Examination Department

143D EXAMINATION

SOLID GEOMETRY

Friday, March 26, 1897 — 1:15 to 4:15 p. m., only

100 *credits, necessary to pass,* 75

Answer 10 *questions but* no more. *If more than* 10 *questions are answered only the first* 10 *of these answers will be considered. Division of groups is not allowed. Draw carefully and neatly each figure in construction or proof, using letters instead of numerals. Arrange work logically. Each complete answer will receive* 10 *credits.*

1 Define *pyramid, frustum of a pyramid, cylindric surface, generatrix, directrix.*

2 Prove that a plane is determined by (*a*) a straight line and a point without that line, (*b*) two intersecting straight lines (*c*) three points not in the same straight line.

3 The area of the entire surface of a rectangular parallelopiped is 320, its volume 336, its altitude 4; find its length.

4 Find the lateral area and the volume of a square pyramid, each side of whose base is 3, and whose altitude is 5.

5 Prove that every point in the plane which bisects a diedral angle is equally distant from the faces of the angle.

6 The volume of a right prism is 2310 and its base is a right triangle whose legs are 20 and 21; find its lateral area.

7 Prove that the lateral area of a prism is equal to the perimeter of a right section multiplied by a lateral edge.

8 Prove that the lateral area of a regular pyramid is equal to the perimeter of its base multiplied by one half its slant hight.

9 The base of a pyramid contains 144 square feet; a plane section parallel to the base and 4 feet from the vertex contains 64 square feet. What is the hight of the pyramid?

10 An edge of a polyedron is 56 and the homologous edge of a similar polyedron is 21; the area of the entire surface of the second polyedron is 135 and its volume is 162. Find the area of the entire surface and the volume of the first polyedron.

11 Prove that two rectangular parallelopipeds having equal bases are to each other as their altitudes when commensurable.

12–13 Prove that the frustum of a triangular pyramid is equivalent to the sum of three pyramids, which have the same altitude as the frustum, and whose bases are the lower base, the upper base, and a mean proportional between the two bases of the frustum.

14 How many bullets, each $\frac{5}{8}$ inches in diameter, can be formed from five pieces of lead each in the form of a cone of revolution, the radius of whose base is 5 inches and whose altitude is 8 inches?

15 Find the area of the surface of a sphere whose volume is V.