High School Department

180TH EXAMINATION

SOLID GEOMETRY

Friday, January 29, 1904—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. 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.*

First division

1 Prove that the intersections of two parallel planes with a third plane are parallel lines.

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

3 Prove that the sum of any two face angles of a triedral angle is greater than the third face angle.

4 Complete and demonstrate the following: an oblique prism is equivalent to a right prism whose base . . .

5 Prove that if the base of a cone is a circle, every section parallel to the base is a circle.

6 Prove that a spheric angle is measured by the arc of a great circle described from its vertex as a pole, and included between its sides produced if necessary.

NOTE—Use π instead of its approximate value 3.1416.

Second division

7 Find the surface of a sphere whose volume is $366\frac{1}{6}\pi$ cubic inches.

8 The sides of a parallelogram which are 12 inches and 8 inches respectively, form an angle of 30°; find the volume and the convex surface of the solid generated by the revolution of the parallelogram about one of its longer sides as an axis.

9 Find the total area of a cone inscribed in a regular triangular pyramid whose altitude is 12 inches and whose lateral edge is $2\sqrt{61}$ inches.

10 The volume of the frustum of a cone of revolution is 105π cubic inches; the altitude of the frustum is 5 inches, and the radius of the upper base is 3 inches. Find the radius of the lower base of the frustum.

11 The angles of a spheric triangle are 80°, 95° and 140° respectively; the radius of the sphere is 8 inches. Find in square inches the area of the triangle.

12 Prove that the smallest section of a sphere made by a plane passing through a given point within the sphere, is that made by a plane perpendicular to the radius through the given point.