D.PHARM • SECOND YEAR

Biochemistry & Clinical Pathology

CHAPTER 12

Organ Function Tests



ENGLISH CHAPTER NOTES

DIPLOMA IN PHARMACY

ORGAN FUNCTION TESTS: PURPOSE & TYPES

WHY ARE THEY DONE?

- detect functional abnormality or early organ dysfunction
- help differentiate conditions with similar symptoms
- monitor disease progression and response to treatment
- provide a baseline before surgery or major therapy

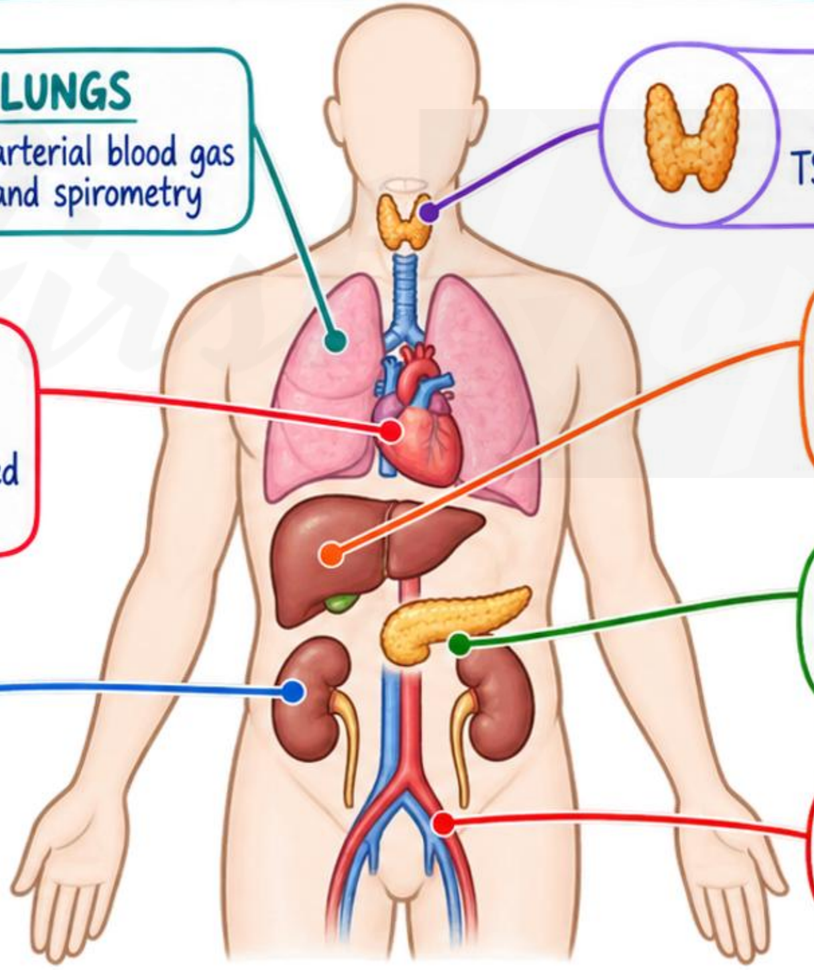
DEFINITION

Organ Function Tests are laboratory investigations used to assess how well an organ is working. They support diagnosis, screening and monitoring.

IMPORTANT

No single result proves a diagnosis: Interpret the pattern with symptoms, clinical findings and other investigations.

COMMON TEST GROUPS



LUNGS



arterial blood gas and spirometry

THYROID

TSH, T_3 and T_4

HEART



troponins, CK-MB, BNP; LDH may be used in selected settings

LIVER



ALT, AST, ALP, bilirubin, albumin, PT / INR

PANCREAS



glucose, amylase and lipase

KIDNEY



creatinine, urea / BUN, eGFR, electrolytes, urinalysis

LIPID PROFILE



total cholesterol, LDL, HDL and triglycerides

FUNCTIONS OF THE KIDNEY

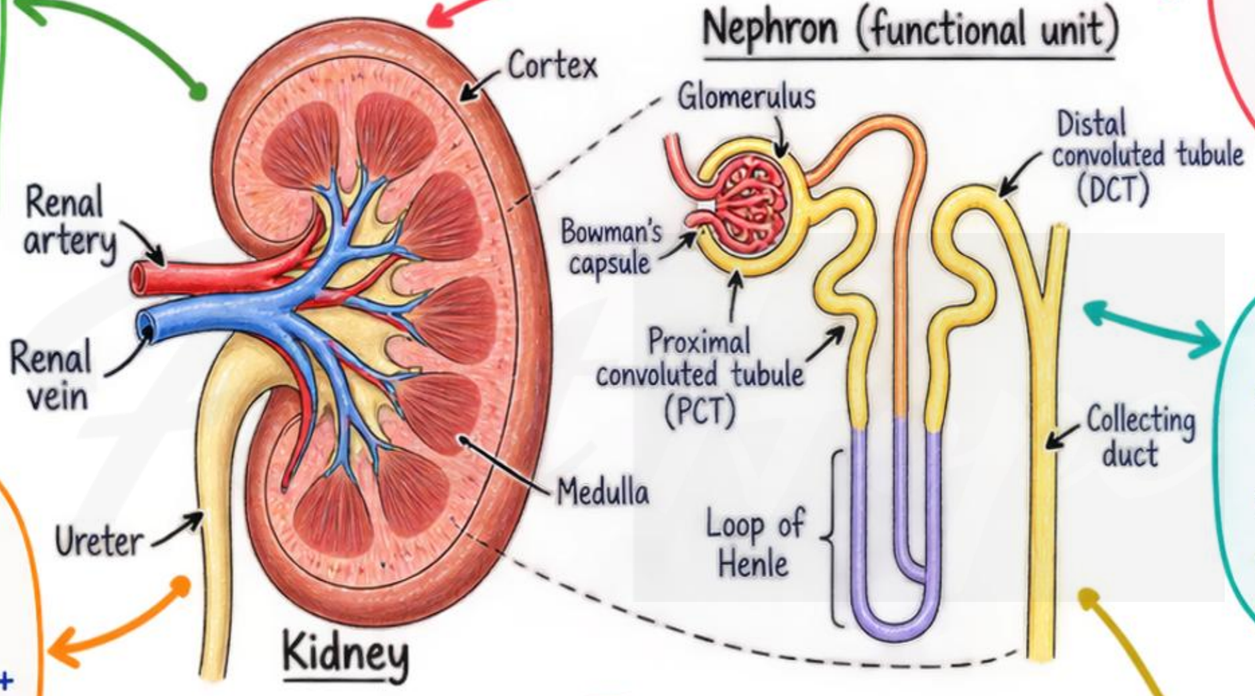
1. EXCRETION

Removes metabolic wastes and foreign substances in urine.

Examples: urea, creatinine and uric acid.

2. WATER & ELECTROLYTE BALANCE

Adjusts water and ions such as Na^+, K^+, Cl^-, Ca^{2+} and phosphate to maintain volume and osmolarity.



3. ACID–BASE BALANCE

Excretes H^+ and reabsorbs or produces HCO_3^- to help maintain normal blood pH.

4. ENDOCRINE FUNCTIONS

- erythropoietin stimulates RBC production
- renin helps activate the RAAS
- kidney forms active vitamin D — calcitriol

5. BLOOD-PRESSURE CONTROL

Regulates sodium, water and the renin–angiotensin–aldosterone system.

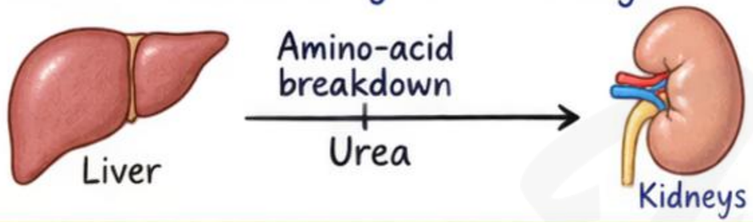
CORE IDEA

Healthy kidneys filter blood, preserve needed substances and remove wastes while maintaining internal balance.

BUN, CREATININE & BUN/CREATININE RATIO

BLOOD UREA NITROGEN – BUN

- Measures the nitrogen portion of urea in blood. Urea is formed in the liver from amino-acid breakdown and is excreted by the kidneys.



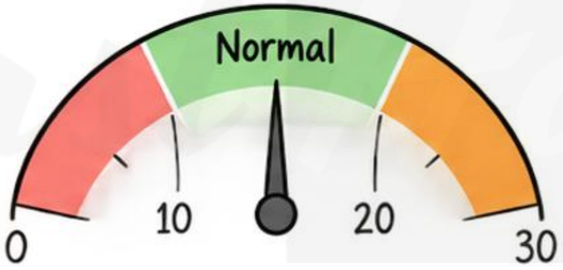
Reference interval: 7–20 mg/dL

- **HIGH** – reduced kidney filtration, dehydration, high protein intake or gastrointestinal bleeding
- **LOW** – severe liver dysfunction, malnutrition or overhydration

BUN / CREATININE RATIO

$$\frac{\text{BUN}}{\text{Creatinine}} \div$$

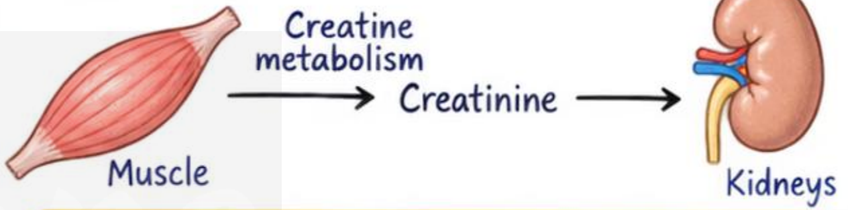
Normal: about 10:1 to 20:1



BUN/Creatinine Ratio

SERUM CREATININE

- Creatinine is produced mainly from normal muscle creatine metabolism and is cleared mostly by glomerular filtration.



Men: about 0.7–1.3 mg/dL
Women: about 0.6–1.1 mg/dL

- **HIGH** – suggests reduced kidney filtration, but interpretation also depends on muscle mass, age and medicines.

HIGH RATIO

- often prerenal causes such as dehydration or reduced renal blood flow; also upper GI bleeding or high protein load

BOTH RISE PROPORTIONATELY

- may occur with intrinsic renal dysfunction

LOW RATIO

- may occur with low urea production, such as severe liver disease or low protein intake

NOTE Reference intervals vary slightly between laboratories.

EGFR, CREATININE CLEARANCE & URINE TESTS

eGFR — ESTIMATED GLOMERULAR FILTRATION RATE

Calculated mainly from serum creatinine, age and sex. Current recommended equations do not use race.

- ≥90 mL/min/1.73 m² is generally normal when no other kidney damage is present
- <60 for at least 3 months, or other persistent evidence of kidney damage, supports CKD
- <15 suggests kidney failure

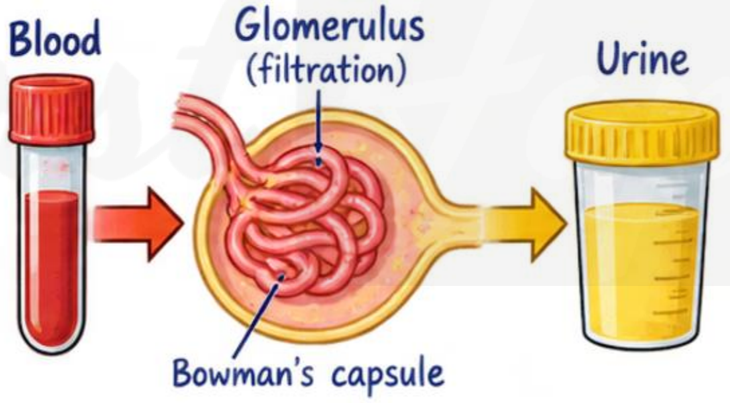
CREATININE CLEARANCE — CrCl

Estimates the volume of plasma cleared of creatinine each minute. It may use a timed, often 24-hour, urine collection and a blood sample.

$$\text{CrCl} = \frac{\text{Urine creatinine} \times \text{urine flow rate}}{\text{Plasma creatinine}}$$

Typical adult value: about 90–140 mL/min; depends on age, sex, body size and collection accuracy.





Filtration → Filtrate → Urine

ROUTINE URINALYSIS



PROTEIN
persistent protein may indicate glomerular damage

BLOOD
may occur with stones, infection, inflammation or other urinary disease

SPECIFIC GRAVITY
reflects urine concentration

pH
shows urine acidity or alkalinity

URINE ALBUMIN

30–300 mg/day was called microalbuminuria; current term: moderately increased albuminuria. It may be an early sign of diabetic kidney disease and increased cardiovascular risk.

First Hope

FREE PREVIEW

Click here to visit our website

PHARMACY PREMIUM NOTES

Complete subject and semesters are available on FirstHope app only.

Scan or click here

Click here to get the app >

Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram >

Scan or click here

@FirstHopeNotes

Instagram

@firsthope.official

Click here to follow >

YouTube channel

FirstHope-Pharmacy / Live streams

Click here to watch >

WhatsApp channel

Follow FirstHope on WhatsApp

Click here to join >

FirstHope website

firsthope.co.in

Click here to visit >

B.Pharm / D.Pharm / M.Pharm / Pharm.D

Preview notes. Complete subjects and semesters in the FirstHope app.