

## 1. Quantities and units in mechanics

- ☐ 1 Fundamental quantities and units in the S.I. system: length, time, mass
- ☐ 2 Derived quantities and units: velocity, acceleration, force, weight, moment
- ☐ 3 Convert one unit into another
- ☐ 4 Position, displacement, distance travelled, velocity, speed, acceleration
- ☐ 5 Understand, use and interpret graphs in kinematics for motion in a straight line
- ☐ 6 Displacement against time and interpretation of gradient
- ☐ 7 Velocity against time and interpretation of gradient and area under the graph
- ☐ 8 Understand, use and derive the formulae for constant acceleration for motion in a straight line
- ☐ 9 Understand and use suvat formulae for constant acceleration in 2-D
- ☐ 10 Use calculus in kinematics for motion in a straight line
- ☐ 11 Extend to 2 dimensions using vectors, Differentiation and integration of a vector with respect to time
- ☐ 12 Model motion under gravity in a vertical plane using vectors; projectiles
- ☐ 13 Derivation of formulae for time of flight, range and greatest height and the derivation of the equation of the path of a projectile

## 2. Forces and Newton's laws

- ☐ 1 Understand and use Newton's first law. Normal reaction, tension, thrust or compression, resistance
- ☐ 2 Understand and use Newton's second law for motion in a straight line
- ☐ 3 Situations where forces need to be resolved (2D)
- ☐ 4 Understand and use weight and motion in a straight line under gravity, acceleration
- ☐ 5 Understand and use Newton's third law
- ☐ 6 Application to problems involving smooth pulleys and connected particles
- ☐ 7 Resolving forces in 2 dimensions; equilibrium of a particle under coplanar forces
- ☐ 8 Understand and use addition of forces; resultant forces; dynamics for motion in a plane
- ☐ 9 Understand and use the  $F \leq \mu R$  model for friction; coefficient of friction; motion of a body on a rough surface; limiting friction and statics

## 3. Moments

- ☐ 1 Understand and use moments in simple static contexts
- ☐ 2 Problems involving parallel and nonparallel coplanar forces, e.g. ladder problems