High School Department
182D EXAMINATION
SOLID GEOMETRY
Friday, June 17, 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 Mention and describe the five regular polyedra. Show that there can be no regular polyedron bounded by hexagons.

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

3 Prove that the opposite lateral faces of a parallelepiped are equal and parallel.

4 Complete and demonstrate the following: two rectangular parallelepipeds are to each other as . . .

5 Give the formula for the volume of (*a*) any prism, (*b*) a circular cone. Derive *one* of these formulas.

6 The volume of a sphere is equal to the product of the area of its surface by one third of the radius. Prove this formula without deriving it from some other formula for the volume of a sphere.

NOTE — Use π instead of its approximate value 8.1416.

Second division 7 Find the length of the projection on a plane of a line 8 inches long (*a*) parallel to the plane, (*b*) making an angle of 60° with the plane. What is the projection of the line if it is perpendicular to the plane?

8 A square and its inscribed circle are revolved about the diagonal of the square as an axis; the side of the square is *a*. Find the surface and the volume of each solid generated.

9 The lateral edges of a truncated triangular prism are 6 inches, 5 inches and 8 inches; the sides of a right section are 10 inches, 9 inches and 17 inches. Find the volume of the solid.

10 The volume of a regular square pyramid is $42\frac{2}{3}$ cubic feet, its altitude is twice one side of the base; find (*a*) the lateral area of the pyramid, (*b*) the area of a section made by a plane parallel to the base and 1 foot from the base.

11 Find the volume of a hollow cylinder 2 inches thick, 8 feet long and 10 inches in its outer diameter.

12 Prove that every section of a prism made by a plane parallel to the lateral edges is a parallelogram.