**Physics Checklist Waves Topic**

For each Learning Objective, rate your understanding (1 very little – 5 excellent) both before you have started revising and afterwards.

**3.3.1 Progressive and stationary waves**

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| **3.3.1.1 -Progressive waves** |
|  | Before Revision (1-5) | After Revision (1-5) |
| Oscillation of the particles of the medium; |  |  |
| amplitude, frequency, wavelength, speed, phase, phase difference, $c=fλ$, $f=\frac{1}{T}$ |  |  |
| Phase difference may be measured as angles (radians and degrees) or as fractions of a cycle. |  |  |

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| **3.3.1.2 Longitudinal and transverse waves** |
|  | Before Revision (1-5) | After Revision (1-5) |
| Nature of longitudinal and transverse waves. |  |  |
| Examples to include: sound, electromagnetic waves, and waves on a string. |  |  |
| Students will be expected to know the direction of displacement of particles/fields relative to the direction of energy propagation and that all electromagnetic waves travel at the same speed in a vacuum. |  |  |
| Polarisation as evidence for the nature of transverse waves. |  |  |
| Applications of polarisers to include Polaroid material and the alignment of aerials for transmission and reception. |  |  |
| Malus’s law will not be expected. |  |  |

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| **3.3.1.3 Principle of superposition of waves and formation of stationary waves** |
|  | Before Revision (1-5) | After Revision (1-5) |
| Stationary waves. |  |  |
| Nodes and antinodes on strings.$f=\frac{1}{2l}\sqrt{\frac{T}{μ}}$ for first harmonic |  |  |
| The formation of stationary waves by two waves of the same frequency travelling in opposite directions. |  |  |
| A graphical explanation of formation of stationary waves will be expected. |  |  |
| Stationary waves formed on a string and those produced with microwaves and sound waves should be considered. |  |  |
| Stationary waves on strings will be described in terms of harmonics. The terms fundamental (for first harmonic) and overtone will **not** be used. |  |  |
| **Required practical 1:** Investigation into the variation of the frequency of stationary waves on a string with length, tension and mass per unit length of the string. |  |  |

**3.3.2 Refraction, diffraction and interference**

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| **3.3.2.1 Interference** |
|  | Before Revision (1-5) | After Revision (1-5) |
| Path difference. Coherence. |  |  |
| Interference and diffraction using a laser as a source of monochromatic light. |  |  |
| Young’s double-slit experiment: the use of two coherent sources or the use of a single source with double slits to produce an interference pattern. |  |  |
| Fringe spacing, $w=\frac{λD}{s}$ |  |  |
| Production of interference pattern using white light. |  |  |
| Students are expected to show awareness of safety issues associated with using lasers. |  |  |
| Students will not be required to describe how a laser works. |  |  |
| Students will be expected to describe and explain interference produced with sound and electromagnetic waves. |  |  |
| Appreciation of how knowledge and understanding of nature of electromagnetic radiation has changed over time. |  |  |
| **Required practical 2:** Investigation of interference effects to include the Young’s slit experiment and interference by a diffraction grating. |  |  |

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| **3.3.2.2 Diffraction**  |
|  | Before Revision (1-5) | After Revision (1-5) |
| Appearance of the diffraction pattern from a single slit using monochromatic and white light. |  |  |
| Qualitative treatment of the variation of the width of the central diffraction maximum with wavelength and slit width. The graph of intensity against angular separation is not required. |  |  |
| Plane transmission diffraction grating at normal incidence.  |  |  |
| Derivation of *d*$\sin(θ=nλ)$ |  |  |
| Use of the spectrometer will not be tested. |  |  |
| Applications of diffraction gratings. |  |  |

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| **3.3.2.3 Refraction at a plane surface** |
|  | Before Revision (1-5) | After Revision (1-5) |
| Refractive index of a substance $n=\frac{c}{c\_{s}}$ |  |  |
| Students should recall that the refractive index of air is approximately 1. |  |  |
| Snell’s law of refraction for a boundary $n\_{1}sinθ\_{1}=n\_{2}sinθ\_{2}$Total internal reflection $sinθ\_{c}=\frac{n\_{2}}{n\_{1}}$ |  |  |
| Simple treatment of fibre optics including the function of the cladding. |  |  |
| Optical fibres will be limited to step index only.  |  |  |
| Material and modal dispersion. |  |  |
| Students are expected to understand the principles and consequences of pulse broadening and absorption. |  |  |