The University of the State of New York

226TH HIGH SCHOOL EXAMINATION

SOLID GEOMETRY

Monday, January 16, 1922 — 9.15 a. m. to 12.15 p. m., only

Write at top of first page of answer paper (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in solid geometry. The minimum time requirement is two recitations a week for a school year or four recitations a week for half a school year.

Name the author of the textbook you have used in your study of solid geometry.

Answer eight questions, including not more than four from group I.

Group I

Answer not more than four questions from this group.

1 Prove that all the perpendiculars that can be drawn to a given line at a given point lie in a plane that is perpendicular to the given line at the given point.

2 Prove that through a line, not perpendicular to a plane, one plane and only one can be constructed perpendicular to the given plane.

3 Prove that (*a*) the lateral areas of two similar cones of revolution are to each other as the squares of their slant heights, (*b*) the volumes of two similar cones of revolution are to each other as the cubes of their altitudes.

4 *a* Show how to construct a plane perpendicular to a given line at a given point in the line. [Explain construction. No proof required.]

  b Show how to construct a line perpendicular to a given plane at a given point in the plane. [Explain construction. No proof required.]

5 Prove that if a point on the surface of a sphere is at a quadrant's distance from each of two other points, not the extremities of a diameter, it is a pole of the great circle passing through the two points.

Group II

6 Prove that if two parallel line segments terminate in a plane, their projections upon the plane have the same ratio as the line segments themselves.

7 Prove that in a birectangular spheric triangle the sides opposite the right angles are quadrants and the third side measures its opposite angle.

8 Given a plane and a line perpendicular to it. Find the locus of all points two units from the plane and at the same time two units from the line. Give proof.

Group III

Irrational results may be left in the form of π and radicals unless otherwise stated.

9 A right circular cylinder with hemispheric ends has its greatest length l and its diameter d. Find its surface in terms of l and d.

10 Each base edge of a regular triangular pyramid is $6''$ and the altitude of the pyramid is $4''$. Find a lateral edge, the lateral area and the volume.