## High School Department

167TH EXAMINATION

# SOLID GEOMETRY

**Friday,** January 25, 1901 — 1.15 to 4.15 p. m., only

*Answer eight questions but* **no more,** *including at least two from eac division. If more than eight are answered only the first eight answer will be considered. Draw carefully and neatly each figure in construc tion or proof, using letters instead of numerals. Arrange work logi ally. Each complete answer will receive* 12½ *credits. Papers entitle to 75 or more credits will be accepted.*

**First division**

1 Define *five* of the following: cone of revolution octaedron, oblique prism, generatrix, spheric segment polyedron, lune.

2 Prove that a line perpendicular to each of two straigh lines at their point of intersection is perpendicular to the plane of those lines.

3 Prove that if two intersecting planes are each perpen dicular to a third plane, their intersection is also perpendicular to that plane.

4 Prove that the acute angle which a straight line makes with its projection on a plane is the least angle which it makes with any line of the plane.

5 Complete and demonstrate the following: the volume of a triangular prism is equal to . . .

6 Complete and demonstrate the following: the lateral area of the frustum of a regular pyramid is equal to . . .

7 Prove that the volumes of two similar tetraedrons are to each other as the cubes of their homologous edges.

8 Prove that a side of a spheric triangle is less than the sum of the other two sides.

**Second division**

NOTE — Use $\pi$ instead of its approximate value 3.1416.

9 Find the volume and surface of the solid generated by a door 3 feet wide and 8 feet high, swinging in an arc of 144°.

10 The hypotenuse of a right triangle is 5 inches, one leg is 3 inches; find the volume of the solid generated by revolving the triangle on its hypotenuse as an axis.

11 The base of a regular pyramid 8 inches high is a hexagon whose side is 6 inches; find the volume and entire surface of the pyramid.

12 Find the volume and surface of a cube inscribed in a sphere whose radius is 6 inches.

13 Find the entire surface of a hemisphere equivalent to a sphere whose radius is 8 inches.

14 Assuming that the radius of the earth is 4000 miles and that the crust is 30 miles thick, find the volume of the crust of the earth.

15 Prove that if a line is parallel to one plane and perpendicular to another, the two planes are perpendicular to each other.