

## Unit M3 Mechanics 3

Candidates will be expected to be familiar with the knowledge, skills and understanding implicit in Units C1, C2, C3, C4, M1 and M2.

Candidates will also be expected to use appropriate mathematical modelling techniques and be aware of underlying modelling assumptions.

Topics	Notes
<p>1. Formation and solution of first order differential equation with separable variables. Formation and solution of second order differential equation of the form</p> $a \frac{d^2 x}{dt^2} + b \frac{dx}{dt} + cx = \alpha t + \beta$ <p>where <math>a, b, c, \alpha, \beta</math> are constants.</p>	<p>The ability to express stated laws as differential equations and interpret their solutions. The auxiliary equation, complementary function, the particular integral. The roots of the auxiliary equation may be real or complex, distinct or equal. Candidates will be expected to quote and use the appropriate form of the complementary function in each case.</p>
<p>2. Rectilinear motion.</p> <p>Formation and solution of simple equations of motion in which</p> <p>(i) acceleration is given as a function of time, displacement or velocity,</p> <p>(ii) velocity is given as a function of time or displacement.</p>	<p>To include use of <math>\frac{d^2 x}{dt^2} = \frac{dv}{dt} = v \frac{dv}{dx}</math>.</p>
<p>3. Simple Harmonic Motion.</p>	<p>Candidates will be expected to set up the differential equation of motion, identify the period, amplitude and appropriate forms of solution. Candidates may quote formulae in problems unless the question specifically requires otherwise. Questions may involve light elastic strings or springs. Questions may require the refinement of the mathematical model to include damping. Angular S.H.M. is <b>not</b> included.</p>

<b>Topics</b>	<b>Notes</b>
<b>4.</b> Impulsive tensions in strings	
Motion of connected particles involving impulse.	Two-dimensional problems may be set.
<b>5.</b> Statics.	
Equilibrium of a single rigid body under the action of coplanar forces where the forces are not all parallel	Problems may include rods resting against rough or smooth walls and on rough ground. Considerations of jointed rods is not required. Questions involving toppling will <b>not</b> be set.