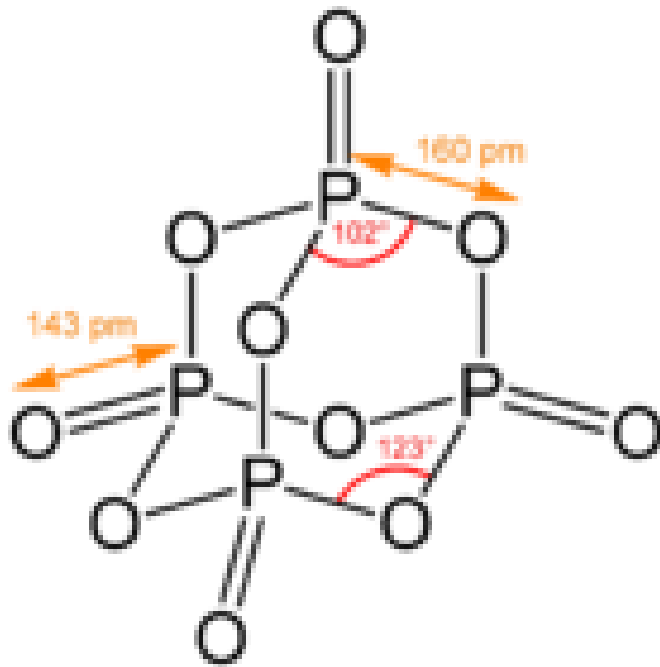


How much phosphorous is in
plant food?

Schweitzer



- PentaPhosphorus pentoxide crystallizes in at least four forms or polymorphs. The most familiar one, shown in the figure, comprises molecules of P₄O₁₀. Weak van der Waals forces hold these molecules together in a hexagonal lattice

Why do they call it phosphate?

- Chemical reaction
 - Non-metal oxide + water \rightarrow Acid
- $\text{P}_4\text{O}_{10} + 6 \text{H}_2\text{O} \rightarrow 4 \text{H}_3\text{PO}_4$ (-177 kJ)
 - Metal oxide + water \rightarrow Base
- $\text{Na}_2\text{O} + \text{H}_2\text{O} \rightarrow \text{Na}^+ + \text{OH}^-$

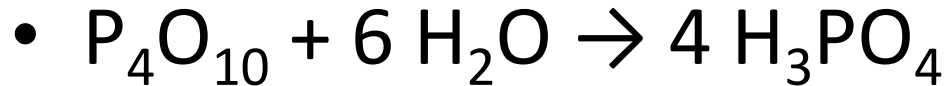
%P in Miracle-Gro®

- The quantity of P Miracle-Gro varies depending on the type of fertilizer you buy.
- We are using a variety that is 8% by mass P_2O_5
 - 100g of Miracle-Gro yield 8g of P_2O_5
- %P in P_2O_5
 - $61.94g/141.94 = 43.6\% P$
 - $8g * .436 = 3.49g$ in 100g of plant food
 - 3.49% P is expected or accepted known value

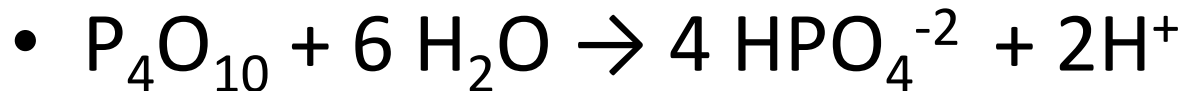
Gravimetric Analysis

- P_2O_5 is a water soluble form of phosphate. This is one of the main reasons it is used. If it was not soluble it would simply not be able to be used by the plant.
- Gravimetric analysis will simply take this water soluble form of phosphate and convert it to a known insoluble form.
- We will then collect and dry it. Based on its chemical composition we will determine the amount of P

Chemical reactions



or



- This reaction takes place as soon as you add it to the water. The water is then a little acidic.

-

Chemical reactions

- Adding Mg^{2+} is needed to form the insoluble salt
- NH_3 Adding the ammonia causes the H^+ to be converted over NH_4^+
- Both of these chemicals are simply being added in excess. Extra simply does not precipitate.
- Salt formed is MgNH_4PO_4



- Determination of P in MgNH_4PO_4
- % mass = mass P/total mass * 100
- Take a moment and determine % mass P.

Final calculation

- Original sample of Plant food: 1.5g
- % Mass = mass of P/1.5 * 100 = %P
- % error, compare your percent to 3.4%