

High School Department

162D EXAMINATION

SOLID GEOMETRY

Friday, January 26, 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 1 Prove that two angles not in the same plane are **division** equal if their sides are respectively parallel and lie in the same direction.

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

3 Prove that the sum of the plane angles formed by the edges of any convex polyedral angle is less than four right angles.

4 Complete and demonstrate the following: the lateral area of a prism is equal to . . .

5 Prove that any parallelepiped may be divided into two equal triangular prisms.

6 Give the formula for the volume of a) a cylinder, b) a cone. Derive *one* of these formulas.

7 Prove that every section of a circular cone made by a plane parallel to the base is a circle.

8 Prove that a plane perpendicular to the radius of a sphere at its extremity is tangent to the sphere.

Second Note—Use π instead of its approximate value 3.1416.

division 9 Find the volume of a regular tetrahedron each of whose edges is 6 inches.

10 The altitude of the frustum of a pyramid is 7.2 inches; the lower base is 10 inches square and the upper base 4 inches square. Find the volume of the frustum.

11 Find the volume and the convex surface of a cone of revolution circumscribing a regular hexagonal pyramid each edge of whose base is 8 inches and whose altitude is 15 inches.

12 The base of a right prism 50 centimeters high is a rhombus, whose longer diagonal is 30 centimeters and whose shorter diagonal is 16 centimeters; find the total surface of the prism.

13 A leaden cylinder of revolution 10 centimeters long and 4 centimeters in diameter is melted and cast into a hemisphere; find the radius of this hemisphere.

14-15 The center of each of two spheres whose common radius is 4 inches is at the surface of the other; find the volume of the solid common to both spheres.