lowing dimensions: 5 centimetres wide; 10 centimetres long, and 20 centimetres deep. It is filled with sulphuric acid whose specific gravity is 1·8. Find the total pressure on the bottom, and on each of the four sides.

4. (*a*) A mass of iron, weighing 15 kilograms and having a specific gravity 7·5, is attached to a string and suspended in the water. Find the tension on the string.

(*b*) How would you find the specific gravity

(i) of a piece of lead;

(ii) of some turpentine?

5 (*a*) State Charles's Law, and also Boyle's (or Marriotte's) Law.

(*b*) A quantity of gas, measured at 10°C. and 750mm., is 500 c.c.; find the volume at 0°C. and 760mm.

6. (*a*) Explain briefly a simple method for finding the specific heat of iron. State where the method is defective and also how it could be improved.

(*b*) Explain why in a cold room iron or stone appears much colder to the hand than the woollen carpet.

(*c*) How would you show that water is a poor conductor of heat?

7. (*a*) Explain the terms *ohm*, *volt*, *ampere*, and indicate approximately their values by reference to ordinary pieces of apparatus.

(*b*) The resistances of iron and copper, relative to silver, are 6·46 and 1·06, respectively. The resistance of 700 feet of No. 24 copper wire is 20 ohms; find the resistance of a mile of iron wire No. 18, whose diameter is twice that of the copper wire. (Answer to three decimal places.)

8. You have four gravity cells, each of E.M.F. 1·1 volts and internal resistance 3 ohms, and you wish to send a current through a coil whose resistance is 4 ohms. Show, by diagrams, the three ways of connecting the four cells, and estimate the current in each case.

9. Draw a diagram of a telephone circuit connecting two places a considerable distance apart, and explain definitely the action of the receiver and the transmitter.

II.

The following are answers to questions 4, 5, 6, 7 and 8 of the Junior Leaving Chemistry paper of 1895.

4. It is assumed in this solution of question 4 that the coal gas is at standard temperature and pressure.

The following equations represent respectively the reactions which take place in the combustion of the several ingredients of the gas. $2H + O = H_2O$; $CH_4 + 4.O = CO_2 + 2H_2O$; $CO + O = CO_2$; $C_2H_4 + 6.O = 2CO_2 + 2H_2O$ $C_4H_8 + 12\,O. = 4CO_2 + 4H_2O$; $H_2S + 3.O = H_2O + SO_2$. Neither nitrogen nor carbon dioxide are combustible and consequently need not be taken into consideration in the solution. The water which is formed in several of these reactions will not remain as a gas at the given temperature and pressure, and need not be considered unless it is desired to compute the volume of the liquid as well as gaseous products.

35 litres of methane, yield 35 litres of carbon dioxide; 7 litres of carbon monoxide, yield 7 litres of carbon dioxide; 4 litres of olefiant gas, yield 8 litres of carbon dioxide; 2.4 litres of butylene yield 9.6 litres of carbon dioxide, and ·3 litres of sulphuretted hydrogen yield ·3 litres of sulphur dioxide. The gaseous products thus occupy 59.9 litres at 0°C and 760mm pressure. At 20°C and 750mm pressure they will occupy $59\,9 \times \frac{2}{2}\frac{9}{7}\frac{3}{3} \times \frac{7}{5}\frac{6}{8}\frac{0}{8} = 65.15$ litres.

5. (*a*) The affinity of sulphur for iron is sufficient to decompose sulphuretted hydrogen, consequently the reaction is represented by the following equation: $Fe + H_2S = FeS + H_2$.