

hydrogen (standard temperature and pressure) by the first of them.

3. (a) Describe the physical properties and allotropic modifications of the elements sulphur and phosphorus.

(b) Compare, as fully as you can, the compounds of sulphur with those of oxygen; and the compounds of phosphorus with those of nitrogen.

4. (a) Enunciate Dulong & Petit's Law.

(b) Define the terms equivalent and atomic weight.

(c) The equivalents of magnesium, phosphorus and silver are respectively, 12, 10.34, and 108. The specific heats of these elements are 0.2475, 0.174 and 0.057 respectively. Determine their atomic weight; giving full work.

5. A mixture of ammonium chloride with quicklime is heated in one test-tube, and a mixture of common salt with sulphuric acid in another. Describe fully what will happen when the tubes are brought near each other, mouth to mouth, and explain all chemical changes by equations.

6. Three test tubes contain respectively, (a) sulphur, (b) potassium chlorate, (c) mercuric oxide. Describe minutely all changes, physical or chemical, which will occur on heating gradually to near a red heat.

7. What would you expect to occur in the following cases? Give reasons for your answers, with explanatory equations:—

(a) A mixture of charcoal powder and potassium nitrate is heated in a test tube.

(b) A bottle is filled with a solution of chlorine in water, and closely stoppered. It is then exposed to bright light.

(c) An iron tube, containing iron filings, is strongly heated, and steam passed through it.

(d) A piece of phosphorus is suspended in a glass tube containing 100 c.c. air, and standing in water.

8. A gas, produced by action upon copper clippings with moderately strong nitric acid, is collected over water. After thorough washing with water, the insoluble gas is mixed in certain proportion with oxygen and the product is found to be quite soluble in water.

(a) Describe all the physical and chemical changes which occur in the experiments referred to.

(b) In what proportions by volume and also by weight must the first gas and oxygen be mixed in order to the production of the soluble gas referred to.

EUCLID—ARTS AND MEDICINE.

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NOTE—Candidates for scholarships are required to take the whole paper. Other candidates will take only eight of the eleven questions.

1. Define point, right line, plane angle, parallelogram, and add short explanatory notes to each definition.

What is an Axiom?

Mention two propositions in Book I. which are deduced directly from the definitions, axioms and postulates without the intervention of any other proposition.

2. State and establish the necessary and sufficient condition that must hold between the lengths of three straight lines that a triangle can be formed having its sides respectively equal to them.

If E and F be any two points, and ABC any straight line, and B be such a point in it that BE and BF make equal angles with ABC , then $BE + BF$ is less than $CE + CF$ wherever C may be in the line.

3. If two triangles have two sides of the one equal to two sides of the other, each to each, but the angle contained by the two sides of the one greater than the angle contained by the two sides, equal to them, of the other, the base of that which has the greater angle shall be greater than the base of the other.

If two quadrilaterals have the four sides of the one equal to the four sides of the other, each to each, but one diagonal of one shorter than the corresponding diagonal of the other, then shall the other diagonal of the first be longer than the other diagonal of the second.

4. Give Euclid's definition of parallel straight lines and the axiom enunciating one of their properties.