EDUCATION DEPARTMENT.

ANNUAL EXAMINATIONS, 1896.

SCIENCE.

Editor.—J. B. TURNER, B.A.

THE HIGH SCHOOL AND UNIVERSITY EXAMINATIONS.

FORM III.

CHEMISTRY.

Examiners: R. R. BENSLEY, B.A.; C. A. CHANT, B.A.; A. MCGILL, B.A.

1. State *fully* what is meant by the following terms, and give examples in illustration of your statements:

(*a*) Chemical compound.
(*b*) Chemical change.
(*c*) Physical change.

2. (*a*) How would you prepare dry Oxygen?

(*b*) What weights of materials would you require to furnish 10 litres of the gas measured under normal conditions?

3. State in words, all the facts that are expressed by the following equation:—

$$Zn + 2HCl = ZnCl_2 + H_2$$

4. Make the following calculations:—

(*a*) The percentage composition of washing soda, from the formula, $Na_2CO_3, 10H_2O$.

(*b*) The formula of a substance which gives the following percentage numbers on analysis:—

Sodium	18.55
Sulphur	25.81
Oxygen	19.35
Water	36.29

(Na = 23; S = 32; C = 12;)

5. Give a general sketch of the chemistry of Sulphur, under the following heads:

(*a*) Occurrence and properties.
(*b*) Compounds with Hydrogen.
(*c*) Compounds with Oxygen.

6. Ten litres of air is contained in a closed glass vessel at a temperature of 60° C. and a pressure of 700 mm. barometer. Make the following calculations:—

(*a*) The pressure on the sides of the vessel, if the temperature be raised to 100° C.

(*b*) The weight of air in vessel. (Density of air in terms of Hydrogen is 14.44.)

7. Describe experiments that may be done with Ammonia, and state the conclusions as to its *composition* and *properties* which are justified thereby.

The following are answers to the questions of the preceding paper:—

1. (*a*) A chemical compound is a substance whose molecule is composed of dissimilar atoms.

Water is an example of a chemical compound, because its molecule is composed of two atoms of hydrogen and one atom of oxygen.

(*b*) A chemical change is one in which the substances formed have properties different from those of the original substance.

The burning of wood is a chemical change, because the substances formed and the residual ash have properties different from those of the wood.

(*c*) A physical change is one in which the condition but not the composition of a substance is changed.

The boiling of water is a physical change because, while the substance is changed from a liquid to a gas, its composition is not changed; it is still composed of hydrogen and oxygen in the same proportions as in the liquid form.

2. (*a*) Dry oxygen may be prepared by heating together a quantity of manganese dioxide and potassic chlorate, and collecting the product over mercury. To ensure thorough dryness the gas should be passed