191ST HIGH SCHOOL EXAMINATION

SOLID GEOMETRY

Monday, January 21, 1907—9.15 a. m. to 12.15 p. m., only

Answer eight questions. 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 if written by students in class A; those entitled to 60 or more credits will be accepted if written by students in class B.

First division

1 Prove that oblique lines drawn from a point to a plane meeting the plane at equal distances from the foot of the perpendicular, are equal.

2 Prove that if two angles not in the same plane have their sides respectively parallel and lying on the same side of the straight line joining their vertices, they are equal and their planes are parallel.

3 Prove that any triangular prism may be divided into three triangular pyramids equal in volume.

4 Prove that the bases of a cylinder are equal.

5 Prove that every section of a sphere made by a plane is a circle.

6 Prove that the sum of the angles of a spheric triangle is greater than 180° and less than 540°.

NOTE—Use π instead of its approximate value 3.1416.

Second division

7 Find the total area and the volume of the cylinder generated by revolving a rectangle $4'' \times 6''$ about its longer side as an axis.

8 Find the volume of a regular tetraedron whose edge is $3\sqrt{2}$.

9 In a triangle the sides including an angle of 120° are respectively a and $2a$; find the volume of the solid generated by revolving the triangle about the shortest side as an axis.

10 The three lateral edges of a truncated right triangular prism are respectively 8″, 9″ and 12″; the sides of the base are respectively 12″, 17″ and 25″. Find the volume of the solid.

11 Find the area of a zone included between parallel planes 7″ apart, the radius of the sphere being 6″.

12 Find the locus of a point in space which is at a given distance from a given point and also at a given distance from a given plane. Show when there will be (1) no solution, (2) one solution, (3) two solutions.