CfE Advanced Higher Physics **Unit 1- Rotational Motion & Astrophysics LOs**

Name_____ **Teacher_____**

✓	**I am confident that I understand this and I can apply this to problems**
?	**I have some understanding but I need to revise this some more**
✘	**I don't know this or I need help because I don't understand it**

1.1 Kinematic Relationships	Covered (✓)	How well can you do this?
1. Can I derive the equations $v = u + at, s = ut + \frac{1}{2}at^2, v^2 = u^2 + 2as$ for linear motion with a constant acceleration from $a = \frac{dv}{dt}$ i.e. $a = \frac{d^2s}{dt^2}$?		✘ ? ✓
2. Can I carry out calculations using the equations above?		✘ ? ✓
3. Do I know what is represented by the gradient of a displacement-time graph?		✘ ? ✓

	Covered (✓)	How well can you do this?
4. Do I know what is represented by the gradient of a velocity-time graph?		✗ ? ✓
5. Do I know how to calculate displacement from a velocity-time graph?		✗ ? ✓

1.2 Angular Motion	Covered (✓)	How well can you do this?
1. Do I understand what is meant by angular displacement?		✗ ? ✓
2. Can I carry out calculations involving the equation $s = r\theta$?		✗ ? ✓
3. Can I describe what is meant by angular velocity?		✗ ? ✓
4. Can I carry out calculations involving the equation $\omega = \frac{d\theta}{dt}$?		✗ ? ✓

	Covered (✓)	How well can you do this?
5. Can I carry out calculations involving $\alpha = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$?		✗ ? ✓
6. Can I carry out calculations involving the following equations $\omega = \omega_0 + \alpha t$ $\theta = \omega_0 t + \frac{1}{2}\alpha t^2$ $\omega^2 = \omega_0^2 + 2\alpha\theta$ where α is a constant angular acceleration?		✗ ? ✓
7. Do I understand what is meant by tangential velocity?		✗ ? ✓
8. Can I carry out calculations involving $v = r\omega$?		✗ ? ✓
9. Can I carry out calculations involving $\omega = \frac{2\pi}{T}$ where T = period?		✗ ? ✓
10. Do I understand what is meant by tangential acceleration?		✗ ? ✓

	Covered (✓)	How well can you do this?
11. Do I understand what is meant by radial (centripetal) acceleration and how it is different from tangential acceleration?		✗ ? ✓
12. Can I derive the equation for centripetal acceleration $a_r = \frac{v^2}{r} = r\omega^2$ And carry out calculations using this equation?		✗ ? ✓
13. Can I describe how a central (centripetal) force allows an object to rotate in circular motion?		✗ ? ✓
14. Can I carry out calculations involving $F = \frac{mv^2}{r} = mr\omega^2$?		✗ ? ✓

1.3 Rotational Dynamics	Covered (✓)	How well can you do this?
1. Can I explain what is meant by torque?		✗ ? ✓
2. Can I carry out calculations involving $T = Fr$ Where F is the force applied at right angles to the axis of rotation?		✗ ? ✓
3. Can I describe the effect of applying an unbalanced torque?		✗ ? ✓
4. Do I understand how an unbalanced torque can affect angular acceleration?		✗ ? ✓
5. Can I explain what is meant by moment of inertia?		✗ ? ✓
6. Do I understand what the moment of inertia of an object depends on?		✗ ? ✓

	Covered (✓)	How well can you do this?
7. Can I carry out calculations involving $T = I\alpha$?		✖ ? ✓
8. Can I describe what is meant by angular momentum?		✖ ? ✓
9. Can I carry out calculations involving $L = I\omega$?		✖ ? ✓
10. Can I carry out calculations involving $L = mvr = mr\omega^2$?		✖ ? ✓
11. Can I explain the principle of conservation of angular momentum?		✖ ? ✓
12. Can I explain the difference between linear and rotational kinetic energy?		✖ ? ✓
13. Can I carry out calculations involving $E_{k(rot)} = \frac{1}{2}\mathrm{I}\omega^2$?		✖ ? ✓

1.4 Gravitation	Covered (✓)	How well can you do this?
1. Can I define gravitational field strength?		✗ ? ✓
2. Can I sketch gravitational field lines for an isolated point mass?		✗ ? ✓
3. Can I sketch gravitational field lines around 2 point masses?		✗ ? ✓
4. Can I carry out calculations involving $F = \frac{Gm_1m_2}{r^2}$ Where G is the gravitational constant?		✗ ? ✓
5. Can I define what is meant by gravitational potential?		✗ ? ✓
6. Do I know how to define the zero of gravitational potential?		✗ ? ✓
7. Can I carry out calculations involving $V = -\frac{Gm}{r}$?		✗ ? ✓
8. Can I define what is meant by gravitational potential energy?		✗ ? ✓

	Covered (✓)	How well can you do this?
9. Can I carry out calculations involving $E_p = Vm = -\frac{GMm}{r}$?		✗ ? ✓
10. Can I explain what a conservative field is?		✗ ? ✓
11. Can I explain the term escape velocity?		✗ ? ✓
12. Can I derive the expression $v = \sqrt{\frac{2Gm}{r}}$ And carry out calculations using this equation?		✗ ? ✓
13. Can I explain what is meant by a black hole?		✗ ? ✓
14. Can I explain the terms Schwarzschild radius and event horizon?		✗ ? ✓

	Covered (✓)	How well can you do this?
15. Can I explain the concept of gravitational redshift?		

1.5 General Relativity	Covered (✓)	How well can you do this?
1. Can I explain the equivalence principle?		✗ ? ✓
2. Do I understand what is meant by space-time?		✗ ? ✓
3. Do I understand that space-time can be curved by mass?		✗ ? ✓
4. Can I explain how the curvature of space-time can affect the motion of mass and light?		✗ ? ✓
5. Do I understand the evidence for and consequences of the curvature of space time, i.e. gravitational lensing and the precession of Mercury?		✗ ? ✓

1.6 Stellar Physics	Covered (✓)	How well can you do this?
1. Can I use the following terms correctly in context: Surface temperature, core, photosphere and corona?		✗ ? ✓
2. Do I understand what is meant by the luminosity of a star?		✗ ? ✓
3. Can I carry out equations using $L = 4\pi r^2 \sigma T^4$?		✗ ? ✓
4. Can I explain what is meant by the apparent and absolute magnitude of a star?		✗ ? ✓
5. Can I explain how stars are classified?		✗ ? ✓
6. Can I explain how stars maintain gravitational equilibrium, with reference to nuclear fusion reactions?		✗ ? ✓
7. Can I describe the process of star formation?		✗ ? ✓
8. Can I explain what the Hertzsprung-Russell diagram is and the significance of a star's position on it?		✗ ? ✓

9. Can I explain what happens to a star at the end of its life cycle and how this depends on the mass of the star?		✗ ? ✓