

Note: This electronic version was re-typed from the original in December 2006

- APPLIED MATHEMATICS

Ordinary and Higher Level Courses

NOTE: SI units to be used throughout.

Candidates will be expected to know the dimensions of any physical quantity dealt with. Knowledge of the relevant parts of the Mathematics course is assumed. Candidates will be required to deal only with such cases as can be treated in two dimensions.

- N.B. Those parts of the syllabus which are printed in *italics* belong to the Higher Level course only. The Higher Level course includes the Ordinary Level course treated in greater depth.
1. Motion of a particle. Displacement, velocity as vectors. Applications of the vector addition law. Description of vectors in terms of unit perpendicular vectors. Elementary treatment of relative motion.
 2. Newton's laws. Mass, momentum. Acceleration and force as vectors. Units and dimensions.
 3. Motion in a straight line under uniform acceleration e.g. motion under gravity, motion on smooth and rough inclined planes. Work, potential energy, kinetic energy, power. Application of energy conservation. Motion of connected particles.
 4. Equilibrium of a particle under concurrent forces, including friction.
 5. Centre of gravity of simple bodies and systems of particles Moments and couples. Equilibrium of a rigid body *or bodies*.
 6. Liquid pressure. Thrust on a horizontal surface. Archimede's Principle.
 7. Projectiles. *Projectiles on inclined plane.*
 8. Angular velocity. Uniform motion in a circle without gravitational forces. Conical pendulum. Circular orbits.
 9. Conservation of momentum. Collisions. Direct collisions, elastic ($0 < e \leq 1$) and inelastic ($e = 0$). *Oblique collisions of smooth elastic spheres in two dimensions.*
 10. *Simple harmonic motion of a particle in a straight line. (Application of simple harmonic motion to include the simple pendulum.)*
 11. *Motion of a rigid body about a fixed axis:*
 - (a) *Calculation of moments of inertia for a rod, rectangular lamina, circular lamina and compound bodies formed of those. (Sphere is excluded). Application of parallel and perpendicular axes theorems, with proofs done as classwork. Idea of radius of gyration. Application of the conservation of energy principle to a rotating body.*

- (b) *Application of the principle of angular momentum: rate of change of angular momentum about a fixed axis equals the total external moment about that axis. Compound pendulum. Simple applications.*

12. *Ordinary differential equations and applications:*

- (a) *first order, variables separable;*
 (b) *Second order reducing to type (a)*

Format of examination papers:

Ordinary Level: six questions to be answered out of nine

Higher Level: six questions to be answered out of ten.

BIBLIOGRAPHY

List of books for the guidance of teachers

Applied Mathematics (Parts I and II)	McGloughlin	Folens, 1976
A Shorter Intermediate Mechanics	Humphrey & Topping	Longmans
Applied Mathematics for Advanced Level	Mulholland & Phillips	Butterworth
Elementary Mechanics (Parts I and II)	Quadling & Ramsay	Bell
Advanced Level Applied Mathematics	Lambe	English University Press
First Year Applied Mathematics	Cannell	University of London Press
A School Course in Mechanics (Parts I and II)	Bull	Cambridge University Press
Practical and Mathematical Physics, Statics and Dynamics	O'Brien	Gills
Differential Equations	Piaggio	Bell
Theoretical mechanics (Vol. 1)	Plumpton & Tomkys	Pergammon Press
Principles of Mechanics	Synge & Griffith	McGraw-Hill
Berkeley Physics Course Vol 1, Mechanics)	Kittel, Knight & Ruderman	McGraw-Hill