also of a flat body on a rough surface. Elementary proof that the ends of a chain over a smooth pulley must rest in a horizontal plane, but in unstable equilibrium. Parabolic curve of the suspension bridge with vertical rods. The common catenary; its equation, length of arc, tension at any point, similarity to a parabola near the vertex; position of equilibrium of a heavy chain resting over two smooth pegs. Suspension rods of equal strength, equation to bounding curve. Catenary of equal strength. Pressure on a curve produced by a string of given tension wrapped round it. Relation between the tensions at the extremities of a string passing round an arc of a rough curve; application to obtain the advantage of passing the fall three times round the windlass of a gyn. The problem of the traction of a carriage; the point of contact between the axle and pipe-box; the angle of draught. The forces acting on a field gun carriage at the moment of discharge. *Marks—April*, 400.

SECTION *Q.—Dynamics* (*Todhunter's Mechanics for beginners*).—Harder questions on the obligatory course. Loss of Vis Viva after impact § 108. Motion in a circle or conic section to be read over only, more advanced proofs being furnished. Chapters XIV, XV. Kepler's laws, § 178.

Notes.—The differential equations of motion. Application to rectilinear motion under the action of a force, (1) constant; (2) varying as the distance; (3) varying inversely as the square of the distance. Law of attraction outside and inside the attracting body. Motion of a heavy chain (1) hanging over a smooth pulley, (2) placed with part hanging over a smooth table. Body moving vertically in a resisting medium, the law being as the square of the velocity; rectilinear motion, neglecting gravity, the law of resistance being as the cube of velocity. Curvilinear motion, the parabola of projection. Given the general equations of motion in two perpendicular directions, to find the tangential and normal accelerations, also the equation of Vis Viva. Equal areas are described in equal times, under the influence of a central force. If the force varies as the inverse square of the distance, the orbit is an ellipse, parabola or hyperbola according as the velocity $<=>$, the velocity of falling from infinity. Motion of a particle on a smooth curve; velocity acquired. Cycloidal pendulum; time of an oscillation; length of "second" pendulum; oscillation through a small circular arc. Conical pendulum. D'Alembert's Theorem. Angular acceleration $= \dfrac{\text{Sum of moments of impressed forces.}}{\text{Moment of inertia.}}$ Compound pendulum. Centres of oscillation and suspension. Kater's method of finding the equivalent simple pendulum. Expression for the alteration of angular velocity produced by impulses. Simple investigation into the pressure on a fixed axis, centre of percussion and axis of spontaneous rotation. Application of D'Alembert's principle to the motion of two equal heavy particles connected by a light rod and constrained to move on two axes, one vertical, the other horizontal; also, of two equal weights connected by a string over two horizontal pulleys, a third weight being suddenly attached midway. *Special attention to the equation of Vis Viva wherever it occurs.* Work done in stretching an elastic rod. Vibrations of a thin vertical elastic rod caused by a falling ring stopped by a projection at its lower end.

Marks—June, 400.

SECTION *R.—Hydrostatics*—(*Besant's elementary*).—Harder questions on the obligatory course, together with the omitted sections, Chapters I to VI. The units involved in $W = Vsw$ and $W = Vg\rho w$.

Notes.—Elementary investigation into the distribution of pressures over a plane rectangular joint with application to reservoir walls; the two conditions for stability. Moments of Inertia of a square, rectangle, circle, ellipse, equilateral triangle, regular polygon and other figures, also of a sphere; of a lamina about a perpendicular axis. Proof and explanation of $I = M(h^2 + k^2)$. Radius of gyration. Application of the calculus to determine the whole pressure on a surface and the centre of pressure on a plane surface. Proof that the centre of pressure is generally below the centre of gravity. Metacentre; determination of its height above the centre of flotation, condition for stability. Application to the floatation of simple solids. The various