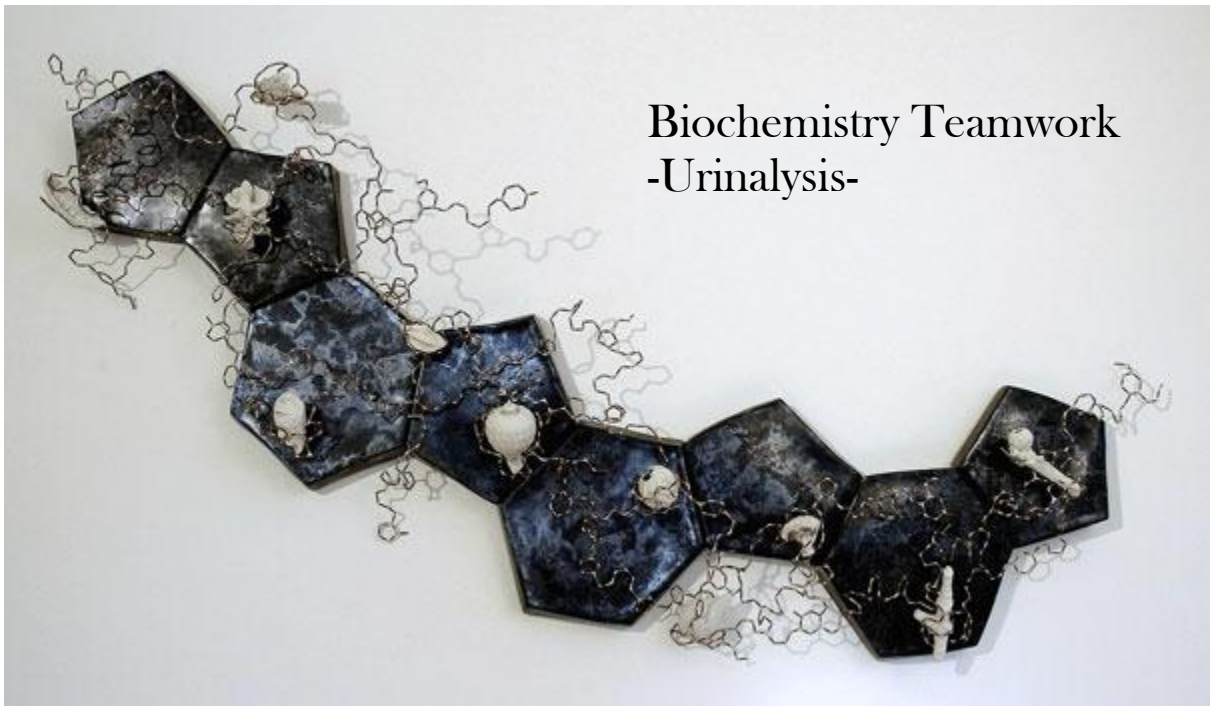

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Urine (introduction):

*Urine is fluid excreted by most of mammals including humans.
*It is formed in the kidneys (renal glomeruli).
*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.

Urinalysis(using dipstick):

Dipsticks are plastic strips impregnated with chemical reagents, which react with specific substances in the urine to produce color-coded visual results

Beginning (up)

End (down)

The same strip from the lab ^

They provide quick determination of -in order showed in the strip: Blood, Urobilinogen, Bilirubin, Protein, Nitrite, Ketone, Glucose, pH, and specific gravity (density/concentration). The depth of color produced related to the concentration of the substance in urine.

Color controls (the picture of what a normal test would look like to compare) are provided against which the actual color produced by the test urine sample can be compared. The reaction times of the impregnated chemicals are standardized. (All the chemicals take within one minute to react with urine)

Procedure:

1- Dip the dipstick in the urine sample provided then remove it immediately.
2- Remove the excess urine. By putting the end of the strip on a paper towel. Or on the side of the tube
3- Read the color produced within 60 seconds.
4- Match the color changes to the control charts.
5- Give a full report about physical and chemical examinations of the urine.

- Dipstick is used for chemical examination + pH for physical examination
- The test is not specific. e.g.: it may indicate proteinuria but it does not tell you if the protein molecules are have high MW (glomerular proteinuria) or low MW (tubular proteinuria)- MW: molecular weight.

Physical properties of urine:

Parameter	Normal	Abnormal	Possible causes
Volume	0.4-2 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 Density/ concentration/ Specific gravity	Pale yellow Or amber yellow	Colorless Very dilute	Excessive fluid intake, uncontrolled diabetes mellitus, chronic renal failure
		Orange concentrated	Dehydration, carotenoid ingestion
		Yellow-green	Jaundice
		Red	Blood drugs etc.
		Dark brown-black	Methemoglobin, alkaptonuria, melanoma, black water fever
		Smoky	Glomerulonephritis
Odor (smell)	Uriniferous Normal odor of urine	Fruity (Acetone smell)	Diabetic ketoacidosis
		Ammoniacal Ammonia	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) This is affected by diet	4.6-7	Acidic meat	Ketosis (diabetes mellitus and starvation), severe diarrhea, metabolic and respiratory acidosis, excessive ingestion of meat and certain fruits.
		Alkaline vegetables	Respiratory and metabolic alkalosis, urinary tract infection, vegetarians

***Chemical properties of urine:(focus on the chemical properties but you still have to read the physical ones)

Parameter	Normal	Abnormal	Possible Causes
Protein	<200 mg/day	Proteinuria(>200 mg/day)	Nephrotic Syndrome, glomerulonephritis, multiple myeloma, lower UTI, tumors or stones.
Glucose	None	Glucosuria	Uncontrolled Diabetes Mellitus (DM), gestational diabetes (pregnancy induced DM) or Fanconi's syndrome.
Ketones	None	Ketonuria	Diabetic ketoacidosis, glycogen storage disease, starvation, prolonged vomiting, unbalanced diet; (high fat and low CHO).
Nitrite	None	Detected	UTI (if nitrite is present >> bacteria)
Bilirubin	None	Detected	Hepatic and post-hepatic jaundice.
Urobilinogen	None	Detected	Jaundice.
Blood	None	Hematuria	Acute and chronic glomerulonephritis, trauma, cystitis, renal calculi, tumors and bleeding disorders; (hemophilia).
		Hemoglobinuria	Hemoglobinopathies; (Thalassemia & sickle cell anemia), Malaria, Transfusion reaction (blood group incompatibility).

Proteins	Nephrotic Syndrome
***Normally less than 200 mg protein is excreted in the urine daily; more than this level leads to a condition called "Proteinuria". *****Two Types:** **1. Glomerular proteinuria** It is due to increase glomerular permeability, resulting in the filtration of high molecular weight proteins.(E.g. glomerulonephritis). **2. Tubular proteinuria** It occurs as a result of decrease tubular reabsorption with normal glomerular permeability. Resulting in the excretion of low molecular weight proteins (e.g. chronic nephritis).	***Large amounts of protein are lost in the urine and hypoproteinaemia develops. ***Increase protein excretion in urine can be one of the following **two types:** **1. High molecular weight protein excretion** Glomerular proteinuria due to increase glomerular permeability leading to filtration of high molecular weight proteins. **2. low molecular weight protein excretion** Tubular proteinuria due to decrease reabsorption with normal glomerular permeability.

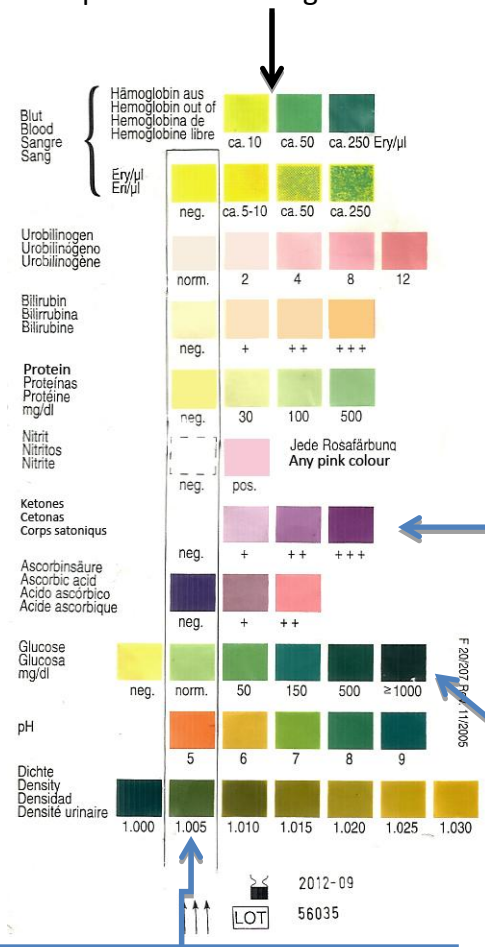
About the exam:

In the exam it's possible that they will give us a picture of a urine dipstick to analyze (exactly the way we did in the lab).

How to analyze a urine dipstick:

1.They will bring a picture of a stick →

2.A picture containing the normal and abnormal values:



1.This column as you can see contains the normal values. The rest is abnormal.

2. As an example, let's look at the "Ketone row".

- If the patient is negative for ketones, then the colour of the stick will be the same as the first column (the column with the normal values).

- But if the patient does have ketones in his urine, then the colour of the stick will be one of the squares**<u>after</u>** the normal value. You must choose the square that has same colour as the one presented on the **<u>stick.</u>**

3. As another example let's take the "Glucose row":

If the patient is positive for Glucose, we take the stick and see which square(After the normal value column)is the same colour of the stick:

-If it's the <u>first</u>square after the normal value, then you have to write its description (written directly below the square).**<u>OR</u>**you could write "+1" **(but it's best to write them both).**

- If it's the <u>second</u> square after the normal value, then you either write the description or "+2". And so on.

Most likely they'll give us a scenario and tell us the positive and negative values of the urinalysis. And ask us to give the most probable diagnosis. Dr. Sumbul confirmed that they would not bring anything out of the two tables above.

EXAMPLES :

A patient came to the outpatient clinic, the doctor requested a urinalysis: (There will be a scenario, might help you with the diagnoses).

1. **You analyzed the urine dipstick and it was positive for Glucose, but everything else was normal. What is the differential diagnosis???**

A- Nephrotic syndrome
B- Nephritic Syndrome
C- Diabetes
D- Glomerulonephritis

2. **The stick was positive for glucose and ketone bodies, the rest were normal. What is the differential diagnosis???**(one of the examples we took in the lab)

A- Nephritic syndrome
B- Diabetic ketoacidosis
C- Cystitis
D- Glomerulonephritis

ANSWERS: 1) C, 2) B