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| **Before** | **Objectives** | **After** |
|  | **28 Understand** and **use** the terms *amplitude*, *frequency*, *period*, *speed* and *wavelength.* |  |
|  | **29 Identify** the different regions of the electromagnetic spectrum and **describe** some of their applications. |  |
|  | **30 Use** the wave equation *v* = *f*λ. |  |
|  | **31 Recall** that a sound wave is a longitudinal wave which can be described in terms of the displacement of molecules. |  |
|  | **32 Use** graphs to represent transverse and longitudinal waves, including standing waves. |  |
|  | **33 Explain** and **use** the concepts of wavefront, coherence, path difference, superposition and phase. |  |
|  | **34 Recognise** and **use** the relationship between phase difference and path difference. |  |
|  | **35 Explain** what is meant by a *standing (stationary) wave*, **investigate** how such a wave is formed, and **identify** nodes and antinodes. |  |
|  | **36 Recognise** and **use** the expression for refractive index *1μ2* = *sin i*/*sin r* = *v1*/*v2*, **determine** refractive index for a material inthe laboratory, and predict whether total internal reflection will occur at an interface using critical angle. |  |
|  | **37 Investigate** and **explain** how to measure refractive index. |  |
|  | **38 Discuss** situations that require the accurate determination of refractive index. |  |
|  | **39 Investigate** and **explain** what is meant by *plane polarised light.* |  |
|  | **40 Investigate** and **explain** how to measure the rotation of the plane of polarisation. |  |
|  | **41 Investigate** and **recall** that waves can be diffracted and that substantial diffraction occurs when the size of the gap or obstacle is similar to the wavelength of the wave. |  |
|  | **42 Explain** how diffraction experiments provide evidence for the wave nature of electrons. |  |
|  | **43 Discuss** how scientific ideas may change over time, for example, our ideas on the particle/wave nature of electrons. |  |
|  | **44 Recall** that, in general, waves are transmitted and reflected at an interface between media. |  |
|  | **45 Explain** how different media affect the transmission/ reflection of waves travelling from one medium to another. |  |
|  | **46 Explore** and **explain** how a pulse-echo technique can provide details of the position and/or speed of an object and describeapplications that use this technique. |  |
|  | **47 Explain** qualitatively how the movement of a source of sound or light relative to an observer/detector gives rise to a shift in frequency (Doppler effect) and **explore** applications that use this effect. |  |
|  | **48 Explain** how the amount of detail in a scan may be limited by the wavelength of the radiation or by the duration of pulses. |  |
|  | **49 Discuss** the social and ethical issues that need to be considered, eg, when developing and trialling new medical techniques on patients or when funding a space mission. |  |