

# Biochemistry Practical



## URINALYSIS

To know what have we  
changed check our  
[Editing file](#)

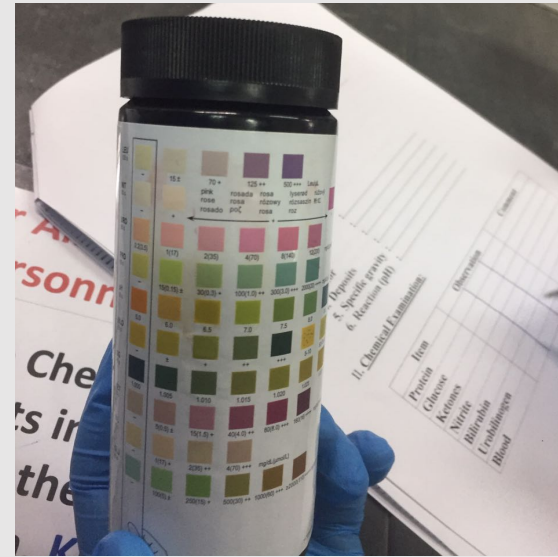
Your body hears  
everything your  
mind says ..  
Stay Positive

- Important.
- Doctors slides



# Notes about the exam :

1. This work is not by any means a reference .
2. As the doctor said the exam will consist of a urinalysis case, and it will be similar to the sample you did in the lab, but instead of finding the features some of it will be given, and there will be a question on the diagnosis of the case ..
3. Do your best and it will be so easy 😊



# URINE :

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## ❖ What is “urine”?

Urine is a fluid excreted by most of mammals including humans .

## ❖ It is formed in :

the kidneys (renal glomeruli) .

## ❖ Urine Excretion :

- The fluid undergoes chemical changes before it is excreted as urine.
  - Normal urine excretion by a healthy person is about **1.5 L per day** .
-

## ❖ Physical Properties Of Urine

IMPORTANT

PARAMETER	NORMAL	ABNORMAL	POSSIBLE CAUSES
Volume	0.4-2.0 L/day	Polyuria	Diabetes , chronic renal failure
		Oliguria	Dehydration , Acute renal failure
Appearance	Clear	Cloudy	Presence of pus cells , bacteria , salt or epithelial cells
Color	Pale Yellow	Colorless	Excessive fluid intake , uncontrolled DM* , DI** , chronic renal failure
		Orange	Dehydration , carotenoid ingestion
		Yellow-Green	Jaundice
		Red	Blood , drugs etc.
		Dark brown-black	Methemoglobin , alkaptonuria , melanoma , black water fever
		smoky	glomerulonephritis
Odor (Smell)	Urineferous	Fruity	Diabetic ketoacidosis
		Ammoniacal	Contaminated and long standing exposed urine
		Mousy	Phenylketonuria
		Burnt sugar	Maple syrup urine disease
Deposits	None	Crystals, salts or cells	Blood clots , necrotic tissues and urinary stones
Reaction (pH)	4.6 - 7.0	Acidic	ketosis (diabetes mellitus & starvation) , severe diarrhea , metabolic and respiratory acidosis , excessive ingestion of meat and certain fruits
		Alkaline	Respiratory and metabolic alkalosis , Urinary tract infection , Vegetarians

\*Diabetes Mellitus

\*\*Diabetes insipidus



## ❖ Chemical Properties of urine

IMPORTANT

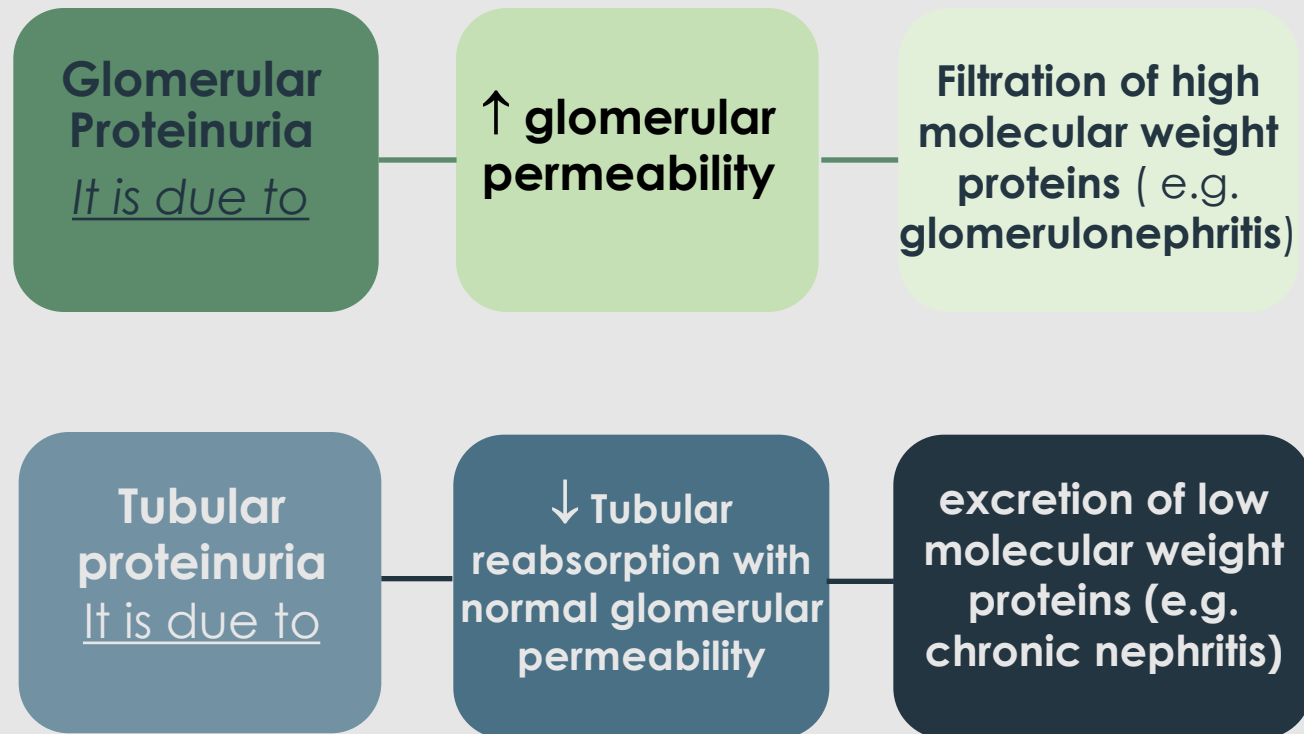
PARAMETER	NORMAL	ABNORMAL	POSSIBLE CAUSES
<b>Protein</b>	< 200mg/day	Proteinuria	Nephrotic syndrome , glomerulonephritis , multiple myeloma , lower UTI , tumors or stones
<b>Glucose</b>	None	Glucosuria	Uncontrolled DM , gestational diabetes , Fanconi's syndrome
<b>Ketones</b>	None	Ketonuria	Diabetic ketoacidosis , Glycogen storage disease, starvation , Prolonged vomiting , Unbalanced diet: <u>high fat &amp; Low CHO diet</u>
<b>Nitrite</b>	None	Detected	UTI
<b>Bilirubin</b>	None	Detected	Hepatic and post-hepatic jaundice
<b>Urobilinogen</b>	Normal Trace (1mg/dl)	> 2 mg/dl	Jaundice
<b>Blood</b>	None	Hematuria	Acute & chronic glomerulonephritis , Trauma , cystitis , renal calculi and tumors , Bleeding disorders (Hemophilia).
		Hemoglobinuria	Hemoglobinopathies , Malaria , Transfusion reaction (Blood Incompatibility)

# PROTEINS

“

Normally less than 200 mg protein is excreted in the urine daily

More than this level leads to a condition called (Proteinuria). ”



# Nephrotic syndrome

“

Large amounts of protein are lost in the urine and hypoproteinemia develops. ”

Increase protein excretion in urine can be one of the following two types:

## A: High Molecular Weight Protein Excretion:

- Glomerular proteinuria due to increase glomerular permeability leading to filtration of high molecular weight proteins

## B: Low Molecular Weight Protein Excretion:

- Tubular proteinuria due to decrease reabsorption with normal glomerular permeability

## ❖ 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, ketones, urobilinogen, bilirubin, blood, hemoglobin, nitrite, and specific gravity. The depth of 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.

### Procedure:

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 more than 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 T1DM, presented to Emergency drowsy with short history of vomiting and abdominal pain. On examination:

- Tachycardia
- Tachypnea with **a fruity smell of breath.**
- BP: 85/50 mmHg (Ref range: 100/66-135/85 mmHg)
- Blood sugar: **26.7 mmol/L** (Ref range: 3.9-5.6 mmol/L)
  - HbA1C: 9.9% (Ref range: 5.7-6.4%)
  - Blood pH: **7.1** (Ref range: 7.35–7.45)
  - **Circulating Ketone bodies: positive**

A mid stream Urine sample was collected for complete urinalysis.

## Important characteristics:

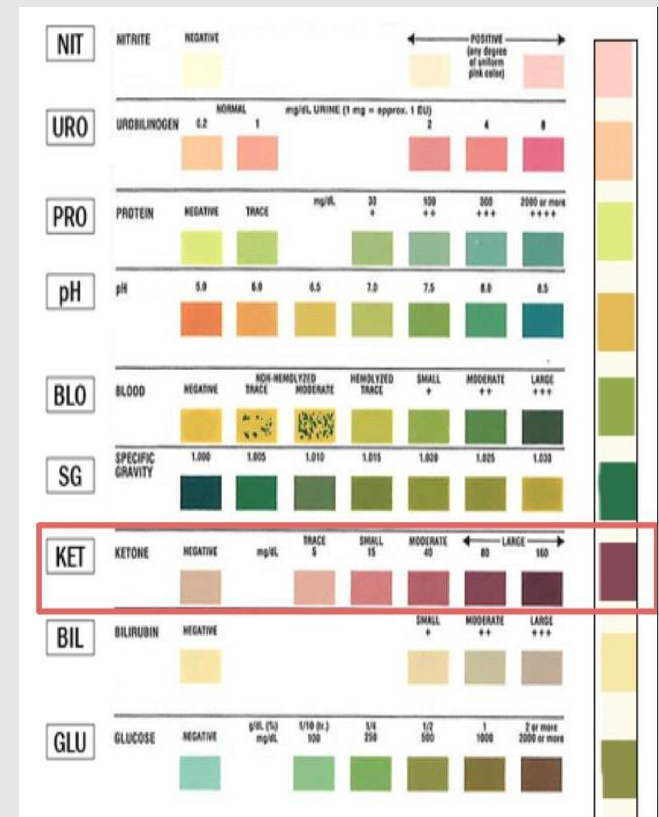
- ❖ **What are the Physical Properties of Urine.?**  
Polyuria, **Fruity Odor**, Acidic PH, colorless  
(usually the rest are normal)
- ❖ **What are the Chemical Properties of urine?**  
**Ketonuria, Glucosuria**  
elevated amount of keton and glucose in urine .  
(usually the rest are normal)



Usually under 25 years patient with **type I diabetes** When there is no enough Insulin, the patient can not use the glucose as a fuel so the body breaks down fat instead, lead to acid (ketones) build up.

Diagnosis is very important

**Diabetic with ketonuria (diabetic ketoacidosis)**





# CASE II

- A 49-year-old woman with history of DM came to hospital with **fever**, weakness and **dysuria** (pain during urination) for the last three days.
- The results of her laboratory tests were as the table below.
- A mid stream Urine sample was collected for complete urinalysis.
  - Microscopic examination of urine showed:-
    - WBCs: **over 100/HPF** (Ref range: 2-3/HPF)
    - RBCs: **10 /HPF** (Ref range: 0-2/HPF)

Test	Result	Reference range
Fasting blood glucose	7.5	3.9-5.8 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

## Important characteristics:

- ❖ What are the Physical Properties of Urine? (**Alkaline**, cloudy) (usually the rest are normal)
- ❖ What are the Chemical Properties of urine? (Proteinuria, Hematuria, **Nitrite detected**) (usually the rest are normal)

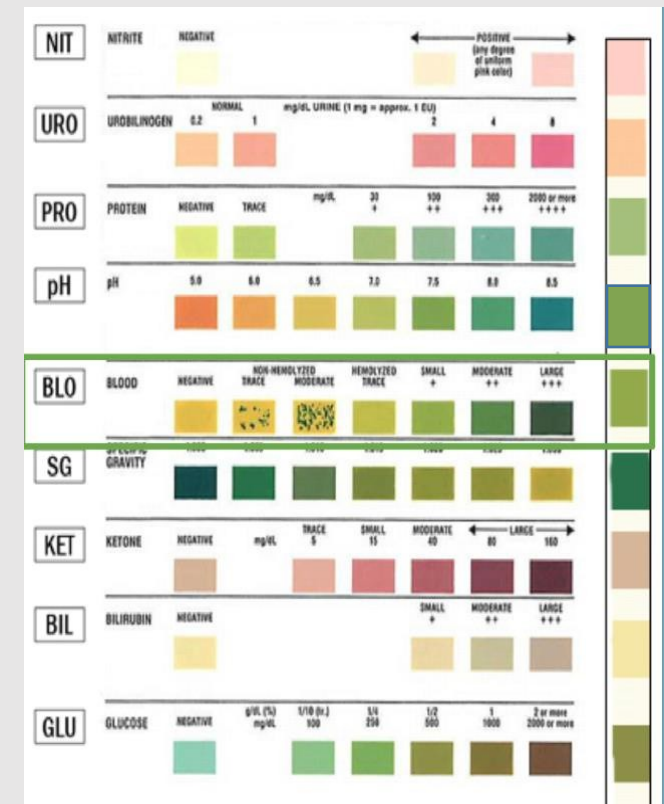


## UTI patients usually have:

- 1- Pain or burning feeling during urination.
- 2- feeling of urgency.
- 3- feeling the need to urinate frequently.
- 4- altered appearance of the urine, either bloody (red) or cloudy.
- 5- pain or pressure in the rectum.

Diagnosis is very important

## Urinary tract infection



# CASE III

A 6-year-old boy, developed marked **edema** over a period of few days. His mother had noted **puffiness** around the eyes, characteristically in the morning. She also noted that his **urine had become frothy**. His general practitioner ordered the following investigations (in the table below):

- A **BLOOD** sample was collected to show 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 g/L
Albumin	14	35-50 gmL
Cholesterol	11	3.2-5.2 mmol/L
Triglycerides	1.5	0.5-2.27 mmol/L

The blood sample shows hypoalbuminemia and hyperlipidemia = Nephrotic

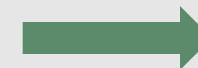
## SYMPTOMS:

- Frothy urine
- Puffiness around the eye
- Edema

### Important characteristics:

- ❖ **What are the physical properties of urine?**  
**Frothy urine.**  
(usually the rest are normal)
- ❖ **What are the Chemical Properties of urine?**  
**Heavy proteinuria.**  
(usually the rest are normal)

Urine dipstick must show proteinuria

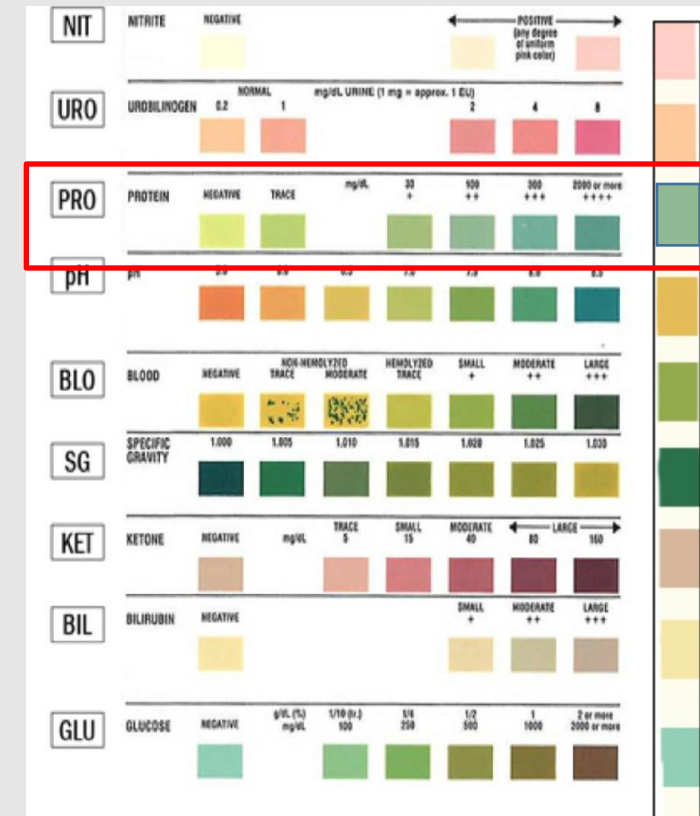


## Nephrotic Syndrome Is A Kidney Disease With:

- Proteinuria
- Hypoalbuminemia
- Edema
- Hyperlipidemia
- Hypercholesterolemia

Diagnosis is very important

## Nephrotic Syndrome



## TEAM LEADERS

- Atekah Kadi
- Mohammad Almutlaq

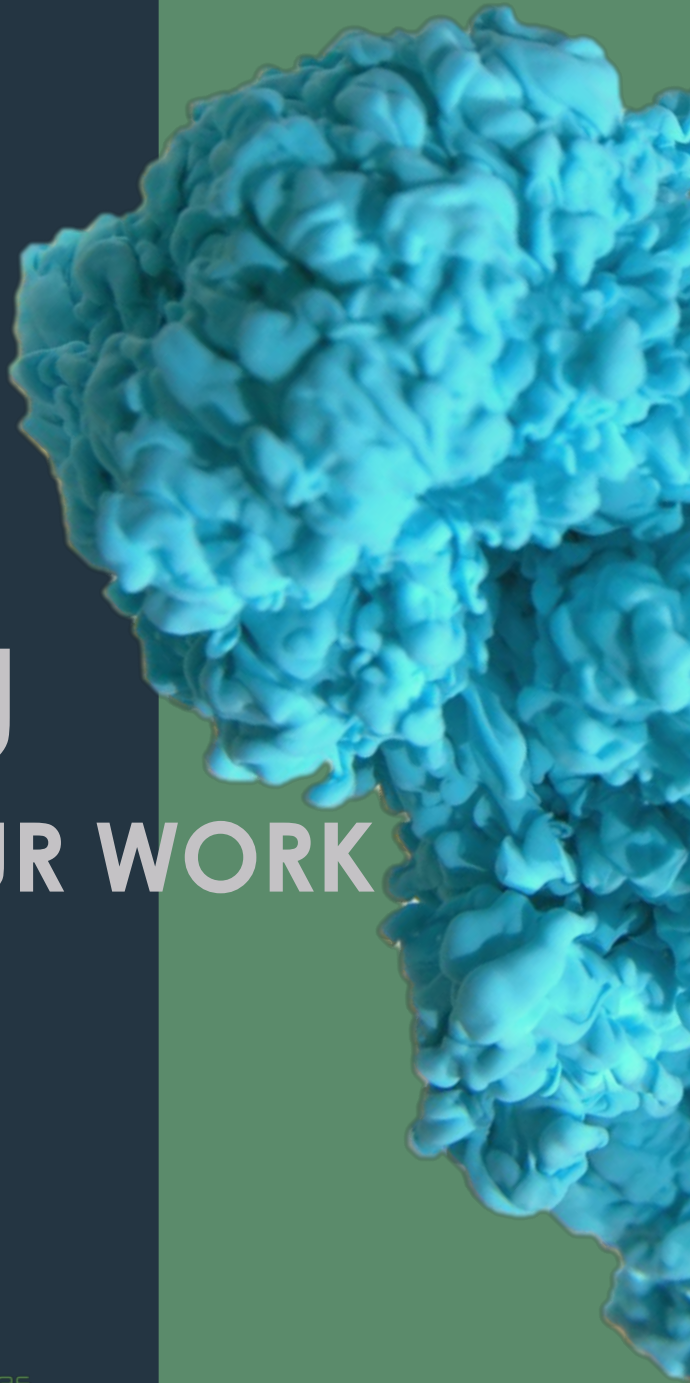
# THANK YOU FOR CHECKING OUR WORK

Done By:

**MUHANNED ALZHRANI**



Biochemistry team 436



## TAKE ME TO SUMMER