sand, sandstone, quartz and flint. It also occurs as a component of granite, and combined with metals and Oxygen to form silicates. It can be obtained in two allotropic forms, Amorphous and Crystalline.

(2). Potassic silico-fluoride when heated to redness in a glass tube with Sodium or Potassium, reacts thus –

$K_2 Si F_6 + 2 Na_2 = Si + 2 K F + 4 Na F$

the mass when cold is well washed with cold water and then with boiling water. Silicon will be left as a brown amorphous powder which is soft to the touch as blacklead and readily burns to SiO_2 when heated in Air or Oxygen.

(3). A *graphitoidal* Silicon can be prepared by strongly heating the brown amorphous powder out of contact with air, when it becomes denser and harder and no longer burns when heated in air; or by fusing aluminium with Potassic Silico-fluoride and boiling the mass with strong Hydric Chloride, when Silicon in the form of hexagonal scales is left undissolved.

(4). Crystalline Silicon is obtained by fusing Potassic Silico-fluoride and Sodium with granulated Zinc; on boiling the mass crystals of Silicon are found deposited on the Zinc, from which they are removed by solution in an acid. It is sufficiently hard to scratch glass, and can be fused at a very high temperature.

(b) Arsenic is found in the free state, but more frequently associated with Sulphur and Iron, Nickel or Cobalt.

(2) When the ores are roasted in a reverberatory furnace the Arsenic is volatilized and condenses as Arsenic Trioxide (As_2O_3) in the long flues attached to the furnace. The crude product is mixed with Charcoal, and when sufficiently heated the Trioxide volatilizes, and its vapors, in passing over the ignited Carbon, will part with their Oxygen:—

$$2As_2O_3 + C_6 = 6CO + As_4.$$

Arsenic is a steel gray, crystalline, brittle metal, having a density of 5.7. It conducts electricity slightly. At a low red heat it volatilizes as a colorless vapor, without undergoing fusion. When strongly heated in air, it burns with a bluish flame, forming As_2O_3. It forms an important alloy with Lead in the manufacture of shot. It unites directly with Chlorine and Iodine at ordinary temperatures, and with Sulphur, when gently heated.

(c) Introduce a small quantity of a solution of Arsenic Trioxide (As_2O_3) into a small hydrogen apparatus, in which Hydrogen is being evolved from dilute Hydric Sulphate by Zinc. As_2O_3 will lose its Oxygen, and have it replaced by Hydrogen, forming Hydric Arsenide. Pass the mixed gases through a small tube of hard glass, having a drawn out point, and light them at the end; into the flame put a cold porcelain cover, Arsenic will be deposited on the porcelain, owing to the decomposition of AsH_3. The process constitutes a very delicate test for the presence of Arsenic compounds containing Hydrogen.

Q.—4. Sketch the points of resemblance and difference of Chlorine, Bromine and Iodine, and of their Hydrogen compounds, *(a)* How would you detect the presence of a soluble Chloride, Iodide, and Fluoride, present singly in a liquid? *(b)* What takes place when Chlorine is passed into a cold solution of Potash (KOH)? *(c)* By slightly varying the conditions of the last experiment, what other body might be formed?

At ordinary temperature Chlorine, Bromine and Iodine are each physically different, being a gas, liquid, and solid, respectively Chlorine becomes a liquid at ordinary temperatures under a pressure of about four atmospheres. This liquid boils at– 60°C, and in presence of water exhibits great bleaching power as well as solubility.

Bromine boils at 63°C, is moderately soluble in water, and has bleaching power, though in a less degree than Chlorine; when cooled to —22° it solidifies.

Iodine, when heated to 107°C, becomes a liquid, and at 180°C a gas. It has no bleaching power, and is scarcely soluble in water.

The Atomic weight of Bromine (80) is nearly the arithmetical mean between those of Chlorine and Iodine.

Chlorine, Bromine and Iodine each combine with Hydrogen to form a heavy, colorless