

Lab.

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ISLAMIC UNIVERSITY

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Serum phosphate



Phosphorus

The total body phosphorus content in normal adults is around 700 to 800 grams. Approximately 80% to 85% is present in the skeleton; the remaining 15% is present in the ECF in the form of inorganic phosphate, and intracellularly in the soft tissues as organic phosphates such as phospholipids, nucleic acids, and adenosine triphosphate (ATP). The skeleton contains primarily inorganic phosphate, predominantly as hydroxyapatite and calcium phosphate.

In blood, organic phosphate is located primarily in erythrocytes, with the plasma containing mostly inorganic phosphate. Inorganic phosphate in serum exists as both divalent (HPO_4^{2-}) and monovalent (H_2PO_4^-) phosphate anions, approximately 10% of the serum phosphorus is bound to proteins; 35% is complexed with sodium, calcium, and magnesium; and the remaining 55% is free. Only inorganic phosphorus is measured in routine clinical tests.

Serum calcium and phosphorus generally maintain a reciprocal relationship

Phosphorus level is dependents upon:

- 1- Parathyroid hormone PTH.
- 2- Renal excretion.
- 3- Intestinal absorption.

Purpose of the test (Indication):

1. This will give an idea of renal and bone diseases.
 2. This test is done to investigate calcium abnormality.
 3. This test is done to evaluate parathyroid abnormality.
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Clinical significance:

***Hyperphosphatemia:** Increased phosphorus level occurs with the following cases:

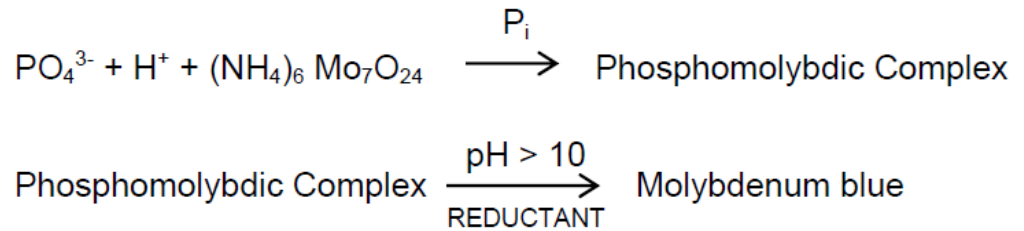
- 1- Bone metastases
- 2- Chronic kidney disease
- 3- Hypocalcemia and Hypoparathyroidism

***Hypophosphatemia: Decreased serum level of phosphorus occurs with:**

- 1- Hyperparathyroidism
- 2- Impaired renal absorption
- 3- Vitamin D deficiency

Principle:

Inorganic phosphate reacts with molybdic acid forming a phosphomolybdic complex. Its subsequent reduction in alkaline medium originates a blue molybdenum color which intensity is proportional to the amount of phosphorus present in the sample.



Procedure:

- 1- Bring reagents and samples to room temperature.
- 2- Pipette into labeled test tubes:

TUBES	Blank	Sample	CAL. Standard
Working Reagent	1.0 mL	1.0 mL	1.0 mL
Sample	–	50 µL	–
CAL. Standard	–	–	50 µL

3. Mix, let stand the tubes for 1 minute and then pipette:

R3. Developer	0,5 mL	0,5 mL	0,5 mL
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4. Mix and let the tubes stand 10 minutes at room temperature.

5. Read the absorbance (A) of the sample and the standard at 740 nm against the reagent blank.

Calculations:

Serum, plasma

$$\frac{A \text{ Sample}}{A \text{ Standard}} \times C \text{ Standard} = \text{mg/dL phosphorus}$$

Notes:

- 1- Avoid anticoagulants like oxalate, citrate, and EDTA
- 2- Samples with concentrations higher than 15 mg/dL (4.8 mmol/L) should be diluted 1:2 with saline and assayed again. Multiply the results by 2.
- 3- This test can be done on serum or heparinized plasma also on urine.