PHYA2 3.2.3

Waves

AS Physics:

what you need to know

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| **Progressive waves; longitudinal and transverse waves** | I can do this already | Covered in class | Strength | Weakness | I have  revised this | Book references |
| I understand that mechanical waves (e.g. sound, earthquake waves) require a **medium** in which to travel. |  |  |  |  |  | AQA: 174 |
| I understand that waves **transfer energy** (and information) but do not transfer the medium in which they travel. |  |  |  |  |  |  |
| I understand that many waves can be classified as either **transverse** or **longitudinal**. |  |  |  |  |  | AQA: 174  APfY: 118 |
| I can describe the **oscillation of particles** within a medium for i) transverse waves, ii) longitudinal waves. |  |  |  |  |  | AQA: 174 |
| I can give examples of **transverse** and **longitudinal** waves. |  |  |  |  |  | AQA: 174;  APfY: 118 |
| I can describe key features of waveforms, including **amplitude** and **wavelength**. |  |  |  |  |  | AQA: 176;  APfY: 116 |
| I can explain what is meant by the **frequency** and time **period** of a wave. |  |  |  |  |  | AQA: 176;  APfY: 114 |
| I understand that the relationship between **frequency** (*f*) and time **period** (*T*) is given by . |  |  |  |  |  | AQA: 176;  APfY: 114 |
| I can describe the relationship between the **speed** of a wave (‘wavespeed’) travelling in a particular medium, and its **wavelength** and **frequency**. |  |  |  |  |  | AQA: 177;  APfY: 115 |
| I can recall and use the equation **wavespeed = frequency x wavelength** (. |  |  |  |  |  | AQA: 177;  APfY: 115 |
| I can describe the **phase difference** (φ) between two waves or between two points on the same wave. |  |  |  |  |  | AQA: 177;  APfY: 117 |
| I understand that all waves may undergo **reflection**, **refraction**, **diffraction** and **interference**. |  |  |  |  |  | AQA: 178;  APfY: 126 |
| I can describe what is meant by the term **polarisation**. |  |  |  |  |  | AQA: 175;  APfY: 119 |
| I can explain why **polarisation is a phenomenon associated with transverse** (but not longitudinal) **waves**. |  |  |  |  |  | AQA: 175;  APfY: 119 |
| I can describe applications of polarised waves (e.g. in t.v. transmission), and polarising filters (e.g. Polaroid sunglasses). |  |  |  |  |  | AQA: 175;  APfY: 119 |

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| **Refraction at a plane surface** | | | | | | |
| I understand that light may change speed as it travels from one medium to another (e.g. from air to glass). This phenomenon is called **refraction**. |  |  |  |  |  | AQA: 178;  APfY: 127 |
| I understand that, when light undergoes refraction, its wavelength changes but its frequency (‘colour’) is unchanged. |  |  |  |  |  | AQA: 191;  APfY: |
| I can define the **refractive index** (*ns*) of a substance as the ratio of the speed of light in a vacuum to the speed of light in the substance, i.e. |  |  |  |  |  | AQA: 190;  APfY: 128 |
| I understand that light travelling between two media of differing refractive index will **change direction** (unless it strikes the boundary at right angles). |  |  |  |  |  | AQA: 188;  APfY: 127 |
| I understand that the **refractive index** (*n*) of a substance is also given by |  |  |  |  |  | AQA: 188;  APfY: 127 |
| **Refraction at a plane surface** continued | I can do this already | Covered in class | Strength | Weakness | I have  revised this | Book references |
| I understand that, for light travelling between media with refractive indices *n1* and *n2*,  This relationship is called **Snell’s law**. |  |  |  |  |  | AQA: 191; APfY: 127 |
| I can explain what is meant by **total internal reflection** (T.I.R.). |  |  |  |  |  | AQA: 193;  APfY: |
| I understand what is meant by the term **critical angle** (*ic*). |  |  |  |  |  | AQA: 193;  APfY: 130 |
| I understand that total internal reflection occurs when the angle of incidence is greater than the **critical angle**. |  |  |  |  |  | AQA: 193;  APfY: 130 |
| I recall that |  |  |  |  |  | AQA: 193;  APfY: |
| I can describe applications of total internal reflection, including in **fibre optics**. |  |  |  |  |  | AQA: 193 & 194; APfY: 131 |
| I can describe the basic construction of a **step-index fibre optic** cable. |  |  |  |  |  | AQA: 194;  APfY: 131 |
| **Superposition of waves; stationary waves** | | | | | | |
| I can explain and use the **principle of superposition**. |  |  |  |  |  | AQA: 180;  APfY: 140 |
| I can explain graphically how **stationary** (‘standing’) **waves** are formed. |  |  |  |  |  | AQA: 182;  APfY: 142 |
| I can explain the similarities and differences between progressive and stationary waves. |  |  |  |  |  | AQA: 182;  APfY: |
| I can describe an experiment which demonstrates stationary waves on a stretched **string**. |  |  |  |  |  | AQA: 183;  APfY: 143 |
| I can define the terms **node** and **antinode**. |  |  |  |  |  | AQA: 182;  APfY: 143 |
| I can determine standing wave patterns for stretched strings. |  |  |  |  |  | AQA: 184;  APfY: 143 |
| **Interference** | | | | | | |
| I can explain the terms **interference**, **coherence**, **path difference**. |  |  |  |  |  | AQA: 180, 196 & 199; APfY: 141 |
| I can explain what is meant by **constructive interference** and **destructive interference**. |  |  |  |  |  | APfY: 140 |
| I understand that a **laser** is a source of **coherent monochromatic** light. |  |  |  |  |  | AQA: 200;  APfY: 183 |
| I am aware of safety issues related to the use of lasers. |  |  |  |  |  | AQA: 200 |
| I can describe an **experiment** which demonstrates two-source interference of light. |  |  |  |  |  | AQA: 196 - 198; |
| I can describe the appearance of **fringes** produced from the two-source interference of i) laser light, ii) white light. |  |  |  |  |  | AQA: 199 - 201; |
| I can recall and use the equation for the **fringe spacing** produced by the double-slit interference of light: (where *s* is the slit separation). |  |  |  |  |  | AQA: 198;  APfY: 149 |
| **Diffraction** | | | | | | |
| I understand that light is diffracted when it passes through a **single** slit and can describe the pattern of fringes produced on a screen. |  |  |  |  |  | AQA: 202;  APfY: 145 |
| I can explain what is meant by a **diffraction grating**. |  |  |  |  |  | AQA: 205;  APfY: 150 |
| I can derive the equation (where *n* is the order of diffraction) for the diffraction of light through a diffraction grating. |  |  |  |  |  | AQA: 206;  APfY: 151 |
| I describe applications of diffraction gratings (e.g. in analysing light from stars). |  |  |  |  |  | AQA: 207;  APfY: 151 |

**Book references:** AQA = ***AQA Physics A*** by Breithaupt (Pub. Nelson Thornes) – the AQA endorsed textbook

APfY =***Advanced physics*** *for you* by Johnson, Hewett, Holt and Miller (Pub. Nelson Thornes)