

5. Describe how the weight of a cubic foot of air may be experimentally determined. How does the density of air vary when the pressure to which it is exposed is varied? How may this relation be experimentally determined? What errors must be guarded against in making this experiment?

6. A boat is rowed at the rate of 176 yds. per min. at right angles to a stream which carries it downwards at the rate of 57 yds. per min. Find the actual speed of the boat.

7. *A, B and C* move with uniformly accelerated velocities in straight lines. At a distance in each case of 33 ft. from the initial point *A's* velocity has changed from 21 to 12; *B's* has changed from 12 to 21; and *C's* has changed from 21 to -12. Find the acceleration and the time in each case.

8. A railway train weighing 150 tons, moving along a level track at the rate of 30 miles an hour, is stopped by friction in a length of 176 rd. What must the average resistance to its motion have been, *taking the weight of a pound mass as the unit of force*?

9. It is wished to upset a tall column by means of a rope of given length pulled by men on the ground; at what height above the base of the column must the rope be attached that the work may be done with the least possible stress on the rope?

10. A vessel containing water with a wooden sphere floating on it is placed under the receiver of an air pump. How will the sphere be affected on exhausting the air from the receiver?

State precisely what will happen if the density of water be 775 times that of air at ordinary pressure, supposing the sphere originally to have been immersed to its centre.

CHEMISTRY.

Examiner—JOHN SEATH, B.A.

NOTE.—The Candidate is requested to arrange, as far as practicable, the different parts of his answers to 2-5 under the following heads: (1) Experiment, (2) Observation, and (3) Inference.

1. 4144 grammes of an organic compound containing the elements C, H, I, and N,

yields on analysis .5 gramme of CO_2 and 1055 grammes of H_2O . 497 grammes of the same compound yields 5335 grammes of AgI. Its vapour density is 109.5. Find its molecular formula.

2. You are given a solution known to contain NaNO_3 , KHSO_4 , CaO , H_2SO_4 , CaCl_2 , H_3BO_3 or K_3PO_4 . By what series of experiments could you determine most simply which of these the solution contains?

3. How would you demonstrate

(a) The differences and the resemblances between the properties of Iodine and Bromine; and

(b) The nature of Flame and of the Blow-pipe flame?

4. You are given Cu, NaCl, H_2SO_4 , KNO_3 , and a liquid containing NH_4OH .

(a) How would you produce therefrom Nitrous Oxide and Nitric Oxide?

(b) How would you demonstrate that you had done so?

5. A sample of green cloth is supposed to contain Arsenic. Describe minutely each step in Marsh's process for determining the question.

6. (a) Calculate the vapour-volume of 10 grammes of H_2SO_4 at 400°C .

(b) What volume of Hydrochloric Acid would be produced by replacing by an equivalent weight of Hydrogen, the Boron in one litre of Boric Chloride (calculated at 0°C)?

EUCLID.

Examiner—J. DEARNESS.

NOTE.—Contractions, and symbols except of operation, may be employed. Use capital letters on the diagrams. It is recommended that every step in the demonstration should begin on a new line, and references and authorities be placed opposite in the margin.

1. If a straight line cut two parallel straight lines it shall make the alternate angles equal to one another, also any exterior angle equal to the interior opposite angle upon the same side, and the two interior angles upon the same side together equal to two right angles.

Given the hypotenuse and the sum of the sides to construct a right angled triangle.