

Things to remember in the last hour before the exam: Level 3 Mechanics

(This is not a revision sheet – you’ve done that by now - it’s a list of things you might want to memorise at the last minute...)

- Most equations are only used once so highlight an equation once you have used it.
- The formulae on the equation sheet are in an order: linear motion (2 rows), angular motion (4 rows), forces – gravitational and centripetal (1 row), SHM (3 rows)
- Any constants you need e.g. $e = 1.6 \times 10^{-19} \text{ C}$ will be given to you e.g.

Useful data	
Speed of light	$= 3.00 \times 10^8 \text{ m s}^{-1}$
Charge on the electron	$= -1.60 \times 10^{-19} \text{ C}$
Acceleration due to gravity on Earth	$= 9.81 \text{ m s}^{-2}$
Permittivity of free space	$= 8.85 \times 10^{-12} \text{ F m}^{-1}$
Universal gravitational constant	$= 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
- You must convert quantities into **SI** before using them in an equation (e.g. $5 \text{ mC} = 5 \times 10^{-3} \text{ C}$) Remember prefixes ($n = 10^{-9}$, $\mu = 10^{-6}$, $m = 10^{-3}$, $c = 10^{-2}$, $k = 10^3$, $M = 10^6$, $G = 10^9$)
- If you can’t remember the units, use the units on the other side of the equation e.g. $I = \Sigma mr^2$ so moment of inertia, I has units of $\text{kg (from } m) \times \text{m}^2 \text{ (from } r^2)$ i.e. kg m^2
- If you are asked to give the answer to the correct number of significant figures use the information in the question (the least number of significant figures) and write your rounded answer after your calculated answer (and not instead of) – have a guess if you can’t remember and it isn’t the same rule as Chemistry. This will probably appear in one question or not at all
- $v = A \omega \cos \omega t$ can be simplified to $v = A \omega$ if you are asked for the maximum value – this works for all 6 SHM formula with sin and cos in (ignore the sin or cos if asked for the **maximum**)
- $I = \Sigma mr^2$ or $I = \Sigma \frac{1}{2}mr^2$ or $I = \Sigma \frac{2}{5}mr^2$ or..... whatever. More importantly: **$I \propto m$** and **$I \propto r^2$** – something else to put into your short term memory. You might be lucky and they might give it to you.
- “Show that” means state the equation you need to use, write it again with the numbers inserted and then check the answer matches the question.
- “Label” including a label (e.g. “ $\rightarrow F_c$ ” not just “ \rightarrow ”)
- The centre of mass of a system remains at rest or moving at a constant velocity providing the system remains an isolated system (Newton’s first law)
- Remember the conservation laws: Momentum and angular momentum are conserved unless an external force or external torque acts.
- $\Delta p = F \times \Delta t$ is rarely used but $F = \Delta p / \Delta t$ is. Practice rearranging to **$F = \Delta p / \Delta t$** and – if needs be - write it down on the exam paper as soon as you are allowed to.
- The conditions required for SHM can be explained by writing $a = -\omega^2 y$ and then explaining what the $-$, the y and the ω^2 are.
- A reference circle is a circle and a phasor is a vector that rotates anticlockwise inside it
- Be prepared to have a guess in this exam (remember only you and the marker get to read what you have written).
- Leave any derivations (calculus stuff) e.g.

$$t_{\text{total}} = \frac{\omega}{\alpha} + \frac{\theta_2}{\omega} \quad \text{until last....}$$