SECTION J—*Spherical Trigonometry* (*Todhunter.*) Chapters 1 to VI, omitting proof of Napier's circular parts. § 68, 69. Areas VIII, § 96 to 99. *Marks—April,* 200.

SECTION K.—*Conics* (*Todhunter.*) Straight Line—Chapter 1 to III, omitting § 27, 37, 48. Transformation of co-ordinates ; practical applications only, Chapter V.

Circle. Chapters VI, VII, omitting § 111, 115 to118, and all but the definition in 119.

Parabola—Chapter VIII, omitting § 157. Notes, principally geometrical, as follows : Construction of tangent ; Inclinations to axis and focal distance ; Locus of the foot of the perpendicular from the focus ; Portion of tangent intercepted between the point of contact and the directrix subtends a right angle at the focus ; Tangents at the extremities of a focal chord are perpendicular and meet upon the directrix. $^2 = ar$; $r = \frac{a}{\sin^2 \theta}$; $r = a + x$. Polar equation. Angle between two radii vectores is double that between the tangents. Sub-normal $= 2a$. Sub-tangent $= 2x$. Curve bisects sub-tangent. Equation to tangent $yy^1 = 2a(x + x^1)$ compared with the equation to the curve; similarly for the circle and other conics. Latus rectum as the parameter. Explanation of the constants in an equation, both those of size and form which are parameters, and those of position which may be removed by choice of axes. Deduction of the general equation $(y - y^1)^2 = 4a(x - x^1)$ from the simplest equation $y^2 = 4ax$; similarly for all other curves (x^1, y^1), being the origin for the simple equation. Analytical investigation into diameters and their properties (alternative with § 147.) Construction of tangents from any external point; their lengths are proportional to the cosecants of their inclinations. Geometrical proof of the equation to the parabola referred to diameter and tangent, together with a proof that the chords parallel to the tangent are bisected, &c. (as in the obligatory course.)

To draw a parabola, given any diameter and the tangent at its vertex and one other point.

To draw a parabola touching two intersecting straight lines at given points; also, to construct the focus and directrix, the latter by at least six points.

To draw a parabola, given its vertex, axis and one point; thence to draw it, given the axis and two points at different distances from the axis.

Ellipse.—Chapter IX, X, omitting § 205,8.

Notes.—Equation found from the definitions of an ellipse as the projection of a circle, as described by the trammel, and as $r + r' = 2a$ instead of that given in Todhunter. Geometric properties proved from the definition $r + r' = 2a$, as follows: Construction of a tangent; its equal inclinations to the focal distances; locus of the foot of the perpendicular from the focus. $pp' = b^2$; $\frac{p}{p'} = \frac{r}{r'}$; $p^2 = \frac{b^2 r}{r'}$.

Locus of intersection of tangent with the perpendicular at the focus to the radius vector; locus of intersection of tangents at the extremities of a focal chord ; proof of Todhunter's definition of an ellipse; the straight lines ae, a, $\frac{a}{e}$; $r = a \pm ex$. Polar equation referred to both focus and centre. The length e^2x' both analytically and geometrically.

Equation at the vertex becomes a parabola if $e = 1$ or $a = \infty$. Latus rectum $= 2\frac{b^2}{a} = 2e\left(\frac{a}{e} - ae\right)$, compared with parabola. e is the tangent of the inclination of the tangent from the foot of the directrix. Other properties compared with the parabola. Relation $p^2 = a^2 \cos^2 \alpha + b^2 \sin^2 \alpha$ for perpendicular from centre on tangent; thence locus of intersection of perpendicular tangents.

The eccentric angle; $x = a \cos \theta$; $y = b \sin \theta$. Locus of a point obtained by measuring $\frac{a+b}{2}$ at an inclination θ and then $\pm \frac{a-b}{2}$ at $-\theta$.