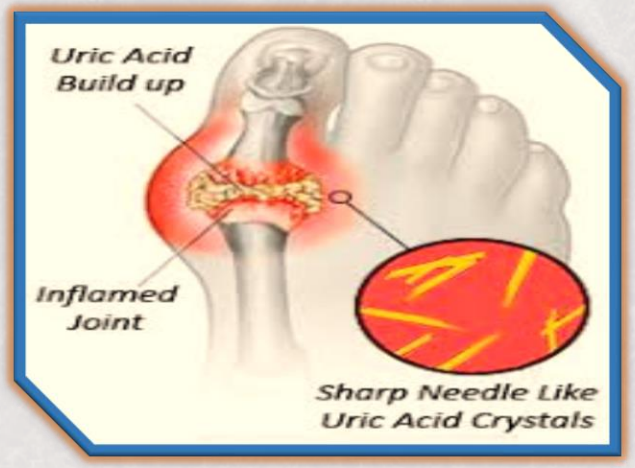
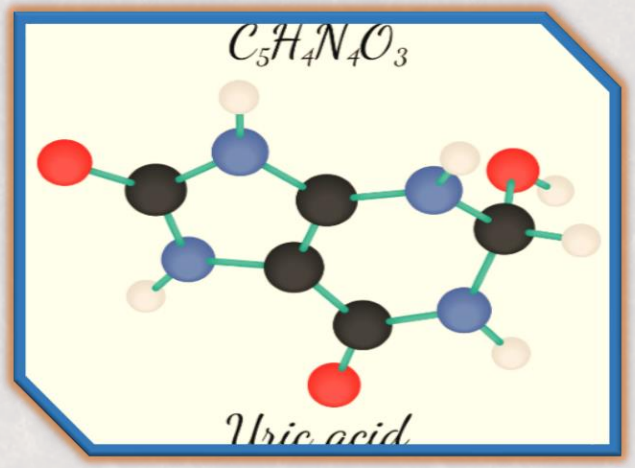
Al-Mustaqbal University College

Pharmacy Department – Third Class

Practical Biochemistry

Estimation of Uric Acid



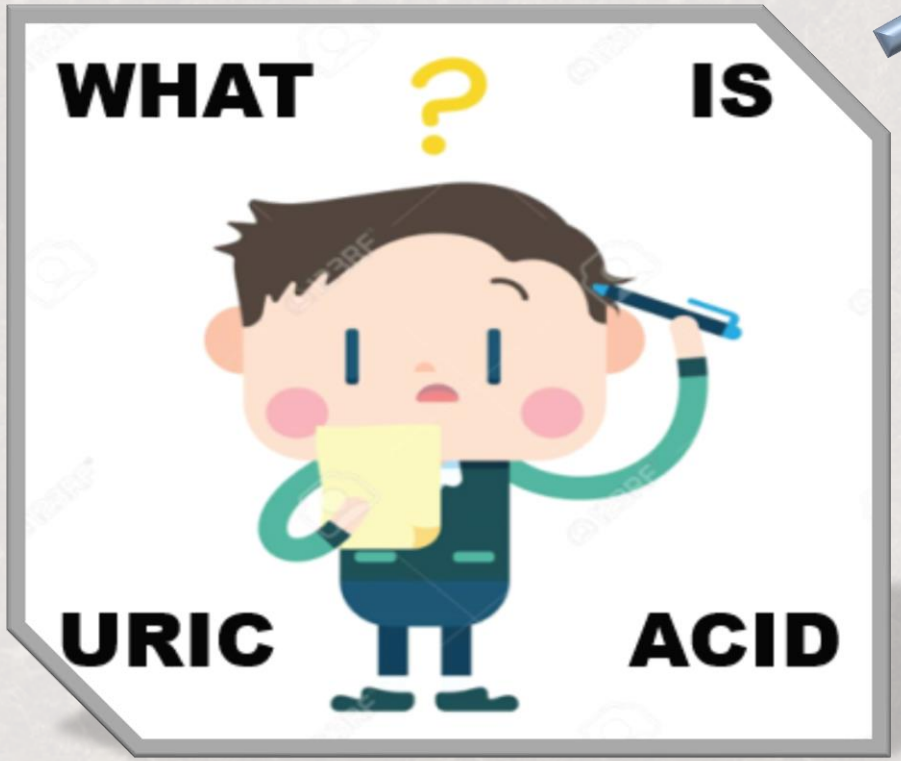


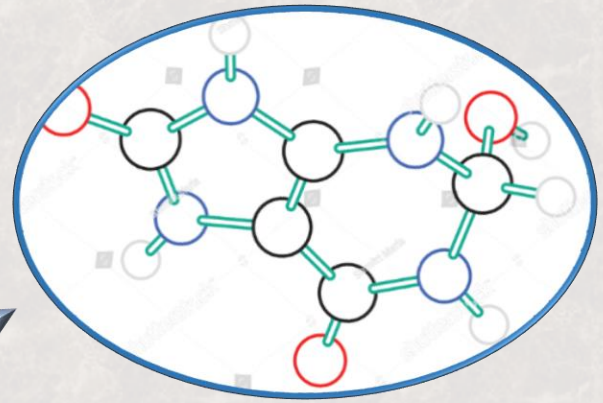
Third Lec.

Assist. Lec. ZAINAB GHALEB

Out Line

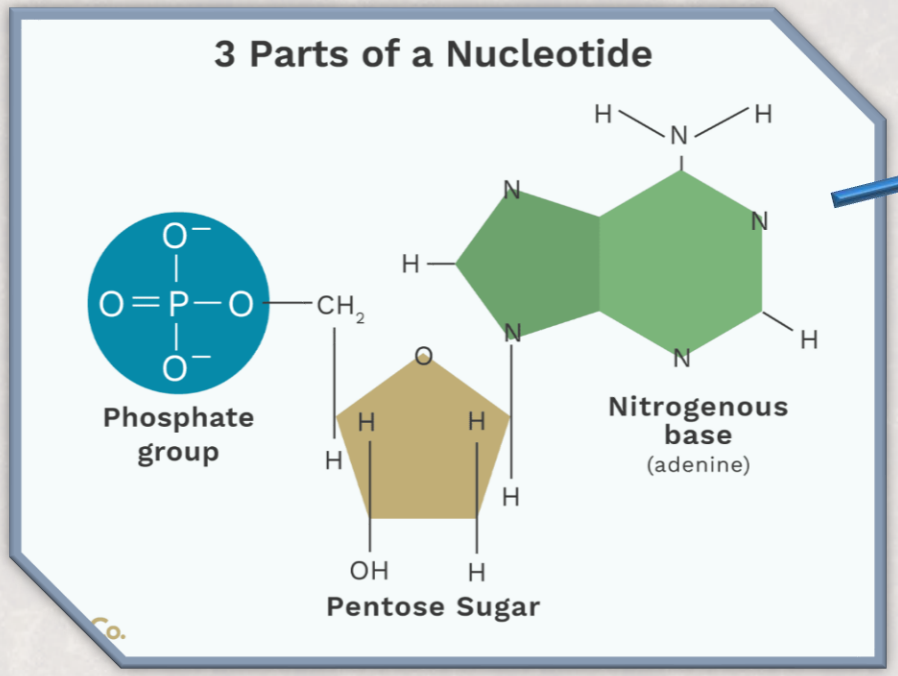
- ✓ Introduction.
- ✓ Purine Catabolism Pathway.
- ✓ Produce of Uric Acid.
- ✓ Normal Value of Uric Acid.
- ✓ Clinical Significance.
- ✓ Determination of Uric Acid in Serum.


WHAT
?
IS
URIC
ACID



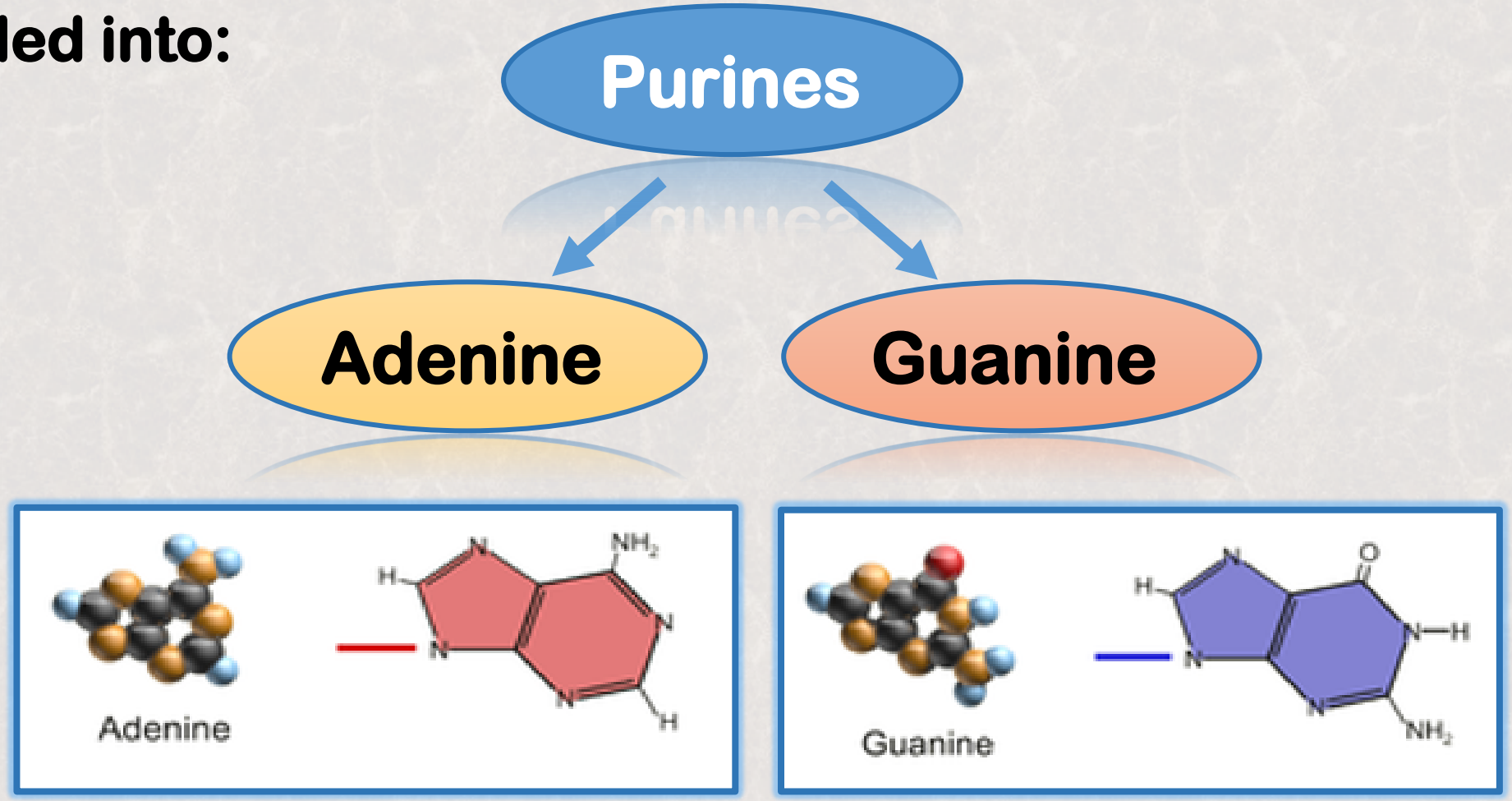
Introduction

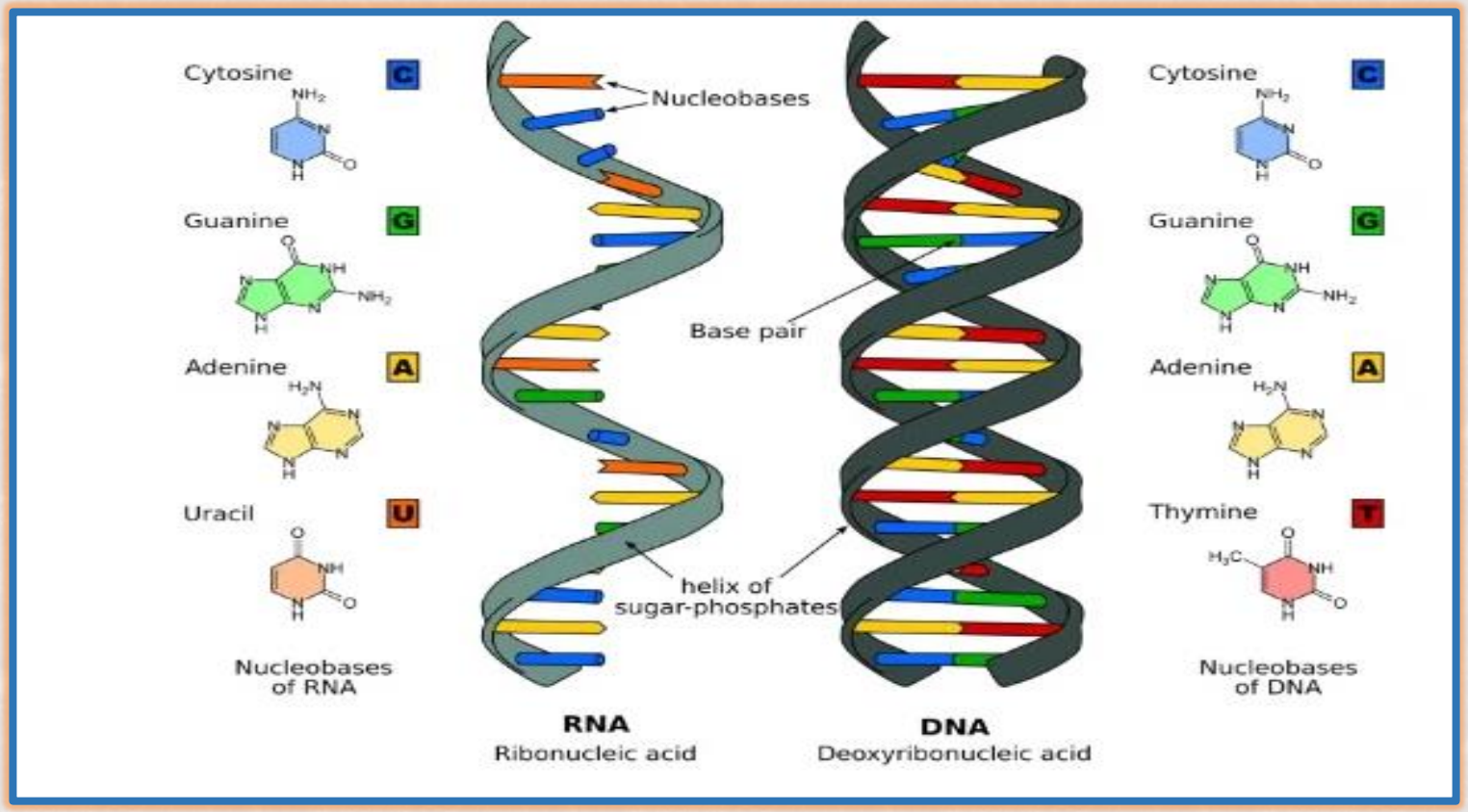
- Uric acid is the **End Product** of **Purine** Catabolism in human.



- Purines are the important constituents of Nucleic Acids (DNA, RNA)

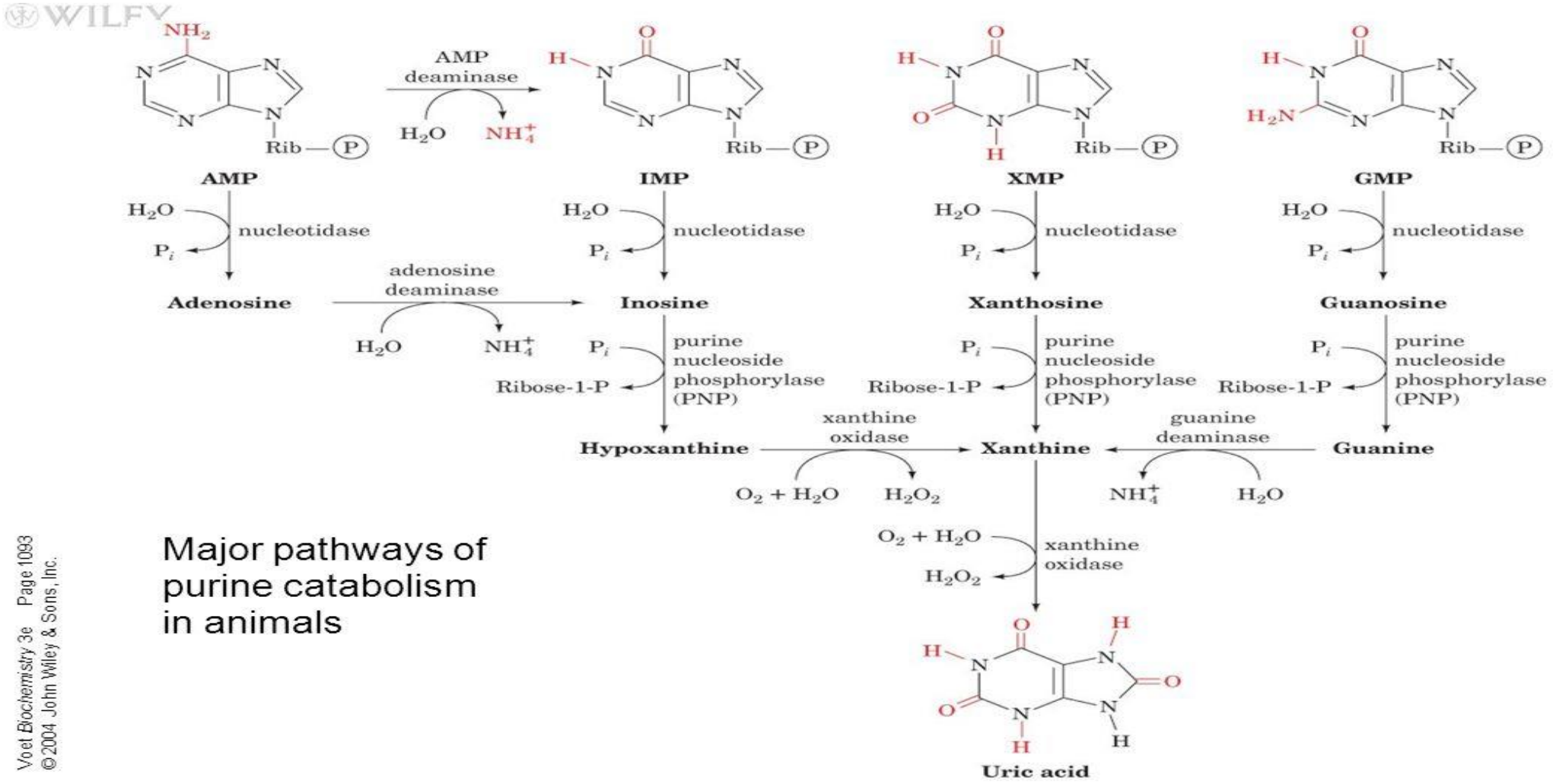
- **Purines:** are **Nitrogen Base** formed with **Sugar** and **Phosphate** a **Nucleotide** (the essential unit of **DNA**, **RNA**) and can be divided into:



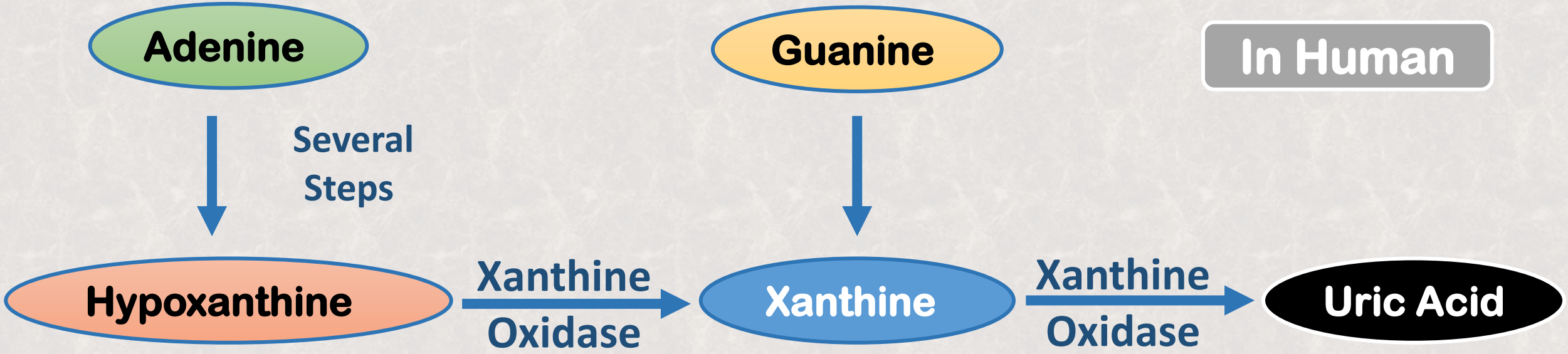


- ❑ **The sources of Purines are:**
- ✓ **Exogenous: The Breakdown of Ingested Nucleic acids (Diet).**
- ✓ **Endogenous: Tissue Destruction.**

Purines Catabolism Pathway



Major pathways of purine catabolism in animals



- Purines are converted into Uric Acid, primarily in the Liver.

- Allantoin is more water-soluble End product.

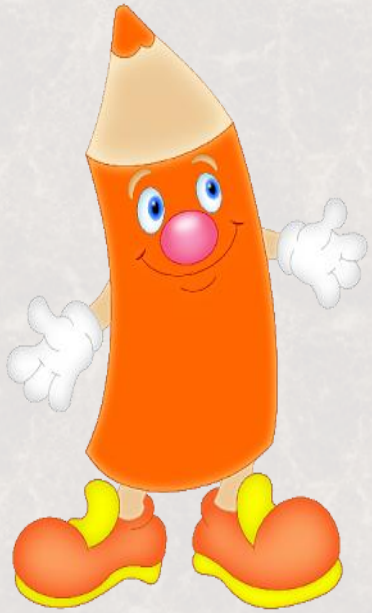
- Uric acid is transported in the Plasma from the Liver to the Kidney, where it is filtered by the Glomerulus.
- Although it is filtered by the Glomerulus and secreted by the Distal tubules into the Urine, most of Uric acid is Reabsorbed in the Proximal tubules and reused.
- Renal excretion is about 70% of Uric acid elimination; the remainder passes into the Gastrointestinal tract and is degraded by Bacterial enzymes.

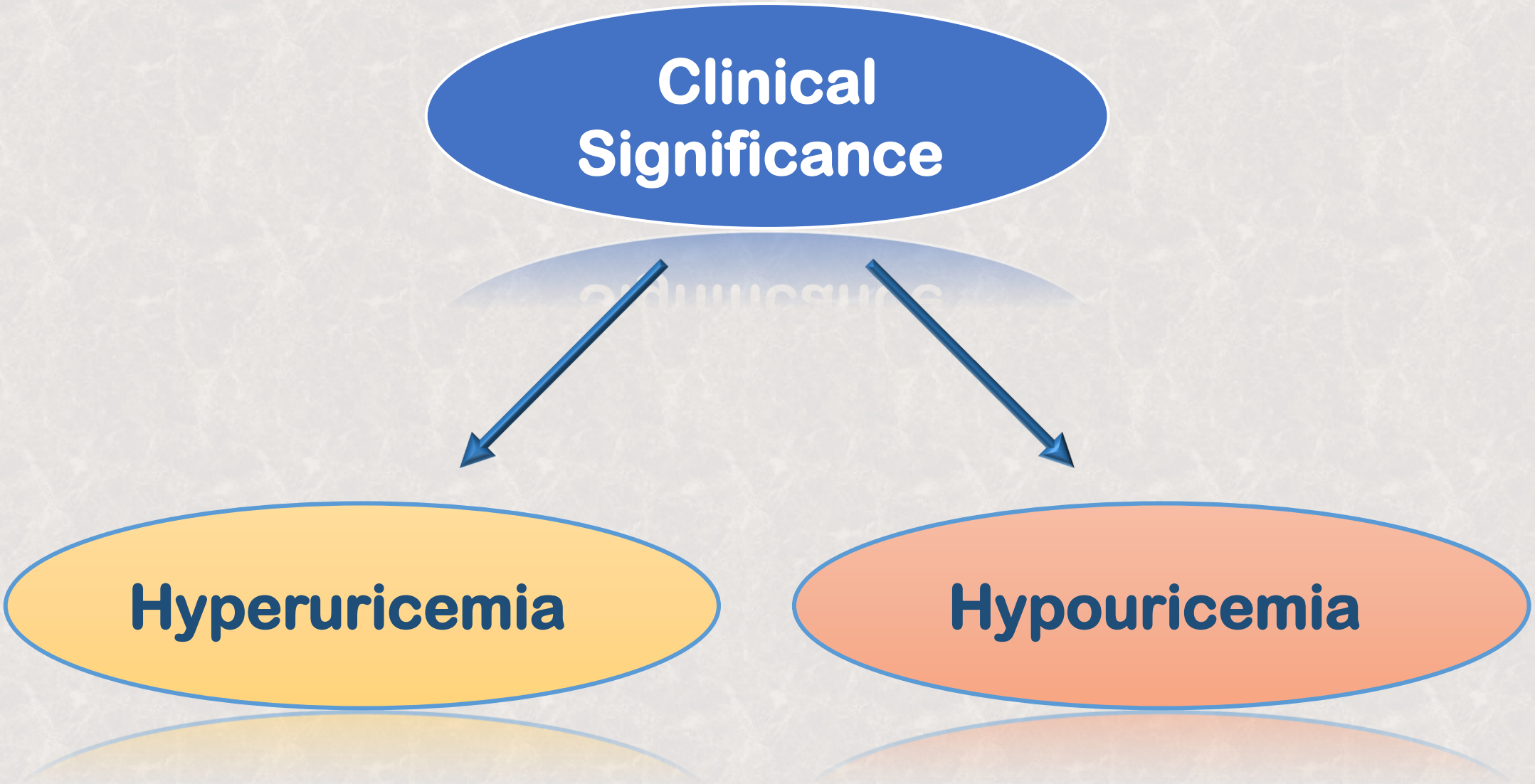
- Uric acid is relatively Insoluble in Plasma and nearly all of it presents in Plasma as Monosodium Urate.
- At high concentrations (the Plasma is Saturated) so, Uric Acid will be Precipitate in the Joints and Tissue, causing Painful Inflammation.

Normal Value

- The Normal Value of Uric Acid is must be between:

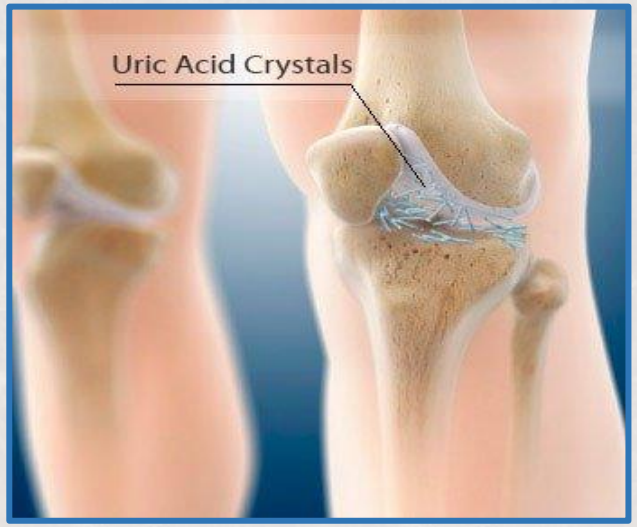
Male	3.4 – 7 mg/dl
Female	2.5 – 6 mg/dl




Clinical Significance
Hyperuricemia
Hypouricemia

Hyperuricemia

1. **Gout** is a disease found Primarily in **Men** and usually is first diagnosed between 30 and 50 years of age. Affected individuals have **Pain** and **Inflammation** of the **Joints** caused by **Precipitation** of **Sodium Urates**.





2. Increased Metabolism of Cell Nuclei, as occurs in patients on (Leukemia, Lymphoma, Multiple Myeloma).

3. Chronic Renal Disease.

4. Ingestion of a purines rich Diet.

5. Increased tissue catabolism due to inadequate Dietary intake (Starvation).

6. Inherited disorders of purine metabolism (Lesch-Nyhan syndrome).

7. Hyperuricemia is a common feature of Toxemia of Pregnancy and Lactic Acidosis.

8. Drugs such as Salicylates and Thiazides.

Hypouricemia

- **Hypouricemia** is less common than **Hyperuricemia**.

1. Liver disease.
2. Defective tubular reabsorption (**Fanconi Syndrome**).
3. Chemotherapy with **Azathioprine** or **6-mercaptopurine**.
4. Overtreatment with **allopurinol** (**Drug using to decrease the Uric Acid level**).

Principle

- **Uric acid is Oxidized by Uricase to Allantoin and Hydrogen Peroxide, according to the following equations:**

$$\text{Uric acid} + O_2 + 2H_2O \xrightarrow{\textit{Uricase}} \text{Allantoin} + CO_2 + H_2O_2$$

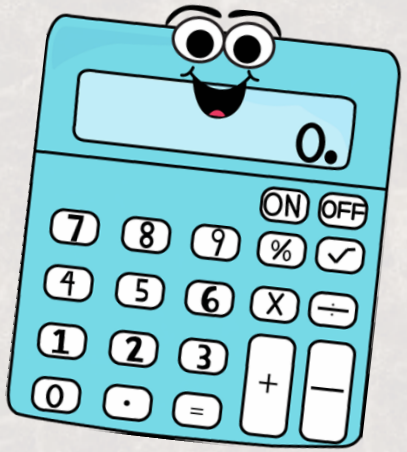
$$2H_2O_2 + \text{4-Aminophenazone} + \text{2,4-dichlorophenol-sulfonate} \xrightarrow{\textit{Peroxidase}} \text{Quinonimine} + 4H_2O$$

Procedure

- In this test (Uric Acid test) Wavelength used is 520 nm. Sample used is Serum.

Solutions	Blank	Standard	Sample
Working Reagent	1 ml	1 ml	1 ml
Standard	-	20 µl	-
Sample	-	-	20 µl
Mix, incubate 5 min at 37 ℃ or 10 min at 25 ℃. Then measure the absorbance at 520 nm.			

Calculations



- The Uric Acid Concentration in the Sample is calculated by using the following general formula:

$$C\ sample = \frac{Absorbance\ of\ Sample}{Absorbance\ of\ Standard} \times Standard\ conc.$$

- The Concentration of the Standard is:

8 mg/dl

Asst. Lec. ZAINAB GHALEB ABDUL KAREEM