

gas, which fumes in air. Chlorine has a very strong affinity for Hydrogen, forming the very stable compound, Hydric Chloride: while Bromine unites with Hydrogen with far more difficulty to form HBr, which can be more easily decomposed than HCl. Iodine combines very imperfectly with Hydrogen to form the quite unstable compound, Hydric Iodide, which, if exposed to air, immediately decomposes.

(a). (1). Argentic Nitrate (AgNO_3) added to any solution containing a Chloride will give a *curdy precipitate* (AgCl) insoluble in boiling Hydric Nitrate but readily soluble in Ammonia.

(2). Heat the suspected liquid with Manganic Oxide (MnO_2) and Hydric Sulphate (H_2SO_4), when Chlorine gas will be evolved.

(1). An iodide may be detected by its action upon some starch paste moistened with a drop or two of Chlorine water.

(2). Argentic Nitrate produces a *pale yellow precipitate* of Argentic iodide, insoluble, both in *Hydric Nitrate* and *Ammonia*.

(3). Plumbic Acetate $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$ gives a *bright yellow precipitate* of plumbic iodide.

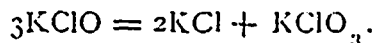
(1). A Fluoride may be detected by mixing the liquid with Hydric Sulphate, and heating it, when Hydric Fluoride (HF) will be evolved which may be tested by its power of etching upon glass.

(b). The following reaction occurs:—
 $2\text{KHO} + \text{Cl}_2 = \text{KCl} + \text{KCLO} + \text{H}_2\text{O}$.
 That is, a mixture of the Chloride and the Hypochlorite of the metal Potassium.

(c). Pass Chlorine to saturation into a strong solution of Caustic Potash (KOH), then boil the solution for some time.

1st. Potassic Hypochlorite is formed.

2nd. This salt is decomposed into a Chloride and Chlorate.



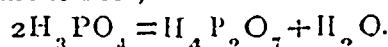
Q.—“Give the principal Hydric Salts of Phosphorus, (a) How are they formed? (b) Give some of their distinguishing tests.”

(1) H_3PO_3 , Trihydric Phosphate, or Phosphorous Acid, is formed by adding H_2O to

P_2O_3 . It is a debasic acid, two atoms of Hydrogen being replaceable.

(2) H_3PO_4 , Trihydric Phosphate, or Phosphoric Acid is formed if a solution of P_2O_5 in water, be boiled. This acid is an exceedingly definite body, is so stable that it is destitute of oxidizing power, and is not reducible by nascent Hydrogen. It may be made to crystallize. It is a tribasic acid, and is distinguished in solution by giving a yellow precipitate with $\text{AgNO}_3 = \text{Ag}_3\text{PO}_4$, also a white precipitate with Ammonia and Magnesium Sulphate = Ammonium Magnesium Phosphate $\text{NH}_4\text{MgPO}_4 + 6\text{H}_2\text{O}$.

(3) $\text{H}_4\text{P}_2\text{O}_7$, Pyrophosphoric Acid is formed if tribasic Phosphoric be heated for some time to 210° ,



It is a tetrabasic acid. *Tetrasodic Pyrophosphate*, $\text{Na}_4\text{P}_2\text{O}_7$, is formed by heating Hydrodisodic Phosphate to redness, $2\text{Na}_2\text{HPO}_4 = \text{H}_2\text{O} + \text{Na}_4\text{P}_2\text{O}_7$. This substance gives with AgNO_3 a White Precipitate $\text{Ag}_4\text{P}_2\text{O}_7$.

4. HPO_3 Metaphosphoric Acid is formed when P_2O_5 is brought into contact with H_2O $\text{P}_2\text{O}_5 + \text{H}_2\text{O} = 2\text{HPO}_3$ or by evaporating a solution of Trihydricphosphate and igniting the residue. The corresponding Sodic Salt is formed by heating the Microcosmic Salt (Na NH_4) HPO_4 when H_2O and NH_3 are driven off and NaPO_3 is left. This acid is Monobasic and may be distinguished by the gelatinous precipitate formed by $\text{AgNO}_3 = \text{AgPO}_3$.

5. H_3PO_2 Hypophosphorous Acid may be regarded as HPO_3 in which one atom of O has been replaced by two atoms of H, $\text{H PH}_2\text{O}_2$. The corresponding Sodic Salt $\text{Na PH}_2\text{O}_2$ is formed by adding P to a solution of Caustic Soda, thus: $3\text{NaOH} + 4\text{P} + 3\text{H}_2\text{O} = \text{PH}_3 + 3\text{NaPH}_2\text{O}_2$.

Q.—6. (a). Name the chief ores of iron. (b) How is the metal obtained from its ores? (c) What is the chemical difference between cast-iron, steel and wrought-iron?