



King Saud University  
College of Medicine  
Department of Pathology  
Clinical Biochemistry unit

# BIOCHEMISTRY PRACTICAL CLASS

RENAL SYSTEM BLOCK

FIRST YEAR

## URINALYSIS

STUDENT'S HANDOUT

# Urinalysis

## Objectives of the Practical Class

It is expected that by the end of this practical class, students should be able to:

1. Understand the physical and chemical of urine in health and disease
2. Perform urinalysis using Dipsticks.
3. Recognize the value of urinalysis as a tool for diagnosis of diseases e.g. metabolic diseases, kidney disorders and for urinary tract infections (UTIs).
4. Interpret the results of urinalysis and correlate it with the patient's clinical findings.

## Plan of work:

1. The handout will be distributed and a presentation about urinalysis will be given for (20 minutes).
2. Hands-on practical for urinalysis using (dipstick) will be conducted for about (20 minutes) for 3 different urine samples.
3. Students will be asked to record their results in the urinalysis report sheet provided in the handout, commenting on both physical and chemical properties of urine.
4. Sign for attendance.

## Venue:

Clinical Chemistry Lab. (1st floor)  
Teaching Lab (1) & Lab (1)

## Urinalysis using dipstick

### Principle:

Dipsticks are plastic strips impregnated with chemical reagents which react with specific substances in the urine to produce color-coded visual results. They provide quick determination of pH, protein, glucose, ketone, urobilinogen, bilirubin, blood, hemoglobin, nitrite, and specific gravity. The intensity of the color produced relates to the concentration of the substance in urine.

Color controls are provided against which the actual color produced by the urine sample can be compared. The reaction times of the impregnated chemicals are standardized.

### Experimental design:

A- Carefully read the attached case scenario.

B- Perform the following procedure for the provided urine samples:

- 1- Dip the strip in the urine sample provided then remove it immediately.
- 2- Remove the excess urine and keep the strip in a horizontal position.
- 3- Read the color produced within 30-60 seconds (Color changes after 2 minutes are of no significance).
- 4- Match the color changes to the color scale provided.
- 5- Give a full report about:
  - Physical examination.
  - Chemical examination.

## Case I

A 12-year-old girl, a known patient with type 1 diabetes mellitus, presented to her pediatric assessment unit drowsy with short history of vomiting and abdominal pain. On examination:

- Tachycardia (rapid heart rate), tachypnea (rapid respiration rate) with a fruity smell on breath.
- Blood pressure: 85/50 mmHg (Reference range: 100/66-135/85mmHg)
- blood sugar: 26.7 mmol/L (Reference range: 3.9-5.6 mmol/L)
- HbA1C: 9.9% (Reference range: 5.7-6.4%)
- Blood pH: 7.1 (Reference range: 7.35-7.45)
- Circulating Ketone bodies: positive

A mid-stream urine sample was collected for complete urinalysis.

### Sample: I

1. Perform urinalysis using dipsticks and give a full report regarding:
  - Physical examination.
  - Chemical examination.
2. What is the most likely diagnosis?

## Case II

A 49-old woman with a history of diabetes mellitus came to hospital with fever, weakness and dysuria (pain during urination) for the last three days. The results of her laboratory tests were as follows:

Test	Result	Reference range
Fasting blood glucose	7.5	3.9-5.6 mmol/L
Creatinine	75	55-120 mmol/L
Urea	3.7	2.5-6.4 mmol/L
Sodium	140	135-145 mmol/L
Potassium	3.9	3.5-5.1 mmol/L

A mid-stream urine sample was collected for complete urinalysis. Microscopic examination of urine showed:-

- WBCs: > 100/HPF (Reference range: 2-3/HPF )
- RBCs: 50/ HPF (Reference range: 0-2/HPF )

### Sample: II

1. Perform urinalysis using dipsticks and give a full report about:
  - Physical examination.
  - Chemical examination.
2. What is the most likely diagnosis?

## Case III

A 6-year-old boy, developed marked edema over a period of few days and his mother had noted puffiness around the eyes, characteristically in the morning and also his urine had become frothy.

His general practitioner ordered the following investigations that showed the following:

Test	Result	Reference range
Creatinine	58	55-120 mmol/L
Urea	3.4	2.5-6.4 mmol/L
Sodium	136	135-145 mmol/L
Potassium	4.0	3.5-5.1 mmol/L
Total protein	34	60-80 mmol/L
Albumin	14	35-50 mmol/L
Cholesterol	11	3.2-5.2 mmol/L
Triglycerides	15	0.5-2.27 mmol/L

A mid-stream urine sample is requested for complete urinalysis.

### Sample: III

1. Perform urinalysis using dipsticks and give a full report about:
  - Physical examination.
  - Chemical examination.
2. What is the most probable diagnosis?