

OXYGEN COMPOUNDS OF PHOSPHORUS

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ANNOTATION

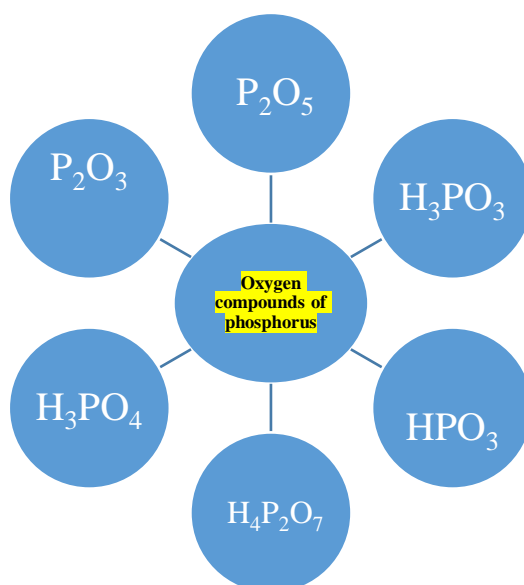
This article discusses the methodology of teaching phosphorus and its compounds using the methods of blitz survey, cluster and brainstorming.

Keywords: Phosphorus (III) oxide, orthophosphoric acid, "Blitz questionnaire", cluster.

Homework - to study the atomic structure of phosphorus, methods for obtaining compounds. Using the "Blitz Questionnaire", the covered topic is asked with the help of quick questions.

Fill in the table:

Nº	Name	Answer
1	Phosphorus chemical symbol	
2	Position in the periodic table	
3	atomic structure	
4	Electronic configuration	
5	Valence	
6	Oxidation level	
7	Allotropic shape changes	



There are 2 oxides of phosphorus.

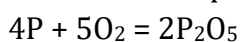
Phosphorus (III) oxide.

P_2O_3 is a white, waxy toxic substance.

Phosphorus(V) oxide.

P_2O_5 is a white crystalline hygroscopic substance.

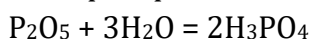
Phosphorus(V) oxide is formed with the participation of a sufficient amount of oxygen in the combustion of phosphorus:



From a solution of P_2O_5 in water under normal conditions:

Metaphosphoric acid $P_2O_5 + H_2O = 2HPO_3$ is formed.

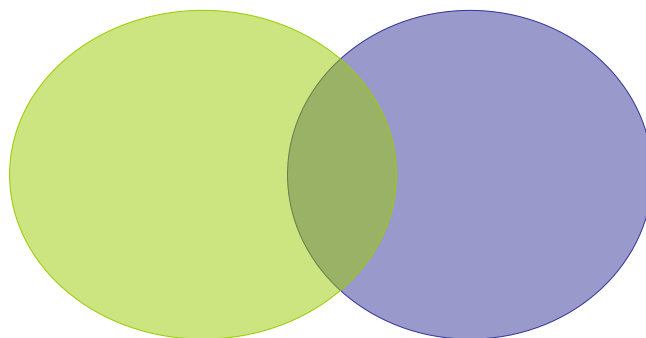
Orthophosphoric acid can be obtained by heating an aqueous solution of P_2O_5 :



Homework is given. Compare the two oxides using a Venn diagram.

P_2O_3

P_2O_5



Phosphoric acids are taught.

H_3PO_3 - phosphitic acid

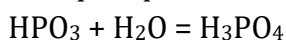
HPO_3 - metaphosphoric acid

H_3PO_4 - phosphoric acid

$H_4P_2O_7$ - pyrophosphate acid

There will be memory training. 2 students go to the blackboard and write the formulas of memorized acids.

Metaphosphate acid reacts with water under the influence of temperature to form orthophosphate acid:

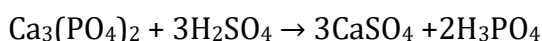


When orthophosphate acid is gently heated, pyrophosphate acid is formed:



Upon further heating, it decomposes to P_2O_5 .

Orthophosphoric acid is obtained in the laboratory by heating calcium orthophosphate under the action of concentrated sulfuric acid:



Orthophosphoric acid - H_3PO_4 . Orthophosphoric acid is a colorless crystalline substance, highly soluble in water, liquefies at $42.3^\circ C$.

When phosphoric acid dissociates, it forms 3 different ions, so 3 series of salts are formed.

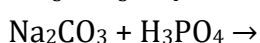
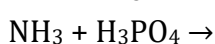
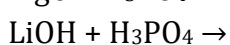
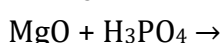
Dihydrogen phosphate: NaH_2PO_4

Hydrophosphate: Na_2HPO_4

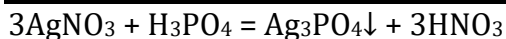
Phosphate: Na_3PO_4

Orthophosphoric acid gives all the general reactions characteristic of acids.

Reactions are written on the board, students continue the reactions and compare:



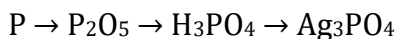
Experience: a solution of phosphoric acid is poured into a solution of silver nitrate, and a yellow precipitate Ag_3PO_4 precipitates.



This reaction is reactive for the phosphate ion.

The famous academic scientist A.Y.Fersman highly valued the importance of phosphorus and called it the "element of life and thought" $\text{Ca}_3(\text{PO}_4)_2$, an inorganic component of human and animal bone tissue. It provides strength and hardness to bones. Energy metabolism in a living organism is carried out by a phosphorus compound - adenosine triphosphate (ATP). The daily intake of phosphorus by a person is approximately 1600 mg.

Make the following changes.



Compare phosphorus oxides with a Venn diagram.

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