High School Department

159TH EXAMINATION

SOLID GEOMETRY

Friday, June 16, 1899 — 1.15 to 4.15 p. m., only

Answer eight questions but **no more.** *If more than eight are answered only the first eight 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 12½ credits. Papers entitled to 75 or more credits will be accepted.*

1 Define *tetrahedron*, *vertical diedral angles*, *regular prism*, *directrix*, *element*.

2 State *four* sets of conditions that determine the position of a plane.

3 Prove that the intersections of two parallel planes by a third plane are parallel lines.

4 Prove that if two planes are perpendicular to each other, a straight line drawn in one of them perpendicular to their intersection is perpendicular to the other.

5 Prove that two rectangular parallelepipeds which have equal bases are to each other as their altitudes, when these altitudes are incommensurable.

6 Prove that the volume of a triangular prism is equal to the product of its base by its altitude.

7–8 Complete and demonstrate the following theorem: the frustum of a triangular pyramid is equivalent to the sum of three pyramids whose . . .

9 Prove that the surface of a sphere is equal to the product of its diameter by the circumference of a great circle.

10 Prove that every section of a prism made by a plane parallel to the lateral edges is a parallelogram.

11 The altitude of a right prism is 10 units, and its base is a regular hexagon inscribed in a circle whose radius is 3 units; find the volume of the prism.

12 The altitude of a right circular cone is 18 inches and the radius of its base is 4 inches; find the volume and lateral surface of the cone.

13 A sphere of lead 6 inches in diameter is recast into the form of a cylinder 8 inches in diameter; find the hight of this cylinder.

14 A regular pyramid 15 inches high has for a base a square whose sides are each 3 inches; find the volume of the frustum of this pyramid formed by a plane parallel to the base and 5 inches from the vertex.

15 Find the surface and volume of a sphere circumscribing a cube each edge of which is 6 units.