**AS Level Mechanics 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **What You Need To Know** | pe03020_[1] | pe03018_[1] | pe03019_[1] |
| 1. Mathematical Modelling
 | * Use of assumptions in simplifying reality.
* Mathematical analysis of models.
* Interpretation and validity of models. This includes commenting on the modelling assumptions made when using the terms such as particle, light, inextensible string, smooth surface and motion under gravity.
* Refinement and extension of models.
 |  |  |  |
| 1. Kinematics in 1 and 2 Dimensions
 | * Displacement, speed, velocity, acceleration. Understanding the difference between displacement and distance.
* Sketching and interpreting kinematics graphs, and use the gradient and area under graphs to solve problems.
* Use the constant acceleration equations.
* Vertical motions under gravity.
* Average speed and average velocity.
* Application of vectors in 2D to represent position velocity or acceleration.
* Use of unit vectors **i** and **j**
* Magnitude and direction of quantities represented by a vector.
* Finding position, velocity, speed and acceleration of a particle moving in 2D with constant acceleration.
* Problems involving resultant velocities, including solution using either vectors or vector triangles.
 |  |  |  |
| 1. Static and Forces
 | * Drawing force diagrams, identifying forces present and clearly labelling diagrams.
* Force of gravity.
* Friction, limiting friction, coefficient of friction and the relationship of $F\leq μR$.
* Normal reaction forces.
* Tensions in strings and rods, thrust in rods.
* Modelling forces as vectors. Only in 2D
* Finding the resultant force acting on a particle.
* Knowledge that the resultant force is zero if the body is in equilibrium. This is used to find unknown forces on a body at rest.
 |  |  |  |
| 1. Momentum
 | * Concept of momentum.
* The principle conservation of momentum applied to 2 particles.
 |  |  |  |
| 1. Newton’s Laws of Motion
 | * Newton’s 3 laws of motion in 1D and 2D.
* Simple applications of the above to the linear motion of a particle of constant mass. Including particles moving up or down an inclined plane.
* Use of $F\leq μR$ as a model for dynamic friction.
 |  |  |  |
| 1. Connected Particles
 | * Connected particle problems that include:
	+ 2 particles connected by a light inextensible string passing over a smooth fixed peg
	+ Car and a trailer etc.
 |  |  |  |
| 1. Projectiles
 | * Motion of a particle under gravity in 2D and be aware of any assumptions you make.
* Calculate the range, time of a flight and maximum height. Also the initial speed or angles of the projectile.
* Modification of equations to take account of the height of release.
 |  |  |  |