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**Knowledge Rich Curriculum Plan**

Science – Physics

Year 13



| **Science**  **Year 13 Physics** | **Unit: Further Mechanics Review** |  |  |
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| **Lesson/Learning Sequence** | **Intended Knowledge:**  *Students will know that…* | **Tiered Vocabulary** | **Prior Knowledge:**  *In order to know this students, need to already know that…* |
| **Lesson:**  **Circular Motion** | * Students will know that motion in a circular path at constant speed implies there is acceleration and requires a centripetal force * Students will know how to use equations involving angular speed, centripetal acceleration and centripetal force * Students will know that radians are used to measure the angle | Centripetal force: force acting towards the centre of circular motion | * ***Students need to already know that centripetal force is the force acting towards the centre of the circle during circular motion*** |
| **Lesson:**  **Simple Harmonic Motion** | * Students will know that for simple harmonic motion to take place:   - acceleration is directly proportional to displacement, but in the opposite direction  - the restoring force is directly proportional to the displacement   * Students will know that the restoring force is the force pulling or pushing the object back towards the midpoint * Students will know how to complete calculations involving acceleration, displacement, angular speed, maximum speed and maximum acceleration * Students will know how to represent variations with displacement, velocity and acceleration with time * Students will know how to explain how the v-t graph is derived from the x-t graph, and how the a-t graph is derived from the v-t graph * Students will know that frequency and period don't depend on amplitude |  | * ***Students need to already know that the gradient of a displacement time graph calculates the velocity*** * ***Students need to already know that the gradient on a velocity time graph calculates the acceleration*** |
| **Lesson:**  **Simple Harmonic Systems** | * Students will know that mass on a spring and a pendulum are examples of simple harmonic systems * Students will know that the time period for oscillations in a mass on a spring is dependent on mass and spring constant * Students will know that the time period for oscillations in a pendulum is dependent on length of the pendulum and gravity * Students will know that gravitational potential energy and kinetic energy (in a pendulum system) will interchange * Students will know how to describe the energy changes in a pendulum swing * Students will know that elastic potential energy and kinetic energy (in a mass on a spring system) will interchange * Students will know how to describe the energy changes in a mass on a spring * Students will know how to complete calculations involving time period, mass and spring constant * Students will know how to complete calculations involving time period, length and gravitational field strength |  | * ***Students need to already know that for simple harmonic motion to take place:***   ***- acceleration is directly proportional to displacement, but in the opposite direction***  ***- the restoring force is directly proportional to the displacement*** |
| **Lesson:**  **Required Practical 7** | * Students will know how to investigate simple harmonic motion using a mass-spring system and a simple pendulum |  | * ***Students need to already know that mass on a spring and a pendulum are examples of simple harmonic systems*** * ***Students need to already know that the time period for oscillations in a mass on a spring is dependent on mass and spring constant*** * ***Students need to already know that the time period for oscillations in a pendulum is dependent on length of the pendulum and gravity*** * ***Students need to already know that gravitational potential energy and kinetic energy (in a pendulum system) will interchange*** * ***Students need to already know how to describe the energy changes in a pendulum swing*** * ***Students need to already know that elastic potential energy and kinetic energy (in a mass on a spring system) will interchange*** * ***Students need to already know how to describe the energy changes in a mass on a spring*** * ***Students need to already know how to complete calculations involving time period, mass and spring constant*** * ***Students need to already know how to complete calculations involving time period, length and gravitational field strength*** |
| **Lesson:**  **Forced Vibrations and Resonance** | * Students will know that resonant frequency is the frequency a system would freely oscillate at * Students will know that a forced vibration is where a system is forced to vibrate by an external force * Students will know that the frequency of the force above is called the driving frequency * Students will know that if the driving frequency is less than the resonant frequency then the two are in phase, and the oscillator will just follow the motion of the driver * Students will know that if the driving frequency is greater than the resonant frequency, the oscillator won't be able to keep up and they'd be out of phase * Students will know that resonance occurs when the driving frequency is equal to the resonant frequency * Students will know that when energy is lost to the surroundings it is called damping * Students will know that light damping reduces the amplitude of the oscillation gradually over time, whilst heavy damping reduces the amplitude quicker * Students will know that critical damping reduces the amplitude in the shortest time possible * Students will know that overdamping causes the system to return to equilibrium slower than a critically damped system * Students will know how to explain the effects of damping on resonance | Damping: the loss of energy to the surroundings in a simple harmonic motion system | * ***Students need to already know that due to resistive forces there are no circumstances where energy can be transferred with perfect efficiency*** |