**Little Heath Sixth Form**

**Mathematics** Personal Learning Checklist

**Student Name: ……………………….…………………………………..………**

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| **Unit Name:****Mathematics (Mechanics 2)** | **Unit Code:****MM2B** |
| *Minimum Target Grade:* | *Aspirational Target Grade:* |

*KEY:* ***Red =*** *with difficulty* ***Amber*** *= not sure* ***Green*** *= yes*

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| --- | --- | --- | --- |
| **GCSE Re-Cap (Skills and Knowledge from M1)** | **Red** | **Amber** | **Green** |
| * Be able to use components of forces Fx=F$\sin(θ)$ or Fy=F$\cos(θ)$
 |  |  |  |
| * Know and use suvat equations
 |  |  |  |
| * Know and use the equation for Friction ie Fr$ \leq µR$
 |  |  |  |
| * Know and use **roruvat** in vector form
 |  |  |  |
| * Know and use F=ma
 |  |  |  |

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| **Skills/Knowledge/Specification** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| * **MOMENTS and CENTRES OF MASS**
 |  |  |  |  |
| * Use Fd and Fd sin θ to calculate the moment of a force about a point
 |  |  |  |  |
| * Understand that clockwise = anticlockwise in equilibrium situations
 |  |  |  |  |
| * Calculate with moments when forces are given as vectors and points as co-ordinates
 |  |  |  |  |
| * Solve balance problems for uniform rods
 |  |  |  |  |
| * Solve balance problems for non-uniform rods
 |  |  |  |  |
| * Solve balance problems when on the point of tilting about one pivot
 |  |  |  |  |
| * Solve problems the equilibrium of a rigid body when the resultant force and the resultant moment are both zero
 |  |  |  |  |
|  |  |  |  |  |
| * Solve problems when all the forces are parallel ie horizontal beam or a ladder leaning against a wall
 |  |  |  |  |
| * Finding the centres of mass of a symmetrical lamina eg circles, rectangles
 |  |  |  |  |
| * Find the centre of mass $\left(\overbar{X}\right.$,$\left.\overbar{Y}\right)$ a system of particles using $\overbar{X}\sum\_{}^{}m$i =$\sum\_{}^{}m$ixi and $\overbar{Y}\sum\_{}^{}m$=$\sum\_{}^{}m$iyi
 |  |  |  |  |
| * Find the angle made with the horizontal or vertical of a body when suspended from a given point
 |  |  |  |  |
| **KINEMATICS AND VARIABLE ACCELERATION** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| * Solve problems involving calculus where the position vector is given as a function of time ie $\overline{r}$ = f(t)$\overline{i}$ + g(t)$ \overline{j}$ + h(t)$ \overline{k}$
 |  |  |  |  |
| * Solve problems involving calculus where the velocity vector is given as a function of time ie $\overline{v}$ = f’(t)$\overline{i}$ + g’(t)$ \overline{j}$ + h’(t)$ \overline{k}$
 |  |  |  |  |
| * Solve problems involving calculus where the acceleration vector is given as a function of time ie $\overline{a}$ = f’’(t)$\overline{i}$ + g’’(t)$ \overline{j}$ + h’’(t)$ \overline{k}$
 |  |  |  |  |
| * Solve problems by differentiating displacements or position vectors to give velocities for one two or three dimensions
 |  |  |  |  |
| * Solve problems by differentiating velocity vectors to give accelerations for one two or three dimensions
 |  |  |  |  |
| * Solve problems by integrating acceleration vectors to give velocities for one two or three dimensions
 |  |  |  |  |
| * Solve problems by integrating velocity vectors to give displacements for one two or three dimensions
 |  |  |  |  |
| * Find the maximum velocity at a given time
 |  |  |  |  |
| * Use initial conditions to find the constant of integration
 |  |  |  |  |
| **APPLICATIONS OF DIFFERENTIAL EQUATIONS**  | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| * Use F = m $\frac{dv}{dt}$ to form differential equations
 |  |  |  |  |
| * Solve differential equations of the form F = m $\frac{dv}{dt}$ by using ‘separating variables’ to obtain relationships between velocity and time.
 |  |  |  |  |
| * Use initial conditions to find the constant of integration
 |  |  |  |  |
| **UNIFORM CIRCULAR MOTION (HORIZONTAL)** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| Convert angular speed from revolutions per minute to radians per second |  |  |  |  |
| Know that velocity is tangential to a circle |  |  |  |  |
| Know that acceleration is directed towards the centre of the circle |  |  |  |  |
| * Know and use the relationships v = rω and a = r ω2 = $\frac{v^{2}}{r}$
 |  |  |  |  |
| * Solve problems such as conical pendulums
 |  |  |  |  |
| * Use position, velocity, and acceleration vectors in relation to circular motion in terms of **i** and **j**
 |  |  |  |  |
| **WORK, ENERGY AND POWER** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| * Calculate kinetic energy using KE = 1/2mv2
 |  |  |  |  |
| * Calculate gravitational potential energy using GPE = mgh
 |  |  |  |  |
| * Calculate work done by a force ie Wk Done = Force x distance = change in energy
 |  |  |  |  |
| * Use the conservation of energy
 |  |  |  |  |
| * Calculate elastic potential energy ie EE = $\frac{λx^{2}}{2l}$ and prove the equation
 |  |  |  |  |
| * Use Hookes’ Law to find the tension in a stretched elastic strings or springs ie T = $\frac{λx}{l}$
 |  |  |  |  |
| * Calculate Power as the rate at which a force does work, and the relationship P = Fv
 |  |  |  |  |
| * Solve problems involving maximum velocity and maximum power
 |  |  |  |  |
|  |  |  |  |  |
| **VERTICAL CIRCULAR MOTION** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| * Use the conservation of energy to solve problems
 |  |  |  |  |
| * Use F=ma towards the centre of the circle where a= $\frac{v^{2}}{r}$ or r ω2
 |  |  |  |  |
| * Find the height gained by a given object using trigonometry
 |  |  |  |  |
| * Be able to solve problems in context such as a body on an inelastic string, Eskimo on an igloo, bead on a wire
 |  |  |  |  |
| * Know and use the condition for the body to make complete circles
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| **REVISION****Use the information on this checklist to make revision cards and notes** |

**Grade tracking:**

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| *Grade* | *Date* | *Grade* | *Date* | *Grade* | *Date* |
|  |  |  |  |  |  |
| *Grade* | *Date* | *Grade* | *Date* | *Grade* | *Date* |
|  |  |  |  |  |  |

*Note: You should discuss this checklist regularly with your subject teacher/mentor*