☆ URINE EXAMINATION – SUPER EASY + DETAILED NOTES

Urine examination is a simple but very important test.
It helps doctors understand:

- How well your **kidneys** are working
- If you have **infections**
- If your **liver** has a problem
- If you have **metabolic diseases** like diabetes
- If there are any **abnormal substances** in urine

Urine examination is divided into **3 main parts**:

1. **Physical Examination**
2. **Chemical Examination (Dipstick test)**
3. **Microscopic Examination**

Let's explain all in simple words.

---

1. PHYSICAL EXAMINATION OF URINE

These are the things we look at without a microscope.

A. Color

- **Normal color:** Pale yellow → Amber
- Due to pigment **Urochrome**

Abnormal colors and meaning:

- **Red:** Blood, beetroot, hemoglobin
- **Dark brown / cola-colored:** Liver disease, myoglobin
- **Very dark yellow:** Dehydration
- **Milky white:** Pus (infection)

👉 Color helps doctors guess what is happening inside the body.

B. Appearance (Clarity)

- **Normal:** Clear

Cloudy urine means:

- WBCs (infection)
- RBCs
- Crystals
- Bacteria
- Mucus

C. Odor

- **Normal:** Slight aromatic smell

Abnormal odors:

- **Fruity smell:** Ketones (DKA in diabetes)
- **Foul smell:** UTI
- **Ammonia smell:** Old urine, infection

D. Volume (24 hours urine)

- Normal amount: **1 – 1.5 liters per day**

Increased urine (Polyuria)

- Diabetes
- Kidney disease
- Excess water
- Diuretics

Decreased urine (Oliguria)

- Dehydration
- Shock
- Kidney failure

No urine (Anuria)

- Kidney shutdown
- Obstruction (stones, tumor)

E. Specific Gravity (SG)

Shows how concentrated urine is.

- **Normal:** 1.005 – 1.030

High SG

- Dehydration
- Diabetes mellitus
- Heart failure

Low SG

- Kidney failure
- Diabetes insipidus
- Drinking too much water

---

2. CHEMICAL EXAMINATION (DIPSTICK TEST)

Dipstick = Plastic strip with small chemical pads that change color when dipped in urine.

Each pad checks one substance.

All Chemical Tests Explained

---

1 pH

Shows acidity or alkalinity.

- **Normal:** 4.6 – 8.0

Acidic urine:

- Diabetes
- High protein diet
- Dehydration

Alkaline urine:

- UTI
- Vomiting
- Vegetarian diet

---

2 Protein

- **Normal:** Negative or Trace
- Protein in urine = **Proteinuria**

Causes:

- Kidney damage (nephritis)
- Nephrotic syndrome
- Hypertension
- Fever
- UTI

👉 **Heavy protein = Nephrotic syndrome**

---

3 Glucose

- **Normal:** Negative

Causes:

- Diabetes (most common)
- Pregnancy
- High sugar intake

---

4 Ketones

Formed when body burns fat instead of glucose.

Positive in:

- Diabetic ketoacidosis (DKA)
- Starvation
- Fasting
- Vomiting
- Low carb diet

---

5 Blood (Hematuria)

Dipstick detects
✔ RBCs
✔ Hemoglobin
✔ Myoglobin

Causes:

- UTI
- Kidney stones
- Injury
- Glomerulonephritis
- Menstrual contamination

---

6 Bilirubin

- **Normal:** Negative
- Tells about **liver problems**

Positive in:

- Hepatitis
- Liver cirrhosis
- Obstruction (gallstones)

---

7 Urobilinogen

Small amount is normal.

High:

- Liver disease

- Hemolytic anemia

Absent:

- Bile duct blockage

---

8 Nitrites

- **Normal:** Negative
- Positive = **Bacteria present**

Bacteria convert **nitrate → nitrite**

👉 **Indicates UTI (especially E. coli)**

---

9 Leukocyte Esterase (LE)

- **Normal:** Negative
- Shows **white blood cells**

Positive in:

- UTI
- Kidney infection (pyelonephritis)

👉 **Nitrite + LE positive = Strong UTI**

---

3. MICROSCOPIC EXAMINATION

Urine is centrifuged → sediment is examined under microscope.

☆ Things seen in Microscopic Exam

A. Cells

1. Red Blood Cells (RBCs)

- Normal: 0–2/hpf
- High in: UTI, stones, kidney disease

2. White Blood Cells (WBCs)

- Normal: 0–5/hpf
- High = Infection (UTI)

3. Epithelial cells

- From urinary tract
- High amount = Contamination or infection

B. Casts

Casts form inside kidney tubules.

Types:

- **Hyaline casts:** Normal in dehydration
- **RBC casts:** Glomerulonephritis
- **WBC casts:** Pyelonephritis
- **Granular casts:** Chronic kidney disease
- **Fatty casts:** Nephrotic syndrome

C. Crystals

Different salts become crystals.

Types:

- **Uric acid:** Gout
- **Calcium oxalate:** Stones
- **Triple phosphate:** UTI
- **Cystine:** Genetic disorder

D. Microorganisms

- **Bacteria:** UTI
- **Yeast:** Diabetes
- **Parasites:** Trichomonas

SUPER EASY SUMMARY

Test	What it tells	Disease indicated
Color	Pigments	Blood, liver disease
SG	Concentration	Dehydration, kidney failure
Protein	Kidney damage	Nephrotic syndrome
Glucose	Sugar level	Diabetes
Ketones	Fat breakdown	DKA, starvation
Blood	RBCs	Stones, UTI
Bilirubin	Liver function	Hepatitis
Nitrite	Bacteria	UTI
LE	WBCs	UTI
Casts	Kidney tubules	Nephritis

IMPORTANT QUESTIONS & ANSWERS

Q1: What are the 3 parts of urine examination?

Answer:

1. Physical
2. Chemical
3. Microscopic

Q2: What is normal color of urine?

Answer:
Pale yellow → Amber (due to urochrome pigment).

Q3: What does high specific gravity mean?

Answer:
Urine is very concentrated due to:

- Dehydration
- Diabetes
- Heart failure

Q4: What causes proteinuria?

Answer:

- Kidney damage
- Nephrotic syndrome
- UTI
- Fever
- Hypertension

Q5: What does nitrite-positive urine indicate?

Answer:
Presence of bacteria → **UTI**, especially **E. coli**.

Q6: What do RBC casts indicate?

Answer:
Glomerulonephritis

Q7: What are ketones and when are they seen?

Answer:
Ketones are produced when fat is used for energy.
Seen in:

- DKA
- Starvation
- Fasting

Q8: What does bilirubin in urine suggest?

Answer:
Liver disease or bile duct blockage.

Q9: What are the signs of UTI in urine?

Answer:

- Positive **nitrite**
- Positive **leukocyte esterase**
- Increased **WBCs**
- Bacteria present

Q10: What crystals are seen in kidney stones?

Answer:
Calcium oxalate crystals
