(*b*). When *dry* litmus-paper is introduced into *dry* Chlorine Gas no reaction whatever takes place. When, however, an aqueous solution of litmus is introduced into Chlorine the litmus is bleached and the solution loses its color. The reaction that takes place is this: the Chlorine has a strong tendency to combine with Hydrogen, hence it robs the water present of its Hydrogen to form Hydric Chloride, thus liberating the Oxygen of the water, which being nascent and therefore possessed of intense combining power, unites with the vegetable coloring matter to form substances which are colorless. This action, it is obvious, could not take place when both the Chlorine and the litmus are dry.

When a burning candle is introduced into Chlorine the candle continues to burn, but with a very red flame and a dense black smoke: the Hydrogen of the candle unites with the Chlorine to form Hydric Chloride, while the Carbon is given off free in the form of soot.

Powder of Copper when thrown into Chlorine will catch fire, owing to the great energy with which the Chlorine unites with Copper to form Chloride of Copper ($CuCl_2$.)

Q. 2.—"Give a brief description of the allotropic modifications of Sulphur, and of the preparation of each modification."

There are two allotropic modifications of Sulphur, differing from each other chemically and physically:

(*a*). One of these allotropic forms is dimorphous, i. e., it has two forms *physically* different, the first of these occurs free in Nature in yellow crystals of the ortho rhombic system. The second is obtained by melting Sulphur, and allowing it to cool slowly in a water bath when it forms crystals, which belong to the oblique rhombic system.

If this common yellow sulphur is melted and vaporized, and then made to condense rapidly, a fine yellow powder is formed which is known as flowers of Sulphur.

Sulphur also occurs combined with metals, forming sulphides, and may be got from them by roasting out of contact with air, as for instance from Sulphide of Iron,

$$3FeS_2 = S_2 + Fe_3O_4.$$

This allotropic form of Sulphur is very inelastic, and conducts electricity very badly. It is insoluble in water, but soluble in Carbon Disulphide and in Oil of Turpentine.

(*b*). The other allotropic form of Sulphur is a semi-transparent plastic substance, made by heating common Sulphur to near its boiling point and suddenly plunging it into cold water. It is insoluble in Carbon Disulphide, and returns to the ordinary form after a few hours, or immediately, by plunging it into boiling water.

Q. 3.—"How would you prove by means of experiment, that water is a compound of Hydrogen and Oxygen?"

(1). By boiling water, and causing the steam to pass over red hot iron filings. The iron will become Oxide of Iron, and a gas will be given off which, on being tested, will be found to be Hydrogen, while the Oxide of Iron may be made to split up into Oxygen and Iron, thus showing that the water consists of Oxygen and Hydrogen.

(2). If we burn Hydrogen in air, water will be formed by the union of the Oxygen of the air with the Hydrogen.

(3). If we pass a mixture of the two gases, Oxygen and Hydrogen, into a eudiometer over Mercury, and pass a current of electricity through them, the two gases will unite, with an explosion, and form water which may be seen to collect as dew on the sides of the tube.

(4). In the last case, instead of using electricity we might pass into the mixed gases a small pellet of spongy platinum and clay, and the water will be formed.

(5). By passing electricity by the two terminal wires of a battery into slightly acidulated water, the electricity will resolve the water into Hydrogen and Oxygen, which may be collected in test tubes, by upward displacement, over the water.

Q. 4.—"If you place a burning candle into