



# URINE ANALYSIS UJGT MODULE LAB 1 2022-2023

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# Routine Urine Culture

## Urine:

- Urine carries waste products and excess water out of the body.
- Normal urine is typically pale yellow and clear.
- Obvious abnormalities in the color, clarity, and cloudiness may suggest different diseases.



**Normal Urine**



**Abnormal Urine**

# Routine Urine Culture

## Aim of the test

- An etiological diagnosis of bacterial urinary tract infection with identification and susceptibility test of the isolated bacteria(s).

## Types of specimen

- Urine (Midstream urine), suprapubic aspiration, catheterized urine.  
✗**Note:** First morning specimens yield highest bacterial counts from overnight incubation in the bladder, and are the best specimens.

## Criteria of specimen rejection

- Un-refrigerated specimen older than **2 hours** may be subject to overgrowth and may not yield valid results; unlabeled specimen; mislabeled specimen; specimen in expired transport container; 24 hours urine specimens.

# Urine Analysis

Specimen Collection

Transportation

Processing

Nonculture Methods

Culture Methods

→ Urine macroscopic analysis

→ Urine microscopic analysis

→ Microscopic hematuria & pyuria

→ Detection of pyuria by leukocyte esterase tests

→ Detection of bacteriuria by nitrite test

## Specimen Collection

### Patient preparing

-Collection of midstream urine for investigation:

☑ Patient not needing assistance:

- ✗ Give the patient a suitable container.
- ✗ Instruct the patient to collect the midstream urine .
- ✗ Tell the patient not to touch the inside or rim of the container.
- ✗ Tell the patient to close the container properly.





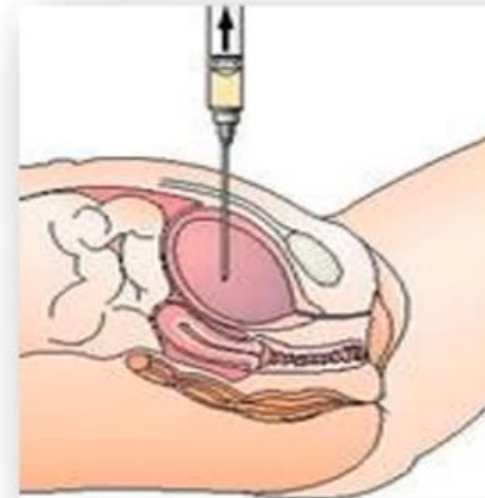
## Specimen Collection

### Who will collect the specimen

- Midstream urine is collected by the patient.
- If disabled, nursing staff will assist in collection.
- For catheterized specimen, nursing staff will collect the specimen.
- Suprapubic aspiration is performed by the physician.

### Quantity of specimen

To fill line in transport tube (~20 mL).



Suprapubic aspiration

## Transportation

### Time relapse before processing the sample

The maximum time allowed for processing a urine sample is **2 hours** from the time of collection.

### Storage

At room temperature unless delay is inevitable; it must be refrigerated or mixed with preservative like boric acid.

## Processing- Nonculture Methods

### Macroscopic Urinalysis

Macroscopic examination used to view elements that are visible by naked eye.

**1- Hematuria:** is the presence of abnormal numbers of red cells in urine due to:

- a. Glomerular damage.
- b. Tumors.
- c. Urinary tract stones.
- d. Upper and lower urinary tract infections.



## Processing- Nonculture Methods

# Macroscopic Urinalysis

## Hematuria

### Two Types of Hematuria

- **Gross hematuria:** means that the blood can be seen by the naked eye. The urine may look pinkish, brownish, or bright red.



**Gross  
Hematuria**

## Processing- Nonculture Methods

### Macroscopic Urinalysis

#### 2- Hemoglobinuria:

- Presence of hemoglobin in urine due to rupturing of RBCs
- This may occur in malaria, typhoid, yellow fever, hemolytic jaundice and other diseases.



## Processing- Nonculture Methods

### Macroscopic Urinalysis

#### 3- Pyuria :

Refers to the presence of abnormal numbers of leukocytes that may appear with infection in either the upper or lower urinary tract or with acute glomerulonephritis.



## Processing- Nonculture Methods

# Microscopic Urinalysis

## Microscopic hematuria & pyuria

Microscopic hematuria & pyuria means that the urine is clear, but RBCs and WBCs can be seen only under a microscope.

**Pyuria:** refers to urine which contains pus cells granulocytes.

Normal values:

- Men: <2 WBCs per high power field
- Women: <5

**Normal values for RBCs in urine:**

4 RBCs per high power field (RBC/HPF).



**Microscopic Hematuria**

## Processing- Nonculture Methods

# Microscopic Urinalysis

## Microscopic hematuria & pyuria

### Reporting:

WBC count recorded as:

<10/ml

10-100/ml

100-500/ml

>500/ml

Other findings may be recorded as:

-/+ = Scanty

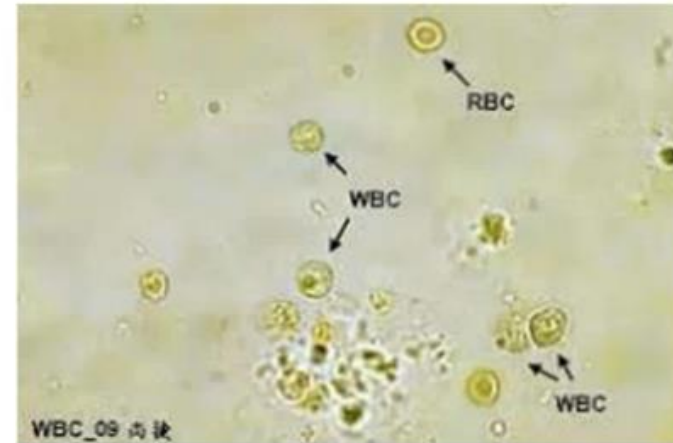
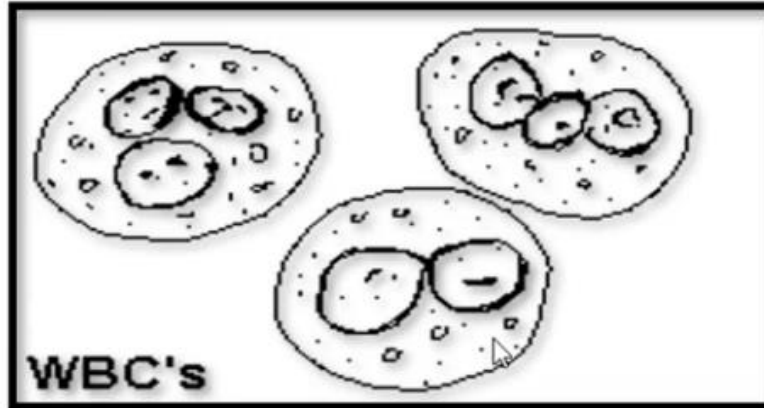
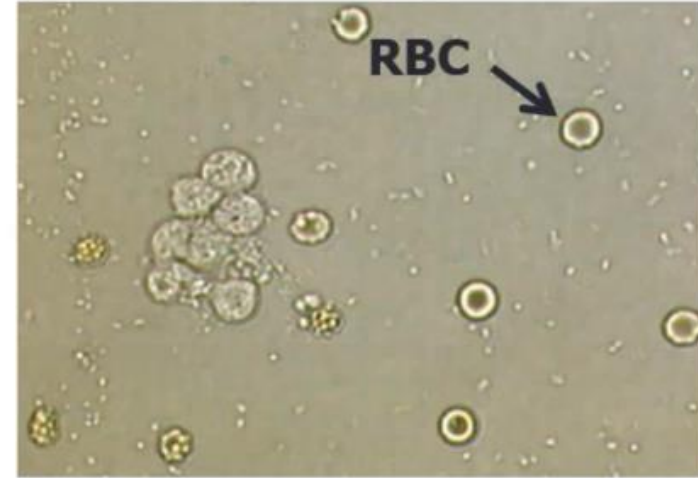
+ = Few

++ = Moderate

+++ = Many



# WBCs and RBCs in Urine



**RBCs in urine**

These white blood cells in urine have lobed nuclei and refractile cytoplasmic granules.

## Processing- Nonculture Methods

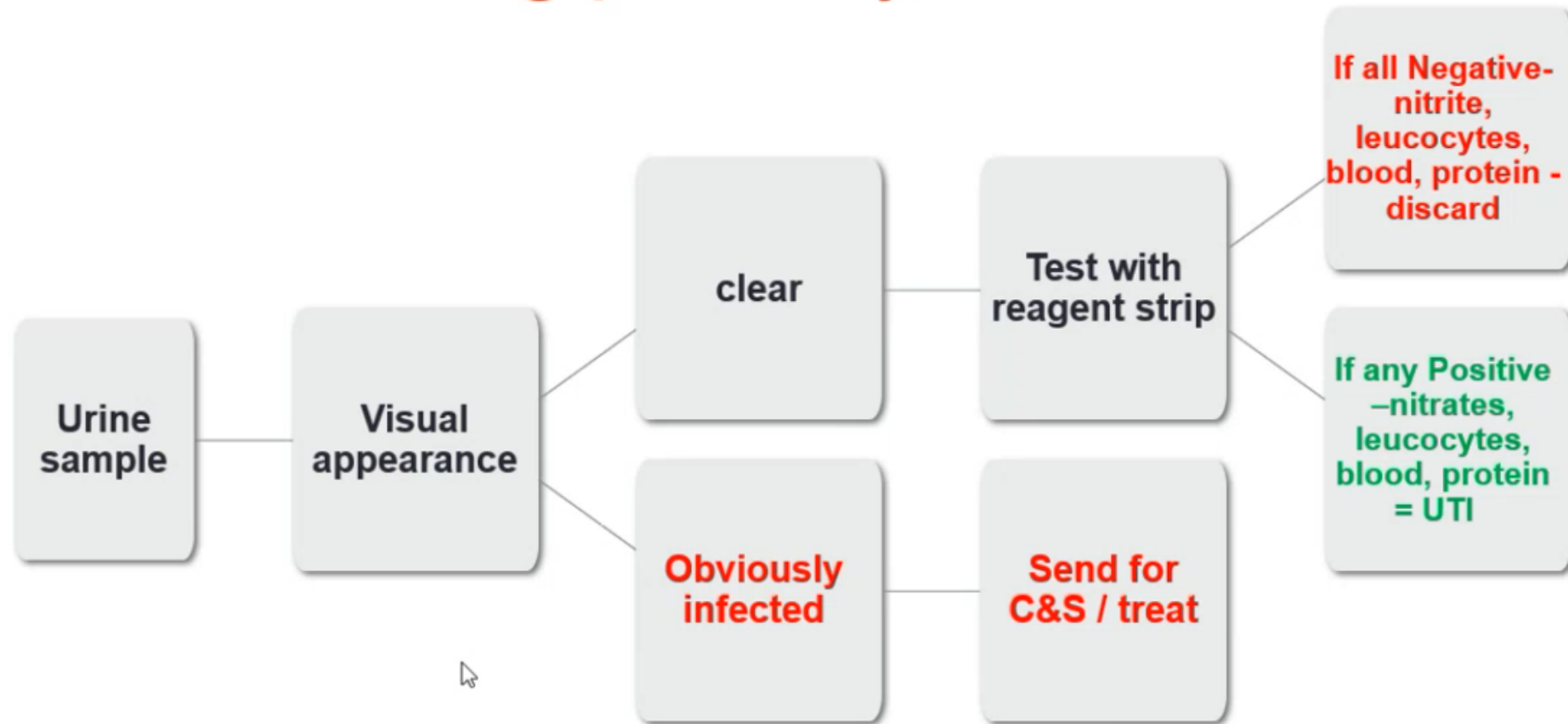
### Microscopic Urinalysis

#### Bacteria

- Bacteria are common in urine specimens (from contamination).
- Therefore, micorganisms in carefully collected urines should be interpreted in view of clinical symptoms.



# UTI testing pathway



## Processing- Nonculture Methods

### Detection of bacteriuria by nitrite test

- Used for screening for **bacteria**.
- Normal urine contain nitrate but not nitrites.
- In the presence of bacteria, the normally present nitrate in the urine is reduced to nitrite.

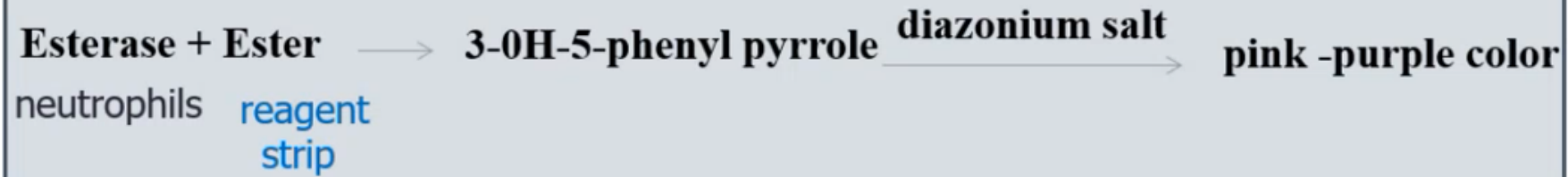


- Positive test indicates presence of more than 10 organisms/ml.
- Detected by **dipstick chemical analysis**

## Processing- Nonculture Methods

### Detection of pyuria by leukocyte esterase tests

-Depends on esterase method:







+ve result: means more than 5 leucocytes/hpf. (high power field)

-Detected by dipstick chemical analysis



# Dipstick chemical analysis

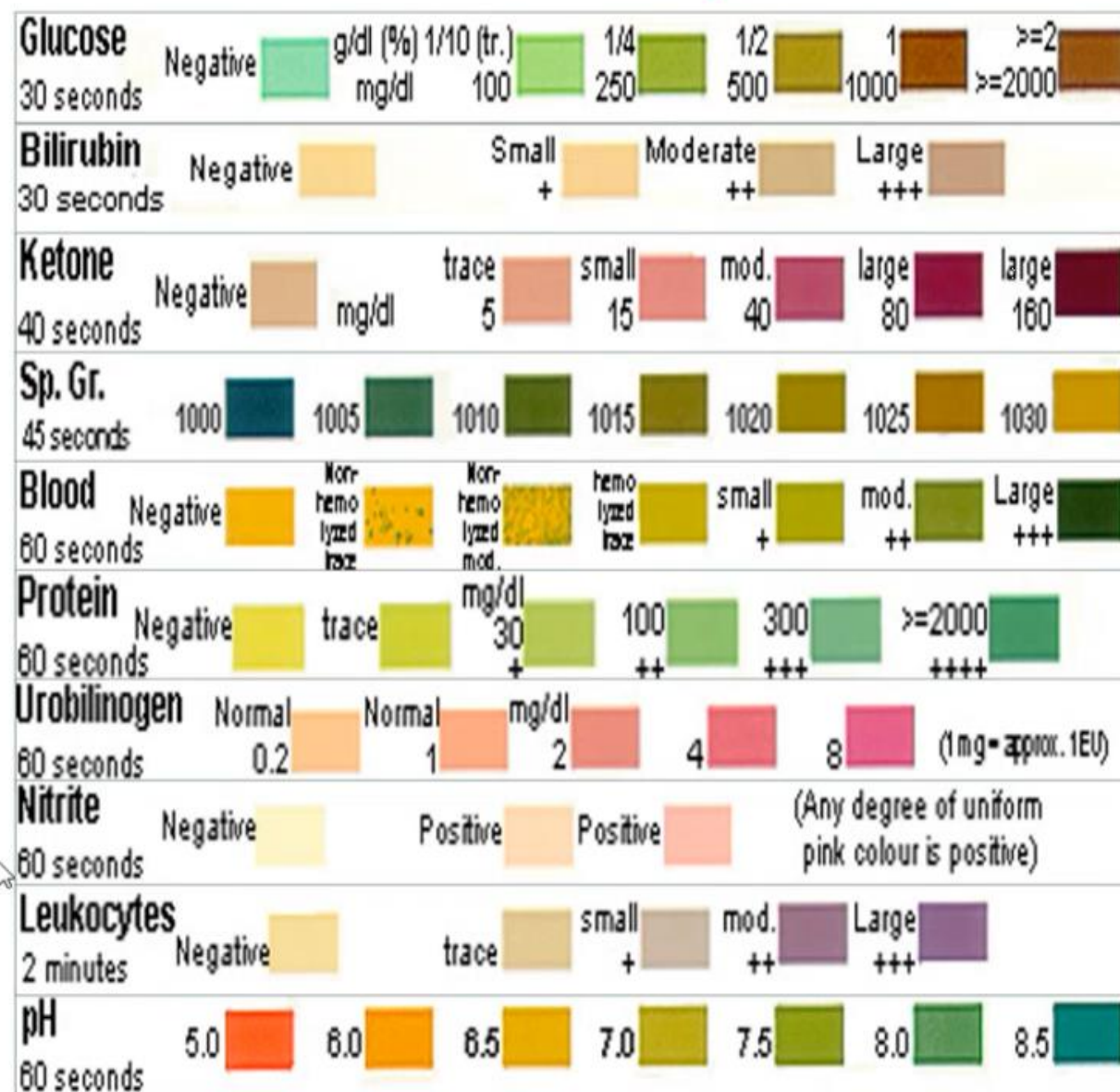
The squares on the dipstick represent the following components in the urine

|   |                           |
|---|---------------------------|
|    | <b>Glucose</b>            |
|    | <b>Bilirubin</b>          |
|    | <b>Ketones</b>            |
|    | <b>Specific Gravity</b>   |
|   | <b>Blood</b>              |
|  | <b>pH</b>                 |
|  | <b>Protein</b>            |
|  | <b>Urobilinogen</b>       |
|  | <b>Nitrite</b>            |
|  | <b>Leukocyte Esterase</b> |



# Dipstick chemical analysis

- Glucose
- Bilirubin
- Ketone
- Specific Gravity
- Blood
- Protein
- Urobilinogen
- Nitrite
- Leukocyte
- pH



## Dipstick chemical analysis

### leukocyte esterase tests



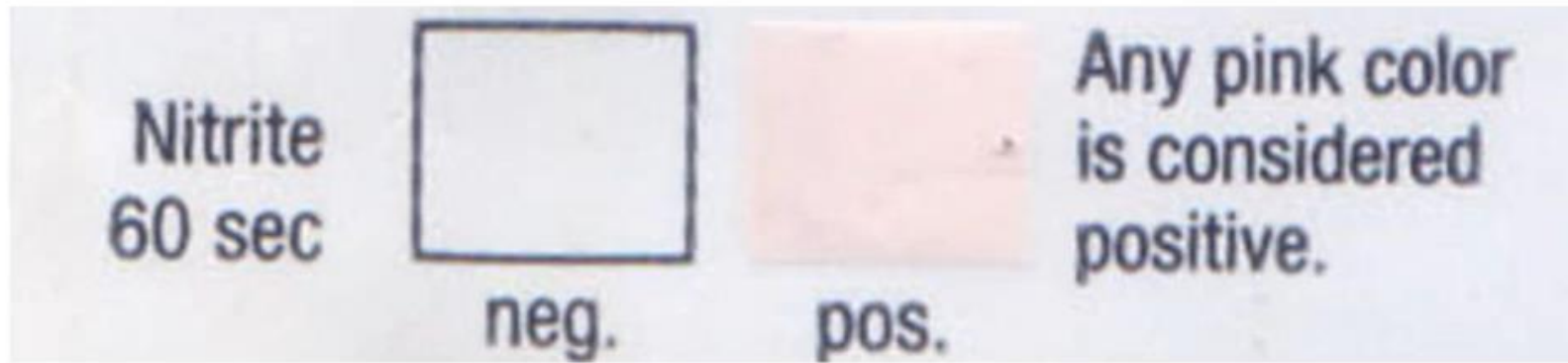
**Leukocytes:** Indicates infection or inflammation

**Normal = negative**

- **Pyuria:** Leukocytes in urine
- **Cystitis:** Bladder infection
- **Pyelonephritis:** Kidney infection

# Dipstick chemical analysis

## Nitrite test



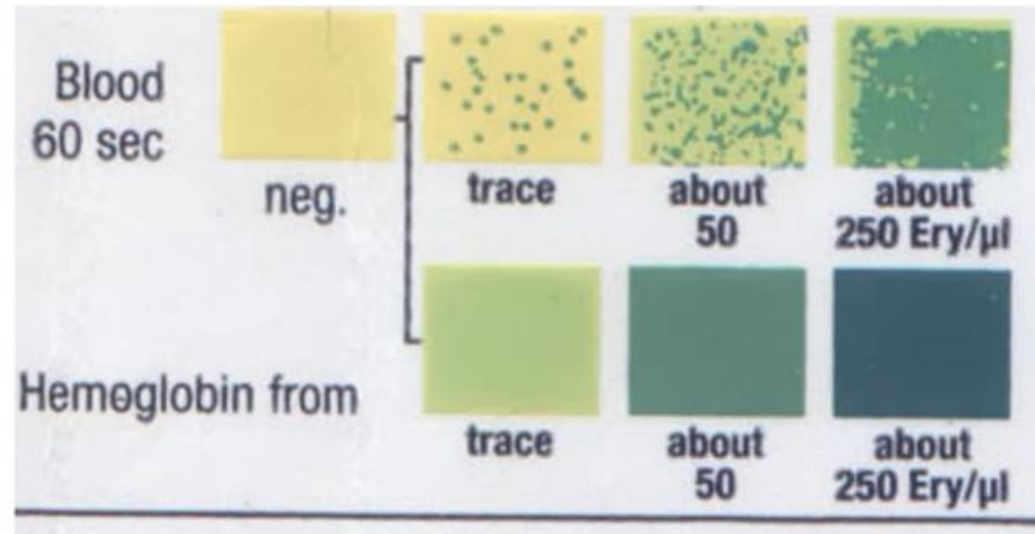
Normal = negative



# Dipstick chemical analysis

## Dipstick Urinalysis Interpretation- Blood

**Blood:** Almost always indicates pathology because RBC are too large to pass through glomerulus



### Normal=negative

- Hematuria: Blood in urine
- Possible causes: Kidney stone, infection, tumor
- **Caution:** Very common finding in women because of menstruation.



## الخدمات الطبية الملكية

مستشفى : .....

فحص البول  
URINALYSIS

اسم المريض الكامل : .....

الرقم الطبي : ..... الخانة : .....

الرقم الوطني :

الرتبة : ..... انثى  ذكر

العمر : ..... متزوج  أعزب

| التاريخ الطلب :  | القسم / العيادة :           | اسم و توقيع الطبيب المشرف : | التاريخ : |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
|--|-----------------------------|-----------------------------|-----------|---------|-----|-------|-----|---------------|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|------|--------|------------------------|--|---------|-----|---------|-----|-------|--|----------|--|----------------|--|
| Diagnosis & Relevant Information :   |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| <table border="1"> <thead> <tr> <th>Test</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Albumin</td> <td>NIL</td> </tr> <tr> <td>Sugar</td> <td>NIL</td> </tr> <tr> <td>Other Tests :</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table> |                             | Test                        | Result    | Albumin | NIL | Sugar | NIL | Other Tests : |  |  |  |  |  |  |  |  |  |  |  |  |  | <table border="1"> <thead> <tr> <th>Test</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Microscopic sediment :</td> <td></td> </tr> <tr> <td>R. B. C</td> <td>0-1</td> </tr> <tr> <td>W. B. C</td> <td>0-1</td> </tr> <tr> <td>casts</td> <td></td> </tr> <tr> <td>Crystals</td> <td></td> </tr> <tr> <td>Other Findings</td> <td></td> </tr> </tbody> </table> |  | Test | Result | Microscopic sediment : |  | R. B. C | 0-1 | W. B. C | 0-1 | casts |  | Crystals |  | Other Findings |  |
| Test   | Result                      |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| Albumin  | NIL                         |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| Sugar  | NIL                         |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| Other Tests :  |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
|  |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
|  |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
|  |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
|  |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
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| Test   | Result                      |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| Microscopic sediment :   |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| R. B. C  | 0-1                         |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| W. B. C  | 0-1                         |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| casts  |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| Crystals   |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| Other Findings   |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| Comments :   |                             |                             |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |
| التسليم :  | اسم و توقيع الطبيب المشرف : | اسم و توقيع طبيب المختبر :  |           |         |     |       |     |               |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |      |        |                        |  |         |     |         |     |       |  |          |  |                |  |

## الخدمات الطبية الملكية

مستشفى : \_\_\_\_\_

فحص البول  
URINALYSIS

اسم المريض الكامل : \_\_\_\_\_

الرقم الطبي : \_\_\_\_\_

الغرفة : \_\_\_\_\_

الرقم الوطني :            الجنس :  ذكر  أنثىالعمر :  أعزب  متزوج

| شرح الطلب :                        | القسم / العيادة :    | اسم و توقيع الطبيب المشرف : | التاريخ : |
|------------------------------------|----------------------|-----------------------------|-----------|
| Diagnosis & Relevant Information : |                      |                             |           |
| Test                               | Result               | Test                        | Result    |
| Albumin                            | Nil                  | Microscopic sediment :      |           |
| Sugar                              | Nil                  | R. B. C                     | 4-6       |
| Other Tests :                      |                      | W. B. C                     | 8-10      |
|                                    |                      | casts                       |           |
|                                    |                      | Crystals                    |           |
|                                    |                      | Other Findings              |           |
| Comments :                         |                      |                             |           |
| اسم و توقيع الطبيب المختبر :       | اسم و توقيع المشرف : | التاريخ :                   | التعليق : |

## الخدمات الطبية الملكية

مستشفى : .....

فحص البول  
URINALYSIS

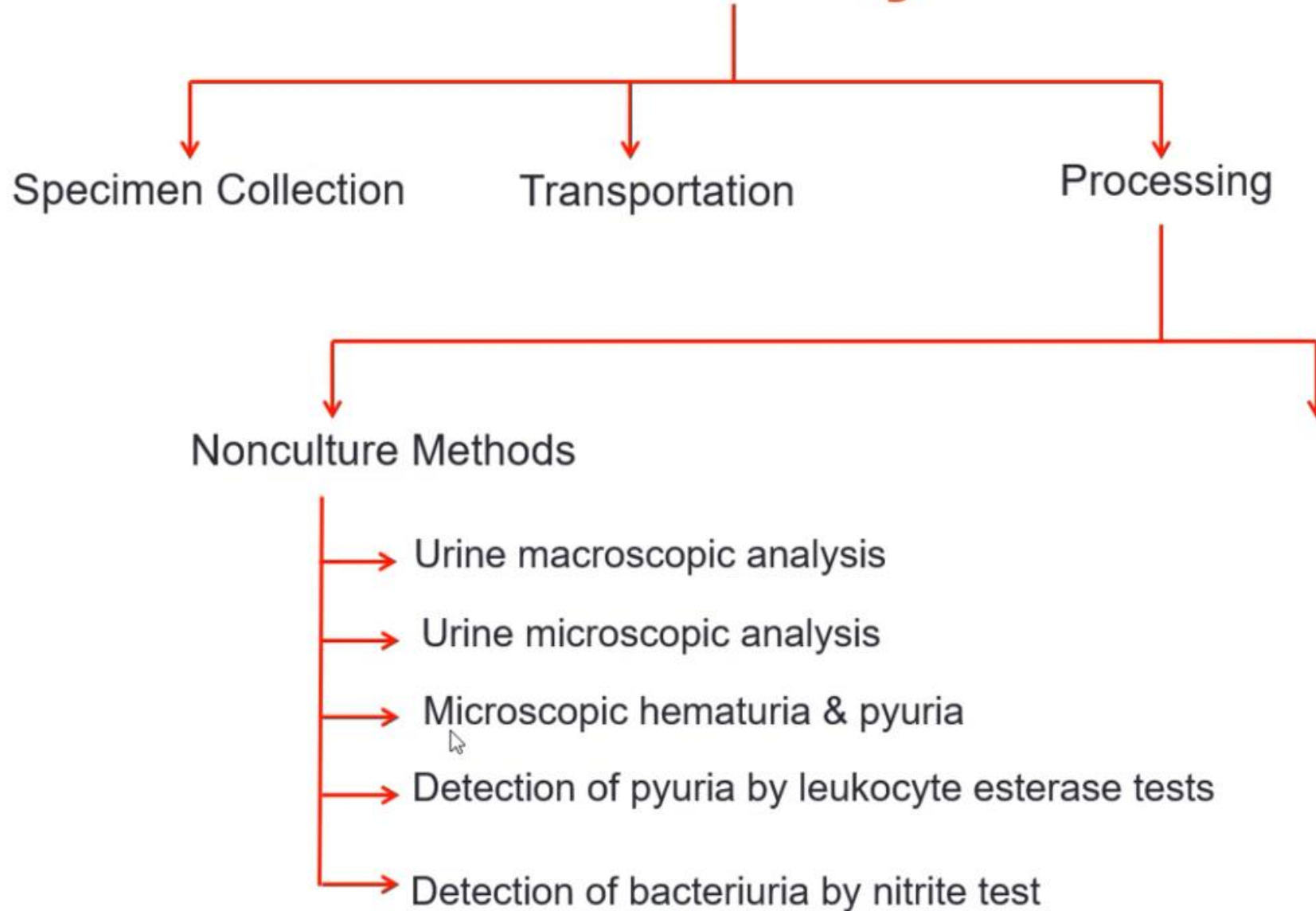
اسم المريض الكامل : .....

الرقم الطبي : ..... الفئة : .....

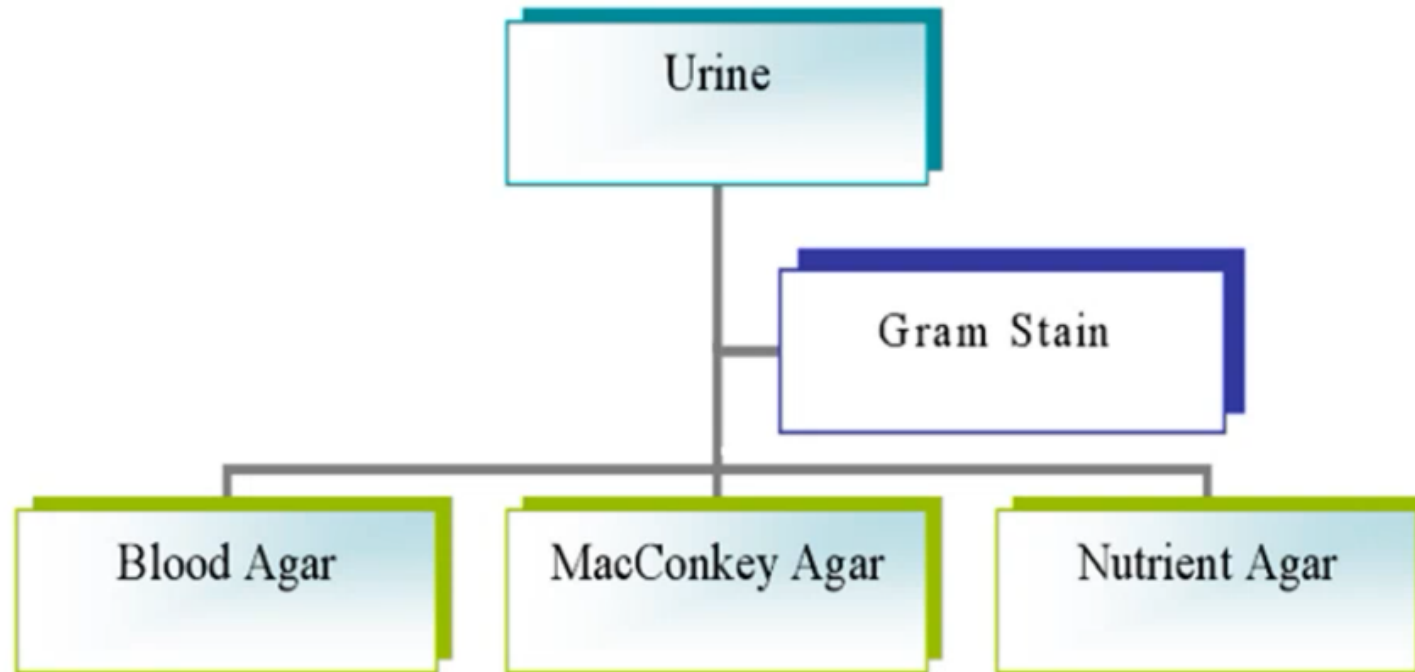
الرقم الوطني : الرتبة : ..... انثى  ذكر العمر : ..... متزوج  أعزب 

|                                    |                   |                             |                            |
|------------------------------------|-------------------|-----------------------------|----------------------------|
| التاريخ الطيب :                    | القسم / العيادة : | اسم وتوقيع الطبيب المشرف :  | الطبيب الاختصاصي :         |
| Diagnosis & Relevant Information : |                   |                             |                            |
| Test                               | Result            | Test                        | Result                     |
| Albumin                            | + (1)             | Microscopic sediment :      |                            |
| Sugar                              | + + (2)           | R. B. C                     | 8-10                       |
| Other Tests :                      |                   | W. B. C                     | 8-20                       |
|                                    |                   | casts                       |                            |
|                                    |                   | Crystals                    | ca <sup>2+</sup> oxalate   |
|                                    |                   | Other Findings              |                            |
| Comments :                         |                   |                             |                            |
| التسلسل :                          | التاريخ :         | اسم و توقيع الطبيب المشرف : | اسم و توقيع طبيب المختبر : |

# Urine Analysis

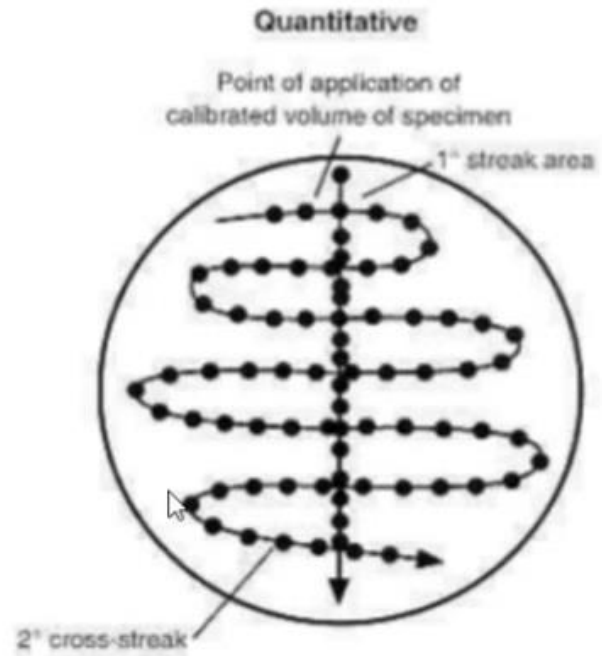
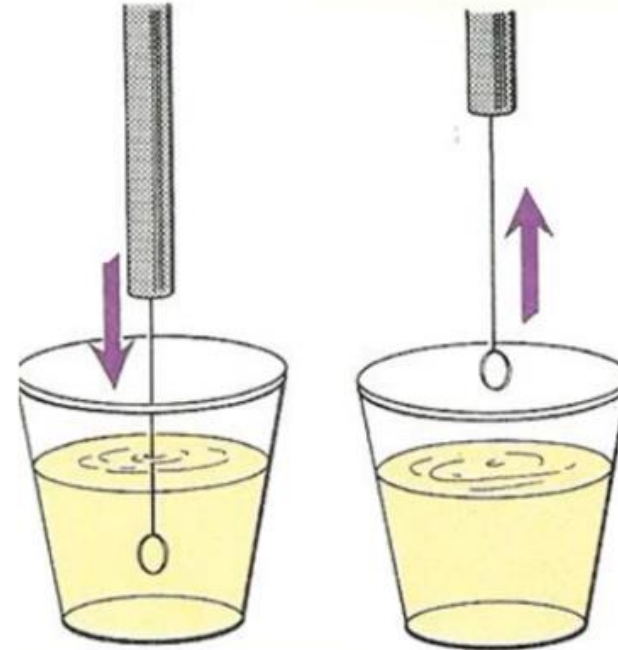
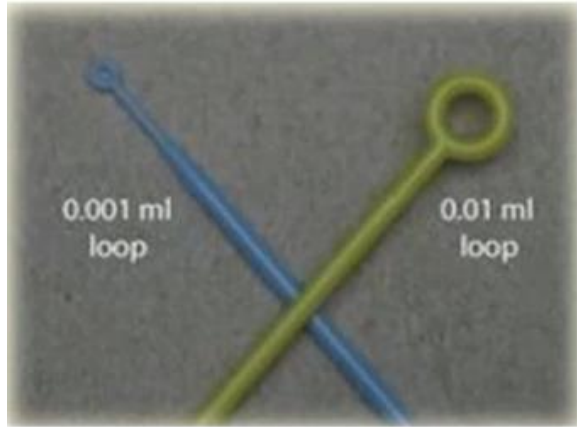


# Urine Analysis





# Culture of urine sample



# General Criteria to Diagnose UTI

## **Suprapubic Aspiration:**

Any growth.

## **Catheterization:**

Greater than 100 colony forming units/ml.

## **Midstream Clean Catch:**

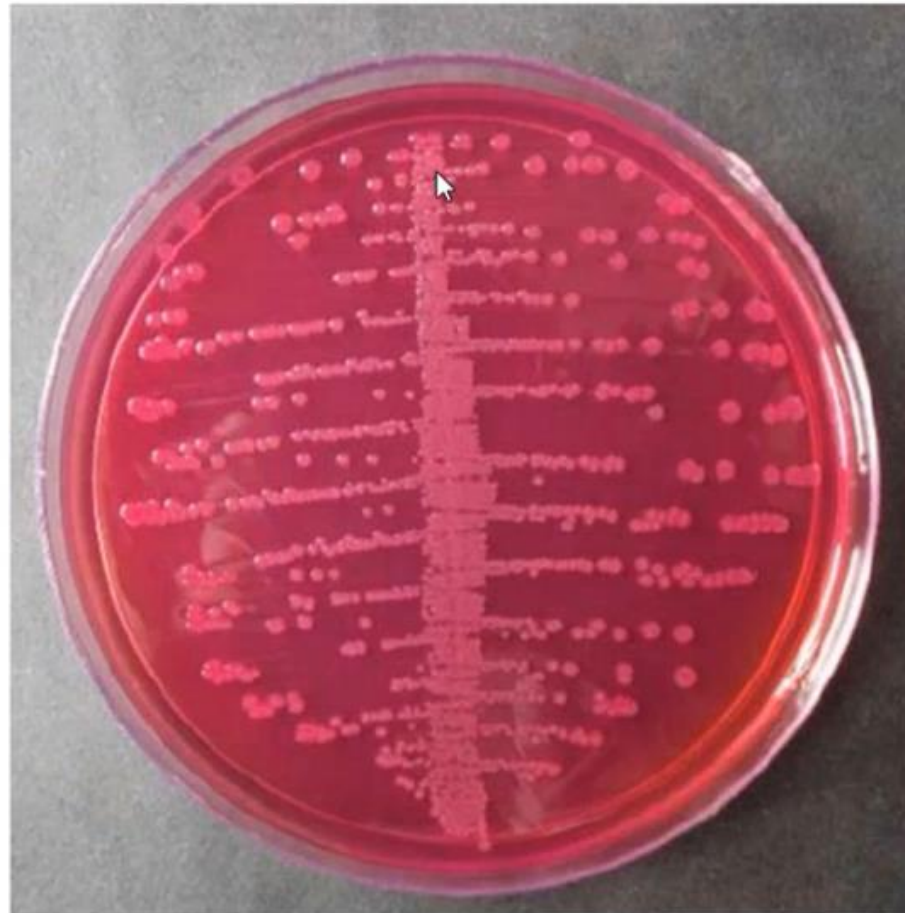
Greater than 100,000 colony forming units/ml.



# Urine Analysis

## Culture Methods

- Significant Growth of E. coli in MacConkey Agar



الخدمات الطبية الملكية

مستشفى : \_\_\_\_\_

فحص الأحياء الدقيقة

MICROBIOLOGY

اسم المريض الكامل : \_\_\_\_\_

الرقم الطبي : \_\_\_\_\_ الفئة : \_\_\_\_\_

الرقم الوطني :

الرتبة :  أنثى  ذكر

العمر :  متزوج  أعزب

|                           |                     |  |                 |
|---------------------------|---------------------|--|-----------------|
| تاريخ الطلب:              | القسم/العيادة :     | اسم وتوقيع الطبيب المشرف :               | التخصص :        |
| Diagnosis :               |                     | Type & Source of Specimen:               | Test Requested: |
| Sensitivity Test          |                     | For Lab. Use                             |                 |
| Sensitive                 | Resistant           | Result :<br>E. coli<br>> 10 <sup>5</sup> |                 |
| Aug                       | Am                  |  |                 |
| TaO <sub>2</sub>          | GN                  |  |                 |
| AK                        | NA                  |  |                 |
| CIP                       | SXT                 |  |                 |
| Ofx                       |                     |  |                 |
|                           |                     |  |                 |
|                           |                     |  |                 |
|                           |                     |  |                 |
|                           |                     |  |                 |
| اسم وتوقيع طبيب المختبر : | اسم وتوقيع المشرف : | التاريخ :                                | التسلسل :       |

## Pathogens and commensals

| Common pathogens  | Commensal flora                         |
|---|---|
| <i>Neisseria gonorrhoeae</i> any colony on chocolate or TM agar (special request).          | <i>Diphtheroid bacilli</i>              |
| <i>E.coli</i> and other <i>Enterobacteriaceae</i>   | <i>Lactobacillus spp</i>                |
| <i>Enterococcus spp</i>   | <i>Coagulase negative Staphylococci</i> |
| * <b><i>Staphylococcus aureus</i></b><br><b>Pure culture regardless to the no. of CFUs.</b> | <i>Alpha Haemolytic Streptococci</i>    |
| <i>Staph saprophyticus</i>  | <i>Bacillus spp</i>                     |
| <i>Corynebacterium jeikeium</i>   | <i>Non pathogenic Neisseria spp.</i>    |
| <i>Acinetobacter spp</i>  | <i>Anaerobic cocci</i>                  |
| <i>Pseudomonas spp</i>  | <i>Commensal Mycobacterium</i>          |
| * <i>Gardnerella vaginalis</i> <b>Unusual</b>   | <i>Commensal Mycoplasma spp.</i>        |
| <i>Beta -haemolytic streptococci</i>  |   |
| * <b><i>Salmonella spp</i> (early stage of infection)</b>                                   | * <b>yeast</b>                          |
| <b>Parasites</b>  |   |
| <i>Schistosoma haematobium</i>  |   |
| <i>Trichomonas vaginalis</i>  |   |

\* Diagnostic Microbiology, BAILEY & SCOTT, 9<sup>th</sup>

EDITION