



>>Entry Name: Phosphorus

CAS Registry Number: 7723-14-0

Related CAS Registry Numbers(s): 12185-09-0 12185-10-3 14596-37-3 16427-80-8 16427-81-9 16999-00-1 18925-96-7 20337-88-6 22537-25-3 55030-78-9
P

Molecular Formula: P

Molecular Weight: 30.974

Accurate Mass: 30.973762

Percentage Composition: P 100.00%

Phosphorus has one stable isotope ^{31}P (100%), but has 6 radioactive isotopes of which ^{32}P is the most important. Important element in nmr spectroscopy. Abundance: 1120 ppm (earth's crust); 0.07 ppm (sea water). Vap. contains P_4 , P_2 molecules and atomic P

Use/Importance: One of the elements forming the basis of life (DNA, RNA) and basis of a secondary biological cycle. ^{32}P useful in trace work

Aldrich: 20967-8

Fluka: 79530

Sigma: P7894

>>Variant: White-form

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three independent P_4 tetrahedra per cell. Quenching the α -form to -185° followed by slow warming gives the γ -form which transforms into the β -form at -120°

Source/Synthesis: Synth. from phosphate minerals e.g. Calcium phosphate ($\text{Ca}_3(\text{PO}_4)_2$) [HTM71-D](#), by heating with $\text{SiO}_2 + \text{C}$ at $1400-1500^\circ$

Use/Importance: Used mainly in manuf. of 2,4,6,8,9,10-Hexaoxa-1,3,5,7-tetraphosphatrimethyldecane 1,3,5,7-tetraoxide [HTK74-W](#), Phosphorus pentoxide [HTN80-K](#), and thence Phosphoric acid [HTV82-A](#)

Physical Description: White (yellow when impure), waxy solid. V. reactive, inflames in air

Melting Point: Mp $44.1-44.3^\circ$

Boiling Point: Bp 280.5°

Solubility: V. sol. CS_2 , PCl_3 , POCl_3 , $\text{SO}_2(\text{l})$, $\text{NH}_3(\text{l})$; sol. CCl_4 (1.27 g per 100 g), Et_2O (1.39 g per 100 g); C_6H_6 (3.7 g per 100 g); sl. sol. Me_2CO ; insol. H_2O

Other Data: d^{20}_{400} 1.82-1.83 (α), d^{20}_{400} 1.88 (β). V. slow oxidation $\rightarrow$ greenish phosphorescence. Reacts vigorously with halogens, S and many metals

Hazard & Toxicity: V. poisonous. Spont. ignites when dry at 35°

>>Variant: Red-form

Molecular Formula: P

Molecular Weight: 30.974

Accurate Mass: 30.973762

Percentage Composition: P 100.00%

Source/Synthesis: Synth. by heating yellow, tetra-atomic P at 400° in absence of air

Physical Description: Red amorphous or cryst. solid, but colour may vary. *Hittorf's phosphorus* is violet, *Schlenck's phosphorus* is scarlet

Melting Point: Mp *ca.* $585-600^\circ$

Solubility: Insol. org. solvs.

Other Data: Less reactive than the white form, e.g. no reaction with aq. alkali. d 2.0-2.4

Hazard & Toxicity: Essentially non-toxic. Ignites only at $>260^\circ$

>>Variant: Black-form

Molecular Formula: P

Molecular Weight: 30.974

Accurate Mass: 30.973762

Percentage Composition: P 100.00%

continuous double layer struct. (b) Has hexagonal lattice layer struct. In (c) atoms have octahedral environment

Source/Synthesis: The action of v. high pressure on white or red P $\rightarrow 200^\circ \rightarrow$ orthorhombic form

Physical Description: Flaky, metallic and graphite-like. A vitreous grey form is hard and brittle

Solubility: Insol. most solvs.

Other Data: Electrical insulator. Stable in air. Practically non-flammable