemin crystals (Teichmann crystals).

B. Procedure-

i) Take a clean glass slide.
ii) Place a small amount of the suspected blood stain on the slide.
iii) Add 1–2 drops of glacial acetic acid.
iv) Add a small crystal of sodium chloride (NaCl).
v) Cover with a coverslip.
vi) Heat gently over a flame for a few seconds (do not boil).
vii) Allow it to cool.
viii) Examine under the microscope (low power first).

Fig no. 18- Haem test

Biochemical tests

1) Urease test-

The Urease test is a biochemical test used to detect the ability of bacteria to produce the enzyme urease, which breaks down urea into ammonia and carbon dioxide.

A. Principle-

Some bacteria produce the enzyme urease.

Urease hydrolyzes urea into:

Urea + Water Ammonia+ Carbon dioxide

Ammonia makes the medium alkaline (↑ pH). A pH indicator (phenol red) is used. When pH increases, the color changes from yellow/orange to pink.

b. Media use-

Christensen's urea agar

Contains:

i) Urea

ii) Phenol red (pH indicator)

iii) Peptone

iv) Agar

v) Distilled water

c. Procedure-

i) Take Christensen's urea agar slant.

ii) Inoculate the test organism on the slant.

iii) Incubate at 37°C for 18–24 hours.

iv) Observe for color change.

D. Result-

i) Pink color → Urease positive

ii) No color change (yellow/orange) → Urease negative

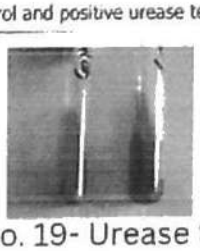

Fig no. 19- Urease test

E. Result interpretation-

Result	Colour	Example of organisms
Positive	Pink	*Proteus* species
Negative	Yellow/ Orange	*E.coli*

2) Citrate utilization test-

The citrate utilization test is a biochemical test used to determine whether a bacterium can use citrate as the sole carbon source and ammonium salts as the sole nitrogen source.

It is mainly used to differentiate members of the family Enterobacteriaceae.

A. Principle-

i) If the organism can utilize citrate:

It converts citrate into alkaline by-products. Ammonium salts are converted into ammonia. The medium becomes alkaline. The pH indicator bromothymol blue changes from green to blue.

ii) If the organism cannot use citrate:

No growth occurs. The medium remains green.

B. Media use-

Simmons Citrate agar

Contains

i) sodium citrate (carbon source)

ii) Ammonium dihydrogen phosphate (nitrogen source)

iii) Bromothymol blue (pH indicator)

iv) Agar

v) Distilled water

C. Procedure-

i) Take a sterile Simmons citrate agar slant.

ii) Inoculate lightly with the test organism using a straight wire (stab and streak method).

iii) Incubate at 37°C for 24–48 hours.

D. Result-

i) Green to blue colour → Citrate utilized.

ii) No color change (Green) → Citrate not utilized.

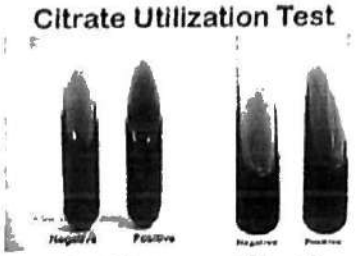

Fig no. 20- Citrate utilization test

E. Result and interpretation-

Result	Colour	Example of organisms
Positive	Green to blue	*Klebsiella, Enterobacter*
Negative	No change (green)	*E.coli*

3) Voges proskeur (vp) test-

Voges–Proskauer (VP) test is a biochemical test used to detect the production of acetoin (acetyl methyl carbinol) from glucose fermentation.

A. Principle-

Some bacteria ferment glucose by the butylene glycol pathway and produce acetoin as an intermediate product.

When α-naphthol and 40% potassium hydroxide (KOH) are added to the culture, acetoin is oxidized to diacetyl, which reacts with peptone in the medium to give a pink/red color.

B. Media use-

MR-VP broth (Glucose phosphate broth)-

Contains

i) Peptone(nitrogen source)

ii) Dextrose (glucose)

iii) Dipotassium phosphate (K_2HPO_4)

iv) Distilled water

C. Procedure-

i) Inoculate MR-VP broth with test organism.

ii) Incubate at 37°C for 24–48 hours.

iii) After incubation add 5 drops of α-naphthol and KOH.

iv) Shake well and keep for 15–30 minutes.

v) Observe for color change.

D. Result-

i) Red colour → VP positive.

ii) No color change (yellow) → VP negative.

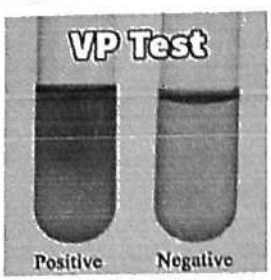

Fig no. 21- VP test

E. Result and interpretation-

Result	Colour	Example of organisms
Positive	Red	*K. Pneumoniae, Enterobacter*
Negative	No change (yellow)	*E.coli*

4) Indole test-

The Indole test is a biochemical test used to determine the ability of bacteria to produce indole from the amino acid tryptophan by the enzyme tryptophanase.
It is mainly used to differentiate members of the family Enterobacteriaceae.

A. Principle-

Some bacteria produce the enzyme tryptophanase, which breaks down tryptophan into:
Indole, pyruvic acid and ammonia.
When Kovac's reagent is added, it reacts with Indole to form a red colored compound (rosindole dye) on the surface.

B. Media use-

Tryptone broth/ Peptone water(rich in tryptophan)-
Contains
i) Tryptone(tryptophan source)
ii) Sodium chloride (maintains osmotic balance)
iii) Distilled water

C. Procedure-

i) Inoculate Tryptone broth with test organism.
ii) Incubate at 37°C for 24–48 hours.
iii) After incubation add few drops of kovac's reagent.
iv) Observe for color change.

D. Result-

i) Red ring at the top → indole positive.
ii) No color change (yellow ring) → indole negative.

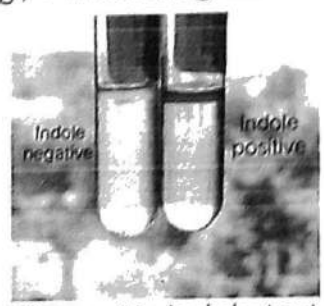

Fig no. 22- Indole test

E. Result and interpretation-

Result	Colour	Example of organisms
Positive	Red ring at the top	*E. coli*
Negative	No change (yellow ring)	*K. Pneumoniae*

Urine Routine Culture

Routine Urine Culture commonly look for urinary tract infection and observe which organisms are causing it.
Along with the urine infection can be detected by using various samples such as fluid, pus, sputum, stool, blood.

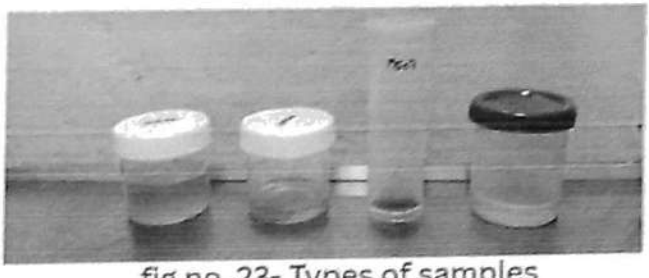

fig no. 23- Types of samples

Urine sample is evaluated in 4 ways-
1) Visual examination
2) Dipstick test
3) Microscopic observation
4) Isolation

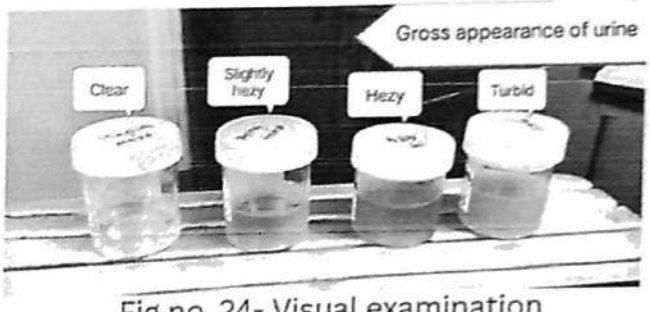

Fig no. 24- Visual examination

Procedure

1st Day-

i) Urine sample is collected and observe for visual examination.

ii) Then all information of that patient is noted down. The consistency, quantity and gross apperance of urine is also noted down.

iii) After that urine sample is observed under microscope by wet mount method.

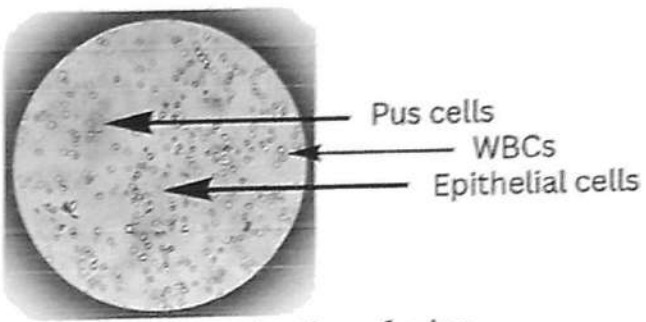

Fig no. 25- Wet mount examination of urine

iv) Simultaneously the urine sample is streaked on blood agar and macconkeys agar plate. Plate is incubate at 37°C for 24hrs.

2nd Day-

i) After incubation the plate is observed for growth of organisms; then organisms are identified by their morphological characters.

ii) Then the growth of organisms are inoculated in biochemical tests like indole test, VP test, citrate test, urease test, triple sugar iron test.

iii) Simultaneously the antibiotic sensitivity test is performed. The growth of organisms are spread on Mueller Hinton (MH) agar and different types of antibiotic discs are placed on that medium.

iv) The biochemical tubes and MH agar plate is incubate at 37°C for 24 hrs.

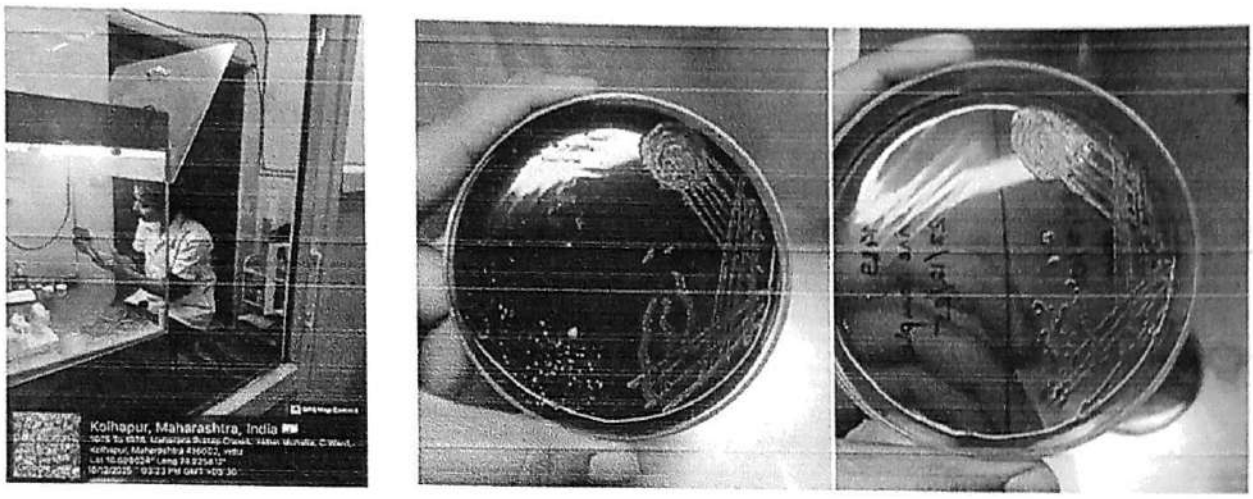

Fig no. 26- Growth of organisms after incubation

3rd day-

i) After sufficient incubation results of biochemical tubes are noted down and detected which type of organisms is present in patient's urine.

ii) The zone of inhibition around the antibiotic discs on the MH agar plate are measured. If the organism is either sensitive or resistant to that particular antibiotic is noted down by using standard Mc Ferland chart.

iii) Then the name of that antibiotics are noted down where organism is sensitive to that particular antibiotics. And report is filled.

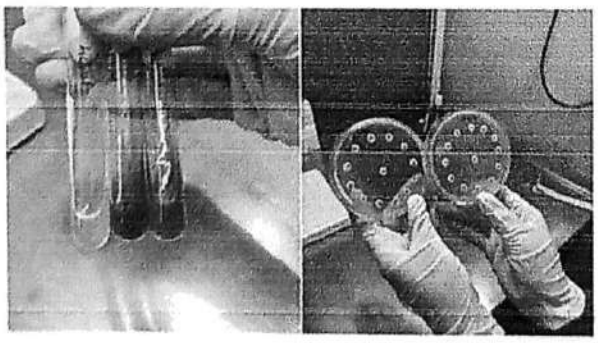

Fig no. 27- Biochemicals and antibiotic sensitivity test before incubation

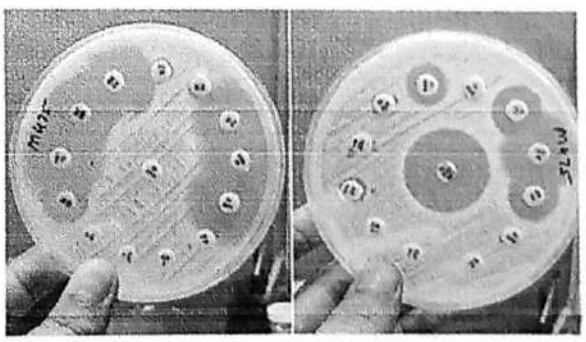

Fig no. 28- Antibiotic sensitivity test after incubation

DR. YUGANDHAR VIJAY PATIL
Consultant Radiologist
M.D. Radio-Diagnosis
Fellowship in Obstetric Ultrasound (Mediscan, Chennai)
Fetal Medicine Foundation, London (FMF, UK) Certified
International Ovarian Tumor Analysis (IOTA), Europe Certified

DR. SHRIYA YUGANDHAR PATIL
Consultant Pathologist
M.D. Pathology

Patient ID	: SUN12528/25	Registered On	: 16-Dec-2025 04 19 PM
Patient Name	**: MS. AYODHYA SHINDE**	Sample Collected On	: 16-Dec-2025 04 27 PM
Age Gender	: 9 Yrs / Female	Sample Reported On	: 18-Dec-2025 02 56 PM
Ref. By	: SELF	Sample ID	
Affiliation	: Self		

CULTURE AND SENSITIVITY

Investigation	Value
CULTURE AND SENSITIVITY	
SPECIMEN	Urine
QUANTITY	5 ml
GROSS APPEARENCE	Clear
GRAM STAIN	Occasional pus cells seen. Occasional epithelial cells seen. Gram positive cocci in pairs seen.
MEDIA USED	Blood Agar, MacConkey's Agar, Mueller Hinton's Agar.
INCUBATION PERIOD	Growth seen after 24 hrs of incubation at 37°C.
ORGANISM ISOLATED	***Enterococcus species***
COLONY COUNT	10 cfu/ml of uncentrifuged urine sample.

Oral & IV Available

Drugs	Zone diameter(mm)	Remark
DOXYCYCLINE	15	Intermediate

Quinolones

Drugs	Zone diameter(mm)	Remark
CIPROFLOXACIN	06	Resistant
LEVOFLOXACIN	06	Resistant
NORFLOXACIN	06	Resistant
GATIFLOXACIN	15	Intermediate

Aminoglycosides

Drugs	Zone diameter(mm)	Remark
HIGH LEVEL GENTAMICIN	06	Resistant

Urinary Antibiotics

Drugs	Zone diameter(mm)	Remark

Dr. Pinaki Patil
MBBS MD (Microbiology)

Dr. Shriya Yugandhar Patil
MD Pathology

NABL ACCREDITED ADVANCED PATHOLOGY LAB
RQC CERTIFIED ADVANCED PATHOLOGY LAB

CT SCAN ULTRASOUND & COLOR DOPPLER X-RAY PATHOLOGY LAB
9922497779 Email : sundiagnosticskop@gmail.com
Unit 1 : 1839 A Ward Near Sai Mandir Rankala Bus Stand Kolhapur-416012
Unit 2 : 'Sun Diagnostics' (Advanced Pathology Lab) F-03 'Business Bay', Near Aditya Corner, Tarabai Park, Kolhapur-416003

SUN DIAGNOSTICS
QUALITY RESULTS ASSURED
Registered Under PCPNDT Act No. 212

DR. YUGANDHAR VIJAY PATIL
Consultant Radiologist
M.D. Radio-Diagnosis
Fellowship in Obstetric Ultrasound (Medscan, Chennai)
Fetal Medicine Foundation, London (FMF, UK) Certified
International Ovarian Tumor Analysis (IOTA), Europe Certified

DR. SHRIYA YUGANDHAR PATIL
Consultant Pathologist
M.D. Pathology

Patient ID	: SUN12528/25	Registered On	: 16-Dec-2025 04:19 PM
Patient Name	: **MS. AYODHYA SHINDE**	Sample Collected On	: 16-Dec-2025 04:27 PM
Age/Gender	: 9 Yrs / Female	Sample Reported On	: 18-Dec-2025 02:56 PM
Ref. By	: SELF	Sample ID	
Affiliation	: Self		

CULTURE AND SENSITIVITY

Investigation	Value	
NITROFURANTOIN	**22**	**Sensitive**

Other Antibiotics

Drugs	Zone diameter(mm)	Remark
CHLORAMPHENICOL	**27**	**Sensitive**
FOSFOMYCIN	**18**	**Sensitive**
TETRACYCLINE	10	Resistant
MINOCYCLINE	**20**	**Sensitive**
AMPICILLIN	06	Resistant
VANCOMYCIN	**25**	**Sensitive**
TEICOPLANIN	**21**	**Sensitive**
LINEZOLID	**28**	**Sensitive**
ERYTHROMYCIN	06	Resistant

TEST METHOD **In-Vitro Sensitivity by KIRBY BAUER Disc Diffusion Method.**

Dr. Pinaki Patil
MBBS, MD.(Microbiology)

Dr. Shriya Yugandhar Patil
MD Pathology

NABL ACCREDITED ADVANCED PATHOLOGY LAB
ROC CERTIFIED ADVANCED PATHOLOGY LAB

CT SCAN ULTRASOUND & COLOR DOPPLER X-RAY PATHOLOGY LAB
(C) 9922497779 Email : sundiagnosticskop@gmail.com
Unit 1 : 1839, 'A' Ward, Near Sai Mandir, Rankala Bus Stand, Kolhapur-416012
Unit 2 : 'Sun Diagnostics' (Advanced Pathology Lab) F-03, 'Business Bay', Near Aditya Corner, Tarabai Park, Kolhapur-416003

Laboratory safety

Laboratory safety refers to the rules and precautions followed in a laboratory to prevent accidents, injuries, and damage while performing experiments. It ensures the safe handling of chemicals, equipment, and biological materials. Following proper safety guidelines helps protect students, researchers, and the laboratory environment.

Fig no. 26- Laboratory safety rules

1) Wear Safety Goggles: Always wear goggles to protect your eyes from chemical splashes or debris.
2) Wear a Lab Coat: A lab coat protects your clothes and skin from harmful chemicals.
3) Tie Back Long Hair: Long hair should be tied back to avoid contact with chemicals or flames.
4) No Food or Drink: Do not eat or drink in the laboratory to prevent accidental ingestion of chemicals.
5) No Horseplay: Do not run, joke, or play in the lab because it can cause accidents.
6) Don't Touch Your Face: Avoid touching your face, eyes, or mouth with contaminated hands.
7) Waft to Smell: If you need to smell a chemical, gently fan the smell toward your nose instead of smelling it directly.
8) Report All Accidents: Immediately inform the teacher or supervisor about any injury, spill, or broken equipment.
9) Be Careful with Flames: Be very cautious when working near open flames or flammable materials.
10) eep Area Tidy: Always keep your work area clean and organized to prevent accidents.

Laboratory waste management

Waste management is the process of collecting, treating, and disposing of waste materials in a safe and environmentally friendly way. It helps reduce pollution, protect human health, and conserve natural resources. Proper waste management includes reducing, reusing, recycling, and safe disposal of waste.

Fig no. 27- Laboratory waste management

1) **Glass (Green Bin):** This bin is for glass materials, which are highly recyclable.
2) **E-Waste (Blue Bin):** This bin is for electronic waste, which often contains hazardous materials and requires specialized disposal methods.
3) **Metal (Red Bin):** This bin is for various metal items, which are valuable recyclable materials.
4) **Paper (Yellow Bin):** This bin is for paper products and cardboard, which can be converted into new products.
5) **Plastic (Orange Bin):** This bin is for plastic waste, which is non-biodegradable and must be managed properly to prevent pollution.
6) **Organic (Grey Bin):** This bin is for organic waste such as food scraps and garden waste, which can be composted.

Learning outcomes from training

During our pathology laboratory training, we gained practical knowledge about various laboratory procedures and biochemical tests. We learned the importance of maintaining hygiene, safety, and accuracy while working in a laboratory. We also developed skills in handling laboratory equipment and preparing samples for testing.

Through this training, we understood different laboratory tests such as blood grouping, hemoglobin (HB), blood sugar, CBC, Hb A1c test, HCV test, urine examination, and semen analysis.

The training improved our observation skills, problem-solving ability, and understanding of laboratory protocols. It also helped us to learn the importance of teamwork, communication, and responsibility in a clinical laboratory environment.

Overall, this training provided valuable practical experience and increased our interest and confidence in the field of clinical laboratory science.