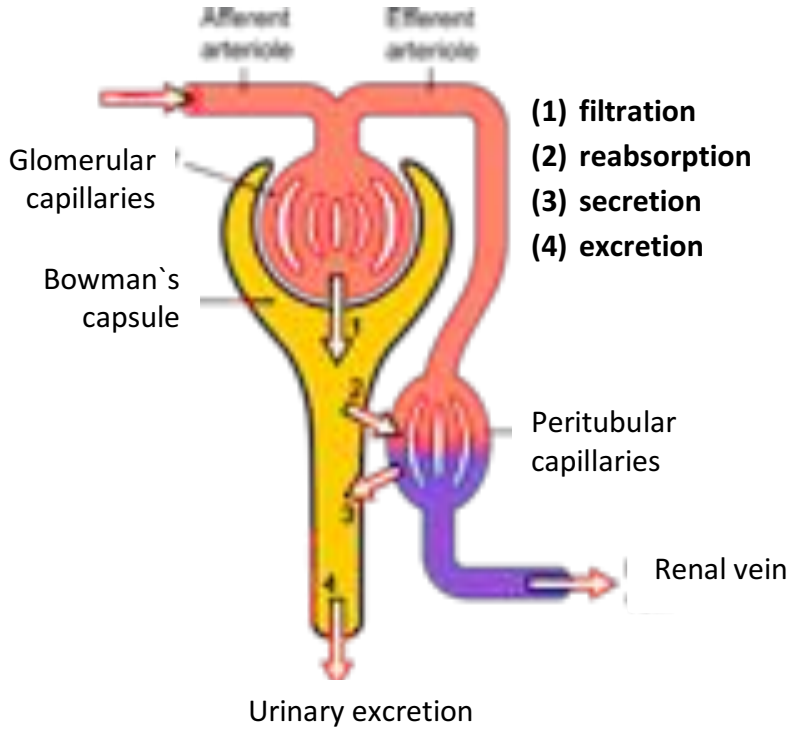
Qualitative analysis of urine

This chapter includes the analysis of kidney function, Liver function, and pancreas function through specific tests on urine.

The kidneys excrete waste products from the body and regulate the chemical composition of body fluids. Each kidney contains approximately one million working units called nephrons. Each nephron consists of a ball of capillaries, known as a glomerulus, connected to a smaller tubular channel, which is called a tubular. Three distance processes take place in each nephron as shown in the figure:

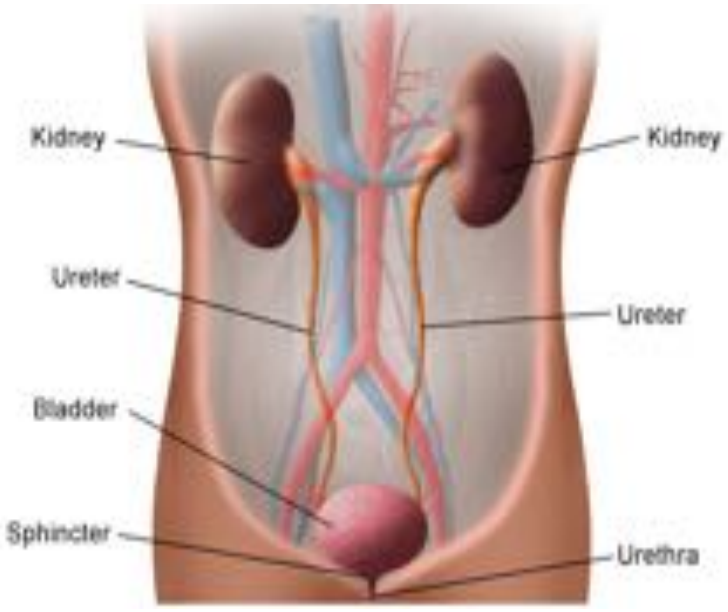


1) ***Glomerular filtration*:** The blood flowing through the capillaries of glomerulus is filtrate. This glomerular filtration contains most of the constituents of the blood

except protein, which does not pass through the normal glomerular membrane in any quantity.

2) ***Tubular reabsorption:*** Water and solutes like amino acid, glucose, and electrolytes also pass back through the walls of tubules into the blood.
3) ***Tubular secretion:*** As the glomerular filtrate passes a long tubule, more solutes are added by secretion through the wall of tubule from adjoining blood vessels.

The end product of these 3 processes passes through larger collecting tubules into the ureters, which carry it to the bladder, from which it is excreted through the urethra as urine (see the below figure).



The urinary tract system

Composition of normal urine:

Urine is a complex aqueous solution of inorganic salts and inorganic waste products of body metabolism.

An average sample of urine has:

(4%) solids dissolved in (96%) water. Of these, approximately (2%) is urea, (1%) NaCl and all the other organic and inorganic constituents make up the remaining (1%). The inorganic substances in urine are urea, uric acid, creatinine and ammonium salts. Among the inorganic substances presents in urine are Na^{+}, Cl^{-}, HCO_3^{-} , K^{+}, Ca^{+2}, Mg^{+2} , PO_4^{-3} and SO_4^{-2}.

Urine also contains some pigments from the hemoglobin of blood (urobilinogen). The enzyme amylase is also constituent of normal urine. The quantitative estimation of some of this normal content is, therefore a matter of considerable clinical importance.

There are simple tests and observations in this handbook, which are widely used as good indications of: general kidney function and liver function.

Routine urinalysis

The most suitable urine sample for routine analysis is the early morning sample collected before breakfast because this is usually a concentrated specimen with an acidic pH. The fresh urine sample should be examined immediately bacteria could increase glucose and urea decomposition, therefore urine becomes alkaline due to the liberation of ammonia. If a urine sample cannot be analyzed while fresh, it can be refrigerated. The typical analysis includes:

1- physical tests:

Volume, clarity and color, specific gravity and pH.

2- Chemical tests:

Glucose, protein, ketone bodies, creatinine, uric acid, urea and bile bodies.

3- Microscopic tests:

Examination of urinary sediments.

4- bacteriologic tests.

Experiment No. (16)

Physical tests

A) Volume:

The average amount of urine excreted by a healthy adult is approximately (122-1500) mL/24hr., this volume is variable, depending upon factors such as:

Water intake, diet, environmental temp., and activity.

- ✓ ***Increased urine output:*** Occurs in dehydration, fever and any types of kidney damage.
- ✓ ***Un-urine:*** The complete absence of urine occurs in kidney failure and urinary tract obstruction.

B) Clarity and color:

Normally, urine is clear and yellowish, although turbidity may appear occasionally due to mucus or precipitated salts (urates or phosphate). Abnormal turbidity may be due to large quantities of cells (red, white or epithelial) or to bacteria. The terms of "clear", "cloudy" or "turbid" are usually appeared in the report urine analysis. The color of urine excreted by a healthy subject is due to urochrome pigments, which ranges from almost colorless, dark to yellowish. The color of urine depends mainly upon the concentration of the sample, the more concentrated specimens usually being a dark yellow. The following table shows the colors of urine and their usual causes.

Color	Usual causes
Yellow (light – dark)	Urochrome
Colorless	Reduced urine conc.
Smoky brown	Blood
Silvery sheen or milky	Pus cells, bacteria or epithelial cells
Black	Malaria
Yellow foam	Bile pigments
Orange, green, blue and red	Medical drugs

C) Specific gravity (sp. gr.):

Specific gravity depends on the number, density and weight of dissolved particles in urine. The Specific gravity of urine is variable over a (24hr.) period. Normally, the range is between (1.008-1.025).

Increased sp. gr.: Occurs in chronic nephritis, & increased fluid intake.

Specific gravity could be measured using a urinometer, which is a hydrometer has been adapted to measure sp. gr. Another method to measure Sp. gr. Is the test strip and tables, where a mixture of chemicals has been mounted as a thin pad onto one end of a plastic strip or fabricated into a tablet. A positive test is revealed by a characteristic change in the color of the pad or the tablet.

D) pH:

The pH of normal urine varies between (4.5-8.0), with an average pH of 5.5. The early morning sample usually is acidic, but later it frequently becomes alkaline due to ammonical fermentation.

Acid urine: Occurs in Diabetes Miletus D.M, meat and bread diet (due to the formation of sulphuric and phosphoric acid).

Alkaline urine: Occurs in Un-urine (renal damage), and vegetarian diet(due to the formation of alkaline carbonates).

Procedure:

Immerse a litmus paper in a quantity of urine, wait 1/2 min., then takes on a characteristic color.

Pink color means: acidic urine.

Blue color means: basic urine.

No change in the paper color means: neutral urine.

Experiment No. (17)

Chemical tests

Abnormal constituents of urine are substances, which are abnormally present in detectable quantities. The qualitative estimation of one or more these abnormal constituents in urine is a matter of great clinical importance jud gmore accurately and to treat the disorder. The abnormal constituents of urine are:

Reducing sugar, proteins, ketone bodies, bile salts and pigments, blood, indicant and pus.

A- Reducing sugar:

In diabetes Mellitus: Sugar appears in urine when its level in blood is over 180mg/dl (pass the renal threshold). In this case, it will be called glycosuria. Another type of sugar is Lactosuria, appears in pregnancy.

Methods of sugar test

1- Benedict's test:

Principle: The reducing property of sugar is due to the presence of free aldehyde. The Benedict's test is based on the reduction of Cu^{++} to Cu^{+} which form colored complex.

Procedure:

To 2ml of Benedict's reagent, add 0.5ml (8 drops) of the urine. Place in a boiling water bath for exactly 5-min. and allow to cool spontaneously in the rack. The color of the product could be used to indicate the sugar %, as following:

sugar	Appearance & Color	Result
0	Blue fluid	(-ve)
0.1%	Green opalescence. Blue fluid	(+) ve
0.2%	Green opalescence and slight yellow ppt. Blue fluid	(++) ve
0.5%	Definite orange ppt. Blue fluid	(+++) ve
1%	Heavy-brown ppt. Blue fluid	(++++) ve
2%	Red brown ppt. No blue fluid	(++++++) ve

2- Clinical tablets and clinistix strips:

The clinical tablet contains all of the reagents involved in Benedict's reaction. The clinistix strips utilize the glucose oxidase reaction to detect glucose. This reaction is discussed on blood glucose determination (experiment No 1).

***Reagents*:**

Benedict's solution:

(a) Dissolve 1 gm of $CuSO_4.5H_2O$ in 100 ml water. Cool.
(b) Dissolve 173 gm sodium citrate and 100gm anhydrous sodium carbonate in 600ml water by heating. Cool and dilute to 850 ml. pour(a) into(b), stirring well and dilute at R. temp, to 1000ml.

B- Proteins :

The excretion of plasma protein in urine is called "proteinuria". Albumin and amounts of globulin are abnormal found in urine due to renal damage. Physiological proteinuria occurs inheavy exercises, and rich protein diet.

Another kind of protein called Bence-Jones protein, may be present in urine, but it is not a plasma protein. It originates in the bone marrow and its presence in urine associated with a disease of the bone marrow.

Methods of protein detection

1- Heat coagulation:

Principle: Proteins which are insoluble in water or dilute salt solutions are known as Fibrous proteins, while soluble proteins are collectively described as globular proteins. Many globular proteins coagulate when their solutions are heated and become permanently insoluble. Such proteins are described as heat- globular proteins. Not all proteins are equally denatured by heat, this fact can be used to distinguished between plasma proteins and Bence- Jones protein by the heat-test.

Procedure:

1. Full 2/3 of a test tube with urine and gently heat the upper half of the fluid.
2. If a cloudy white ppt. appears in the heated part , it may be due to the presence of albumin or phosphate salt.
3. Add few drops of acetic acid sol. to the white ppt. and notice the result. If the ppt. disappeared, that is a phosphate salt. If not, that is globular protein.

Note: Bence- Jones protein could be distinguished by heating the urine, cooling and reheating to (60-70)°C. First heating should produce cloudy urine, but if it vanishes on cooling, reappears on re-warming and disappears again on boiling, this indicates the presence of Bence- Jones protein.

2- Precipitation by acids:

Principle: It is probable that precipitation is due to the formation of soluble salts between the acid anions and the positively charged protein particles.

Procedure:

(a) ***Heller's test:*** To 2 ml of conc. HNO_3, pipette 2 ml of urine slowly down the side of the tube. A white ring or ppt. at the junction of the acid and urine indicates the presence of protein.

(b) ***Sulphosalicylic acid (S.S.A) test:*** Add 2 ml of S.S.A solution to 5 ml of urine. A white ppt. or cloudiness indicates the presence of protein. This test may be carried out semi-quantitatively by comparing the cloudiness of the urine with std. tubes containing known protein conc. Trichloroacetic acid (10%) may be used in place of S.S.A.

***Reagents*:**

1- Acetic acid(5%): Dilute 5 ml of the conc. acid to 100 mL by D.W.

2- S.S.A. solution (20%) : Dissolve 13 gm of salicylic acid in 20 mL of conc. H_2SO_4 with warming, cool and carefully add 67 mL of D.W.

(C) Ketone bodies:

The ketone bodies sometimes found in urine are: Acetoacetic acid β- hydroxyl butyric acid and acetone. Their presence indicates excessive metabolism of body fats. Which may occur in diabetic acidosis, malnutrition or after anesthesia and toxanemia of pregnancy.

Methods of ketone bodies detection :

1- Rothera's test :

Saturate 5ml of urine by shaking it vigorously with an excess of solid ammonium sulphate. Add (2) drops of freshly prepared (2%) sodium nitroprusside and 1 mL of NH_4OH. Mix and allow to stand in the rack. A permanganate color indicates the presence of acetone bodies.

2- Longe test :

Add 5mL of urine to 5 drops of glacial acetic acid and drops of sodium nitroprusside sol. (40%). Mix well then add (slowly down the side of the tube) 1 mL of NH_4OH sol. a purple- red ring color at the junction of solutions indicates the presence of ketone bodies.

3- Reagent tablets(Acetest)and strips (keto stix) :

They are available for detection of ketone bodies. Both employ the nitroprusside reaction.

***Reagents*:**

1. ***Sodium nitroprusside sol. (2%):*** Dissolve 2 gm of the substance in 100 ml D.W.

2. ***Sodium nitroprusside saturated (40%):*** Dissolve 40 gm of the substance in 100 mL D.W. Mix to complete solubility let the unsoluble salt to settle down the flask.
3. ***NH_4OH sol. (28%) :*** Dilute 28 ml of conc. ammonia to 100 ml by D.W.

(D) Creatinine :

This content of urine arises, almost entirely, from the breakdown of body tissues. The daily excretion of creatinine in urine is about 1.2 gm. Creatinine has certain advantages over urea: the filtered creatinine is not reabsorbed by tubules and creatinine level is relatively constant and independent of protein ingestion, water intake, rate of urine production and exercise. Thus, the amount of creatinine excreted in the urine is a function of glomerular filtration.

Jaffe's test :

Principle: Creatinine reacts with picric acid in alkaline solution to produce an orange red color of creatinine picrate.

Procedure:

1. To 1 mL of saturated sol. of picric acid add 0.5 mL of (10%) NaOH and Divide the solution into 2 test tubes.
2. Add 3 mL of urine and to one tube and add an equal volume of D.W to the second. A deeper red- orange color indicates creatinine.

***Reagents*:**

1. **NaOH sol. (10%) *:*** 10 gm of NaOH /100 mL D.W.
2. **Saturated picric acid sol.*:*** saturated the sol. of picric acid by excess acid.

(E) Bile salt and pigments :

Bile is a solution consists of water, bile salts, cholesterol, bile pigments, lipids and electrolytes.

Certain bile composition may appear in excess in the urine of patient with:

1. Bile duct obstruction.
2. Liver disease.

Bile salts test :

Bile salts are formed in the liver and defined as dehydrogenated bile acids where Na^+ or K^+ replaced by the lost hydrogen atom.

1- Hay's test : This is based on the fact that bile salts lowers the surface tension of the liquid:

Procedure:

Prepare 2 test tables, add 5 mL of clear urine (filtered if it is turbid) to the first and 5 mL of D.W to the second. Sprinkle a spatula point of flowers of sulfur onto the surface of liquid in each tube (don't mix). ***Notice the result.*** (the sulfur sinks on the surface of the tube contains bile salts).

2- Millius test : It depending on the reduction of bile salts by furfural in acidic condition.

Procedure:

Prepare 2 test tables, add 5 mL of clear urine (filtered if it is turbid) to the first and 5 mL of D.W to the second. To each tube add 3 drops of furfural(0.1%) and 3 mL of conc. H_2SO_4. Mix well, cool, and mix again. ***Notice the result.*** (red colored solution in the tube contains bile salts).

(B) Bile pigment tests :

Certain bile pigment, such as bilirubin and biliverdin may appear in the urine when the liver is unable to complete normal metabolism of the heme.

1- Foucht's test :

Principle: Bile pigments are absorbed on a precipitate of barium sulphate. The precipitate, colored with the type of the pigments, is filtered and then treated on a filter paper with Fouchet's reagent ($FeCl_3$ in a solution of trichloroacentic acid (TCA). The bilirubin, which is yellow, is oxidized to biliverdin (green) and cholecyanin (blue).

Procedure:

1. Prepare 2 test tables, add 10 mL of clear urine (filtered if it is turbid) to the first and 10 mL of D.W to the second.

2. To each tube add 2 ml of $BaCl_2$ and drop of 2N- H_2SO_4 a white precipitate of barium sulphate is formed.

3. Mix well and allow to stand till most of the ppt. is settled down.

4. Discard most of the supernatant fluid and then filter the remaining suspension of $BaSO_4$ through a small filter paper.

5. Unfold the filter paper and lay it on 2 or 3 sheets of dry filter paper.

6. Allow a drop of Fouchet's reagent to fall on the ppt. ***Notice the result. (***a greenish blue color formed in the tube containing bile pigments.

Significance of the solutions:

1. ***H_2SO_4*:** Used to provide sulphate ions.
2. ***$BaCl_2$*:** Used to provide barium ion which reacts with SO_4^{-2} to give $BaSO_4$.

2- Rosenbach's test :

Pour 10 ml urine through the same filter paper several times. When the paper has drained completely after the last filtration, open the paper out carefully and place on top of a pad of 3 dry filter papers on a watch glass. Add one drop of conc. HNO_3 from a dropping pipette in the center of the filter paper and note the formation of colored rings if bile pigments are present.

***Note* :** If human bile is used in place of urine, dilute 1 mL by 100 mL D.W.

***Reagents*:**

1. ***H_2SO_4*:** Dilute 28 ml of conc. HCl 500 mL in D.W. (3 drops of saturated $(NH_4)_2\ SO_4$ may be used in place of H_2SO_4).
2. ***$BaCl_2$ solution (10%)* :** Dissolve 10 gm of $BaCl_2$ in 100 mL D.W.
3. ***Fouchet's reagent :*** Dissolve 2.5 gm of (T.C.A) in 60 mL D.W., then add 10 mL of $FeCl_3$ sol. (prepared in 1 g/dL conc.), make the volume to 100 mL by D.W.

(C) Urobilinogen test :

Urobilinogen is formed by the action of intestinal bacteria upon bilirubin. Some urobilinogen is reabsorbed into the blood, returned to the liver, and ultimately excreted via the kidneys. Therefore, small amount of it is present as normal constituent of urine (see also the figure in page 45).

Normal values of urine urobilinogen are 1-4 mg daily, but increased urinary excretion occurs in many types of liver disease and in hemolytic anemia.

The absence of urobilinogen from the urine may indicate biliary tract obstruction since the obstruction would prevent excretion of bilirubin into the intestine.

3- Ehrlich test :

Principle: Urobilinogen react with Ehrlich aldehyde reagent to give a red-colored compound.

Procedure:

1. Prepare 2 test tubes: 1st = 2.5 ml urine and 2nd = 2.5 ml water.
2. Add to each tube 2.5 ml of Ehrlich reagent and mix well
3. Add slowly with stirring 5 ml of saturated sodium acetate sol.

Note : The pink-red color compound in the tube containing urobilinogen.

Note : Ehrlich reagent does not react with urobilin which form from urobilinogen oxidation by light.

Significance of the solutions:

Sod- acetate is added to buffer the HCl and to enhance the color of the product.

***Reagents*:**

1. ***Ehrlich reagent*** : Dissolve 0.7 mg of p-dimethyl-aminobenz aldehyde in 150 ml of conc. HCl. Add 100 ml water, mix and store in a brown bottle.
2. ***Saturated Na, acetate sol***. : crystals of Na, acetate should always be visible the bottom of the flask to ensure saturation.

F- Blood :

Blood may be present in urine as intact red cells, which may be seen under microscope, or as hemoglobin resulting from the haemolysis of red cells.

***o*-Toldine test for blood**

To 2mL of *o*-Toldine in glacial acetic acid solution, add 2 mLof the urine and 1 mL 3% H_2O_2. Shake, a blue color develops.

H- Urinary amylase :

The greatest conc. of amylase is present in the pancreas, where the enzyme is synthesized by the acinar cells and then secreted into the intestinal tract for digestion of starch. Salivary glands also secrete amylase to initiate hydrolysis of the starch. However, there are conflicting views regarding the usefulness of the urinary amylase as diagnostics test.

Pancreatic amylase is called "Diastase" when it is execrated into the urine. However, urinary amylase reflects changes in serum amylase when kidney function is normal.

The urinary amylase is assayed here in terms of its ability to completely digest starch under the experimental conditions. Diastolic index is defined as the number of mLs of 0.1% starch digested by (1ml) of urine at 37°C in 30 min.

Normal value: 1-3 enzyme unit, this value is evaluated in acute pancireatities and obstruction of pancreatic dust.

Procedure:

1. Set up a series of test tubes as follows (avoid contamination with saliva (salivary amylase).

Tube No.	1	2	3	4	5	6	7	8	9	10
Urine (ml)	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
D.W. (ml)	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9

2. Add 2 ml of (0.1)% starch sol. to each tube and place in a water bath at 37°C for 2 min.

3. Add iodine solution slowly drop by drop to each tube and observe carefully wither any blue color is produced. The smallest volume of urine may show a reddish color due to the presence of erythrodextrin.

Calculations:

$$\text{Diastatic Index:(ml/min)} = \frac{Volume\ of\ starch\ sol.(2ml)}{Smallest\ volume\ of\ urine\ giving\ blue\ color}$$

***Reagents*:**

1. **0.1% starch solution**
2. **Iodin solution** *:* 12.685 gm iodine crystals and 18 gm of K1. Dissolve in 150 ml of water make it up to 1 L.

Experiment No. (19)

Microscopic test

Clinically, useful information of urinary sediments may be obtained on a microscopic examination. These sediments are divided into 2 classes, namely, the organized (different types of bells, casts and micro- organisms) and the unorganized (inorganic constituents) sediments which are:

1. ***Ammonium magnesium phosphate:*** Which crystallizes as colorless of feathery stars.
2. ***Calcium oxalate :*** This can be distinguished by its envelope shaped (octahedral) or dumb – bell shaped colorless crystals.
3. ***Calcium phosphate :*** Colorless wedge shaped crystals, often grouped in the form of rosettes. Also called stellar phosphate.
4. ***Uric acid :*** Yellow to reddish brown prisms, wedges, dumb, bells, rosettes and etc. The color is due to the absorption of the urinary pigments on the surface of the crystals.
5. ***Urates :*** Yellow to reddish brown amorphous particles.

Table (1): Calculated normal values and clinical significance of the chemical blood components (serum or plasma).

Substance	Normal values	Clinical significance	
		Hyper	Hypo
Glucose	65-120 mg/dl	Diabetes M.	Hyperinsulinemia
Cholesterol	150-250 mg/dl	Myocardial infarction, obstructive jaundice nephrotic-synd., diabetes.	
Urea	15-40 mg/dl	Renal failure, intestinal obstruction, cardiac failure.	
Creatinine	0.8-1.4 mg/dl	Renal failure	
Uric acid	2-7 mg/dl	Gout, renal failure	
Bilirubin	0.1-0.8 mg/dl	Jaundice types.	
Total protein	6-8 g/dl	Myelotomies.	Nephritis syndrome, burns, fever.
Albumin	3.5-5.6 g/dl	Dehydration.	Renal disease
Globulin	1.3-3.2 g/dl	Liver damage, dehydration, myelotomies	Deep burns.
GOT	2-20 U/L	Cardiac failure, hepatitis.	
GPT	2-15 U/L	Hepatitis	
Alkaline phosphate	4-13 K.A. U/L	Bone disease, liver disease	Hyperparathyroidism, Hyperparathyroidism.
Acid phosphate	1.1-3.5 K.A. U/L	Prostate cancer, liver disease	
Amylase	80-180 smoggy/dl	Pancreatitis, acute hepatitis	
Calcium	9-11.5 mg/dl	Hyperparathyroidism, myelotomies, bone tumors.	Rickets, tetany.
Inorganic phosphate	2.8-4.2 mg/dl	Nephritis	Children rickets
Sodium	136-149 mEq/L	Hyradernalism, hypertonic sever dehydration.	Polyuria, diabetic acidosis, hypotonic.
Potassium	3.8-5.2 mEq/L	Renal disease	Prolonged diarrhea & vomiting, hyperaldosteronism
Chloride	100-107 mEq/L	Nephritis, Prostatic obstruction	Intestinal obstruction hedydration, Addison's disease.
Iron	110-180 μg/dl	Hemolytic anemia hemochromatosis.	Iron-deficiency anemia, chronic blood loss, malignancies, pregnancy.

Table(2): The relative conc. of selected substances in plasma, and urine of normal adults

Organic Substance	Conc.(mg/dl)		Inorganic Substance	Conc.(mg/dl)	
	Plasma	Urine		Plasma	Urine
Glucose	100	0	Na^{+}	142	125
Urea	26	1820	K^{+}	5	60
Uric acid	4	50	Ca^{+2}	4	5
Creatinine	1	190	Mg^{+2}	3	15
Protein	7g/dl	0	Cl^{-}	103	130
Ammonia	0.06	700 g daily	HCO^{-3}	27	14
			SO_4^{-2}	1	33
			PO_4^{-3}	2	40

Table(3): Normal and abnormal values of routine urine analysis in this manual

Test	Normal values	Abnormal values	Reasons
Color	Straw to amber	1. Silvery shine	Pus , bacteria, epithelial cells.
		2. Yellow foam	Bile.
		3. Smoky brown	Blood.
Quantity	600-2500	1- Increased excretion	Diabetes , hyperthyroidism
	ml/24hr.	2- Decreased excretion	Dehydration, fever.
		3- un urine	Urinary obstruction
Specific gr.	1.003-1.03	1. Increased (↑)	Acute nephritis, diabetes
		2. Decreased(↓)	Chronic nephritis
Reaction	PH=5.6-8	1- (↑) acidity	Diabetes , fever
		2-(↑) Alkalinity	Urine retention, alkali therapy
Sugar	Nill	Foundation	Diabetes, exercise of emotional disturbance.
Ketone bodies	Nill	Foundation	Prior to diabetic coma, after anesthesia, gastro intestinal disorders.
Protein	Nill	Foundation	Kidney disorders, excessive exercise
Creatinine	1-2g/24hr.	(↑)	Break down of tissues.
Bile salts	Nill	Foundation	Liver diseases, biliary obstructive.
Bilirubin	Nill	(↑) Foundation	Liver diseases
Urobilinogen	1-4mg/24hr.	1- (↑)	Liver diseases, hemolytic anemia
		Un found	Bile duct obstruction.

Clinical words meaning

Words	Meaning
Acromegaly	زيادة إفراز هرمونات النمو
Acute hepatic necrosis	تنخر الكبد الحاد
Acute hepatitis	التهاب الكبد الحاد
Acute nephritis	التهاب كلوي حاد
Acute pancreatitis	التهاب البنكرياس الحاد
Adrenal cortex	قشرة الكظر
Adrenal medulla	لحاء الكظر
Adrenocortical-trophic hormones	الهرمونات المحرضة للقشرة الكظرية
Alimentary tract	القناة الهضمية
Alkali therapy	المعالجة بالقلويدات
Amniotic fluid	السائل الامينوسي
Anesthesia	التخدير
Angina pectoris	مرض الذبحة الصدرية
Anterior pituitary gland	الغدة النخامية الأمامية
Atherosclerosis	طور في مرض تصلب الشرايين
Biliary cirrhosis	تليُّف قناة الصفراء
Biliary obstruction	انسداد قناة الصفراء
Bone calcification	تكلّس العظم
Bone marrow	نخاع العظم
Breast cancer	سرطان الثدي
Calculi	حصوات
Carcinoma metastatic to bone	سرطان العظم المتقدّم
Cardiac failure	فشل قلبي

Cerebrospinal fluid	السائل النخاعي الشوكي
Cholestasis	الركود الصفراوي
Chronic hepatitis	التهاب الكبد المزمن
Chronic nephritis	التهاب كلوي مزمن
Chronic pancreatitis	التهاب البنكرياس المزمن
Coagulation of the blood	تخثر الدم
Convulsion	ارتعاش
Coronary thrombosis	تخثر الدم بالأوعية التاجية
Cushing's syndrome	فرط إنتاج هرمون الهايدروكورتزون
Dehydration	الانكاز(الجفاف)
Diabetes Mellitus	مرض البول السكري
Diabetic coma	الغيبوبة السكرية
Duodenum	الاثنى عشري
Enterohepatic circulation	دورة كبدية داخلية
Exercise of emotional disturbance	اضطرابات عاطفية
Extra hepatic obstruction	انسداد كبدي نتيجة أسباب خارجية
Fasting blood sugar	سكر الدم الصيامي
Feces	براز
Fever	حُمّى
Gastric juice	العصير المعدي
Gastrointestinal disorders	الاضطرابات المعدية المعوية
Glomerulonephritis	مرض التهاب الكبيبات الكلوية
Glucose tolerance	تحمل الكلوكوز
Gout disease	داء النقرس
Growth hormones	هرمونات النمو
Hemolytic anemia	فقر الدم التحلّلي

Hemolytic jaundice	اليرقان التحلّلي
Hemorrhage	النزف الدموي
Hepatic jaundice	اليرقان الكبدي
Hepatitis	التهاب الكبد
Hepatobiliary diseases	أمراض الكبد وقناة الصفراء
Hyperparathyroidism	فرط هرمون غدة الجنب
Hyperthyroidism	الإفراط بإفراز هرمون الثايروكسين من الغدة الدرقية
Infective hepatitis	التهاب الكبد المعدي
Intra hepatic obstruction	انسداد كبدي نتيجة أسباب
Kidney or renal failure	فشل كلوي
Large intestine	الأمعاء الغليظة
Liver cirrhosis	تليُّف الكبد
Liver dysfunction	السوء الوظيفي للكبد
Lungs	الرئتين
Malabsorption	سوء الامتصاص
Malignant tumors	أورام خبيثة
Malnutrition	سوء التغذية
Mammary gland	الغدة اللبنية
Metastasized prostatic	السرطان المتقدم لغدة البروستات
Mucous membranes	الأغشية المخاطية
Multiple myeloma	السرطان المضاعف (النخاعي)
Mumps disease	مرض النكاف
Muscle destruction	تلف شديد للعضلة
Muscular diseases	الأمراض العضلية
Muscular dystrophy	مرض الاضمحلال العضلي

Muscular twitching	التواء العضلات
Myocardial infarction	مرض الاحتشاء القلبي
Myxedema	مرض ناتج عن قصور الغدة الدرقية
Nephritis	التهاب الكلى
Nephrosclerosis	مرض تصلّب الكلية
Nephrotic syndrome	التهاب الكلية المتزامن
Neuromuscular sedative	مهدئ عضلي عصبي
Obstructive jaundice	يرقان إنسدادي
Edema	ارتشاح مصلي بالأنسجة الرخوة
Paget's disease	مرض التهاب العظم الضخامي
Pancreatitis	التهاب البنكرياس
Pregnancy	حمل
Prostatic carcinoma	سرطان غدة البروستات
Rickets disease	مرض الكساح
Saliva	لعاب
Salivary gland	الغدة اللعابية
Sclera	طبقة العين البيضاء
Severe hepatitis	التهاب الكبد الشديد
Small intestine	الأمعاء الدقيقة
Spleen	طحال
Starvation	التجوّع
Synovial fluid	السائل المفصلي
Tetany disease	مرض الكزاز
The liver conjugation capacity	قابلية الاقتران الكبدي
The liver excretion capacity	قابلية التفريغ الكبدي
Toxemia of pregnancy	فقر الدم التسممي في الحمل

Toxic hepatitis	التهاب الكبد السام
Tremor	رجفة
Tubular necrosis	مرض النخر الأنبوبي الكلوي
Uncontrollable muscular cramps	تشنجات عضلية غير مسيطر عليها
Urinary obstruction	انسداد المجاري البولية
Viral hepatitis	التهاب الكبد الفيروسي
Vomiting	تقيؤ

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