

High School Department

164TH EXAMINATION

SOLID GEOMETRY

Friday, June 15, 1900—1.15 to 4.15 p. m., only

Answer eight questions but no more, including at least two from each division. 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 $12\frac{1}{2}$ credits. Papers entitled to 75 or more credits will be accepted.

First division 1 Define five of the following: *projection of a point, polyedral angle, prism, cylinder of revolution, conical surface, small circle, directrix.*

2 Prove that two straight lines perpendicular to the same plane are parallel.

3 Prove that a straight line perpendicular to one of two parallel planes is perpendicular to the other.

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

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

6 Complete and demonstrate the following: the lateral area of a cone of revolution is equal to . . .

7 Prove that every plane section of a sphere is a circle.

8 Prove that the surface of a sphere is two thirds that of the circumscribed cylinder of revolution.

Second division **NOTE**—Use π instead of its approximate value 3.1416.

9 Find the volume and total surface of a regular prism 20 inches high, whose base is a regular hexagon each side of which is 4 inches.

10 The base of a regular pyramid 15 inches high is 6 inches square; a plane parallel to the base of the pyramid bisects its edges. Find *a*) the volume of the pyramid, *b*) the lateral surface of the pyramid, *c*) the area of the parallel section.

11 Find the volume of a sphere inscribed in a cone whose elements and the diameter of whose base are each 8 inches.

12 A hollow iron sphere 10 inches in diameter and 1 inch thick is melted and cast into a cylinder 4 inches in diameter; find the height of this cylinder.

13-14 Find the surface of a sphere whose volume is equal to that of a regular tetrahedron each edge of which is 4 inches.

15 Given a sphere whose radius is 6 inches; find the altitude of a cone of revolution whose volume equals that of the sphere and whose base is a great circle of the sphere.