High School Department

157TH EXAMINATION

SOLID GEOMETRY

Friday, January 27, 1899—1.15 to 4.15 p. m., only

Answer 10 *questions but* **no more.** *If more than* 10 *are answered only the first* 10 *answers will be considered. 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. Papers entitled to* 75 *or more credits will be accepted.*

1 Define *pyramid, regular polyedron, generatrix, cylinder of revolution, great circle.*

2 Prove that through a given point in a given plane one perpendicular to that plane can be drawn and only one.

3 Prove that if two straight lines are intersected by three parallel planes their corresponding segments are proportional.

4 Prove that two diedral angles have the same ratio as their plane angles, when the plane angles are commensurable.

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

6 Prove that the sections of a prism made by parallel planes are equal polygons.

7 To what is the volume of a cone equal? Give proof.

8 The base of a pyramid 15 feet high contains 169 square feet; find the distance from the vertex at which a plane must be passed parallel to the base so that the section may contain 81 square feet.

9 Find the volume of a regular pyramid whose hight is 12 feet and whose base is an equilateral triangle each side of which is 5 feet.

10 The hight of a right circular cone is 18 inches and the radius of its base is 3 inches; find the volume of the frustum of this cone made by a plane parallel to the base and 6 inches from it.

11 The diameter of a sphere is 6 decimeters; find the area of a section made by a plane whose distance from the center of the sphere is 18 centimeters.

12 Find the total interior surface of a tunnel 5000 feet long whose section is a semicircle with a radius of 10 feet.

13 A light is placed 3 feet from the center of a sphere whose radius is 1 foot; find in inches the illuminated surface of the sphere.

14 Prove that the square of a diagonal of a rectangular parallelepiped is equal to the sum of the squares of its three dimensions.

15 A is the vertex and BCD the base of a tetrahedron; prove that the section of the tetrahedron made by a plane parallel to both AB and CD is a parallelogram.